Consents Hearing
5 April 2018

Woldwide One Limited – APP 20171445

Appendices

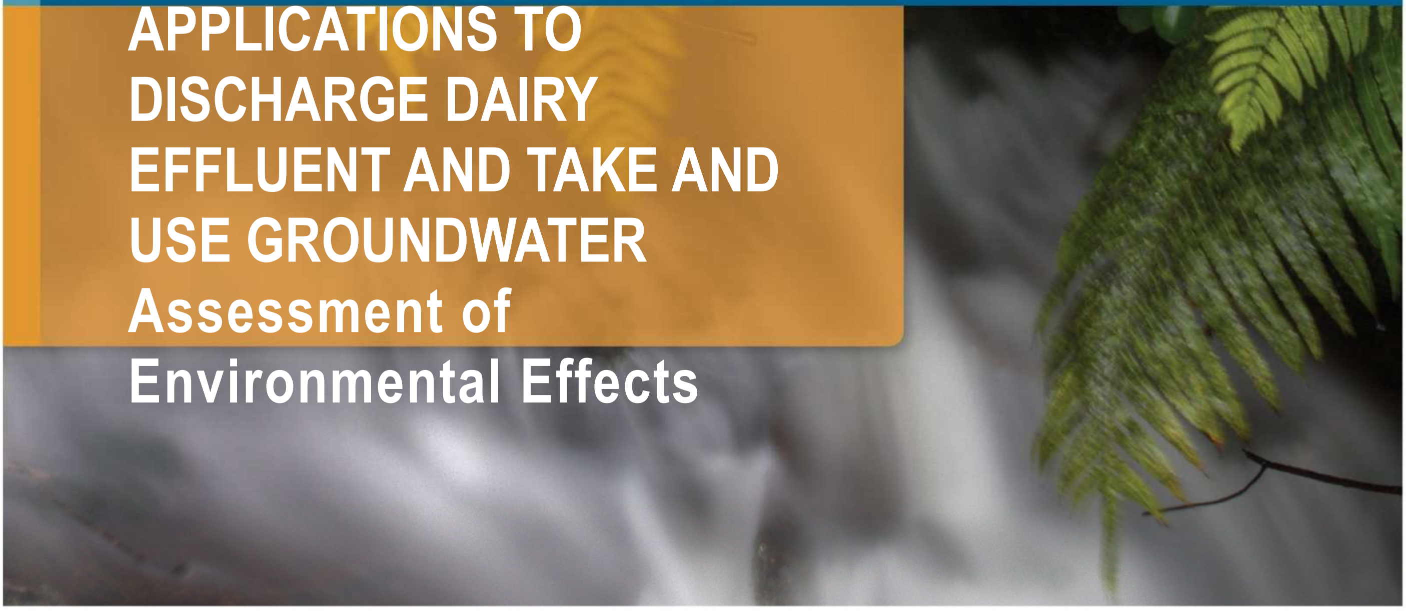
Application

AQUALINC

Resource Consents REPORT

APPLICATIONS TO DISCHARGE DAIRY EFFLUENT AND TAKE AND USE GROUNDWATER

Assessment of Environmental Effects



PREPARED FOR
Woldwide One Limited

C14114/05

24/08/2017

PREPARED BY
Nicole Matheson

AQUALINC

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To: The Chief Executive, Southland Regional Council

APPLICATION FOR A RESOURCE CONSENT

Part A: Application Details

1. Full name(s) and address of applicant

Surname:		First names:	
OR Company name:	Woldwide One Limited		
Postal address:	104 Shaws Trees Road, Heddon Bush, RD 3, Winton 9783		
Phone (home):	03 225 8344	Phone (mobile):	
Fax (home):		Fax (business):	
Email:	abe@woldwide.nz	Contact person	Abe de Wolde

2. Consultant/Agent details ***(who is also the contact person during the processing of this application)***

Contact person:	Nicole Matheson	Email:	n.matheson@aqualinc.co.nz
Phone:	(03) 964 6521	Fax:	(03) 964 6520
Company:	Aqualinc Research Ltd		
Postal address:	PO Box 20-462, Bishopdale, Christchurch		

3. Names & addresses of the owner and occupier of the site to which this application relates

Same as Section 1 above.

4. Location of the site to which this application relates

Site address:	Hundred Line Road East		
Locality:	Heddon Bush	Map ref (if known):	1225175-4888760
Legal description:	Lot 4 DP 399915, Parts Lot 18 DP 942, Lot 1 DP 10885 and Section 420 Taringatura Survey District		

5. In which District or City Council is this site located? Southland District

6. What type(s) of resource consents are you applying for from the Regional Council?

Coastal Permit							
	Reclaim/drain foreshore or seabed		Place/alter/remove structure		Disturb foreshore/ seabed		Deposit substance
	Planting foreshore/seabed		Occupy coastal marine area		Remove natural material (e.g. sand)		Install/alter bore
	Take water		Dam water		Divert water		Use water
	Discharge contaminant to air		Discharge contaminant or water to water		Discharge contaminant to land		Other

Land Use Consent							
	Install/alter bore		High country burning		Earthworks		Vegetation clearance

	Contaminate storage		Activity in coastal hazards zone		Fencing/grazing in waterway		Planting in waterway
	Use/place/alter/remove structure in waterway		Place a structure within 8 m of a waterway		Deposit substance in waterway		Reclaim/drain waterway
	Disturb bed of waterway (including excavation of gravel)						

Water Permit									
X	Take groundwater		Take surface water		Dam water		Divert water	X	Use water

Discharge Permit					
X	Discharge contaminant to air		Discharge contaminant or water to water	X	Discharge contaminant to land

7. Description of the activity

This consent application is for the following; • To discharge dairy effluent to land (from 800 cows during the milking season and 640 cows during the winter); and • To take and use 91 m^3/day of groundwater for dairy shed and stockwater supply.

Part B: Assessment of Environment Effects

See attached AEE report.

Part C: Other Information

1. Previous consents held at this site for this activity or any related activities

	None	X	Yes	Consent No:	301663 – to discharge dairy effluent to land 301664– to take groundwater water for dairy purposes

2. Duration sought for this consent:

The proposed consents are sought to expire 9th November 2027 (same as existing consents 301663 and 301664).

	24/08/2017	Nicole Matheson
Signature of person authorised to sign on behalf of applicant	*Date*	*Full name of person signing*

TABLE OF CONTENTS

1 INTRODUCTION

This Assessment of Environmental Effects (AEE) has been prepared in accordance with the Fourth Schedule of the Resource Management Act 1991 (RMA) to support the applications of the RMA by Woldwide One Limited (the applicant) to discharge dairy effluent (from 800 cows) and take and use 91 m^3/day of groundwater for dairy shed and stockwater supply.

Section 88(4)(b) of the RMA requires that every application shall include an assessment of any actual or potential effects that the activity may have on the environment, and the ways in which any adverse effects may be mitigated. Section 88(6)(b) also requires that any assessment shall be in such detail as complies with the scale and significance of the actual or potential effects that the use may have on the environment, and shall be prepared in accordance with the Fourth Schedule. This assessment is made in accordance with these requirements.

The legal description of the property is Lot 4 DP 399915, Parts Lot 18 DP 942, Lot 1 DP 10885 and Section 420 Taringatura Survey District.

The location of the property is illustrated in Appendix A.

A copy of resource consents 301663 and 301664 are included in Appendices D and E respectively.

The proposed consents are sought to expire 9th November 2027 (same as existing consents 301663 and 301664).

2 BACKGROUND

Woldwide One Limited (the applicant) own and operate a dairy farm located at Hundred Line Road, Heddon Bush. The operation is consented under resource consents 301663 to discharge dairy effluent and 301664 to take groundwater for a dairy purposes.

Existing consent 301663 is to discharge dairy effluent from a maximum of 540 cows. This application is to increase the effluent discharged at the property from 540 cows to 800 cows. Although, this will be limited to a maximum of 700 cows until a new dairy shed is built at the property, once the new shed is built 800 cows will be able to be milked at the dairy shed. The applicant also wishes to change the boundary of the Woldwide One property as part of a land swap with the neighbouring property Woldwide Two. The new property boundary is shown in Appendix A.

The property has an existing effluent storage pond with a storage volume of 3,397 m^3. The dairy effluent storage calculator has been used to determine the volume of effluent storage required (a copy of the results are included in Appendices F and G). The applicant is intending to increase the volume of the effluent storage to a minimum of 3,917 m^3 (as calculated in Appendix G). A land use consent application for the proposed storage facility will be submitted to Environment Southland once completed.

The existing water supply for dairy shed use and stockwater supplies for the property is taken from groundwater via bore E45/0071 under existing consent 301664. Consent 301664 allows a maximum of 60 m^3/day to be taken from bore E45/0071. The applicant wishes to increase the volume taken to 91 m^3/day. Once the new dairy shed is constructed, 800 cows will be able to milked in the dairy shed. However, as the new shed will have an effluent scraper, the volume of water used for dairy shed wash down will not increase above the volume required for 700 cows i.e. 35 m^3/day for dairy shed washdown.

This application seeks to have a new consent for the discharge of dairy effluent granted for 10 years. Best practice effluent management utilising buffer effluent storage and low rate irrigation will be incorporated into the farming system to ensure compliance. Good management practices relevant to dairy farming in Oxidising and Central Plains physiographic zones are implemented on farm.

2.1 Increase in cow numbers

This application is to increase the effluent discharged at the property to 800 cows, from 540 cows consented under resource consent 301663. This is considered to be a discretionary activity under rule 21 of the Proposed Southland Water and Land Plan.

This proposal has been modelled in Overseer by Cain Duncan (Fonterra Farm Source) a copy of the .xml files and Nutrient Budgets/Analysis have been attached to this application. The results of the Overseer modelling are shown in Table 1 for the combined Woldwide One and Woldwide Two properties.

Table 1: Estimated nitrogen and phosphorus loss to water - Woldwide One and Woldwide Two combined

	Nitrogen loss to water (kg/year)	Nitrogen loss to water (kg/ha/year)	Phosphorus loss to water (kg/year)	Phosphorus loss to water (kg/ha/year)
Existing situation	11,162	17	330	0.7
Proposed situation	11,002	16	357	0.7
Change	**-160**	**-1**	**27**	**No change**

The Overseer modelling shows the nitrogen loss to water decreases as a result of this proposal but the phosphorus loss to water increases slightly. The increase in phosphorus loss has been explained in the Nutrient Budgets/Analysis for Woldwide One prepared by Cain Duncan (Sustainable Dairy Advisor, Fonterra Farm Source) which has been included with the application. The Overseer model assumes 30% of all phosphorus deposited on stocklanes is lost to water, with assumptions also from other structures on farm such as feed pads, silage pits etc. However, the model does not take into account the location of stocklanes on the property or on farm Good Management Practices (as per the attached Farm Environment Management Plan), such as ensuring runoff from stocklanes is unable to enter waterways. Therefore it is considered that in reality the phosphate loss to water is likely to reduce of remain the same as the current situation.

Because the Overseer modelling has indicated that both the nitrogen and phosphorus loss to water is likely to remain the same or decrease as a result of this proposal together with the implantation of good management practices (as per the attached Farm Environment Management Plan), further assessment on the effects of dairying farming on groundwater and surface water has been assessed as not being required.

As a result of the no change or a small decrease in nitrogen and phosphorus lost to water the cumulative effects of this proposal for dairy farming are likely to remain the same or decrease and hence no change or a slight improvement in the water quality of both the groundwater and surface water.

3 PROPOSED CONSENT CONDITIONS

3.1 Discharge Dairy Effluent

In order to mitigate any potential environmental effects the following conditions are proposed:

1. This consent will expire 9th November 2027 and shall commence on the surrender or expiry of resource consent 301663.

   (Note: Pursuant to Sections 123 and 124 of the Resource Management Act 1991, a new consent will be required at the expiration of this consent. The application will be considered in accordance with the plans in effect at that time, and the adverse effects of the proposed activity.)

2. This consent authorises the discharge of dairy shed effluent and wintering shed slurry onto land, via a land discharge system, as described in the application, on land known as Lot 4 DP 399915, Parts Lot 18 DP 942, Lot 1 DP 10885, and Section 420 Taringatura Survey District.

   (Note: The effluent/slurry discharge area shown in Appendix 1 can be altered and/or extended, subject to the approval of the Director of Environmental Management, if the consent holder submits a new plan showing the new effluent discharge area, and providing the written approval(s) of any person whose property boundary will be closer to that area. In the event that written approval cannot be obtained, the effluent discharge area can only be amended by way of limited notification.)

3.
   a. No dairy shed effluent/slurry shall be discharged to any surface watercourse by overland flow, run-off, or via a pipe, nor shall there be any surface run-off/overland flow, ponding or contamination of water resulting from the exercise of this consent. See Best Practice Notes 1, 2 & 3.
   b. The land discharge system shall be operated and maintained to ensure that there is no odour or spray drift to the extent that it causes an adverse effect beyond the property boundary.
   c. The consent holder shall install and maintain an alarm and automatic switch-off system as a contingency measure in the event of a system failure such as a sudden pressure drop, irrigator stoppage or breakdown of the travelling irrigator. See Best Practice Note 4.

4. Subject to condition 3(a), the land discharge system is limited to the following:
   a. a maximum depth of application of 10 mm for each individual application. Where the slurry is applied by the slurry tanker, the depth of application shall be averaged across the width of the applicators on the tanker.

Note: The application depth needs to be less than the soil-water deficit (i.e. the depths above are maximum depths and as soil moisture levels approach field capacity, smaller depths will be necessary to avoid losses of contaminants from the root zone. When soil moisture levels reach field capacity, irrigation will need to cease completely to prevent these losses.)

b. the maximum loading rate of nitrogen onto any land area shall not exceed 150 kg of nitrogen per hectare per year from the effluent/slurry; See Best Practice Note 5.

5. Effluent/slurry may be applied to the land as described in the application and generally as shown in Appendix 1, but the following specific buffers shall be observed:

a. there shall be no application of effluent and/or slurry within:

i. 20 metres of any surface watercourse;

ii. 100 metres of any potable water abstraction point;

iii. 100 metres of any residential dwelling other than residential dwellings on the property;

b. dairy shed effluent shall not be applied to land by travelling irrigator within 20 metres of a property boundary.

(Note: this does not prevent discharge within 20 metres of the property boundary of effluent and/or slurry applied by tanker.)

Where there is conflict between Appendix 1 and these specified buffers, the latter shall apply.

6.

a. The amount of dairy shed effluent discharged of onto land shall not exceed that from 800 cows.

b. The amount of herd home slurry discharged of onto land shall not exceed that from 640 cows.

7. Prior to the 1st August 2018, the consent holder shall have at least 3,397 m^3 of effluent/slurry storage for the purpose of:

a. avoiding irrigation of effluent/slurry when soils are at or above field capacity; see Best Practice Note 8.

b. providing a contingency measure when the irrigation system is inoperative; and/or

c. for primary treatment when it is necessary for the proper operation of the effluent discharge system.

8. By the 1st August 2018, the consent holder shall have at least 3,917 m^3 of effluent/slurry storage for the purpose of:

a. avoiding irrigation of effluent/slurry when soils are at or above field capacity; see Best Practice Note 8.

b. providing a contingency measure when the irrigation system is inoperative; and/or

c. for primary treatment when it is necessary for the proper operation of the effluent discharge system.

9. The consent holder shall notify the Council, by 1 September 2017, of the person who is in charge of the operation of the effluent/slurry discharge system. If the person in charge of the effluent system changes during the term of this consent, the consent holder shall notify the Council of the new operator no later than five working days after that person takes responsibility. See Best Practice Notes 6 & 7.

(Note: The person identified by condition 8(a) will be the primary contact for Council staff for monitoring purposes and/or in the event of an incident. Nothing in this condition removes or limits the consent holder's liability to ensure compliance with the consent and its conditions.)

10. The Southland Regional Council may serve notice of its intention to review the conditions of this consent, in accordance with the conditions of this resource consent and Sections 128 and 129 of the Resource Management Act 1991, during the period 1 February to 30 September each year, or within two calendar months of the completion of any enforcement action (prosecution or infringement notice), for the purposes of:

    a. dealing with any adverse or cumulative effects, including the adverse effects of high stocking rates, on the environment which may arise from the exercise of this consent;
    b. considering any changes to information on the effects of land discharge of dairy shed effluent/slurry;
    c. complying with the requirements of a regional plan;
    d. amending monitoring requirements; or
    e. imposing a notification requirement for potential effects on registered drinking water supplies.

11. The consent holder shall pay an annual administration and monitoring charge to the Southland Regional Council, collected in accordance with Section 36 of the Resource Management Act. This charge may include the costs of inspecting the site three times each year (or otherwise as set by the Council's Annual Plan), and of monitoring the effects of the discharge on groundwater by taking representative samples of the bore water, from Bore E45/0622 once every six months and analysing for:

    - electrical conductivity;
    - nitrate nitrogen concentration;
    - Total Nitrogen concentration;
    - Dissolved oxygen concentration – field measurement;
    - E. coli concentration;
    - bromine concentration;
    - chloride concentration.

    Except that the first sample shall also be analysed for Dissolved Iron concentration.

    (Note: The Administration Charges are payable for the costs of the Council's administration, monitoring and supervision of this resource consent. For new conversions, the first monitoring inspection by the Council, in accordance with the Council's Annual Plan, of the exercise of the resource consent shall be carried out following installation of the effluent discharge system.)

12. If an event (such as effluent/slurry overflow to water, significant over-application on a free-draining area or pond collapse) occurs that may have significant adverse effect on water quality at the abstraction point of a registered drinking-water supply, the consent holder shall notify, as soon as reasonably practicable, the following:

- Environment Southland's Compliance Manager (ph 03 211 5115 or 03 211 5225 after hours);
- Southland District Council (ph 0800 732 732).

(Note: The consent holder is advised to contact Environment Southland's Compliance Manager in the event of any unexpected event that may result in non-compliance with the conditions of this resource consent or the rules of a regional plan.)

Best Practice and Explanatory Notes

1. Dairy shed effluent should not be discharged onto any land area that has been grazed within the previous 5-10 days. Where there has been significant damage to soil during grazing, it is recommended that effluent not be applied until that damage has been repaired.
2. To avoid contaminating water directly or indirectly, the consent holder should not apply effluent to land when the soils are at or above field capacity. Moisture content is to be determined by either actual monitoring on site or by reference to the appropriate Council monitoring site. The Council's soil moisture monitoring sites can be viewed at http://www.es.govt.nz and following the "Farming", "Dairy Advisor" and "Soil Moisture Map" links.
3. For the purposes of this condition, ponding is the accumulation of effluent on the soil surface resulting from the application of effluent to saturated soils, or the application of effluent inducing saturated soil conditions. It does not refer to the temporary accumulation of effluent on the soil surface resulting from the application of effluent at a rate that exceeds the soil infiltration rate.
4. Where the effluent reticulation system is installed in such a way that effluent can be siphoned when pumping ceases, the consent holder should install and maintain an anti-siphon device in the effluent pipe line.
5. A loading of 150 kg N/ha/year is approximately equivalent to a loading of dairy shed effluent to land of 4 ha/100 cows. However, there are significant benefits to having a larger effluent discharge area in terms of managing potassium. Further, scientific research has highlighted decreased nitrogen use efficiency and increased nitrogen leaching losses at annual nitrogen loading rates (from combined fertiliser and effluent N) greater than 150 kg/N/ha/yr. Extreme caution should therefore be taken when applying nitrogen fertiliser to the effluent discharge area. It is recommended that a nutrient budget is used to check that nitrogen and potassium application rates to the effluent discharge area are not excessive.
6. The consent holder should prepare and comply with a Farm Environmental Management Plan. The plan should:
    - specify and implement a nutrient budgeting system for the property;
    - provide for the management of effluent discharge to avoid applications when soils are at or above field capacity;
    - identify, as far as is practicable, the drains in the effluent discharge area, so that appropriate management procedures can be taken to avoid contamination of the drains by effluent;
    - if relevant, provide for the operation and management of any feedlot and/or wintering pad;
    - include the provision for monitoring application rates to ensure the consent requirements are being met;
    - include the monitoring requirements specified in this consent; and
    - address ancillary matters such as protecting well-head(s) from contamination; preventing leachate from any silage pits entering water, including groundwater; preventing soil damage; controlling run-off from lanes; and preventing stock access to and maintaining the riparian margins of any watercourses on the property.

A template may be viewed at:
http://www.es.govt.nz/media/4831/dairy-farm-plan-consent-template.pdf

7. The consent holder should display, in a prominent place in the dairy shed, a copy of the resource consent and relevant limits about the operation of the effluent discharge system that must be complied with. The material to be displayed will be provided by the Council on laminated sheets suitable for display purposes.

8. Storage ponds should be operated at low levels when conditions for effluent discharge are suitable in order to maintain storage for wet weather periods. In particular, storage ponds should

be emptied in late summer/early autumn to ensure sufficient storage capacity for the following late winter/early spring period.

9. Storage ponds should not, for practical purposes, leak. This resource consent does not authorise the discharge of contaminants due to leaks or failure of the storage ponds. If an existing storage pond is modified (such as by increasing the embankment height to increase storage), the modification will require resource consent.

3.2 Take and Use Groundwater

In order to mitigate any potential environmental effects the following conditions are proposed:

1. This consent will expire 9th November 2027 and shall commence on the surrender or expiry of resource consent 301664.

   (Note: Pursuant to Sections 123 and 124 of the Resource Management Act 1991, a new consent will be required at the expiration of this consent. The application will be considered in accordance with the plans in effect at that time, and the adverse effects of the proposed activity).

2. This consent authorises the abstraction of water from bore E45/0071 at about NZMS 260 E45:350-507.

3. The rate of abstraction shall not exceed 91 cubic metres per day.

4. The consent holder shall install a backflow prevention device or take other appropriate measures to ensure water and/or contaminants cannot return to the water source.

5. The consent holder shall monitor water usage to ensure compliance with condition 3 of this consent, as follows:
   a. by installing a flow meter prior to commencement of the abstraction:
      i. able to continuously measure the amount of water taken;
      ii. capable of accuracy to within 5% of the true flow rate, on each abstraction;
      iii. that shall record volumes in litres;
      iv. in accordance with the manufacturer's instructions;
      v. that is sealed and as tamper proof as practicable;
      vi. in a location that measures all water taken;
      vii. that is suited to the qualities of the water it is measuring (such as temperature, algae content and sediment content);
   b. by recording the volume of abstraction, at or about the same time each week when the consent is being exercised.

   A copy of this record is to be provided to the Council's Compliance Manager by 31 May each year (escompliance@es.govt.nz).

6. The consent holder shall pay an administration and monitoring charge to the Southland Regional Council collected in accordance with Section 36 of the Resource Management Act, payable in advance on the first day of July each year.

7. The Council may, in accordance with section 128 and 129 of the Act, serve notice, during the period 1 February to 30 September each year, of its intention to review conditions for the purpose of:
   a. dealing with any adverse effects on the environment which may arise from the exercise of this consent;
   b. requiring monitoring of the rate of, or the effects of, the abstraction;
   c. requiring efficiency of water use; and/or
   d. complying with the requirements of a regional plan.

4 LEGAL AND PLANNING MATTERS

4.1 Restrictions Relating to Water

Section 14 of the RMA states that no person may take, use, dam or divert any water unless the taking, using, damming or diverting is expressly allowed by a rule in a Regional Plan, in any relevant proposed regional plan, or by a resource consent. Water is allowed to be taken for an individual's reasonable domestic needs and the reasonable needs of an individual's animals for drinking water. The taking or use of that water shall not have, or shall not be likely to be having, an adverse effect on the environment. Water required for fire fighting purposes may also be taken.

The proposed activity is not expressly allowed by a rule in the Southland Regional Water Plan, and therefore a resource consent is required for the proposed activity.

4.2 Restrictions Relating to Discharges

Section 15 of the RMA states that no person may discharge any contaminant or water into water, contaminant onto or into land in circumstances which may result in that contaminant (or any other contaminant emanating as a result of natural processes from that contaminant) entering water, contaminant from any industrial or trade premises into air, or contaminant from any industrial or trade premises onto or into land water unless the discharge is expressly allowed by a rule in a Regional Plan, in any relevant proposed regional plan, or by a resource consent.

The proposed activity is not expressly allowed by a rule in the Southland Regional Water Plan, and therefore a resource consent is required for the proposed activity.

4.3 Regional Policy Statement

4.3.1 Operative Regional Policy Statement

The Regional Policy Statement provides a framework for managing Southland's natural and physical resources. It promotes sustainable development and management, and addresses resource management objectives and policies for the region. In relation to this application, the following policies are of relevance:

Policy 4.4

The AEE carried out to support this application shows that the allocation of the groundwater resource is reasonable, and that water is used efficiently.

Policy 4.6

The Te Tangi a Tauira Iwi Management Plan for the Murihiku area has been considered in this application. The potential effects of the proposed activity on the cultural values of Tangata Whenua are addressed in Section 4.6 of this applciation.

Policy 4.7

The AEE provides adequate information that justifies that the allocation of the groundwater resource is appropriate, reasonable and efficient.

Policy 5.2

This AEE assesses the effects of the discharge of dairy effluent and use of land for dairy farming on water quality.

Policy 8.1

The AEE and FEMP provide mitigation to ensure the effects on soil on the applicant's property are less than minor.

4.3.2 Proposed Southland Regional Policy Statement 2012

The Proposed Southland Regional Policy Statement 2012 was publicly notified on 19 May 2012. In relation to this application, the relevant policies have been addressed as follows:

Policy TW.3 – Iwi Management Plans

The Te Tangi a Tauira Iwi Management Plan for the Murihiku area has been considered in this application. The potential effects of the proposed activity on Tangata Whenua are addressed in Section 4.6.

Policy WQUAL.2 – All water bodies

As part of this application Overseer has been modelled to assess the effects of the proposal on water quality as discussed in Section 2.1. The results indicate that the nitrogen loss to water will be reducing as a result of this proposal which will improve the water quality in the surrounding area.

Policy WQUAL.5 – Water in natural state

As part of this application Overseer has been modelled to assess the effects of the proposal on water quality as discussed in Section 2.1. The results indicate that the nitrogen loss to water will be reducing as a result of this proposal which will improve the water quality in the surrounding area.

Policy WQUAL .7 – Preference for discharge to land

Part of this application is to discharge dairy effluent to land as such the application meets Policy WQUAL.7.

Policy WQUAL .8 – Untreated human and animal waste

This application is not for the direct discharge of effluent to water therefore Policy WQUAL.8 does not apply.

Policy WQUAL .9 – Sitting and operation
The applicant has proposed mitigation to ensure the effect on groundwater and surface water from the discharge of effluent to land is less than minor.

Policy WQUAL.10 – Sources of community water supplies
There are no community water supplies in the vicinity of the property.

Policy WQUAN.1 – In-stream values

The AEE carried out to support this application shows that there is a high degree of hydraulic connection between bore E45/0071 and the Bog Burn, however as the hydraulic connections is less than 2 l/s no specific minimum flow restrictions will be imposed on the groundwater take.

Policy WQUAN.2 – Overallocation

The taking of water from bore E45/0071 is within the allocation limit of the Bog Burn and Waimatuku Primary allocation limit.

Policy WQUAN.5 – Abstraction management

This application proposes to increase the take from bore E45/0071 from 60 m^3/day to 91 m^3/day. The AEE has assessed the effects on neighbouring wells and surface water resources which identified the effects of bore are considered minor.

Policy WQUAN.6 – Efficient use of water

The AEE carried out to support this application shows that the allocation of the groundwater resource is reasonable, and that water is used efficiently.

Policy RURAL.2 – Land use change and land development activities
As part of this application the applicant has proposed mitigation measures to ensure the change of land use to allow dairy farming is minor.

Policy RURAL.5 – Effects of rural land development
As part of this application the applicant has proposed mitigation measures to ensure the development of the property is minor.

Policy AQ.1 – Adverse effects of discharges
As part of this application the applicant has proposed mitigation measures to ensure the discharge of effluent to air on human health, cultural and amenity values and the environment is minor.

4.4 The Regional Water Plan

The proposed activity is assessed against the following policies and rules of relevance of the Regional Water Plan (RWP):

4.4.1 Policies

Policy 3 – No reduction in water quality

The AEE carried out to support this application has assessed the effect of the discharge of dairy effluent and the use of land for dairy farming on surface water and groundwater quality. The assessment identified that the effect of this application on surface water and groundwater quality is unlikely to be measurable.

Policy 4 – Surface water bodies outside Natural State Waters

The applicant has proposed mitigation measures to ensure the discharge of dairy effluent will meet the water quality standards.

Policy 7 – Prefer discharges to land

This application proposes to discharge dairy effluent to land.

Policy 14B – Considering a water permit application for a previously authorised activity

The AEE carried out to support this application to replace existing resource consent 301664 provides detailed information on the proposed groundwater take and its effects on the environment.

Policy 21 – Reasonable use of water

The total volume and rate of groundwater abstraction have been assessed as reasonable in the AEE.

Policy 22 – Water measuring devices

The applicant has flow metering installed on bore E45/0071 (i.e. the water use will be monitored).

Policy 23 – Review of water permits

Proposed condition 7 of the consent to take and use groundwater enables the Southland Regional Council to review consent conditions in accordance with Sections 128 and 129 of the RMA. It is not proposed to change or remove this condition.

Policy 25 - Adverse effects arising from point source and non-point source discharges

The applicant has proposed mitigation measures to ensure the discharge of dairy effluent will be managed to ensure the effects on groundwater and surface water quality will be less than minor.

Policy 28 – To manage groundwater abstraction

The AEE shows that adverse effects of the proposed activity on long-term aquifer storage volumes, existing water users, surface water flows, aquatic ecosystems and habitats, and on groundwater quality will be no more than minor.

Policy 29 – Stream depletion effects

The AEE carried out to support this application shows that there is a high degree of hydraulic connection between bore E45/0071 and the Bog Burn, however as the hydraulic connections is less than 2 l/s no specific minimum flow restrictions will be imposed on the groundwater take.

Policy 30 – Groundwater abstraction

The AEE carried out to support this application provides adequate information about potential adverse environmental effects of this proposal. The information is supported by a conceptual hydrogeological model that corresponds to the level of allocation from the aquifer.

Policy 31 – Interference effects

The well interference assessment carried out in Section 9.2 indicates that adverse effects on neighbouring bores are no more than minor.

Policy 31A – Matching discharges onto or into land to risk

The applicant has proposed mitigation measures to ensure the discharge of dairy effluent to land will be managed to ensure the effects of the activity will be no more than minor.

Policy 31B – Natural State Catchments
The applicant's property is not within conservation areas, reserves and national park therefore this policy does not apply.

Policy 31C - Manage discharges of contaminants onto or into land

The applicant has proposed mitigation measures to ensure the discharge of dairy effluent to land will be managed to ensure the effects of the discharge to land will be no more than minor.

Policy 41 - Adverse effects of agricultural effluent ponds
The applicant's effluent storage pond is clay lined to ensure no leakage to groundwater, is managed to ensure no overflow of effluent and the effluent storage volume has been calculated using the dairy effluent storage calculator.

Policy 42 – Farm dairy effluent

The applicant has proposed mitigation measures to ensure the discharge of dairy effluent to land will be managed to ensure the effects of the activity will be no more than minor.

Policy 42A
Woldwide One has been an operating dairy farm prior to 17 July 2010.

Policy 43
These applications are for a proposed duration of 10 years which adequately matches the level of environmental risk, changes in the dairy industry and the development of technology.

4.4.2 Rules

Rule 17A – Transitional rule relating to the establishment of new dairy farms

Rule 22(c) – Bores and wells
The design and headworks of bore E45/0071 prevents the infiltration of contaminants and the uncontrolled discharge or leakage of water from the surface and between aquifers. Therefore, the use of bore E45/0071 is classified as a permitted activity under Rule 22(c).

Rule 23 – Abstraction and use of groundwater
The applicant proposes to take water from the Waimatuku aquifer, which is a lowland aquifer. Therefore, the proposed activity is classified as a discretionary under Rule 23(d)(ii).

Rule 49 – Agricultural effluent ponds
A land use consent application will be submitted to Environment Southland to increase the size of the current effluent storage pond.

Rule 50 – Discharge of farm dairy effluent to land
The discharge of dairy effluent at the Woldwide One property is a controlled activity under Rule 50(b)(ii) as the effluent is discharged via a slurry tanker and travelling irrigator.

4.5 Proposed Southland Water and Land Plan

The proposed activity is assessed against the following policies and rules of relevance of the Proposed Southland Water and Land Plan (pSWLP). It is noted that the weighting that should be given to the pSWLP is limited due to its current proposed status.

4.5.1 Policies

Policy 1 – Enable papatipu rūnanga to participate
If Environment Southland request a copy of this application will be forwarded to Te Rūnanga o Ngāi Tahu and the local runanga Ngāi Tahu ki Murihiku.

Policy 2 – Take into account iwi management plan
The Te Tangi a Tauira, (the Iwi Management Plan for the Murihiku area) is taken into account in section 4.6 of this application.

Policy 5 – the majority of the applicant's property is within the Central Plains Physiographic Zone, which has the following transport pathways;

- deep drainage of nitrogen; and
- artificial subsurface drainage.

The potential effect of deep drainage of nitrogen is nitrogen entering groundwater and the potential effect of artificial subsurface drainage is on the quality of surface water. The applicant has implemented good management practices on the property to reduce the effects on groundwater and surface water quality (see attached Farm Environment Management Plan). The most significant of the good management practices/mitigation measures to reduce the effects on water quality are as follows;

- Cows are housed inside in winter;
- Wintering barn can be used as a feed pad during wet conditions;
- Streams are fenced;
- Effluent can be stored in the storage pond when soil moisture levels are high or if the soils are dry and cracking and fissures are present; and
- Fertiliser is applied little and often when conditions are appropriate.

Policy 10 – the remaining area of the applicant's property is within the Oxidising Physiographic Zone, which has the following transport pathways;

- overland flow;
- deep drainage of nitrogen; and
- artificial subsurface drainage.

The potential effect of overland flow is on surface water quality, the potential effect of deep drainage of nitrogen is nitrogen entering groundwater and the potential effect of artificial subsurface drainage is on surface water. The applicant has implemented good management practices on the property to reduce the effects on groundwater and surface water (see the attached Farm Environmental Management Plan). The most significant of the good management practices/mitigation measures to reduce the effects on water quality are as outlined in Policy 5 above.

Policy A4 of the National Policy Statement for Freshwater Management 2014
The AEE shows that the effects of the proposed activity on freshwater quality will be no more than minor.

Policy 13 states the following;

> *Manage land use activities and discharges (point source and non-point source) to land and water so that water quality and the health of humans, domestic animals and aquatic life, is protected.*

As part of this application Overseer modelling has been used to assess the effect on water quality from using land for dairy farming and discharging dairy effluent. With the implemented good management practices at the property (specifically the cows being wintered inside) the effect on water quality is potentially reducing. Also in relation to human health the Woldwide One milking platform is located approximately 2.3 km north of a registered drinking water site located at the Heddon Bush School (bore E45/0718). The groundwater flow in the vicinity of the property is likely to flow in a southeasterly direction towards Winton. Therefore, the discharge of effluent from the Worldwide One property is unlikely to effect the Heddon Bush School take.

Policy 14 – Preference for discharges to land
This application is to discharge dairy effluent to land.

Policy 15 - Maintaining and improving water quality

This application does not propose to discharge dairy effluent directly to surface water or an artificial watercourse. Overseer modelling has indicated that the effects on groundwater and surface water will remain or will be slightly reducing as a result of this proposal (as discussed in Section 2.1). The applicant has implemented good management practices on the property to reduce the effects on groundwater and surface water (see attached Farm Environment Management Plan). The most significant of the good management practices/mitigation measures to reduce the effects on water quality are as follows;

- Cows are housed inside in winter;
- Wintering barn can be used as a feed pad during wet conditions;
- Streams are fenced;
- Effluent can be stored in the storage pond when soil moisture levels are high or if the soils are dry and cracking and fissures are present; and
- Fertiliser is applied little and often when conditions are appropriate.

Policy 16 – Farming activities that affect water quality

This application meets the conditions of Policy 16 given the following;

- The applicant's property is not in close proximity to any of the sensitive waterbodies listed in Appendix Q or to coastal lakes, lagoons, tidal estuaries, salt marshes or coastal wetlands;
- As discussed in Section 2.1 of this application the effects on groundwater and surface water quality are likely to reduce or remain the same as a result of this proposal.
- A farm environment management plan has been prepared for the property;
- The property is flat and all waterways are fenced to reduce sediment run-off to waterways;
- Critical source areas have been mapped; and
- Central Plains and Oxidising Physiographic Zones are managed according to the Environment Southland Good Management Practice Factsheets.

The most significant of the good management practices/mitigation measures to reduce the effects on water quality are as follows;

- Cows are housed inside in winter;
- Wintering barn can be used as a feed pad during wet conditions;
- Streams are fenced;
- Effluent can be stored in the storage pond when soil moisture levels are high or if the soils are dry and cracking and fissures are present; and
- Fertiliser is applied little and often when conditions are appropriate.

Policy 17 – Effluent management
This application has given regard to the relevant provisions of Policy 17 and finds that it is in accordance with them given the following;

- As part of the consent application the applicant has proposed mitigation measures to ensure the effects on water quality from the discharge and storage of effluent is less than minor;
- Once the dairy shed is increased the current effluent pond will also be increased in size, the proposed effluent pond will be constructed to meet the Dairy NZ Farm Dairy Effluent Design Standards and Code of Practice and Practice Note 21.
- The applicant proposes to maintain and operate the effluent systems in accordance with best practice guidelines;
- The applicant will ensure the discharge of dairy effluent does not result in surface run-off/overland flow, ponding or contamination of water;
- This application does not propose to discharge of raw sewage and untreated agricultural effluent to water.

Policy 18 – Stock exclusion from waterbodies

All waterways on the property are fenced to exclude stock access.

Policy B7 of the National Policy Statement for Freshwater Management 2014
The AEE shows that adverse effects of the proposed activity on long-term aquifer storage volumes, existing water users, surface water flows, aquatic ecosystems and habitats, and on groundwater quality will be no more than minor.

Policy 20 – Management of water resources
The AEE shows that adverse effects of the proposed activity on long-term aquifer storage volumes, existing water users, surface water flows, aquatic ecosystems and habitats, and on groundwater quality will be no more than minor.

Policy 21 – Allocation of water
This application proposes to increase the groundwater take from bore E45/0071 from 60 m^3/day to 91 m^3/day, however the taking of water from bore E45/0071 is within the allocation limit of the Bog Burn and Waimatuku Primary allocation limit.

Policy 22 – Management of the effects of groundwater and surface water use

The well interference assessment carried out in Section 9.2 indicates that adverse effects on neighbouring bores are no more than minor. The AEE carried out to support this application shows that there is a high degree of hydraulic connection between bore E45/0071 and the Bog Burn, however as the hydraulic connections is less than 2 l/s no specific minimum flow restrictions will be imposed on the groundwater take.

Policy 23 – Stream depletion effects

The AEE carried out to support this application shows that there is a high degree of hydraulic connection between bore E45/0071 and the Bog Burn, however as the hydraulic connections is less than 2 l/s no specific minimum flow restrictions will be imposed on the groundwater take.

Policy 39 – Application of the permitted baseline

This application has considered all adverse effects on water quality and has proposed mitigation where required.

*P**olicy 42 – Consideration of water permit applications***

This application is not to apply for new water in a fully allocated groundwater zone or surface water catchment, this application is not to replace an expiring resource consent, bore E45/0071 has a water meter, the stream depletion assessment in section 9.6 indicated that the stream depletion or minimum flow conditions were not required.

4.5.2 Rules

Rule 20(i) and (j) – Farming

i. From 30 May 2018, the use of land for a farming activity in the Oxidising, Riverine or Peat Wetlands Physiographic Zones, other than dairy farming of cows or intensive winter grazing, that does not comply with the condition of Rule 20(e) or Rule 20(f) is a discretionary activity.

j. From 30 May 2019, the use of land for a farming activity in the Central Plains, Bedrock/Hill Country or Gleyed Physiographic Zones, other than dairy farming of cows or intensive winter grazing, that does not comply with the condition of Rule 20(g) is a discretionary activity.

The applicant's property is located within both Oxidising and Central Plains Pysiographic Zones, therefore the use of land for dairy farming is considered a discretionary activity under conditions (i) and (j) of Rule 20.

Rule 21 – Existing dairy farming of cows

The use of land for dairy farming of cows that existed as at 30 May 2016 is a permitted activity, provided the following conditions are met: (a)

a. the dairy platform has a discharge consent for agricultural effluent that specifies a maximum number of cows; and (b)

b. there is no increase in the number of cows, beyond that specified in Rule 21(a); and (c)

c. a Management Plan is prepared and implemented in accordance with Appendix N, including the mitigations relevant to the farming type being undertaken and relevant physiographic zone, and provided to Environment Southland upon request, or the farming activity and the landholding on which the activity is undertaken is listed on the Environment Southland Register of Independently Audited Self-Management Participants; and (d)

d. the activity does not occur in the Alpine physiographic zone.

As, this application is to increase cows milked at the property 540 cows to 800 cows this application is considered a discretionary activity.

***Rule* 22(a) – New or expanded dairy farming of cows**

a. The use of land for dairy farming of cows that did not exist as at 30 May 2016 or does not comply with Rule 21(a) or 21(b) in the Riverine, Gleyed, Bedrock/Hill Country, Oxidising, Central Plains, or Lignite-Marine Terraces physiographic zones, is a discretionary activity, provided the following condition is met:

i. a Management Plan is prepared and implemented in accordance with Appendix N including the mitigations relevant to the farming type being undertaken and relevant *physiographic zone, and provided to Environment Southland upon request, or the farming activity and the landholding on which the activity is undertaken is listed on the Environment Southland Register of Independently Audited Self-Management Participants.*

This application is to expand the dairy platform at the Woldwide One property with land that was previously within the Woldwide Two milking platform, therefore no new land will be used for dairy farming. However, the number of cows milked at the property is increasing. A Farm Environmental Management Plan has been prepared for the property and a copy accompanies this application. The use of land for dairy farming is considered a permitted activity under condition (a) of Rule 22.

Rule 23 – Intensive winter grazing

- a. *Until 30 May 2018, the use of land for intensive winter grazing is a permitted activity.*
- b. *From 30 May 2018, the use of land for intensive winter grazing is a permitted activity, provided the following conditions are met:*
    - i. *a Management Plan is prepared and implemented in accordance with Appendix N, including the mitigations relevant to the farming type being undertaken and relevant physiographic zone, and provided to Environment Southland upon request, or the farming activity and the landholding on which the activity is undertaken is listed on the Environment Southland Register of Independently Audited Self-Management Participants;*
    - ii. *no intensive winter grazing is undertaken in the Alpine physiographic zone;*
    - iii. *not more than 20 hectares of intensive winter grazing is undertaken on a landholding within the Old Mataura, or Peat Wetlands physiographic zones;*
    - iv. *not more than 50 hectares of intensive winter grazing is undertaken on a landholding within the Riverine, Gleyed, Bedrock/Hill Country, Oxidising, Central Plains, or Lignite-Marine Terraces physiographic zones;*
    - v. *the area of land used for intensive winter grazing is recorded for each year and provided to Environment Southland on request;*
    - vi. *the location of any sub-surface drains within the area of land used for intensive winter grazing, and their outlet position and relative depth, is mapped and provided to Environment Southland upon request;*
    - vii. *a vegetated strip is maintained, and stock excluded from, the outer edge of the bed of any river, wetland, modified watercourse or artificial watercourse for a distance of:*
        - 8. *3 metres from the outer edge of the bed on land with a slope of less than 4 degrees; and*
        - 9. *10 metres from the outer edge of the bed on land with a slope between 4 and 16 degrees; and*
        - 10. *20 metres from the outer edge of the bed on land with a slope of greater than 16 degrees; and*
    - viii. *the winter grazing does not occur within 100 m of the outer edge of the bed of any lake or the Coastal Marine Area;*
    - ix. *overland flow of run-off water does not cause a conspicuous discolouration or sedimentation of any adjacent waterbody.*

As the property is located within both Oxidising and Central Plains Pysiographic Zones, a Farm Environmental Management Plan has been prepared for the property and the area used for intensive winter grazing is less than 50 ha, the activity is considered a permitted activity under condition (b) of Rule 23.

Rule 35 – Discharge of agricultural effluent to land

b. *The discharge of agricultural effluent or water containing agricultural effluent onto or into land, in circumstances where contaminants may enter water, is a restricted discretionary activity, provided the following conditions are met:*

   i. *the discharge is the replacement of a lawfully established discharge pursuant to Sections 124-124C of the RMA,*

   ii. *the existing discharge consent for agricultural effluent specifies a maximum number of animals from which the effluent is collected, and that number is not increasing; and*

   iii. *any pond, tank or structure used to store agricultural effluent prior to discharge is certified by a Chartered Professional Engineer as:*

      1. *being structurally sound;*

      2. *meeting the relevant pond drop level outlined below, when tested in accordance with the methodology in Appendix P.*

Maximum Depth of Pond (m) excluding freeboard	Maximum Allowable Pond Level Drop (mm per 24 hours)
<0.5	1.2
0.5 to 1.0	1.4
1.0 to 1.5	1.6
1.5 to 2.0	1.8
>2.0	2.0

d. *The discharge of agricultural effluent or water containing agricultural effluent to land, in circumstances where contaminants may enter water, which does not comply with Rule 35(b) or Rule 35(c) is a non-complying activity.*

This application proposes to increase the number of cows wintered on the property in the wintering barn, which will increase the volume of effluent collected. It is proposed to increase the size of the current effluent pond the new effluent pond will have a new synthetic lined storage pond which will be signed off by CPEng. Therefore this proposal will be a restricted discretionary activity.

Rule 38 – Animal and vegetative waste

The discharge of solid animal waste (excluding any discharge directly from an animal to land), sludge or vegetative material containing animal excrement or vegetative material, including from a high intensity farming process, feed lot or wintering barn or industrial or trade process, into or onto land, or into or onto land in circumstances where a contaminant may enter water is a permitted activity provided the following conditions are met:

a. *the material does not contain any hazardous substance or hazardous waste; and*

b. *the material does not include any waste from a human effluent treatment process;*

c. *the maximum loading rate of nitrogen onto any land area does not exceed 150 kilograms of nitrogen per hectare per year; and*

d. *the material is not discharged:*

   i. *onto the same area of land more frequently than once every two months; or*

   ii. *onto land where solid animal waste, or vegetative material containing animal excrement or vegetative material from a previous application is still visible on the land surface; or*

   iii. *onto land when the soil moisture exceeds field capacity; or*

   iv. *from 1 May to 30 September in any year; or*

v. *within 20 metres of the landholding boundary, a bore used for water abstraction, the bed of a river, lake, or modified watercourse or the Coastal Marine Area; or*

vi. *with a depth of material of greater than 10 mm on the land surface*

The discharge of solid effluent and sludge from the wintering barn will be managed to ensure the activity is a permitted activity under rule 38.

Rule 53 - Bores and wells

The design and headworks of bore E45/0071 prevents the infiltration of contaminants and the uncontrolled discharge or leakage of water from the surface and between aquifers. Therefore, the use of bore E45/0071 is classified as a controlled activity under Rule 53.

Rule 54(d) - Abstraction and use of groundwater

Other than that provided by Rule 54(a), groundwater takes from groundwater management zones listed in Appendix L is a discretionary activity provided the following conditions are met:

i. *the total groundwater allocation is within the primary or secondary allocation limits established in Appendix L.5; and*

ii. *if the degree of hydraulic connection, calculated in accordance with Appendix L.2 is not Riparian, Direct or High, the relevant surface water minimum flows and allocation limits are met;*

iii. *any interference effects are 'acceptable' in accordance with Appendix L.3;*

iv. *if the total groundwater allocation is within the secondary allocation limit, then minimum groundwater level cut-offs and seasonal recovery triggers are established in accordance with criteria outlined in Appendix L.6.*

The applicant takes primary allocation water from the Waimatuku Aquifer which is a lowland aquifer. The AEE carried out to support this application shows that there is a high degree of hydraulic connection between bore E45/0071 and the Bog Burn, however as the hydraulic connections is less than 2 l/s no specific minimum flow restrictions will be imposed on the groundwater take and the well interference effects are acceptable.

4.6 Te Tangi a Tauira Iwi Management Plan

Section 6 of the RMA requires the recognition of the relationship of Maori and their culture and traditions. Section 7 states that particular regard should be given to kaitiakitanga. Section 8 requires the principles of the Treaty of Waitangi to be taken into account in relation to managing the use, development and protection of natural and physical resources.

The Southland Regional Policy Statement requires that Tangata Whenua values have to be incorporated into resource management decision making and practice. The values that Maori place on water have to be recognised and provided for. Further, consultation with the local iwis is encouraged in terms of resource management issues.

To assess potential effects on Tangata Whenua from the proposed abstraction of groundwater, policies from the Te Tangi a Tauira, the Iwi Management Plan for the Murihiku area, have been used. According to policies described in section 3.5 (Southland Plains) of this plan, the proposed activity complies as follows:

4.6.1 Farm Effluent Management

Policy 3.5.1.1

The applicant recognises the role of Ngāi Tahu ki Murihiku in relation to good management practises for managing farm dairy effluent at the property.

Policy 3.5.1.2

The AEE shows that the effect of the discharge of farm dairy effluent at the property is unlikely to have adverse effects on Murihiku that are any more than minor.

Policy 3.5.1.3

The applicant currently hold resource consent 301663 to discharge dairy effluent and this proposal will not go ahead until the granting of the associated resource consent.

Policy 3.5.1.4

The AEE shows that the proposal will sustain and safeguard the life supporting capacity of the soils for future generations.

Policy 3.5.1.5

The soil at the applicant's property is not Waikoikoi clay and peat.

Policy 3.5.1.6

This proposal is not to discharge dairy effluent to water.

Policy 3.5.1.7

Effluent will be discharged at low depth.

Policy 3.5.1.8

The discharge of dairy effluent at the property will be managed to ensure the Good Management Practices are achieved.

Policy 3.5.1.9

A Farm Environment Management Plan has been submitted with this application.

Policy 3.5.1.10

Proposed condition 10 enables the Southland Regional Council to review consent conditions in accordance with Sections 128 and 129 of the RMA.

Policy 3.5.1.11

The applicant will manage the discharge of dairy effluent to ensure there is no surface run off/overland flow or contamination of water.

Policy 3.5.1.13

Farm dairy effluent will not be discharged within 20 m of waterways.

Policy 3.5.1.14

Farm dairy effluent will not be discharges within 100 m of any groundwater bores on the property.

Policy 3.5.1.15

Spray drift of effluent will be managed to ensure it does not leave the property boundaries.

Policy 3.5.1.16

The consent application proposes a conditions to monitor water quality.

Policy 3.5.1.17

The consent application proposes a duration of 10 years.

4.6.2 General Water Policy

Policy 3.5.10.1
The applicant recognises the role of Ngāi Tahu ki Murihiku as kaitiaki of freshwater.

Policy 3.5.10.3
The AEE shows that the groundwater take from bore E45/0071 is unlikely to have adverse effects on freshwater resources throughout Murihiku that are any more than minor.

Policy 3.5.10.4
The AEE shows that the cumulative effects on the groundwater system are minor.

Policy 3.5.10.5
The AEE shows that the groundwater take from bore E45/0071 is unlikely to have adverse effects on freshwater resources throughout Murihiku that are any more than minor.

Policy 3.5.10.8
The AEE carried out to support this application shows that there is a high degree of hydraulic connection between bore E45/0071 and the Bog Burn, however as the hydraulic connections is less than 2 l/s no specific minimum flow restrictions will be imposed on the groundwater take. The customary relationship of Ngāi Tahu ki Murihiku with freshwater resources is therefore unlikely to be compromised.

4.6.3 Rivers

The AEE carried out to support this application shows that there is a high degree of hydraulic connection between bore E45/0071 and the Bog Burn, however as the hydraulic connections is less than 2 l/s no specific minimum flow restrictions will be imposed on the groundwater take. As such, adverse effects on surface water resources are unlikely to be any more than minor.

4.6.4 Water Quality

Policy 3.5.13.1
The applicant recognises the role of Ngāi Tahu ki Murihiku as kaitiaki of water.

Policy 3.5.13.2
The applicant is proposing mitigation measures to ensure the adverse effects of the proposed activity on the water quality are minor.

Policy 3.5.13.3
The AEE carried out to support this application provides an assessment of cumulative effects that the proposed activity may have on water quality.

Policy 3.5.13.4
The AEE carried out to support this application shows that the allocation of the groundwater resource is reasonable, and that water is used efficiently.

Policy 3.5.13.5
This proposal is to discharge dairy effluent to land.

Policy 3.5.13.6
The applicant is proposing mitigation measures to ensure the discharge of dairy effluent is appropriate and will avoid impacts on water.

Policy 3.5.13.9
Buffer areas will ensure effluent will not runoff into waterways.

4.6.5 Water Quantity – Abstractions

Policy 3.5.14.3

The AEE carried out to support this application provides scientifically sound and culturally relevant information.

Policy 3.5.14.4

This application is for a groundwater take from within the Southland Plains region.

Policy 3.5.14.6

The AEE carried out to support this application shows that the allocation of the groundwater resource is reasonable, and that water is used efficiently.

Policy 3.5.14.7

The applicant has been farming the subject property for many years. Water use is monitored to ensure an efficient use of the resource.

Policy 3.5.14.9

The AEE carried out to support this application shows that the allocation of the groundwater resource is reasonable, and that water is used efficiently.

Policy 3.5.14.10

The AEE indicates that the cumulative effects on the groundwater system and surrounding surface water bodies are no more than minor.

Policy 3.5.14.11

The well interference assessment carried out in the AEE indicates that adverse effects on neighbouring bores are no more than minor.

Policy 3.5.14.14

The AEE carried out to support this application shows that there is a high degree of hydraulic connection between bore E45/0071 and the Bog Burn, however as the hydraulic connections is less than 2 l/s no specific minimum flow restrictions will be imposed on the groundwater take and the well interference effects are acceptable.

Policy 3.5.14.16

The applicant has flow metering installed on bore E45/0071 (i.e. the water use will be monitored).

Policy 3.5.14.17

The consent application proposes a duration of 10 years.

Policy 3.5.14.18

Proposed condition 7 enables the Southland Regional Council to review consent conditions in accordance with Sections 128 and 129 of the RMA.

Policy 3.5.14.20

The AEE carried out to support this application shows that there is a high degree of hydraulic connection between bore E45/0071 and the Bog Burn, however as the hydraulic connections is less than 2 l/s no specific minimum flow restrictions will be imposed on the groundwater take and the well interference effects are acceptable.

5 CONSULTATION UNDERTAKEN

The applicant has not undertaken consultation as the effects of the proposed discharge of dairy effluent and abstraction and use of groundwater are considered to be minor.

6 DESCRIPTION OF THE ENVIRONMENT

6.1 Physiographic zones

The Woldwide One property overlies Oxidising and Central Plains physiographic zones. This is shown on the map of physiographic zones shown in Figure 1. Please refer to the attached Appendix N Farm Environment Management Plan for relevant good management practices which are implemented on farm to mitigate contaminant loss in this zone.

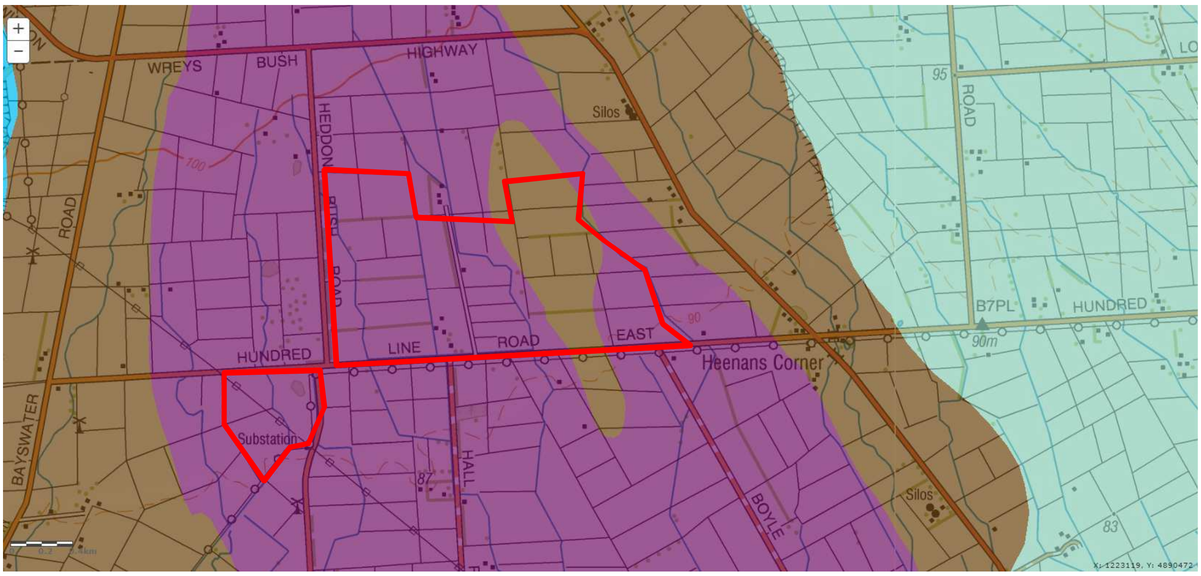
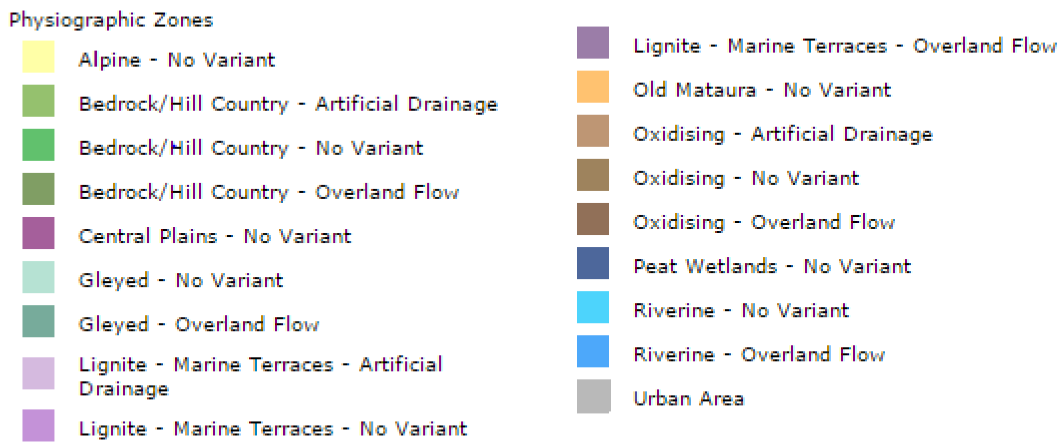


Figure 1: Map of physiographic zones at the Woldwide One property



6.2 Soil Types

The soil types and areas shown on Topoclimate appear to be incorrect for the milking platform, John Scandrett (Scandrett Rural) has mapped the soil of the property. The property is overlying Braxton and Drummond soil types as shown in Figure 2. The soils for the Horner block have been obtained from the Topoclimate layer in Environment Southlands Beacon mapping service. The Horner block is overlying Braxton and Pukemutu soils as shown in Figure 3.

