AQUALINC

Resource Consents REPORT

FARM ENVIRONMENTAL MANAGEMENT PLAN

PREPARED FOR
Woldwide One Limited

C14114/06

23/11/2017

PREPARED BY
Nicole Matheson

AQUALINC

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TABLE OF CONTENTS

1 PROPERTY DETAILS

Entity Name:	Woldwide One Limited (Woldwide)
Contact Person:	Jacques Jooste
Legal Description:	Lot 4 DP 399915, Parts Lot 18 DP 942, Lot 1 DP 10885 and Section 420 Taringatura Survey District
Land Area:	Milking platform – 240 ha and Horner block 48 ha
Resource Consents:	Existing discharge consent 301664

This document is designed to be a living document.

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

2 MAPS

2.1 Boundaries

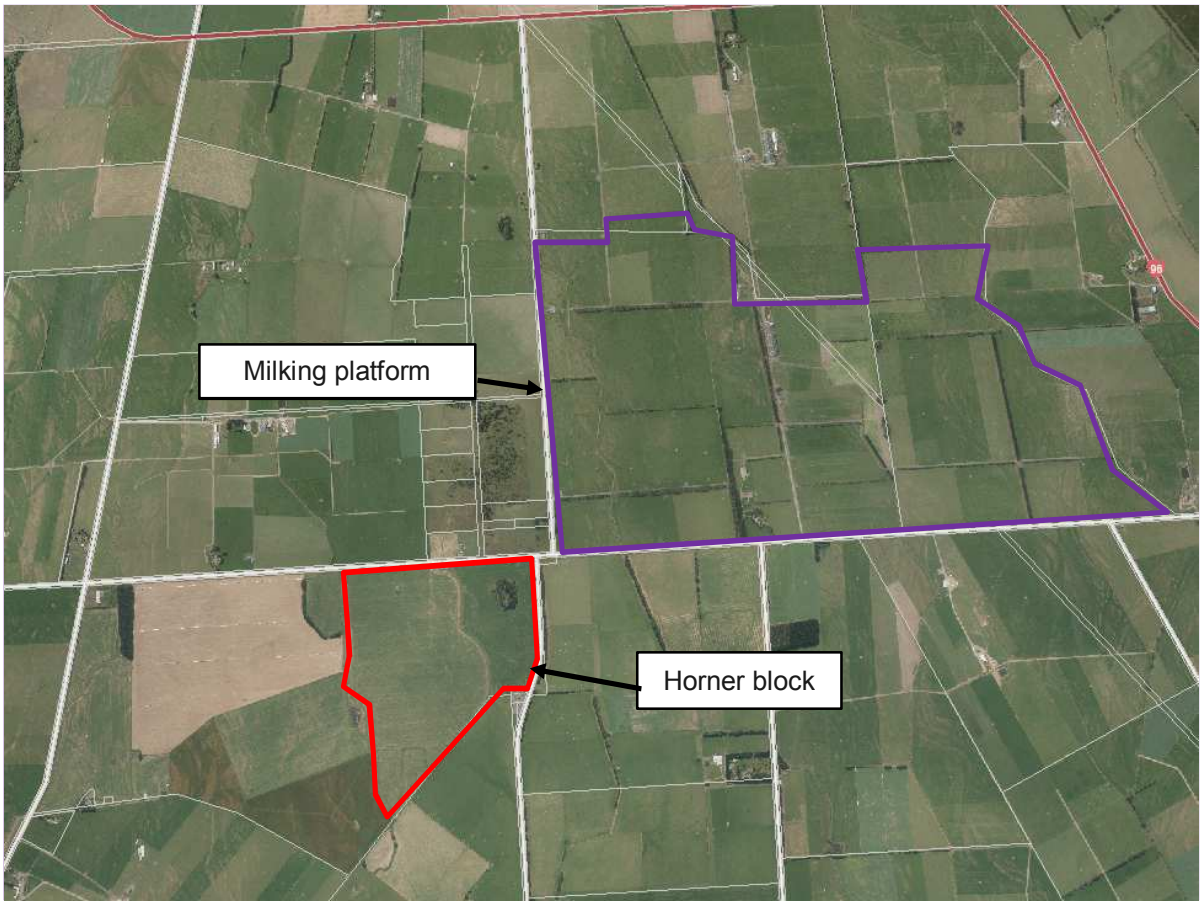


Figure 1:Woldwide One milking platform and Horner block property boundary

2.2 Infrastructure

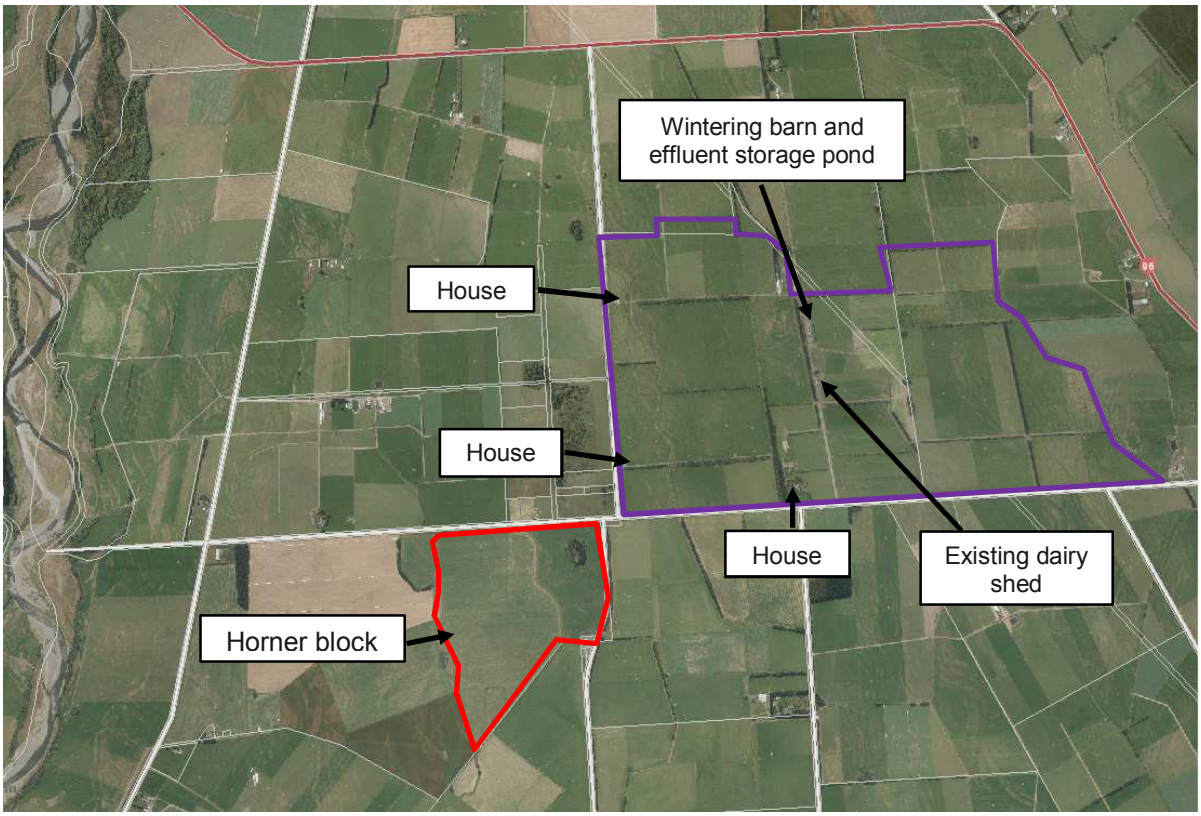


Figure 2: Woldwide One – Location of dairy shed, storage and farm houses

Figure 3: Woldwide One – Effluent discharge areas

2.3 Waterways, Stock Crossings and Critical Source Areas

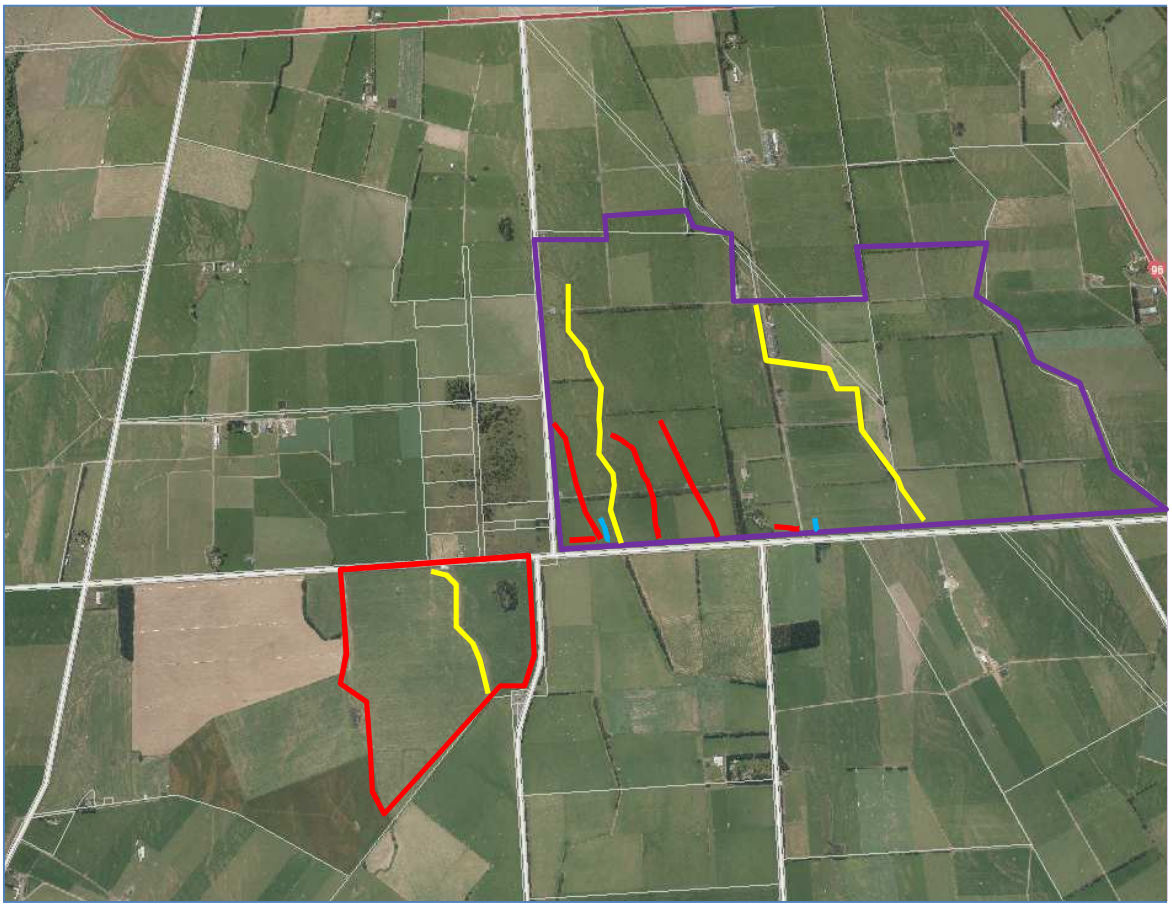


Figure 4: Woldwide One – Waterways and critical source areas

Key	
Open Drain	
Tile Drain	
Critical Source Area	

2.4 Physiographic Zones

The Woldwide One property overlies Oxidising and Central Plains Physiographic Zones as shown in Figure 5.

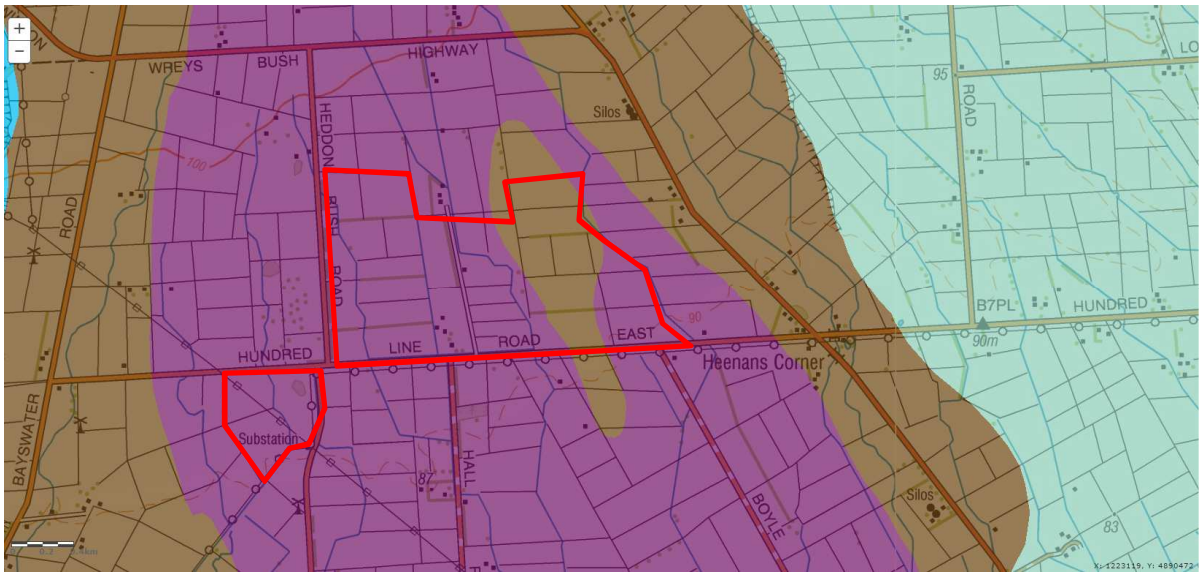


Figure 5: Map of physiographic zones at the Woldwide One and Horner block property

Physiographic Zones

- Alpine - No Variant
- Bedrock/Hill Country - Artificial Drainage
- Bedrock/Hill Country - No Variant
- Bedrock/Hill Country - Overland Flow
- Central Plains - No Variant
- Gleyed - No Variant
- Gleyed - Overland Flow
- Lignite - Marine Terraces - Artificial Drainage
- Lignite - Marine Terraces - No Variant
- Lignite - Marine Terraces - Overland Flow
- Old Mataura - No Variant
- Oxidising - Artificial Drainage
- Oxidising - No Variant
- Oxidising - Overland Flow
- Peat Wetlands - No Variant
- Riverine - No Variant
- Riverine - Overland Flow
- Urban Area

2.5 Riparian Vegetation and Fencing

There are numerous small streams and drains which flow through the Wordwide One property. All streams and drains are fenced off to ensure cows cannot enter the waterways.