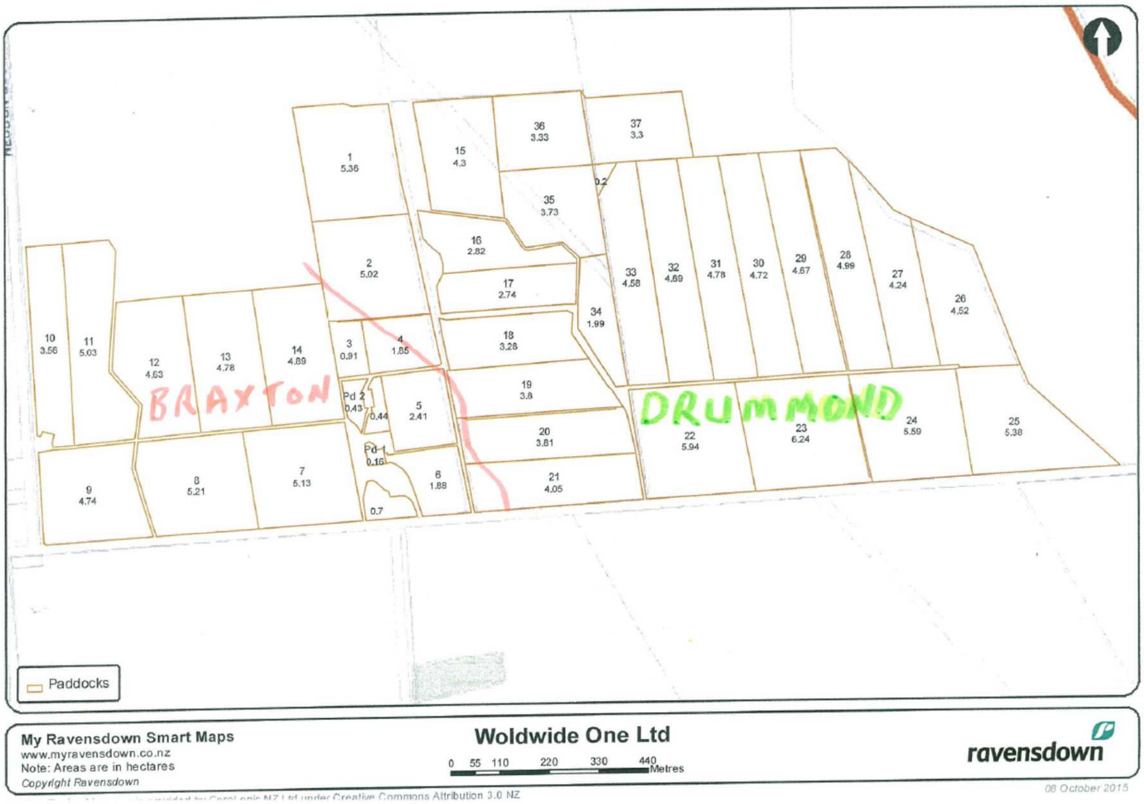


Figure 2: Map of soil types at the Woldwide One property

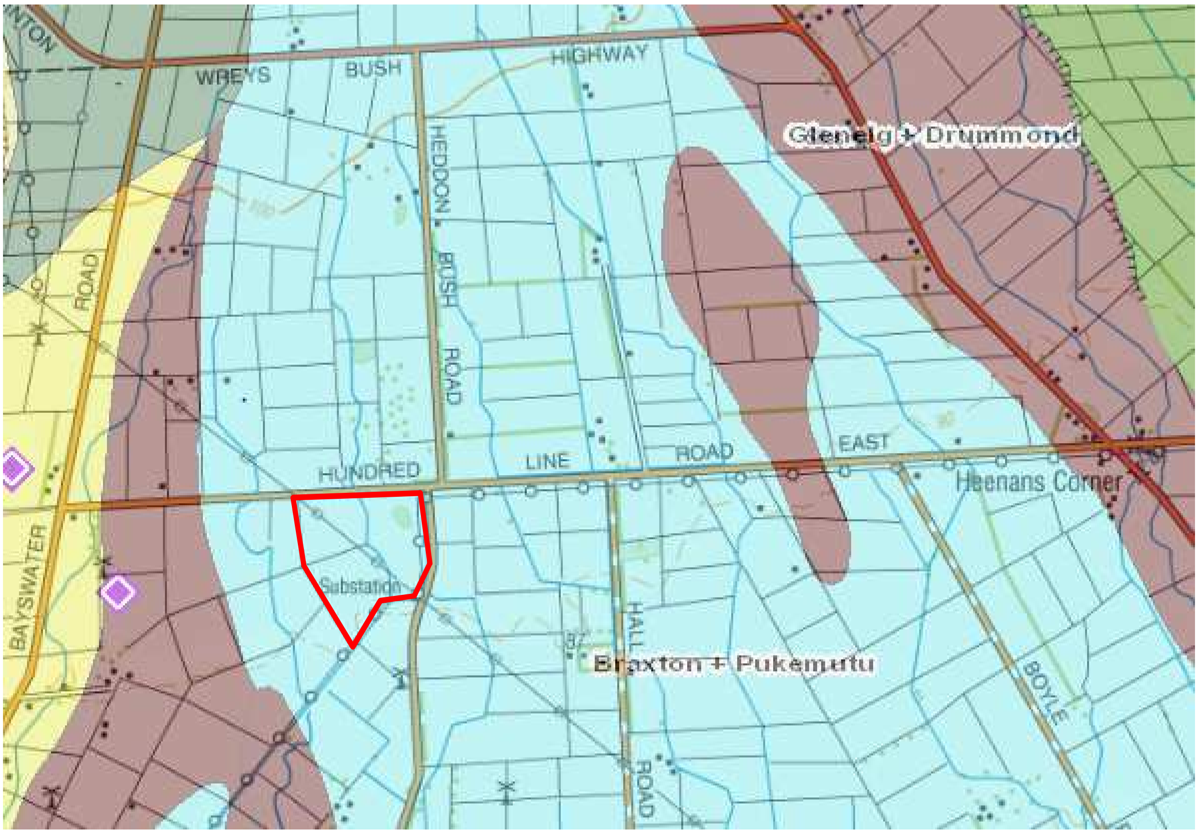


Figure 3: Map of soil types at the Woldwide One property – Horner Block

The vulnerability factors of the soils on the property are shown in Table 2.

Table 2: Vulnerability of soils at the Woldwide One property

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

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 3.

Table 3: PAW values for the Woldwide One property

Soil Type	Area (ha)	Percentage (%) of property	PAW_{30}
Braxton	97	33.7	85 mm
Drummond	191	66.3	48 mm

6.3 Groundwater Quality

Condition 10 of existing Resource Consent 301663 required groundwater quality samples to be taken from bore E45/0622 once every six months. The results of the sampling are included in Table 4.

Table 4: Groundwater quality sample results from bore E45/0622

Parameter	30/04/2015	11/11/2015	14/04/2016	01/11/2016
Electrical Conductivity (µS/cm)	320	351	313	331
Dissolved Iron (g/m^3)	< 0.02	-	-	-
Chloride (g/m^3)	27.2	35.2	30.7	32.4
Nitrite – N (g/m^3)	< 0.002	< 0.002	<0.002	<0.002
Nitrate – N (g/m^3)	9.1	8.6	7.59	7.75
Nitrate N + Nitrite N (g/m^3)	9.1	8.6	7.59	7.75
E coli (MPN/100mL)	<1	<1	<1	<1

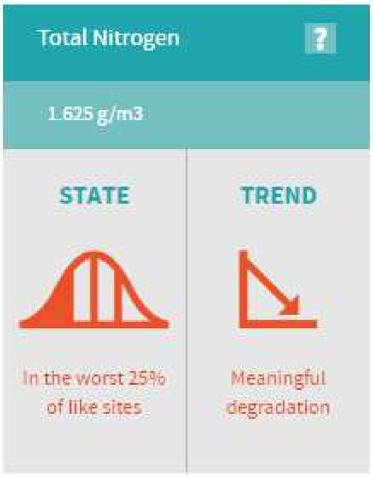
The results indicate the electrical conductivity and chloride are slightly increasing, Nitrate N and Nitrate N + Nitrite N decreasing whilst the remaining parameters have remained constant.

6.4 Surface Water Quality

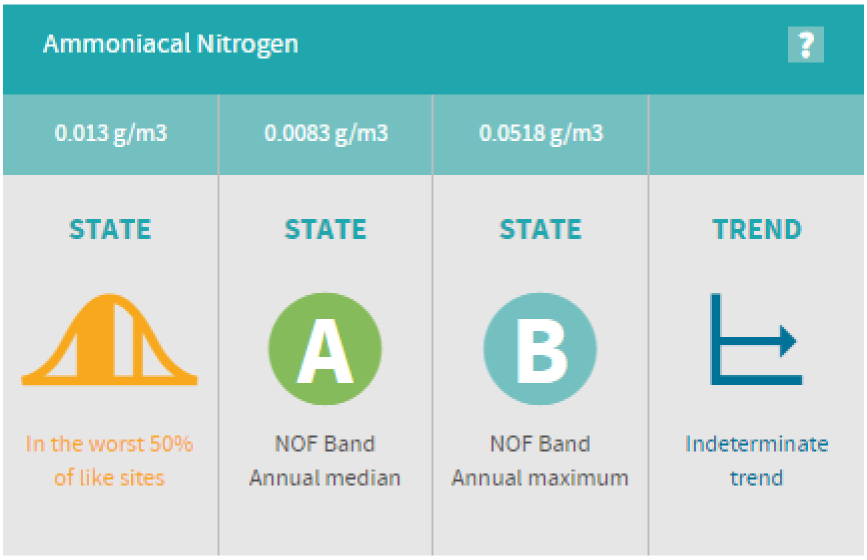
The applicant's property lies within both the Aparima River and Oreti River catchments. The Aparima River and Oreti River catchments are dominated by intensive land uses including dairy and sheep and beef farming.

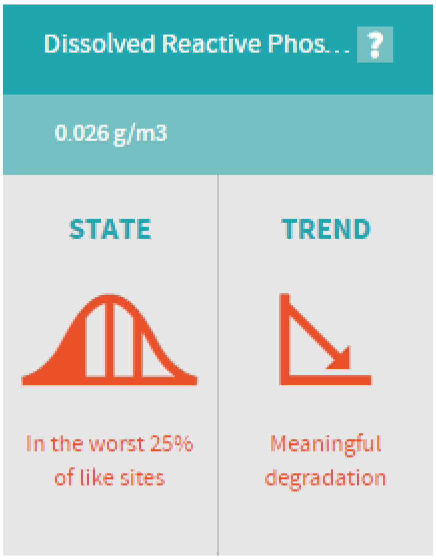
The Oreti River is subject to a Water Conservation Order which protects the water quality in the river, however the water quality is only protected from upstream of Rocky Point which is upstream of the applicant's property.

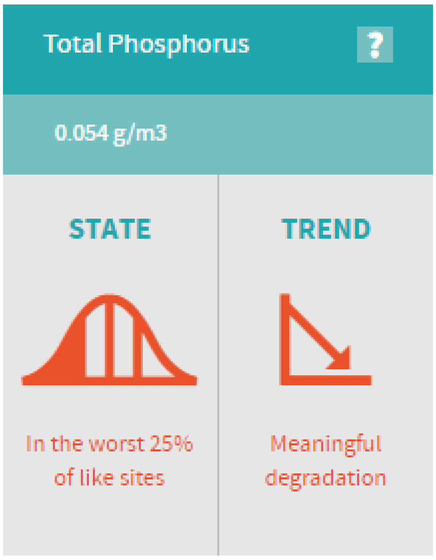
Long term water quality trends can be used as an indication of cumulative effects on water quality. Results from the LAWA site for the Bog Burn downstream of Hundred Line Road reflects the impacts land use is having on water quality. The Bog Burn is the closest monitoring site to the property and is within the Oreti River catchment; the site is located approximately 5 km downstream from the applicant's property. Data below is from the LAWA, monitoring station for the Bog Burn downstream of Hundred Line Road.


Total Nitrogen
1.625 g/m3
STATE
TREND
In the worst 25% of like sites
Meaningful degradation


Total Oxidised Nitrogen
1.13 g/m3
3.8 g/m3
STATE
STATE
STATE
TREND
B
C
In the worst 25% of like sites
NOF Band Annual median
NOF Band 95th percentile
Meaningful degradation


Ammoniacal Nitrogen
0.013 g/m3
0.0083 g/m3
0.0518 g/m3
STATE
STATE
STATE
TREND
A
B
In the worst 50% of like sites
NOF Band Annual median
NOF Band Annual maximum
Indeterminate trend


Dissolved Reactive Phos...
0.026 g/m3
STATE
TREND
In the worst 25% of like sites
Meaningful degradation


Total Phosphorus
0.054 g/m3
STATE
TREND
In the worst 25% of like sites
Meaningful degradation

Five of the six scientific indicators indicate the Bog Burn water quality is very low, with total nitrogen, total oxidised nitrogen, dissolved reactive phosphorus, total phosphorus and E. Coli all within the worst 25 % of similar sites and ammoniacal nitrogen within the worst 50 % of similar sites. In summary the surface water quality downstream of the property in the Bog burn catchment is low.

7 FARM DAIRY EFFLUENT DISCHARGE

7.1 Duration of consent sought

To expire on 9th November 2027 (same as existing consent 301663).

7.2 Herd size

The milking herd will be not more than 700 cows until a new dairy shed is constructed within the next five years. Following the construction the milking herd will increase to a maximum of 800 cows. With 640 cows wintered in the wintering barn.

7.3 Factory supply number

Supplier number is 32650.

7.4 Volume of effluent – Dairy Shed

Dairy shed effluent for 700 cows at 50 l/cow per day is 35 m^3/day. Once the new dairy shed is constructed, 800 cows will be able to milked in the dairy shed. However, as the new shed will have an effluent scraper, the volume of water used for dairy shed wash down will not increase above the volume required for 700 cows i.e. 35 m^3/day for dairy shed washdown.

7.5 Volume of effluent – Wintering Barn

Existing consent 301663 allows for effluent from the wintering barn to be discharged onto land from 400 cows. This application proposes to allow for effluent from the wintering barn to be discharged to land from 640 cows. The current wintering barn will be widened which will enable 640 cows to be wintered at the property in the barn.

The wintering barn has a sealed concrete floor. Dung and urine deposited by the cows is scraped down a scraper lane into a concrete lined sump. From the sump the effluent is pumped into the effluent storage pond.

The effluent from the wintering barn is connected to the dairy shed effluent system. The volume of effluent collected from the wintering barns has been calculated as approximately 2,179 m^3/year, the volume has been calculated as follows;

May;

$$400\ cows\ x\ 6\ Hours/day\ x\ 50\ l\frac{effluent}{24}Hours\ \ x\ 31\ days = 155\ cubic\ metres$$

June and July;

$$640\ cows\ x\ \ 50\ l\frac{effluent}{day}\ x\ 61\ days = 1{,}972\ cubic\ metres$$

August;

$$400\ cows\ x\ 2\ Hours/day\ x\ 50\ l\frac{effluent}{24}Hours\ \ x\ 31\ days = 51.7\ cubic\ metres$$

Total

$$155\ m3 + 1{,}972\ m3 + 52\ m3\ \ = 2{,}179\ cubic\ metres$$

Note - the use of the wintering barn as a stand-off pad is very weather dependant and its use will vary each year.

The effluent from the wintering barns will drain by gravity into the adjacent effluent sump and be pumped into the effluent storage pond.

7.6 Period of discharge

Farm dairy effluent will be discharged throughout the year when soil conditions are suitable.

7.7 Milking frequency

Twice per day.

7.8 Winter milking

Winter milking is not currently anticipated on Woldwide One. The cowshed will be operated from 1 August to 31 May each year, with a limited number of cows (which calved late) milked until mid-June.

The property is factory supply, with cows only calving in spring and the applicant does not have a winter milking contract with Fonterra. However, cows are dried off according to their calving date, i.e. if cows calve late in spring they are milked later into June.

The midpoint of calving is 15th August and midpoint drying off is 15th June, with each cow “dry” for two months. When approximately 100 cows are left they are all dried off as it is uneconomic to milk less than 100 cows.

7.9 Other sources of effluent

Underpass – None

Silage Pad – None – not connected to the dairy effluent discharge system

7.10 Area of land

The total land area of the dairy platform is 240 ha plus 48 ha of the Horner Block, which will also be used for effluent application. This application seeks to discharge dairy effluent to a maximum area of 288 ha, excluding standard buffers from dwellings, bores and waterways (as indicated in Appendix B).

7.11 Stocking rate

800 cows on 240 ha (milking platform) gives a stocking rate of 3.3 cows per ha.

7.12 Effluent collection and storage details

7.12.1 Dairy Shed Effluent System

i. During adequate soil moisture deficit conditions the effluent from the dairy shed will be discharged directly to the land via a 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 is pumped from the pond to the slurry tanker for spreading onto the property; and

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

7.12.2 Wintering Barn Effluent System

i. The effluent flows by gravity to a concrete collection sump and 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 via a vacuum pump; and

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

7.12.3 Storage Capacity

Storage Capacity – Existing storage pond 3,397 m^3

The following scenarios have been calculated with the Dairy Effluent Storage Calculator;

- Scenario 1 – before new dairy is constructed
  - 700 cows milked
  - Yard area – 553 m^2
  - Milking shed roof area diverted.
  - 400 cows wintered on a covered feedpad that included an uncovered area of 148 m^2 that is not diverted for 2017.
  - 640 cows wintered on a covered feedpad that included an uncovered area of 180 m^2 that is not diverted for 2018.
  - The Dairy Effluent Storage Calculator the 90% probability volume of storage required is 3,036 m^3 (refer to Appendix F).
- Scenario 2 – after new dairy is constructed
  - 800 cows milked (August to May)
    - 400 cows milked in June (to cover cows that calve late)
    - 50 cows milked in July (to cover cows that calve late)
  - Yard area – approximately 1,150 m^2
  - Milking shed roof area diverted.
  - 640 cows wintered on a covered feedpad that included an uncovered area of 180 m^2 that is not diverted.
  - The Dairy Effluent Storage Calculator the 90% probability volume of storage required is 3,917 m^3 (refer to Appendix G).

7.13 Effluent irrigation method

This application is to allow for effluent to be discharged via a travelling irrigator or a slurry tanker, with a backup option of an umbilical system. The discharge system will meet the following conditions:

- A maximum depth of application of 10 mm for each individual application;
- A minimum return period of 28 days between applications;
- A maximum combined depth of application of 25 mm per year to any land area; and
- A minimum land area of 8 hectares/100 cows for the dairy shed effluent.

The slurry tanker will meet:

- A maximum depth of application of 5 mm for each individual application;

The travelling irrigator will meet:

- A maximum depth of application of 10 mm for each individual application; and

The umbilical system will meet:

- A maximum depth of application of 5 mm for each individual application.

7.14 Effluent testing

The nutrient content of the dairy shed effluent has not been tested to date. However the nutrient content of the wintering barn effluent has been tested with the results shown in Table 5.

Table 5: Nutrient content of wintering barn effluent

Potassium	Nitrogen	Phosphorus	Sulphur
2,900 g/m^3	2,900 g/m^3	440 g/m^3	390 g/m^3

7.15 Buffer zones

The applicant intends to comply with all buffer zones as recommended by Environment Southland, that is:

i. 20 metres from any surface watercourse;

ii. 100 metres from any potable water abstraction point;

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

iv. 200 metres from 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 5 – 10 days; and

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

7.16 Other discharges

The Woldwide One property is within the discharge area for Fonterra's consent to discharge whey (resource consent 20146925-V3). However, going forward the whey will not be discharged on the property; a copy of the email from Fonterra to Environment Southland confirming the cessation of whey applications at the Woldwide One property is included in Appendix H. Therefore, no further assessment is required as only effluent from Woldwide One's dairy shed and wintering barn will be discharged at the property.

Silage leachate – the silage pit and any associated leachate is not connected to the effluent pond.

Underpass – there is no stock underpass at the Woldwide One property.

7.17 Water zones

Groundwater Zone(s):

The applicant's property is within the Central Plains and Waimatuku Groundwater Zones.

Surface Water Catchment:
Aparima River and Oreti River.

7.18 Groundwater depth

The static water level in bore E45/0061 (adjacent to the dairy shed) was 2.5 m bgl at the time of drilling in 2001. This bore is used for dairy shed use and stockwater supply for the property.

7.19 Slope of effluent discharge area

The property is located in the Oreti Plains and the discharge area is predominately flat.

7.20 Existing environment

The discharge of effluent is an existing activity at the property and this application will not lead to any change to the existing environment. The following effects of the effluent discharge have been assessed on the existing environment;

a. In stream life	No Effect
b. Food gathering from watercourses	No Effect
c. Wetlands/ bird nesting habitats	No Effect
d. Recreational activities	No Effect
e. Areas of aesthetic or scientific value	No Effect
f. Waste discharges	No Effect
g. Other water takes	No Effect

8 ASSESSMENT OF ENVIRONMENTAL EFFECTS

8.1 Effects of Discharge on Nitrogen Entering Groundwater

Table 6 shows that the proposal to milk up to 800 cows for factory supply and winter 640 cows in a wintering barn and to spread effluent over an area of at least 200 ha will result in a nitrogen loading rate of 119 kg/ha/year. As the proposed nitrogen loading rate is less than 150 kg per year there is no need for further assessment of the effects of nitrogen entering groundwater.

Table 6: Nitrogen loading rate calculation

	Dairy shed	Wintering barn
Number of cows	800	640
Maximum hours used per day		24
Nitrogen collected	0.024 Kg N/cow/day	0.018 Kg N/cow/hour
Daily nitrogen produced	19.2 Kg N/day	276.5 Kg N/day
Maximum days used per year	300	65 (approximately)
Annual nitrogen produced	5,760 Kg N/year	17,971 Kg N/year
Total nitrogen produced	23,731 kg N/year	
Minimum annual size of discharge area (ha)	200 ha	
Annual maximum nitrogen loading rate	**119 kg N/ha**	

8.2 Effects of Pathogens Entering Groundwater

As the dairy shed effluent is to be applied to the land, there is the potential for pathogens to pass through the soil profile and enter groundwater. However, studies indicate that if the effluent is spread at a rate not exceeding half the amount of water held within the root zone of the soil, the potential for pathogens passing through the soil and entering groundwater are minimal.

As the majority of the soil at the Woldwide One property is considered to have a high FDE risk category the maximum application depth will not exceed 10 mm, which is also less than half of the lowest average soil's PAW30. Therefore, the effects of pathogens entering groundwater can therefore be considered minor.

8.3 Effect on Local Water Bodies

For the discharge of dairy effluent proposed condition 5(a) proposes buffer distances of 20 m to surface water bodies and 100 m to potable water abstraction points. This complies with the buffer distances listed in both Rule 50 of the operative Regional Water Plan (RWP) and Rule 35 of the proposed Southland Water and Land Plan (pSWLP).

8.4 Effects of Odour and Pathogens in Air

The following steps will be taken to ensure that odour will not be a nuisance to people living and working in the surrounding area of the discharge sites:

- The effluent will be discharged to the land daily when soil conditions allow. Routinely discharging the effluent will reduce the development of potentially odorous compounds.
- All neighbouring dwellings are separated from the discharge areas by distances of at least 500 m.
- The distance from the storage pond to the western boundary of the Woldwide One property is approximately 850 m.

To ensure that pathogens will not cause harm to people using the area surrounding the discharge site the travelling irrigator will operate at relatively low pressures and produce relatively large-sized droplets. The travelling irrigator will also operate at moderately low heights (approximately 2 m) above the ground to reduce the potential for spray drift. The slurry tanker is equipped with a trailing shoe applicator, which makes a groove in the ground, with the effluent slurry deposited into the groove so the slurry will not be travelling through the air.

8.5 Effects of Odour Due to Storage of Effluent

When effluent is stored, particularly when stored for long periods of time, the potential for odours to become a nuisance to neighbours and those passing the property is increased. This, however, is unlikely to occur on the applicant's property with the effluent storage area situated approximately 1.4 km from the closest neighbouring house (owned by Careykin Limited). Furthermore, effluent will be discharged daily during the milking season when soil conditions allow with no prolonged storage during the summer period, thereby reducing the potential for odours to develop to unacceptable levels. The effluent collected from the wintering barn is collected and stored during the colder part of the year reducing the potential for odour and is discharged to land as soon as soil moisture conditions allow in the spring.

8.6 Effects on Visual Amenity

Dairying is typical of the land use in the Oreti Plains, where Woldwide One is one of five dairy farms the applicant is currently operating in the area. Furthermore, the changes proposed by the applicant pertain only to increasing the number of cows milked at the property, and the number of cows wintered in the wintering barn and swapping some of the area of land used for dairy farming with Woldwide Two. There will be no change to the overall activity on the property and as such, the effects on visual amenity from the proposed activity will not change under this proposal.

8.7 Potential to Affect Soil Quality

The application of excessive contaminants to the soil can have detrimental effects upon the soil structure and its ability to support plant, animal and insect life.

The effluent and washdown water gravitates from the dairy shed and wintering barn. The pipe connecting the sump to the irrigators and storage pond are appropriately sealed to prevent leakage either from the pipe itself or from around the inlet or outlet. This system does not allow for significant volumes of effluent to be in contact with the soil until it is discharged to land. As such, it is not considered this activity will have any adverse effects on soil quality.

The proposed storage facility will consist of a synthetic lined storage pond with a storage capacity of at least 3,917 m^3.

All associated yards, tanks, pipes, sumps and channels shall be sealed and maintained at all times with appropriate material such as concrete to prevent leakage of contaminants onto or into land where it may enter water.

Given the above it is considered that the potential for the proposed activity to significantly adversely affect groundwater quality is minor.

8.8 Beneficial Effects

The discharge of dairy shed effluent to land allows for sustainable land management practices to be undertaken. Collected dairy shed effluent provides a valuable resource to be recycled, containing nitrogen, phosphorus, potassium and sulphur – all nutrients required to optimise pasture growth. In addition, the effluent adds organic matter to the soil, thereby increasing earthworm activity.

8.9 Effect on Tangata Whenua Values

The effects on Tangata Whenua are unlikely to be any more than minor because:

- The proposed activity does not interfere with cultural values, the relationship of Maori to land and water, kaitiakitanga and the Treaty of Waitangi as stated under Part 2 of the RMA;
- The proposed activity is consistent with the policies described in the Te Tangi a Tauira Iwi Management Plan;
- The location of the proposed activity is unlikely to have adverse effects on sensitive areas such as lakes, rivers and streams that are any more than minor; and
- The proposed activity is not within, adjacent to, or likely to affect a Statutory Acknowledgement Area or a silent file area.

Therefore, the effects from the proposed activity on Tangata Whenua are considered to be no more than minor.

8.10 FDE risk categories

The majority of the effluent discharge area has a soil risk category of A – artificial drainage or course soil structure, the remaining areas of the discharge area have a soil risk category of E – other well drained but very light flat land. As shown in Table 7 the soil risk category A soil is considered high risk which has the following restrictions;

- an application depth less than the soil water deficit;
- only discharge effluent when a soil water deficit occurs;
- a maximum depth of 10 mm with a high rate tool (i.e. travelling irrigator).

As shown in Table 7 the soil risk category E soil is considered low risk which has the following restrictions;

- an application depth less than half of the soil PAW30;
- discharge effluent 24 hours after drainage saturation;
- a maximum depth of 10 mm with a high rate tool (i.e. travelling irrigator).

The Farm Dairy Effluent Storage Calculator was used to determine the required storage volume (copies are included in Appendices F and G) based on 190 ha of high risk soil and 50 ha of low risk soil. As the FDE storage calculator has been modelled with the majority of the property as high risk soil (artificial drainage) the storage volume is considered to be appropriate to allow for effluent storage to occur when the groundwater level is high and when artificial drainage may be occurring at the property.

Table 7: Guidelines to minimise the risk of effluent ponding and runoff occurring (DairyNZ Pocket guide to determine soil risk for farm dairy effluent application https://www.dairynz.co.nz/media/757892/fde_soil_risk_pocket_guide.pdf)

Dairy Effluent (FDE) Risk Categories	A	B	C	D	E
Soil & landscape feature	Artificial drainage or coarse soil structure	Impeded drainage or low infiltration rate	Sloping land (>7°) or land with hump and hollow drainage	Well drained flat land (<7°)	Other well drained but very light flat land (<7°)
Risk	High	High	High	Low	Low
Application depth (mm)	<SWD[1]	<SWD	<SWD	<50% PAW30[2]	<10mm & ≤50% PAW30
Storage requirement	Only apply when SWD exists	Only apply when SWD exists	Only apply when SWD exists	24hours drainage post saturation	24hours drainage post saturation
Max depth: high rate tool[3]	10mm	10mm	10mm[4]	25 mm[5] (10mm at field capacity)	10mm
Max depth: low rate tool[6]	25mm	25mm	10mm	25mm	10mm

1 SWD = Soil Water Deficit
2 PAW30 = Plant Available Water in top 30cm of soil
3 A high rate tool is an irrigator that discharges effluent at application rates over 10 millimetres per hour (mm/hr)
4 Only applicable when the instantaneous application rate from the irrigator is less than the infiltration rate.
5 Suggested maximum application depth when a suitable SWD exists (≥15mm)
6 A low rate tool is an irrigator that can discharge at an application rate of less than 10mm/hr.

Note: Application rate refers to the speed (i.e. volume over time), while application depth refers to the depth of effluent and any irrigation water applied to an area over a 24 hour period.

At the Woldwide One property the proposed maximum application depth from the travelling irrigator is 10 mm and application depth the slurry tanker with trailing shoe applicator is approximately 2 mm.

8.11 Physiographic Zones

The applicant's property is overlying both Central Plains and Oxidising Physiographic Zones. The contaminant pathways for nutrients to the receiving environment are discussed below.

8.11.1 Central Plains

The Central Plains zone includes areas of clay-rich soils found in the central parts of the Southland Plains. These soils can crack extensively during summer as they dry out, and swell when wet in winter and early spring, becoming poorly drained.

The contaminant transport within the Central Plains consist of both artificial subsurface drainage and deep drainage of nitrogen.

Artificial subsurface drainage
Artificial subsurface drainage occurs when the soils are wet and/or the groundwater levels are high resulting in contaminants moving through via the drains to streams.

As part of this application the dairy effluent storage calculator was used to ensure the effluent storage volume was adequate for periods when effluent could not be discharged due to saturated soils, high groundwater levels and artificial drainage occurring. Having adequate storage volume means effluent can be stored when the soil is to wet for effluent to be discharge. This along with a wintering barn which acts as a feed pad during the milking season if the paddocks are too wet to graze is the optimum mitigation to reduce the nitrogen loss to drains.

Deep drainage of nitrogen
Deep drainage of nitrogen occurs when the clay minerals in the soil dry and shrink, resulting in the opening of cracks and fissures. The cracks and fissures allow for contaminants to move below the root zone to groundwater and hydraulically connected waterways.

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.

8.11.2 Oxidising

The contaminant transport within the Oxidising Physiographic Zone consist of artificial subsurface drainage, deep drainage of nitrogen and overland flow. For artificial subsurface drainage, deep drainage of nitrogen see above explanations.

Overland flow

As the Woldwide One property is flat, overland flow at the Woldwide One property is unlikely to occur except potentially during periods of intense rainfall.

The Woldwide One property has a wintering barn which also acts as a feed pad during the milking season if the paddocks are too wet to graze. During periods of intense rainfall the cows will kept off the pasture to help to reduce the risk of contaminants getting into waterways.

8.12 Values

The values considered to apply to this application are groundwater quantity, groundwater quality and surface water quality. The effects on groundwater and surface water quality have been addressed in Sections 8.1 – 8.3 of this AEE. The effects on groundwater quantity have been addressed in Section 9.3 of this AEE.

8.13 Modelled nutrient loss effect the environment

Groundwater quality samples have been taken from bore E45/0622, the results of the samples are included in Table 3 of this AEE. The average from the four samples available for nitrate-nitrogen is 8.26 g/m^3. Overseer modelling calculates the nitrogen loss in drainage for each block, the average nitrogen loss in drainage for the Woldwide One and Two property is 3.8 g/m^3. The higher levels of nitrate-nitrogen in bore E45/0622 can be attributed to the cumulative effect of nitrogen loss from all farms in the surrounding area, whereas the lower figure from Overseer is only the nitrogen loss to drainage from the Woldwide One and Two properties.

The results from the Overseer modelling indicate that the nitrogen loss to water will reduce below the current consented situation, with phosphorus loss to water slightly increasing above the current consented situation. However, with the implementation of good management practices at the property (specifically the cows being wintered inside) and ensuring phosphorus from laneways cannot enter waterways; the groundwater and surface water quality is likely to remain the same or reduce below the current consented situation. The potential for nitrogen loss associated with deep drainage is also likely to remain the same or reduce below the current consented situation. Therefore this application meets Policy 15 of the pSWLP as the Overseer modelling results indicate water quality will be maintained or improved.

8.14 Limitations of Overseer

Overseer was developed to assist with fertiliser maintenance requirements and has since been modified to assist regional councils with assessing potential nitrogen and phosphorus lost to water. With Overseer being used by regional councils yearly nutrient budgets are being prepared which causes its own issues given the model is based on average long term climate data, this is especially concerning for irrigation inputs; for example if during drought years the actual irrigation water used is entered Overseer will model excess drainage as the climate data is assuming an average season. The results of Overseer modelling are very dependent on how the data is entered into the model, two people can enter the same data and get different results. Given the limitations the results need to be considered to be within a scale of plus or minus 30 %. Overseer also only models nutrient loss to the bottom of the root zone therefore if the deep drainage was to occur in the Central Plains Physiographic zone below the root zone Overseer will not take account of any nutrient loss to deep drainage. Overseer is also not soil site specific and cannot model all good management practices.

However, Overseer is the most comprehensive farm system tool we have currently available for use to assess nitrogen and phosphorus loss to water which takes into account both farm inputs and outputs.

8.15 Receiving environment

Groundwater and surface water quality information in the vicinity of the Woldwide One property was included in Sections 6.3 and 6.4 of this application. As discussed previously this proposal may potentially improve the water quality in the vicinity of the property. Also, given the following, the effects of dairy farming and discharging dairy effluent are likely to be minor;

- The Woldwide One property has been a dairy farm since 1992 (i.e. not a new conversion);
- the applicant is operating under good management practices according to their farm environment plan;
- intensive farming is common practise in the Oreti Plains;
- the application is not to discharge effluent into surface water,

- The mitigation proposed in the application will ensure water quality will potentially improve in the vicinity of the property;
- The applicant's property is not within close proximity to any of the sensitive waterbodies listed in Appendix Q of the Proposed Southland Water and Land Plan;
- All waterways are fenced off; and
- Cows are wintered inside (i.e. not grazed on the land)

The Woldwide One milking platform is located approximately 2.3 km north of the Heddon Bush School which has a groundwater take from bore E45/0718 which is a registered drinking water site. Bore E45/0718 is 20 m deep. Borelogs in the surrounding area indicate layers of clay and claybound gravels from approximately 15 – 20 m, these clay layers will help to reduce any potential risk of contaminants entering the drinking water supply. The groundwater flow in the vicinity of the property is understood to flow in a southeast direction (i.e. towards Winton). Therefore, the discharge of effluent from the Worldwide One property is unlikely to effect the Heddon Bush School take.

8.16 Monitoring of effects

The potential effects on the environment will be monitored by proposed condition 10 which requires groundwater quality samples to be taken once every six months from bore E45/0622.

Overseer modelling will also be carried out annually to monitor the proposed nitrogen and phosphorus loss to water.

8.17 Travelling irrigator application depth test

A travelling irrigator application depth test was carried out in 2012 as part of the consent application to discharge dairy effluent (resource consent 301663).

8.18 Assessment of the risk of contaminant transportation – farm dairy effluent

The entire design of the effluent discharge system meets best practice by using buffer storage and low depth application. The use of best practice effluent application should avoid adverse effects on the environment. This principle is well documented in various scientific reports prepared for Environment Southland during the process of setting policies and rules around effluent discharge to land. The 2009 Houlbrooke and Monaghan report provides context and background to the principle that low depth effluent application should not cause adverse effects on water quality.

8.18.1 Neighbourhood and wider community:

As the applicant intends to adhere to Environment Southlands buffer zones around boundaries, dwellings, bores etc, there will be no more than minor effects on the neighbourhood and wider community.

The farm is already operating as a dairy farm, with the required infrastructure in place. No issues have been raised (by neighbours or any other person) with the existing owner during their ownership.

8.18.2 Physical effect on the locality including landscape and visual effects:

The discharge of effluent has minimal landscape and visual effects. The discharge of effluent is an existing activity at the property and this application will not lead to any change of the existing landscape and visual effects.

8.18.3 Plants and animals, habitats and ecosystems:

The effluent discharge area covers approximately 288 ha of the property, excluding buffers from dwellings, bores and waterways. The size of the effluent area is important to ensure nitrogen, potassium and phosphate loadings are within expected limits to avoid environmental effects and animal health issues. The total available discharge area is above the Environment Southland and Industry recommended area of 8ha/100 cows (i.e. 64 ha).

Effluent application adds nutrients and organic matter improving soil structure, aeration and drainage. Soil structure is important for plants, habitats and soil ecosystems.

8.18.4 Natural and physical resources having special value:

There are no known QEII covenant's, historical places or sites of special significance to Maori on the property.

8.18.5 Discharge of contaminants into the environment:

Effluent itself may be considered a contaminant, however as discussed above, when applied according to best practice guidelines, it has minimal impact on the environment.

8.18.6 Natural hazards, hazardous substances or installations:

N/A

8.19 Mitigation measures

8.19.1 Maintenance Details:

The effluent irrigation pump performance and need for maintenance will be monitored via a pressure gauge fitted at the pump. The effluent pump and irrigation lines will be drained for the winter period.

8.19.2 Effluent Irrigation Mitigation Methods:

- All buffer zones as recommended by Environment Southland will be adhered to.
- Effluent irrigation will only be undertaken when there is a soil moisture deficit as per the closest Environment Southland website soil moisture monitoring site.
- Effluent will be applied at the appropriate rate and depth as prescribed by consent conditions.
- The travelling irrigator is fitted with a "fail safe" system.

- The tractor towing the slurry tanker has a GPS system which also monitors speed and can provide proof of placement.

8.19.3 Contingency details:

Mechanical Breakdown

If the irrigation pump fails contingency measures will be implemented such as:

- Effluent volumes will be minimised, a contractor will be called if required;
- Effluent being applied using a slurry tanker or umbilical system;
- The pump will be repaired or a backup or loan pump will be installed; and
- The aim is to manage the effluent irrigation system to always ensure there is buffer storage available. This allows a storage contingency for wet weather or pump failure.

Wet Weather

The storage structures will contain enough storage for dairy shed effluent even after allowing for the rainwater and effluent runoff from the yard areas during periods of inclement weather.

8.19.4 Farm Effluent Management Plan

See the attached Appendix N FEMP document.

8.20 Alternative locations or methods

The travelling irrigator and slurry tanker have been chosen as the main irrigation method over other possibilities as there are fewer adverse effects and it is consistent with Environment Southland policies. They are the farms existing equipment and have proven reliability.

9 TAKE AND USE GROUNDWATER

Existing resource consent 301664 allows water to be taken from bore E45/0071, with a maximum volume of 60 m^3/day. The applicant proposes to take 91 m^3/day at a maximum rate of 2 l/s from bore E45/0071. The bore details are as follows;

- E45/0071 – 44.3 m deep, 150 mm diameter at or about map reference 1225144-4888768

The groundwater take is a discretionary activity under Rule 54 of the Proposed Southland Water and Land Plan as the take meets the following conditions;

- The proposed rate is less than 5 l/s;
- The proposed volume is greater than 86 m^3/day;
- Bore E45/0071 are not within 50 m of an existing lawfully established groundwater take
- The applicant does not proposes to take any surface water to supply the property; and
- The farming type, stocking rate and point of abstractions are all included in this application.

The groundwater take is a restricted discretionary activity under Rule 23 of the Southland Water Plan as the proposed combined rate of take from bore E45/0071 is less than 2 l/s.

As the proposed take is a restricted discretionary activity under Rule 23 of the Southland Water Plan a resource consent is required to take and use groundwater. Therefore the following Assessment of the Environment Effects from taking groundwater from bore E45/0071 has been carried out.

9.1 Scope of Potential Effects

The potential effects relevant to this application are:

- Effects on neighbouring bores (domestic, irrigation, public and other uses);
- Cumulative effects on the aquifer;
- Reasonable and efficient water use;
- Effects due to cross-connection of groundwater;
- Effects on surface water resources through groundwater-surface water connections;
- Effect on groundwater quality;
- Effects on cultural values;
- Effects on recreational values; and
- Effects on Biodiversity.

9.2 Effects on Neighbouring bores

Policy 31 of the RWP states that the interference effect of any new groundwater abstraction should be limited to no more than 20 percent of the available drawdown in any neighbouring bore, provided the neighbouring bore is lawfully established and adequately penetrates the aquifer.

Due to a lack of information regarding the drawdown in bores and water levels in this area, it is not possible to accurately determine 20 percent of available drawdown in neighbouring bores. Because of this, 20 percent of the aquifer thickness has been assumed as an alternative threshold. This approach has been adopted in other groundwater take applications within the Southland region.

The potential effects of pumping bore E45/0071 have been assessed using the Theis (1935) drawdown assessment. This method of assessment provides a conservative estimate of the drawdown effects of the proposed groundwater abstraction and often provides an over-estimate of the effects on neighbouring bores.

The following aquifer parameters have been used in this analysis:

Aquifer parameters

Brydon Hughes advised that a maximum transmissivity value of 200 m^2/day is appropriate for the Waimatuku Groundwater Allocation Zone in the vicinity of the Woldwide One property (email dated 14/02/2017). For this assessment a transmissivity of 200 m^2/day has been used. This is the same value as what was used in the stream depletion assessment. Brydon Hughes also advised that a Storativity value of 0.001 would be an appropriate storativity value for aquifers in the Oreti Plains (email dated 16/02/2017).

Bore E45/0071

Transmissivity = 200 m^2/day

Storativity = 0.001

7 day pumping rate = 1.05 ℓ/s (based on 91 m^3/ day)

300 day pumping rate = 1.05 ℓ/s (same as Q7)

The nearest neighbouring bore used for pumping purposes is bore E45/0605 which is located approximately 1.25 km southeast of bore E45/0071. Bore E45/0605 is used for dairy shed supply.

Figure 4 shows that the nearest neighbouring pumping bore (E45/0605) may have a drawdown of approximately 0.035 m from the pumping of bore E45/0071 for 7 days at a distance of approximately 1.25 km. Based on an aquifer thickness of 10 m the drawdown of 0.035 m in bore E45/0605 for 7 days pumping is approximately 0.35 percent of the aquifer thickness which is within the 20 percent available drawdown recommended by Policy 31 of the RWP.

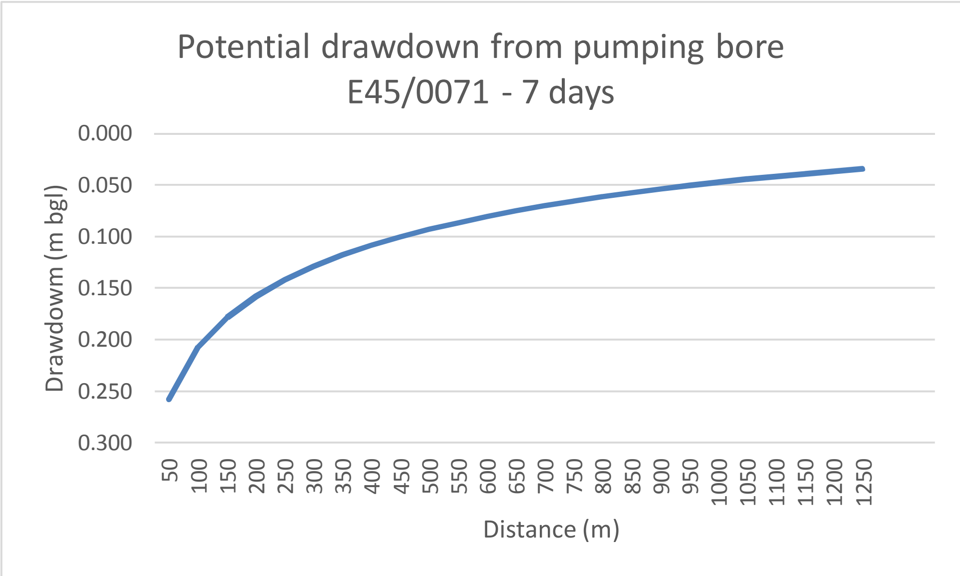


Figure 4: Estimated maximum drawdown effects from pumping bore E45/0071 for 7 days

Figure 5 shows that the nearest neighbouring pumping bore (E45/0605) may have a drawdown of approximately 0.161 m from the pumping of bore E45/0071 for 300 days at a distance of approximately 1.25 km. Based on an aquifer thickness of 10 m the drawdown of 0.161 m in bore E45/0605 for 300 days pumping is approximately 1.61 percent of the aquifer thickness which is within the 20 percent available drawdown recommended by Policy 31 of the RWP. Therefore the effect of the proposed pumping upon neighbouring bores is considered to be minor.

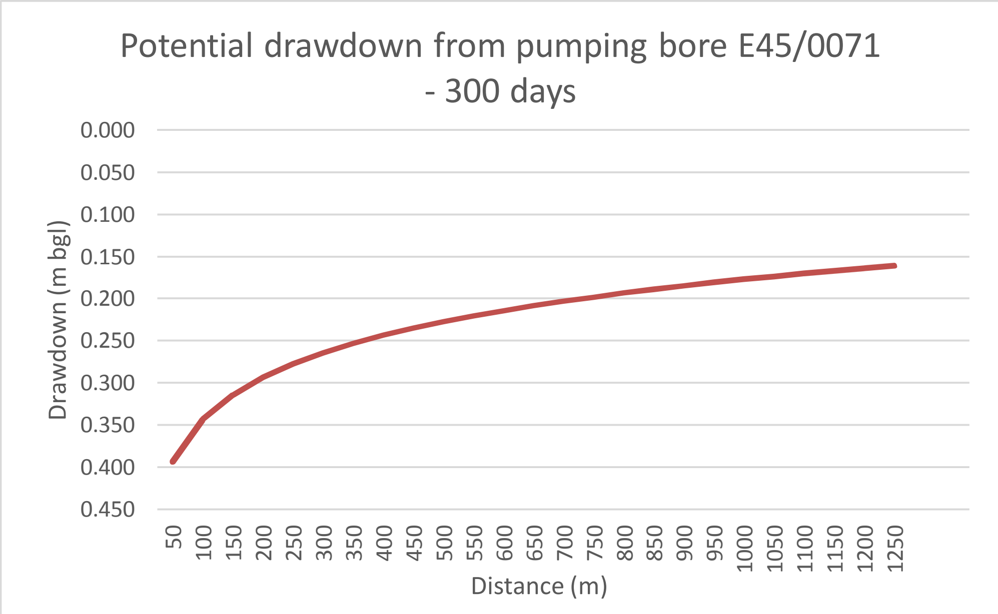


Figure 5: Estimated maximum drawdown effects from pumping bore E45/0071 for 300 days

9.3 Cumulative Effects on the Aquifer

The applicant's property is located in the Waimatuku Groundwater Allocation Zone. This application is to increase the maximum daily volume from 60 m^3/day to 91 m^3/ day. Under the proposed Southland Water and Land Plan the Waimatuku Groundwater Allocation Zone is only 6.6 % allocated. Therefore the cumulative effects on the groundwater system are considered minor and no further assessment is required.

9.4 Reasonable and Efficient Water Use

The RMA requires that the quantity of water abstracted is both reasonable and used efficiently. Table 2 details the approximate quantity of water required based on a dairy herd of 800 cows during the milking season.

Table 8: Daily water allocation for stock water and dairy shed water use

Water use activity	Number of cows	Water use (ℓ/cow/day)	Daily water use (m^3/day)	Water use period (days)	Annual water use (m^3/year)
Stockwater (during milking season)	800	70	56	300	16,800
Stockwater (outside of milking season)	640	45	28.8	65	1,872

Dairy shed water	700*	50	35	300	10,500
		Total	**91**		**29,172**

*** Note** –Once the new dairy shed is constructed, 800 cows will be able to milked in the dairy shed. However, as the new shed will have an effluent scraper, the volume of water used for dairy shed wash down will not increase above the volume required for 700 cows i.e. 35 m^3/day for dairy shed washdown.

From the assessment in Table 8, the maximum daily water take is 91 m^3 and the total annual allocation required for stockwater and dairy shed use is 29,172 m^3, which is considered both reasonable and efficient. This volume will reduce once the new dairy shed is built as a yard scraper will be used in the dairy shed and overall water use in the dairy shed will be minimal.

9.5 Effects Due to Cross-connection of Groundwater

Taking water from a bore screened at more than one depth may result in contamination of aquifers, with artificial recharge from one aquifer to another (either upwards or downwards, depending on the location). Contamination may also occur if the consent holder has a system with a common mainline supplied from two different bores in two different aquifers, where non-return valves have not been fitted.

As bores E45/0071 is only screened between 41.2 and 44.2 m below ground level, the taking of water from E45/0071 is unlikely to generate an adverse effect from cross-connection on groundwater quality and hence no further assessment is required.

9.6 Effects on Surface Water Resources

Pumping groundwater from the bore E45/0071 could affect surface water bodies (such as rivers and wetlands) if the water bodies are hydraulically connected to the aquifer and the cone of depression resulting from pumping bore intercepts these water bodies.

Policy 29 stated in Section 3.3 of the Regional Water Plan (RWP) outlines the framework for the management of stream depletion effects resulting from groundwater abstraction in the Southland Region. The policy specifies criteria for classifying the degree of hydraulic connection between a bore and nearby surface water ways including a method to proportion the allocation between surface water and groundwater. The policy also identifies those groundwater takes that may be subject to minimum flow control to mitigate impacts during periods of low flow.

Bore E45/0071 is approximately 1,000 m from a tributary of the Bog Burn.

In order to classify the degree of hydraulic connection between bore E45/0045 and the tributary of the Bog Burn a stream depletion analysis has been undertaken using the parameters shown in Table 9 and the Hunt (1999) solution. Brydon Hughes advised that a maximum transmissivity value of 200 m^2/day is appropriate for the Waimatuku Groundwater Allocation Zone in the vicinity of the Woldwide One property (email dated 14/02/2017). For this assessment a transmissivity of 200 m^2/day has been used. This is the same value as what was used in the well interference assessment. Brydon Hughes also advised that a Storativity value of 0.001 would be an appropriate storativity value for aquifers in the Oreti Plains and that a Lambda value of less than 2 m/day is an appropriate value for the Bog Burn (email dated 14/02/2017). A Lambda value of 2 m/day has been used as it is the most conservative value. The parameters used in the stream depletion analysis are shown in Table 9.

Table 9: Parameters used in stream depletion analysis

Parameters	Bores E45/0071
Transmissivity (m^2/day)	200
Storativity	0.001
Separation distance from Bog Burn (m)	1,000
Lambda (m/day)	2
Pump rate over 7 days (ℓ/s)	1.05
Pump rate over 300 days (ℓ/s)	1.05

The stream depletion calculations are shown in Appendix I. The stream depletion analysis in Appendix I shows that over 7 days pumping at an average rate of 0.97 ℓ/s the depletion will be 0.5 ℓ/s or a depletion rate of 52 % and that over 300 days pumping at an average rate of 0.97 ℓ/s the depletion will be 0.9 ℓ/s or a depletion rate of 93 %. Therefore according to Policy 29 of the RWP pumping from bore E45/071 would be classified as a high degree of connection with the tributary of the Bog Burn. However as the hydraulic connections is less than 2 l/s no specific minimum flow restrictions will be imposed on the groundwater take from the spring fed stream.

Appendix L2 of the Proposed Southland Land and Water Plan states that a groundwater take with a high degree of hydraulic connection *“where the magnitude exceeds 2 litres per second the calculated stream depletion effect will be managed as an equivalent take from an adjacent surface waterbody with the remainder of the allocation included in the allocation volume for the relevant groundwater zone. Groundwater takes classified as having a high degree of hydraulic connection will be subject to any relevant minimum flow regime.”* As the stream depletion assessment has assessed the groundwater take to have a high hydraulic connection, but the hydraulic connection is less than 2 l/s the take will not be included within the Bog Burn allocation and no specific minimum flow restrictions will be imposed on the groundwater take.

In summary, under the RWP and the Proposed Southland Land and Water Plan the proposed pumping from bore E45/0071 would be classified as having a high degree of connection with the tributary of the Bog Burn, however as the hydraulic connection is less than 2 l/s no specific minimum flow restrictions would be imposed on the proposed groundwater take from the tributary of the Bog Burn.

9.7 Effects of Groundwater Quality

The applicant seeks consent to increase the volume of water taken groundwater to service the dairy shed and provide stockwater supply from 60 m^3/day to 91 m^3/ day. Given this use, combined with the limited volumes of water to be used, this proposal will not have any measurable effect upon groundwater quality and, hence, an assessment is not required.

Note that the potential effects upon groundwater quality as a result of this application to increase the number of cows effluent has been assessed above as part of the consent to discharge dairy effluent to land.

9.8 Effects on cultural values

The effects on Tangata Whenua are unlikely to be any more than minor because:

- The proposed activity does not interfere with cultural values, the relationship of Maori to land and water, kaitiakitanga and the Treaty of Waitangi, as stated under Part 2 of the RMA;
- The proposed activity is consistent with the policies described in the Te Tangi a Tauira, the Iwi Management Plan for the Murihiku area;
- The location of the proposed activity is unlikely to have any adverse effects on sensitive areas such as lakes, rivers and streams; and
- The proposed activity is not within, adjacent to, or likely to affect a Statutory Acknowledgement Area or a silent file area.

As such, the effects from the proposed activity on Tangata Whenua are considered to be minor.

9.9 Effects on recreational values

Woldwide One has been operating as a dairy farm for a number of years. As the proposed groundwater take increase is only for a short period until the new dairy shed is built at the property the effects on the recreational values within the Waimatuku Aquifer are considered minor, and no further assessment is required.

9.10 Effects on Biodiversity

Woldwide One has been operating as a dairy farm for a number of years. As the proposed groundwater take increase is only for a short period until the new diary shed is built at the property the effects on the local biodiversity are considered minor, and no further assessment is required.

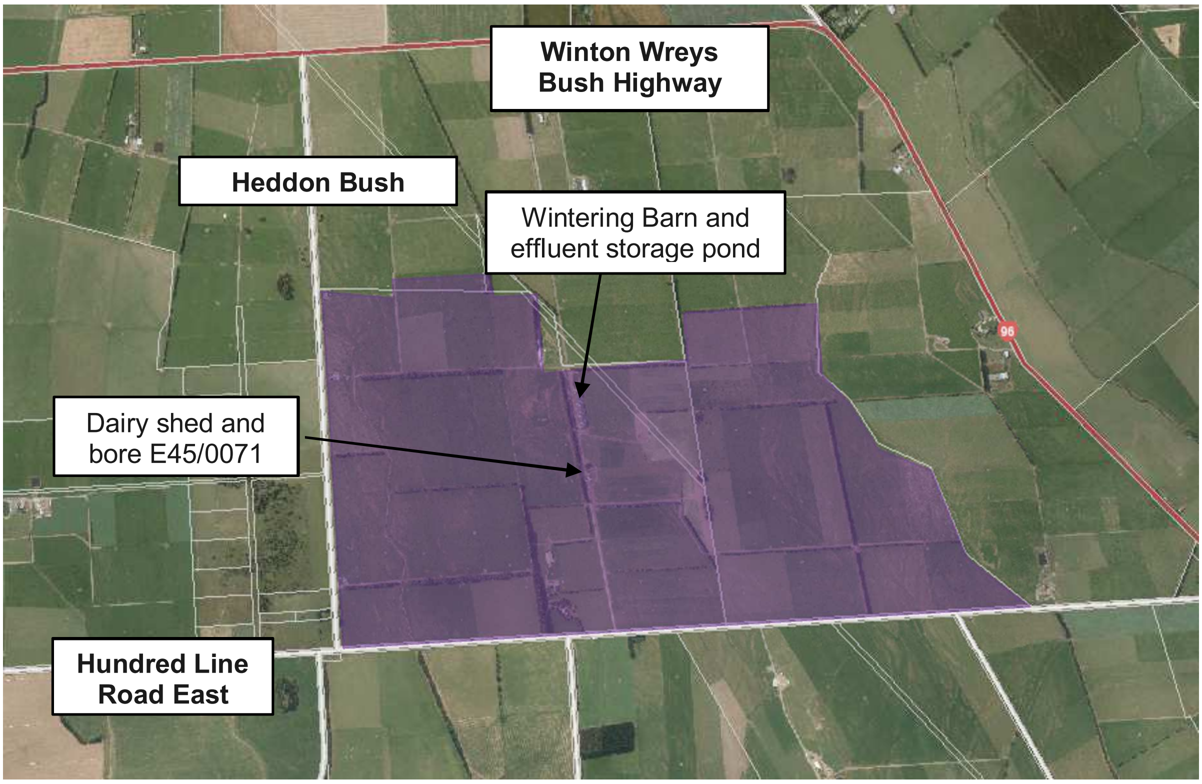
REFERENCES

Gray, C.W. Wheeler, D and McDowell R.W. (2016): Review of Phosphorus Loss Submodel in Overseer. Prepared for Overseer. AgResearch.

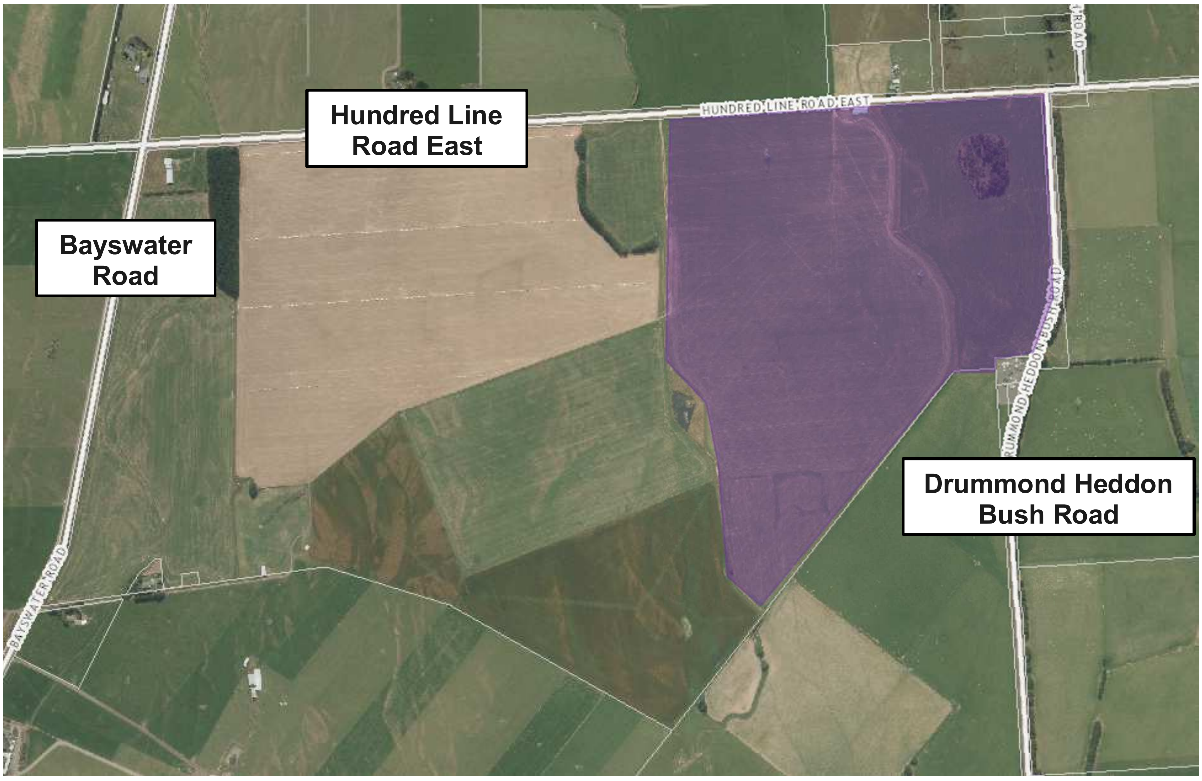
Houlbrooke DJ and Monaghan RM (2009): The influence of soil drainage characteristics on contaminant leakage risk associated with the land application of farm dairy effluent. Prepared for Environment Southland. AgResearch.

Theis, C.V., 1935. The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using groundwater storage, Am. Geophys. Union Trans., vol. 16, pp. 519-524.

Woldwide One Milking Platform – Proposed



Horner Block

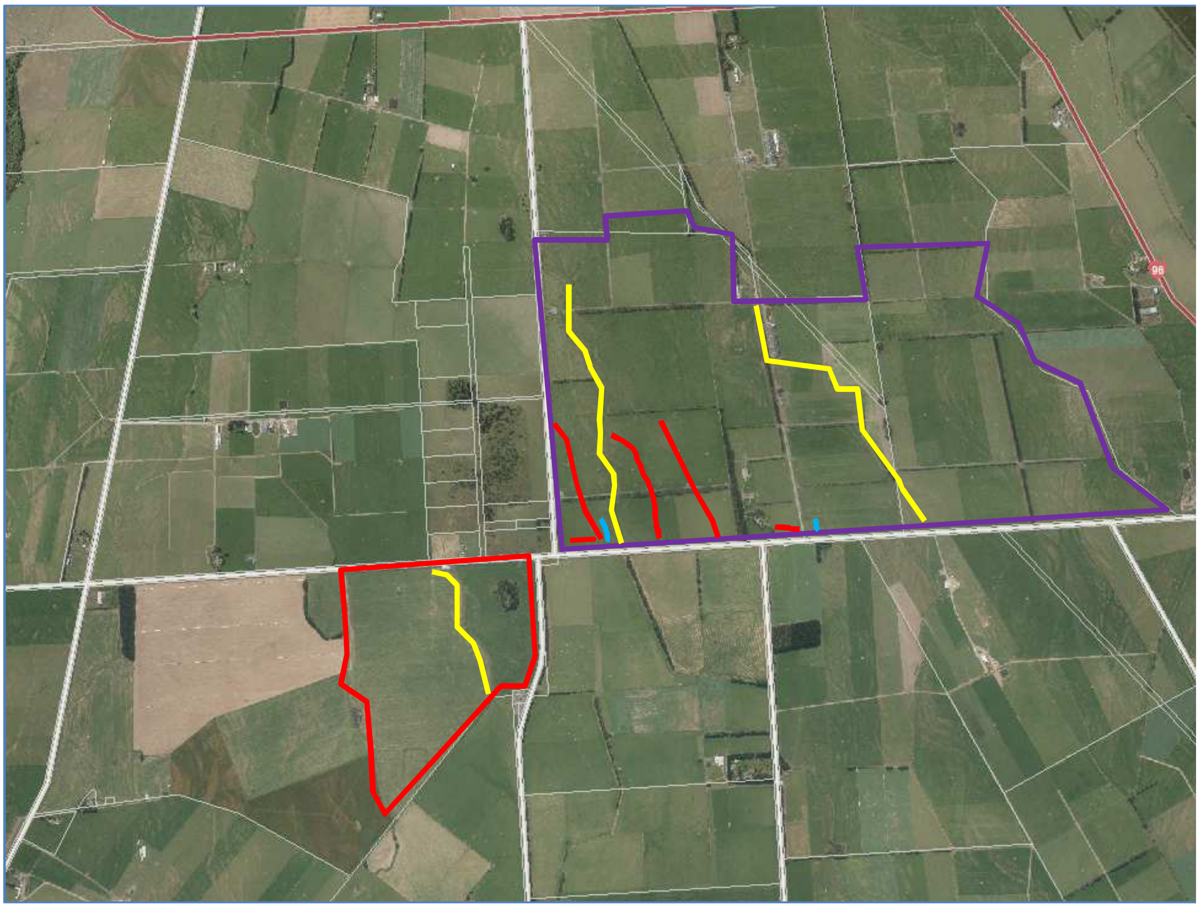


Woldwide One Milking Platform – Existing

Appendix B: Effluent Discharge Area

Woldwide One Milking Platform – Discharge area

Woldwide One Horner Block – Discharge area



Key	
Open Drain	
Tile Drain	
Critical Source Area	

Consent No: 301663

environment SOUTHLAND

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

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

Discharge Permit

Pursuant to Section 104B of the Resource Management Act 1991, a resource consent is hereby granted by the Southland Regional Council (the "Council") to **Woldwide One Ltd** (the "consent holder") of **C/- A and J J de Wolde, 104 Shaws Trees Road, Heddon Bush, R D 3, Winton 9783** from **9 November 2012.**

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

Details of Permit

Purpose for which permit is granted:		To discharge dairy shed effluent to land
Location	- site locality	Hundred Line, Heddon Bush
	- map reference	E45:350-504
	- receiving environment	Land
	- catchment	Waimatuku
Legal description of land at the site:		Lot 4 DP 399915, Parts Lot 18 DP 942, Lot 1 DP 10885, and Section 420 Taringatura Survey District
Expiry date:		9 November 2027

Schedule of Conditions

These conditions should be read in conjunction with the best practice recommendations that are appended. These will reduce the risk of non-compliance with the consent conditions.

1. This consent is granted for a period of 15 years and shall commence on the surrender or expiry of resource consent 202559.

   (Note: Pursuant to Sections 123 and 124 of the Resource Management Act 1991, a new consent will be required at the expiration of this consent. The application will be considered in accordance with the plans in effect at that time, and the adverse effects of the proposed activity.)

2. This consent authorises the discharge of dairy shed effluent and herd home slurry onto land, via a land disposal system, as described in the application, on land known as Lot 4 DP 399915, Parts Lot 18 DP 942, Lot 1 DP 10885, and Section 420 Taringatura Survey District.

(Note: The effluent/slurry disposal area shown in Appendix 1 can be altered and/or extended, subject to the approval of the Director of Environmental Management, if the consent holder submits a new plan showing the new effluent disposal area, and providing the written approval(s) of any person whose property boundary will be closer to that area. In the event that written approval cannot be obtained, the effluent disposal area can only be amended by way of limited notification.)

3. (a) No dairy shed effluent/slurry shall be discharged to any surface watercourse by overland flow, run-off, or via a pipe, nor shall there be any surface run-off/overland flow, ponding or contamination of water resulting from the exercise of this consent. *See Best Practice Notes 1, 2 & 3*

   (b) The land disposal system shall be operated and maintained to ensure that there is no odour or spray drift to the extent that it causes an adverse effect beyond the property boundary.

   (c) The consent holder shall install and maintain an alarm and automatic switch-off system as a contingency measure in the event of a system failure such as a sudden pressure drop, irrigator stoppage or breakdown of the travelling irrigator. *See Best Practice Note 4*

4. (a) Subject to condition 3(a), the land disposal system is limited to the following:

   (i) a maximum depth of application of 10 mm for each individual application. Where the slurry is applied by the trailing shoe system, the depth of application shall be averaged across the width of the applicators on the tanker.
   Note: The application depth needs to be less than the soil-water deficit (i.e. the depths above are maximum depths and as soil moisture levels approach field capacity, smaller depths will be necessary to avoid losses of contaminants from the root zone. When soil moisture levels reach field capacity, irrigation will need to cease completely to prevent these losses.)

   (ii) the maximum loading rate of nitrogen onto any land area shall not exceed 150 kg of nitrogen per hectare per year from the effluent/slurry; *See Best Practice Note 5*

   (b) (i) within six months of commencement of this resource consent he consent holder shall measure the application rate of the irrigator as installed to confirm the operating conditions required to ensure compliance with condition 4(a);

   (ii) within one month of commencing use of the trailing shoe-type tanker, the consent holder shall measure the application rate of the tanker to confirm compliance with condition 4(a);

   (iii) the consent holder shall notify the Council's Compliance Manager in advance of each measurement (escompliance@es.govt.nz);

   (iv) the Council may audit the measurement of the application rate to ensure accuracy. The consent holder shall pay the costs of auditing the measurement in accordance with Section 36 of the Resource Management Act.

The result of each measurement shall be forwarded to the Council's Compliance Manager, (escompliance@es.govt.nz) within 10 working days of the measurement being completed.

5. Effluent/slurry may be applied to the land as described in the application and generally as shown in Appendix 1, but the following specific buffers shall be observed:

(a) there shall be no application of effluent and/or slurry within:

(i) 20 metres of any surface watercourse;
(ii) 100 metres of any potable water abstraction point;
(iii) 100 metres of any residential dwelling other than residential dwellings on the property;

(b) dairy shed effluent shall not be applied to land by travelling irrigator within 20 metres of a property boundary.

(Note: this does not prevent discharge within 20 metres of the property boundary of effluent and/or slurry applied by trailing shoe-type tanker.)

Where there is conflict between Appendix 1 and these specified buffers, the latter shall apply.

6. (a) The amount of dairy shed effluent disposed of onto land shall not exceed that from 540 cows.

(b) The amount of herd home slurry disposed of onto land shall not exceed that from 400 cows.

7. The consent holder shall have at least 3,000 m^3 of effluent/slurry storage for the purpose of:

(a) avoiding irrigation of effluent/slurry when soils are at or above field capacity; *see Best Practice Note 8*
(b) providing a contingency measure when the irrigation system is inoperative; and/or
(c) for primary treatment when it is necessary for the proper operation of the effluent disposal system.

8. (a) The consent holder shall notify the Council, by 31 March 2013, of the person who is in charge of the operation of the effluent/slurry disposal system. If the person in charge of the effluent system changes during the term of this consent, the consent holder shall notify the Council of the new operator no later than five working days after that person takes responsibility. *See Best Practice Notes 6 & 7*
(Note: The person identified by condition 8(a) will be the primary contact for Council staff for monitoring purposes and/or in the event of an incident. Nothing in this condition removes or limits the consent holder's liability to ensure compliance with the consent and its conditions.)

(b) The consent holder shall notify the Council's Compliance Manager (escompliance@es.govt.nz or ph 03 211 5115) prior to the commencement of the discharge of slurry/effluent from the storage pond each year.

9. The Southland Regional Council may serve notice of its intention to review the conditions of this consent, in accordance with the conditions of this resource consent and Sections 128 and 129 of the Resource Management Act 1991, during the period 1 February to 30 September

each year, or within two calendar months of the completion of any enforcement action (prosecution or infringement notice), for the purposes of:

(a) dealing with any adverse or cumulative effects, including the adverse effects of high stocking rates, on the environment which may arise from the exercise of this consent;
(b) considering any changes to information on the effects of land disposal of dairy shed effluent/slurry;
(c) complying with the requirements of a regional plan;
(d) amending monitoring requirements; or
(e) imposing a notification requirement for potential effects on registered drinking water supplies.

10. The consent holder shall pay an annual administration and monitoring charge to the Southland Regional Council, collected in accordance with Section 36 of the Resource Management Act. This charge may include the costs of inspecting the site three times each year (or otherwise as set by the Council's Annual Plan), and of monitoring the effects of the discharge on groundwater by taking representative samples of the bore water, from Bore E45/0622 once every six months and analysing for:

- electrical conductivity;
- nitrate nitrogen concentration;
- Total Nitrogen concentration;
- Dissolved oxygen concentration – field measurement;
- *E. coli* concentration;
- bromine concentration;
- chloride concentration.

Except that the first sample shall also be analysed for Dissolved Iron concentration.

(Note: The Administration Charges are payable for the costs of the Council's administration, monitoring and supervision of this resource consent. For new conversions, the first monitoring inspection by the Council, in accordance with the Council's Annual Plan, of the exercise of the resource consent shall be carried out following installation of the effluent disposal system.)

11. If an event (such as effluent/slurry overflow to water, significant over-application on a free-draining area or pond collapse) occurs that may have significant adverse effect on water quality at the abstraction point of a registered drinking-water supply, the consent holder shall notify, as soon as reasonably practicable, the following:

- Environment Southland's Compliance Manager (ph 03 211 5115 or 03 211 5225 after hours);
- Southland District Council (ph 0800 732 732).

(Note: The consent holder is advised to contact Environment Southland's Compliance Manager in the event of any unexpected event that may result in non-compliance with the conditions of this resource consent or the rules of a regional plan.)

for the **Southland Regional Council**

Ken Swinney
Policy and Planning Manager

Best Practice and Explanatory Notes

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

2. To avoid contaminating water directly or indirectly, the consent holder should not apply effluent to land when the soils are at or above field capacity. Moisture content is to be determined by either actual monitoring on site or by reference to the appropriate Council monitoring site. The Council's soil moisture monitoring sites can be viewed at http://www.es.govt.nz and following the "Farming", "Dairy Advisor" and "Soil Moisture Map" links.

3. For the purposes of this condition, ponding is the accumulation of effluent on the soil surface resulting from the application of effluent to saturated soils, or the application of effluent inducing saturated soil conditions. It does not refer to the temporary accumulation of effluent on the soil surface resulting from the application of effluent at a rate that exceeds the soil infiltration rate.

4. Where the effluent reticulation system is installed in such a way that effluent can be siphoned when pumping ceases, the consent holder should install and maintain an anti-siphon device in the effluent pipe line.

5. A loading of 150 kg N/ha/year is approximately equivalent to a loading of dairy shed effluent to land of 4 ha/100 cows. However, there are significant benefits to having a larger effluent disposal area in terms of managing potassium. Further, scientific research has highlighted decreased nitrogen use efficiency and increased nitrogen leaching losses at annual nitrogen loading rates (from combined fertiliser and effluent N) greater than 150 kg/N/ha/yr. Extreme caution should therefore be taken when applying nitrogen fertiliser to the effluent disposal area. It is recommended that a nutrient budget is used to check that nitrogen and potassium application rates to the effluent disposal area are not excessive.

6. The consent holder should prepare and comply with a Farm Environmental Management Plan. The plan should:

   - specify and implement a nutrient budgeting system for the property;
   - provide for the management of effluent disposal to avoid applications when soils are at or above field capacity;
   - identify, as far as is practicable, the drains in the effluent disposal area, so that appropriate management procedures can be taken to avoid contamination of the drains by effluent;
   - if relevant, provide for the operation and management of any feedlot and/or wintering pad;
   - include the provision for monitoring application rates to ensure the consent requirements are being met;
   - include the monitoring requirements specified in this consent; and
   - address ancillary matters such as protecting well-head(s) from contamination; preventing leachate from any silage pits entering water, including groundwater; preventing soil damage; controlling run-off from lanes; and preventing stock access to and maintaining the riparian margins of any watercourses on the property.

   A template may be viewed at:

http://www.es.govt.nz/media/4831/dairy-farm-plan-consent-template.pdf

7. The consent holder should display, in a prominent place in the dairy shed, a copy of the resource consent and relevant limits about the operation of the effluent disposal system that must be complied with. The material to be displayed will be provided by the Council on laminated sheets suitable for display purposes.

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

9. Storage ponds should not, for practical purposes, leak. This resource consent does not authorise the discharge of contaminants due to leaks or failure of the storage ponds. If an existing storage pond is modified (such as by increasing the embankment height to increase storage), the modification will require resource consent.

Environment Southland*

(03) 211 5115

Toll Free 0800 76 88 45 (Southland only)

or

Emergency After Hours (03) 211 5225

if you have an effluent or pollution problem, call us

environment SOUTHLAND

Held by: Woldwide One Ltd

- the total milking herd cannot exceed 540 cows.
- the amount of herd home slurry disposed of onto land shall not exceed that from 400 cows.
- effluent may only be applied within the area shown on the attached map, as detailed in the application for the Consent.
- effluent cannot be applied within 20 metres of the property boundary.
- if there are waterways within the approved area, effluent cannot be applied within 20 metres of the waterways and ditches.
- a maximum depth of application of 10 mm for each individual application. Where the slurry is applied by the trailing shoe system, the depth of application shall be averaged across the width of the applicators on the tanker.
- the contingency plan consists of:

  - Ability to defer the effluent discharge by storing effluent in a 3,300 m^3 storage pond during adverse conditions.

(the above is a synopsis. You should ensure you understand the full consent. If you do not have a copy, contact Environment Southland*)

Problem Solving

• the number of cows intended to be milked exceeds the consent limit	**Contact Environment Southland for a Variation to the Consent**

If you have any effluent or pollution problems, please contact Environment Southland at the following numbers: Environment Southland: (03) 211 5115 or 0800 76 88 45 during office hours or 03 211 5225 (emergency response) after hours.

Winton Wreys Bish Highway
Heddon Bush Road
Bore E45/0071
Hundred Line Road East
Hall Road
Drummond Heddon Bush Road
Key
Bore/Well
Property Boundary
Effluent Discharge Areas
environment SOUTHLAND
Appendix 1
WoldeWide One Ltd
Date: 23/08/2012
N
1:17,500
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Consent No: 301664

environment SOUTHLAND

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

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

Water Permit

Pursuant to Section 104B of the Resource Management Act 1991, a resource consent is hereby granted by the Southland Regional Council (the "Council") to **Woldwide One Ltd** (the "consent holder") of **C/- A and J J de Wolde, 104 Shaws Trees Road, Heddon Bush, R D 3, Winton 9783** from **9 November 2012.**

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

Details of Permit

Purpose for which permit is granted:		To take groundwater for a dairy operation
Location	- site locality	Hundred Line, Heddon Bush
	- map reference	E45:350-507
	- groundwater zone	Waimatuku
	- catchment	Waimatuku Stream
Legal description of land at the site:		Part Lot 18 DP 942
Expiry date:		9 November 2027

Schedule of Conditions

1. This consent is granted for a period of 15 years and shall commence on the surrender or expiry of Resource Consent 202560.

   (Note: Pursuant to Sections 123 and 124 of the Resource Management Act 1991, a new consent will be required at the expiration of this consent. The application will be considered in accordance with the plans in effect at that time, and the adverse effects of the proposed activity).

2. This consent authorises the abstraction of water from bore/well E45/0071 at about NZMS 260 E45:350-507.

3. The rate of abstraction shall not exceed 60,000 litres per day.

4. The consent holder shall install a backflow prevention device or take other appropriate measures to ensure water and/or contaminants cannot return to the water source.

5. The consent holder shall monitor water usage to ensure compliance with condition 3 of this consent, as follows:

   (a) by installing a flow meter prior to commencement of the abstraction:
      (i) able to continuously measure the amount of water taken;
      (ii) capable of accuracy to within 5% of the true flow rate, on each abstraction;
      (iii) that shall record volumes in litres;
      (iv) in accordance with the manufacturer's instructions;
      (v) that is sealed and as tamper proof as practicable;
      (vi) in a location that measures all water taken;
      (vii) that is suited to the qualities of the water it is measuring (such as temperature, algae content and sediment content);

   (b) by recording the volume of abstraction, at or about the same time each month when the consent is being exercised.

   A copy of this record is to be provided to the Council's Compliance Manager by 31 May each year (escompliance@es.govt.nz).

6. The consent holder shall pay an administration and monitoring charge to the Southland Regional Council collected in accordance with Section 36 of the Resource Management Act, payable in advance on the first day of July each year.

7. The Council may, in accordance with section 128 and 129 of the Act, serve notice, during the period 1 February to 30 September each year, of its intention to review conditions for the purpose of:

   (a) dealing with any adverse effects on the environment which may arise from the exercise of this consent;
   (b) requiring monitoring of the rate of, or the effects of, the abstraction;
   (c) requiring efficiency of water use; and/or
   (d) complying with the requirements of a regional plan.

for the **Southland Regional Council**

Ken Swinney
Policy and Planning Manager

Dairy Effluent Storage Calculator
Summary Report

Regional authority:	Environment Southland Regional Council
Authorised agent:	J Scandrett
Client:	Woldwide one
Program version:	1.47
Report date:	Tuesday, 17 January 2017

General description:

Woldwide One, scenario 1
{Two Scenarios, 1) 700 milked, 553 sq m yard, original shed, 400 wintered inside 2017, 640 wintered inside 2018

2) 800 cows, new shed, yard scraped, 640 wintered inside,}

Note there is a covered wintering shed on farm which has a small uncovered catchment of 148 sq m. The details are included under feedpad.

Climate

Rainfall site:	Drummond Marson Rd
Mean annual rainfall:	1061 mm/year

Effluent Block

Area of low risk soil:	50.0 hectares
Minimum area of high risk soil:	190.0 hectares
Surplus area of high risk soil:	0.0 hectares

Wash Water

Yard wash:

- Milking season starts: 01 August
- Milking season ends: 15 June

Month	Number of Cows	Hours in Yard	Wash Volume (cubic metres)
January	670	3.5	34.0
February	660	3.5	33.0
March	640	3.5	32.0
April	580	3.0	27.0
May	500	3.0	25.0
June	25	1.0	1.3
July	0	0.0	0.0
August	300	3.0	15.0
September	600	3.5	30.0
October	700	4.0	35.0
November	680	4.0	34.0
December	670	3.5	34.0

Feedpad wash:

Month	Number of Cows	Hours on Pad	Wash Volume (cubic metres)
January	0	0.0	0.0
February	0	0.0	0.0
March	0	0.0	0.0
April	0	0.0	0.0
May	400	6.0	0.0
June	640	24.0	0.0
July	640	24.0	0.0
August	400	2.0	0.0
September	0	0.0	0.0

October	0	0.0	0.0
November	0	0.0	0.0
December	0	0.0	0.0

Irrigation

Winter-spring depth:	2 mm
Spring-autumn depth:	4 mm
Winter-spring volume:	80 cubic metres
Spring-autumn volume:	160 cubic metres
Irrigate all year?	Yes

Catchments

Yard Area:	553 square metres
Diverted?	No
Shed Roof Area:	175 square metres
Diverted?	Yes
Feedpad Area:	148 square metres
Covered?	No
Diverted?	No
Animal Shelter Area:	0 square metres
Covered?	Yes
Diverted?	No
Other Areas:	0 square metres

Storage

Pond/s present?	Yes
No. of ponds:	1 pond/s
Includes irregular ponds?	No
Pond 1	
- total volume:	3875 cubic metres
- pumpable volume:	3401 cubic metres
- surface area:	965 square metres
- width:	19.5 metres
- length:	49.5 metres
- batter:	0.5:1
- total height:	4.8 metres
- pumped?	Yes
Tank/s present?	No
Emergency storage period:	0 days

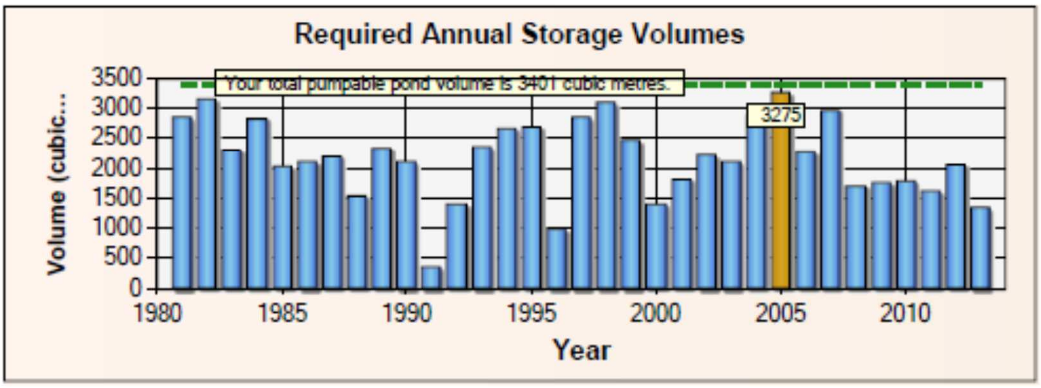
Solids Separation

Solids separator/s present?	No

Outputs

Maximum required storage pond volume:	3275 cubic metres

90 % probability storage pond volume:	3036 cubic metres
During the period from:	01 July 1980
To:	30 June 2013



Dairy Effluent Storage Calculator
Summary Report

Regional authority:	Environment Southland Regional Council
Authorised agent:	Nicole Matheson - Aqualinc
Client:	Woldwide one
Program version:	1.47
Report date:	Thursday, 24 August 2017

General description:

Woldwide One, scenario 2
{Two Scenarios,} 1) 700 milked, 400 wintered inside 2017
and 640 inside 2018
2) 800 cows, new dairy shed,yard scraped, 640 wintered inside,

Note there is a covered wintering shed on the farm and under feedpad I have included the stock details plus allowed for a small uncovered catchment of 180 sq m at the end of the shed.

Climate

Rainfall site:	Drummond Marson Rd
Mean annual rainfall:	1061 mm/year

Effluent Block

Area of low risk soil:	50.0 hectares
Minimum area of high risk soil:	190.0 hectares
Surplus area of high risk soil:	0.0 hectares

Wash Water

Yard wash:

- Milking season starts: 01 August
- Milking season ends: 15 July

Month	Number of Cows	Hours in Yard	Wash Volume (cubic metres)
January	800	4.0	35.0
February	800	4.0	35.0
March	800	4.0	35.0
April	800	4.0	35.0
May	800	4.0	35.0
June	400	2.0	20.0
July	50	1.0	2.5
August	800	4.0	20.0
September	800	4.0	35.0
October	800	4.0	35.0
November	800	4.0	35.0
December	800	4.0	35.0

Feedpad wash:

Month	Number of Cows	Hours on Pad	Wash Volume (cubic metres)
January	0	0.0	0.0
February	0	0.0	0.0
March	0	0.0	0.0
April	0	0.0	0.0
May	400	6.0	0.0
June	640	24.0	0.0
July	640	24.0	0.0
August	400	2.0	0.0
September	0	0.0	0.0

October	0	0.0	0.0
November	0	0.0	0.0
December	0	0.0	0.0

Irrigation

Winter-spring depth:	2 mm
Spring-autumn depth:	4 mm
Winter-spring volume:	80 cubic metres
Spring-autumn volume:	160 cubic metres
Irrigate all year?	Yes

Catchments

Yard Area:	1150 square metres
Diverted?	Yes
- diversion start:	01 July
- diversion end:	01 August
Shed Roof Area:	175 square metres
Diverted?	Yes
Feedpad Area:	180 square metres
Covered?	No
Diverted?	No
Animal Shelter Area:	0 square metres
Covered?	Yes
Diverted?	No
Other Areas:	0 square metres

Storage

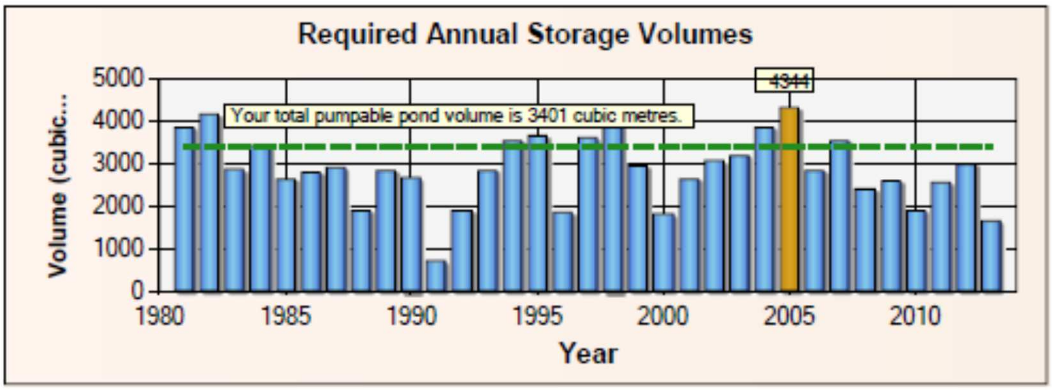
Pond/s present?	Yes
No. of ponds:	1 pond/s
Includes irregular ponds?	No
Pond 1	
- total volume:	3875 cubic metres
- pumpable volume:	3401 cubic metres
- surface area:	965 square metres
- width:	19.5 metres
- length:	49.5 metres
- batter:	0.5:1
- total height:	4.8 metres
- pumped?	Yes
Tank/s present?	No
Emergency storage period:	0 days

Solids Separation

Solids separator/s present?	No

Outputs

Maximum required storage pond volume:	4344 cubic metres
90 % probability storage pond volume:	3917 cubic metres
During the period from:	01 July 1980
To:	30 June 2013



Nicole Matheson

From:	Abe de Wolde <abe@woldwide.nz>
Sent:	Friday, 30 June 2017 4:31 PM
To:	Nicole Matheson; 'Scandrett Rural'
Subject:	FW: Ceasing discharge of whey by-product to Woldewide Farms under AUTH-20146925-V3

From: Christian Gunter [mailto:Christian.Gunter@fonterra.com]
Sent: Friday, 30 June, 2017 3:47 p.m.
To: Joanna.Gilroy@es.govt.nz; Alexandra King (Alexandra.King@es.govt.nz) <Alexandra.King@es.govt.nz>
Cc: Erika McNaught (Erika.McNaught@hwr.co.nz) <Erika.McNaught@hwr.co.nz>; Vijai Lal <Vijai.Lal@fonterra.com>; Hannah Furze <Hannah.Furze@fonterra.com>; dewolde@farmside.co.nz
Subject: Ceasing discharge of whey by-product to Woldewide Farms under AUTH-20146925-V3

Hi Joanna

Abe De Wolde has asked for the discharge of whey to his farms listed under AUTH-20146925-V3 to be stopped. This includes:

1)	Woldewide Farms (WW1)	1354 Hundred Line Rd East	A & A De Wolde
2)	Woldewide Farms (WW)	1914 Winton Mossburn Hwy	A & A De Wolde
3)	Woldewide Farms (Mayfield Dairy)	805 Mayfield Rd	A & A De Wolde
4)	Woldewide Farms	Cnr Bayswater and Hundred Line Rd	A & A De Wolde

We understand that he has an application in, but that it is being held up due to his farms receiving whey.

Fonterra Edendale and Herberts Transport have been made aware of Abe's intentions not to receive whey on any of his farms and have been following his instructions.

You are likely to be aware that Alex is currently processing amendments to the abovementioned consent in relation to the addition of whey application properties. We are happy for the removal of the Woldewide Farms to be part of this amendment or for this to be captured by future amendments.

Please advise what further information you need if any from ourselves or Abe.

Kind Regards

Christian Günter
Environmental Advisor

Fonterra Co-operative Group Limited
christian.gunter@fonterra.com
mobile +64 27 563 1383
PO Box 20, Edendale, 9848, 60 North Road, Edendale, Edendale, New Zealand

Fonterra
Dairy for life

1

Appendix I: Stream Depletion Calculations

(i) *Potential 7-day effect*

Stream Depletion Analysis

Aquifer parameters

Transmissivity	200	(m^2/day)
Storage coefficient	0.001	
Separation distance	1000	(m)
Streambed conductance	2	(m/day)
Stream depletion factor	5.0	(days)
Streambed factor	10.0	

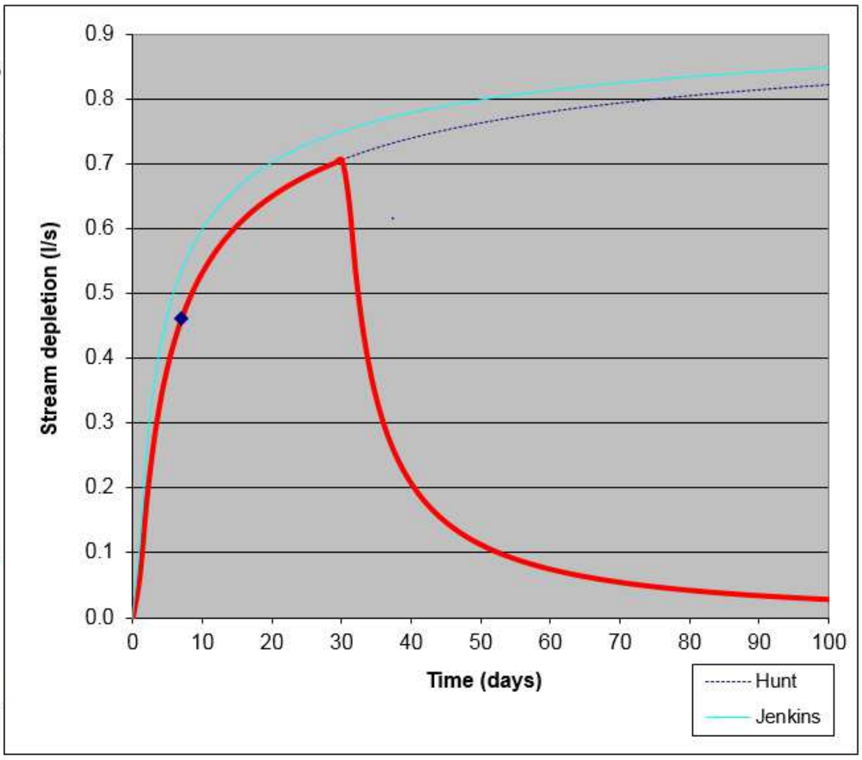
Pumping details

Maximum rate	0.97	(l/s)
Hours per day	24	
Days per return period	7	
Return Period	7	(days)
Average rate	1.0	(l/s)
Cut back time	30	(days)
Cut back average rate	0	(l/s)

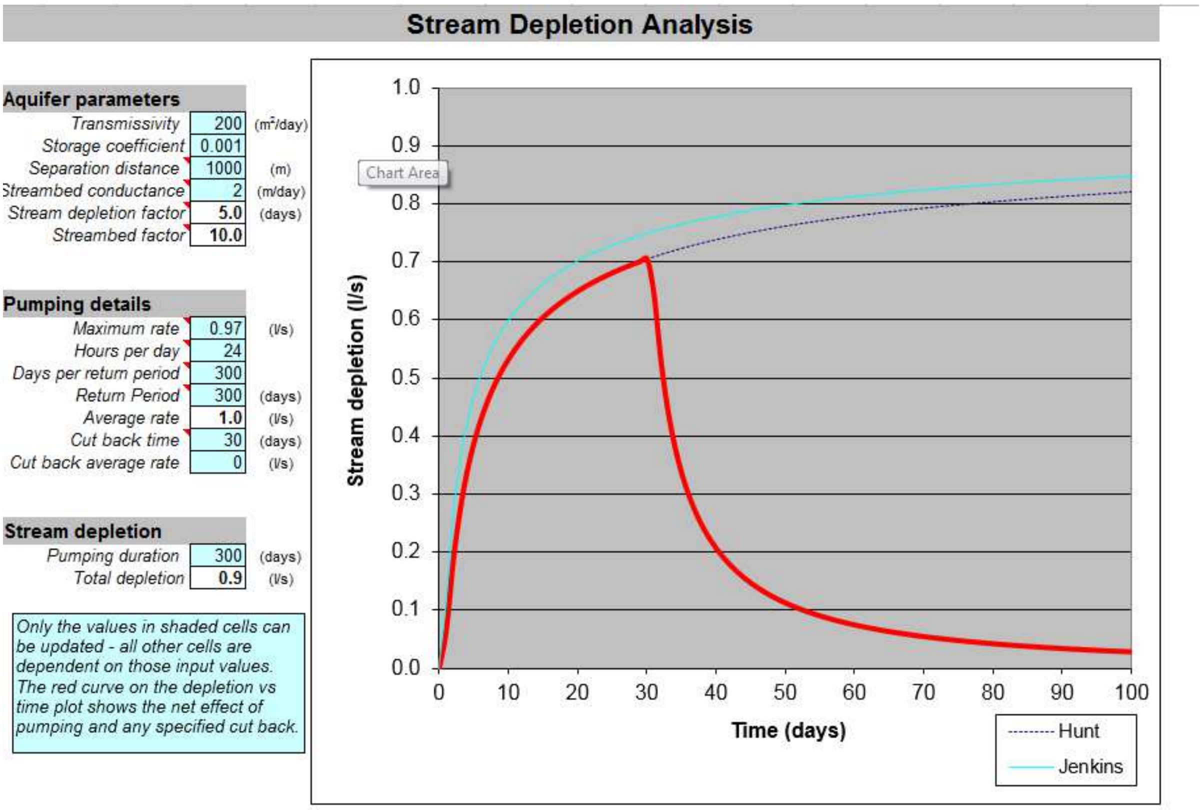
Stream depletion

Pumping duration	7	(days)
Total depletion	0.5	(l/s)

Only the values in shaded cells can be updated - all other cells are dependent on those input values. The red curve on the depletion vs time plot shows the net effect of pumping and any specified cut back.



(ii) Potential 300 – day effect



AQUALINC

Resource Consents REPORT

FARM ENVIRONMENTAL MANAGEMENT PLAN

PREPARED FOR
Woldwide One Limited

C14114/06

24/08/2017

PREPARED BY
Nicole Matheson

AQUALINC

Disclaimer

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Quality Control

Client	Woldwide One Limited
Document Title	Farm Environmental Management Plan
Document Number	C14114/06
Authors	Nicole Matheson
Reviewed By	Neal Borrie and John Scandrett
Approved By	Neal Borrie
Date Issued	24/08/2017
Project Number	C14114/06
Document Status	Draft
File Name	C14114_Woldwide One_FEMP_July17.docx

For more information regarding this document please contact

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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.

2.1 Boundaries

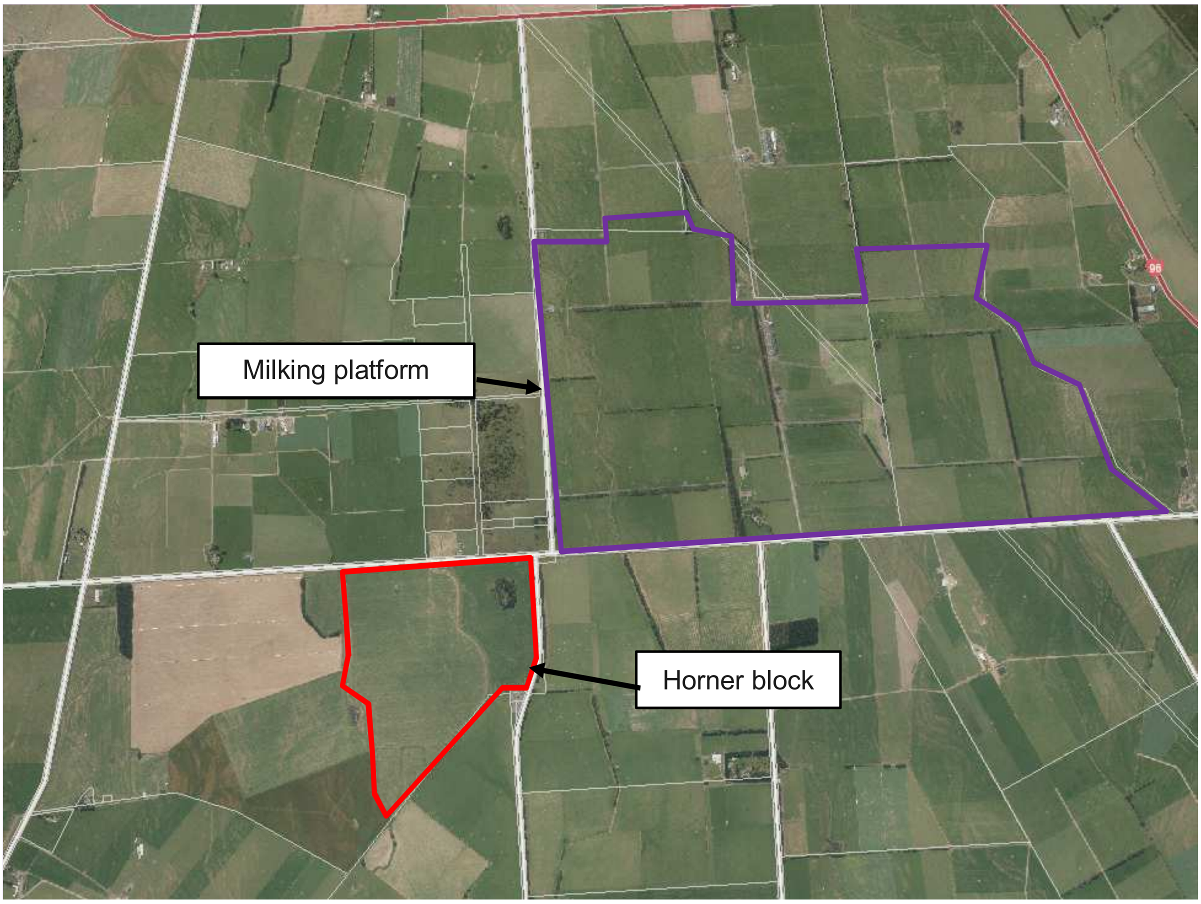


Figure 1:Woldwide One milking platform and Horner block property boundary

2.2 Infrastructure

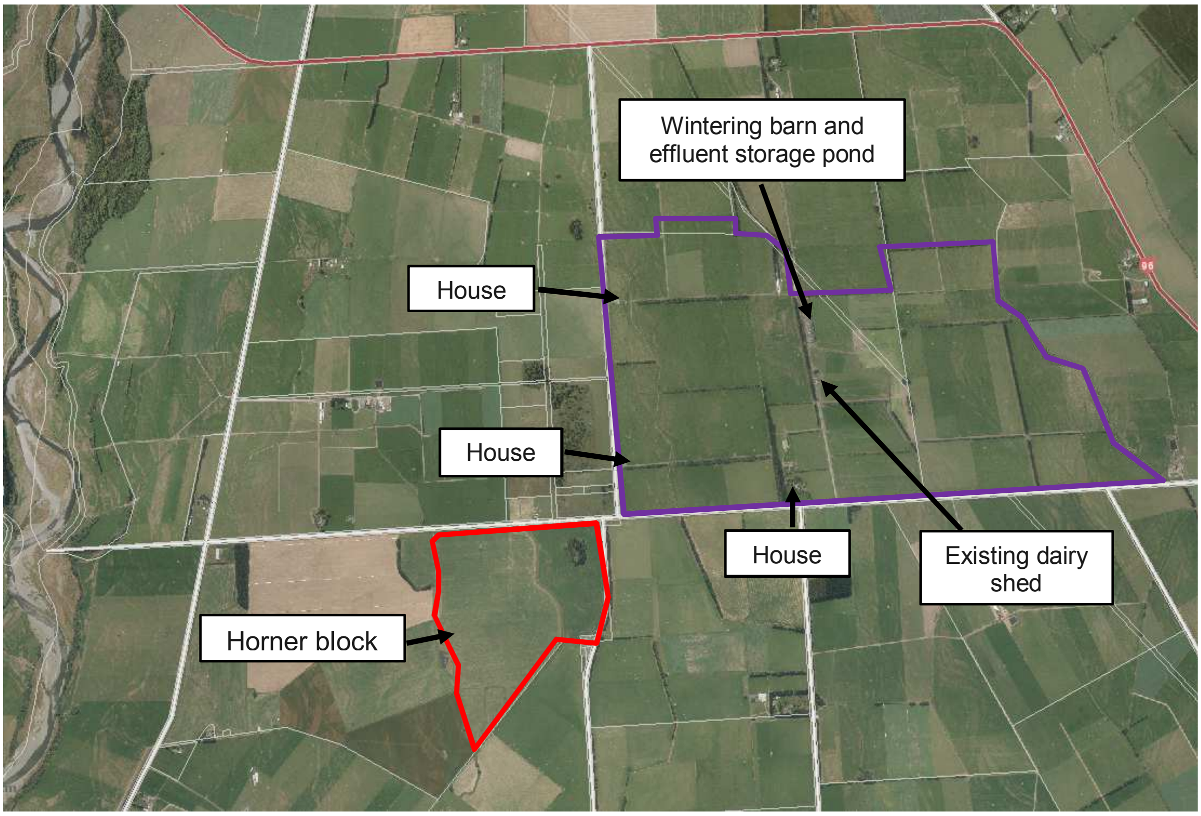


Figure 2: Woldwide One – Location of dairy shed, storage and farm houses

Figure 3: Woldwide One – Effluent discharge areas

2.3 Waterways, Stock Crossings and Critical Source Areas

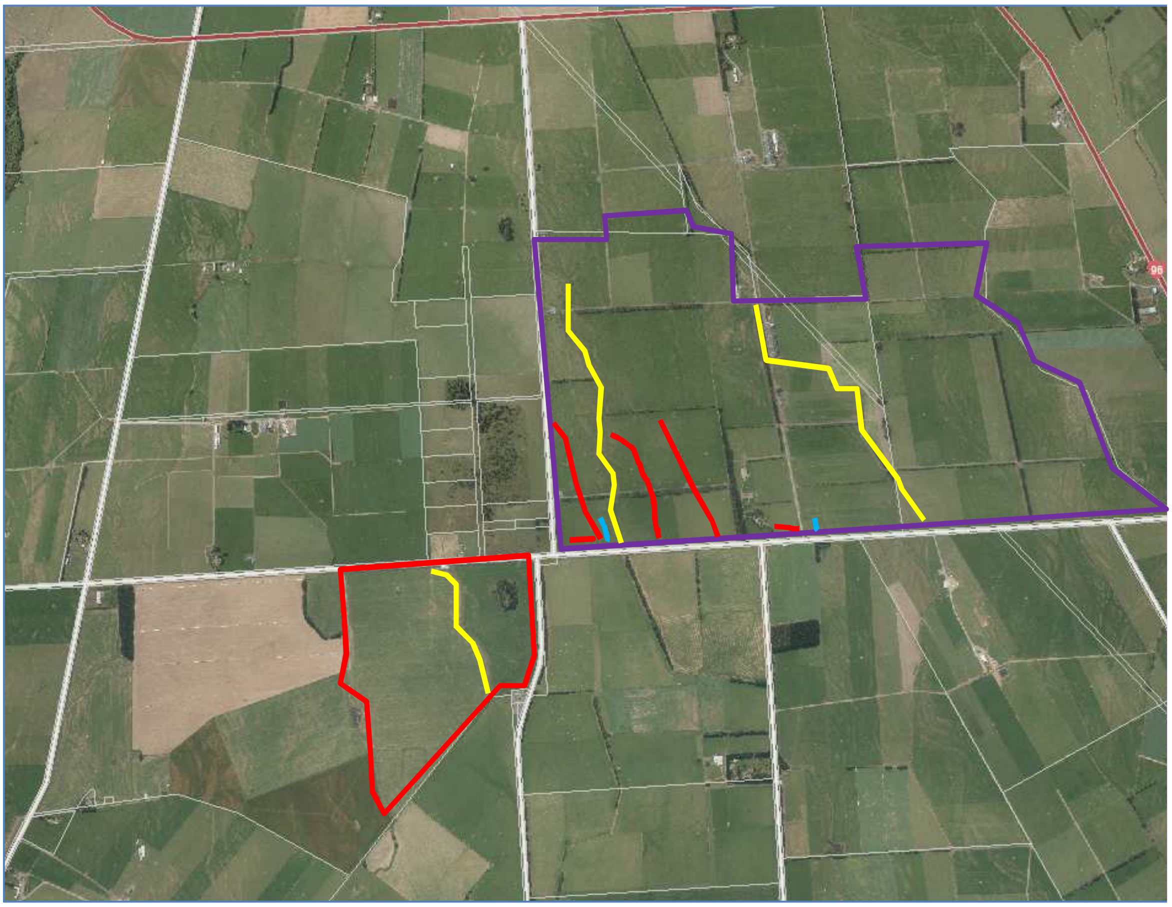


Figure 4: Woldwide One – Waterways and critical source areas

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.

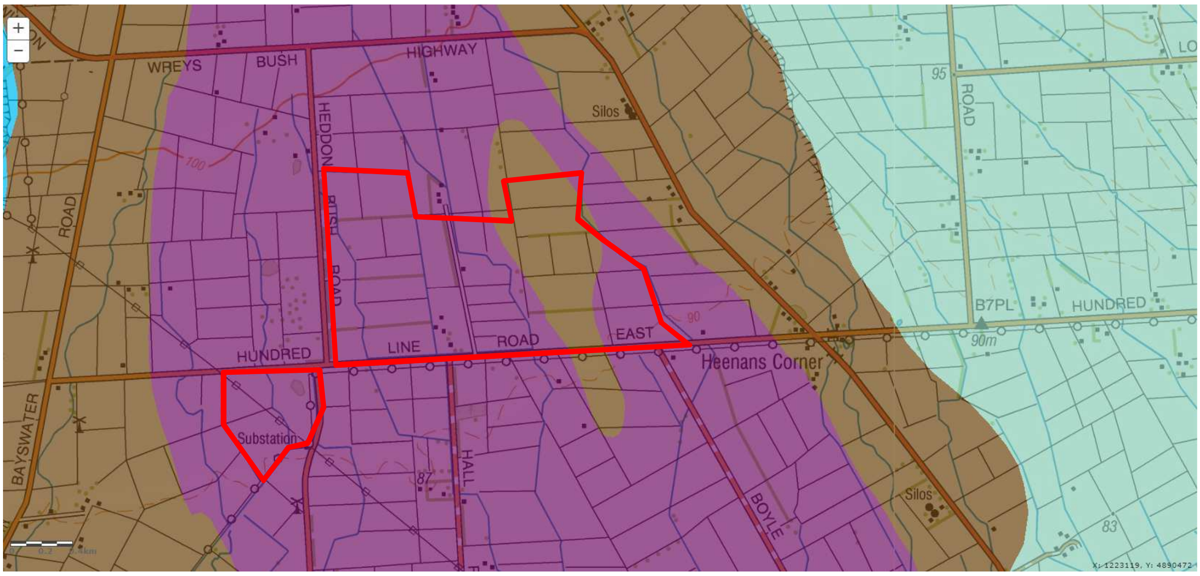
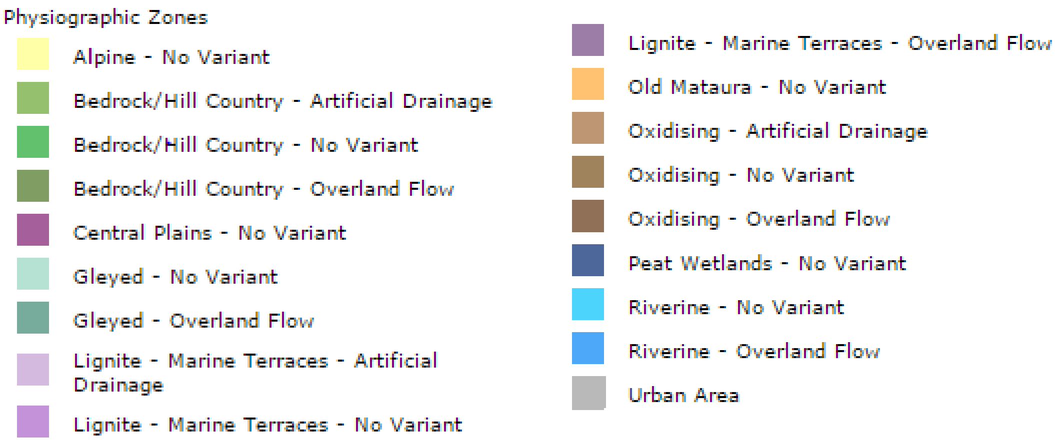


Figure 5: Map of physiographic zones at the Woldwide One and Horner block property



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.

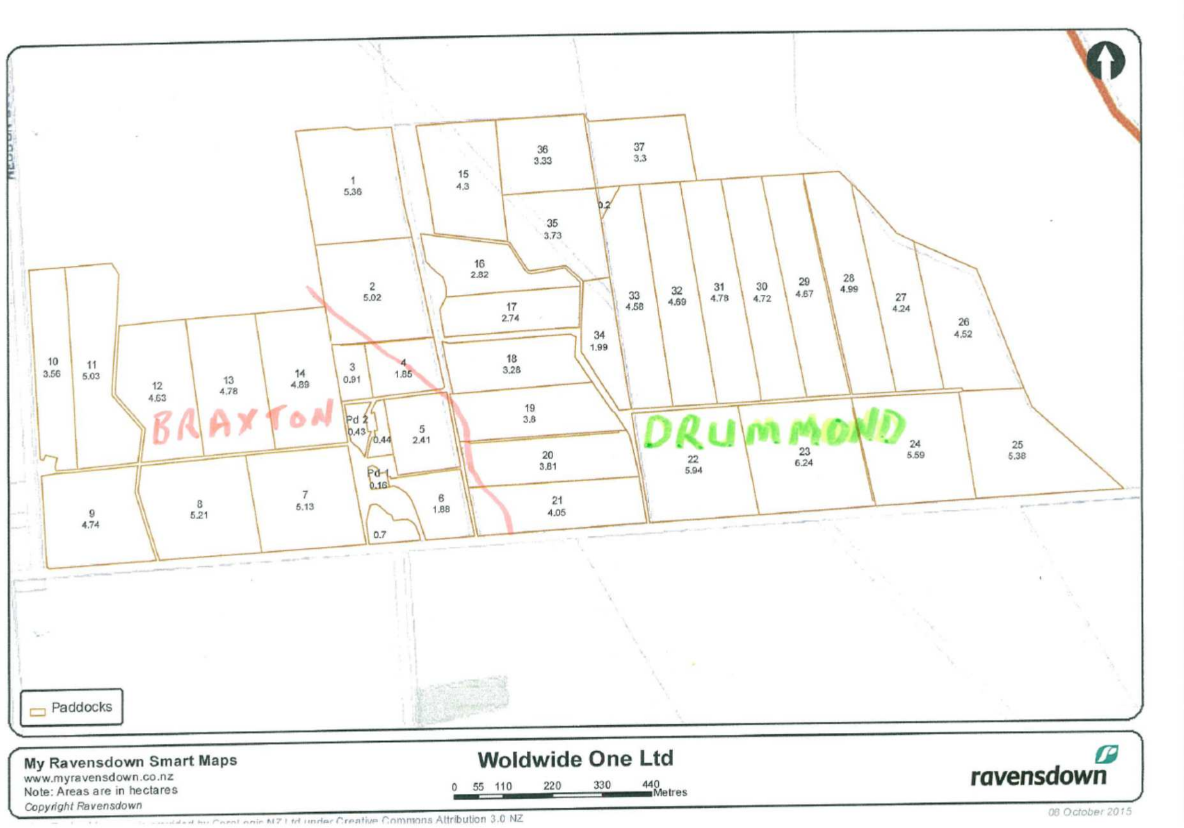


Figure 6: Map of soil types at the Woldwide One property

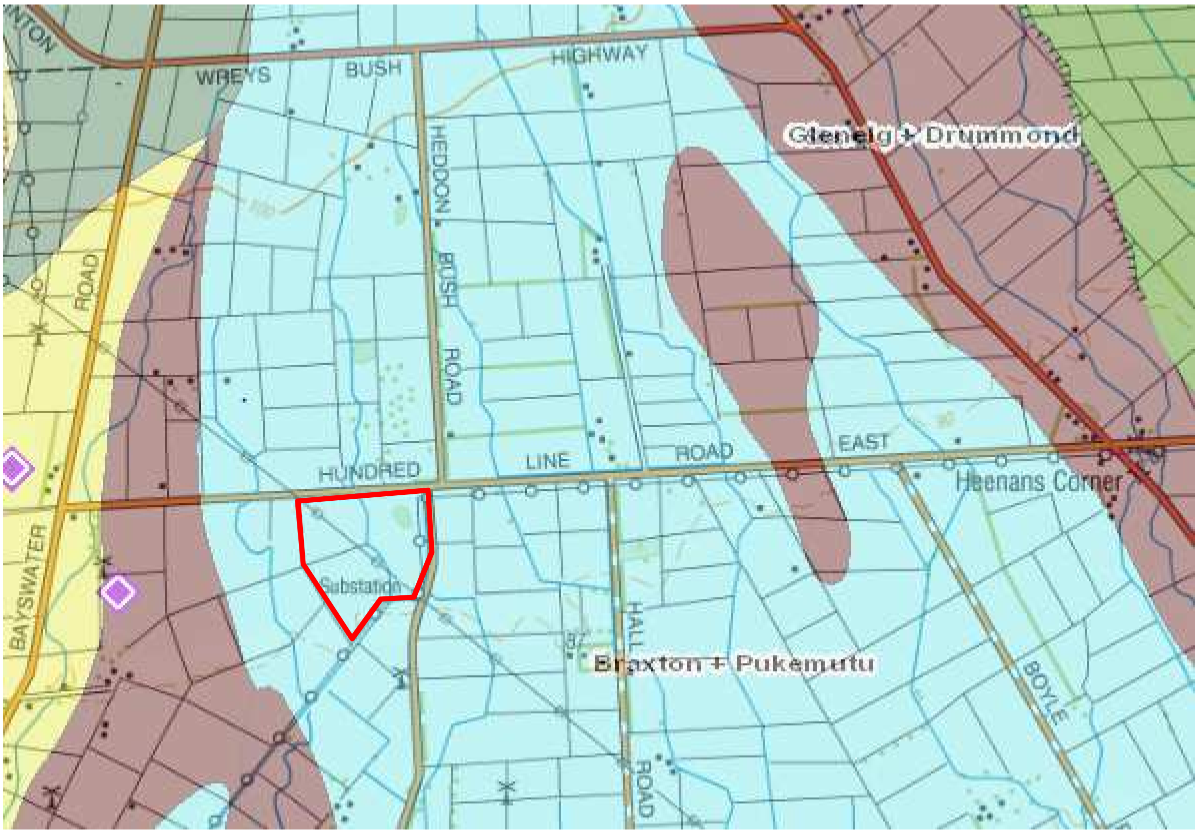


Figure 7: Map of soil types at the Woldwide One property – Horner Block

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 °C	
	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.

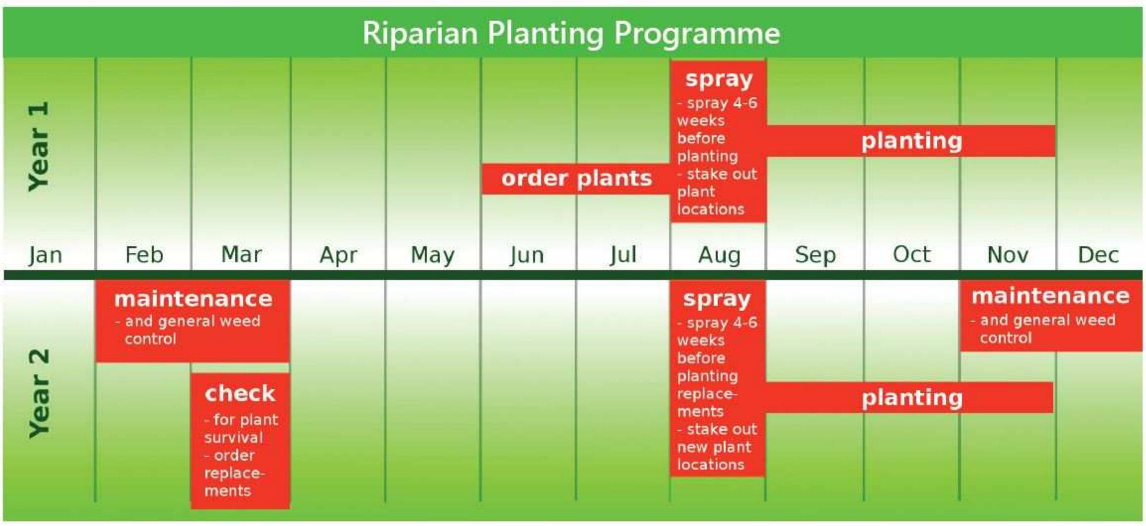
5.2 Weeds and Pests

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

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 m³/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. 100 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.			

Nutrient Budgets/Analysis – Woldwide 1 – Soil Survey

File Overview

Current

This scenario has been modelled on the current dairy farm (Woldwide 1) and the Horner Support Block as currently managed. The Horner Support Block is currently used for the spreading of wintering barn (and some small quantities of dairy) effluent from Woldwide 1 and the cut and carrying of grass silage for three wintering barns (including Woldwide 1). The dairy unit (Woldwide 1) currently occupies an effective area of approximately 204ha and is consented for 540 cows.

The current dairy farming area associated with Woldwide 2 that will become part of Woldwide 1 has not been modelled as part of the existing Woldwide 1 scenario. This land (including the associated nutrient losses) has already been allocated in the consent application to expand the land area associated with Woldwide 2. In order to gain a true reflection of the total nutrient losses from the proposed changes, the current losses from Woldwide 1 and Woldwide 2 will be compared to the proposed scenarios for both of these farms.

Fertiliser inputs for the file have been taken from the 2015/16 season application plan which reflects a typical farming year for the property.

Supplements taken off the cut and carry blocks are based on an average weight of 17T/DM/ha taken over four cuts. Silage feed to mature cows in the wintering barn and in paddocks are based on silage intakes of 700kg/DM/cow in winter and 513kg/DM/cow during the rest of the season. Additional supplements have also been utilised in the form of Palm Kernel Extract, Barley Grain and Molasses to supplement pasture and allow higher milks solids production per cow (491kg/MS/cow/yr).

Wintering barn slurry is generally applied to the Horner Block in three applications totalling between 1200m^3 and 1400m^3 depending on the season. Modelling has been undertaken on the maximum volume of 1400m^3.

To enable the utilisation of testing carried out on the nutrient content of the wintering barn effluent; effluent from the wintering barn has been entered as all exported with imported dairy effluent subsequently entered as a fertiliser on the support blocks. The nutrient content of the wintering barn effluent is derived from testing carried out by AgResearch in 2009 as part of their report on characterising dairy manures and slurries (used by Environment Southland). Subsequent testing has also been carried out Ravensdown, which has shown a slightly lower nutrient content.

Proposed

The proposed farming operation has an additional 54ha of land from Woldwide 2 added to the northern end of the current milking platform with a proposed increase of 260 cows (800 cows total).

The wintering barn will be increased in size to accommodate 620 cows with any additional cows wintered off the farm. Wintering barn effluent will continue to be spread on the Horner Support Block to support the cut and carry silage production for three wintering barns. With the additional effluent from the barn, imported fertiliser use will decrease on the Horner Block.

It is proposed to apply wintering barn effluent at 150kg/N/ha to minimise the amount of artificial fertiliser that needs to be applied. Even with all of Woldwide 1's wintering barn effluent being applied on the Horner Support Block (143kg/N/ha) this is insufficient to meet the nitrogen, phosphate and potassium requirements of the cut and carry operation (due to the lack of nutrient return via animal dung and urine while grazing).

Approximately 310-350 units of nitrogen per hectare are required to operate the cut and carry operation efficiently along with 73-80 units of phosphate per hectare.

On the main dairy platform Olsen P levels are proposed to be reduced from their current levels (40+) to 30. This is still within the range of a high producing dairy farm and more than adequate to sustain the levels of pasture production being proposed. The decrease in Olsen P levels also reduces the risk of phosphate being lost from the farming system.

Palm Kernel use in the dairy shed is proposed to increase slightly to supplement pasture eaten in paddocks and maintain high levels of production per cow with barley and molasses remaining the same on a per cow basis.

Nitrogen losses across Woldwide 1 & Woldwide 2 are outline in the following table and show a slight decrease in total nitrogen lost as a result of the farm changes. This is largely due to the removal of the wintering grazing from Woldwide 2 (SH96 Block), the effective cut and carries operations that are carried out on the Horner Block to support the wintering barn operations and the soil types on which the farms are located.

Total phosphate losses increase by 5.6% as a result if the changes to the farming enterprises, however this represents a total change of just 27kg across 572ha of land that makes up WW1 & WW2.

Current			
Nutrient	*Woldwide 1*	*Woldwide 2*	*Total*
Nitrogen (kg/yr)	3598	7564	**11162**
Phosphate (kg/yr)	141	189	**330**

Proposed			
Nutrient	*Woldwide 1*	*Woldwide 2*	*Total*
Nitrogen (kg/yr)	4350	6652	**11002**
Phosphate (kg/yr)	176	181	**357**

65% of the total phosphate loss is modelled as occurring from "other sources", which are farm scale losses from farm infrastructure, i.e. laneways, silage stacks, etc. A May 2015 report, prepared for Overseer by AgResearch, on the phosphorus loss sub-model was critical of the 'other sources' section of the P sub-model stating a review of these structures (lanes, pads, silage pits, etc) needs to be undertaken to identify whether these should actually be included in the model with a particular focus on lanes to determine whether the current loss factor is reasonable.

It would appear that most of the phosphate losses in “other sources” are being derived from lanes. Overseer automatically assumes 30% of phosphate deposited on a lane is lost, even if there is no surface water nearby.

In terms of the phosphate sub-model in Overseer, this estimates phosphate loss from dairy farm systems via run-off to surface water. This is either surface flow, interflow or subsurface flow to second order streams. It estimates the concentration of dissolved phosphate in an overland flow event from Olsen P and the soils P retention or ASC ability. The instigation of run-off is derived from a hydrological model within Overseer and a weighting for slope.