2.6 Heritage

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

2.7 Significant Indigenous Biodiversity

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

2.8 Soils

The soil types and areas shown on Topoclimate appear to be incorrect, John Scandrett (Scandrett Rural) has mapped the soil on the property as shown in Figure 6. The soils for the Horner block have been obtained from the Topoclimate layer in Environment Southlands Beacon mapping service. The Horner block is overlying by Braxton and Pukemutu soils as shown in Figure 7.

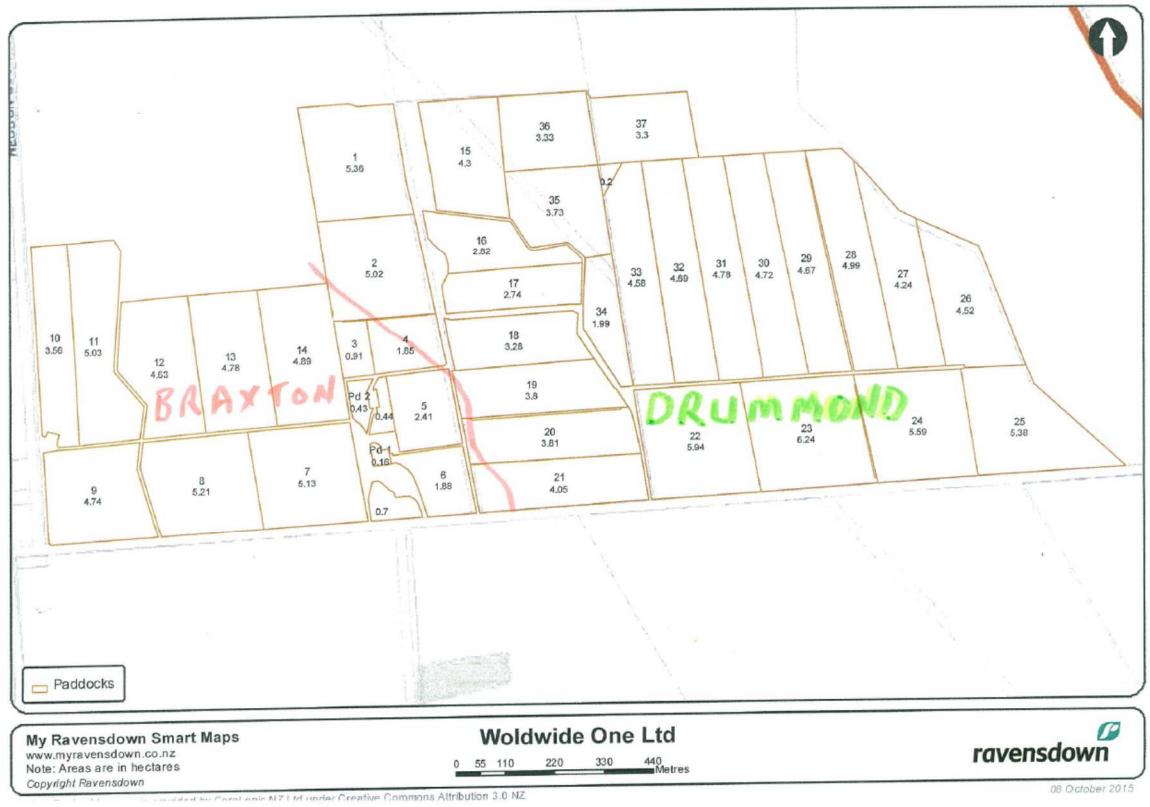


Figure 6: Map of soil types at the Woldwide One property

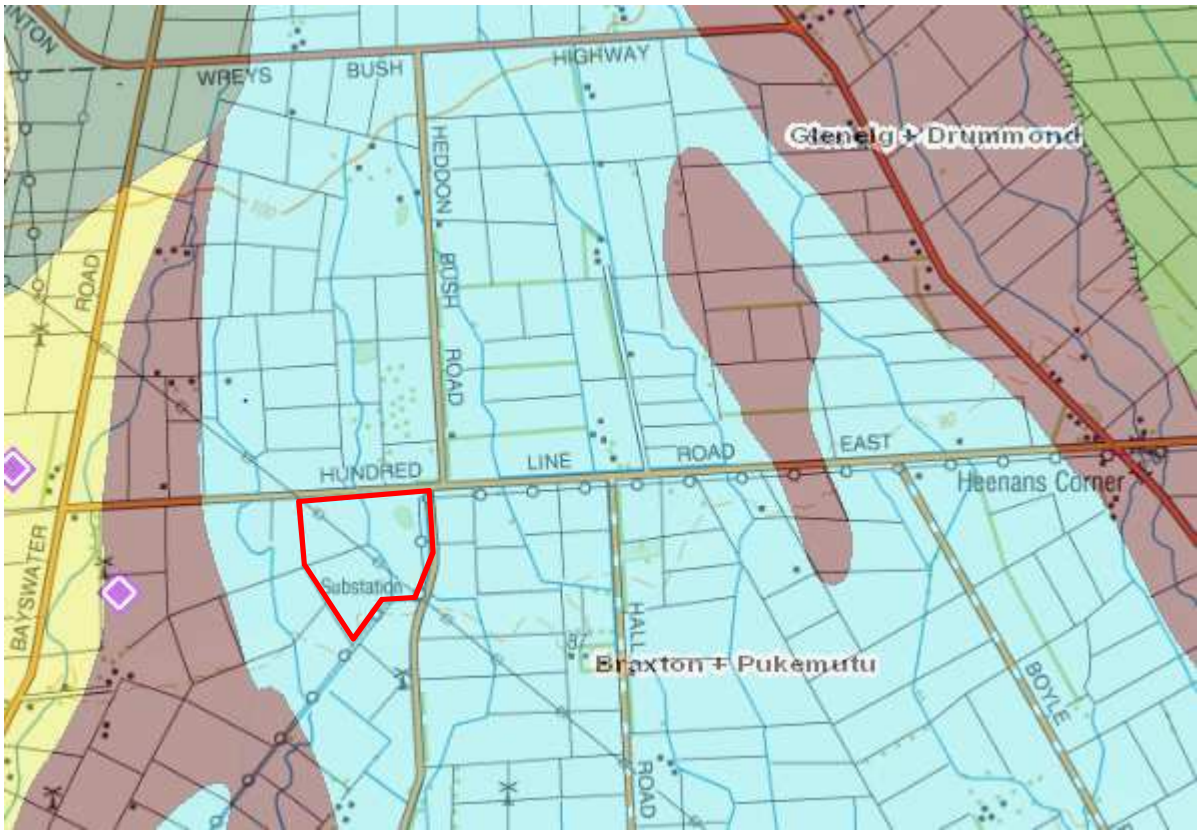


Figure 7: Map of soil types at the Woldwide One property – Horner Block

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

Table 1: Vulnerability of soils at the Woldwide One and Horner block property

Soil type	Compaction	Nutrient Leaching	Erodibility	Organic Matter Loss	Waterlogging
Braxton	Moderate	Slight	Slight	Slight	Severe
Drummond	Minimal	Moderate	Minimal	Slight	Slight

3 NUTRIENT BUDGET

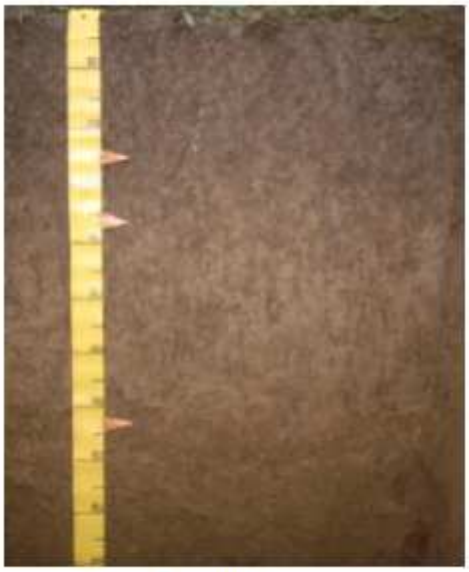
3.1 Soils and Properties

The soils at the Woldwide One property are shown in Figures 6 and 7.

3.1.1 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

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

Braxton profile

3.1.3 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 for the Woldwide Two property

Soil Type	Area (ha)	Percentage (%) of property	PAW_{30}
Braxton	97	33.7	85 mm
Drummond	191	66.3	48 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 manage fertiliser and lime application to maintain optimum soil fertility levels. Testing should initially be annually until a pattern is established;

ii. Fertiliser management plan prepared for each soil type with guidance from Overseer output reports;

iii. Exclude stock from streams;

iv. Tracks and lanes sited away from streams. 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;