Phosphorus losses can be further mitigated (beyond that modelled by Overseer) by detailing at a farm level how surface and subsurface run-off will be prevented from entering waterways (this can’t be modelled in Overseer as the model can’t look at individual farm surface water flow paths or critical source areas). In addition to this, the large losses from “other sources” can be mitigated in a similar manner. Overseer automatically assumes 30% of phosphorus deposited on farm lanes is lost, when in reality there needs to be a transport mechanism to get the phosphorus from the lane to a waterway, thus good lane management, especially around waterways will be a further mitigation above that able to be modelled in Overseer.

Current – 540 cows (Soil Survey Soils)

- Potential nitrogen loss to water of 17kg/ha (Fonterra Ward Mean = 33 kg/ha/yr based on 243 farms)
  Nitrogen leaching to water is nitrogen that leaves the soil root zone, it does not account for denitrification within the soil profile or the underlying aquifer. This may be significant in some physiographic zones.

- High Nitrogen Conversion Efficiency at 63%
  This is the percentage of nitrogen that is brought into the farming system from fertiliser, supplementary feed and clover fixation that is converted to products (milk and meat).The higher the percentage, the more efficient the farm is at using its nitrogen resources. Indicative range = 10-45%. ***This farm includes a moderate sized cut and carry block, which accounts for the nitrogen conversion efficiency sitting outside the normal range for a typical dairy farm.***

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Woldwide 1 - Current (Soil Survey) Cain Duncan

Woldwide 1 Fonterra

Client reference:

Farm name: 32650-1516-F (2015-16)

Farm Nutrient Budget - Whole farm

	N	P	K	S	Ca	Mg	Na
				(kg/ha/yr)			
Nutrients added							
Fertiliser, lime & other	235	42	81	39	55	4	1
Rain/clover N fixation	77	0	2	4	3	6	25
Irrigation	0	0	0	0	0	0	0
Supplements imported	72	15	30	10	3	6	3
Nutrients removed							
As products	96	16	23	5	22	2	7
Exported effluent	49	8	43	5	11	4	2
As supplements	0	0	0	0	0	0	0
To atmospheric	117	0	0	0	0	0	0
To water	17	0.7	18	56	58	3	12
Change in internal pools							
Plant material	32	3	31	2	7	0	0
Organic pool	64	17	4	-16	0	1	0
Inorganic mineral	0	5	-18	0	-2	-3	-4
Inorganic soil pool	11	8	12	0	-36	10	11

- Phosphate applications generally well matched to soil test results with areas of high Olsen P receiving below maintenance phosphate applications (will reduce Olsen P overtime) and areas with lower Olsen P receiving capital applications.

- Paddock 8 has an Olsen P of 60ug/ml. Consider reducing P inputs to this area well below maintenance levels and re-test over the coming seasons.

- Overall Olsen P levels are high, even for a high producing dairy farm. These are proposed to be gradually reduced to 30. Maintaining Olsen P levels above 40 results in few productivity gains and disproportionally high costs and risk of P loss.

NZ 60842384-H/38321950

SOIL ANALYSIS

Lab Number	Sample Name	Core Length (cm)	pH	Olsen Sol. P ug/mL	Calcium QTU	Magnesium QTU	Potassium QTU	Sodium QTU	Sulphate Sulphur ug/g	Ext.Org. Sulphur ug/g
1392390	36	7.5	6.2	30	11	30	11	7	10	8
1392391	13	7.5	5.9	43	12	34	11	9	9	16
1392392	30	7.5	5.9	37	12	25	6	6	15	13
1392393	23	7.5	6.0	48	13	41	9	10	5	13
1392394	19 Eff	7.5	6.4	42	17	50	20	8	8	18
1392395	8	7.5	6.3	60	18	61	14	12	9	19

- Nitrogen summary report shows slightly higher nitrogen losses on the Drummond soil blocks due to the nature of the soil. These soils are well drained making them more susceptible to nutrient leaching. The farms overall nitrogen leaching risk is low (17kg/ha) when compared to other dairy farms in the region (Ward 35 Lower Quartile = 22 kg/ha – 243 farms).

- Proportionally higher nitrogen losses are occurring on the areas where summer turnips are grazed due to the lack of plant uptake of urinary N when grazing (ground fallow once crop eaten).

- The strategic use of nitrogen (rather than simply following the cows) to fill specific feed gaps is encouraged as good practice both environmentally and economically.

Woldwide 1 - Current (Soil Survey) Cain Duncai
Woldwide 1 Fonterra
Client reference:
Farm name: 32650-1516-F (2015-16)

Block Phosphorus

Block name	Total P lost (kg P/yr)	P lost (kg P/ha/yr)	P loss categories Soil	Fertiliser	Effluent
Effluent (Drum_2a.1)	10	0.3	Low	Low	Medium
Turnips	1	0.2	n/a	n/a	n/a
Non-Effluent (Brax_4a.1) ##	14	0.5	Low	Medium	n/a
Non-Effluent (Drum_2a.1) ##	18	0.2	Low	Low	n/a
New Grass	1	0.2	Low	Low	n/a
Support Horner Blk (CC) Barn Eff (Br	13	0.3	n/a	n/a	n/a
Other farm sources	84				
Whole farm	141	0.7			

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

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Woldwide 1 - Current (Soil Survey) Cain Duncan
Woldwide 1 Fonterra
Client reference:
Farm name: 32650-1516-F (2015-16)

Block Nitrogen

Block name	Total N lost (kg N/yr)	N lost to water (kg N/ha/yr)	N in drainage * (ppm)	N surplus (kg N/ha/yr)	Added N ** (kg N/ha/yr)
Effluent (Drum_2a.1)	722	23	6.2	310	317
Turnips	325	50	**11.5**	62	133
Non-Effluent (Brax_4a.1) ##	300	11	3.3	233	249
Non-Effluent (Drum_2a.1) ##	1456	17	4.6	230	249
New Grass	53	11	3.1	163	61
Support Horner Blk (CC) Barn Eff (Br	497	10	3.0	-6	334
Other farm sources	246				
Whole farm	3598	17			
Less N removed in wetlands	0				
Farm output	3598	17			

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

** Sum of fertiliser and external factory effluent inputs.

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

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

<u>Proposed – 800 cows (Soil Survey Soils)</u>

- Increase in cow numbers from 540 to 800 over an additional 54ha.
- Inputs (fertiliser & imported feed) increased proportionally based on current per cow demands with some additional increases to in shed feed (PKE).
- Milk solids production increased to 392,000kg/yr from 270,050kg/yr.
- No crops produced.
- Reduction in Olsen P levels on dairy platform from 40+ to 30 with corresponding reduction in phosphate fertiliser to maintain Olsen P at 30.

 Version 6.2.3, on 2017-07-05 04:44:12

Woldwide 1 - Proposed - 800cows — Cain Duncai

Woldwide 1 — Fonterra

Client reference:

Farm name: 32650-1516-F (2015-16)

Farm Nutrient Budget - Whole farm

	N	P	K	S	Ca	Mg	Na
				(kg/ha/yr)			
Nutrients added							
Fertiliser, lime & other	230	33	82	31	42	4	1
Rain/clover N fixation	88	0	2	4	3	6	25
Irrigation	0	0	0	0	0	0	0
Supplements imported	87	19	37	12	4	8	3
Nutrients removed							
As products	113	19	27	6	26	2	8
Exported effluent	63	9	57	6	15	5	3
As supplements	0	0	0	0	0	0	0
To atmospheric	128	0	0	0	0	0	0
To water	16	0.7	20	53	61	3	13
Change in internal pools							
Plant material	0	-1	5	-1	0	-2	-1
Organic pool	85	15	4	-17	0	1	0
Inorganic mineral	0	4	-19	0	-2	-3	-4
Inorganic soil pool	0	4	26	0	-51	11	11

- Nitrogen loss per hectare reduces from 17kg/ha to 16kg/ha with total nitrogen loading increasing from 3598 kg/ha to 4350kg/ha. This <u>does not take into account</u> the existing baseline losses from the land associated with Woldwide 2 that now forms part of Woldwide 1. Total nitrogen losses need to be compared across both Woldwide 1 and Woldwide 2 to obtain a full understanding of total nitrogen losses. This comparison is undertaken on page 2 of this document.

- Nitrogen Conversion Efficiency remains high at 62%

- Expansion of wintering barn results in the majority of cows being able to be wintered indoors, minimising the need for cows to be wintered on support land within the catchment.

- No increase in phosphate losses per hectare (0.7kg/ha) but total phosphate loading increases from 141 to 176kg/ha. This does not take into account the existing baseline losses from the land associated with Woldwide 2 that now forms part of Woldwide 1. Total phosphorus losses need to be compared across both Woldwide 1 and Woldwide 2 to obtain a full understanding of total phosphorus losses. This comparison is undertaken on page 2 of this document.

 Version 6.2.3, on 2017-07-05 04:51:11

Woldwide 1 - Proposed - 800cows — Cain Duncar
Woldwide 1 — Fonterra
Client reference:
Farm name: 32650-1516-F (2015-16)

Block Phosphorus

Block name	Total P lost (kg P/yr)	P lost (kg P/ha/yr)	P loss categories		
			Soil	Fertiliser	Effluent
Effluent (Drum_2a.1)	12	0.2	Low	Low	Medium
Non-Effluent (Brax_4a.1)	23	0.4	Low	Low	n/a
Non-Effluent (Drum_2a.1)	14	0.1	Low	Low	n/a
New Grass	2	0.4	Low	Low	n/a
Support Horner Blk (CC) Barn Eff (Br	12	0.3	n/a	n/a	n/a
Other farm sources	113				
Whole farm	176	0.7			

 Version 6.2.3, on 2017-07-05 04:52:12

Woldwide 1 - Proposed - 800cows

Cain Duncar

Woldwide 1

Fonterra

Client reference:

Farm name: 32650-1516-F (2015-16)

Block Nitrogen

Block name	Total N lost (kg N/yr)	N lost to water (kg N/ha/yr)	N in drainage * (ppm)	N surplus (kg N/ha/yr)	Added N ** (kg N/ha/yr)
Effluent (Drum_2a.1)	1184	24	6.3	294	301
Non-Effluent (Brax_4a.1)	749	12	3.5	228	249
Non-Effluent (Drum_2a.1)	1706	18	5.0	227	249
New Grass	39	8	2.4	127	30
Support Horner Blk (CC) Barn Eff (Br	323	7	1.9	16	312
Other farm sources	350				
Whole farm	4350	16			
Less N removed in wetlands	0				
Farm output	4350	16			

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

** Sum of fertiliser and external factory effluent inputs.

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

Appendix 1 Map

Date: 9/03/2018

Legend

Wells

Effluent Discharge

Farm Boundary

N

1:15,000

environment SOUTHLAND REGIONAL COUNCIL Te Taiao Tonga

DATA SOURCE: ES GIS 2018

Catchment Boundaries

Date: 9/03/2018

Legend

Farm Boundary

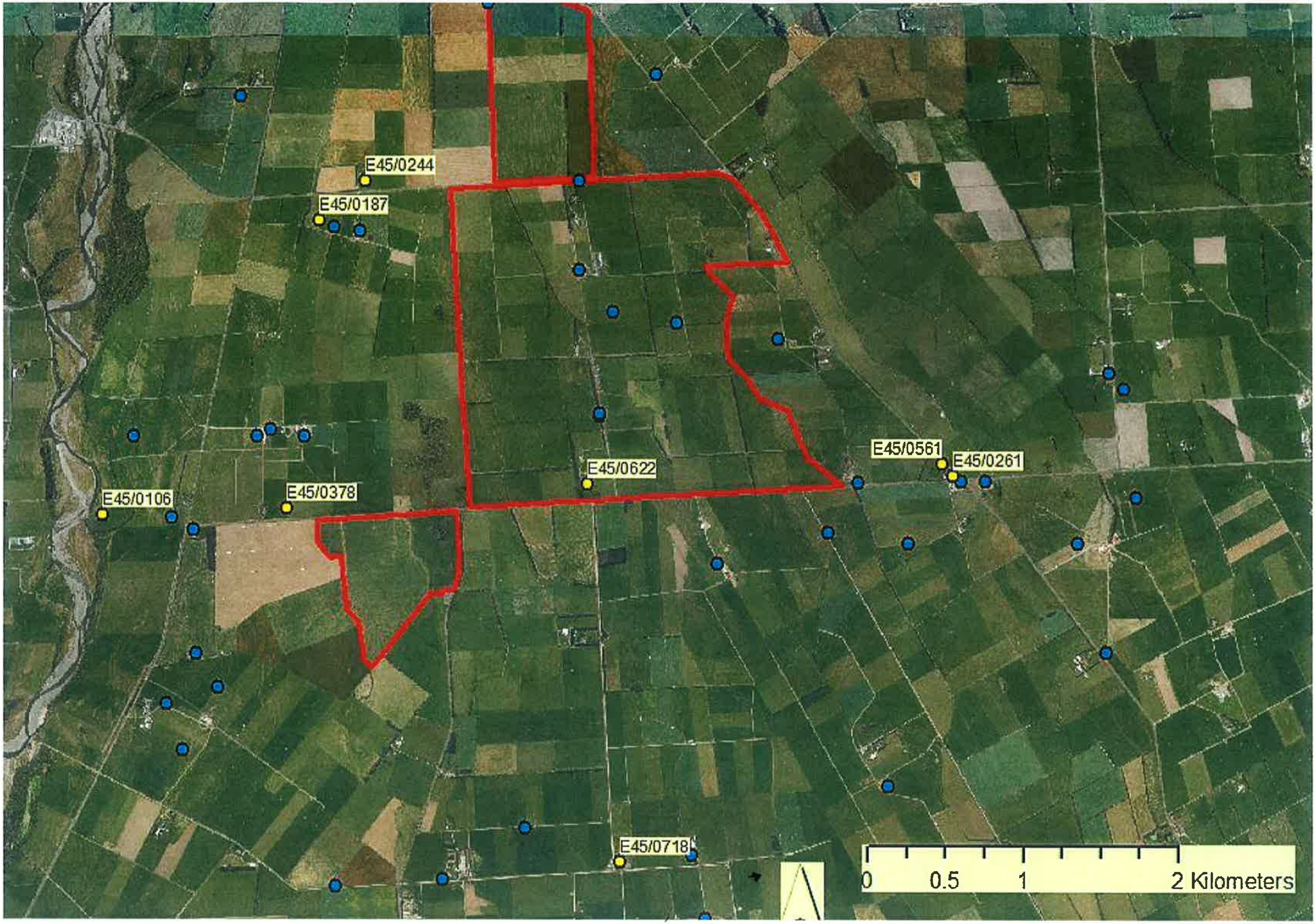
Catchment Boundaries

N

1:20,000

environment SOUTHLAND
REGIONAL COUNCIL
Te Taiao Tonga

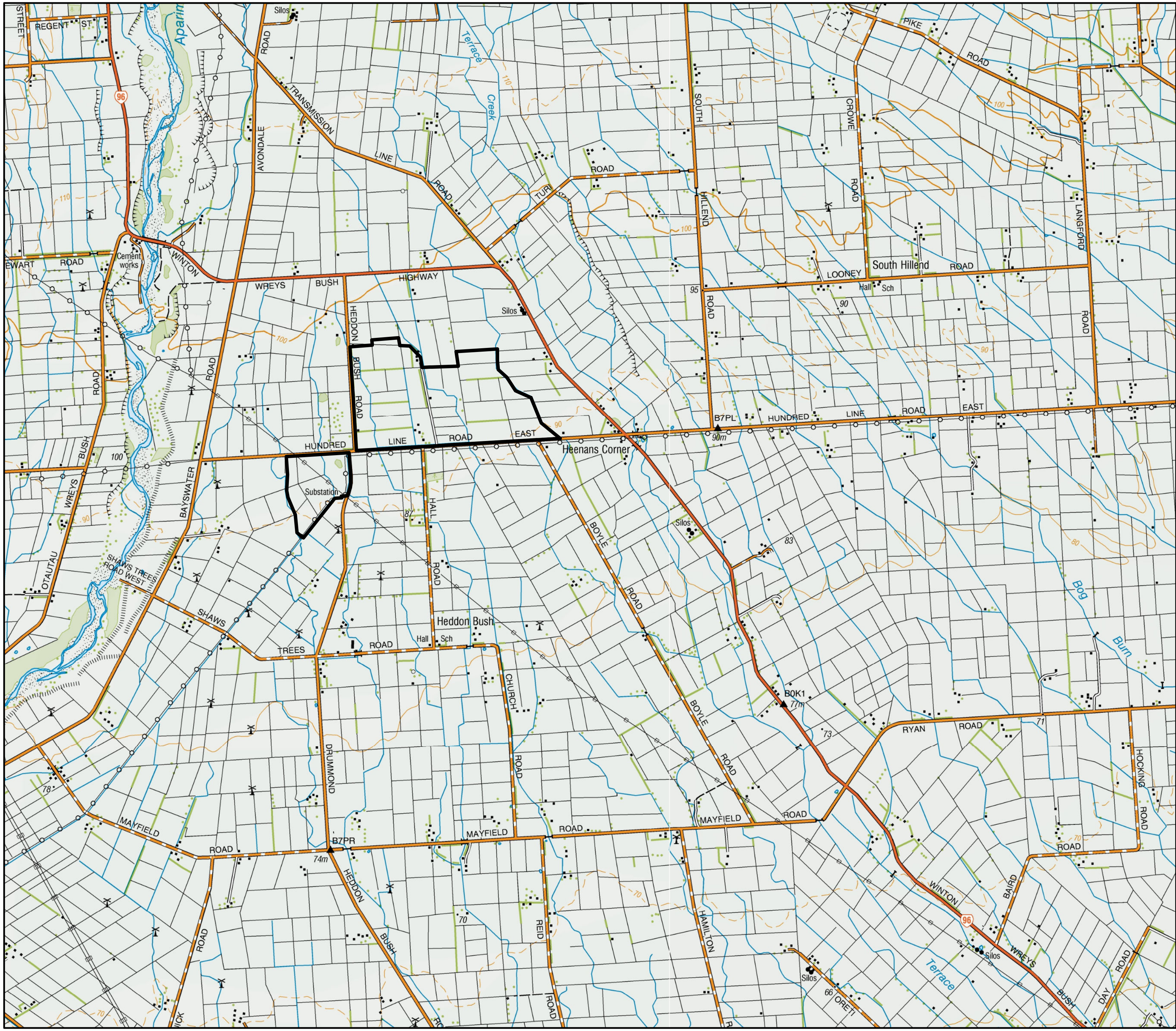
DATA SOURCE: ES GIS 2018



E45/0244
E45/0187
E45/0561
E45/0261
E45/0622
E45/0106
E45/0378
E45/0718
0
0.5
1
2 Kilometers

Physiographic Zones

Date: 9/03/2018



Legend

Farm Boundary

N

1:60,000

environment SOUTHLAND REGIONAL COUNCIL
Te Taiao Tonga

DATA SOURCE: ES GIS 2018

Location of Farm and Heddon Bush School

Date: 9/03/2018

Legend

Registered Drinking Water Site

Farm Boundary

N

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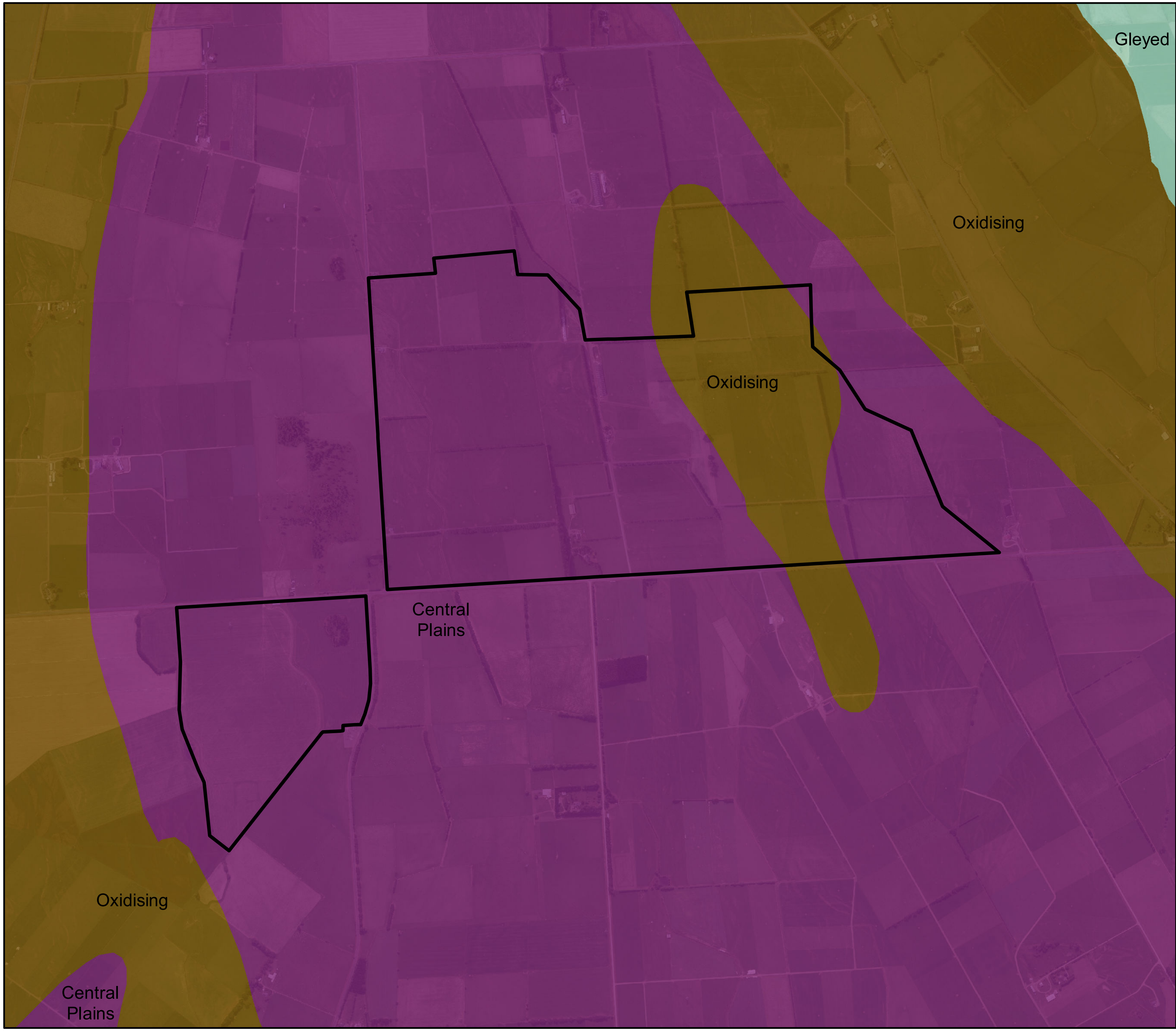
environment SOUTHLAND
REGIONAL COUNCIL
Te Taiao Tonga

DATA SOURCE: ES GIS 2018



Physiographic Zones

Date: 9/03/2018

Legend

Farm Boundary

N

1:20,000

environment SOUTHLAND
REGIONAL COUNCIL
Te Taiao Tonga

DATA SOURCE: ES GIS 2018

Further Information

Our Reference: APP-20171445
Enquiries to: Alexandra King
Email: Alexandra.King@es.govt.nz

environment SOUTHLAND
REGIONAL COUNCIL
Te Taiao Tonga

8 September 2017

Aqualinc Research Limited
C/- Nicole Matheson
PO Box 20-462
Christchurch 8543

Dear Nicole,

Request for Further Information under Section 92(1) of the Resource Management Act 1991 - Application by Woldwide One Limited

Thank you for your application to discharge dairy shed effluent from up to 800 cows and wintering pad effluent from up to 640 cows to land, to take groundwater, and to expand an existing dairy farm, at Hundred Line Road East, Heddon Bush.

I require further information before a determination can be made on your application. Please provide[1], in accordance with Section 92(1) of the Resource Management Act, the following information:

Assessment of Environmental Effects

- Please provide an assessment of surface water quality at the property, the sensitivity of these water bodies, and the potential effect of the proposed intensification on this. Council's Compliance team are able to provide data that may help you with this assessment.

- Please provide an assessment of groundwater quality in the vicinity, the sensitivity of this water body, and the potential effect of the proposed intensification on this. Council's Science team are able to provide data that may help you with this assessment.

- Please provide more information on how the assessment of the potential effects on the water supply at Heddon Bush School was assessed. Council's records suggest that groundwater flow is likely southerly, rather than south easterly as suggested in the application.

- Guidance around how to write an assessment of effects is available at: http://www.environmentguide.org.nz/rma/resource-consents-and-processes/applying-for-a-resource-consent/preparing-the-assessment-of-environment-effects/

Farm Effluent Management Plan (FEMP)

- Please describe how effluent irrigation decisions will be made on farm (i.e. how are 'suitable conditions' assessed?). This is not addressed in the FEMP.

[1] Under Section 92(1) of the Resource Management Act 1991 (RMA) the Council may, at any time before the hearing of an application, or if no hearing is to be held, before the decision to grant or refuse the application is made, request in writing that the applicant provide further information relating to the application

- Please describe how the risk of nutrients and contaminants from effluent entering groundwater via ‘cracks’ will be managed. This is not addressed in the FEMP.

- Please confirm whether cows will be winter grazed on farm. The application suggests that all cows will be wintered either in the barn or off the platform, however the FEMP describes winter grazing practices to be employed.

Other information required

- Please confirm whether an application rate test has been carried out on the irrigator. If this has been done within the last season, please provide these results. If this has not been done, please propose a date when this would be completed by.

- Please propose a date for which the Appendix N Plan will be completed.

- Please confirm the proposed effluent discharge buffer distance from dwellings not on the applicant’s property. In the proposed Discharge Permit conditions and in section 9.7 of the Management Plan 100 metres is proposed, in section 7.15 of the application 200 metres is proposed, and in section 8.4 of the application 500 metres is proposed.

- Please confirm whether cows are proposed to be winter grazed on crop.

This information is required in order for your application to be considered complete in accordance with section 88(2) of the Resource Management Act.

Determination of your application is postponed until receipt of this information. Under Section 92A of the RMA you have until 15 working days from the date of this request, which we calculate to be 29 September 2017, to either provide the information, tell the Council in writing, whether you agree to provide the information, or that you refuse to provide the information[2].

If you refuse to provide the information requested, or if you do not respond to this request, the Council may decline the application on the grounds that it has inadequate information to determine the application.

Please contact me once you have read this letter, so that I can answer any questions you may have.

Yours sincerely,

Alexandra King
Senior Consents Officer

CC: Woldwide Two Limited, C/- A & J J de Wolde, 104 Shaws Trees Road, RD 3, Winton 9783

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[2] Under Section 357 of the Resource Management Act, any person who has had an application returned as incomplete under section 88(3), has a right of objection to the appropriate consent authority in respect of that requirement. Any such objection shall be made by notice in writing to the consent authority or local authority, setting out the reasons for the objection, within 15 working days after the decision or requirement being notified to that person, or within such further time as may in any case be allowed by the consent authority or local authority.

This assessment has been prepared to address the issues raised in Environment Southland's Request for Further Information letter dated 8th September 2017.

1. Assessment of Environmental Effects

1.1 Surface water quality

Surface water quality samples have been taken at the applicant's property (site 32650). The results of the samples (downstream and upstream) are shown in Table 1, for the previous 10 years where samples were available.

Table 1: Surface water quality sample results for Woldwide One property – site 32650

Date	Parameter	Electrical Conductivity (µS/cm)	Total Ammoniacal Nitrogen (g/m^3)	Nitrogen (g/m^3)	Dissolved Reactive Phosphorus (g/m^3)	E coli (MPN/100mL)
11/4/2007	Downstream	312	0.015	2.5	0.019	43
	Upstream	311	0.015	2.5	0.024	6
11/10/2007	Downstream	263	0.035	1.5	0.03	2300
	Upstream	239	0.015	1.2	0.018	190
2/04/2008	Downstream	299	0.035	3.3	0.011	10
	Upstream	326	0.025	4.8	0.012	50
14/10/2008	Downstream	344	0.12	9.6	0.0092	2610
	Upstream	342	0.12	9.4	0.01	2760
5/11/2009	Downstream	332	0.73	9.46	0.082	6490
	Upstream	331	0.75	9.62	0.086	2250
7/5/2010	Downstream	381	0.014	17.7	0.024	31
	Upstream	376	0.0188	17.7	0.028	52
18/11/2011	Downstream	277	<0.01	8.7	0.013	8160
	Upstream	283	<0.01	8.6	0.014	8160
14/03/2012	Downstream	331	0.01	7.0	0.038	377
	Upstream	333	0.01	7.2	0.035	31
11/02/2013	Downstream	287	<0.01	0.14	0.009	75
	Upstream	308	0.098	3.7	0.017	52

The surface water quality samples indicate that both Nitrogen and E-coli levels are reducing after peaks in the 2009 – 2011 period. However with only one sample available per year, samples not taken at the same time each year and no recent samples available no trend in the quality of surface water at the property is able to be calculated.

Long term groundwater quality samples have been taken from bores E45/0010 (9.5 m deep) and E45/0330 (15 m deep). As the hydraulic connection between groundwater and surface water was assessed to be a high degree of connection (Section 9.6 of the consent application) it is considered the long term surface water quality is likely to be very similar to the ground water quality results as assessed below. Therefore, the surface water quality has been assessed as part of the assessment on groundwater quality below.

1.2 Groundwater quality

In the vicinity of the Woldwide One property there are two bores with long term water quality samples. Bore E45/0330 (15 m deep) approximately 300 m south of the Woldwide One property and bore E45/0010 (9.5 m deep) approximately 1.2 km west of the Woldwide property. As both bores are shallow the samples provide an indication of the water quality in the vicinity of the Woldwide One property for the previous 10 years.

Figure 1 shows the Nitrogen results for bore E45/0330 from October 2007 to present. The results indicate there is no apparent trend and that the nitrogen levels in bore E45/0330 are relatively high however they do not appear to have increased with the development of farm land to dairying in the Waimatuku and Central Plains catchments over the previous 10 years.

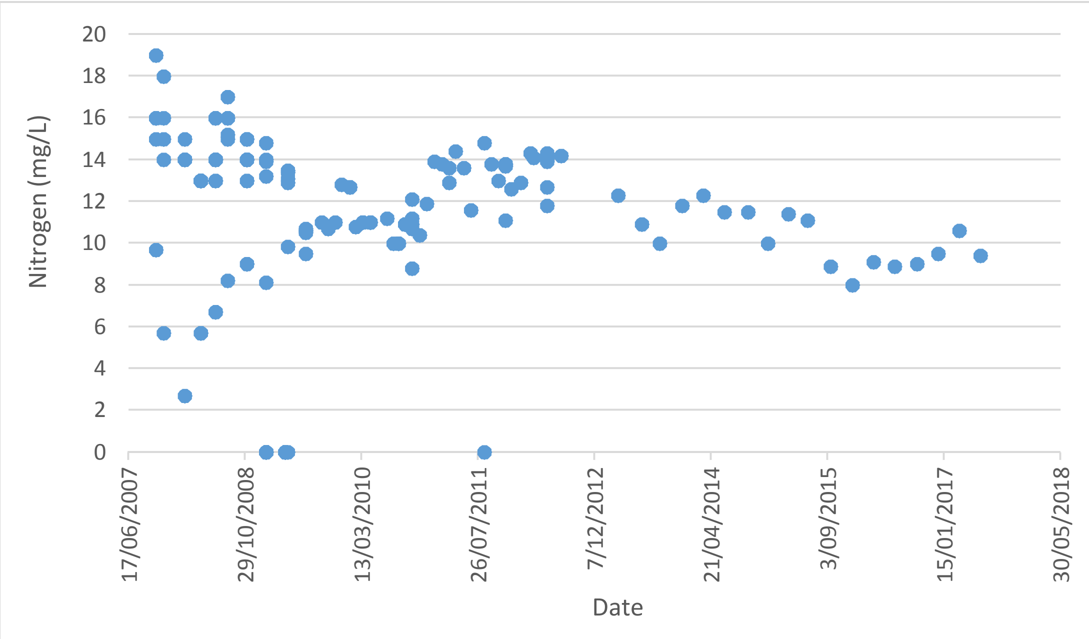

Figure 1: Nitrogen (Nitrate-Nitrite) results from bore E45/0330 (2007-present)

Figure 2 shows the E-Coli results for bore E45/0330 from September 2007 to present. The results indicate there is no apparent trend and that the E-Coli levels in bore E45/0330 are low and do not appear to have increased with the development of farm land to dairying in the Waimatuku and Central Plains catchments over the previous 10 years.

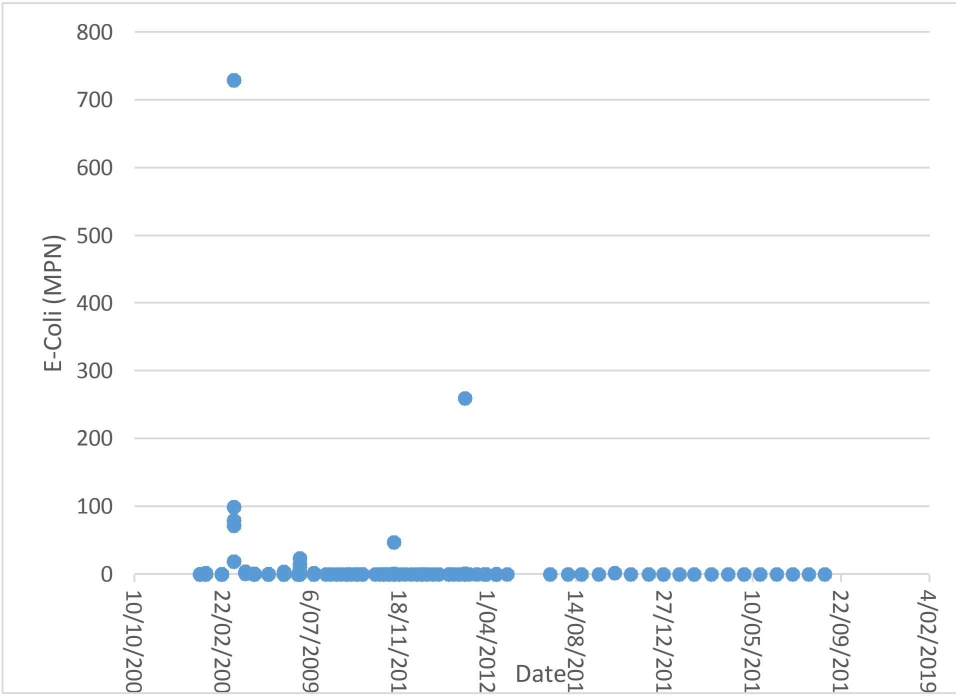

Figure 2: E-Coli results from bore E45/0330 (2007-present)

Figure 3 shows the Nitrogen results for bore E45/0010 from September 2007 to present. The results indicate there is no apparent trend and that the nitrogen levels in bore E45/0010 are relatively high however they do not appear to have increased with the development of farm land to dairying in the Waimatuku and Central Plains catchments over the previous 10 years.

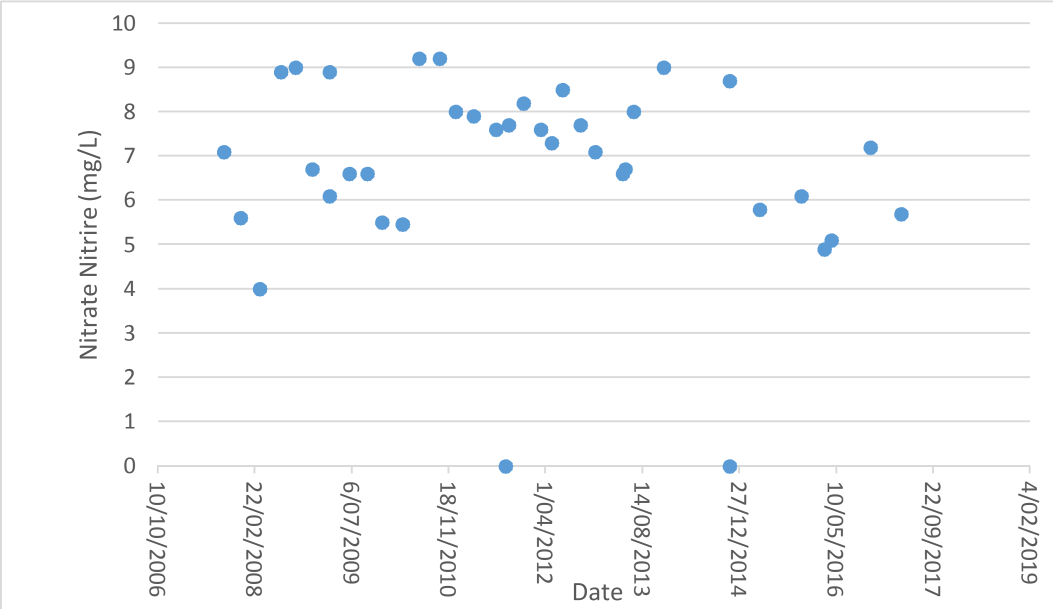

Figure 3: Nitrogen (Nitrate-Nitrite) results from bore E45/0010 (2007-present)

Figure 4 shows the E-Coli results for bore E45/0330 from September 2007 to present. The results indicate there is no apparent trend and that the E-Coli levels in bore E45/0330 are low and do not appear to have increased with the development of farm land to dairying in the Waimatuku and Central Plains catchments over the previous 10 years.

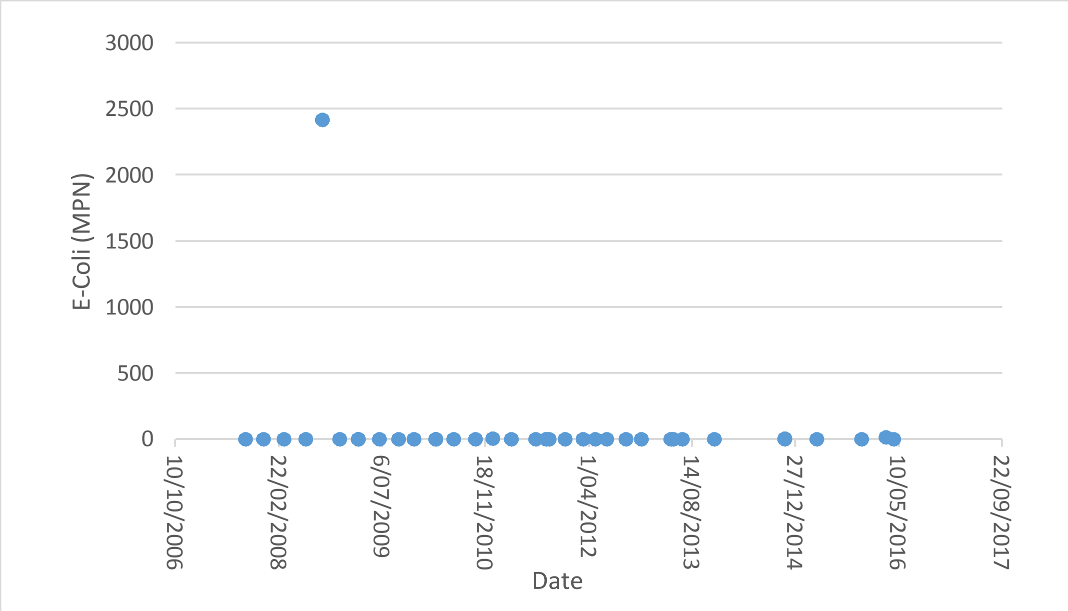

Figure 4: E-Coli results from bore E45/0010 (2007-present)

The nitrogen results in both bores E45/0330 and E45/0010 indicate that the water is currently within the drinking water quality standard (11.3 mg/L).

Overseer modelling calculates the nitrogen loss in drainage water from each block. The range of nitrogen loss in drainage water for the proposed scenario for the Woldwide One property (including the Horner Block) is 1.9 to 6.3 g/m^3 with a weighted average of 4.3 g/m^3. The average nitrogen loss in drainage water from Overseer modelling is below the current groundwater nitrogen sample values taken from both bores E45/0330 and E45/0010. This Overseer modelling has indicated that the nitrogen loss to water from the applicant's proposed development would be lower than the existing groundwater concentrations in bores E45/0330 and E45/0010. Hence the proposed development is likely to improve the groundwater nitrogen concentration.

The applicant's property overlies both the Waimatuku and Central Plains Aquifers which are both recharged via land surface i.e. rainfall, therefore there is very little dilution able to occur to reduce the high nitrogen levels. Any reductions in the nitrogen levels need to be at a catchment scale with all farmers reducing their nitrogen loss to water in drainage. The Overseer modelling has indicated that this proposal will likely result in a decrease in the nitrogen loss to water, therefore this proposal has the potential to help to reduce the nitrogen levels in the catchment.

1.3 Groundwater flow

Based on the 2014 piezometric survey we agree that the groundwater direction in the vicinity of the Woldwide One property is Southerly.

In May 2017 the Heddon Bush School bore was drilled to a depth of 14.9 m (a copy of the borelog is included in Appendix A). The water supply passes through a Trojan Ultra Violet Water Treatment System before the water enters the school water supply. Given this treatment system the school water supply will be protected from E-coli.

The Principal of Heddon Bush School has also indicated that E-coli and coliforms have been absent from all samples taken in the last 3 years (while she has been Principal). Since the drilling of the new bore water quality sampling of the bore will be carried out quarterly.

Since 2010 the Southern District Health Board has only one nitrogen sample of 1.51 g/m^3, unfortunately no date is available for this sample.

2. Farm Effluent Management Plan

2.1 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;

2.2 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.

2.3 Winter grazing

The proposed Southland Water and Land Plan defines intensive winter grazing as;

Intensive winter grazing of stock between May and September (inclusive) on forage crops.

All cows wintered on the property in June and July will be housed in the wintering barn, however during May and August the herd will spend part of the time outside grazing pasture and the remaining time in the wintering barn while during September all cows will be outside grazing pasture. Therefore during May, August and September when the cows are outside grazing pasture intensive winter grazing practices will be implemented.

3. Other information required

3.1 Travelling irrigator application rate test

An applicant rate test was not carried out last season on the travelling irrigator however the applicant proposes to carry out such a test this season by the end of March 2018.

3.2 Appendix N – Farm Environment Management Plan

The Appendix N has been completed as the Farm Environment Management Plan that was submitted with the consent application. This document is called a Farm Environment Management Plan rather than an Appendix N document which will not mean anything to the farmer and staff using the document to manage the property.

3.3 Effluent discharge buffer distances to dwellings

The applicant proposes a buffer distance to neighbouring dwellings of at least 100 m, however currently the closest house is 500 m from the discharge area (owned by Careykin Limited the eastern neighbour).

3.4 Winter grazing on fodder crop

The cows will be not be winter grazed on fodder crop.

Appendix A: Heddon Bush School – Borelog

SOUTHDRILL
WATER EXPLORATION

BORE LOG DATA SHEET

CLIENTS NAMES:	Heddon Bush School
FULL ADDRESS:	233 Hall Road
RESOURCE CONSENT NO:	20171265
BORE SIZE:	150mm
START DATE:	31 May 2017
FINISH DATE:	1 June 2017
MACHINE:	Schramm T555
RAPID NO:	233
GRID REFERENCE:	E1225283 N4885878
DRILLER:	Shaun Crosland
MEASURED FROM:	Top of casing
300mm UPSTAND:	Yes
TOTAL DEPTH BORE:	14.9m
TOP LEADER:	13.9m
STATIC WATER LEVEL:	4.5m
SCREEN - SLOT:	2.5mm
TYPE	Stainless
PVC SLOTTED:	NA
SCREEN:	700mm
LEADER:	300mm
SUMP:	N/A
TOTAL CASING USED:	14.2m
AT TIME OF PUMPING-BORE DID:	117 lps per min @ 13m
TEST PUMP PERIOD:	Overnight, 14 hours
DRAWDOWN FROM SWI:	8.5m
AIR/PUMP INTAKE:	14m
BACTERIAL WATER TEST:	yes
CHEMICAL WATER TEST:	yes
IMPERVIOUS SEAL AT GROUND LEVEL AROUND CASING	Yes
CASING TOP SEALED TO PREVENT CONTAMINATION	Yes

COMMENTS:

BORE LOG:

0 - 12m	Clay
1.2 - 6m	Clay Bound Gravel
6 - 14.9m	Wet Gravels

P:\Contracting\SouthDrill\1 SouthDrill 2016 - 2017\Bore Log Data Sheets\1705\Heddon Bush School 20171265 Bore Log 31.05.17

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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Quality Control

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Document Title	Farm Environmental Management Plan
Document Number	C14114/06
Authors	Nicole Matheson
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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

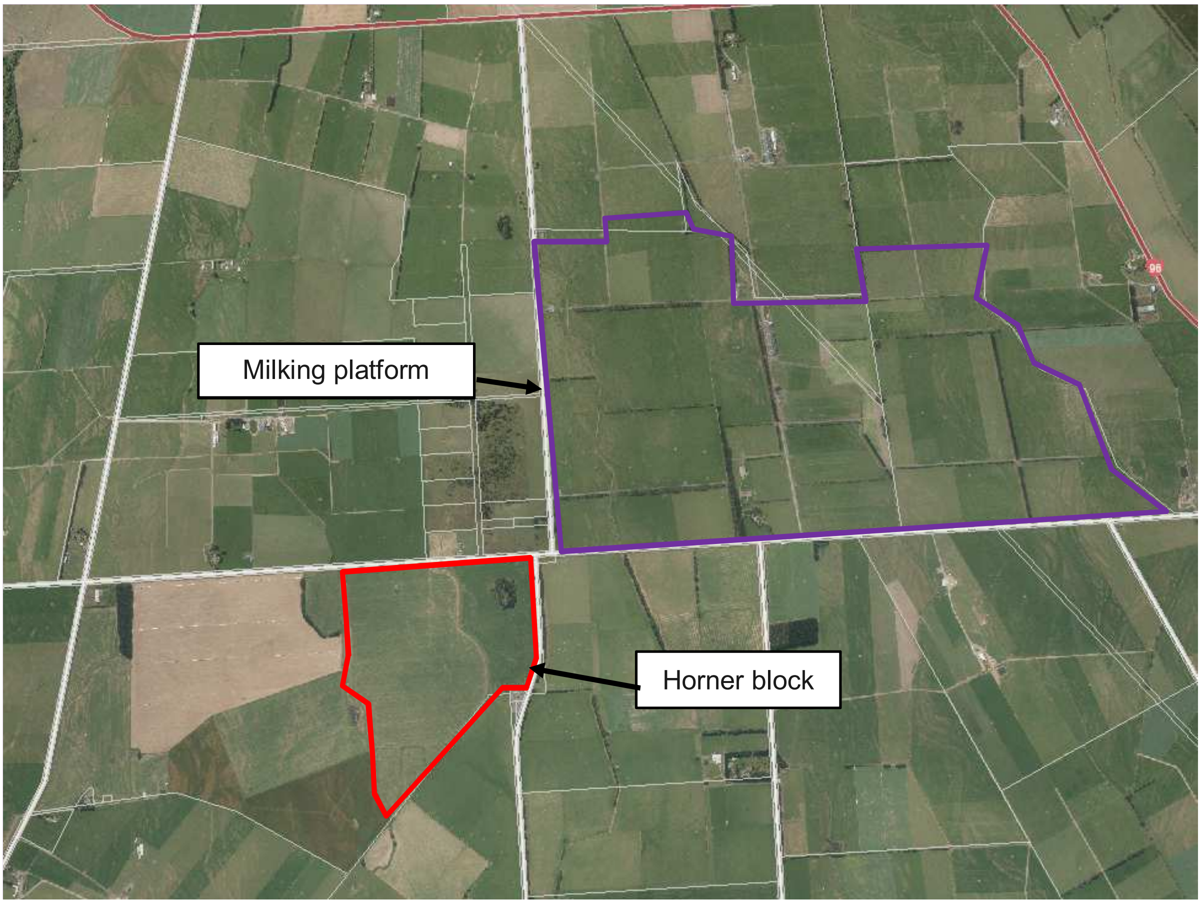

Figure 1:Woldwide One milking platform and Horner block property boundary

2.2 Infrastructure

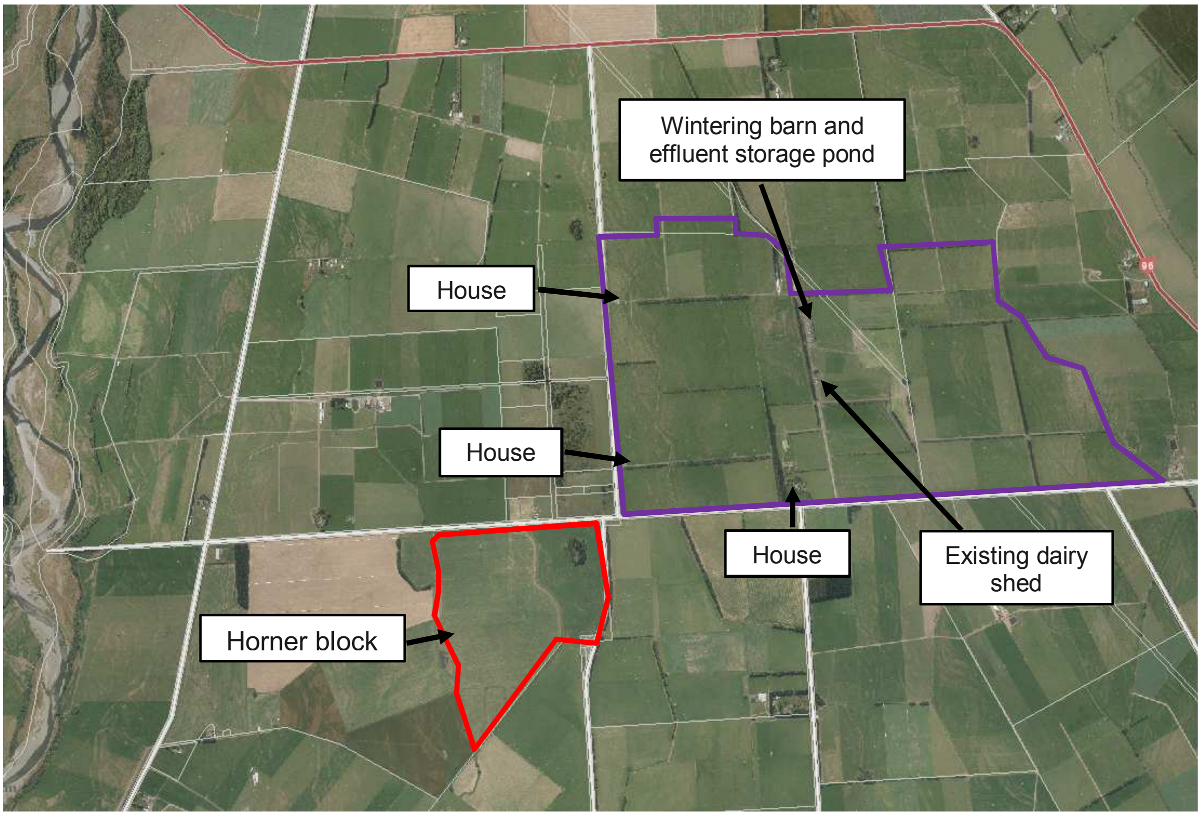

Figure 2: Woldwide One – Location of dairy shed, storage and farm houses

Figure 3: Woldwide One – Effluent discharge areas

2.3 Waterways, Stock Crossings and Critical Source Areas

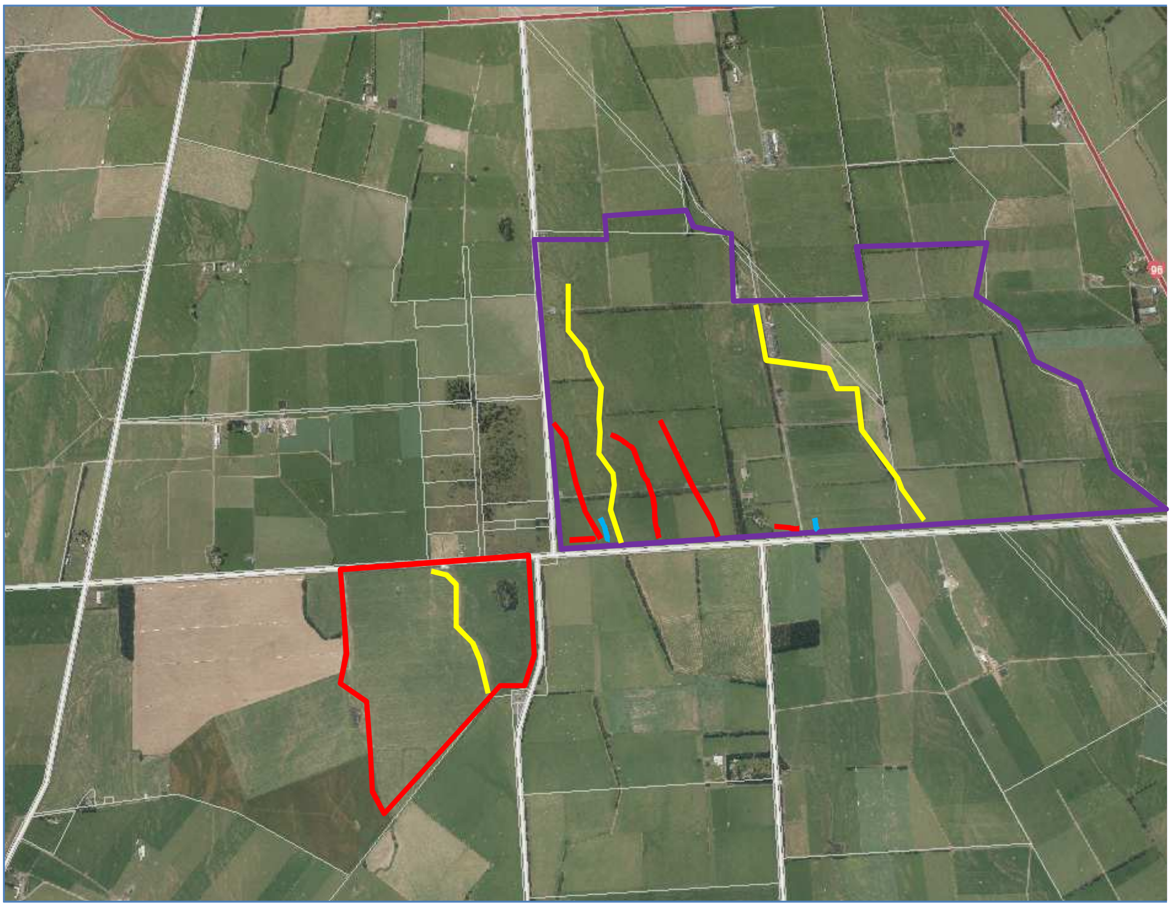

Figure 4: Woldwide One – Waterways and critical source areas

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.

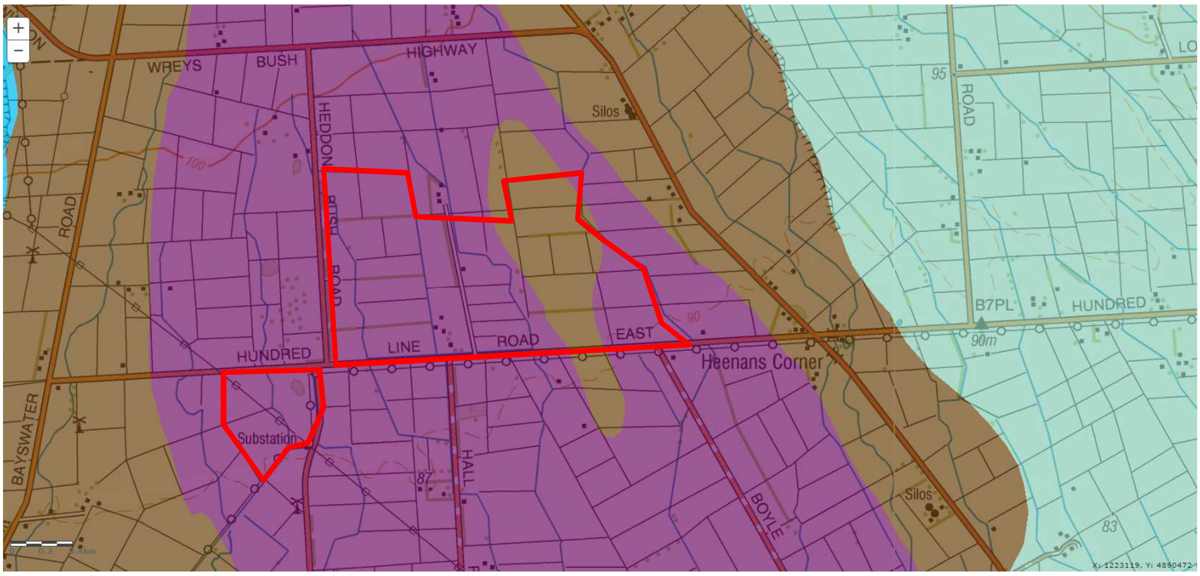

Figure 5: Map of physiographic zones at the Woldwide One and Horner block property

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.

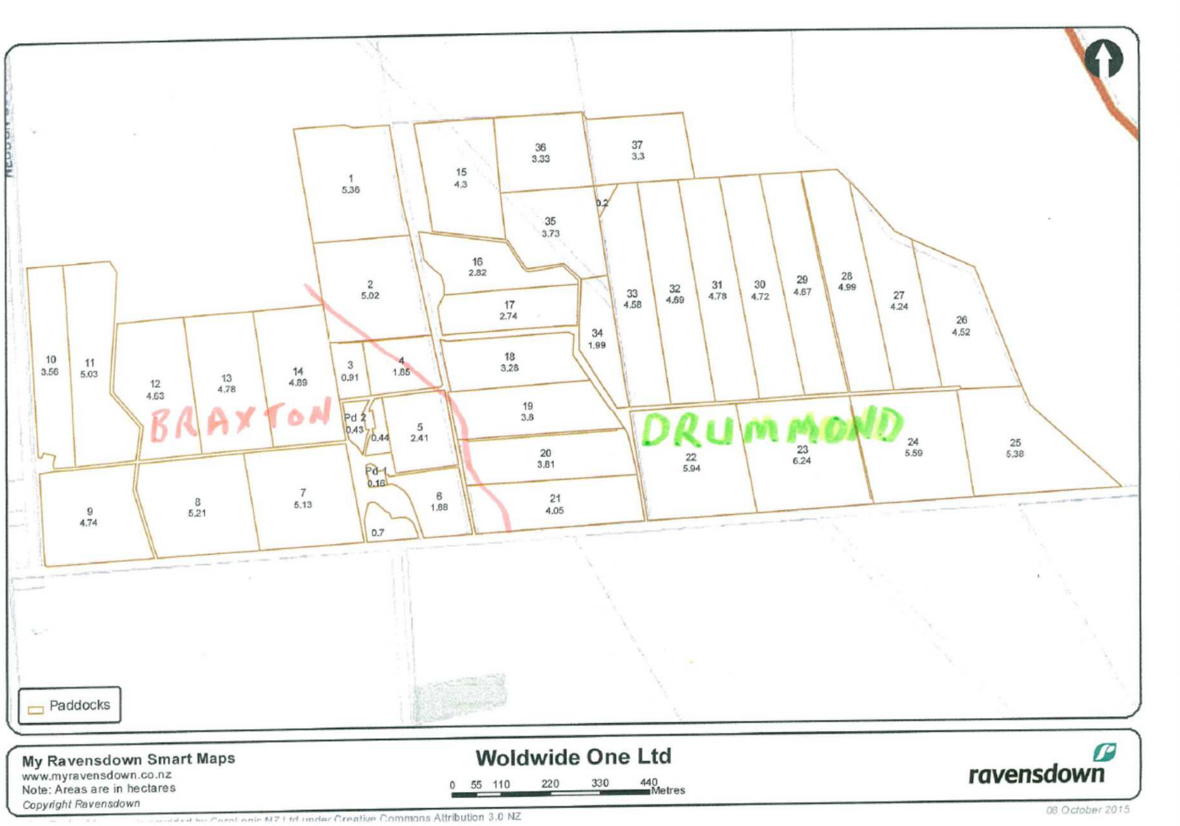

Figure 6: Map of soil types at the Woldwide One property

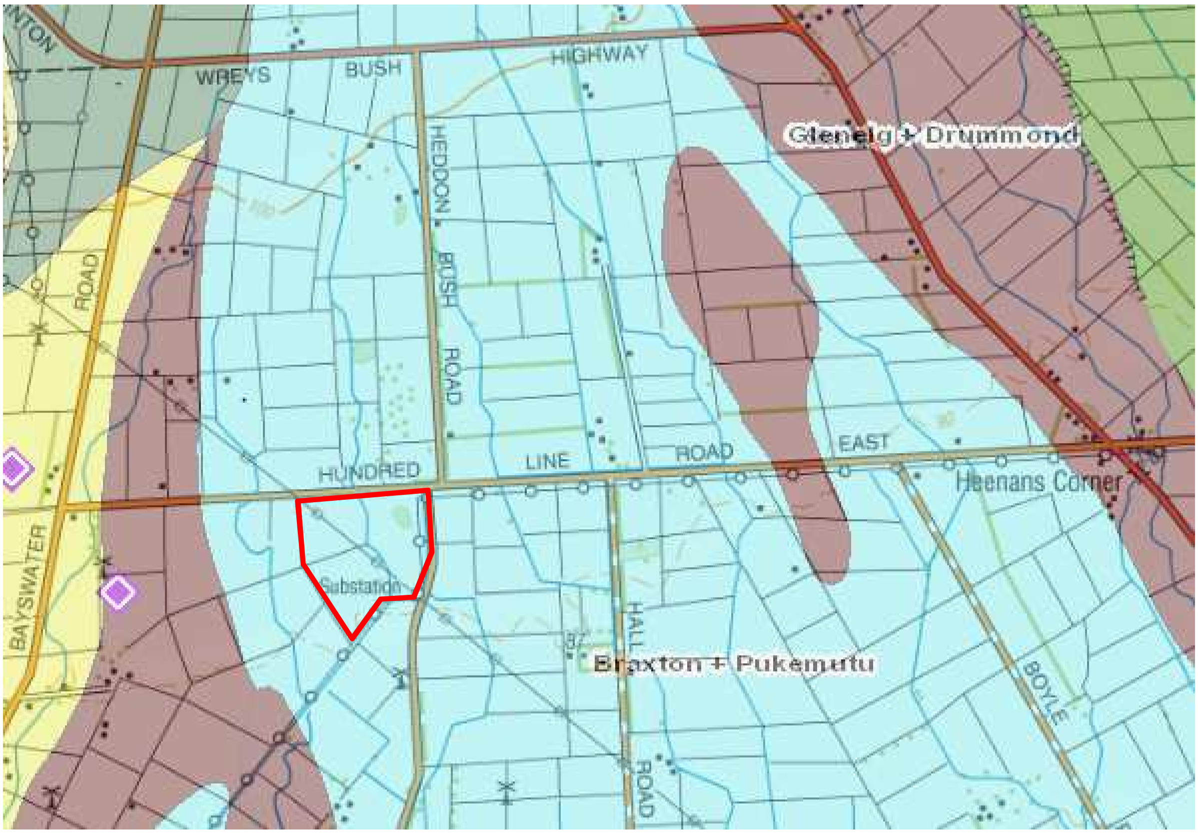

Figure 7: Map of soil types at the Woldwide One property – Horner Block

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.

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 m^3 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 m³/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.			

Submissions

MINISTRY OF EDUCATION
TE TĀHUHU O TE MĀTAURANGA

FORM 13

Submission on a publically notified application concerning resource consent under section 96, Resource Management Act 1991

To:	Southland Regional Council
Name of submitter:	**Ministry of Education ('the Ministry')**
Address for service:	C/- Beca Ltd PO Box 13960 Armagh Street Christchurch 8141
Attention:	Jess Bould
Phone:	(03) 968 4375
Email:	Jess.Bould@beca.com

This is a submission on an application from *Worldwide One Limited* at Hundred Line Road East, Heddon Bush (legally described as Lot 4 DP 399915, Parts Lot 18 DP 942, Lot 1 DP10885 and Section 420 Taringatura Survey District).

The application is for resource consent to use land to increase cow numbers, discharge dairy shed and wintering barn effluent to land via travelling irrigator and to take up to 91,000 litres of groundwater for dairyshed washdown and stockwater supplies.

The specific parts of the application that the Ministry of Education's submission relates to are:

The Ministry's submission relates to the water quality aspects of the application and how potential discharge of nutrients may affect the drinking water supply for Heddon Bush School. Of specific concern to the Ministry is the potential effect of nitrates entering the drinking water supply and potential impact on human health. The school is located approximately 2km downgradient from the applicant's site.

Background:

The Ministry is the Government's lead advisor on the education system, shaping direction for education agencies and providers and contributing to the Government's goals for education. The Ministry's overall purpose is:

'Lifting aspiration and raising education achievement for every New Zealander.'

Amongst other matters, the Ministry has responsibility for manging all education property owned by the Crown. They also have a role in ensuring education providers have the resources and support they need to deliver services to students. The safety of students and teachers is a high priority and as such, the Ministry monitors and responds to land use applications that may have a potential impact on the operation of a school or the safety or wellbeing of teachers and students.

Under the Resource Management Act (RMA) 1991, decision makers must have regard to the health and safety of people and communities. Furthermore, there is a duty to avoid, remedy or mitigate actual and potential adverse effects on the environment. The Ministry considers there to be a potential adverse effect from the proposed activity, on the safety and wellbeing of students and teachers using drinking water from the supply well at Heddon Bush School, through the uncertainty around effects of nitrates discharging to the groundwater supply as a result of the increased nutrient discharge from the site.

The Ministry of Education's submission is:

The Ministry opposes the application to increase the number of cows at the site and the resulting increase in discharge of nutrients to land. Cumulative effects from intensificiation of farming in the area is likely to impact on groundwater quality. The discharge of nutrients to land near drinking water protection zones is of increasing concern to the Ministry.

The Ministry are responsible for supplying safe drinking-water to students and staff at Heddon Bush School in accordance with the New Zealand Drinking Water Standards 2008. As indicated in the attached memorandum from Beca Senior Hydrologists there are concerns of the actual and potential adverse effects on the quality of the drinking-water supply of the school, particularly given that a water supply bore was installed at the school in May 2017.

Groundwater sampes have been collected from the school bore. The results are not available at the time of the submission. However groundwater sampling taken within the vicinity of the applicant's farm show elevated nitrogen concentrations which have exceeded the Drinking Water Standards for New Zealand. There is also concern of the pathogen risk to the drinking supply of the school arising from the applicant's operation.

The applicant has not addressed cumulative effects from other potential sources such as neighbouring farms or any lag time effects from the application of nutrients. There is no reference to additional monitoring that may be required or additional treatment or alternative sources of drinking water for the school in the application.

The Ministry of Education seeks the following decision from the consent authority:

The Ministry opposes this application and considers the actual and potential adverse effects on the drinking water supply of Heddon Bush School from the discharge of nutrients has not been adequately assessed in the application.

The Ministry wishes to be heard in support of their submission.

____

(Signature of person authorised to sign on behalf of the Ministry of Education)

Date: *22 January 2018*

Memorandum

To:	Jess Bould	**Date:**	18 January 2018
From:	Dora Avanidou, Mike Thorley	**Our Ref:**	4262476
Copy:	Paul Whyte		
Subject:	Worldwide One Ltd Application		

Assessment of potential effects on groundwater quality on Heddon Bush School water supply bore

Worldwide One Limited, a dairy farm located at 104 Shaws Trees Road, Heddon Bush (Figure 1), currently holds a consent (301663) to discharge dairy effluent from a maximum of 540 cows. Worldwide One is seeking consent to discharge dairy effluent from 800 cows (an increase of 48%) and increase the groundwater take from a maximum of 60m^3/day to 91 m^3/day.

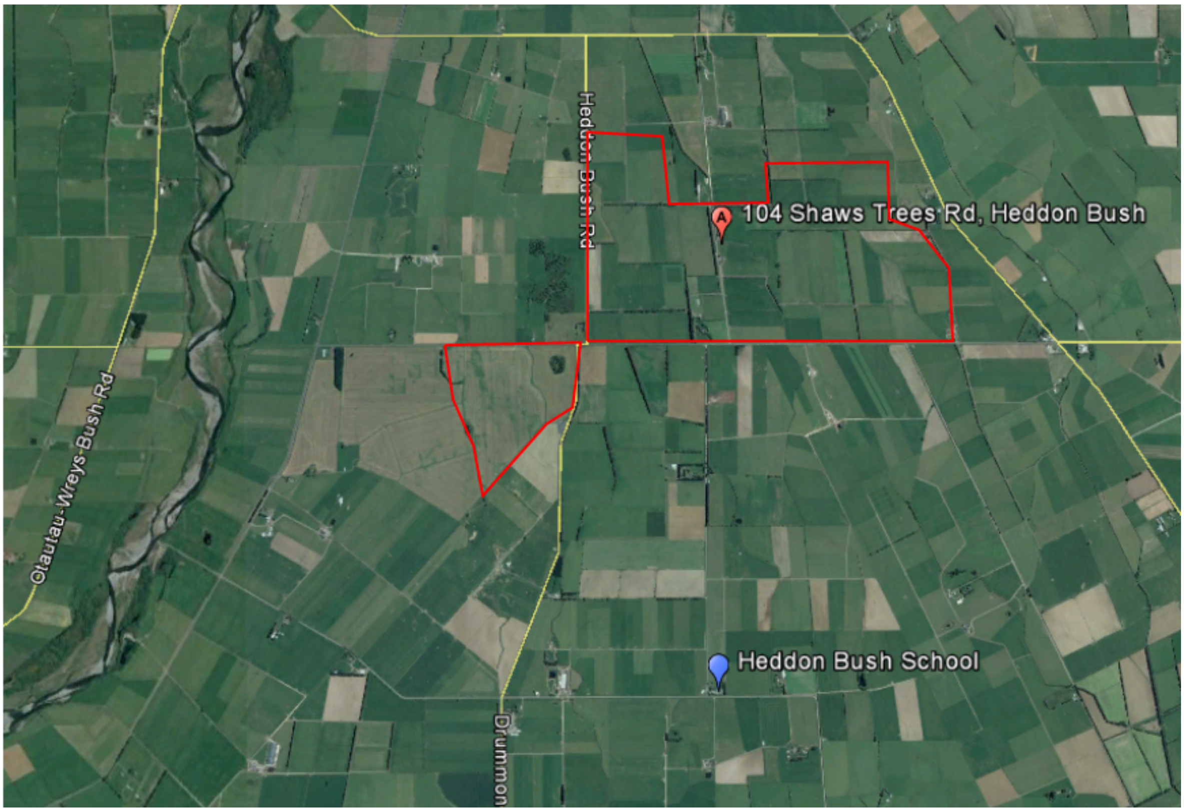

Figure 1: Location Plan (approximate boundaries of proposed area to discharge dairy effluent)

Heddon Bush School is located ~ 2km south of the Worldwide One farm. Groundwater flow in the vicinity of the Worldwide One property is southerly. In May 2017 a water supply bore was constructed in Heddon Bush School property. The bore was drilled to a depth of 14.9m below ground. A simplified geological profile as described in the driller's borelog is presented in Table 1.

Table 1 – Simplified Geological Soil Profile

Depth (m bgl)	
0 – 1.2m	Clay
1.2m – 6.0m	Clay Bound Gravel
6.0m – 14.9m	Gravels

The bore is screened from 13.9m bgl to 14.9m bgl. The static groundwater level measured at that time was 4.5m bgl. Groundwater quality samples from the school bore have been collected but were not available at the time of writing.

Groundwater quality testing undertaken in samples from bores within ~2.5km of the farm show elevated nitrogen concentrations (average values range from 3.83 mg/L -15.8mg/L). Long term groundwater quality data are limited. In the vicinity of the Worldwide One property there are three bores with relatively recent groundwater quality data. E45/0330 is approximately 300m south, E45/0010 approximately 1200m west and E45/0435 is approximately 2000m south east of the Woldwide One property (Figure 2). Nitrogen concentration data from those bores are presented in figures 3, 4 and 5 (data obtained from Environment Southland).

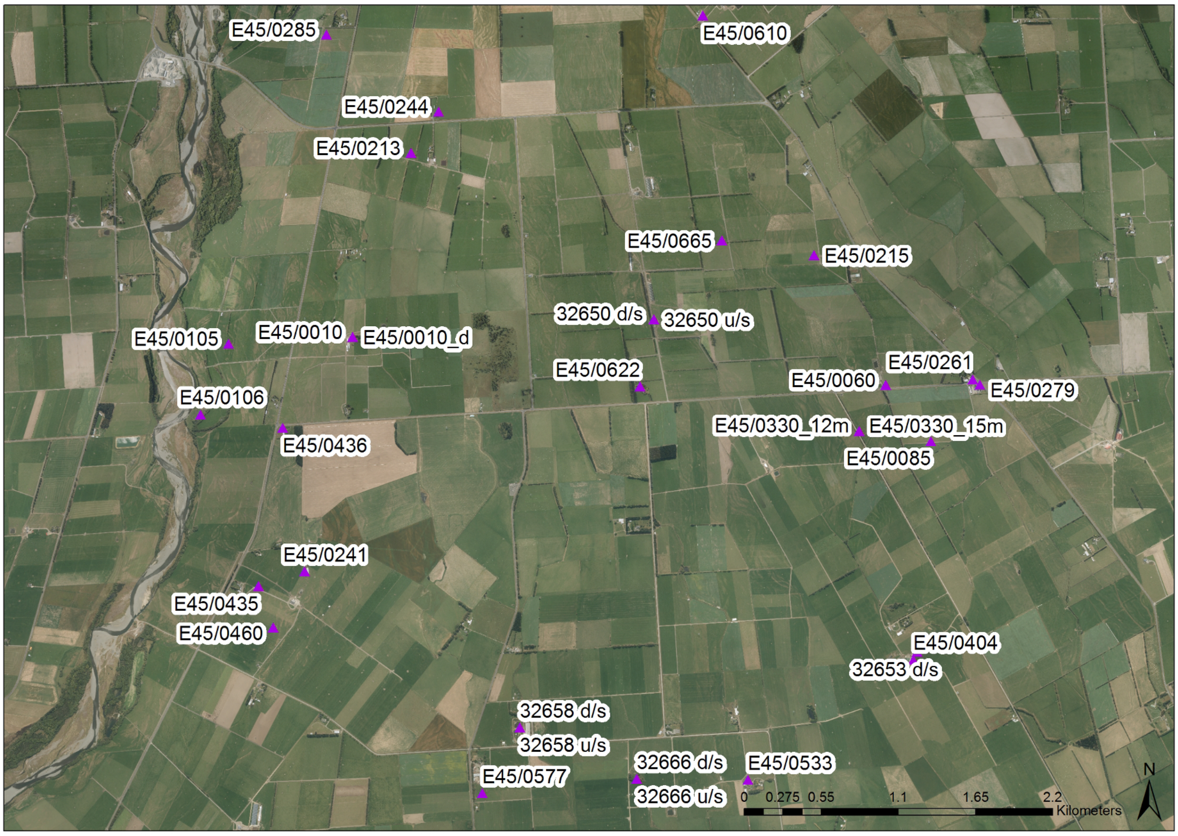

Figure 2: Water quality data map (data obtained from Environment Southland)

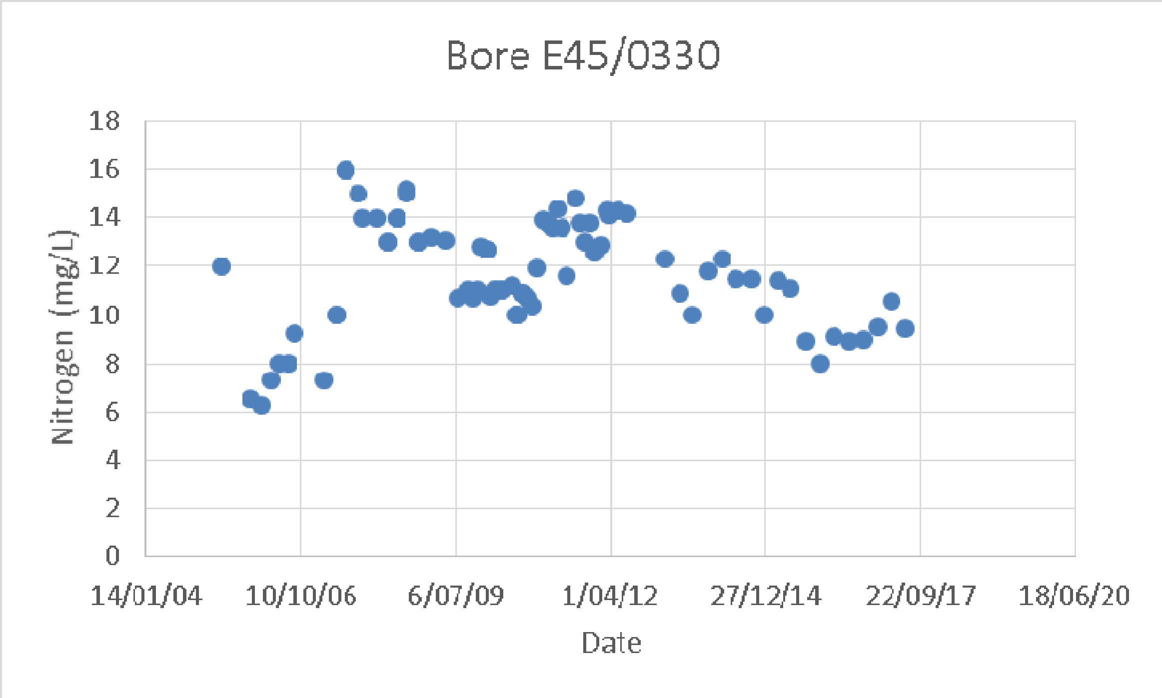

Figure 3: Nitrogen (Nitrate – Nitrite) Concentrations in bore E45/0330 (2004 – 2017)

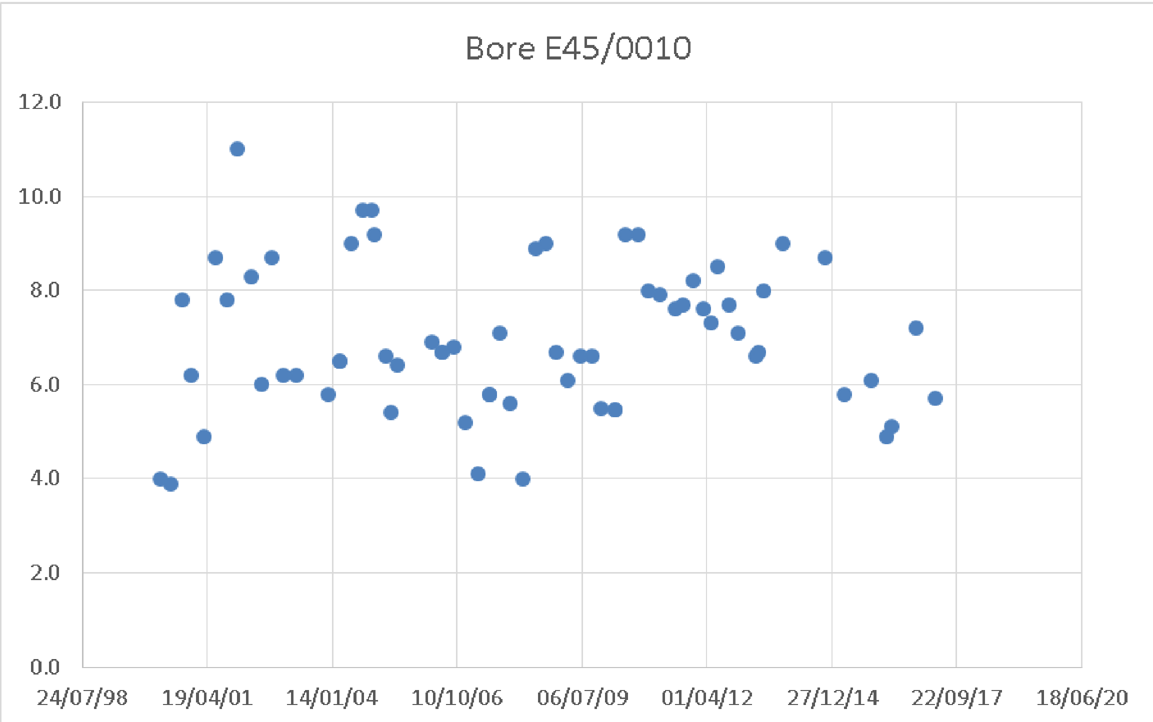

Figure 4: Nitrogen (Nitrate – Nitrite) Concentrations in bore E45/0330 (2000 – 2017)

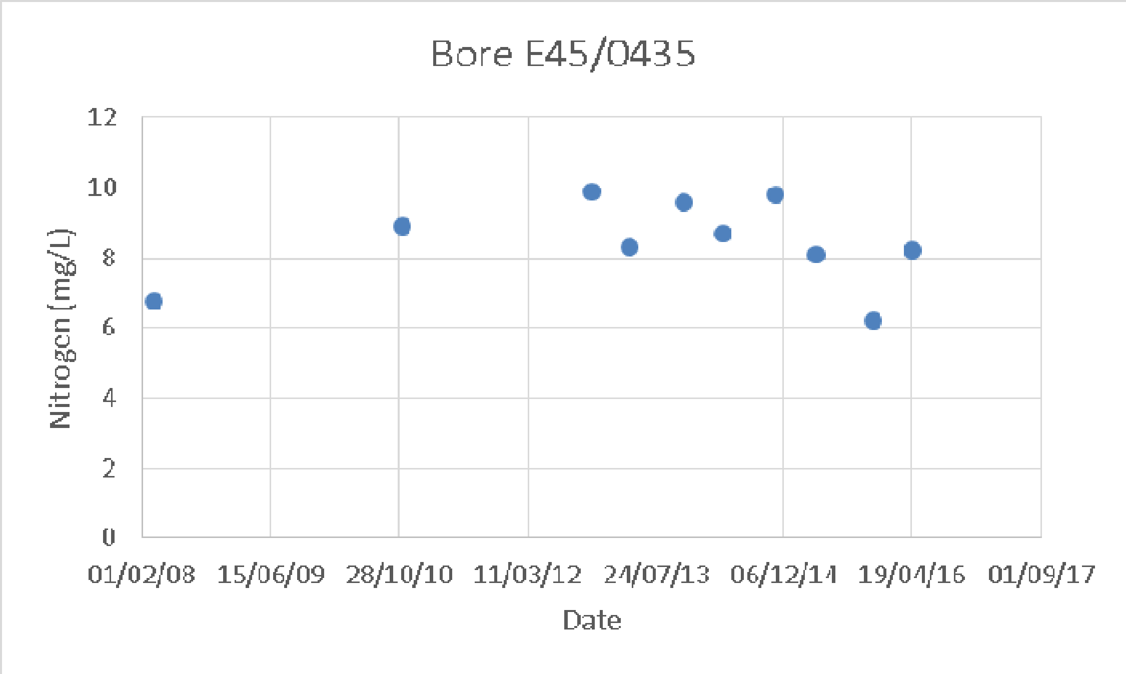

Figure 5: Nitrogen (Nitrate – Nitrite) Concentrations in bore E45/435 (2008 – 2017)

In all three bores the data indicate there is no apparent trend on nitrogen concentrations over the years and the nitrogen concentrations are close and have exceeded the Maximum Accepted Value for Nitrogen (11.3mg/L) in Drinking Water Standards for New Zealand (DWSNZ) in the past.

Very limited (2010 - 2011) water quality data (surface and groundwater) are available from Environment Southland database in bores within ~700m of the Heddon Bush School (Figure 2). Nitrogen concentrations (<3 mg/L) were measured both at surface water and groundwater samples (Table 2).

Table 2 – Groundwater and Surface water Nitrogen concentrations within 700m radius of Heddon Bush School

Sample	Site Name	Date	Nitrogen (mg/L)
Groundwater	E45/0533	18/03/2010	1.51
Groundwater	E45/0577	19/01/2011	0.27
Surface Water	32658 d/s	19/02/2010	0.006
Surface Water	32658 u/s	19/02/2010	0.004
Surface Water	3266 d/s	18/11/2010	2.79
Surface Water	3266 u/s	18/11/2010	2.81

Recent data are not currently available to identify if in the last 6 – 7 years groundwater quality in the vicinity of school has deteriorated.

As stated in Environment Southland Technical Report “Water Quality in Southland: Current State and Trends” assessment of groundwater Nitrate Nitrite Nitrogen concentrations against the drinking water standard illustrate that median concentrations were worse than drinking water standards in 19 of 159 bores measured in the Southland region (Figure 6).

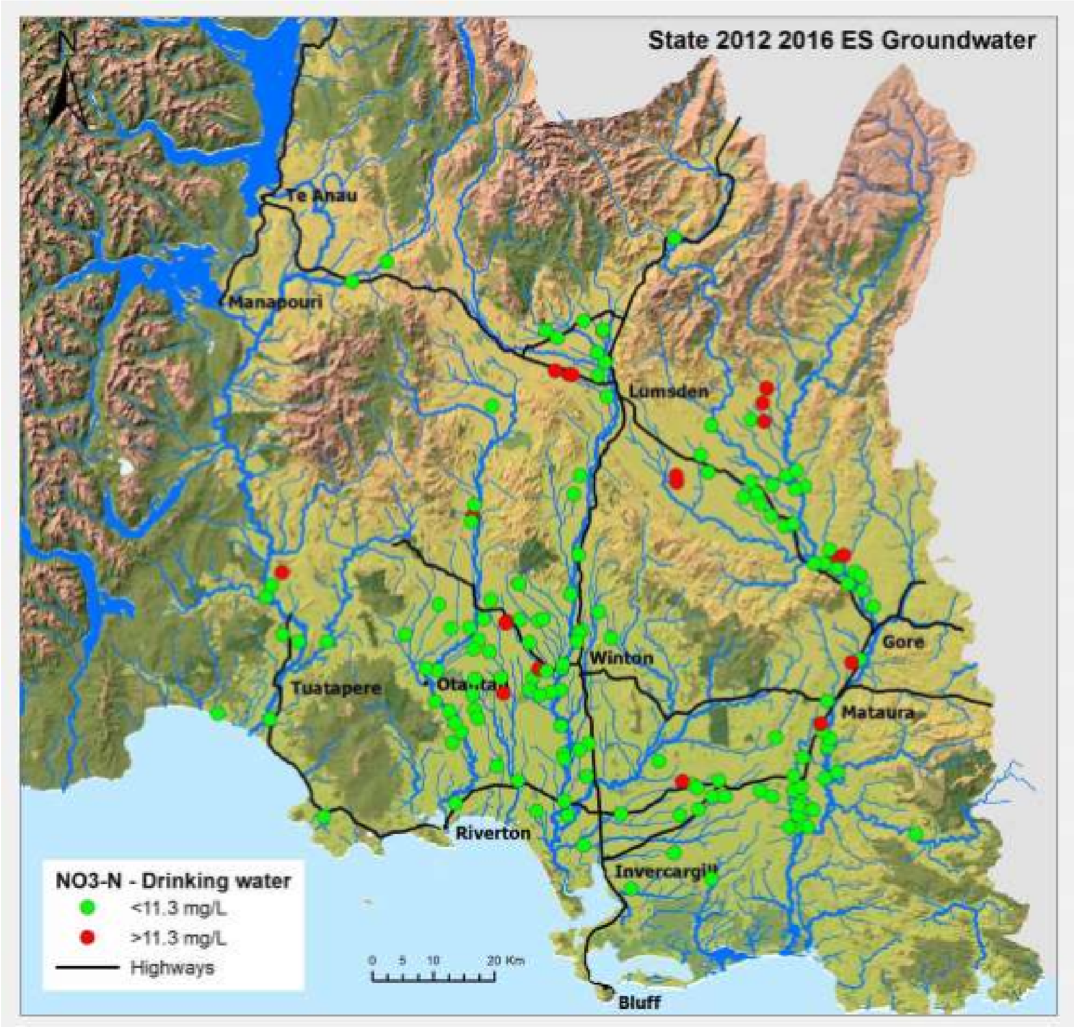

Figure 6: Groundwater quality state for Nitrate Nitrite Nitrogen (from ES Technical Report 2017-04)

Nutrients have a “lag time” between when the nutrients are applied and when they reach the groundwater. This means the ultimate effect of extra nutrients being applied to a site is not known immediately. Some effects may be apparent soon after while others may take 10 or 20 years to show.

The application is presenting modelling results using Overseer for the additional discharge and this has shown that it is likely to have greater effects on groundwater quality when compared to the current farm operation. As mentioned above, groundwater flow in the area has a southerly direction and therefore applying more nutrients to the land up-gradient of the Heddon Bush school water supply will potentially affect the water quality of the aquifer that the school bore is drawing water from. Furthermore the cumulative effects of different sources (additional neighbouring farms) and time taken for contaminants to migrate to bores is not assessed in the current application and therefore no mitigation measures are proposed i.e. additional groundwater quality monitoring downgradient of the disposal areas or trigger levels on Nitrogen (Nitrate and Nitrite) measured in groundwater to meet the Maximum Acceptable Values (MAV) and the ratio thereof as given in the Drinking Water Standard for New Zealand 2005 (revised 2008) (DWSNZ).

Under the DWSNZ, larger water suppliers are required to notify the drinking water assessor and monitor determinands that are more than 50% of the MAV. 50% is effectively the point at which larger suppliers would be put on a “watch list” until the concentration drop back below 50% of the

MAV. Therefore, to have several monitoring bores in the area showing Nitrate and/or Nitrite concentrations exceeding MAV seems to indicate that sooner or later, additional treatment and/or alternative sources for the school supply may be required.

In terms of the pathogen risk, the current level of treatment provided by the school needs to be confirmed (we have not been able to confirm at the time of writing). Under Table 5.1a of the DWSNZ, the catchment risk is likely to be categorised as requiring 5 LOG credits for treatment as the catchment contains "…*frequent high concentrations of cattle, sheep horses or humans*…". This is the highest level of catchment risk and level of treatment required under the DWSNZ. To meet a Log Credit requirement of 5, a water supplier under the DWSNZ would need to provide two treatment barriers, usually akin to UV and filtration treatment. Disinfection for bacteria using chlorination would also be recommended given the source risk and vulnerability of the population at the school i.e. young children.

More information is required to confirm the raw water quality and current level of treatment at Heddon Bush School. Further deterioration in groundwater quality and the catchment risks likely mean that the school's water supply will require additional monitoring and treatment. The contribution to the water quality issues at Heddon Bush School from Worldwide One Ltd in combination with other activities has not been assessed by the applicant. In the absence of specific assessment of contaminant transport and fate from Worldwide One, it appears likely the proposal could potentially contribute to further decline in the water quality in the Heddon Bush School bore.

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Submission on application APP 20171445
By Woldwide One Limited
To discharge to land and to take and use groundwater

Submitter: Niki Gladding
I am **opposed** to the application and submit that it should be declined in full
Phone: 027 6300654
Postal Address: PO Box 32 Glenorchy, 9350
Street address: 4297 Queenstown-Glenorchy Rd, Glenorchy
Email: ngladding@hotmail.com
I **would** like the opportunity to speak at the hearing

I am objecting on the basis that the proposed activities – both the take and use of groundwater and the discharge to land – are likely to have effects on the environment that are more than minor.

I want to reiterate the Council's concerns and adopt them as mine own:

- The proposed operation has been modelled using Overseer, and this has shown that the proposal is likely to have greater effects on groundwater quality when compared to modelling of the current operation.
- Council's groundwater monitoring data shows that nitrate concentrations are elevated in this area.
- The application describes some good management practises and mitigation measures undertaken on farm, however these will not fully mitigate the potential adverse effects on water quality.
- Policy 15 of the proposed Southland Water and Land Plan which directs that water quality is to be maintained or improved, nor Policy 16. 1. (b), which strongly discourages applications to further intensify existing dairy farming where the effects on water quality, including cumulatively, cannot be avoided or fully mitigated, or in areas where water quality is already degraded to the point of being over allocated.

I'm also concerned that the proposed storage capacity of the effluent/slurry pond will be inadequate and that the land may not have sufficient capacity to handle the increased effluent volumes and **concentrations** (which I'm concerned have not been considered) if the area experiences prolonged wet or very dry periods. It seems to me that predictable climatic changes may not have been factored into the equations for calculating storage volumes and the capacity of the soil/plants to hold and uptake nutrients.

Therefore, my concern is that the modelled effects on the environment (as stated in the application) are not a good predictor of the actual and potential effects (on soil and ground and surface waters).

I'd also like to challenge the Overseer analysis and the suggestion that the current proposal will see reduced nutrient losses when compared with current practice. Even if this is the case, due to improved practices, I would argue that the number of cows on the farm should remain at 540 and practices should be improved (as stated) to reduce current losses to ground. Any modelled improvement should NOT be seen as a benefit of the proposed activity.

I'm also concerned that the proposed take of water may have adverse effects on the Bog Burn (that have not been properly considered).

And finally, I'd like to add that the proposed use of groundwater (to enable intensification of dairying) is not an efficient use of the resource particularly given the pressures on water quality and quantity in Southland currently. Therefore, the proposed activities do not meet the purpose of the Act or relevant policies around efficiency within the Regional Plan.

My apologies for the hurried submission. I hope to expand on these point at the Hearing.

Bronwyn Auckram

From:	Mikayla Scott on behalf of Facility Manager
Sent:	Tuesday, 23 January 2018 9:10 a.m.
To:	Bronwyn Auckram
Subject:	FW: Woldwide Submission
Attachments:	Submission on application APP 20171445.docx

Submissions to go to you?

From: niki gladding [mailto:ngladding@hotmail.com]
Sent: Monday, 22 January 2018 4:47 p.m.
To: Alexandra King; Facility Manager
Cc: n.matheson@aqualinc.co.nz
Subject: Woldwide Submission

Hi

Please see submission attached.

Best regards

Niki Gladding

To: The Chief Executive
Environment Southland
Private Bag 90116
DX20175
Invercargill

SUBMISSION FORM

Submission on a Notified Application for a Resource Consent

I: Dr Rye Senjen, Environmental and Human Health Aotearoa, www.ehh-aotearoa.org *(Name(s))*

of: 50 Craigleith Street, Dunedin *(Address)*

at: 0226262115 *(Phone* | *(Fax)* | ryesenjen@ehh-aotearoa.org *(E-mail)*

Wish to OPPOSE submit a submission on the application of:

Name: **Woldwide One Limited,**

And/or Organisation: ______

Application Number: **APP-201714** Location: 1200 Hundred Line Road East, Heddon Bush

My reasons for my submission are: *(State the nature of your submission and give clear reasons. Continue on attached pages if necessary)*

- Environmental effects: The proposed operation has been modelled using Overseer, and this has shown that the proposal is likely to have greater effects on groundwater quality when compared to modelling of the current operation. This is likely to be very detrimental to an already fragile environment, creating toxic algae, chocking the water of oxygen and leading to widespread death of invertebrates, insects, plants etc. For instance, almost three quarters of NZ native fish are under threat.
- Receiving environment: Council's groundwater monitoring data shows that nitrate concentrations are elevated in this area. Adding an additional up to 800 cows is only going to make nitrate levels worse. The effect of increased nitrate level is multi facetted with the effect on new born babies (methaemoglobinaemia) being the most well publicized.
- There is also the ever present issue of groundwater contamination by for instance E. coli. E. coli not only makes the water unswimmable, but undrinkable. The latter especially can lead to severe ill health in human populations (see Hawke's Bay in 2016, resulting in the death of three people and many more with health issues).
- The application must be rejected because the described management practices and mitigation measures undertaken on farm are not sufficient to mitigate the adverse effects on water quality. In this context we also strongly encourage Environment Southland to adhere to Policy 15 of the proposed Southland Water and Land Plan which directs that water quality is to be maintained or improved, and Policy 16. 1. (b), which strongly discourages applications to further intensify existing dairy farming where the effects on water quality, including cumulatively, cannot be avoided or fully mitigated, or in areas where water quality is already degraded to the point of being over allocated.
- Many pollutants will take years moving through groundwater can take decades to emerge in lakes and other water ways. The worst may still be to come.

I wish the Council to make the following decision:

We hence urge the Council to adopt a precautionary approach and not only reject the application but to require the applicant to reduce cow numbers to such a level that nitrate levels fall below elevated levels.

REJECT land Use Consent to increase cow numbers.

REJECT discharge Permit to discharge dairy shed and wintering barn effluent to land from up to 800 cows by travelling irrigator.

REJECT Water Permit to take up to 91,000 litres per day of groundwater from a bore in the Waimatuku Groundwater Zone.

(Give precise details, including the nature of any conditions sought)

I, am not *(choose one)* a trade competitor* of the applicant (for the purposes of Section 308B of the Resource Management Act 1991).

**If trade competitor chosen, please complete the next statement, otherwise leave blank*

I am not *(choose one)* directly affected by an effect as a result of the proposed activity in the application that:

(a) adversely affects the environment; and

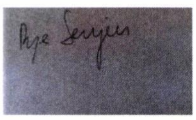
(b) does not relate to trade competition or the effects of trade competition.

I, do wish to be heard in support of my submission.

I, do *(choose one)* wish to be involved in any pre-hearing meeting that may be held for this application.

I have served a copy of my submission on the applicant. [ ] Yes [x] No

Signed ______________________________ **Date** **22 Jan 2018**



If you have any queries about this form or its purpose please contact the Consents Division of Environment Southland (03) 211 5115 or 0800 76 88 45.

Bronwyn Auckram

From:	Mikayla Scott on behalf of Facility Manager
Sent:	Monday, 22 January 2018 11:04 a.m.
To:	Bronwyn Auckram
Subject:	FW: App-20171445
Attachments:	southland submission_form-22 Jan 18.pdf

From: Rye Senjen [mailto:ryesenjen@ehh-aotearoa.org]
Sent: Monday, 22 January 2018 10:54 a.m.
To: Facility Manager; econsents@es.govt.nz
Subject: App-20171445

Please find attached my submission. Regards Dr Rye Senjen

Submission on a Limited Notified Application for Resource Consent

To:	Environment Southland Private Bag 90116 **Invercargill 9840**
Name of submitter:	Fish & Game New Zealand – Southland Region ('Fish & Game') PO Box 159 **Invercargill 9825** **Attention: Alexandra King – Consents Officer**
Name of Applicant:	Woldewide One Ltd, Heddon Bush ('the Applicant')
Application:	APP-20171445
Description of activity:	The Applicant has applied for the following consents associated with expansion of an existing dairy farming operation:

- **Land Use Consent** to increase cow numbers from 540 cows to 800 cows.

  The proposal is a discretionary activity under Rule 22(a) of the Proposed Southland Land and Water Plan.

- **Discharge Permit** to discharge dairy shed and wintering barn effluent to land from up to 800 cows by travelling irrigator.

  The proposal is a discretionary activity under Rule 35(c) of the proposed Southland Water and Land Plan.

- **Water Permit** to take up to 91,000 litres/day of groundwater from a bore in the Waimatuku Groundwater Zone.

  The proposal is a discretionary activity under Rule 54(d) of the proposed Southland Water and Land Plan.

The proposed consents are sought to expire on 9 November 2027, which is common to the expiry dates of consents currently held by the Applicant for the existing dairy farming operation, namely consent 301663 (to discharge dairy effluent to land) and consent 301664 (to take groundwater water for dairy purposes).

Location:	1200 Hundred Line Road East, Heddon Bush at about NZTM2000 1225175E 4888760N.
Our submission relates to:	The whole application.
Our submission is:	We <u>oppose</u> the application.

Our reasons for comments are:

Fish and Game is responsible for the management of sports fish and game birds within the Southland region. Fish and Game has an interest in dairy expansion activities, particularly where they may affect water quality, quantity and aquatic ecosystems.

The proposal is to expand an existing dairy farming operation in the Waimatuku catchment, apply farm dairy effluent (FDE) to land and take groundwater for shed use and stock drinking water. The Waimatuku catchment, which is located between the Oreti and Aparima catchments. The headwaters of the Waimatuku catchment are fed by a large swamp area (the Bayswater Peat Bog) with small springs in the Drummond district also contributing to the base flow.

The Waimatuku catchment has fish and game values, including recreational hunting and fishing values. Specifically:

1. It is a sensitive small rain and spring-fed catchment draining into the Waimatuku Stream and Estuary, which is a 2km long, shallow, tidal river mouth estuary (approximately 20ha) that periodically closes to the sea.

2. The Waimatuku catchment supports a population of native and introduced waterfowl, including game species that have been hunted annually during the game bird hunting season.

3. Waimatuku Stream, including its tidal / estuarine waters, and its tributaries support a brown trout fishery, which historically was a productive lowland fishery. In recent years the Waimatuku fishery has declined. Research provides that water quality parameters are limiting brown trout growth and productivity in the Waimatuku Stream.[1]

   Fish & Game national angler use surveys (repeated every seven years) have recorded a significant decline in angler usage of the Waimatuku Stream since commencement in 1994 / 1995 in a pattern that is consistent with decline of the fishery.

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[1] Moate, D. (November 2010), *'Waimatuku Stream, Southland – Brown Trout Diet and Growth'*, Report for partial fulfilment of Bachelor of Environmental Science – Southern Institute of Technology (unpublished), 68 pages.

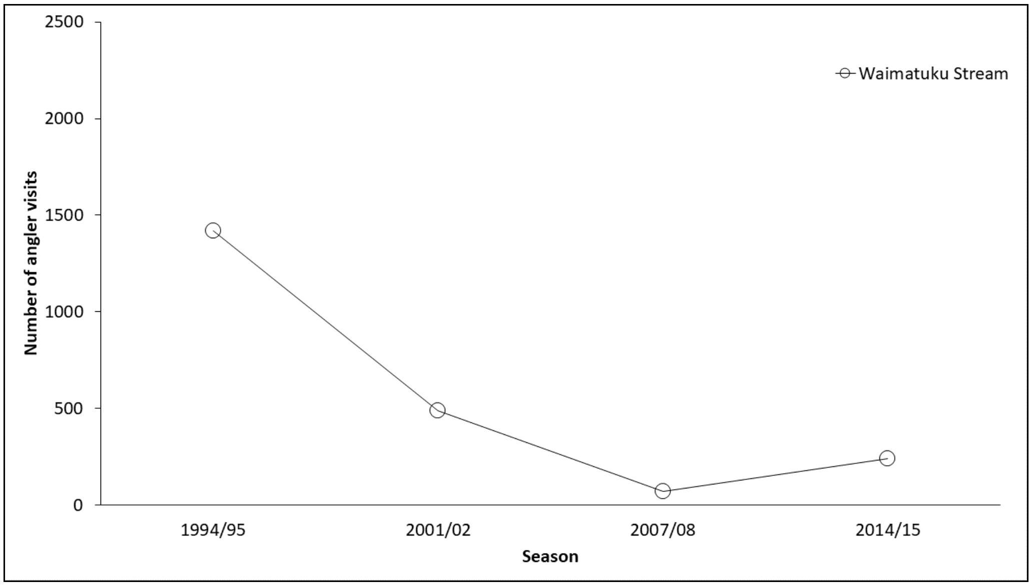

Figure 1 – Angler usage of the Waimatuku Stream (1994 / 95 – 2014 / 15)[2]

Waimatuku Stream and its tributaries provide spawning habitat for the brown trout fishery. In this case, the property is intersected by four unnamed tributaries of Middle Creek, which flows into Waimatuku Stream upstream of Waimatuku settlement.

4. Waimatuku Stream and its tributaries, provide habitat for a number of indigenous fish species, including: Long fin and short fin eels, lamprey, torrent fish, freshwater crayfish, inanga, common bully, common smelt, and galaxias.[3]

5. Waimatuku Wetlands, which are situated immediately east of the Waimatuku River mouth, are identified as a regionally significant wetlands in Southland.[4] Waimatuku Wetlands have been restored to their original water level, and are the only remaining example of a chain of small coastal wetlands which occurred between Invercargill and Riverton / Aparima.

Position on the Application

<u>Actual and potential effects on the environment</u>

Water permit

The proposed abstraction is 90,000 litres/day of groundwater from the Waimatuku Groundwater Zone, which equates to 112.5 litres/cow/day and is consistent with the Council's standard estimate for dairy operations for combined dairy shed use (50 litres/cow/day) and stock drinking water (70 litres/cow/day).

Discharge permit and land use consent – expansion of existing dairy farming operation

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[2] Unwin M. (July 2016) *'Angler usage of New Zealand lake and river fisheries - Results from the 2014/15 National Angling Survey'*, Prepared for Fish & Game New Zealand, NIWA, Appendix 1.
[3] New Zealand Freshwater Fish Database - https://nzffdms.niwa.co.nz/search. Accessed 22 January 2018.
[4] Appendix B – Regionally Significant Wetlands in Southland, Regional Water Plan for Southland and Appendix A – Regionally Significant Wetlands in the Proposed Southland Water and Land Plan.

The potential adverse effects of the proposed dairy expansion and discharge of dairy effluent onto land onto land include: contamination of groundwater, odour, effects on soil structure and fertility and contamination of watercourses (surface water).

Physiographic zone(s)

The application provides that the Applicant's property overlies the Oxidising and Central Plains physiographic zones. Depiction of the overlaying physiographic zones shows that the Applicant's property is predominantly located in the Central Plains physiographic zone.

Environment Southland information provides that the Central Plains zone includes areas of clay-rich soils found in the central parts of the Southland Plains. These soils can crack extensively during summer as they dry out, and swell when wet in winter and early spring, becoming poorly drained.[5] As such, patters for contaminant loss to aquifers and streams vary depending upon whether soils are wet or dry as follows:

1. Wet soils – prone to waterlogging, resulting in extensive artificial drainage network (mole and tile drains). When soils are wet, contaminants (including nutrients, sediment and microbes) can be potentially lost to rivers and streams via artificial drainage into a dense network of nearby streams.

2. Dry soils – prone to shrinking and cracking, allowing drain to bypass the soil to the underlying aquifer. When soils are dry, cracking and deep drainage allow nitrogen to move rapidly through the soils to underlying aquifers.

The gravels underlying the Central Plains zone host an extensive 'unconfined' aquifer system and a dense network of small streams flows through the zone, which are fed by artificial drainage. Streams and aquifers are not diluted or 'flushed' by a major river. Good management in the Central Plains zone includes measures for reducing the effects of artificial drainage and deep drainage.

The above considerations raise issues regarding:

1. The implementation and timing of good management practices and onsite mitigations to reduce the adverse environmental effects of the proposed activity; and

2. The timing and frequency of monitoring for ground and surface water monitoring.

Soils

The application provides that Braxton (97ha) and Drummond (191ha) soil types have been identified within the farm boundary, which have the following properties[6]:

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[5] http://gis.es.govt.nz/apps/water-and-land/zones/Central%20Plains.pdf Accessed 22 January 2018.
[6] http://gis.es.govt.nz/soil-classification/index.aspx

Table 1 – Topoclimate soil types and vulnerability factors

Soil type	Vulnerability factors		
	Structural compaction	**Nutrient leaching**	**Waterlogging**
Braxton (97ha)	Moderate	Slight	Severe
Drummond (191ha)	Minimal	Moderate	Slight

The extent to which the property is underlain with subsurface drainage, such as tile drains, is not identified in the application. This is significant in circumstances where:

1. The Applicant's property is predominantly located in the Central Plains zone where contaminant losses to streams via artificially drained wet soils is an issue; and

2. The Applicant's property includes soils that are prone to severe waterlogging.

Catchment

The proposed expansion of the existing dairy farm operation and FDE discharge area is located within the Waimatuku catchment, where there are existing issues with respect to ground and surface water quality and estuarine health. Specifically:

1. Groundwater quality

   The results from groundwater monitoring of bore E45/0622 show highly variable nitrate and E-coli concentrations.

   Environment Southland data provides that groundwater in the vicinity of the Applicant's property could be regarded as significantly degraded due to anthropogenic inputs.

2. Surface water quality

   Surface water quality in the Waimatuku Stream is monitored by Environment Southland at Lorneville-Riverton Highway.

Table 2 – Waimatuku Stream at Lorneville – Riverton Highway[7]

Parameter	State - Comparative	State – NoF band	Trend (10 year trend)
E-coli (500n/100ml)	Worst 25% of like site	B – NoF band annual median	Indeterminate trend
Clarity (1.12m)	Worst 50% of like site	-	Indeterminate trend
Turbidity (3.3 NTU)	Worst 50% of like site	-	Indeterminate trend
Total Nitrogen (3.9g/m^3)	Worst 25% of like site	-	Meaningful improvement
Total Oxidised Nitrogen	Worst 25% of like site	C – NoF band annual median (3.35g/m^3);	Meaningful improvement

[7] https://www.lawa.org.nz/explore-data/southland-region/river-quality/waimatuku-stream/waimatuku-stream-at-lorneville-riverton/ Accessed 22 January 2018

		and C – NoF band annual maximum ($5.5g/m^3$)	
Ammoniacal Nitrogen	Worst 50% of like site	A – NoF band annual median ($0.0104g/m^3$); and A – NoF band annual maximum ($0.0416g/m^3$)	N/A
Dissolved Reactive Phosphorus ($0.042g/m^3$)	Worst 25% of like site	-	Meaningful degradation
Total Phosphorus ($0.0605g/m^3$	Worst 25% of like site	-	Indeterminate trend

In summary, there are issue with respect to surface water quality in the Waimatuku Stream at Lorneville-Riverton Highway, particularly with respect to nutrients.

3. Estuarine health

Research commissioned by Environment Southland in 2011[8] identifies that:

a. Eutrohication and sedimentation are major issues in the Waimatuku Estuary; and

b. There is a need to manage Waimatuku Estuary and its surroundings to ensure that the assimilative capacity is not breached. It is recommended that appropriate catchment management nutrient and sediment guideline criteria be developed and that guideline criteria are used to assess the extent to which catchment loads meet these guidelines.

As yet, no interim catchment limits have been developed for the Waimatuku catchment.

<u>Nutrient budget</u>

The applicant has modelled nutrient losses using Overseer from the proposed activity verses the status quo.

Table 3 – Summary of nutrient outputs

	Total N loss (Woldewide 1 and 2)	**N loss (kg N/ha/yr)**	**Total P loss (Woldewide 1 and 2)**	**P loss (kg P/ha/yr)**
Status quo	11,162	17	330	0.7
Proposal	11,002	16	357	0.7
Change	-160	-1	+27	No change

[8] Stevens, L. and Robertson, B., (July 2011), *Waimatuku Estuary 2011 – Fine Scale Monitoring and Macrophyte Mapping'*, Prepared for Environment Southland, Wiggle Coastal Management.

In summary, the nutrient budget for the proposal predicts a long term scenario across both Woldewide 1 and 2 of:

1. N losses reducing by a total of 160kg/year compared to the status quo; and

2. Phosphorus losses increasing by 27kg/year compared to the status quo.

Fish & Game considers that the Overseer modelling undertaken needs to be treated with care in circumstances where:

1. Overseer calculates an annual nutrient budget that represents the long term annual average if the management system described remained in place. Accordingly, Overseer assumes that:

    a. 'Good management practices' have been implemented on the farm;

    b. The inputs, such as stocking rates and rate / timing of fertiliser applied, are correct; and

    c. Specific 'good management practices' selected as additional measures have been implemented on the farm if selected.

    An issue with respect to the Overseer modelling relates to the fact that:

    a. The Applicant's property is located in the Central Plains zone where contaminant loss via dry soils and deep drainage is identified as an issue; and

    b. Overseer models nutrient loss to the bottom of the root zone, hence Overseer does not take account of nutrient loss via deep drainage.

    In addition, the application does not provide detail on:

    a. What, if any, audit or review of the operation is proposed to ensure that the modelled leaching rates remain in place and further intensification resulting in increased nutrient loss does not occur over time.

    b. Where the 200 cows that are not be wintered in the extended wintering barn on the Applicant's property will be wintered. No detail is provided as to whether these cows are to be wintered off farm in or outside the Waimatuku catchment.

    c. How and when the bulk of nutrients from the proposed activity is transported to ground / surface water and whether this could be further mitigated. As discussed, it is unclear whether the Applicant's property, which is predominantly in the Central Plains zone, is underlain by a network of subsurface drains discharging to tributaries of Waimatuku Stream, which may have an effect on water quality.

2. As yet, no statutory body has acted to develop nutrient loading limits to address issues raised in the Waimatuku catchment or other catchments in Southland. However,

Environment Southland intends to complete interim limit setting for catchments within the Southland Region by 2021.[9] No consideration is given in the application to:

a. The possibility that the applicant may be required to reduce their modelled losses should future planning instruments require reductions; or

b. Alternative land uses, which would result in lower nutrient leaching.

3. As yet, no peer review of the Overseer modelling has been undertaken by Environment Southland. Fish & Game is reliant on Environment Southland to provide information on whether the predicted nutrient losses are justified and have a sound basis.

Planning assessment

As presented, the application is contrary to:

1. The purpose of sustainable management defined in Part 2 of the RMA. Consent conditions proposed by the Applicant do not:

   a. Safeguard the life-supporting capacity of water and ecosystems; or

   b. Avoid, remedy or mitigate adverse effects;

2. Matters of national importance outlined in s 6 of the RMA, including: 6(a), 6(b) and 6(c);

3. Other matters outlined in s 7 of the RMA, including: 7 (aa), 7(b), 7(c), 7(d), 7(f), 7(g) and 7(h) of the RMA;

4. Section 30(1)(c)(ii) of the RMA;

5. The objectives and policies of the National Policy Statement for Freshwater (2014)[10] (NPS-FWM), including:

   a. Policies A2, A3 and A4 which require Environment Southland to set objectives and limits to assist improvements of water quality in water bodies;

   b. Policies B5 and B7 which seek to protect the life-supporting capacity of freshwater resources; and

   c. Policy C1 which requires integrated management of freshwater and land use.

6. The objectives and policies of the Proposed Southland Water and Land Plan ('the Proposed WLP'), including:

   a. Objectives 1, 3, 6(a) and (b), 7, 8(a), 13(c), 14 and 18; and

---

[9] http://waterandland.es.govt.nz/setting-limits - Accessed 22 January 2018.
[10] As amended in August 2017 to incorporate amendments from the National Policy Statement for Freshwater Amendment Order 2017.

b. Policy 5, Policy A4 of the NPS-FWM, Policies 13, 15(1), (2) and (3), and 16(1)(b) and (2)(c).

7. The objectives and policies of the Regional Policy Statement for Southland (2017) (‘the RPs’), including:

a. Issues WQUAL .1 - .3, Objectives WQUAL. 1 and .2, Policies WQUAL. 1, .2, .5 and 12 and Method WQUAL .3; and

b. Objectives BIO .1 and .2 and Policy .4.

Decision we wish the Council to make

That the application be declined, unless the following consent conditions are imposed:

1. Robust monitoring is imposed for the duration of the consent to accurately determine effects of the proposed activities on ground and surface water quality. The timing and frequency of monitoring should be tailored to when contaminant losses (nutrients, sediment and microbes) are most likely to occur in the Central Plains zone.

2. Good practice mitigation activities, including their timing / seasonality and frequency, made in nutrient modelling shall be implemented, including:

a. ‘Assumed’ good management practices; and

b. Any good management practices selected as ‘additional measures’.

3. Annual audit / review and reporting of:

a. Modelled nutrient leaching, including any determinate trends; and

b. Current state and trends in surface and ground water quality at a property and catchment scale.

Fish & Game wishes to be heard in support of its submission at a hearing if needed.

Fish & Game wishes to be involved in any pre-hearing meeting that may be held for this application.

If others make a similar submission, Fish & Game will consider presenting a joint case with them at a hearing.

Fish & Game has served a copy of its submission on the Applicant.

Jacob Smyth

Jacob Smyth
Resource Management Officer
Fish & Game New Zealand – Southland Region

Date: Monday, 22 January 2018

Cc: Aqualinc Research Ltd
PO Box 20462
Bishopdale
Christchurch 8543

Attention: Nicole Matheson

To: The Chief Executive
Environment Southland
Private Bag 90116
DX20175
Invercargill

SUBMISSION FORM

Submission on a Notified Application for a Resource Consent

I: Maureen Fraser *(Name(s))*

of: 408 Hallett Road, RD2, Otakiri, Whakatane *(Address)*

at: 0273451474 *(Phone)* ______ *(Fax)* kiwimaud@yahoo.com *(E-mail)*

Wish to SUPPORT / OPPOSE / submit a NEUTRAL submission on *(circle one)* **the application of:**

Name: Woldwide One Limited, Heddon Bush

And/or Organisation:

Application Number: APP-20171445 Location: 1200 Hundred Line Road East. Heddon Bush

My reasons for my submission are: *(State the nature of your submission and give clear reasons. Continue on attached pages if necessary)*

I, Maureen Fraser. Oppose the application of World One Limited to increase intensification of Dairy Farming at the location of 1200 Hundred Line Road, Heddon Bush due to the following reasons.

1. Increase Cow numbers - Land in this area has already demonstrated that it is high in nitrate contamination. Policy 16.1 (b) needs to be upheld in this instance as there is no demonstration that the increased cow numbers will not cause detrimental effects to land an water on a less than minor scale.
2. Discharge Permit to discharge dairy shed and wintering barn effluent to land from up to 800 cows by travelling irrigator - Winter conditions increase the likelihood of irrigated effluent washing into ground waterways and adversely affecting the region's streams and rivers ecology. Ground levels of nitrate are elevated in this area and are unsuitable to take further incursion from dairy .... please see additional page.

I wish the Council to make the following decision *(Give precise details, including the nature of any conditions sought)*

I wish the council to decline this application or impose strict removal of effluent especially during the wintering months to an off site treatment facility.
I wish the council to decline further water allocation until water ways have recovered and nitrate levels reduce significantly.

Although the applicant has demonstrated some policy to mitigate the detrimental effects of the proposed intensification application. Section 15 as a directive of the council to commit to improving or not further allowing applications that cause degration to surface and / or ground water must be upheld. As multiple applications with even minor effects as a collective, go against the intended nature of section 15 to improve through stricter planning the state of the region's water until such time as it can adequately recover.

I, am/am not *(choose one)* a trade competitor* of the applicant (for the purposes of Section 308B of the Resource Management Act 1991).

**If trade competitor chosen, please complete the next statement, otherwise leave blank*

I, am/am not *(choose one)* directly affected by an effect as a result of the proposed activity in the application that:

(a) adversely affects the environment; and

(b) does not relate to trade competition or the effects of trade competition.

I, do/do not *(choose one)* wish to be heard in support of my submission.

I, do/do not *(choose one)* wish to be involved in any pre-hearing meeting that may be held for this application.

I have served a copy of my submission on the applicant. ☑ Yes ☐ No

Signed ______________________ **Date** 22/1/18

If you have any queries about this form or its purpose please contact the Consents Division of Environment Southland (03) 211 5115 or 0800 76 88 45.

intensification. Policy 16.1 (b) should be upheld until effects from discharge can be demonstrated by the applicant as causing less than minor effects to leaching from land especially during the wintering months from their proposed operation. I suggest that any application in already elevated nitrate land areas be either suspended until levels subside or all applications should show planning to allow for removal of all wintering effluent to an off site treatment facility.
3. Water Permit to take up to 91,000 litres per day of groundwaterfrom a bore in the Waimatuku Groundwater Zone. - As with many of Canterbury's Ground water and surface water ways. There is evidence of over allocation and potential flaws in previously viewed, reliable algorithm for calculating appropriate water take. As such, until the Canterbury region has recovered that any increase in water take should be heavily restricted and there fore declined.

Bronwyn Auckram

From:	Mikayla Scott on behalf of Facility Manager
Sent:	Monday, 22 January 2018 12:50 p.m.
To:	Bronwyn Auckram
Subject:	FW: APP-20171445
Attachments:	Notes_180122_124220_69d.pdf; download.pdf

From: Maureen Fraser [mailto:kiwimaud@yahoo.com]
Sent: Monday, 22 January 2018 12:48 p.m.
To: Facility Manager
Subject: APP-20171445

Please find attached my submission. Please also advise email for applicant so I can forward my submission.

Kind regards
Maureen Fraser.

Sent from Yahoo Mail on Android

SUBMISSION ON AN APPLICATION FOR RESOURCE CONSENT UNDER SECTION 95 (a) OF THE RESOURCE MANAGEMENT ACT 1991

To: Environment Southland
Cnr North Rd and Price St
Waikiwi
Invercargill 9810

Submitters name: Public Health South on behalf of Southern District Health Board

1. The application is by Woldwide One Limited for a resource consent to discharge dairy shed and wintering barn effluent from up to 800 cows by travelling irrigator for a period of 10 years. Up to 91,000 litres of ground water will be taken per day from a bore in the Waimatuku Groundwater Zone. The proposal is a discretionary activity under Rule 35[c] of the proposed Southland Water and Land plan.

2. This submission relates to the permit to discharge dairy shed and wintering barn effluent to land from up to 800 cows by travelling irrigator.

3. Public Health South notes the application proposes a 32% increase in cow numbers from 540 to 800 in a catchment where the adverse effects of intensification are clearly indicated by nitrate levels in groundwater.

4. The proposed Southland Water and Land plan (pSWLP)

   "..... has been developed by Environment Southland under the Resource Management Act 1991 (RMA). This Plan is intended to provide direction and guidance regarding the sustainable use, development and protection of water and land resources in the Southland region. This Plan fits within, and is influenced by an RMA framework of national, regional and local policy documents".

   There are 18 objectives outlined in the pSWLP and attention is drawn to objectives 1 and 6 outlined here for ease of reference:

   Objective 1
   Land and water and associated ecosystems are managed as integrated natural resources, recognising the connectivity between surface water and groundwater, and between freshwater, land and the coast.

   Objective 6
   There is no reduction in the quality of freshwater, and water in estuaries and coastal lagoons, by:
   (a) maintaining the quality of water in waterbodies, estuaries and coastal lagoons, where the water quality is not degraded; and
   (b) improving the quality of water in waterbodies, estuaries and coastal lagoons, that have been degraded by human activities.

Water Quality

5. Setting limits for water quality and quantity is one of the requirements for all regional councils under the Government's National Policy Statement for Freshwater Management. Limits include restricting the amount of contaminants that can be discharged into waterways and how much water can be removed (extracted). The limit setting process is the third main component of your Water and Land 2020 and Beyond project[1]. Public Health South suggests that strong

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[1] Environment Southland 2015 Water and Land and Beyond 2020. At http://waterandland.es.govt.nz/setting-limits

consideration be given to not granting this application until proposed catchment limit setting processes are completed to ensure achievement of the objectives.