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

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

vii. Wintering cows off the property.

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.

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

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

- Application must not occur within 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 are 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:

- Test effluent nutrient concentrations and apply the depth that corresponds with the nutrient content of the effluent.
- The soil test values for the paddocks receiving effluent will be considered and the depth of application adjusted to suit.
- At all times the management of the effluent system will comply with the discharge consent conditions.
- Low application effluent irrigation system and deferred storage.
- Buffer distances as required in the discharge consent will be followed.
- It is recognised that for typical farm dairy effluent a minimum of 8 ha/100 cows is required as an effluent receiving area. In practice the area available will be in excess of this i.e. a minimum of 64 ha is recommended for 800 cows and approximately 240 ha will be available.

- 7 -10 days post grazing before effluent application.
- Application of sludge solids – less than 7mm depth to suitable ground, with consideration of climate conditions.
- 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.

3.5 Potential Nutrient Loss Effects of Dairying

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

Table 3: Nutrient loss summary for Woldwide One property

Indicies	Average NZ Farm	Woldwide One Dairy Farm	Average NZ Dairy Farm
N/loss to water, kg N/ha/yr	5-20	23	24-42
N conversion efficiency, %	15-25	46 %	27-35
P loss to water, kg/ha/yr	0.11-1.6	0.6	0.5-1.6

The nitrogen and phosphate losses are low compared to the range of dairy farm losses due to the low stocking rate.