6. Levels of nitrate in groundwater used for drinking have been monitored for many years with an increasing trend noted across many parts of Southland including the locality of the applicant as shown in the attached risk map (Appendix 1). Objective 6 of the pSLWP is for no reduction in freshwater quality but this will only be achieved through the reduction of nitrogen inputs. High nitrate levels in drinking water have been known to cause Methaemoglobinaemia or Blue Baby Syndrome in infants less than six months of age and the unborn foetus of pregnant women through exposure to high nitrate levels.[2] An analysis of monitoring of consented bores within a 2.5km radius of the applicant's property has indicated an average nitrate concentration of 9.5g/m^3 since sampling began in 1996. This is well in excess (and we understand the highest[1]) against the background nitrate levels in Southland of 0.4-1.0g/l that are seen appropriate for modern day background levels showing only diffuse inputs of NO_3-N from human activity[3]. While the applicant has provided commentary as to how this proposal relates to the water from Heddon Bush School, they have not considered their operation in relation to any other domestic drinking water takes or its contribution to the total nitrogen loading of the catchment.

7. The Assessment of Environment Effects noted the natural watercourse the Bog Burn originates from the property. It is also noted there is a hydraulic connection between groundwater on the property and the Bog Burn. The Bog Burn is a tributary to the Orieti River. It is noted the Oreti River in the vicinity of the Bog Burn is categorised as being in the worst 25% of rivers of its category for total nitrogen, total oxidised nitrogen, dissolved reactive phosphorous, total phosphorous and E.coli. We also note the trend for these parameters is ongoing meaningful degradation. This clearly does not align with Objective 6 of the pSWLP.

8. The Ministry for the Environment recently commissioned an assessment of the quality of coastal waters across New Zealand. A key finding of the report for Southland was that due to the current magnitude of land use across the region, seawater off Oreti beach is now no longer nitrogen limited and as such the risk of Harmful Algal Blooms (HAB) has increased markedly. Aalgal blooms have been reported from Oreti Beach[4]. Internationally, there is a strong correlation between eutrophication of coastal waterways and the incidence of paralytic shellfish poisoning, neurotoxic shellfish poisoning, amnesic shellfish poisoning, ciguatera fish poisoning and various other HAB phenomena such as fish kills, loss of submerged vegetation, shellfish mortalities, and widespread marine mammal mortalities. Given Oreti is the only site with long term monitoring, it is hard to know if the near coastal environments associated with the discharges from the Mataura and Aparima River are also no longer limited with regard to nitrogen. If nitrogen is no longer limited at other beaches impacted by these rivers, we have now greatly increased the risk of HAB.

Disease Risk

9. More cattle will produce more effluent and higher loads of micro-organisms including pathogenic organisms such as Campylobacter, Cryptosporidium, Giardia, and Salmonella. These leach into the ground with irrigation and move into the aquifers. Drinking water from ground bores can no longer be considered secure as evidenced by the campylobacter outbreak in Havelock North in August 2015. Findings from the stage 2 inquiry were that '...the vast majority of New Zealand's waterborne disease burden arises not from significant outbreak events... but from underlying sporadic waterborne illness that is never linked to a particular

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[2] Canterbury District Health Board (2013). Nitrate in Drinking Water "Blue Baby" Syndrome.
[3] Rissmann 2012 The Extent of Nitrate in Southland Groundwaters Regional 5 Year Median (2007–2012 (June)) Technical Report
[4] Environment Southland: Nick Ward, Coastal/Marine Scientists pers. communication

outbreak. It is estimated that some 18,000 to 100,000 people become ill in this way from consuming drinking water every year....[5]

10. Local notifiable disease surveillance data shows high rates of these infections in Southern region compared to NZ as a whole (Appendix 2). This is an undercount as many cases go undetected for a variety of reasons. Public Health submits that an increase in cows in this catchment will add pathogens to the ecosystem that in turn will add to the increasing burden of illness and that the applicant has not taken this sufficiently into consideration in the proposed mitigations.

11. The issue of antibiotic resistance has been raised as one of six new environmental issues of 2017 by the United Nations. According to the World Health Organization, we may be entering a post-antibiotic era when previously treatable bacterial infections can kill and routine medical procedures that rely on antibiotic preventative treatment will no longer be possible. Once consumed, most antibiotic drugs are excreted unmetabolized, along with resistant bacteria. They can then pass either through sewage systems or more directly into water and soils, and mix with environmental bacteria in the presence of other pollutants that may add further pressure to help select for antibiotic resistance. This principle applies in agriculture as it does in human settings. Although the use of antibiotics as a livestock growth promoter has not been practiced in New Zealand, antibiotics are still used to treat animal health conditions and there is a high probability there will be bacteria in the environment relating to this application that have developed resistance to antimicrobial residues[6].

Soil Characteristics

12. The shrinking and cracking characteristics associated with the high permeability Braxton soil types are the same as those that impacted the Havelock North Community[7]. These soils are prone to shrinking and cracking during drier months allowing nitrates and other contaminants to leach directly to underlying groundwater[8]. We understand this application is based on the use of Overseer® that does not apply well to the soil types applicable to this application[9].

13. This submitter is neutral and neither supports or opposes this application. We are only concerned that adequate conditions are accepted to protect public health.

14. The decision sought in the event that consents are granted, is the imposition of adequate conditions related to the mitigation of potential human health risks as described:

    (i) Efforts need to be undertaken to remove E.coli and pathogens from effluent. We understand Ozone is used in similar applications in other jurisdictions. This or similar mechanisms should be used as a way of removing pathogens from the effluent.

    (ii) Specific compliance monitoring bores are established on the property that represent an adequate reflection of groundwater quality that is impacted by the operation. As such these bores need to be shallow and at a depth that reflect water from an unconfined aquifer.

    (iii) Bores need to be sampled at the beginning, middle and end of the recharge period. Analytes need to include nitrate, nitrogen and E-coli as a minimum.

    (iv) The consenting authority (ES) should review Waimutuku Catchment early in the coming Catchment Limit Setting process and consider withholding consent for this application until it has been completed.

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[5] Havelock North enquiry proceedings 2017 paragraph 82 at https://www.dia.govt.nz/diawebsite.nsf/Files/Report-Havelock-North-Water-Inquiry-Stage-2/$file/Report-Havelock-North-Water-Inquiry-Stage-2.pdf

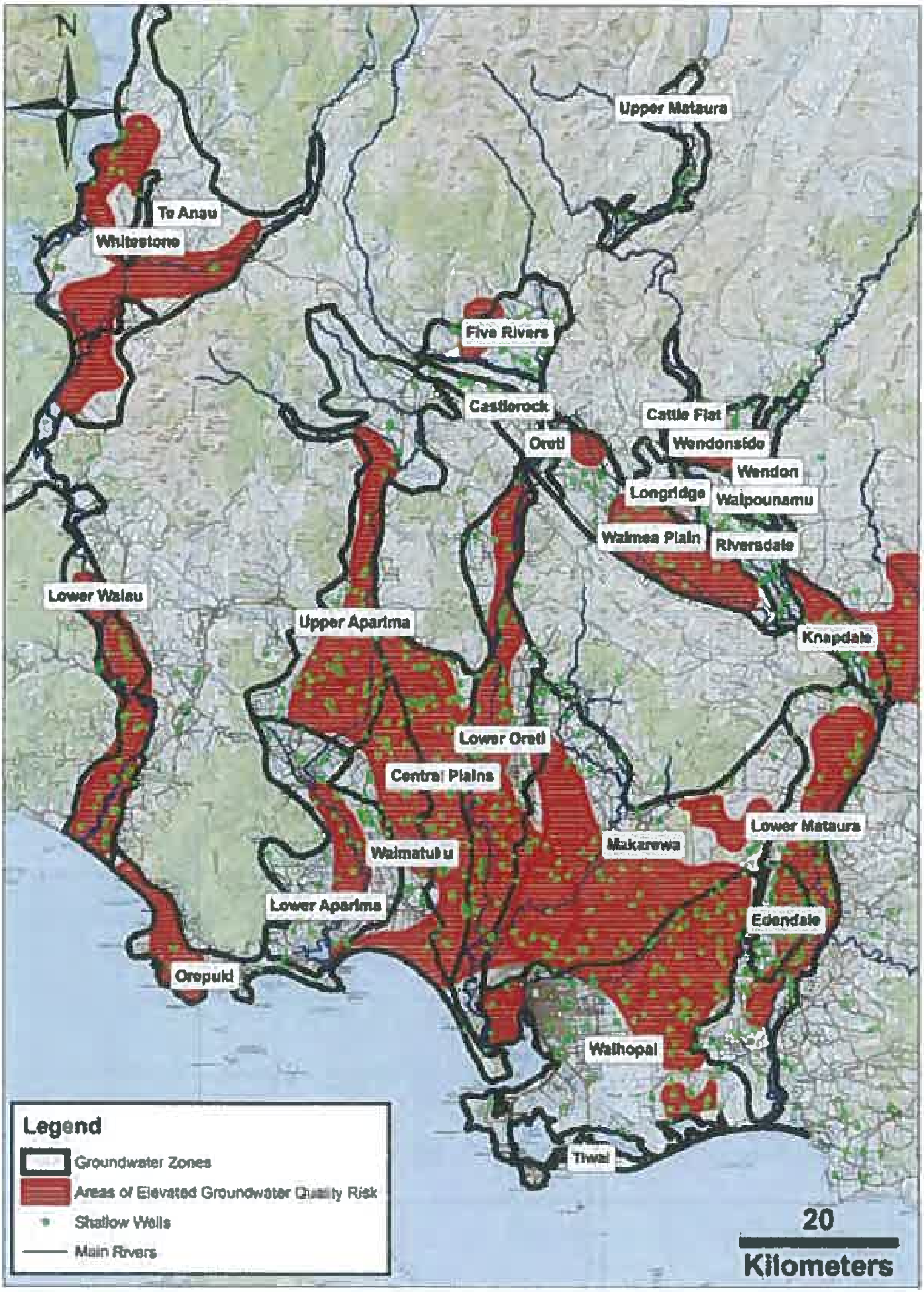
[6] UN Environment 2017. Frontiers 2017 Emerging Issues of Environmental Concern

[7] Rissmann pers. communication Jan 2018

[8] Environment Southland. Central Plains Technical Information. *Water and Land 2020 & Beyond*

[9] Aqualink (2017) Assessment of Environmental Effects prepared for Woldwide One Ltd

Appendix 1
Nitrate Affected Groundwater in Southland



Appendix 2
Disease Notifications 2015 - 17

Number of Cases for each Territorial Authority

Reporting Period: 1/01/2015 - 31/12/2015
Public Health Service: Public Health South
Office Selected: All

Territorial Authority

Disease Name	Waitaki District	Central Otago District	Queenstown-Lakes District	Dunedin City	Clutha District	Southland District	Gore District	Invercargill City	Total
Campylobacteriosis	41	38	53	149	44	83	30	74	512
Chikungunya fever	1			1			1		3
Cryptosporidiosis	8		3	10	3	20	6	11	61
Dengue fever	1		1	2					4
Gastroenteritis - unknown cause			1	9				1	11
Gastroenteritis / foodborne intoxication				1					1
Giardiasis	2	11	39	11	1	5		3	72
Hepatitis A				1	1			1	3
Hepatitis C				3					3
Hepatitis NOS								1	1
Invasive pneumococcal disease	3	1	1	12	5	3		6	31
Legionellosis	1	1		9				1	12
Leprosy								1	1
Leptospirosis				1	1	4		2	8
Listeriosis				1					1
Malaria				1					1
Meningococcal disease			2	1		1			4
Paratyphoid fever			1	1					2
Pertussis	11	21	101	28	1	2		5	169
Ross River virus infection						1			1
Salmonellosis	9	19	13	59.	2	14	5	15	136
Shigellosis	3		1	3					7
Tuberculosis disease - new case				2				4	6
Tuberculosis infection - on preventive treatment				1					1
Typhoid fever			1	1				1	3
VTEC/STEC infection	1	3	2	5	1	3		1	16
Yersiniosis	3	1	6	14	4	3		7	38
Total:	84	95	225	326	63	139	42	134	1108

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* Excludes "Not a case" | Version 2

Number of Cases for each Territorial Authority

Reporting Period: 1/01/2016 - 31/12/2016
Public Health Service: Public Health South
Office Selected: All

Territorial Authority

Disease Name	Waitaki District	Central Otago District	Queenstown-Lakes District	Dunedin City	Clutha District	Southland District	Gore District	Invercargill City	Total
Campylobacteriosis	54	42	63	164	53	81	28	82	567
Chikungunya fever		1							1
Cryptosporidiosis	10	5	7	19	4	8		6	59
Dengue fever	1	1	3	5					10
Gastroenteritis - unknown cause	1		2	10	1				14
Gastroenteritis / foodborne intoxication				2					2
Giardiasis	6	3	29	35	5	5	2	5	90
Hepatitis A		1	1	1					3
Hepatitis B			1	1					2
Hepatitis C				3					3
Invasive pneumococcal disease	2	2	3	7	1	4		6	25
Latent tuberculosis infection				3				1	4
Legionellosis			1	8		2		3	14
Leptospirosis				2		3		1	6
Listeriosis	1								1
Listeriosis - perinatal								1	1
Measles			1						1
Meningococcal disease	1		7	9		2			19
Mumps		1							1
Paratyphoid fever			1	2					3
Pertussis	2	1	9	35	5	3		7	62
Rheumatic fever - initial attack					1				1
Salmonellosis	10	9	23	32	6	9	5	14	108
Shigellosis		2	1	4					7
Tuberculosis disease - new case		1			1		4	1	7
Typhoid fever				1					1
VTEC/STEC infection	1	2	4	6	3	6	3	6	31
Yersiniosis	6		7	30	3	1		9	56

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* Excludes "Not a case" Version 2

Number of Cases for each Territorial Authority

Disease Name	Waitaki District	Central Otago District	Queenstown Lakes District	Dunedin City	Clutha District	Southland District	Gore District	Invercargill City	Total
Zika virus		1		1					2
Total:	95	72	163	380	83	124	42	142	1101

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* Excludes "Not a case" | Version 2

Number of Cases for each Territorial Authority

Reporting Period: 1/01/2017 - 31/12/2017
Public Health Service: Public Health South
Office Selected: All

Territorial Authority

Disease Name	Waitaki District	Central Otago District	Queenstown-Lakes District	Dunedin City	Clutha District	Southland District	Gore District	Invercargill City	Total
Campylobacteriosis	61	55	103	227	72	104	39	83	744
Cryptosporidiosis	30	9	11	42	27	18	3	7	147
Dengue fever			1				1		2
Gastroenteritis - unknown cause				4			3		7
Gastroenteritis / foodborne intoxication				3		1		1	5
Giardiasis	6	3	39	23	5	9	4	4	93
Haemophilus influenzae type b								1	1
Hepatitis A				1				1	2
Hepatitis B				3					3
Hepatitis C	1			1	1				3
Hydatid disease						1			1
Invasive pneumococcal disease	2	2	2	12		3	1	10	32
Legionellosis	1	2		7	2	1		5	18
Leprosy	1								1
Leptospirosis				1		4		2	7
Malaria				2					2
Meningococcal disease	1		3	2				1	7
Mumps	7	6	1	33				1	48
Pertussis	4	32	45	81	5	10	3	55	235
Rheumatic fever - initial attack	2								2
Ross River virus infection			1						1
Salmonellosis	10	4	9	29	10	17	6	15	100
Shigellosis			7	8	1	1			17
Taeniasis				1					1
Tuberculosis disease - new case	1		2	3	1	1		1	9
Typhoid fever			1	1		2			4
VTEC/STEC infection	12	17	17	49	22	9	5	8	139
Yersiniosis	6	3	13	18	5	5	2	2	54

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* Excludes 'Not a case' | Version 2

Number of Cases for each Territorial Authority

Disease Name	Waitaki District	Central Otago District	Queenstown-Lakes District	Dunedin City	Clutha District	Southland District	Gore District	Invercargill City	Total
Zika virus			2						2
Total:	145	133	257	551	151	186	67	197	1687

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(v) We support conditions relating to the Farm Management Plan including the use of hard stand for wintering and wet weather, cut and carry proposals and that effluent (subject to condition (i) above) discharge shall not be at times of saturated soil or dry conditions where there are obvious cracks.

15. The reasons for this submission are to promote the reduction of adverse environmental effects on the health of people and communities, and to improve, promote and protect their health pursuant to the New Zealand Public Health and Disability Act 2000 and the Health Act 1956. These statutory obligations are the responsibility of the Ministry of Health and in the Southland District the obligations are carried out under contract by Public Health South (under Crown funding agreements, on behalf of the Southern District Health Board). The Ministry of Health requires Public Health South to reduce any potential health risks by means including submissions, on resource consents to ensure the public health significance of effluent discharge and the effect on ground water is adequately considered by consent authorities. This application has the potential to create adverse effects from contamination of ground water on the health of people and communities.

16. This submitter is not a trade competitor of the Applicant for the purposes of s.308 of the Act.

17. This submitter will wish to be heard in support of this submission.

Dated at Dunedin 22nd day of January 2018

Signed

Tom Scott
For and on behalf of Public Health South, Southern District Health Board
Address for service
Attention: Tom Scott
Email: tom.scott@southerndhb.govt.nz
DDI: 034769746
Fax: 034769858

Pre-hearing Meeting

Report on pre-hearing meeting

Section 99 of the Resource Management Act 1991

From: Aurora Grant – Team Leader Consents

To: Hearing Panel

Date: 13 February 2018

Pre-hearing meeting

1. On the Environment Southland (ES), conducting its function as consent authority under the Resource Management Act 1991 invited Abe and Anita de Wolde, of Woldwide One Limited, who have applied for resource consent, and the following submitters, to meet.

2. ES also invited Marion Millar, as an independent facilitator for the meeting.

3. At that stage the application had been notified on 1 December 2017, submissions closed on 22 January 2018, six submissions received, and four submitters opposing and one neutral to the application indicated they wished to be heard at a hearing. The requested meeting was therefore a pre-hearing meeting held under section 99 of the RMA.

4. The meeting was requested by ES at the request of the applicant and their consultant for the purpose of clarifying the matters or issues raised in submissions. The meeting agenda, circulated on 12 February 2018 by ES, outlined the matters for clarification as:
   a. Issues raised in submissions received by submitters in attendance;
   b. Ideas for resolution of issues; and
   c. Determine whether progression to hearing is warranted.

5. The meeting was held on 13 February 2018 as follows:
   a. Location: Kean Room, Environment Southland, Price Street, Invercargill;
   b. Present at the meeting was:

Applicants:

- Abe de Wolde, Applicant
- Anita de Wolde, Applicant
- Nicole Matheson, Consultant for Applicant
- John Scandrett, Consultant for Applicant

Submitters:

- Jess Bould, Ministry of Education
- Paul White, Ministry of Education
- Ryan Holt, Ministry of Education
- Jacob Smyth, Fish and Game New Zealand – Southland Region
- Tom Scott, Public Health South for Southern District Health Board
- Jitender Aroha, Public Health South for Southern District Health Board
- Linda Robertson, Public Health South for Southern District Health Board
- Niki Gladding

- Dr Rye Senjen, Environmental and Human Health Aotearoa

Environment Southland Staff:

- Alexandra King, Processing Officer
- Aurora Grant, Chair
- Ewen Rodway, Scientist
- Michael Killick, Scientist

Facilitator:

- Marion Miller

Statutory and procedural matters

6. In this case the applicant requested the meeting to be held and for submitters to attend. ES agreed this was appropriate and advised by email on 8 February 2018 that a meeting was to be held and requested attendance to the parties listed above.

7. If attendance is requested, as opposed to required, the attendance of the applicant and submitters is optional and their decision to attend can be made without prejudice. In this case, all the requested parties attended.

Attendance of those delegated to make decisions

8. Section 99(4) states that an officer of the authority who has the power to make the decision on the application may attend, subject to the agreement of all the parties attending and participating, and if the consent authority is satisfied their presence is appropriate.

9. Such as person's presence at the hearing can be important because section 100 allows the substantive decision to be made without a hearing, if submitters advise they no longer wish to be heard.

10. In this case, officers with delegation to use section 100 (to avoid the need for a hearing) and delegation to determine a notified application (section 104) were present at the meeting. These officers were: Alexandra King and Aurora Grant. No officers with delegation to determine a notified application (section 104) were present at the meeting

11. Section 99(5) and (6) require the chairperson of the meeting to prepare a report outlining particular matters, and to circulate that report to all of the parties and the consent authority (meaning, the commissioners or hearings panel that will hear and determine the application) no less than 5 working days before the hearing.

12. The report must, for the parties who attended the meeting:
    a. set out the issues that were agreed; and
    b. set out the issues that are outstanding

13. However, the report must not include anything communicated or made available at the meeting on a without prejudice basis.

14. In addition, the report may, for all the parties:
    a. set out the nature of the evidence that the parties are to call at the hearing; and
    b. set out the order in which the parties are to call the evidence at the hearing; and
    c. set out a proposed timetable for the hearing.

15. The matters in paragraph 14 have not been set at this stage.

Status of this report and next steps

16. Section 99(6) requires the chairperson to send this report to the consent authority and all the parties so that they have it at least 5 working days before the hearing. The report was sent by email and hard copy to the parties on Monday 23 February 2018 respectively.

17. At the time of writing, no parties have advised that they no longer wish to be heard, and the application is not yet to be scheduled to be heard.

18. Section 99(7) **requires** the consent authority (meaning, the commissioners delegated power of the consent authority by to determine the application) to **have regard to** this report in making the decision on the application.

Issue 1 – Water quality

Issue still to be resolved

19. All submitters raised concern regarding further degradation of surface and ground water if the application is granted. *The full detail of this discussion, and the other issues raised can be found it the transcript from the pre hearing meeting.*

20. The main points for discussion regarding water quality degradation was the possible effects that dairy intensification could have on ground water in the vicinity and downstream of the property, and questions were raised on what degraded ground water would mean for users of that water, in particular the Heddon Bush School and neighbouring potable bores.

21. Concern was also raised by the submitters for sensitive receiving environments such as the Bog Burn wetland and waterway, which is downstream of the property. Submitters felt that the science was not settled on the current state of the environment, and what impact that the application would have on these waterbodies, and others in the catchment. It was voiced that the cumulative effects of contaminant losses were not being considered.

22. It was agreed that a key issue of the application was that there was a lack of certainty regarding the applications potential impact on receiving environments.

23. The applicant discussed potential consent conditions involving further monitoring and nutrient loss limits. Some submitters disagreed and stated that this monitoring should be done prior to the consent being granted, to give an actual idea of the existing environment. The submitters requested better certainty regarding the need for drinking water security. The matter remained unresolved.

Issue 2 – OVERSEER limitations

Issue still to be resolved

24. Submitters expressed concern regarding the limitations of OVERSEER, and the potential that losses from the intensification could be higher than what was modelled, especially from the Central Plains physiographic when consideration was given to the tendency of these soils to crack when dry.

25. The applicant and submitters agreed that OVERSEER did have limitations and uncertainty, however it was not agreed how to address these concerns in regard to the application.

Issue 3 - Climate change and pond size/ effluent application

Issue partially resolved

26. Submitters questioned how the applicants farming practices would be affected by climate change, in particular, the amount of storage available for deferred effluent application, and the available time during the year for when effluent is actually able to be applied (having regard to soil types). The applicant discussed his farming practices and explained that the amount of storage currently available was consistent with the dairy effluent storage calculation.

27. It was agreed that the property technically has enough storage, however some submitters felt that it was not sufficient and the applicant had not had regard to climate change.

Issue 4 – Antibiotic use and other potential contaminants

Issue still to be resolved

28. Submitters expressed concern regarding other potential sources of contaminants which had not been addressed in the application – such as antibiotic use on farm and how that could impact on human and environmental health. Other contaminants such as glysophate and shed cleaners were also discussed. The applicant stated that chemical use was limited and animal medicines were vet prescribed and not widely used on farm. Antibiotic use was tailored to the individual cows requirement.

29. Submitters requested a list of all chemicals used on farm to be supplied to them.

Other matters

30. It should be noted that one of the submitters, Niki Gladding, knew the Chair of the meeting, Aurora Grant, through a family connection (the Chair's family lived in the same small town as the submitter). The two have no other connections. The connection was realised at the hearing and the Chair was not aware of this prior. It is not considered a conflict of interest and should not be perceived as one.

Conclusion

31. The meeting concluded with no submitters changing their view towards the application. The applicants agreed to gather more information for the submitters.

Aurora Grant
Team Leader Consents

APP-20171445: Woldwide One Ltd Application for Resource Consent
Pre-hearing meeting minutes

Date: Tuesday, 13 February 2018
Time: 10:00 a.m. – 12:00 noon
Venue: Kea Meeting Room, Environment Southland, Invercargill

Present: Abe de Wold – Applicant
Anita de Wold – Applicant
Nicole Matheson – Acting for Applicant
John Scandrett – Acting for the Applicant
Jess Bould – Ministry of Education
Paul White – Ministry of Education
Ryan Holt – Ministry of Education
Jacob Smyth – Fish and Game – Southland Region
Tom Scott – PHS for SDHB
Jitender Aroha – PHS for SDHB
Linda Robertson – PHS for SDHB
Dr Rye Senjen – Environmental and Human Health Aotearoa
Alexandra King – Processing Officer
Aurora Grant – Chair
Ewen Rodway – Scientist
Michael Killick – Scientist
Marion Miller – Facilitator

Background and application overview:

Mr de Wolde highlighted the following around his farming operation and his application as it currently stood:

- Woldwide one was purchased in 1992 and at that time was used predominantly for grain cropping
- grain cropping had caused soil nitrogen levels to be high and organic matter levels to be low
- over the last 25 years Mr de Wolde had concentrated on sustainability – social, economic and environmental sustainability has to be in sync and all requirements have to be met to have a successful farming operation
- with sustainability in mind, 12 years ago Mr de Wolde was dissatisfied with wintering with cows on winter crops because of erosion and soil management, compaction, overland flow and the first wintering barn was built
- cows are kept inside in the wintering barn and all manure is stored until spring when the soil temperature is over 5 degrees which minimises nitrogen losses
- feed for cows over winter is grown in an allocated silage harvesting area on land close by which was owned by Mr de Wolde. Nutrients collected in the winter went back on to the silage harvesting area

- an issue Mr de Wolde found was that so much grass was being grown it was difficult to dry grass enough to make proper silage in the Autumn. As a result there was silage leachate generated which occurs when a stack of silage is not dry enough and this leachate is very damaging
- in the winter the silage area had to be grazed with young stock trucked in to the area which was not ideal environmentally
- in 2015 Mr de Wolde leased land 30kms away from his operation with the idea to green feed grass in the wintering shed so that he didn't have to winter graze or import young stock. This was the last piece of the puzzle in the bigger plan and instead of wintering 250 to 300 cows outside and instead of introducing 900 young stock to graze the silage area in the winter, put everything inside and contain nutrients until the grass grew
- with these farming methods Mr de Wolde said they could farm with a nitrogen loss of 16kgs per hectare
- his intention was to combine best farming practices from around the world and going forward, farm smarter. It was highlighted that social, environmental and economical factors all have to be met to farm sustainably.

Mr Scandrett (consultant for the de Wolde's) stressed that the operation was very efficient and nitrogen losses were at the low end for a diary farm and were closer to sheep farm ranges. The proposal being presented was for a slight reduction in any losses by overseer from 17 down to 16 kilograms per hectare.

Mr de Wolde noted that his farming principles and practices could be seen at www.woldwide.nz.

Submitters questions on background and proposal:
Jacob Smyth (Fish & Game) asked if the proposal was that all 800 cows would be wintered on the property in the wintering shed or would there be 200 cows wintered outside the catchment? The answer was that above 600 they would be culled cows. There would be no cows outside. Mr de Wolde explained that at the end of the milking season cow numbers were culled so the cows all fitted inside the wintering barn and new young stock were introduced the following spring.

Dr Rye Senjen (Environmental and Human Health Aotearoa) via phone Link asked: "The claim was made that that it's similar to a sheep farm and I would be very interested in the evidence, if the evidence by the OVERSEER programme or have you got actual measurements; and my second question is the cows feed in the winter, I understand you feed palm kernel extract and I would be very interested in knowing how you see palm kernel extract fits in with your sustainability aspirations."

Mr de Wolde said he could talk about palm kernel but questioned if it was relevant to the current discussion. Mrs Millar advised that unless it was in the application that it wasn't necessarily relevant. Ms King asked Mr de Wolde to elaborate. He said:

- He could elaborate on palm kernel but he was not sure how it fitted in with the today's discussion about environmental impact

- they do feed some palm kernel and it was going to be limited just like all dairy farms in years to come to about 3 kilograms per cow per day due to the effects that it has on the fat composition in the cow's milk
- in the winter he had not been feeding with any palm kernel
- with regards to the sheep farming question it was answered that nitrogen loss is very low and most likely comparable to a sheep farm
- Mr de Wolde said 16 kgs per hectare was coming out of OVERSEER information

Dr Senjen asked: "My question around palm kernel extract is relevant because there's a lot of talk about sustainability and we have to then take into account all inputs and it's quite clear that palm kernel extract is not sustainable, it's also unpalatable to the cows and we have raised it as an issue in our submission but I think it's an issue that needs to be talked about and sorted out."

Mrs Millar stated that although she understood this point of view discussion needed to remain on the current topic.

Niki Gladding asked: "Talking about wintering cows in sheds but looking at the application there's only a couple of months where the cows are in the shed over that May to September period, why is that?"

Mr de Wolde answered that the cows went inside during the month of May. As cows couldn't calve in the barn they went back outside in September to calve. Cows were scanned so it was known when they were ready to calve.

Niki Gladding: "You mentioned you had that issue with cutting the silage over winter and not being able to turn it into feed, is there another way instead of having cows come and eat it, could you cut it with a tractor?."

Mr de Wolde responded that that was what they were currently doing. Fresh grass was harvested every day for the cows in the wintering barn.

Submitter:
Ministry of Education Paul White(by phone link) added:
OVERSEER modelling is showing modelling similar to a sheep farm, is that because you are collecting effluent in the barn and being able to distribute it to land throughout the year. Is that correct?

Applicants consultant: "Yes that's correct and because there's no cows outside in the winter, that reduces nitrogen loss to water"

Ministry of Education: "What level is your storage capacity at, for example you can't discharge to land because the ground is too wet".

Applicants consultant: "We use the dairy effluent storage calculator which is used all over the country for acceptable effluent volume storage.

We use the historic data each year for the storage that will be required. It works on the basis that you can't apply effluent when the soil is close to full capacity or there's not enough soil moisture deficit to hold the effluent depth you are applying.

Effluent to us is not something we want to get rid of, it's nutrients that we want to use so for us it would make no sense to apply it when the soil's not ready for it and the grass can't take it in, so it makes no sense for us to do that".

Ministry of Education: "In our submission we've highlighted that some of the wells in the vicinity of the school show high nitrate levels already approaching limits and obviously the school is concerned that this operation might exacerbate that, but what you are saying is that the modelling is showing the nitrate levels will remain more or less static and not increase. Is that correct?"

Applicants consultant: "Yes that is correct.
I think that the nitrate levels would be lower coming from underneath this farm and surrounding area based on overseer. We have done some water sampling on farm and that sort of confirms it but there is limited data at this stage".

Applicants consultant: "Do you have any samples from the Heddon Bush School bore?"

Ministry of Education: "I understand we are still waiting for those."
The over-arching Ministry view is obviously the protection of the children's health and safety and making sure that there is no diminishment in the water allocation to the school. From my perspective that's all that the Ministry is really interested in, making sure that there's no adverse effects.

Applicants consultant: "Is it correct that the school bore has E.coli screens?"

Ministry of Education: "There is a filtration system in the school bore but I don't have the details on that. There are other school around Southland that do have E.coli screenings and other filters."

Applicants consultant: "I have seen the system that does have filtration down to one micron and a UV steriliser. I guess the other point is that school is drawing water from in the order of about 13 meters so it is a bit deeper than a lot of the shallow bores in the area."

de Wolde: "Our farming operation has been there for 25 years and we have improved farming practices over those 25 years so if it would have had any adverse effect then you would have expected it to arrive at the school by now".

Submitter:

Public Health South: “The issue is not so much with the application more that this particular area we are looking at is one of Southland’s hot spots. I guess line of our submission goes along the lines of there is the soil types that obviously exacerbate contamination of ground water, certainly dry and cracking soils that are obviously part of this farm, are similar to those that gave rise to issues in Havelock North when it came to contamination of groundwater. We’re also concerned I guess that in some ways the proliferation of dairy farming in Southland and the consequence, risk and human diseases that can occur through farming intensification. Going back one step this application is actually a very good one but it’s really about allowing the proliferation of operations that have got the potential to contaminate groundwater in an area that is obviously a hot spot”.

There were no questions put to Public Health South.

Submitter:
Fish & game

Comment Summary

- Fish & Game appreciate your comments around sustainability
- From Fish & Game’s perspective point of view it’s about ensuring that the Land Use consent reflects some of the inherent assumptions made in the overseer modelling
- Overseer modelling is good but it’ s only useful if the current operation is conducted in accordance with what’s being proposed with regards to things such as management of stock, fertiliser application and inputs that drive the outputs
- we understand that you are endeavouring to deal with the inputs to control the outputs but Fish & Game would like to see that detail encapsulated in the consent
- we think there would be some merit in developing a monitoring programme to go with the farm management plan because

Question from applicants consultant to F&G: “Because the groundwater and surface water is connected would you be happy with just groundwater monitoring just because it’s easier?”

Fish & Game: “Yes I think that would make good sense to encapsulate some of that seasonality. What you see with your data set is you are getting quite a bit of scattering and my impression is that’s why there’s no discernible trend at this point in time. When I looked at the surface water it was reflecting a lot of the same variability that was in groundwater so I think that’s probably a fair point. For it to work though there’d need to be upstream and downstream sampling sites”.

Submitter
Niki Gladding

Comment “My concerns are for water quality and I’m concerned that this area with the receiving environment as it already is, we’ve got high risk soils as stated in the application, but also sensitive receiving environments like the bog burn and wetland areas nearby. Looking at your application you had detail in there (regarding a waterway) and it was deteriorating and was very poor quality. There’s high levels of nitrate in the groundwater there’s a degradation in surface water and groundwater so with all of those things even if you are potentially putting in 16kgs of nitrogen per hectare according to OVERSEER, can the environment even handle that? I think we need to look at it not in terms of this is great compared with what you might be permitted in Canterbury but what are the actual effects on the environment. Everything we’ve got to date is just modelling so I’m very interested in the actual losses in what we can actually mitigate rather than just what’s on paper. I think your application itself acknowledges the OVERSEER’s limit and the phosphorus is over and could cause more than minor effects but you’ve stated in the application that perhaps this is overstated and you could go 30% over or 30% under on OVERSEER, so potentially we could be quite could be significantly over in terms of nitrogen. To me it looks like a very limited time when you can discharge effluent, you can’t take out when it’s under 5 degrees, when it’s not cracked, you can only load it up every couple of months with a slurry, there’s so many constraints and I’m wondering when are you going to be able to spread it in a way that doesn’t increase those losses to groundwater. We’re getting climatic extremes now and more rainfall now, is that pond going to be taking on water, is it open to air?”

Mr de Wolde: “Yes the open is open. We’ve found that over time evaporation from it is like anywhere else”.

Gladding: “I imagine at different times of the year you’ll have rain, I’m worried that you’ll have enough storage for winter.”

Mr de Wolde: “We allow for that.”

Gladding: “So you can discharge from that as long as your soil content is right. That’s not detailed in your application, what is the right, correct range? How much of an area are you going to check for cracks? How big an area is acceptable? OVERSEER is not taking all that on board which is why I am thinking the losses are potentially going to be a lot greater. The other think is sewage discharge, are you going to look at the concentration of the effluent? There’s nothing in the application about concentrations. If potentially you had to store over summer and the effluent sat and there was evaporation the concentration of the effluent is going to be much higher than at other times of the year. So when you apply that you have to take the concentration into account. There’s no information about testing for that and changing your rate of application and whether high concentrations could potentially burn off soil and how that would effect. It’s such a complex system that to me when there’s already pressure on the environment. The other thing is your mitigation measures sound great but when you ran through them there’s actually not a lot of detail and it relies on your staff fully understanding how it works. There’s no staff training manual or signing off sheets. There’s nothing that someone could tick off and say “that’s done”.”

Discussion was held around tile drains and overground/underground pumps. The effluent pond was clay lined but would be lined with a synthetic liner in the near future.

Discussion was held around monitoring logs. Monitoring was written in the Fonterra diary. That farm had been audited by Fonterra a couple of weeks prior and had passed. All farm procedures had been checked and had passed.

Discussion was held around drinking water bores within 500m of the property apart from the Heddon Bush School bore, and the potential for them to be affected.

ES processing officer answered the bore question: "When the application was notified copies of the application when to key parties that were identified as likely to be effected which included every property owner within the radius southeast of the property, to pick up properties with bores. Environment Southland doesn't have record of every bore in the region as some were created a long time ago and bore logs had only been required in the last10 years".

Submitter
Rye Senjen – Environmental and Human Health Aotearoa

Comment "…one of the problems with the application is it didn't take in to account a number of different scenarios for instance what happens if we have a drought and the effluent can't be spread. The storage containers are not endlessly large. Eventually they will flow over. It all seems to rely totally on the OVERSEER model and this is a very simplistic model, it takes inputs and it then has outputs. The applicant themselves acknowledges that there could be a 30% error and that there could be operator error. What you need to have is a number of different scenarios for example an idea of a what if situation. The other problem with the application and I think it's apparent in the OVERSEER as well is that it's very much concentrated on a farm. Unfortunately the farm does not exist by itself but in the wider environment which has already degraded. Adding additional cows is no good, no matter how good the management. Other contaminants are not taken into account. There are potentially all manner of other chemicals, oestrogen because the cows naturally excrete oestrogen, and this has not been taken into account. It is our opinion that this application cannot be accepted under any circumstances. The council's new proposed policy says we should strongly discourage applications from further intensifying further any dairy farming. Adding additional cows is a further intensification in our opinion. Ideally the council should implement policy where we actually reduce cow numbers. It is a reality that water quality is already effected and every single extra cow will have an effect. I urge that the application is rejected".

Mr de Wolde: "I don't know how we can view this adding cows because no cows have been added, because the land use has not been changed, so that is not relevant".

Question: "how is going from 560 cows to 800 cows not adding cows?"

Applicants consultant: "Some land from Woldwide II has become Woldwide I".

Mr de Wolde: "There is no other land use going into dairy farming, it's going from one dairy farm into another dairy farm with similar land use with similar stocking rates."

Discussion of ideas to solve issues raised

In response to a question from Fish and Game it was clarified:

- land from Woldwide II went into Woldwide I
- An application was granted to add more cows but on bigger land so cows per hectare did not change i.e. land use did not change
- Although the number of cows across the two farms had increased, the walkway land increase had been granted
- The whole picture was two dairy farms next to each other with the application area in the same catchment area. Yes cow numbers had increased by 140 but now they did not have to increase cows 900 young stock in to graze

Discussion was held around cow numbers. There was opposition to the "increase" in cow numbers from Environmental and Human Health Aotearoa.

Discussion was held around that land had been increased by a quarter but cow numbers had been increased half again. This was relevant because of the amount of effluent that was being put on to a particular piece of land.

Discussion was held around compaction, that wintering cows inside for 2 months lessened the possibility of going over 150kg per hectare of nitrogen if cows were wintered outside or for longer than 2 months inside. Going over 150kg per hectare would mean the de Wolde's were not permitted.

It was noted that the discharge area could be increased if it went over 150kg per hectare.

Mr de Wolde explained that after silage removal the slurry was put on. The slurry was more concentrated and thicker than effluent. It was put down in strips on the land so the nitrogen was utilised. 2 mls per hectare at 20,000 litres per hectare was applied. Application was recorded by GPS. There was no compaction. There was no compaction of animals in wet conditions because they were inside in wet conditions. All the manure was stored and contained which helped phosphate overland flow.

Slurry that was produced in the winter was applied in the Spring over the first three silage cuts and was not put on after February because it was a slower release kind of nitrogen, and by then it was almost the next winter.

The wintering sheds had a scraper system. The scraper went through the shed (cows stepped over it when it came past). Effluent was not diluted which was why the application depth was only 2mm. In each application it was known there was 60 nitrogen, 8.8 phosphate, 60 potassium and 7.7 sulphur in each application. We know exactly what we put on. We take those numbers off fertiliser inputs.

Question from Environmental and Human Health Aotearoa – (An excerpt from the application was read out relating to effluent discharges from 540 cows to 800 cows). “The whole application is about increasing cow numbers so I cannot understand how you can argue that there is not an increase in cow numbers.”

Applicants consultant: “Land is increased also so the cow number issue evens itself out.”

Environmental and Human Health Aotearoa: “Then how do you see the OVERSEER error as there is a 30% error either way. Discharging could be a third or it could be 23.”

Mrs Miller – Yes we have agreed that cow numbers are increasing but the OVERSEER issue is definitely a large debate (an unending debate). There are people who agree that it works and people who agree that it doesn’t work.

Environmental and Human Health Aotearoa: “The question I have for the application is how they see this issue because the problem is that OVERSEER is farm specific and we have a bigger issue here. It’s not just about this farm it’s about water degradation in Southland whether permitted or not.”

Mrs Miller: “What would satisfy you in regard to that. You said the application should be rejected but with regard to OVERSEER what would satisfy you. You mentioned that Environment Southland should have an independent assessment, have you got any suggestions about the way forward?”

Environmental and Human Health Aotearoa: “one suggestion is that we actually need actual data. Somebody needs to go out and test for all sorts of issues then apply the precautionary principle. You want real scientific data not pretend scientific data, which means you want standard errors of deviation, you want confidence in the data and it’s all about measurement. The measurements from various locations can be measured with the output of OVERSEER. Then apply climate modelling. The OVERSEER people should turn their model into a scenario planning model which can be supplemented with real data. Not with fantasy data.”

Applicants Consultant: “There has been a lot of work done to try and ground truth OVERSEER and that’s how the model has been derived. There’s been quite a lot of work done in the Bogburn catchment which I know because I was involved in some of that work. AgResearch, on farm, looked at losses and that’s part of the science that goes towards groundtruthing OVERSEER”.

Fish and Game: "I don't think it's been suggested in this case that the losses are absolute. It's being used for comparative purposes which is a useful use of the model. I'm interested in whether the applicant is agreeable to consent conditions that effectively consent the activity in alignment with the input data. We're not at a point where we've set limits for the catchment. Essentially inputs are going to control outputs and a good example of that is in the application where you aren't going to undertake in situ grazing of fodder crop. From Fish and Game's point of view, to give veracity to OVERSEER modelling you'd probably have to consent the activity with regard to land use in accordance with those inputs. Would the applicant be agreeable to conditions on the fodder crop".

Discussion was held. Generally speaking the application should be in accordance with the current industry good management practices rather than specifics. Limits have not yet been set so we don't know what they are so it would be premature to say you can't exceed 16 from Overseer when no one is arguing that is the absolute loss.

Mr de Wolde: "For your information fertiliser is applied by an approved applicator and we get proof of placement."

Water quality issues

Applicants Consultant: "would you be happy with water monitoring quarterly for nitrogen, E.coli and pH upstream and downstream?"

Discussion was held around quarterly monitoring from one bore or from all bores.
It was suggested that the ES bore could be used as a trigger level.
It was noted that there needed to be something to compare against. The groundwater flowed in a southerly direction. If a bore was located close to the farm boundary and could be used as a control level vs one that was located within the downstream flow path.

Ewen Rodway (ES science): "I made the suggestion that groundwater monitoring should continue and that it has been useful in the past to establish both the state of the groundwater under the vicinity of the farm and also get some assessment of the effects on the farm. Monitoring is certainly useful going into the future. Certainly in terms of assessing the absolute effects of the farming operation on groundwater I would agree with Fish and Game's suggestion of having an upstream and downstream approach as it is better than having a single site. As per the frequency it has been occurring at 6 monthly which is fairly standard for our dairy monitoring. There is evidence to suggest that more frequent monitoring is certainly more beneficial especially when you are looking at losses in this particular physiographic, when we have cracking over the drier periods and potentially large losses during the first flush when drainage occurs heading into winter. Certainly specific to this situation, the frequency of monitoring could be improved from six monthly".

Niki Gladding: "Can the first flush and cracking etc be related to the physiographics? So it actually relates to the environmental conditions at the time rather than specific periods in time?"

Applicants consultant: "Would it help to be at the same time as the ES bore, because we've got that information there already?"

Ewen Rodway (ES Science): "Potentially. It is difficult in this situation, the ES bore was quarterly monitoring so four times a year. Specific to both the bore depth and it's connection to the land surface. So that would depend on the depth of the monitoring bore, where the groundwater is, how deep and if you can assess what that connection is that would inform you of the frequency that is most appropriate. There's a lot of work that could go into better making a decision about what that monitoring would look like and that's probably not something we can answer in 10 minutes around this table."

Discussion was held regarding a potential example consent condition, which was to be circulated around submitters by the applicants after the meeting.

Comment was made from Dr Rye Senjen that she would like the applicant to outline what they could do to satisfy her objections. The applicant should address the question of groundwater quality, groundwater monitoring, groundwater contamination, climate change and what they will do.

Applicants consultant answer:

- we are proposing quarterly groundwater monitoring for pH, E.coli and nitrogen
- potentially we can use the ES bore as a trigger level but we need to decide that with all of the submitters and see what they are happy with
- we are also proposing that OVERSEER is run each year and is audited
- that groundwater quality results are reported each year and supplied to ES
- that soil moisture is monitored which will show whether it is either too wet or too dry to discharge effluent

In response to a question around using BOD monitoring for dairy farm effluent monitoring it was answered that the effluent when applied to land, stayed in an aerated state that mineralises in an aerated manner. The soils stay aerated otherwise plants die. There was a very good indicator of soil health and what was happening by plant growth.

It was noted that BOD was an indicator of the effectiveness of the treatment process for human effluent. Given that the farm was not treating human effluent there seemed little point in asking them to test for it.

Discussion was held around all conditions and activities needing to be so precise there was a large chance of failure due to factors and due to human error.

Mr de Wolde responded

- there is no actual system change happening and we've been doing this for 12 years
- we have found over those 12 years that building up top soil and soil health is improved and we have seen no negative effects

- in reality this is what people in Europe have done for the last 500 years successfully

It was noted that what was written down and spoken about was great, but it didn't necessarily translate into action because it would be so difficult to do everything that was set out in the application. Conditions have to be achievable but there are people involved, and only so much time and so much money. When the council puts conditions on they have to be achievable.

Mr de Wolde responded

- you have to keep in mind this is something that is not new to us, it is something that we cherish
- it is nutrients that make our grass grow
- it's an economic incentive for us to utilise as best as we can

It was noted that if Mr de Wolde used less cows then he would be truly sustainable, otherwise he was using sustainable practices to intensify, which was not sustainability.

Returning to the point raised by Dr Senjen around climate change, it was asked about contingency plans for a heavy rain event.

It was answered:

- OVERSEER and the dairy effluent storage calculator have climate data inputted into them so we think those results are acceptable. With the dairy effluent storage volume calculator, the storage volume we end up with is the 90% volume. So nine out of 10 seasons it will be sufficient, which is what ES currently accepts.

In response to a question around cracking, Mr de Wolde said

- There was a lot of talk about cracking particularly about the Braxton soils, the last part of our farm is Braxton soil. As a farmer farming it for 20 plus years we have found it doesn't crack
- I invited an ES scientist out and we had a really good look around and the cracking is not as bad as is assumed
- a very dry year like this year was a good example of showing that

Michael Killick (ES Science) summarised his observations and report

- we didn't see big cracks that you could put your arm into, however cracking was observed
- not all soil was cracked
- but perhaps the understanding of this central plains physiographic unit has been a bit side-tracked just on the subject of cracking
- when the soils are dry, whether they are obviously cracked or not, there may be more drainage than you anticipate
- Abe was very helpful checking on an area where we knew it was wet and boggy in winter and after heavy rainfall, hadn't ponded
- more generally, what we are seeing is that dry soils can be free draining whereas they are more often thought of as poorly drained and anaerobic soils, there's a cross over when they are drier. Obviously once they are rained on they are going to become wet and start to behave like wet

soils but it's at that crossover that the effects are difficult to quantify but may explain some of the nitrate in groundwater which is higher than we might anticipate

- this is not a lot different than what was described for the physiographic zone, that there is a period when the soils are vulnerable when they are dry, then heavy rain
- this is to account for something which is being seen which is nitrated groundwater which is more than you might expect. To answer the question why is that, this is a hypothesis to account

Fish and Game: "From Fish and Game's point of view, if you are going to do monitoring, we'd like to see that tied in to trend analysis for example is there determinant trend or not. Then that needs to be tied in to the farm management plan. If a deterioration was seen then more mitigations could be adopted on farm if that was possible."

It was noted that pasture rotation may help.

Dr Senjen's concerns and comments

- do monitoring for two or three or four years before granting the consent to collect the data
- monitor nitrogen, phosphorus, estrogen, E.coli etc, complete a suite of monitoring for a number of years
- do this monitoring on a monthly basis, not quarterly
- after 3 or 4 years a consent decision could be made depending on all the data collected
- presently if the consent was granted and after 3 or 4 years it was discovered it was a bad idea, the land would be even further degraded than it is already
- the important thing is not to see this farm as isolated land but to understand that the farm is part of a bigger ecosystem.
- What is happening to this bigger ecosystem? This bigger ecosystem is very complex
- We are looking at nitrates – what is happening to invertebrates, the fish population, birds, insects, plants, everything that is living there. This all needs to be taken into account on a bigger scale
- Again I have to emphasise that we need to precautionary principle and we need to think about the fact that we should be reducing intensification not increasing it

In response John Scandrett summarised

- in relation to Michael Killick's comments, when soils are very dry and also have a very large ability to store water. There's areas that that have received 100mm of rainfall (not all at once) and the drains haven't run yet. The soils don't have full capacity yet, so there has been no loss to groundwater yet. That will vary from soil type to soil type and region to region. Just because we get rainfall doesn't mean we lose nutrients
- we have been monitoring nitrate in the groundwater on farm looking at Woldwide II which is the farm upstream and the house bore for Woldwide I which is more downstream, ES's bore and a bore that hasn't been used for 25 years on the Eastern side of the property
- the highest level (from memory) that we had for Woldwide II Woldwide I were 6mg per litre, the Woldwide II house bore was 6.2, the monitoring bore from Woldwide II was similar, the house was quite low, less than 3 from memory

- what I'm wondering is what water are we actually sampling, where did it come from, when did it get contaminated, how fast is it travelling down the plains. You can go 10m in either direction and have a 50% difference in concentration

It was noted that the limit setting process was still a couple of years away. If something happened after the catchment limit setting process that meant changes needed to be made to the consent, then those changes would be made. And that goes for everybody.

In response to a question about chemical use, and monitoring chemicals Mr de Wolde responded
- we use glysophate occasionally to spray off the paddock
- to clean the dairy shed we use normal cleaner you would use to wipe tables etc

Ministry for Education comments
- our main concern is the school water supply so we are interested in what is proposed in terms of monitoring of frequency and location of bores
- what happens in terms of protecting the school water supply, what are the triggers and what alternative arrangements are there to supply the school
- cumulative effect doesn't get out of control

Applicants consultant response:
- a proposed condition which would have a trigger level based on the ES monitoring bore which I will discuss with Ewen Rodway. We can email that around later

Public Health South said they would like the safety plans reviewed for the school water. It was noted the school needed to do some work on their water safety plan. The school was aware that their safety plans were not up to date.

Question to Mr & Mrs de Wolde : "how many staff do you have?"

Response
- we look after the effluent/slurry, the dairy farm staff do not
- we have 38 people on our farms and tend to stay with us for a long period of time (5-8 years)
- for our ES conditions we have to make sure that the people on farm know how everything works and have a person accountable to a specific thing and the mitigation measures
- we have senior staff that have been there for 7 or 8 years

Any other points

Feedback from the applicants was requested regarding antibiotic resistance.

Mr de Wolde responded
- feedback from our farming perspective is that we are trying to limit our antibiotic use on farm. At the end of lactation all cows get antibiotics. We no longer insert antibiotics into the teats we have seal the cows teats and we only treat the ones that actually have an infection

- we don’t use growth hormones, we are not allowed to do that
- by good farming practice we try to limit antibiotic use
- all our cell counts in our milk for mastitis are very low
- if cows are infected we try to identify what bug it is, then treat accordingly with the antibiotic that the bug is sensitive to
- we treat individual cows as needed
- we looked into the health of cows and antibiotic use over winter when cows are all together inside the wintering shed and there’s no increase needed
- our cows are individually dried off according to their calving dates so we can pay more attention to each cow and we know if they need to be treated for anything
- this incorporates all diseases
- I researched how much time the cows spent lying or standing as that is a big determinant of animal welfare
- I analysed hoof health, bumps and bruises and early abortions

A list of all pharmaceuticals and chemicals used on farm that could go to groundwater was requested. Mr de Wolde said he was happy to supply this.

Summary of points raised

Alexandra King:

- discussed the use of OVERSEER and the limitations of the model
- discussed the inputs into the model that create different numbers coming out at the bottom of the model – fertiliser use, cropping types etc.
- discussed potential conditions including monitoring conditions
- ideas for monitoring conditions i.e. increase groundwater monitoring to more frequently throughout the year (currently twice a year, quarterly could be considered)
- discussed number, location and depth of bores, want further discussion
- results of groundwater monitoring to be collated and submitted to council annually as part of the consent conditions
- suggested that analysis of results and some sort of trigger limit be discussed
- OVERSEER modelling as proposed by the applicant to be done annually and audited
- soil moisture monitoring is proposed to be installed to help inform effluent decisions
- discussion about adaptions, mitigations based on the groundwater results, if results show something then something will happen to change a condition around that
- Conditions proposed by the applicant will be circulated to attendees of the meeting

Technical Evidence

BEFORE SOUTHLAND REGIONAL COUNCIL

IN THE MATTER	Resource consent application
BY	Woldwide One Limited
	APPLICANT

EVIDENCE OF EWEN RODWAY ON BEHALF
SOUTHLAND REGIONAL COUNCIL

Qualifications and Experience

1. My full name is Ewen Maurice Rodway. I hold the qualifications of BSc (Geology), MSc (Geology and Geochemistry). I have completed the Advanced Sustainable Nutrient Management course offered by Massey University. I have 5 years' experience working in Groundwater quality, landscape attributes in relation to water quality, contaminant transport, nutrient management, hydrogeology and geochemistry. My experience began initially in Australia but I have spent the last 4 years in Southland working on local water quality and environmental science projects. My current role is Environmental Scientist (Chemistry and Groundwater) at Environment Southland.

2. I acknowledge that I have read the Code of Conduct (2014) and agree to comply with this.

Scope of Evidence

3. The evidence provided discusses ground and surface water quality, nitrate nitrogen contamination, groundwater monitoring, and FDE discharge and risk to water quality associated with this. These matters are within my area of expertise.

4. My opinions are based primarily on water quality testing results, physiographic research (specifically the influence natural physical land attributes have on water quality in Southland), nutrient cycling, and aquifer properties.

5. The opinions expressed are due to my interpretation of the facts and information summarised in the above point.

6. I have not omitted to consider material facts available to me that might alter or detract from opinions expressed. Literature used and relied upon is listed in the references section of this statement.

7. This evidence provides some initial assessment of the Overseer modelling methods, whether groundwater monitoring is appropriate, and background information on groundwater and surface water quality and risks to this in the vicinity and relating to the proposed activity. This evidence also includes some comments specifically related to the proposed activity.

SUMMARY OF EVIDENCE

8. Overall the Overseer modelling is logical and follows best practice input standards. Because the new area of land added to WW1 was not modelled in the current scenario the specific budgets for WW1 can be compared on a per hectare basis only. It is noted that additional modelling including the WW2 farm is provided and overall losses from the two farms combined can be compared for the current and proposed scenarios. Further review of the actual modelling methods was not sought at this stage. Contaminant loss may be underestimated by Overseer due to bi-modal drainage characteristics in the farm area.

9. Groundwater monitoring is appropriate and should be continued on the existing bore and a new bore drilled for additional monitoring.

10. Groundwater in the vicinity of the proposed activity is highly degraded with regard to nitrogen and in relation to the Southland Region. Groundwater is likely to be highly sensitive and at high risk to further nitrogen contamination as demonstrated by chemical measurements and physiographic observations. In saying this information on the groundwater quality directly under the property is limited and further information would be useful to assess the state more robustly.

11. Any increased nitrogen inputs at the proposed farm are likely to have a degrading effect on an already degraded and highly sensitive groundwater environment. Any further degradation of groundwater is likely to result in further degradation of sensitive surface water receiving environments particularly the Waimatuku Stream because of high the hydraulic connectivity and it’s current state with regard to nitrogen pollution.

EVIDENCE

Overseer Assessment

12. As part of the overall assessment I undertook a basic review if the Overseer modelling provided. The purpose of this initial review was to identify whether the modelling was logical and to determine if a further more detailed review was required. My findings are presented below.

13. Overall the modelling is logical, follows best practice input standards and provides a satisfactory representation of the farm scenarios. In this case the modelling was carried out to include the Woldwide One (WW1) and Woldwide Two (WW2) farms in order to make an overall comparison between the current and proposed scenarios given there is a land swap between WW2 and WW1. Only Overseer modelling of WW1 was supplied and assessed.

14. Aspects of the model that were checked include:
    - Pasture production
    - Blocking
    - Supplements imported
    - Animal distribution
    - Stock numbers
    - Farm areas

15. Some issues with the modelling were found and these are detailed below.

16. The modelled effluent discharge area is inconsistent with the area described in the provided farm management plan. Only 31 ha plus the Horner block 49 ha is modelled as receiving effluent in the current scenario and only 50 ha plus the Horner block 49 ha is modelled in the proposed scenario. The management plan highlights essentially the whole farm as receiving FDE.

17. The lack of a detailed soil map supporting the remapping that was undertaken makes assessment of the blocking within Overseer difficult.

18. It is theorised (Rissmann et al. 2016, Hughes et al. 2016) that the broad scale hydraulic properties of the soils that make up the Central Plains physiographic are not well represented within Overseer as it does not take into account the bimodal and bypass drainage characteristics of this area. Because of this, reduction of nitrogen in the soil profile may be overestimated and contaminant loss via deep drainage may be underestimated in the modelling.

19. Because the new area of land added to WW1 was not modelled in the current scenario the specific budgets for WW1 can be compared on a per hectare basis only. It is noted that additional modelling including the WW2 farm is provided and overall losses from the two farms combined can be compared for the current and proposed scenarios.

20. In conclusion a more detailed review of the actual inputs and specifics of the Overseer modelling is not required.

Groundwater Monitoring

21. Due to the physiographic setting and existing state of the groundwater at this location groundwater monitoring is deemed appropriate. The existing monitoring at E54/0622 should be continued. Results from E45/0622 show highly variable nitrate and *E.coli* concentrations. Because of this and because of the highly sensitive receiving environment another dedicated monitoring well should be drilled within the location specified in Figure 1.

Figure 1: Designated area for installation of a dedicated monitoring well.

22. The monitoring bore should be drilled and screened below the summer static water level to avoid seasonal drying of the well. A seasonal fluctuation in water level of approximately 2 metres can be expected. While this fluctuation needs to be accounted for it is important that the well is screened at the most shallow depth possible and drilled in accordance with the relevant drilling standards (NZS 4411:2001). Testing should include nitrate, nitrite, nitrate plus nitrite (TON), total nitrogen, E. coli (as MPN), electrical conductivity, and chloride. Six monthly sampling is appropriate to give an indication of seasonal variation in effects.

23. The total vertical travel time (lag time) between the surface and groundwater in the area of the farm is modelled to be approximately 3 – 5 years (Wilson et al., 2014). This indicates that shallow groundwater monitoring is appropriate to help assess the effects of the proposed activity and that if representative samples can be collected the measurements observed should reflect the effect of on farm practice.

Background information relating to water quality in the area

24. The proposed WW1 farm has potential drainage contributions to the Waimatuku, Aparima and Oreti Rivers. It is estimated that the largest proportion of drainage via groundwater and surface water is to the Waimatuku Stream. Each of these waterways are showing signs of ecological stress and degradation as presented in Hodson et al. (2017) (discussed further below). The farm is situated predominantly within the Central Plains physiographic with some area of Oxidising zone. Both of these zones have been identified as being at high risk to nitrogen contamination (Rissmann et al., 2016; Hughes et al., 2016).

Groundwater

25. At a regional scale the Central Plains physiographic has the second highest median TON concentration, second only to the Old Mataura physiographic zone (Figure 2).

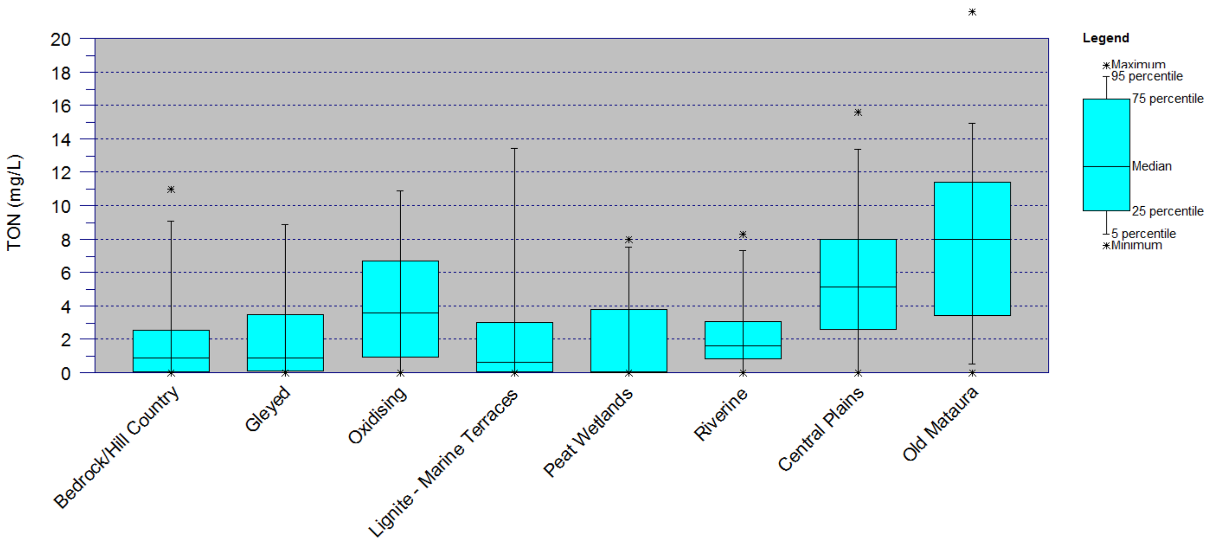

Figure 2: Box plots summarising all groundwater median data split by physiographic zone.

26. This groundwater nitrogen contamination reflects the characteristics of the zone such as low dilution potential, oxidised groundwater and bypass drainage allowing drainage water to bypass the soil profile in dry summer early autumn months. It is theorised based on water chemistry, hydrological and soil data as well as physical observations that the soils that characterise this zone exhibit bi-modal drainage. This is primarily due to shrink-swell properties causing the development of macropore structures when the soils are dry. This means that when the soils are wet they are in general 'poorly drained' and when dry can become 'well drained' (Rissmann et al 2016; Hughes et al., 2016). An investigation carried out by Environment Southland Technical Specialist (Michael Killick) in January 2018 identified the presence of cracks in many but not all of the soils on the Woldwide farms. This observed cracking likely represents the shrink-swell nature of some of the soils in the area and is a visual marker of the development of macropore bypass structures within the soil profile. An observation was also made after significant rainfall showing no ponding of water in an area that commonly ponds in winter indicating the soils were in fact acting in a well-drained manner after this summer dry period. These observations indicate that many of the soils on the Woldwide farms are likely to be consistent with the hypothesised bi-modal drainage of the wider Central Plains physiographic zone. The full report my M. Killick is attached in Appendix 1.

27. At a more local scale historic and on-going sampling within the vicinity of the proposed farm indicates that the groundwater is generally highly degraded with respect to nitrogen contamination. This sampling has been carried out over many years and using methods adhering to the guidelines outlined in the National Protocol for State of the Environment Groundwater Monitoring in New Zealand (MfE, 2006). Figure 3 below presents median total oxidised nitrogen (TON) concentrations from all available samples within a 2.5km radius of the WW1 farm. TON is used here and throughout as this allows more data to be considered. TON can be compared to nitrate nitrogen standards such as those in the national objectives framework (NOF) (MfE, 2017) as nitrite concentrations are negligible in these oxidised environments.

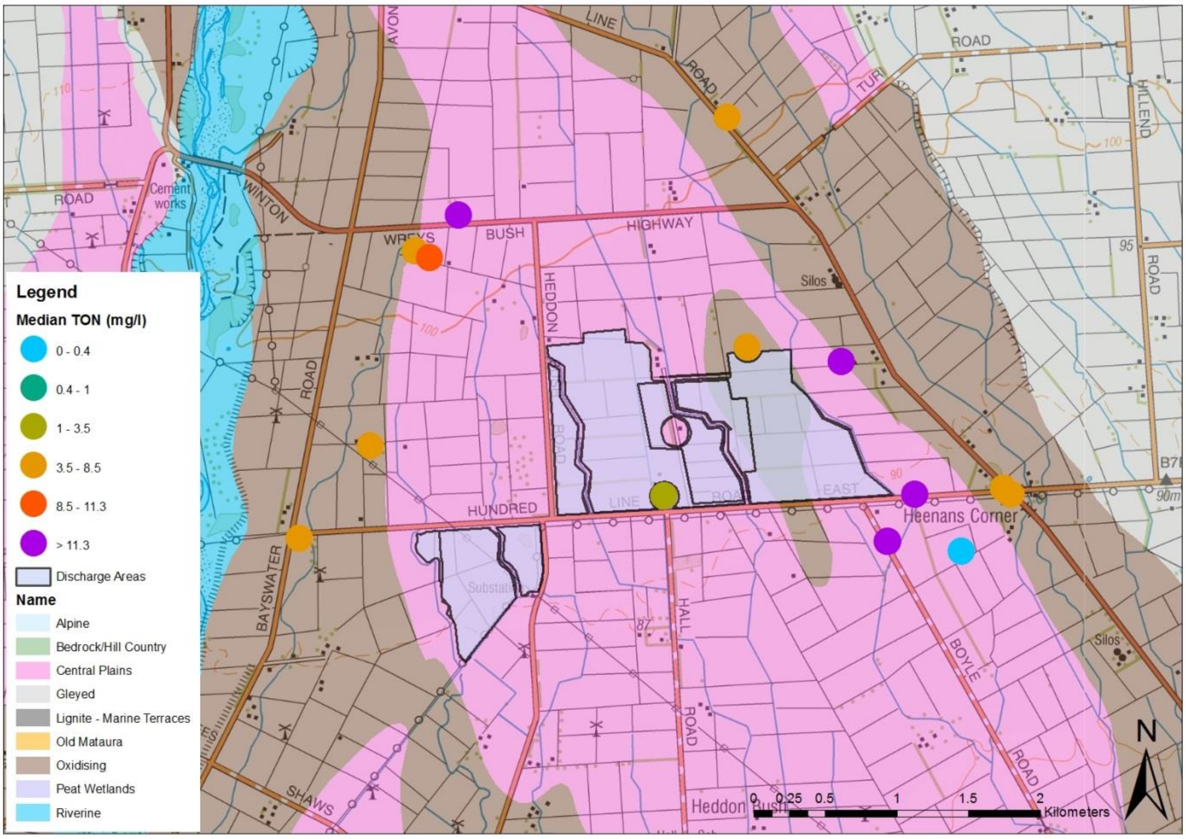

Figure 3: Median TON concentrations within 2.5km of the WW1 farm.

28. Figure 3 illustrates that there are four bores within the vicinity where median groundwater TON concentrations exceed the drinking water standard of 11.3 mg/L (MoH, 2008). It should be noted that the monitoring bore on the WW1 farm has a lower median concentration of 2.1 mg/L. As mentioned in the groundwater monitoring section results from this bore have been highly variable and potentially subject to direct contamination, thus this bore may not be an adequate representation of the surrounding groundwater quality. Higher spatial resolution of sampling within the farm area would be required to better assess the groundwater state under the farm.

29. Given the oxidising nature of the aquifers in this area (Rissmann et al., 2016) there is potential for cumulative effects of nitrogen contamination to occur as water moves down gradient within the aquifer. These effects on absolute concentration in groundwater are highly spatially variable and dependent on land use and surface inputs, however, the effects on nitrogen load to the catchment and receiving environment are likely to be cumulative. Any increase in

nitrogen inputs in this area is likely to have a degrading effect on the already degraded and sensitive groundwater in this region.

30. The application has correctly identified that the connection between groundwater and surface water in this area is high. The flow in the Waimatuku in particular is heavily groundwater dependant and the hydraulic connection between surface water and groundwater is high (Hitchcock, 2014). Because of this it is appropriate to consider groundwater nitrate concentrations with respect to surface water standards as detailed in the NOF (MfE, 2017). Table 1 below presents the NOF numeric and narrative objectives for the protection of ecosystem values in New Zealand rivers and streams.

Table 1: NOF nitrate nitrogen numeric and narrative objectives for surface waters.

Surface water nitrate toxicity band	Narrative objective	Numeric objective - Median NO_3-N (mg/L)
A	High conservation value system. Unlikely to be effects even on sensitive species	**≤ 1.0**
B	Some growth effect on up to 5% of species.	**> 1.0 and ≤ 2.4**
C	Growth effects on up to 20% of species (mainly sensitive species such as fish). No acute effects	**> 2.4 and ≤ 6.9**
D	Impacts on growth of multiple species, and starts approaching acute impact level (ie risk of death) for sensitive species at higher concentrations (>20 mg/L)	**> 6.9**

31. Following this Figure 4 presents groundwater median values classed according to the NOF bands in order to highlight the potential effect of groundwater contamination on surface water quality. Please note these are not numerical objectives for groundwater stipulated in any national or regional plan or policy. Groundwater concentrations may not be realised in surface waters due to subsequent attenuation.

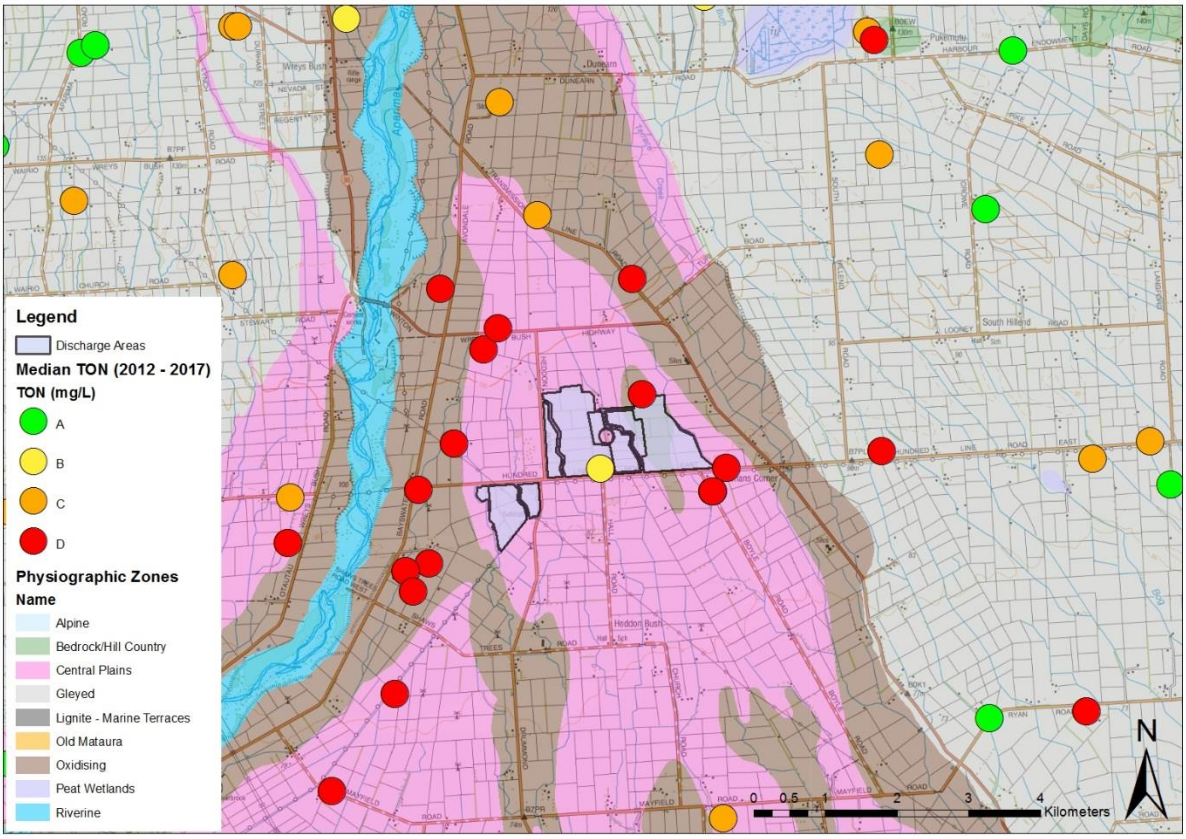

Figure 4: Groundwater median TON concentrations in the vicinity of the farm in relation to the NOF nitrate toxicity numerical objectives.

32. Figure 5 below presents groundwater median TON values classed in the same way as above but for the wider northern central plains area. This map is intended to demonstrate the relative level of groundwater contamination and risk in the area of the proposed farm.

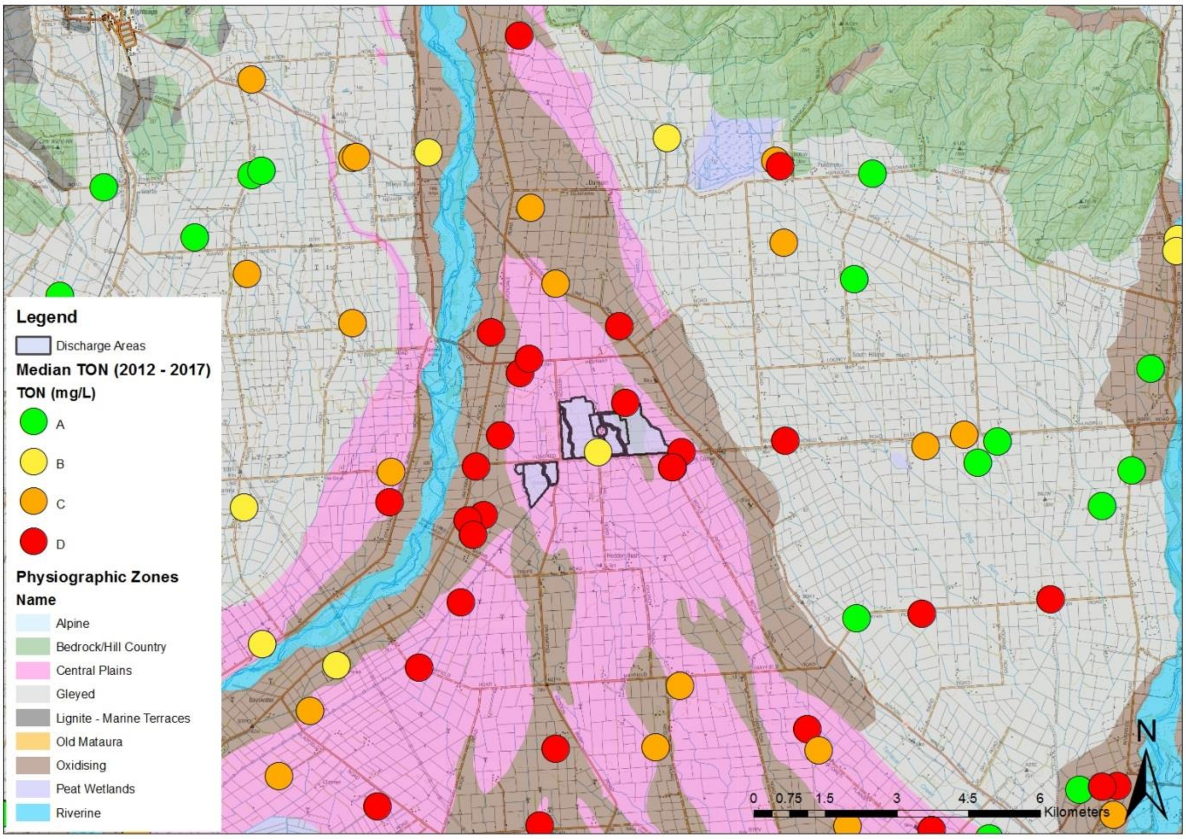

Figure 5: Groundwater median TON concentrations in the wider area relation to the NOF nitrate toxicity numerical objectives.

Groundwater Flow Direction

33. Figure 6 below uses the piezometric surface from Hitchcock (2014) to show inferred groundwater flow direction in the area of the proposed farm. From this piezo survey and subsequent piezometric surface the flow direction can be inferred as south to south-south east in the area and downgradient of the farm.

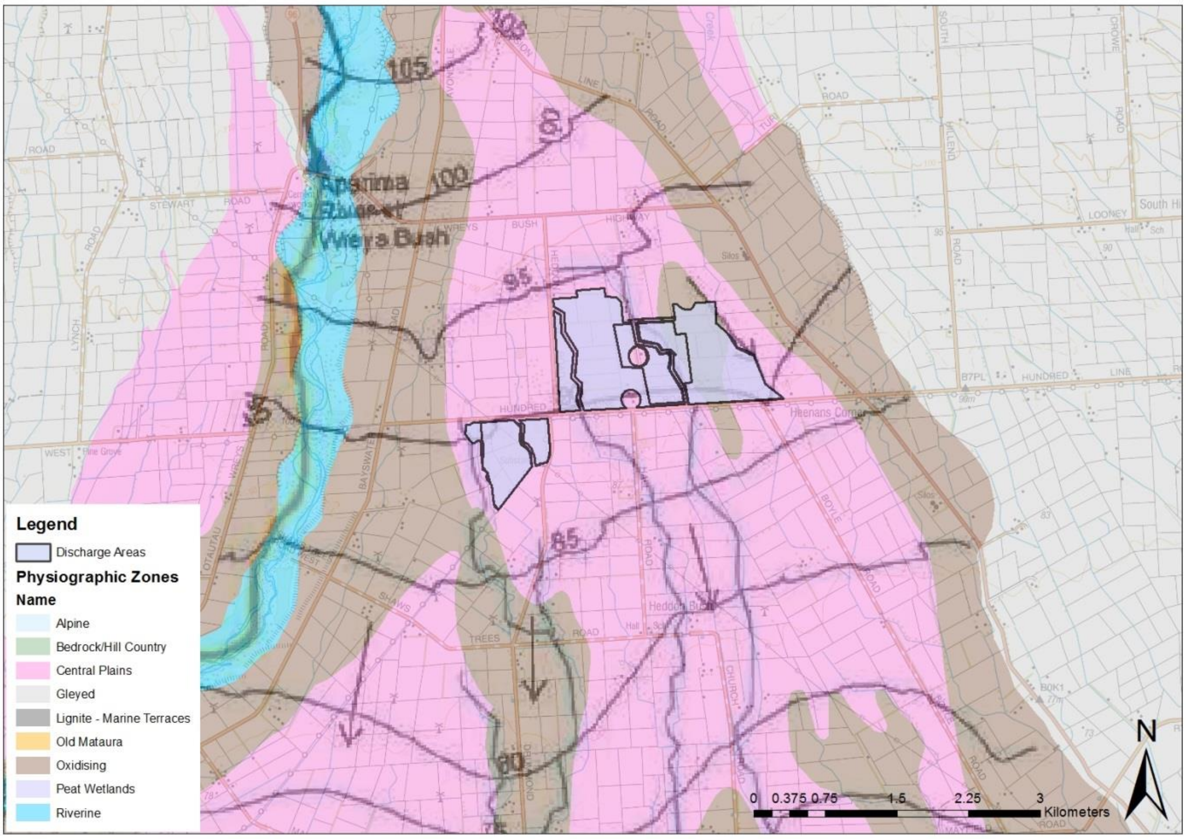

Figure 6: Piezometric surface map and flow direction indication from Hitchcock 2014 shown in relation to the proposed farm area (from Hitchcock, 2014).

Surface Water

34. All three waterways potentially affected by the proposed activity are showing signs of water quality degradation and ecological stress (Evidence by Nick Ward and Hodson et al., 2017). The Waimatuku Stream is classed within the NOF C band for nitrate toxicity measured at Lorneville Riverton Highway. This indicates there will be growth effects on up to 20% of species (mainly sensitive species such as fish). When compared to the ANZECC trigger values (ANZECC, 2000) all three rivers that are potential receiving environments exceed the relevant trigger value for nitrate nitrogen. The Waimatuku Stream is also showing ecological stress and degradation with regard to phosphorus, E.coli and MCI (macroinvertebrate community index).

35. Surface water monitoring data provided by the applicant to satisfy a further information request indicates that surface water on the property is degraded with a median nitrogen concentration of 7.0 mg/L in the downstream samples. This is below the national bottom line of 6.9 mg/L. It should be noted that concentrations have been highly variable between 2007 and 2013 with some periods of much more severe degradation. The data also shows variable and sometimes severe (in excess of bottom line for human recreation) E.coli contamination. More frequent and recent data would need to be collected to assess the state of surface water on the property more robustly.

Comments specifically related to the application

36. It has been suggested that monitoring of nitrogen in groundwater only is sufficient to monitor effects of the activity on both surface and groundwater. Whilst this may be somewhat appropriate for nitrogen due to the high groundwater surface water connectivity this approach does not account for nitrogen lost to surface water via overland flow or tile drainage. The approach of only monitoring groundwater is not appropriate to monitor the effects with respect to other contaminants or indicators relevant to surface water quality such as E.coli, phosphorus and ecological indicators.

37. It is stated that the estimated (Overseer) concentrations on nitrate in drainage are less than the current expected concentrations in groundwater and therefore the proposed activity will in fact have a diluting or positive effect on groundwater nitrate concentrations. This assumption is flawed given these estimated concentrations in drainage water are an annual average and hence do not fully represent the potential peaks in concentration associated with temporal drainage events and nutrient loss. This temporal pattern in nutrient loss has been described in literature (Cameron & Di, 2014).

38. The Heddon Bush School is located approximately 2 km south and hydrologically downgradient of the proposed Woldwide 1 Farm. Contaminant losses from the Woldwide Farm are unlikely to have a direct measurable impact on the groundwater extracted at the Heddon Bush School, however, the groundwater quality at the school is likely to be significantly impacted as a result of cumulative effects from surrounding agriculture of which the Woldwide Farm operation does, and will contribute to in the future. Depending on the geological setting at the Heddon Bush School site the water source that is accessed by the school bore may be geologically separated from the shallow most contaminated groundwater. To assess this water chemistry information would need to be collected for the school bore.

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Appendix 1

Investigation of cracking soils: Heddon Bush, January 2018.
Michael Killick, Technical Specialist (Soils and Groundwater Quantity)

On January 30, 2018, I visited dairy farms of the Woldwide group with the owner, Abe de Wolde, in the area of Heddon Bush, to see if we could observe soil cracking as is described for the Central Plains physiographic unit. We looked at a paddock ('Site 1') on the corner of Hundred Line Road and Drummond Heddon Bush Road which in the Topoclimate survey is mapped as Braxton + Pukemutu soils. There were noticeable cracks in the soil at this site, 3-10mm wide, less than 150mm long, 5-10m apart. It was not clear how many cracks might be hidden by pasture, but there were areas of sparse pasture which had no cracks.

A shallow hole (~15cm deep) at the site showed the soil was friable with many small to medium well-formed peds. A creek on the west side of the paddock which is a small tributary of Middle Creek was dry at the culvert where the bed was a metre or so below ground level. Site 1 was described by Abe as wet in winter with areas of standing water, the effects of which could still be observed in the dry conditions of our visit (re-sowing with new pasture had been prevented in one place due to previous muddy conditions). See figures 1-5.

Figure 1. Cracked soil at Site 1.


Figure 2. Uncracked soil at Site 1.


Figure 3. Creek bed at Site 1.

Figure 4. Site 1 locations.


Figure 5. Soil at Site 1.

We also looked at a site ('Site 2') on the north side of Hundred Line Rd mapped as Glenelg soils. This soil did not appear cracked although the soil surface was disrupted by the remains of past pugging so it was not easy to observe. A hole dug to about 15cm depth at this site brought up a number of stones supporting the mapped classification as Glenelg soil.

We walked a transect of approximately 50m at a third site ('Site 3', Figure 7) mapped as Glenelg + Drummond soils (close to the boundary of Braxton + Pukemutu soils). Cracks in this soil were observed at a density of at least one in the region of each stride i.e. 1/m2. The cracks were smaller than at Site 1, 2-4mm wide and less than 100mm long (see Figure 6). A hole dug to about 15cm depth at this site brought up two large stones (~90mm) and a number of small stones. A steel ruler was inserted easily into a crack to a depth of ~20cm, but could be inserted with similar ease to similar depth in soil without cracks at the site. (The depth of the cracks could not otherwise be ascertained as it was not visible from the surface and the soil structure and cracks collapsed easily with digging.)


Figure 6. Cracking at Site 3. These cracks do not show up well in the photo because of their smaller size and the high contrast shadows but were easily visible at the time.

A fourth site ('Site 4') on Braxton + Pukemutu soils with heavier pasture cover than sites 1 and 3 showed no cracking although the soil surface was difficult to see beneath the pasture. Large cracks would have been visible if a reasonable number had been there, but possibly smaller cracks such as those at Site 3 might have been present but not seen.

A site mapped as Tuatapere soils on Bayswater Road showed cracking at similar or somewhat greater density than Site 3 and the cracks were a similar or somewhat smaller size. There were frequent small stones on the surface of this soil. Tuatapere soil is described

Figure 7. Site 3 location.

as having stones at greater than 45cm depth, but it is contiguous in this area with stonier soils (Waiau and Glenelg) and may also have been modified by cultivation at some point.

Following the field observations on 30 January, sustained rainfall occurred on the properties and across the region beginning late January 31 and continuing through February 1. At Site 1 further observations were made by Abe to see how it responded to rainfall. At the location described above which was muddy in winter (i.e. where re-sowing had been prevented) no surface ponding occurred after 30mm rainfall or after 60mm rainfall. As this location was a slight depression, prone to ponding in winter, it is not thought that the rainfall was shed in runoff.

At the Environment Southland site, Central Plains Aquifer at Heddon Bush, about 2.7 km from Site 1, rise in the groundwater level in the 6m deep bore occurred within 12 hours of the onset of rainfall. The location of this site is mapped as Braxton and Pukemutu soils but it was found at installation to be stony, so the site description was changed to Glenelg soils. Earlier, lesser rainfall events in January had little effect on groundwater level. See Figure 8.

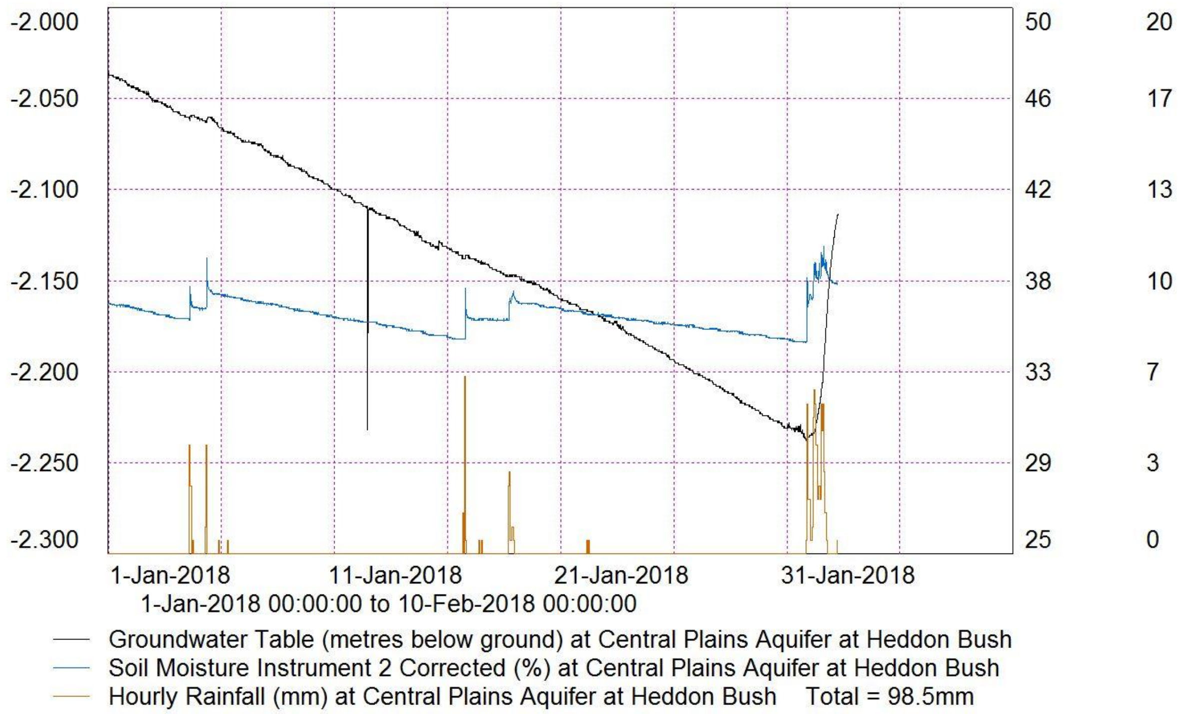

Figure 8. Groundwater level, soil moisture and rainfall at the Environment Southland Heddon Bush monitoring site.

Discussion

All the soils observed were dry and pasture was stressed and sparse to varying degrees. Some soils mapped as Braxton + Pukemutu showed cracks, while other soils with this mapped description did not. Likewise, some stony soils (mapped as Glenelg and Tuatapere) in the area were cracked and some not. It is not surprising that some stony soils were cracked as the fine matrix material in these soils is sourced from the same mafic parent materials in the Takitimu Mountains as the Braxton and Pukemutu soils, and so may also contain clays prone to shrink-swell behaviour. Cracking in stony soils may, however, have drawn less attention in studies of soil behaviour as it would not greatly alter the soil properties from those they are already thought to possess i.e. free drainage with risk of nutrient leaching.

The largest cracks seen were ~10mm wide. Most were 2-5mm wide. As discussed above, some Braxton/Pukemutu soils or variants were not cracked. Glenelg soils at the nearby Environment Southland monitoring site (Central Plains Aquifer at Heddon Bush) had volumetric soil moisture <35% throughout December 2017-January 2018 and <30% for two weeks prior to the observations (and were not visibly cracked). Soil moisture at comparable sustained, low levels was last recorded at the Heddon Bush site in January-February 2008 which was recognized as a drought year. Soil temperature in the two weeks prior to the current observations was 18-27°C. In these conditions further drying of the soil occurs only slowly as the residual moisture is tightly held in fine pores, hence it would take a significant continuation or intensification of the conditions then current to make the soils significantly drier with whatever structural changes might accompany that.

It seems reasonable to conclude that the occurrence of very large cracks such as feature in some anecdotes about the soils (e.g. 'to reach your arm into') would now be rare in the soils observed for this investigation, and might not occur. Continued development or changes in management of the soils e.g. the ongoing effects of drainage, or conversion from sheep to dairy, may have influenced the historical pattern of soil behaviour. Or it may be that occurrences of Braxton soils other than those described here, crack more.

The strong, friable structure of the Braxton/Pukemutu soils observed raises the prospect that they may behave as free draining soils when very dry, with or without visible cracking. This behaviour of the dry soils with regard to drainage, and the effects of cracks where present, has not been quantified, but is described in the literature relating to the Central Plains physiographic zone (see following link).

http://eswaterandland.datacomsphere.com.au/southland-science/physiographic-zones/physiographics-and-farm-management

The potential for Braxton and related soils to crack when dry – as was observed for some soils in the investigation described above - has perhaps attracted more attention than the general capacity of these soils for 'bi-modal' transport of leachate and contaminants, as described in the physiographic zone technical sheet, via more general structural changes which may include visible cracking. Understanding the transition from the 'summer soil' to the 'winter soil' – when wetting of dry soils occurs - could help further explain nutrient loss processes in the Central Plains physiographic unit where the observations described above were made.

During the investigation there was some discussion of the possible influence of different pasture conditions, or variations in soil type, on the prevalence or absence of cracking. Some soils in the area are thought to have been mapped previously as Makarewa soils (now Braxton). The distinction between these soils apparently relates to the geomorphic setting with Braxton soils on terraces and Makarewa soils on flood plains (because of this, Makarewa soils may also be younger). It was seen, however, that cracking could occur in a variety of soils in the area. Further investigations could shed light on the influence of pasture condition, soil type and moisture content on the drainage capacities of soils and thresholds of dryness and rainfall associated with deep drainage.

BEFORE SOUTHLAND REGIONAL COUNCIL

IN THE MATTER	Resource consent application
BY	Woldwide One Limited
	APPLICANT

EVIDENCE OF NICK WARD ON BEHALF
SOUTHLAND REGIONAL COUNCIL

Qualifications and Experience

1.1. My Full name is Nicholas James Haydon Ward and I hold the position of Freshwater and Marine Science Leader.

1.2. I acknowledge that I have read the Code of Conduct (2014) and agree to comply with this.

1.3. My qualifications as an expert are set out above. I confirm that the issues addressed in this brief of evidence are within my area of expertise.

1.4. I have not omitted to consider material facts to me that might alter or detract from opinions expressed.

1.5. I hold the qualifications of BSc Honours Environmental Geology from University of Leeds 2000), Graduate Diploma Science (Victoria University Wellington 2007 and Post Graduate Diploma Marine Biology/Ecology (Victoria University Wellington 2009).

1.6. My current role of 4 years as Freshwater and Marine Science Leader at Environment Southland involves leading a staff of 4 in the scientific domains of Freshwater, Lakes, Estuaries and Coast.

1.7. I have over a year of experience at Environment Southland as a Coastal Scientist.

1.8. I have approximately a year of experience at Environment Southland as a Technical compliance officer, overseeing consented aspect of waste water treatment plants, meat works and other industry consented activities.

1.9. Previously my experience has been working in the contaminated land and waste industry; and indoor air quality scientist.

Scope of Evidence

1.10. The evidence provides an assessment of the appropriateness of the assessment of environmental effects in the application.

1.11. The evidence provided discusses estuaries, cumulative effects, surface water quality/ecology and pathogens.

1.12. My opinions are based primarily on environmental monitoring and research, water quality testing results. These matters are within my area of expertise.

1.13. The opinions expressed are due to my interpretation of the facts and information summarised in the above point.

1.14. Literature used and relied upon is listed in the references section of my Technical Comment.

1.15. A summary of evidence is set out below.

Summary of evidence

1.16. It is not clear from the assessment of environmental effects (AEE) which catchment the activity is located within.

1.17. The Waimatuku Estuary is under environmental stress. As are Jacobs River Estuary and New River Estuary.

1.18. River water quality is very high for Waimatuku (presumably the catchment the activity is within); only one site in the Oreti system is considered in the AEE.

1.19. The increase in cow numbers will increase the pathogen loading of the activity. How this will be mitigated is not reflected in the AEE.

1.20. The ecology of the catchments in question and how they may be affected have not been considered in the application.

Waimatuku Estuary

1.21. The Waimatuku is experiencing stress from nutrient input and to lesser extent sediment (Robertson and Stevens 2012). This receiving environment will be influenced by the activities and discharges in the catchment. There is little to no assessment of the receiving environment (less than a page) and how this activity will contribute to cumulative effects. Estuaries are susceptible to cumulative effects of sediment and nutrient which can and has resulted in hypoxic areas within these systems (Robertson and Stevens 2013, 2013a). An assessment of cumulative effects would be useful to consider the bottom of catchment receiving environment, using tools such as the estuary trophic index (ETI).

1.22. The application refers to an activity within the Waimatuku catchment but it mentions that there is also discharge eventually into the Oreti River and the Jacobs River estuary but is not mentioned in the assessment. Indeed the consideration given to surface water quality is within the Oreti at Bog Burn downstream of Hundred Line Road. Clarity needs to be gained as to the receiving environment/s that ultimately receive/s the contaminants. Depending on the catchment the activity is within the relative estuary should be considered. Oreti/New River Estuary, Aparima/Jacobs River Estuary and Waimatuku/Waimatuku Estuary.

1.23. The condition of New River Estuary (Oreti) and Jacobs River (Aparima) estuary are not reflected in the assessment of environmental effects. These systems are clearly experiencing major stress from cumulative sediment and nutrient input and are over-allocated for purposes of maintaining a healthy ecosystem (Robertson and Stevens 2013, 2013a).

River Water Quality

1.24. Again, clarity needs to be gained as to the receiving environment/s that ultimately receive/s the contaminants. This will enable the correct surface water sites to be assessed for their current situation.

1.25. The monitoring site upstream on the Waimatuku stream (Waimatuku stream at Lorneville Riverton Highway) has the highest nitrate and total nitrogen concentrations for Southland[1] (Hodson et. al 2017).

1.26. There needs to be a better assessment of surface water quality in the application and the effects downstream. Some of this assessment should go beyond just national objective frameworks which set a low bar. A more appropriate ecological assessment would be to use the Australian and New Zealand Guidelines for Fresh and Marine Water Quality document (*ANZECC* 2000 Guidelines). The macroinvertebrate community also needs to be considered as an assessment against the macroinvertebrate index (MCI) and the Southland Regional water plan, though this does have indeterminate trends the state may still be considered.

Pathogens

1.27. There is not an assessment of pathogens and how an increase in stock numbers will contribute more pathogen loading to the area and how this may access groundwater and surface water. E. coli concentrations from dairy cattle are substantial (Table 1) and should be deliberated. Especially their potential effect on the nearby groundwater and surface water conditions and how this may be mitigated.

1.28. Table 1. Dairy cattle excretion loadings of pathogens.

Animal (reference)	**Micro-organisms**	**Conc.**	**Prevalence (%)**	**Mean daily excretion of faeces (kg)**	**Mean daily excretion of organisms**	**Mean daily excretion by 100 animals**
Dairy Cattle (Moriarty *et al.* 2008)	*E. coli*	8.2×10^4	99.05	24.8	2.03×10^9	2.01×10^{11}
	Enterococci	4.5×10^2	93.3		1.12×10^7	1.05×10^9
	Campylobacter	4.3×10^2	63.9		1.06×10^7	6.77×10^8

1.29. How pathogens will be managed needs to be assessed, taking into consideration proximity to tile drains/streams/drains/creeks, bypass flow (temporally variable), attenuation and mitigating factors.

Ecology

1.30. Consideration is given only to water quality and not the wider environment, i.e. ecology. Greater thought should be given towards the potential effects of this activity on periphyton, macroinvertebrate community and riparian habitat. Especially as the ecology often gives a time integrated sample. Macroinvertebrate community information is available from the southland regional council.

[1] 2012-2016 data, n=60. Nitrate median =3.35, Total nitrogen=3.8

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Additional Information

4 OBJECTIVES, POLICIES & METHODS

4.1 OBJECTIVES

The resource management objectives with regard to the discharge of effluent and sludge from sanitary appliances and fixtures, community sewage schemes, agricultural activities and industrial or trade processes are:

Objective 4.1.1 - Soil

To ensure that the life supporting capacity of the soil ecosystem is safeguarded from the adverse effects of discharges of effluent and sludge onto or into land.

Policies 4.2.1, 4.2.4, 4.2.7, 4.2.10 – 4.2.16;
Methods 4.3.1 – 4.3.15

Objective 4.1.2 - Water

To ensure that water quality and the life supporting capacity of the water ecosystem is safeguarded from the adverse effects of discharges of effluent and sludge onto or into land which may enter water.

Policies 4.2.2 – 4.2.16;
Methods 4.3.1 – 4.3.15

Objective 4.1.3 - Human and animal health

To ensure that effluent and sludge discharges onto or into land do not adversely affect human and animal health.

Policies 4.2.1 – 4.2.7, 4.2.10 – 4.2.16;
Methods 4.3.1 – 4.3.15

Objective 4.1.4 - Amenity values

To ensure that amenity values are not adversely affected by discharges of effluent and sludge onto or into land.

Objectives 4.1.4, 4.1.5;
Policies 4.2.1 – 4.2.3, 4.2.5, 4.2.7 – 4.2.16;

Objective 4.1.5 - Takata whenua

To recognise and provide for the relationship of takata whenua with ancestral sites, wahi tapu and other taoka.

Policies 4.2.1 – 4.2.16;
Methods 4.3.1 – 4.3.15

Objective 4.1.6 - Significant vegetation and habitats

To ensure that effluent or sludge discharges onto or into land do not adversely affect areas of significant indigenous vegetation and significant habitats of indigenous fauna.

Policies 4.2.1 – 4.2.16;
Methods 4.3.1 – 4.3.15

Principal Reasons
Soils provide the foundation and medium in which plants grow, and are an integral and living part of the wider ecosystem, as well as being an ecosystem in their own

right. The soil ecosystem provides an environment where the bioremediation of effluent and sludge can take place and the soil ecosystem can also benefit from some effluent and sludge discharges. It is therefore important that the life supporting capacity of the soil ecosystem is safeguarded.

Discharges of effluent and sludge onto or into land has the potential to enter water either directly or indirectly, through leaching, run-off, spray drift, or some other process. If the discharge enters water, there is potential for the water quality to be degraded. This would adversely effect the life supporting capacity of the water ecosystem.

Generally, the life supporting capacity of the water ecosystem is an indicator of water quality. The greater the biological diversity, the better the water quality. Good quality water is needed for a range of uses, including drinking supplies and stock water.

The contents of effluent and sludge being discharged onto or into land is an indicator of the health of the human population that gave rise to it. Effluent and sludge contains a number of pathogens and viruses, all of which can have an adverse effect on either human or animal health. Industrial and trade process effluent can contain any number of contaminants, particularly of concern are heavy metals, hydrocarbons, persistent organic compounds, toxics and bioaccumulative substances. These can also have adverse effect on either human or animal health. These adverse effects should be avoided.

Amenity values include those characteristics that contribute to people’s appreciation of an area’s pleasantness, aesthetic coherence, and cultural and recreational attributes. Effluent and sludge discharge systems can be designed, managed and operated in a manner that ensures that these amenity values are not adversely affected.

The cultural and traditional spiritual values and relationships that have been developed over time by takata whenua are a combination of environmental and conservation ethics and history. These values need to recognised and provided for. The discharge of effluent and sludge has the potential to adversely affect ancestral sites, wahi tapu sites and other taoka. Wahi tapu are sacred places, and for cultural reasons they need to be protected.

Southland has large numbers of stock which are moved on a regular basis within the Region resulting in a relatively high number of trucks on the road carrying stock. Effluent from stock trucks can enter water courses from the road and result in reduced water quality, cause damage to roads in terms of the chemical composition of the effluent and the way it reacts with road surfaces and cause a nuisance to other road users.

The main statutory framework for managing the discharge of effluent from stock trucks on state highways is the Transit New Zealand Act 1989. It is an offense under Section 51(2)(e) of this Act to cause or allow any effluent to flow from any vehicle onto a road or into a ditch or drain associated with the road. Anyone breaching this section is liable to be fined.

4.2 POLICIES

The resource management policies with regard to the discharge of effluent and sludge from sanitary appliances and fixtures, community sewage schemes, agricultural activities and industrial or trade processes are:

Policy 4.2.1 - Sustainability of the soil ecosystem

Protect the sustainability of the soil ecosystem from adverse effects of effluent and sludge discharges onto or into land.

Methods 4.3.1 – 4.3.15

Explanation
Soils are utilised as either a treatment medium and/or a final receiving environment of most effluent and sludge discharge systems. While the soil can benefit from applications of effluent and sludge, the soil ecosystem can be adversely affected by these discharges and as a consequence, needs to be managed. The soil ecosystem, in particular the microbiological components of the soil, act as a treatment medium. If the soil ecosystem is adversely affected as a result of the siting, design or operation of the system, or the discharge of sludge, the ability of the soil to act as a treatment medium may be compromised. It is necessary to protect the sustainability of the soil ecosystem in order that it can continue to act as a treatment medium for effluent and sludge discharges into on onto it.

Site specific constraints must also be taken into account. A failure to provide for site specific constraints such as depth to groundwater, slope, soil type and permeability or proximity to water, can lead to a failure of the system. If the system fails, the life supporting capacity of the soil ecosystem may be adversely affected. If the life supporting capacity of the soil ecosystem is adversely affected, the ability for the soil to continue to act as a treatment medium may be compromised. If this occurs, measures to remedy or mitigate them, or an upgrade, repair or replacement of the system or, where appropriate, connection to a community sewage scheme, may be required.

Sludges are discharged in a variety of ways. Where there is a specific sludge discharge facility, the facility will be required to be sited, designed and operated to avoid where practicable, remedy or mitigate any adverse affect on the soil ecosystem. Where the discharge is from a sludge tanker, the discharge will be required to be undertaken in a manner so as to avoid where practicable, remedy or mitigate adverse effects on the soil ecosystem.

Some sludges and industrial and trade process effluent has the potential to contain toxic, biotoxic or bioaccumulative substances, for example, heavy metals. These substances have the potential to have significant adverse effects on soil ecosystems, as well as human and animal health. Where it is unclear whether these substances are present in a sludge, tests should be undertaken to confirm if they are present or not.

Policy 4.2.2 - Discharge to land

Utilise land treatment of effluent and sludge where this can be undertaken in a sustainable manner and without significant adverse effects.

Methods 4.3.1 – 4.3.15

Explanation
Any new effluent and sludge discharges will be encouraged to utilise land-based discharge methods rather than water. Many water-based discharge methods are heavily reliant upon dilution, which may be highly variable in inland watercourses, and can be objectionable. Discharge onto or into land is preferable. Treatment of an effluent and sludge before discharge to land may be necessary to remove contaminants that are difficult or impossible to bioremediate. In some instances where discharges onto or into land will give rise to significant adverse effects and discharge to water can be undertaken in a manner that, after reasonable mixing,

meets water classification standards, it may be appropriate to discharge effluent and sludge to water.

Policy 4.2.3 - Avoid where practicable, remedy or mitigate adverse effects on water

> **Avoid where practicable, remedy or mitigate adverse effects on water quality, water ecosystems and water potability from effluent and sludge discharges onto or into land.**

Methods 4.3.1-4.3.15

Explanation
Discharges from effluent discharge systems and of sludges onto or into land utilise the soil as either a treatment medium and/or a final receiving environment. However, through the process of direct runoff or leaching, it is possible that the contaminants may reach water, including groundwater. Where this occurs, it is important that the adverse effects on the water ecosystem are avoided where practicable, remedied or mitigated.

Groundwater is increasingly being utilised as a source of potable water so it is important that the potability of that groundwater is not reduced. Where the existing water quality is better than the drinking water standards, as defined by the 'Drinking Water Standards for New Zealand 1995', the water quality should be maintained.

Sludges are discharged in a variety of ways. Where there is a specific sludge discharge facility, the facility will be required to be sited, designed and operated to avoid where practicable, remedy or mitigate any adverse affect on the water ecosystem. Where the discharge is from a sludge tanker or is sprayed onto land, the discharge will be required to be undertaken in a manner so as to avoid where practicable, remedy or mitigate adverse effects on the water ecosystem.

As more development takes place, whether it be an increase in the density of subdivision or use of the land, there is a corresponding increase in the potential for cumulative effects resulting from effluent and sludge discharges onto or into land. Initially the potential for cumulative adverse effects should be avoided through design, location and operation of the discharge system. Where there are existing effluent and sludge systems, and there are undesirable background levels of contamination, measures will need to be taken to remedy or mitigate those existing adverse effects. In some cases, where development has become too great, a community sewerage scheme may have to be considered.

Policy 4.2.4 - Precautionary approach

> **Adopt a precautionary approach to the discharge of effluent and sludge onto or into land where there are uncertainties regarding adverse effects.**

Methods 4.3.1 – 4.3.8, 4.3.10, 4.3.12, 4.3.13

Explanation
In the absence of adequate or sufficient evidence regarding the discharge of effluent and sludge, a precautionary approach needs to be taken in relation to decision making. A precautionary approach can be reflected in a number of ways, including buffer distances. Any precautionary approach should take into account site specific factors.

Policy 4.2.5 - Development

Methods 4.3.1 – 4.3.15

Advocate that territorial authorities include provision for effluent and sludge management when evaluating subdivision and development proposals.

Explanation
New subdivisions and development proposals have the potential to increase the intensity of land use. As land use intensifies, the potential for cumulative adverse effects increases. This is of particular concern as pressure to develop in the peri-urban areas increases.

Territorial authorities should be encouraged to assess the effects of new development on any existing community sewage scheme. In particular, consideration should be given to the effects of new industrial development on community sewage schemes. In some cases, where subdivision or development warrants, it may be necessary for a new community sewage scheme to be developed, or alternatively, an existing scheme upgraded.

Residential subdivisions, when not serviced by a community sewage scheme, have the potential to increase the volumes of sewage sludge being produced and discharged. Territorial authorities should ensure that there are either sufficient facilities to accept this sludge, or there is sufficient land available to discharge it in accordance with this plan.

Where development is in the form of an effluent or sludge producing industry, the facilities available for discharging that effluent or sludge should be assessed at the earliest possible stage.

The actual discharge of effluent and sludge is a Southland Regional Council responsibility, and is controlled by this Plan. However, territorial authorities should assess the effects or potential effects of the subdivision, or development, particularly in relation to the potential necessity for a community scheme to service that development or subdivision, or development on any community sewage scheme, particularly where an existing scheme is at, or near its design capacity, as the territorial authority is the body responsible under the Local Government Act 1974 for ensuring the provision of community sewage schemes.

Policy 4.2.6 - Human and animal health

Methods 4.3.1 – 4.3.6, 4.3.10 – 4.3.12

Avoid where practicable, remedy or mitigate any adverse effects to human and animal health arising from discharges of effluent and sludge onto or into land.

Explanation
Discharges of effluent and sludge onto or into land can introduce contaminants, particularly heavy metals and pathogens, and/or chemicals into the soil ecosystem. Potential adverse effects can be avoided by ensuring that the foul water discharge is properly managed.

Policy 4.2.7 - Good practice and maintenance

Methods 4.3.1 – 4.3.6

Promote good practice and regular maintenance of effluent and sludge systems.

Explanation
Good practice and regular maintenance are an integral part of ensuring that the system continues to function as it was designed to. Good practice includes:

- reduction of effluent and sludge at source
- regular cleaning
- protection of any treatment/soakage field so that it remains capable of acting as a receiving environment
- ensuring that the design parameters of the system are not exceeded due to inappropriate volumes, substances and/or chemicals being put through the system
- avoiding solids entering any treatment field
- ensuring that grey water is separated from stormwater
- efficient water usage
- effluent and sludge management system
- reviewing of contingency plans

Policy 4.2.8 - Takata whenua

Recognise and provide for takata whenua concerns related to the discharge of effluent and sludge onto or into land.

Methods 4.3.1 – 4.3.12

Explanation
Takata whenua have concerns relating to the discharge of human effluent. The primary concern is the discharge of effluent and sludge into the water ecosystem. There are also wider concerns relating to the effects on the cultural values of the land. These values include wahi tapu, ancestral sites and other taoka.

Policy 4.2.9 - Amenity values

Avoid where practicable, remedy or mitigate any adverse effects on amenity values from discharges of effluent and sludge systems onto or into land.

Methods 4.3.1-4.3.15

Explanation
Discharges of effluent and sludge onto or into land have the potential to have adverse effects on amenity values. Discharges should avoid any potential adverse effects on amenity values, because the current technology for effluent and sludge systems is such that adverse effects should not arise. Where this is not possible, measures should be taken to remedy or mitigate any adverse effects on amenity values from effluent and sludge discharges onto or into land.

Policy 4.2.10 - Monitoring

Monitor, as appropriate, discharges of effluent and sludge onto or into land and, where practicable, the effects.

Methods 4.5.7, 4.3.13

Explanation
Monitoring will enable the Southland Regional Council to ascertain whether the objectives of this section of the Plan are being achieved. Other benefits of monitoring may include clarification of the contributing sources and effects on non-point source pollution of groundwater and surface water. Monitoring will also assist in avoiding adverse effects and provide a better understanding of the effects of discharging effluent and sludge onto or into land.

Policy 4.2.11 - Encourage the use and development of dump stations

Methods 4.3.1 – 4.3.15
Section 7

Encourage the use and development of dedicated foul water dump station effluent from vehicular sources, including campervans and mobile homes.

Explanation
Dedicated foul water dump stations are designed to collect the effluent from the holding tanks of campervans and mobile homes. There are already many dump stations throughout the Southland Region. While some stations are provided by local authorities, many are also provided by commercial camping grounds. The problem appears to be that campervan and mobile home users are either unaware of the location of dedicated foul water dump stations or they are unaware that they have an obligation to discharge their effluent in a responsible manner.

Encouraging campervan and mobile home users to use dump stations through such methods as education, will assist in reducing the noxious, offensive and objectionable effects of foul water discharges from mobile sources.

The incidence of unauthorised or nuisance discharges from campervans and mobile homes is an indication that a more extensive network may be needed. By encouraging the provision of these stations, an extensive network can be developed. Such a network of dump stations would assist mobile home and campervan users to locate a dump station, and reduce unauthorised discharges on road sides.

Policy 4.2.12 - Changes to campervan and mobile home design

Methods 4.3.1, 4.3.9, 4.3.15

Promote rules requiring that new campervans be fitted with:

i. dedicated foul water holding facilities; and

ii. discharge couplings that only allow the emptying of holding facilities at dedicated effluent dump stations.

Explanation
The design of the discharge points and toilet facilities on many campervans and mobile homes allows users to empty their foul water at any time and any location. Changes to the design of vehicles would help to reduce the discharge of foul water at places other than dedicated dump stations.

Policy 4.2.13 - Development and use of treatment facilities

Methods 4.3.1 – 4.3.6, 4.3.9 – 4.3.12

Promote the development and the use of properly designed and managed sludge treatment facilities.

Explanation
There are a wide variety of facilities that can bioremediate, accept or store sludges, including landfills, sewage schemes, or a dedicated sludge containment facility. These facilities are either designed or are able to accept a variety of sludge types. By discharging sludges into these type of facilities, the potential adverse effects of discharging sludges can be avoided.

However, there is a lack of these facilities that are specifically designed to accept and/or treat sludges in Southland. Although the actual provision of sludge treatment facilities is not a Southland Regional Council role, the Southland Regional Council can take a proactive advocacy role for the development and use of sludge facilities that avoid any adverse effects on the environment.

Policy 4.2.14 - Trade waste bylaws

Encourage Territorial Authorities to adopt trade waste bylaws.

Method 4.3.1, 4.3.6, 4.3.11, 4.3.12

Explanation
The quality of effluent being discharged from a community sewage scheme is dependent on a number of factors, including; the type of contaminants entering the scheme; retention time; and the biological processes that work within the scheme. Trade waste bylaws assist to control the type and volume of trade wastes entering a community sewage scheme. Trade waste bylaws also assist ensuring that new or expanding industry does not overload existing community sewage schemes.

Policy 4.2.15 - Significant Indigenous Vegetation

Avoid where practicable, remedy or mitigate the adverse effects on areas of significant indigenous vegetation and habitats of indigenous fauna from effluent and sludge discharges onto or into land.

Method 4.3.1 - 4.3.15

Explanation
Discharges of effluent or sludge onto or into land has the potential to adversely affect significant indigenous vegetation and habitats of indigenous fauna. These adverse effects can arise from the direct discharge into or onto land which supports the significant indigenous vegetation and habitats of indigenous fauna, or from the indirect contamination of water from discharges into or onto land. Where discharges occur it is important that adverse effects on significant indigenous vegetation and habitats of indigenous fauna are avoided where practicable, remedied or mitigated.

Policy 4.2.16 - Stock Truck Effluent

Encourage the use of holding tanks on stock trucks.

Method 4.3.1, 4.3.3, 4.3.9

Explanation
Effluent that is discharged onto roads from stock trucks has the potential to be washed into stormwater drains and enter water, thereby adversely affecting water quality. In addition, the effluent can cause a nuisance to other road users, as well as having an adverse effect on public health. Effects of public health are a particular concern where effluent is discharged in urban areas and small rural townships. The use of holding tanks in stock trucks will assist in avoiding such discharges.

The main statutory framework for managing the discharge of effluent from stock trucks on state highways is the Transit New Zealand Act 1989. It is an offence under Section 51(2)(e) of this Act to cause or allow any effluent to flow from any vehicle onto a road or into a ditch or drain associated with the road. Anyone breaching this section is liable to be fined.

4.3 METHODS

The resource management methods with regard to the discharge of effluent and sludge from sanitary appliances and fixtures, community sewage schemes, agricultural activities and industrial or trade processes are:

5 Setting the Direction

5.1 Objectives

5.1.1 Water Objectives

Water Quality

Issues 1, 4, 6, 7
Policies 1-13, 5-13, 25-27
Rules 1-17, 22
Section 2.3

Objective 1 – Natural State Waters

To maintain the quality of water where it is in its natural state.

Explanation
Natural state water quality occurs in waters on land managed by the Department of Conservation where the overall water quality is unaffected or largely unaffected by human activities. Water bodies where the water quality is in a natural state are generally low in nutrients and the riverbed substrate is comprised predominantly of gravels with a relatively small proportion of fine sediment. For the purposes of the water quality section of this Plan, "Natural State Waters" means waters that are either within National Parks (including land for the time being administered as if it was a national park pursuant to any statute or written agreement with the owners) and/or waters within other areas of public conservation land, where the overall water quality is largely unmodified or unaffected by human activities and have been identified in Table 1 "Natural State Waters outside National Parks" in Appendix M "Natural State Waters outside National Parks" of this Plan. In either situation these waters should be protected so there is no net deterioration in quality. Natural state water quality is a standard specified in the Third Schedule of the Act. It requires that the natural quality of the water shall not be altered and, as with all standards, applies after a zone of reasonable mixing of any contaminant or water with the receiving water, disregarding the effect of any natural perturbations that may affect the water body.

Issues 1-4, 6, 7
Policies 1-13, 25-27
Rules 1-17, 22
Section 2.3

Objective 2 – Maintain water quality

To manage water quality so that there is no reduction in the quality of the water in any surface water body, beyond the zone of reasonable mixing for discharges, below that of the date this Plan became operative (January 2010).

Explanation
This objective adopts the philosophy of Section 69(3) of the Act. It reflects the fact that in many parts of Southland, particularly in lowland surface water bodies, water quality is poor and should not be allowed to deteriorate further. It also reflects the fact that there are areas of very

high quality water outside Natural State Waters, which should be protected from any overall deterioration in quality. While a one-off or temporary discharge with no long-term impacts on water quality may be acceptable into this high quality water, a discharge that will result in long-term or permanent deterioration in water quality would not be acceptable. One of the main purposes of this objective is to take into account the cumulative effects of discharges into water.

Objective 3 – Surface water bodies other than in Natural State Waters

Issues 1, 6, 7
Policies 1, 3, 4, 6-13
Rules 1, 2, 3A-17
Section 2.3

To maintain and enhance the quality of surface water bodies so that the following values are protected where water quality is already suitable for them, and where water quality is currently not suitable, measurable progress is achieved towards making it suitable for them.

In surface water bodies classified as mountain, hill, lake-fed, spring-fed, lowland (hard bed), lowland (soft bed) and Mataura 1, Mataura 2 and Mataura 3:

(a) bathing, in those sites where bathing is popular;
(b) trout where present, otherwise native fish;
(c) stock drinking water;
(d) Ngāi Tahu cultural values, including mahinga kai;
(e) natural character including aesthetics.

In surface water bodies classified as mountain lakes and hill lakes:

(a) bathing
(b) trout
(c) Ngāi Tahu cultural values, including mahinga kai
(d) natural character including aesthetics

In surface water bodies classified as lowland/coastal lakes:

(a) native migratory fish;
(b) stock drinking water;
(c) healthy aquatic habitats;
(d) Ngāi Tahu cultural values, including mahinga kai;
(e) natural character including aesthetics

Explanation
In many areas of Southland, water quality is degraded. The first priority is to ensure that the water quality does not degrade further. The objective is then to improve the quality so that it can support the relevant uses and values. The objective shows the values that the consultative process identified for waterbodies outside Natural State waters. Appendix G details the water quality parameters and relevant standards that have been identified as being necessary to protect these values by focusing on the critical or most sensitive values for each waterbody. These "critical values" were agreed through the consultative

process. Measurement and monitoring of these parameters will determine whether or not the objectives are being met. Examples of parameters and standards that are relevant to natural character and aesthetics of water quality include conditions relating to bacterial and fungal slime growths and visual clarity.

Contact recreation standards are appropriate in areas that are regularly used for bathing and also in hill and mountain lakes where water quality is high. In other water bodies, this standard is unrealistic in the short term. Protection of the instream ecosystem is a more appropriate goal. Maintaining habitat suitable for trout or native fish, as appropriate, will ensure protection of the macroinvertebrate, aquatic plant and periphyton communities on which they depend. All water should be suitable for stock to drink and to support Ngāi Tahu's cultural values. Lowland lakes are at risk of eutrophication, hence the objective to protect against excessive enrichment and excessive sedimentation.

Several values are common to a number of different surface water body types. However, achieving the objective may require different tools or take longer, depending on the water classification of the surface water body. These goals will not be met overnight. The objective is therefore to make progress towards achieving them. Progress will be reviewed by monitoring the specified water quality parameters and trends in these parameters. A lack of progress towards the goals may result in a review of the Plan provisions to require stricter standards.