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.

4 GOOD MANAGEMENT PRACTICES

4.1 Land

Key strategies to achieve this objective:

- Fencing off all waterways;
- Maintain riparian vegetation and programmed planting of all riparian strips where appropriate;
- Excluding stock from high risk critical collection source areas and swales when the soil is near or at field capacity;
- Ensuring adequate buffer zones from waterways during tillage;
- Implementation of an Intensive Winter Grazing Plan; and
- Stock management to avoid excessive pugging.

4.2 Effluent and Nutrients

Key strategies to achieve this objective:

- Prepare, implement and monitor a Nutrient Management Budget to maximise the returns and minimise losses from the resource particularly N, P and K;
- Subject to soil moisture and weather conditions, irrigate effluent at every practical opportunity to keep the storage pond as empty as possible;
- 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;
- Record each application of dairy effluent including the location of the sprinklers and the depth applied;
- 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;
- Ensure by regular inspection (that coincides with effluent application) that the farm's drains do not contain any obvious signs of dairy effluent contamination;
- 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
- Controlled, judicious and justifiable use of fertiliser and other imported nutrients including nutrients in supplementary feed.

4.3 Physiographic Zones and Transport Pathways

The pysiographic zones for the property are shown on a map in Figure 5. These zone have the potential for N and P to leach to waterways and groundwater through artificial drainage, deep drainage and

overland flow as shown in Table4. Good Management Practices for these transport pathways are listed in section 4.6.

Table 4: Pysiographic zones and transport pathways for Woldwide One property

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

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 1 June 2017 – 31 May 2018

Strategy Type	Summary of Management Practices	Relevant section in Farm Environment Plan	For Review June 2018
Capital	Fencing and enhancing riparian areas according to an agreed riparian enhancement plan.	Riparian Management	
	Look to create wetlands in discharge critical source areas where there are risks of point source discharges to water.	Riparian Management	
	Upgrading FDE handling equipment as new technology improves the utility and reduces risks of these systems.	Overview of Effluent Collection, Storage and Irrigation system	
	Culverts or bridges at stock crossings	Riparian Management	
Operational	Utilising a nutrient management plan.	Nutrient Budget	
	Stock exclusion from streams and wetlands.	Riparian Management	
	Tracks and lanes sited away from streams and lane runoff diverted to land.	Other Environmental Issues	
	Grass buffer strips.	Cultivation	
	The herd will be wintered in wintering barns onsite.	Intensive Winter Grazing	
	Restricted grazing of draining pastures in autumn/spring.	Intensive Winter Grazing	
	Strategic placement for winter grazing of forage crops. Adhere to winter grazing plans using best practices.	Intensive Winter Grazing	
	Restricted grazing of cropland.	Intensive Winter Grazing	
	Not grazing stock in Critical Source Areas (these may have to be temporarily fenced off) when the ground is near or at field capacity or when these areas are flowing to drainage.	Intensive Winter Grazing	

Strategy Type	Summary of Management Practices	Relevant section in Farm Environment Plan	For Review June 2018
	Care in irrigation of FDE, especially when the ground is near or at field capacity.	Effluent System Management	
	Increased land application area to ensure N & K returns are not excessive.	Effluent System Management	
	Minimise effluent volumes at source.	Effluent System Management	
	Low depth FDE irrigation.	Overview of Effluent Collection, Storage and Irrigation system	
	Appropriate FDE storage volume to allow for deferred irrigation.	Collected Agricultural Effluent	
	Ensure all data and maps are kept up to date and available and all staff are trained and informed of any changes.	Effluent System Management	
	Ensure programmed maintenance is done in and around FDE and silage leachate collection and piping infrastructure around the dairy shed silage bunkers, cow yards etc.	Monitoring, Maintenance & Operating procedures	
	All fencing around riparian areas is maintained, (or replace as required) with stock excluded from the riparian areas.	Riparian Management	
	Reduce runoff – cutoffs and shaping of lanes, move troughs and gateways from water flow paths.	Other Environmental Issues	

4.6 Good management Practices for Key Transport Pathways 1 June 2017 – 31 May 2018

Mitigation	Good Management Practise	Key transport pathway
Reduce the accumulation of surplus N in the soil, particularly during autumn and winter	Reduce inputs of N, such as fertiliser or nitrogen contained in imported feed	Deep drainage of nitrogen Artificial subsurface drainage
	Control the duration of grazing of pasture (on-off grazing)	
	Winter stock off-paddock in wintering barn	
	Optimise timing and amounts of effluent application	
	Substitute autumn diets with low-N feed (barley)	
	Low stocking rate (3.1 cows/ha)	
	Cut and carry fodder crops if practical and affordable	
	Use gibberellic acid in Autumn and Spring to boost pasture growth to reduce overall N inputs	
	No nitrogen fertiliser applied after mid-April	
	Only apply nitrogen fertiliser if soil temperature is above 6 ºC	
	Re-sow areas of bare or damaged soil as soon as possible	
	Only re-sow 10 % of property each year	

Mitigation	Good Management Practise	Key transport pathway
Protect soil structure, particularly in gullies and near stream areas	Cultivate before 1st March to avoid Autumn loss of nutrients	Artificial subsurface drainage Overland flow
	Re-sow areas of bare or damaged soil as soon as possible	
	Avoid heavy grazing on vulnerable or wet soils	
Reduce phosphorus use or loss	Soil test whole farm every 4 years	Artificial subsurface drainage Overland flow
	Reduce use of P fertiliser where Olsen P values are above agronomic optimum	
	Use low solubility P fertiliser forms if runoff risk is high; or fertilise outside risk months (May to September inclusive)	
	Riparian plant adjacent to stream	
Avoid preferential flow of effluent through drains	Defer effluent application when soil moisture levels are high	Artificial subsurface drainage
	Do not apply effluent above tile drains	
	Apply effluent at low application rate and depth	
Manage critical source areas	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)	
	Use low solubility P fertiliser if applying to critical source areas	
	Identifies critical source areas on property	

5 RIPARIAN MANAGEMENT

5.1 Streams, Creeks and Ditches

- All waterways are riparian fenced on both sides;
- Regular riparian fencing checks are to be completed and any damaged sections or breakages/breaches are to be repaired immediately;
- Calves or other stock that are found in the riparian areas are to be removed immediately;
- Release spray in early (November) or late summer (February/March) as required;
- Repair or prevent any bank erosion to protect fencing and plants;
- Check all crossings are contoured to channel silt and manure onto pasture;
- Remove drain cleanings and spread over paddocks to utilize the nutrients and to prevent material returning to the water way; and
- Make sure fish have passage through all culverts and underneath bridges.

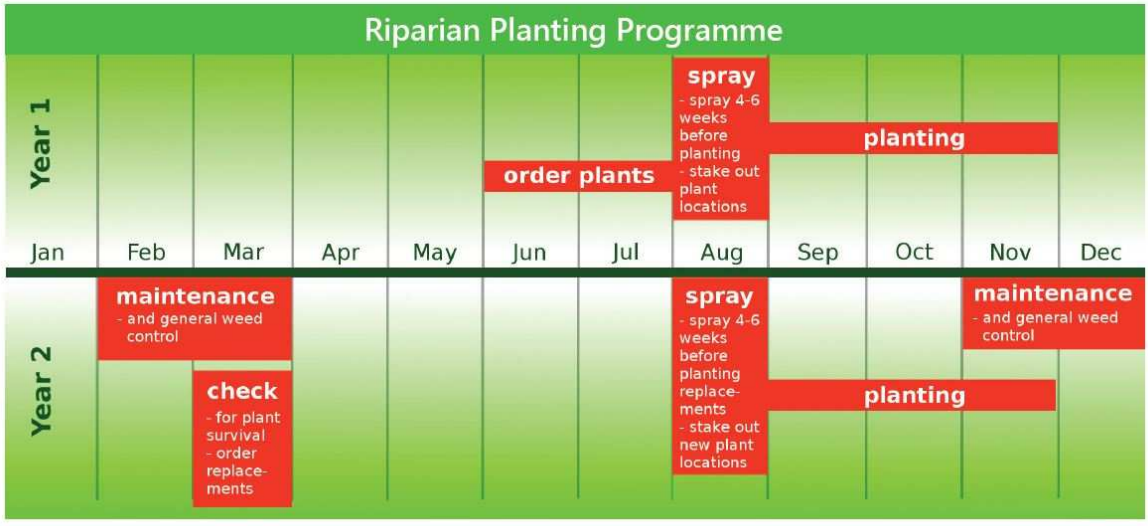
5.2 Weeds and Pests

Plant Pests

i. Thistles – especially Nodding – destroy plants prior to them seeding; and

ii. Gorse, broom, blackberry, ragwort, etc,- destroy all plants within 20 metres of an open waterway or property boundary.

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



Use this calendar to plan your riparian maintenance programme.

Extract from Environment Southland Fact Sheet: Maintaining Riparian Zones

6 CULTIVATION

6.1 Area of Cultivation

For the 2017/18 season there are no areas of cultivation and no cropping is anticipated in the future only regrassing.

6.2 Cultivation Good Management Practices

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

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

iii. Plough lines will be kept 3 metres back from the top of ditch banks or the edge of gullies.

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. 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

7.2.1 Paddock Selection

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

7.2.2 Back Fencing

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

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

7.2.3 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.

7.2.4 Buffer Zones

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

7.2.5 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.

7.3 Supplementary Crop Feeding

When feeding supplementary crops:

- Indentify swales in the paddock that will carry overland flow when it rains heavily. Temporarily fence them off during winter grazing;
- Break feed towards the waterway;
- Provide transportable troughs for stock drinking water;
- Back fence stock off land that has been already been grazed;
- Exclude all stock from surface water where possible;
- Place baleage in paddock before soil becomes too wet thereby preventing heavy vehicles from damaging the ground; and
- Minimise use of heavy vehicles when feeding out hay/silage etc.

8 COLLECTED AGRICULTURAL EFFLUENT

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

8.1.1 Dairy Shed Effluent System

i. During adequate soil moisture conditions the effluent will be discharged 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.

8.1.2 Wintering Barn Effluent System

i. The effluent flows by gravity 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 for discharge to the land; and

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

8.2 Effluent System Volumes

8.2.1 Effluent Sources

i. Cowshed - 800 cows x 50l/cow per day = 40 m^3 per day.

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

iii. Wintering barns will enable 640 cows to be wintered at the property, with the effluent collected in the effluent storage pond adjacent to the wintering barn.

8.2.2 Effluent Volume

Total average effluent generated per day at the dairy shed should be approximately 40 m^3.

8.2.3 Effluent Storage Volume

The existing storage pond has a total volume of approximately 3,875 m^3 and a pumpable volume of approximately 3,401 m^3.

8.3 Effluent Application Rate and Depth

The irrigator's application rate, application depth and uniformity 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).

8.3.1 Application Depth

The minimum application depth of the travelling irrigator is 7 – 8 mm, 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 m³ per hour.

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.

8.4.1 Application Log book

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

For example:

Date	Paddock	Soils/comments	Settings	Time/depth	Staff
12/09/20xx	B43 – boundary end	Dry	continuous	2 hrs @4mmhr = 8mm	RXD
13/09/20xx	B44 – Road end	2mm Rain overnight	15/15	3 hrs @ 2mmhr = 6mm	Pete
13/09/20xx	B44 – mid section	Heavy dew	15/15	4 hrs @2mmhr = 8mm	Pete

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

8.4.2 Drainage Monitoring Log Book

A log book is to be maintained that monitors drainage flows following effluent irrigation.

For example:

Date	Paddock/outfall #	Soils/comments	Staff	Comments
12/04/20xx	23/a	Running clear.	John	Pods at head of south hollow
13/04/20xx	24/a/c – Road end	No discharge	Bob	Pods along western fence
13/04/20xx	26/a	No discharge	Bob	Pods away from hollow to south

8.4.3 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

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 is wet 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;
- Increase speed of tractor if a smaller application depth is required.

Liquid 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;

8.6 Deep drainage of nitrogen – cracking and fissures

To reduce the occurrence of deep drainage of nitrogen the applicant will endeavour to prevent cracks or fissures occurring as much as possible. This will be achieved by keeping a higher pasture cover and discharging effluent little and often to ensure the soil moisture is kept as high as possible to prevent 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 applicant will avoid areas with cracking or move to another part of the property where there are no cracks. If there are substantial cracks and no areas suitable to discharge effluent the applicant will store effluent 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; Jacques Jooste.

9.2 Effluent System training

9.2.1 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.

9.2.2 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:

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

9.4 Effluent Pumping

The specified pump will deliver 16 – 18 m^3/hr approximately depending on the distance of the irrigation sprinklers 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 288 ha 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 moisture levels reaching field capacity. Field capacity is the point at which drainage starts either by passing down through the soil profile or flowing over the surface (overland flow).

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/regrassing rotations, drainage, fencing changes etc affect the relative risks.

High and Low Risk
50 ha of the property is considered to be in the low risk soil category for dairy effluent discharge with the remaining area of the property (190 ha) is considered to be in the high risk soil category for dairy effluent discharge. 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 done 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 property 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. Dairy shed 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

9.8.1 Field Moisture Conditions

Visual survey

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, moles, drains etc.

9.8.2 Near Field Capacity

When soils are near field capacity, the depth of application is to be limited to 5 mm. During operation of the system the irrigated area will be checked to ensure there is no ponding.

9.8.3 Drier Ground

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

9.9 Drainage Monitoring

9.9.1 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.

9.9.2 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.

9.9.3 Monitoring

i. Tile outfalls should be regularly monitored when effluent irrigation is occuring in their vicinity or when it is possible that there may be moles that run to the tiles when the ground

moisture conditions plus the proposed irrigation volumes are approaching field capacity; and

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

9.10 Solids Removal

9.10.1 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.

9.10.2 Discharge of solids

Solids can either be spread thinly, less than 7mm 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

10.2.1 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.

10.2.2 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.

10.2.3 Pipelines

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

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

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

iv. Training of new staff in system operation; and

v. 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 cutouts, 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 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

12.3.1 Overland Flow

See Ponding Section 12.2.

12.3.2 Discharge Ex-Tile

See Effluent in Open Drains Section 12.3.3

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 – Jacques Jooste		
Environment Southland	0800 768 845 or 03 211 5115	
Dairy Green Ltd	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 moling, 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		Distribution List
1.0	22 August 2017	JS	A & JJ de Wolde
1.2			
1.3			
2.			
3.			