Issues 1, 6, 7
Policies 1, 3, 4, 6-13
Rules 1, 2, 3A-17
Section 2.3

Objective 4 – Gradual improvement in surface water quality parameters

To manage the discharge of contaminants and encourage best environmental practice to improve the water quality in surface water bodies classified as hill, lowland (hard bed), lowland (soft bed) and spring fed, and in particular to achieve a minimum of 10 percent improvement in levels of the following water quality parameters over 10 years from the date this Plan became operative (January 2010):

(a) microbiological contaminants
(b) nitrate
(c) phosphorus
(d) clarity

Explanation

The quality of water in many surface water bodies does not currently meet the goals in Objective 3. Improvements in lowland streams may be hardest to achieve, due to prevalence of intensive farming in the catchments, and upstream cumulative effects. Discharges of the contaminants specified into hill, lowland and spring fed classes of water body are the most significant barrier to achieving Objective 3. Achieving a reduction in these contaminants will also result in a reduction of other associated contaminants, for example ammonia. Attempting to achieve them in a short timeframe would require significant constraints on both land use activities and direct discharge of contaminants to water. Achieving the Objective will require each land manager to implement best practice with regard to maintenance of soil health, nutrient budgeting and effluent disposal to ensure that any applied nutrients are absorbed by plants. These practices, coupled with riparian management developed in a way that overland flow is filtered through soil, will reduce nutrient and soil inputs into water bodies. As best management practices are implemented in all sectors of the community and resource consents replaced, parameter levels will indicate improvement and determine if higher targets should be set when the Plan is reviewed.

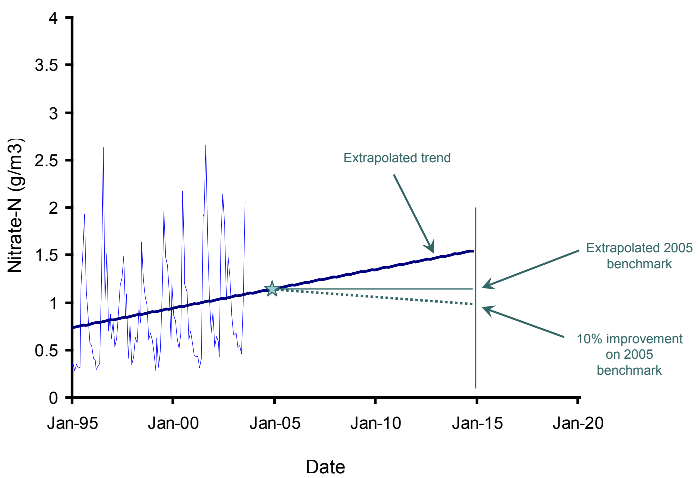
So how will this approach and level of improvement contribute to reversing the present upward trend levels of contaminants in the lowland, hill and spring-fed water bodies and aid in protecting the values and goals identified in Objective 3?

By way of illustration, the figure below shows an example of nitrate concentrations over a ten year period (1995-2004) in the Ōreti River at Wallacetown. The graph provides an example of the potential effect of achieving a 10% improvement in nitrate concentrations.

The data shows a positive trend towards increasing nitrate concentrations. The thick black trend line is extrapolated to estimate the nitrate levels in 2015 based on existing trends. The thin black line extrapolates the current 2005 data to establish a benchmark in which to gauge a 10% improvement over the next ten years. The dashed line shows the minimum10% reduction in nitrate concentrations based on the 2005 benchmark.

This example demonstrates that for some river and lake parameters the increasing trend will first need to stabilise and reverse before any improvement can be measured. If this trend continues its positive momentum (thick black line) a greater overall improvement will be required to first counteract any increase since 2005 and then achieve a further 10% reduction (dashed line).

Oreti River at Wallacetown



An improvement of a minimum of 10 percent over the life of the Plan is considered to be a realistic goal given that in many of the water bodies there is an increasing trend in parameter concentrations affecting water quality and the first task is to reverse this trend and then work toward implementing strategies to measure improvements. The approach taken under this objective does not curtail future options of stricter controls if the current approach to progressing toward the long-term goals through the short-term indicators is unsuccessful in achieving the objectives. At the same time however the approach should ensure the current situation does not deteriorate further.

Management and improvement of discharges to the said water bodies will require a combination of regulatory and non-regulatory mechanisms. The water quality section of the Plan with associated polices and rules is but one intervention or tool to manage discharges of contaminants and recognise for point and non point sources of pollution. The Regional Effluent Land Application Plan, Regional Solid Waste Management Plan, and policies and rules in the bed disturbance section of this Plan govern management of some sources of these contaminants. A number of sites in Southland are monitored regularly for the parameters listed under Objective 4. Monitoring of these sites will determine success at meeting this objective and where necessary stricter controls on resource consents, higher standards for permitted activities, and advocacy, education and incentives to improve practices that result in the discharge of contaminants through non-point means will be implemented.

Water Quantity Objectives

(see also Section 5.1.2 Groundwater Objectives)

Issues 2, 3, 5
Policies 14-23, 28-31
Rules 18-21, 23
Section 2.3

Objective 5 – Sufficient water availability

To have sufficient water to support the reasonably foreseeable needs of current and future generations and enable people and communities to provide for their social, economic and cultural wellbeing while protecting aquatic ecosystem health and the life supporting capacity and natural character of surface water bodies.

Explanation
Surface water bodies within the region sustain a wide range of instream values, such as ecological, recreational, landscape and cultural values, and out-of-stream uses, such as abstraction, damming and diversion for social and economic purposes. There can be conflict between these values and uses, particularly when water is limited during times of low flow. The objective is to balance these competing values and uses so people are able to provide for their social, economic and cultural wellbeing, but in a way that protects the health and life-supporting capacity of ecosystems.

It is assumed that, by aiming to protect aquatic ecosystem health and the life supporting capacity of surface water bodies, associated ecological, recreational, landscape and cultural values will also be protected to a level that is acceptable to the community. The term "ecological values" refers to the value of all vegetation and fauna that may be present within and dependant on a water system. For practical purposes, the most important ecological values that need to be considered under this objective are areas of significant indigenous vegetation, significant habitats of indigenous fauna, and the habitats of trout and salmon. It should be noted certain activities affecting surface water bodies (such as restoration of existing habitats and creation of new habitats, through damming and diversion) can result in the enhancement of ecological values.

Objective 6 – The Waiau catchment

Issue 3
Policies 19, 19A
Rule 21
Section 2.3

To provide for the national importance of the existing hydro-electric generation in the Waiau catchment, and recognise the resultant modified flow and level regime.

Explanation
The operation of the Manapōuri Power Scheme and its use of the water resources of Lakes Manapōuri and Te Anau, the Waiau and Mararoa Rivers and tributaries, was provided for by the Manapōuri - Te Anau Development Act 1963. The Scheme was commissioned in 1972 and is of national and local importance, both in its contribution to the nation's electricity generating capacity and to the operation of the New Zealand Aluminium Smelters facilities at Tiwai – the largest electricity consumer in New Zealand. Under the provisions of the Resource Management Act 1991 it is appropriate to provide for the continued use of this water resource of national importance. However this use and future uses are required to be undertaken in a manner that avoids, remedies or mitigates the adverse effects on the environment. The modified environmental flow and level regimes of the Waiau catchment provide some mitigation of the adverse effects on the ecosystem. Other remedial actions are also in place. Opportunities exist for ongoing mitigation and remediation that will result in the enhancement of ecological values. These activities need to be managed positively.

Objective 7 – Efficient Water Use

Issues 2, 3, 5
Policies 20-24
Rules 18-21, 23
Section 2.3

To maximise the efficiency of water use.

Explanation
This objective is consistent with Objective 4.4 of the Regional Policy Statement, which is to achieve the efficient use of water extracted from water bodies. It is also consistent with Section 7(b) of the Resource Management Act 1991, which provides that particular regard must be given to the efficient use and development of natural and physical resources.

Efficiency can be interpreted in many different ways but in terms of water use generally refers to achieving a given outcome using the least amount of water practicable thereby avoiding waste and maximising availability of the water resource.

5.1.2 Groundwater Objectives

(see also Section 5.1.1 Water Quality and Quantity Objectives)

Issue 4
Policies 25-27
Rules 3, 22
Section 2.3

Objective 8 – Drinking Water Standard

(a) To maintain groundwater quality in aquifers that already meet the *Drinking-Water Standards for New Zealand 2000*; and

(b) To enhance groundwater quality in aquifers degraded by land use and discharge activities (with the exception of those aquifers where ambient water quality is naturally less than the *Drinking-Water Standards for New Zealand 2000*) to ensure general compliance with the *Drinking-Water Standards for New Zealand 2000* by the year 2010.

Explanation
Groundwater is extensively used for drinking water within the region, with a significant percentage of rural properties reliant on groundwater to some extent for domestic and/or stock water. The widespread use of groundwater for drinking reflects both the importance of the resource, and the expectation within the community that groundwater should be suitable for both human and stock consumption without the need for treatment.

The suitability of water for human consumption is measured against the *Drinking-Water Standards for New Zealand 2000* (DWSNZ 2000) which set Maximum Acceptable Values (MAVs) for a range of contaminants. Recent studies in Southland suggest that the vast majority of groundwater currently falls within these limits, and is safe for human consumption. However, a small percentage of groundwater samples show nitrate and faecal coliform bacteria levels either above or approaching the MAVs.

The objective, therefore, is to maintain high quality groundwater in a state that is suitable for human consumption, and to enhance groundwater quality in aquifers degraded by land use and discharge activities to a drinkable standard (except for those aquifers that have naturally high levels of substances, such as iron, which reduce the suitability of groundwater for human consumption in the first instance). In addition, the objective links to Policy 25, which allows for localised impacts resulting from point source and non-point source discharges provided there is no deterioration of groundwater quality in the receiving aquifer after reasonable mixing, unless it is consistent with the promotion of the sustainable management of natural and physical resources, as set out in Part 2 of the Resource Management Act 1991, to do so.

The objective also recognises that there may be a significant time lag between changes in land use practice and resulting effects on groundwater quality.

Objective 9 – Sustainable abstraction

Issue 5
Policies 17, 20-23, 28-31
Rule 23
Section 2.3

To ensure that the total volume and rate of groundwater abstraction is sustainable.

Explanation
Significant quantities of groundwater are extracted from aquifers within the region for important social and economic purposes, including domestic, farm, municipal and industrial supply. With changing land use practices, the abstraction and use of groundwater is on the increase, yet there is an expectation within the community that this use will be sustainable, and that water will continue to be available for current and future users.

The objective, therefore, is to ensure that groundwater abstraction, over both the short and long-term, is carried out in a sustainable manner. This means that the volume and rate of abstraction needs to be set at levels which ensure aquifer storage volumes and minimum surface water flows are maintained. The sustainable management of groundwater will ensure that the water resource continues to be available for human use and continues to sustain natural values such as aquatic ecosystems and habitats.

5.1.3 River Bed (including beds of streams and modified watercourses) and Lake Bed Use and Development Objectives

Objective 10 – Habitats and ecosystems

Issue 6
Policies 32-36
Rules 24-48
Section 2.3

To maintain or enhance the diversity and integrity of aquatic and riverine habitats and ecosystems.

Explanation
The phrase "diversity and integrity of aquatic and riverine habitats and ecosystems" means the range of habitat and ecosystem types within river and lake beds and their integrity or life-supporting capacity. The objective recognises that habitats, being the natural places where organisms live, are an essential part of healthy ecosystems[42]. Many habitats and ecosystems within river and lake beds have been lost or

[42] As well as requiring suitable habitat, aquatic organisms need water of sufficient quality and quantity to survive. The Water Quality and Water Quantity sections contain objectives which seek to have levels of water quality and quantity that will, in combination with the right habitat, support healthy ecosystems.

degraded through use and development, and should at least be maintained, and where possible enhanced.

The objective recognises that healthy ecosystems have intrinsic value and support a range of human uses that are fundamental to the economic, social and cultural wellbeing of communities. It is also a matter of national importance under the Act to recognise and provide for the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna, while particular regard must be had to the protection of trout and salmon habitat.

Issue 6
Policies 32-36
Rules 24-48
Section 2.3
Appendix C

Objective 11 - Heritage

To protect significant heritage values from the adverse effects of activities in the beds of rivers and lakes including archaeological sites and wāhi tapu.

Explanation
The objective is that significant heritage values in the beds of rivers and lakes will be protected. The objective applies to areas or sites of significance to the general community (e.g., archaeological sites and historic structures), as well as to sites that have particular significance to the tāngata whenua (e.g. wāhi tapu and other taonga).

The objective recognises that heritage sites are fundamental to the sense of identity of the community, and may have social, technological, cultural or spiritual significance. In addition, it is a matter of national importance under the Act to recognise and provide for the relationship of Māori with culturally significant sites. Statutory Acknowledgment areas are areas where the Crown has acknowledged Ngāi Tahu's special relationship with identifiable areas, namely Ngāi Tahu's particular cultural, spiritual, historical and traditional association with these areas. These areas were identified in the Ngāi Tahu Claims Settlement Act 1998 (the Settlement Act) and are described in Appendix C of this Plan. The Settlement Act also sets up a range of other sites and information that may be relevant to any applicant or consent holder, or to the public generally. The Statutory Acknowledgement areas and other sites and information have significant heritage value for Ngāi Tahu. However, it should be noted that not all the areas identified in Appendix C are areas within the jurisdiction of this Plan. Particular regard must also be had to the recognition and protection of heritage values.

Issue 6
Policies 32-36
Rules 24-48
Section 2.3

Objective 12 – Public access

To maintain and enhance public access to river beds (including beds of streams and modified watercourses) and lake beds except in circumstances where public health and safety are at risk.

Explanation
Public access to Crown land and land held by local authorities for the purpose of public access in river or lake beds is a traditional right and is important for social, cultural and recreational reasons. The Act recognises this right by stating that the maintenance and enhancement of public access to and along lakes and rivers is a matter of national importance. Activities that take place on Crown land and land held by local authorities for the purpose of public access in river and lake beds should therefore be carried out in a way that either maintains or enhances public access, unless it is necessary to restrict access for safety reasons. It is necessary for operators of electricity generation infrastructure to restrict public access to their assets including hydro lakes and canals in a range of circumstances. For example, large intake structures often need to be fenced off to prevent people swimming near them. Fixed machinery and other areas where automated machinery operates may also need to be fenced off for safety, security and operational reasons. Similarly, the water discharged from a power station is often oxygenated and therefore presents a buoyancy hazard for prospective swimmers and boat users.

The objective is aimed at maintaining or enhancing public access where the right of access currently exists (i.e. on Crown land and land held by local authorities for the purpose of public access). However, it is recognised that a number of river beds within the region are in private ownership, and there is no traditional right of public access to these areas. It is also acknowledged that the riparian margins of some rivers have no "Queens Chain" right of access. The objective does not apply to these areas.

Objective 13 – Natural character and outstanding natural features

Issue 6
Policies 32-36
Rules 24-48
Section 2.3

To protect natural character and outstanding natural features of rivers and lakes from inappropriate use and development.

Explanation
High levels of natural character and outstanding natural features are still found in many rivers and lakes, particularly in the less developed upper catchments and on Conservation land. More developed lowland rivers and lakes may lack the level of natural character present in less modified rivers and lakes, however they may still retain strong elements of natural character (e.g., channel form, bed rapids, seasonably variable flows and natural habitats).

The objective recognises the importance of the natural character of rivers and lakes within the Southland landscape. It is also a matter of national importance under the Act to recognise and provide for the preservation of the natural character of rivers and lakes from inappropriate use and development.

Explanations and Principal Reasons for Objectives

General Note for all Objectives

Under Section 69(3) of the Resource Management Act 1991, a regional council is not allowed to set standards in a plan which result, or may result, in a reduction of the quality of water existing at the time of public notification of its proposed plan, unless it is consistent with the purpose of the Act to do so. The purpose of the Act is to promote the sustainable management of natural and physical resources.

5.2 Policies

5.2.1 Water Policies

Water Quality

Policy A4 of the National Policy Statement for Freshwater Management 2011

1. When considering any application for a discharge the consent authority must have regard to the following matters:

   a. the extent to which the discharge would avoid contamination that will have an adverse effect on the life-supporting capacity of fresh water including on any ecosystem associated with fresh water and
   b. the extent to which it is feasible and dependable that any more than minor adverse effect on fresh water, and on any ecosystem associated with fresh water, resulting from the discharge would be avoided.

2. This policy applies to the following discharges (including a diffuse discharge by any person or animal):
   a. a new discharge or
   b. a change or increase in any discharge –
   of any contaminant into fresh water, or onto or into land in circumstances that may result in that contaminant (or, as a result of any natural process from the discharge of that contaminant, any other contaminant) entering fresh water.

3 This policy does not apply to any application for consent first lodged before the National Policy Statement for Freshwater Management takes effect on 1 July 2011.

Objectives 1-4
Issues 1, 6, 7
Rules 1, 2, 3A-17
Section 2.3

Policy 1 – Surface water body classes

(a) Recognise the different characteristics of the following surface water body classes when managing discharges:

- (i) Natural State Waters
- (ii) Lowland (hard bed)
- (iii) Lowland (soft bed)
- (iv) Hill
- (v) Mountain
- (vi) Lake-fed
- (vii) Spring-fed
- (viii) Mataura 1
- (ix) Mataura 2
- (x) Mataura 3
- (xi) Lowland/coastal lakes and wetlands
- (xii) Hill lakes and wetlands
- (xiii) Mountain lakes and wetlands

(b) Apply water quality standards established under any Water Conservation Order.

Explanation
Surface water bodies within Southland have been grouped into a number of classes as listed in Policy 1 above. Appendix D contains water quality maps showing which class each surface water body falls into. In addition, the definitions of Natural State and Spring-fed in the Glossary of the Plan should be referred to for the detail of the waters included in (and excluded from) those two classifications.

Recent analysis of water quality at sites throughout Southland (Ryder Consulting 2004) shows that differences in water quality between river types are fairly subtle. River type, based on 'source of flow' from the River Environment Classification system developed by NIWA, correlates quite closely with land-use and this is likely to influence the water quality and benthic ecosystems. For rivers and streams, the classes chosen are similar to those used to determine critical values in the water quantity section of this Plan. 'Lowland' water bodies are split into 'soft bed' and 'hard bed' to reflect the different ecosystems found in these two environments. Standards for mountain, hill and lowland/coastal lakes and wetlands have been set using parameters more appropriate for these water bodies. The Mataura River has its own standards reflecting the provisions of the Water Conservation Order (Appendix G "Water Quality Standards"). Except for particular situations specified in the Conservation Order (sections 5(2) and 7(2)), water and discharge permits that contravene these standards may not be granted.

The classes chosen allow the various water bodies to be managed to particular standards depending on their existing water quality, surrounding land-use and values. For example the standards set for the 'mountain' class are high, reflecting the existing high water quality, undeveloped catchments and the expectation that water quality should remain high. The standards for lowland rivers are lower and more realistic for these water bodies, given the existing water quality and the highly developed nature of the surrounding land.

Objectives 1-4, 8
Issues 1, 4, 6, 7
Rules 1-17, 22
Section 2.3

Policy 2 – Natural State Waters

Provide for discharges to Natural State Waters only where there will be no measurable adverse effects on existing water quality beyond the zone of reasonable mixing, unless it is consistent with the sustainable management of natural and physical resources as set out in Part 2 of the Resource Management Act 1991.

Explanation
Water quality within Natural State Waters is largely unaffected by human or animal activity. The water quality within these waters should be protected. Discharges to water within Natural State Waters should be avoided where practicable, but where they are unavoidable, should not result in any deterioration of the water quality beyond the zone of reasonable mixing. This policy therefore gives effect to Section 69(3) of the Act. Minor discharges with temporary adverse effects may be acceptable, but a long-term deterioration of water quality is not. Section 107(2) of the Act provides that the Council may grant a discharge permit to allow a discharge which after reasonable mixing is likely to give rise to all or any of the effects described in Section 107(1) of the Act if it is satisfied that:

(a) exceptional circumstances justify the granting of the permit; or
(b) the discharge is of a temporary nature; or
(c) the discharge is associated with necessary maintenance work;

and that it is consistent with the sustainable management of natural and physical resources set out in Part 2 of the Act.

Objectives 1-4, 8
Issues 1, 4, 6, 7
Rules 1-17, 22
Section 2.3

Policy 3 – No reduction in water quality

Notwithstanding any other policy or objective in this plan, allow no discharges to surface water bodies that will result in a reduction of water quality beyond the zone of reasonable mixing, unless it is consistent with the promotion of the sustainable management of natural and physical resources, as set out in Part 2 of the Resource Management Act 1991, to do so.

Explanation
Section 69 (3) of the Act states that:

"Subject to the need to allow for reasonable mixing of a discharged contaminant or water, a regional council shall not set standards in a plan which result, or may result, in a reduction of the quality of the water in any waters at the time of the public notification of the proposed plan unless it is consistent with the purpose of this Act to do so."

Water quality standards for different classes of surface water bodies have been set in Appendix G "Water Quality Standards". However, where the existing water quality in any surface water body is higher than the standards set for that water body, there is a need to ensure water quality does not deteriorate down to the standards unless it is consistent with the promotion of the sustainable management of natural and physical resources, as set out in Part 2 of the Resource Management Act 1991, to do so. There is also a need to ensure that the cumulative effect of all discharges does not result in deterioration. This policy therefore provides guidance to Council to ensure that the individual and cumulative effect of discharges does not threaten water quality and puts the onus on applicants to prove that any proposal to lower water quality meets the purpose of the Act. Section 107(2) of the Act provides that the Council may grant a discharge permit to allow a discharge which after reasonable mixing is likely to give rise to all or any of the effects described in Section 107(1) of the Act if it is satisfied that:

(a) exceptional circumstances justify the granting of the permit; or
(b) the discharge is of a temporary nature; or
(c) the discharge is associated with necessary maintenance work;

and that it is consistent with the sustainable management of natural and physical resources set out in Part 2 of the Act.

Policy 4 – Surface water bodies outside Natural State Waters

Objectives 1-4
Issues 1, 6, 7
Rules 1, 2, 3A-17
Section 2.3

For surface water bodies outside Natural State Waters, manage point source and non-point source discharges to meet or exceed the water quality standards referred to in Rule 1 and specified in Appendix G "Water Quality Standards", unless it is consistent with the promotion of the sustainable management of natural and physical resources, as set out in Part 2 of the Resource Management Act 1991, to do so and so avoid levels of contaminants in water and sediments that could harm the health of humans, domestic animals including stock and/or aquatic life.

Explanation

Surface water bodies have been grouped into a number of classes as listed in Policy 1 above. Water quality standards for each class are detailed in Appendix G "Water Quality Standards". Appendix D contains water quality maps showing which class each water body falls into. The standards apply following reasonable mixing with the receiving water. Managing discharges to ensure compliance with these standards following reasonable mixing will avoid levels of contaminants in water and sediments that could harm the health of humans, domestic animals including stock and/or aquatic life. Where water quality in any surface water body is higher than the standards set for that water body, Policy 3 provides that it will not be allowed to deteriorate down to those standards unless it is consistent with the promotion of the sustainable management of natural and physical resources, as set out in Part 2 of the Resource Management Act 1991, to do so.

The standards used are as follows:

Temperature
Trout have a narrow range of thermal preferences, with lethal effects occurring at 24 – 30^{o}C for adults. Native fish can survive in temperatures higher than those likely to be found in Southland's surface water bodies. Mayflies, which are favoured food for trout, are one of the macroinvertebrate species most sensitive to temperature. They have an LT50 (the temperature at which half will die) of 22.6^{o}C. An upper limit of 23^{o}C for the receiving water has therefore been set for lowland and hill country rivers. For mountain rivers, lake outlets and springs a lower temperature of 21^{o}C is more appropriate and in keeping with the natural temperature regime. In addition to this, the natural or existing water temperature shall not be exceeded by more than 3°C when the natural or existing water temperature is 16°C or less. For example, if the natural temperature of a river was 15°C then the maximum temperature in keeping with the standards would be 18°C. If the natural or existing water temperature is above 16°C, the natural or existing water temperature shall not be exceeded by more than 1°C.

A maximum of 11^{o}C between May and September is set for water classes that may support trout spawning. In all classes, a maximum change in temperature of 3^{o}C is set. This reflects the standard in the Third Schedule of the Act for water managed for fishery purposes and fish spawning purposes.

pH
Low pH can have a direct adverse effect on aquatic life. Most low pH streams in Southland are as a result of natural acids from forests and wetlands. ANZECC 1992 guidelines specify a pH range of 6.5 – 9. This is appropriate for lowland and hill streams, but a narrower range of between 7.2 – 8 is more appropriate for other river systems. This reflects the higher standard in the ANZECC 2000 guidelines. In addition, a standard requiring that there shall be no pH change due to a discharge that results in a loss of biological diversity or a change in community composition is considered appropriate.

Dissolved oxygen (DO)
The most sensitive species to low levels of DO are trout and mayflies, both of which represent important components of Southland's water bodies. The dissolved oxygen (or saturation) concentration standard proposed for lowland streams is 80%. This reflects water classes (Classes AE, F, FS, SG waters) specified in the Third Schedule of the Act. A higher saturation concentration standard of 99% (ANZECC 2000 guidelines) is considered more appropriate for mountain, lake fed and spring fed water bodies.

Bacterial and fungal slime growths, such as sewage fungus, are undesirable in any water bodies, and a standard limiting their growth is proposed.

Water clarity
Water clarity is important because of its effect on instream ecology, recreation and aesthetic value. The ANZECC 2000 guidelines for lowland and hill country rivers are proposed. For mountain, lake fed and spring fed water bodies, which have high clarity, a higher standard is set.

Ammonia
Ammonia is toxic to aquatic organisms. It is present as a result of breakdown of organic matter and as a contaminant from wastewater discharges and run-off. The ANZECC 2000 trigger values for total ammonia are used.

Faecal coliforms/*Escherichia coli*
Faecal contamination is a serious issue in Southland's surface water bodies. Many water bodies currently grossly exceed guidelines for contact recreation and stock drinking water. It is not feasible, given the level of agricultural development in the region, to meet the contact recreation standard for all water bodies. For lowland, hill and spring-fed water bodies, the stock drinking water guideline is considered appropriate, apart from those areas that are regularly used for bathing. For those areas, and for mountain and lake-fed water bodies which have inherently higher water quality, the contact recreation standard is appropriate. It is expected that it will take 10 to 15 years to achieve these standards. A schedule of those areas that are regularly used for bathing that are to be managed for contact recreation purposes is included as Appendix K "Popular Bathing Sites".

Periphyton
High levels of nutrients can result in excessive growths of algae, which can affect biodiversity and aesthetic value. However, nuisance growths only develop when temperature conditions are right and there are sustained periods of stable flow. Setting guidelines for periphyton growth ensures that the effect of high nutrient levels is managed, rather than the levels of nutrients themselves, which may cause no problems if other conditions are not conducive to algal growth.

The MFE guidelines for periphyton growths in gravel and cobble streams are used. For lowland streams, the least stringent guideline (for trout habitat and angling) is set. For hill and mountain streams, the aesthetic/recreation guidelines is used, and for spring and lake outlet streams, the benthic biodiversity guideline.

Macroinvertebrate Community Index
The macroinvertebrate community index (MCI) assesses habitat quality by considering the community composition and how tolerant particular species or groups are to poor water quality. It can give an indication of how polluted or organically enriched a water body is. Communities less tolerant of pollution might be expected to be found in cleaner water bodies. The highest MCI is set for mountain streams, with the second

highest for hill streams, then lake bed, spring fed and lowland hard-bedded streams. Lowland soft-bedded streams can be expected to support a community indicative of the lowest MCI score.

Objectives 1, 2
Issue 1
Rules 3-17
Section 2.3

Policy 5 – Discharges to water in artificial watercourses

Manage discharges to water in artificial watercourses so that any new discharge, in conjunction with existing discharges, does not reduce the water quality of the surface water body into which the artificial watercourse flows below any standards set for the surface water body in Appendix G "Water Quality Standards" following a zone of reasonable mixing from the point of confluence of the artificial watercourse with the surface water body.

Explanation
Artificial watercourses include irrigation canals, water supply races, canals for the supply of water for electricity power generation and farm drainage canals. They do not include modified (e.g. straightened) natural surface water bodies. Some artificial watercourses do have aquatic ecosystem values although they are not generally constructed for this purpose. Water quality standards have not been set for artificial watercourses and the management of discharges to them will depend on the particular values that are present.

This policy seeks to address the cumulative effects of discharges into artificial watercourses by requiring new discharges, in conjunction with existing discharges, to meet the water quality standards of the surface water body into which the artificial watercourse flows following a zone of reasonable mixing from the point of confluence.

Objectives 1-4, 8
Issues 1, 4, 6, 7
Rules 1-17, 22
Section 2.3

Policy 6 – Non-regulatory methods

(a) Use non-regulatory methods, in addition to rules, to maintain and enhance water quality.

(b) Assess on an ongoing basis whether the adoption of non-regulatory methods has resulted in improvements to water quality, and consider the introduction of other interventions if improvements have not resulted.

Explanation
Non-regulatory methods include approaches such as education, promotion, provision of incentives or rewards, and best management practices. These methods are a key tool in achieving the stated objectives and can be used independently of or in conjunction with rules. Non-regulatory methods are also necessary to promote environmental awareness and good practice.

For the reasons outlined below, non-regulatory methods for point source and non-point source discharges in Southland need to focus on:

(a) reducing faecal contaminant inputs to water;
(b) reducing nutrient inputs to water;
(c) avoiding or reducing discharges that increase Biochemical Oxygen Demand (BOD) in the water;
(d) reducing inputs of contaminants that alter colour and clarity of the water.

Methods to achieve the above include, but are not limited to, the following best management practices:

- keeping stock out of streams and riparian margins;
- establishing or maintaining a dense ground cover in the riparian margin;
- riparian vegetation planting that shades water bodies, assists in minimising sediment, animal faecal matter and nutrients entering water bodies, and promotes bank stability;
- adopting good soil conservation practices;
- appropriate nutrient management, including use of nutrient budgeting tools;
- applying effluent when there is a soil moisture deficit (as opposed to when soils are saturated);
- appropriate management of installed sub-surface drainage systems;
- managing stocking rates;
- using low erosion risk cultivation methods;
- undertaking appropriate track placement and construction;
- putting in place measures to minimise erosion before undertaking earthworks or forestry activities;
- establishing catchment and sub-catchment groups/committees and catchment and sub-catchment management plans;
- adopting sustainable drain/stream management techniques when constructing and maintaining drains and streams; and
- following industry Codes of Practice and guidelines where they exist.

It is recognised that it may not be possible to adopt "best management practices" in every circumstance, in which case adoption of the best practicable option is acceptable.

To achieve the Plan's objectives, Environment Southland will continue to actively promote best management practices in relation to land management and point source and non-point source discharges. Environment Southland will also continue to support and promote local and national codes of practice, provide advice on appropriate best management practices and work with territorial authorities and government bodies in developing joint approaches to water quality issues such as wetlands.

If ongoing assessment shows there is no evidence that adoption of non-regulatory methods has resulted in an improvement in water quality, then the need for increased regulation, will be considered and a plan change initiated if necessary.

Need for non-regulatory methods
Many Southland surface water bodies are susceptible to nuisance algal growths during summer months. For example, toxic cyanobacteria algal mats have been recorded in the Mataura River. Nuisance algal growths are excessive biomass accumulation. Algae becomes a nuisance when it is of a type and/or extent that instream management objectives are compromised e.g. extensive algae may make the surface water body undesirable for swimming, clog water intakes, clog whitebait nets, degrade benthic invertebrate communities or impair spawning habitat for native fish. A reduction in nutrients can help prevent nuisance algal growths. The availability of phosphorus limits algal growth in many of Southland's rivers. Nitrogen limits algal growth in estuaries and in the headwaters of some rivers.

It should be noted that high levels of nutrients are not enough on their own to cause nuisance or toxic algal growths. The lack of major freshes will result in periphyton accumulation. Climatic factors also play a role in periphyton accumulation. However, reduction of nutrient inputs is something that can be controlled by people while climate is largely beyond human control. Nutrients enter water bodies via seepage into groundwater, bound to soils or via overland flow as well as through point source discharges. The policy aims to reduce nutrient levels in point source discharges, to encourage the adoption of best management practices to reduce the amount of nutrients entering freshwater bodies via non-point source discharges and to encourage soil conservation practices that keep high quality fertile soils on the land.

Biochemical oxygen demand (BOD) measures the strength of a waste, and its ability to remove dissolved oxygen from water by decomposition. BOD levels in Southland have reduced. It is important to avoid or reduce discharges such as nitrogen based compounds and carbon based compounds that increase BOD in Southland surface water bodies if they are to be suitable for native fish and salmonids.

This policy recognises the need for a reduction of inputs of faecal material into these rivers. Reducing the amount of faecal material entering water bodies is critical to ensuring compliance with stock drinking water and contact recreation guidelines. The loss of riparian vegetation has resulted in the reduction in the quality of the in-stream environment. This adds to increased erosion, flooding, decreased habitat and allows for an increase in overland contaminants reaching the water body. Riparian vegetation has beneficial effects in farmed catchments, reducing the detrimental effects of runoff and stock access and helping maintain healthy aquatic environments. Fostering such management practices helps reduce the amount of nutrients entering the water. In addition, reducing faecal contamination will assist with improving water quality in estuaries and shellfish gathering areas, as required by the Coastal Plan.

This policy also recognises that not all water bodies run clear naturally, i.e. some are humic stained. Most of these water bodies are lowland water bodies. Hill country water bodies should have good colour and clarity. Some rivers are carrying a high sediment loading and that has downstream adverse effects in estuaries, increases the frequency at which mechanical drainage work is required, and adversely affects the habitat quality for native fish and trout. Reducing the amount of sediment entering the water bodies through best management practices will help to address some of these issues.

Land management practices can disturb the land to the extent that soil is washed away by rainfall and end up as sediment in surface water bodies. Suspended sediment reduces light penetration, reducing water clarity. This can affect both river ecosystems and recreational uses of the water body such as angling or swimming. Sediment that settles out on the streambed can smother trout redds and the habitat for benthic invertebrates.

Application of fertiliser or agricultural effluent can, if poorly managed, result in large quantities of nutrients leaching into groundwater or washing directly into surface water bodies. The current Code of Practice for Fertiliser Use provides advice and guidelines that can minimise adverse effects on water bodies. Nutrient budgeting tools are also available. The Regional Action Plan (2004) for implementation of the Dairying and Clean Streams Accord sets a target of 100 percent of dairy farms having in place systems to manage nutrient inputs and outputs by 2007. The need to balance nutrients also applies to other farming systems.

Policy 7 – Prefer discharges to land

Objectives 1-4
Issue 1
Rules 1-3A, 11, 12, 14
Section 2.3

Prefer discharges to land over discharges to water where this is practicable and the effects are less adverse.

Explanation

The adverse effects of discharges on surface water quality can largely be avoided by removing the discharge from surface water altogether. This policy is derived from Regional Policy Statement Policy 5.4 "Utilise land treatment of liquid wastes where this can be undertaken in a sustainable manner and without significant adverse environmental effects".

In many cases, the discharge of contaminants to land is a practical alternative to discharging to water. Often, there are less adverse effects associated with discharging to land, and in fact there can be benefits (e.g. discharge of effluent promoting pasture growth). In these circumstances, the Council will prefer discharges to land. However, the Council recognises that discharges to land can have adverse effects on surface water bodies, groundwater and soil quality (e.g. through runoff or leaching), and will not be practicable in every case.

Policy 8 – Discharges to water

Objectives 1-4
Issue 1
Rules 1-3A
Section 2.3

Prefer point source discharges of contaminants to water at times of high flow over discharges at normal or low flows, and ensure that where discharging does take place at low flows, the effects that could not be practically avoided are minimised.

Explanation
When rivers are flowing at above mean annual flow they have a better capacity to assimilate discharges and there are likely to be less adverse effects than at normal or low flows. Where discharges to water cannot be minimised or effects not practically avoided as a result of continuing low flows, adopting contingency methods is a remedy. For example providing capacity for onsite storage of a contaminant will allow for discharge to water at times of high flow. However, it should also be noted that some rivers are used for example by certain fish species i.e. long fin eels during migration and by recreationists for kayaking at high flows, especially the Upper Mararoa, lower Waihōpai, parts of the Mataura and parts of the Waiau. Discharges at high flows may therefore conflict with some recreation and habitat values and may not always be appropriate.

If appropriate, resource consents may state the flows at which discharging may take place and specify measures to be taken to minimise the effects. Those discharging should also take responsibility to minimise the effects of their discharges at low flows.

Note that this policy does not apply to discharges of water to water. Where water quality is as good as or higher than the receiving water and other issues concerning the discharge of water have been addressed, the effect of these discharges at low flows is likely to be minor or may be beneficial.

Policy 9 – Zone of reasonable mixing

Objectives 1-4
Issue 1
Rules 1-3A
Section 2.3

When determining the size of the zone of reasonable mixing, minimise the size of the area where the relevant water quality standards are breached. Consideration should be given to, but not be limited to, the following matters:

(a) the aquatic ecosystem values in the affected reach;
(b) the need for fish passage;
(c) the uses of the water body adjacent to and downstream of the point of discharge

Explanation
A zone of reasonable mixing provides for reasonable mixing of any contaminant or water with the receiving water. The size of the zone of reasonable mixing (the zone where the water quality standards are not met) needs to be determined on a case-by-case basis.

The factors listed above should be considered when determining the size of the zone of reasonable mixing. For example, if water is taken for domestic consumption downstream of a discharge point, the zone of reasonable mixing should be sufficiently small so that water may still be taken unaffected by the discharge.

The size of the zone of reasonable mixing will vary depending on site specific factors including:

(a) the flow rate, velocity and concentration of the discharge;
(b) the design (e.g. number and configuration of outlets) and location of the outfall;
(c) the depth, velocity and rate of turbulent mixing of the receiving water;
(d) the ambient concentrations in the receiving water;
(e) discharge and receiving water temperature;
(f) natural character and amenity values of the receiving environment; and
(g) water body class.

Applicants should consider these factors in order to minimise the size of this area. Resource Management Ideas No. 10 "Reasonable Mixing" produced by the Ministry for the Environment (1994) provides additional guidance on determining the size of the zone of reasonable mixing. In small streams, reasonable mixing is generally considered to have occurred at the point downstream from a sediment discharge where the stream returns to uniform colour and clarity. Determining the size of the zone of mixing in larger water bodies or where a discharge of contaminants that cannot be seen has occurred (e.g. faecal contaminants) is a much more complex process.

It is also important to appreciate that a single discharge containing a number of contaminants may have different sized areas where standards are breached for different contaminants.

Policy 10 - Use of diffusers

Objectives 1-4
Issue 1
Rules 1-3A
Section 2.3

Promote where appropriate, the use of diffusers for point source discharges into water.

Explanation
Various techniques are available to dilute discharges, including dilution at the discharge point (mixing with "clean" water). The method preferred is the use of diffusers that eject the discharge into the water or air to maximise mixing. The purpose of the use of diffusers is to reduce the impacts of discharges in the freshwater environment. They should not be viewed as a means of increasing the concentration or amount of a discharge. Without diffusers there would in many instances be a plume of concentrated effluent flowing from the discharge point, requiring a large zone of reasonable mixing.

Objectives 1-4
Issue 1
Rules 1-3, 11, 12
Section 2.3

Policy 11 – Stormwater discharges

Apply consent conditions requiring consented discharges of stormwater to meet both the ANZECC sediment guidelines (as shown in Appendix E of this Plan) and the relevant water quality standards specified in Appendix G "Water Quality Standards" following reasonable mixing to:

(a) all resource consents for new stormwater discharges; and
(b) all new resource consents for existing stormwater discharges. Unless it is consistent with the purpose of the Act to allow further time, existing discharges will be required to meet the standards and guidelines by 2010 or the date the resource consent commences, whichever is the latter.

Explanation
The policy as been developed to ensure that discharges into surface water meet the ANZECC sediment guidelines and the relevant water quality standards following reasonable mixing with receiving waters from the point of discharge. The policy does not include discharges into reticulated systems as Section 15 of the Act only allows the Council to control discharges from these systems. The Local Government Act 2002 enables territorial authorities to establish Trade Waste Bylaws to control what can be discharged into the stormwater systems in the region. Environment Southland needs to work closely with the territorial authorities to achieve this policy having regard to the practical constraints that exist and the communities' ability to pay for improvements. It is recognised that it would be unreasonable and costly to require existing stormwater systems to comply with water quality standards within the short term. As a consequence, a 10-year period from the date the proposed Plan was publicly notified (30 September 2000) is provided during which those persons or authorities responsible for these discharges can take action to meet the appropriate standards.

It is expected that the prime means of achieving these standards will be through adopting best management practices (or the best practicable option where it is not possible to adopt best management practices) to prevent contaminants entering the stormwater system. This could occur immediately on all new developments and could occur in other areas as upgrades take place. In some cases, it may be necessary to install some form of settling system that captures the first flush of stormwater in a rain event, before it enters a surface water body.

Policy 6 "Non-regulatory methods" is also relevant to stormwater discharges. Environment Southland will support the development and implementation of best management practices such as those contained in the various industry codes of practice and guidelines. The oil industry is one sector that has produced a detailed guideline that addresses management of stormwater discharges from petroleum industry sites

(Environmental Guidelines for Water Discharges from Petroleum Industry Sites in New Zealand, Ministry for the Environment, 1998).

Policy 12 – Application of agrichemicals and vertebrate pest control poisons

Objectives 1-4
Issue 1
Rules 1-3, 4-7
Section 2.3

Promote the application of agrichemicals to control plant (including aquatic plant) pests and the application of vertebrate pest control poisons to control animal pests in a manner that avoids adverse effects on water quality.

Explanation
The need to control plant (including aquatic plant) and animal pests is recognised. Equally, the potential effects of the misuse of agrichemicals and vertebrate pest control poisons and the potential effects of their use on water quality need to be taken into account. This policy provides the basis for the Council to ensure that the application of agrichemicals and vertebrate pest control poisons is carried out in circumstances and using methods that avoid such adverse effects.

Plan users should note that the Hazardous Substances and New Organisms (HSNO) Act 1996 also specifies controls regarding the application of agrichemicals and vertebrate pest control poisons. Compliance with New Zealand Standard 8409: 2004 (Management of Agrichemicals) is a means of minimising the adverse effects of agrichemical application and complying with the conditions of Rules 4 and 5 of this Plan and HSNO regulations.

Policy 13 – Discharge of untreated effluent

Objectives 1-4
Issue 1
Rule 14
Section 2.3

Avoid the point source discharge of raw sewage, foul water and untreated agricultural effluent to water.

Explanation
Discharge of raw sewage and untreated agricultural effluent to water can significantly raise the level of microbial contamination and increase the risk of disease if the water is used for drinking or contact recreation. Furthermore, discharge of sewage is culturally offensive to most people, particularly tāngata whenua. Methods for treating raw effluent are available, as are alternative disposal methods, such as discharge to land. This policy clearly indicates that discharge directly to water from any source, including from boats, is not acceptable.

Objectives 1, 3, 4
Issue 1, 4
Rule 16C
Section 2.3
See also: Policy 4

Policy 13A – Transitional policy relating to effects of new dairy farming[43]

Recognise that new dairy farming in the Region can have adverse effects on water quality.

Objectives 1, 3, 4
Issue 1, 4
Rule 16C
Section 2.3
See also: Policy 4

Policy 13B – Transitional policy relating to change of land use for new dairy farming

(a) Manage the risk of adverse effects of new dairy farming on water quality by requiring a resource consent for the establishment and operation of new dairy farming and by adopting a management plan approach to addressing effects.

(b) When considering any application for resource consent the consent authority (without restricting the matters to be considered) shall have particular regard to:

   (i) As a first priority, the extent to which the proposed new dairy farming would avoid contamination that will have an adverse effect on the life supporting capacity of fresh water, including any ecosystem associated with fresh water;

   (ii) Where contamination cannot be avoided, the extent to which it is feasible and dependable that any more than minor adverse effect on fresh water, or on any ecosystem associated with fresh water resulting from the proposed new dairy farming, would be avoided;

   (iii) The proposed measures to manage adverse effects on water quality, as outlined in a Farm Management Plan prepared for the landholding on which the milking platform is located.

(c) Where the risk of adverse effects on water quality cannot be adequately managed, the Council will consider declining consent to use land for new dairy farming.

Explanation

The Council notes that State of the Environment monitoring shows that water quality at a number of surface water and groundwater monitoring sites in Southland is below standards referred to in Rule 1 and specified in Appendix G "Water Quality Standards" for nitrogen, phosphorus, and clarity. Risks to water quality in the region remain, from a combination of historical and current land uses. These land uses give rise to both point source and non point source discharges that can affect water quality.

[43] The shaded provisions took legal effect from 14 April 2012 (the date of public notification of Plan Change 13), in accordance with Section 86B(3) of the Resource Management Act 1991.

The Council recognises that intensive agriculture, particularly an increase in the number of dairy farms, has the potential to pose risks to water quality in the region. The risks are particularly acute on heavy and very light soils in the region, and arise primarily from non point source discharges of contaminants, including fine sediment, phosphorus, nitrates and faecal bacteria. Policy 13A recognises the effects that new dairy farming can have on fresh water quality.

The Council acknowledges that expansion of the dairy industry in Southland through the establishment of new dairy farming will be a significant contributor to the regional economy. However the environmental effects of new dairy farming are a matter of general public interest, and effects on water quality require management for the sustainability of the industry in the region.

Policy 13B is a transitional regional wide policy and makes the establishment of new dairy farming a discretionary activity in the Southland region.

Rule 16C requires new dairy farming to obtain consent, in order for the Council to ensure that adverse effects and risks to water quality have been considered and will be managed. For the avoidance of doubt, any activities relating to new dairy farming that occur off the landholding where the milking platform is located will not be subject to consent under Rule 16C.

The purpose of the transitional provisions is not to prevent the establishment of new dairy farming, but to ensure each new development is sustainable from an environmental, social, economic and cultural view point.

Inclusion of the word 'transitional' in the headings for each of the policies and the rule reflects the fact that the Council is developing a long-term policy framework that will eventually replace Policies 13A and 13B and Rule 16C. Throughout 2012 and 2013 it is anticipated that new provisions relating to a series of agricultural activities will be publicly notified. Where applicable, these new provisions will replace the transitional policies and rule. The Council has also commenced work on developing water quality load limits and allocating those limits, as required by Policy A1 of the National Policy Statement on Freshwater Management. A timetable for this work will be publicly notified by 30 December 2012.

Water Quantity
(see also Section 5.2.2 Groundwater Policies)

Policy B7 of the National Policy Statement for Freshwater Management 2011

1. When considering any application the consent authority must have regard to the following matters:

    (a) the extent to which the change would adversely affect safeguarding the life-supporting capacity of fresh water and of any associated ecosystem; and
    (b) the extent to which it is feasible and dependable that any adverse effect on the life-supporting capacity of fresh water and of any associated ecosystem resulting from the change would be avoided.

2. This policy applies to:

    (a) any new activity; and
    (b) any change in the character, intensity or scale of any established activity –

    that involves any taking, using, damming or diverting of fresh water or draining of any wetland which is likely to result in any more than minor adverse change in the natural variability of flows or level of any fresh water, compared to that which immediately preceded the commencement of the new activity or the change in the established activity (or in the case of a change in an intermittent or seasonal activity, compared to that on the last occasion on which the activity was carried out).

3. This policy does not apply to any application for consent first lodged before the National Policy Statement for Freshwater Management takes effect on 1 July 2011.

Objectives 5, 9
Issue 5
Rule 23
Section 2.3

Policy 14 – Manage the taking, use, damming or diversion of surface water

While recognising the positive effects resulting from the use and development of water resources, manage the taking, use, damming or diversion of surface water so as to avoid where practicable, remedy or mitigate significant adverse effects on:

(a) the quality and quantity of aquatic habitat;
(b) natural character, natural features, and amenity, aesthetic and landscape values;
(c) areas of significant indigenous vegetation and significant habitats of indigenous fauna;
(d) recreational values;

(e) cultural and spiritual values;
(f) water quality, including temperature;
(g) the rights of lawful existing users;
(h) groundwater quality and quantity.

Explanation
The abstraction, damming and diversion of surface water is important for social and economic reasons, but can have significant adverse effects on the instream values of water bodies. The extent of the adverse effects is dependent on the characteristics of a particular surface water body, the values associated with it, and the amount of water taken, dammed or diverted. In some cases taking, use, damming and diversion of surface water can result in benefits to the environment, particularly when degraded habitats are being restored or new habitats created and if the adverse effects are minor or temporary.

Where it is appropriate that these activities take place, any adverse effects on the environment need to be avoided where practicable, or remedied or mitigated. In many cases it may not be possible to remedy or mitigate the adverse effects of abstraction. For example, there may not be a practical way of repairing or offsetting the adverse effects on an aquatic ecosystem caused by the abstraction of large quantities of water. The avoidance of adverse effects is therefore preferred in the first instance. The other policies in this section, particularly Policy 15 "Surface water abstraction, damming, diversion and use" and Policy 16 "Environmental flow and level regimes", put in place a management framework designed to avoid significant adverse effects.

Policy 14A– Determining the term of a water permit

To determine the term of a water permit consideration will be given, but not limited, to:
(a) the degree of certainty regarding the nature, scale, duration and frequency of adverse effects from the activity;
(b) the level of knowledge of the resource;
(c) relevant tangata whenua values
(d) the allocation sought, particularly the proportion of the resource sought;
(e) the duration sought by the applicant, plus material to support the duration sought;
(f) the permanence and economic life of the activity;
(g) capital investment in the activity;
(h) monitoring and review requirement in permit conditions;
(i) the desirability of applying a common expiry date for water permits that allocate water from the same resource; and
(j) the applicant's compliance with the conditions of the previous permit (where a new water permit is sought for a previously authorised activity).

Explanation
Matters (a) to (j) can be taken into account when determining whether a water permit should be approved. However, to help achieve efficient and reasonable use of water when electing the appropriate term for a water permit, matters (a) to (j) will guide Council staff, Councillors, applicants and other stakeholders to ensure the term is appropriate to the specific nature of both the proposed activity and the resource affected.

The matters listed in this policy are drawn from central government guidance and case law on determining the term of a consent. Therefore, it is appropriate that Council staff and decision makers refer to them when recommending or deciding on an appropriate term for a water permit. Applicants should also refer to this policy to ensure water permit applications address all pertinent factors.

Policy 14B – Considering a water permit application for a previously authorised activity

In addition to the matters specified in section 104 of the Act, when considering a water permit application for a previously authorised activity where:

(a) the status of the activity has altered solely as a consequence of subsequent permits being granted to increase allocation from that resource;
(b) the activity and knowledge of its adverse effects are the same or similar in character, intensity, and scale to that which existed previously; and
(c) the adverse environmental effects of the activity are not significant.

regard will be given to:

(i) the status of the activity at the time the original water permit was granted; and
(ii) the conditions that applied to that permit.

Explanation
The staged management approach to the allocation of water resources is likely to result in the status of a particular take changing over time, as provided for in Rules 18 and 23. This means that Council may require more detailed information on the take and the effects of it when a new water permit is applied for than may have been the case with the application for the previously authorised activity. Council may also impose more and more stringent conditions on any new permit it grants.

In addition to the staged management approach, the management framework provided for by the Mataura River Water Conservation Order has the effect of requiring the imposition of conditions that ensure that no more than 5% of the flow within the River is allocated. As the volume of water extracted from the Mataura River increases the point at which takes are "cut-off" progressively increases. For ease of administration these cut-off flows increase in two cubic metre steps. The cut off flows imposed on a new water permit granted as a replacement may be set at a higher level for this reason.

This policy will not prevent the status of a take from changing as a result of increased allocation, either though the granting of additional consents or a change in any other circumstances. However, where the status of an activity has altered solely as a consequence of subsequent permits increasing the allocation from that resource, it is appropriate for Council to take into account the cut-off flow, and any other relevant condition imposed on the original consent.

There should not be an expectation that the conditions on any expired consent will be carried over to any new consent that is sought. Regard must be given to any changes to the extent and vulnerability of the resource that have occurred since the application was first approved. When considering an application that is subject to this policy the Council will also have regard to Objective 7 and Policy 21 The decision in relation to any consent is required to be made within the framework provided by various sections of the Act, especially section 104.

Policy 15 – Surface water abstraction, damming, diversion and use

Objectives 5
Issue 2
Rules 18-21
Section 2.3

(a) Use a staged management approach to allocate surface water for abstraction, damming, diversion and use in Southland to allow the knowledge gained by the progressive development of the region's surface water resources to be built into its future management.

(b) Recognise the different characteristics of the following surface water management units when managing surface water quantity:

(i) Lowland
(ii) Hill (including Hill2 – Hokonui/Catlins)
(iii) Mountain
(iv) Lake
(v) Mataura
(vi) Natural State
(vii) Waiau

(c) Apply allocation and minimum flow and level regimes established under any Water Conservation Order.

(d) Have regard to lake management guidelines developed by the Guardians of Lakes Manapōuri, Monowai and Te Anau.

(e) Recognise and provide for surface water abstraction, damming, diversion and use resulting in positive effects and no net loss of water in a catchment.

(f) Recognise and provide for surface water abstraction, diversion and use permitted under Section 14(3) of the Resource Management Act 1991.

(g) Provide for:
- (i) a level of permitted surface water abstraction, damming, diversion and use where there is a minimal risk of adverse effects;
- (ii) a primary allocation for consented water abstraction, damming, diversion and use; and
- (iii) a supplementary allocation for consented water abstraction, damming, diversion and use.

(h) Require resource consent applications for surface water abstraction, damming, diversion and use to be supported by a level of information that corresponds to the level of risk of adverse environmental effects.

(i) Ensure that surface water abstractions, damming or diversions with a high risk of adverse environmental effects, in conjunction with existing abstractions, damming and diversions, will not:

- (a) result in significant adverse ecological effects through the increase in time the relevant surface water body is at or below its minimum flows or levels;
- (b) compromise the availability and reliability of water supply for existing users;
- (c) result in significant adverse effects on the matters listed in Policy 16(b)(i) to (xvi).[44]

(j) Impose monitoring on resource consents for surface water abstraction, damming, diversion and use that corresponds to the level of risk of adverse environmental effects.

(k) Where monitoring shows adverse environmental effects are occurring in a specific water body, remedy or mitigate those effects using one or more of the following methods:

- (i) reviewing the conditions of existing water consents for that water body in accordance with Section 128 of the Resource Management Act 1991;
- (ii) ceasing any further allocation of water from that water body; and
- (iii) imposing water restrictions in accordance with Policy 17 "Instigate appropriate water conservation procedures".

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[44] Any proposed activity that is a non-complying activity under Rules 18(f), 19(c) or 21(b) of the Plan is likely to have a high risk of adverse effects. Section 104D of the Act provides that the Council may grant a resource consent for a non-complying activity only if it is satisfied that either the adverse effects of the activity on the environment will be minor or the activity will not be contrary to the objectives and policies of this Plan. Where the adverse effects of a non-complying activity are likely to be more than minor, Policy 15 (i) is the key policy the Council will use to determine whether or not to grant resource consent for a non-complying activity under Rules 18(f), 19(c) or 21(b) of the Plan.

Explanation
This policy sets out a management framework for surface water quantity. The traditional approach to managing surface water quantity in

New Zealand is to set a fixed allocation volume for an individual surface water body based on an estimate of the maximum sustainable allocation for that surface water body. The level of confidence in this estimate depends on the level of knowledge and understanding of the surface water body. In general, there is a higher level of knowledge and understanding of surface water bodies that have high levels of development.

Most of Southland's surface water bodies have low levels of development and hence there is generally insufficient knowledge and understanding of these surface water bodies to develop fixed allocation volumes. In order to address this uncertainty, a staged management approach to surface water allocation in Southland has been developed.

The approach maintains an appropriate level of management intervention to ensure adverse environmental effects remain within acceptable levels while allowing progressive development of the surface water resource. The knowledge that is gained by the progressive development of the resource will be built into its future management. Such an approach is ideally suited to deal with the varying risk of adverse environmental effects resulting from the differing stages of surface water knowledge and resource development in the Southland region.

As part of the management approach, the region's surface water bodies have been classified into management units that group together spatially separate surface water bodies with similar physical and biological characteristics using the River Environment Classification system. Water Quantity Maps 1 to 13 of Appendix D depict these management units.

Significant values, both instream and out-of-stream, were derived for each management unit. Following this, "critical values" for each management unit were identified and are used in Policy 16 "Environmental Flow and Level Regimes" as the basis for determining minimum flows and levels. The concept of critical values is that by providing sufficient flow to sustain the most flow sensitive value, the other significant values will also be sustained. Further information on the process used to derive critical values for each management unit is contained in Section 4.2 "Resource management" and *Review of methods for setting water quantity conditions in the Environment Southland draft Regional Water Plan, NIWA, June 2004*.

The policy also recognises that there are other surface water management frameworks in place. Allocation and minimum flow and level regimes established under any Water Conservation Order will be applied by Environment Southland in accordance with Section 217 of the Resource Management Act 1991. Environment Southland will also have regard to lake management guidelines developed by the Guardians of Lakes Manapōuri, Monowai and Te Anau. These guidelines are recommended to the Minister responsible for the administration of the Manapōuri Te Anau Development Act 1963, who then promulgates, by notice in the Gazette, operating guidelines aimed at protecting the existing patterns, ecological stability and recreational values of the vulnerable shorelines of Lakes Te Anau and Manapōuri and to optimise the energy output of Manapōuri power station.

The policy recognises and provides for surface water abstraction, damming, diversion and use resulting in positive effects and no net loss of water in a catchment such as habitat enhancement and restoration activities. Many surface water body ecosystems have undergone extensive change as a result of land use and other human activities. Flow regimes in some cases have been altered and habitats destroyed or degraded. The ability to halt and reverse this trend is desirable and the resulting enhancement of ecological values is a positive effect.

The policy recognises and provides for surface water abstraction, diversion and use permitted under Section 14(3) of the Resource Management Act 1991.

In addition to the surface water abstraction, damming, diversion and use permitted under the Act, the policy also permits these activities where there is a minimal risk of adverse environmental effects. All other surface water abstraction, damming, diversion and use will require resource consent with the level of information required to support the consent application increasing as the level of risk of adverse effects increases. The information requirements for surface water abstraction, damming, diversion and use are specified in Appendix A "Information to be Submitted with a Resource Consent Application".

Any consent applicant for a surface water abstraction, damming or diversion with a high risk of adverse effects will be required to supply detailed information that demonstrates that the proposed abstraction, damming or diversion, in conjunction with existing abstractions, damming and diversions, will not result in significant adverse ecological effects, compromise the availability and reliability of water supply for existing users, or have other significant adverse effects. If the proposed abstraction will have any or all of these effects, it will be considered contrary to Policy 15(i). There are a number of methods that may be utilised to avoid or mitigate potential adverse effects such as the application of a higher minimum flow than that applied to existing abstractions and diversions.

The primary allocation limit will be established by the above requirement. In addition, the policy makes available a supplementary allocation where the minimum flow applied is equal to the natural mean flow. This allocation provides access to water at higher flows and allows water harvesting. At higher flows, water is sufficiently abundant that abstraction, damming, diversion and use is unlikely to have more than minor effects on instream values or other users. Consent conditions will address matters such as flow variability and flood flows. Flow variability is part of the natural character of rivers and flood flows are important for natural ecosystem function.

The policy stipulates that the monitoring imposed on resource consents for surface water abstraction, damming, diversion and use will increase in conjunction with the level of risk of adverse effects. The information that is obtained through this monitoring will be used in the future management of the surface water resource including intervention actions to address adverse environmental effects where these are occurring. The use of the intervention actions listed in clause (k) of the policy will be determined on a case-by-case basis having regard to the particular circumstances. Where catchments or parts of catchments are considered to be over allocated, water will not be able to be "reallocated" under a Section 128 review to new uses until such time as consents expire or are surrendered.

Policy 15A – Water abstraction for community water supply

Subject to Policy 19, recognise the need for, and assign priority to, the provision of water for community water supply when allocating water, provided that significant adverse effects on the following are avoided:

(a) the quality and quantity of aquatic habitats;
(b) natural character, natural features, and amenity, aesthetic and landscape values;
(c) areas of significant indigenous vegetation and significant habitats of indigenous fauna;
(d) recreational values;
(e) cultural and spiritual values;
(f) water quantity and quality; and
(g) long-term aquifer storage volumes.

Explanation
Section 14 of the RMA gives recognises a special status for water to be taken by individuals for their reasonable domestic needs, the reasonable needs of their animals and for fire fighting purposes. Territorial authorities are also required by Part VII of the Local Government Act 2002 to ensure a safe and adequate supply of potable water to persons living in towns so as to protect their health and welfare and to provide for their social and economic well-being. This requires assigning a high priority to the supply of water for such purposes. While this may relate primarily to town supplies, owned and operated by municipal authorities, there will be instances where groups of private individuals decide to work together to provide for their needs.

It should also be noted that Objective 7 "Efficient Water Use" and Policy 21 "Reasonable use of water" apply to community water supplies as well as to abstractions and diversions for other purposes.

Policy 15B – Water demand management strategy

Require a water demand management strategy commensurate to both the scale of the activity and its potential effects as part of any application for:

(a) a new water permit for a community water supply; or
(b) an amendment to an existing water permit for a community water supply.

Explanation
Community water supplies utilise significant quantities of the water resource. Through a reticulated supply, community water supplies make water available primarily for human use and consumption. This water is treated to meet drinking water standards and is supplied to meet basic human needs but it may also be used for other community activities. In order to determine the needs of a community and to put in place provisions that provide for the long term management and the efficient use of the resource it is necessary to prepare a water demand management strategy. The detail contained within the water demand management strategy shall be commensurate to the scale of the activity. Council will not process the associated consent as being for a community water supply until water demand management strategy is provided to the Council by the applicant.

Policy 16 – Environmental flow and level regimes

(a) When granting resource consents for surface water abstraction, damming, diversion and use, the Council where appropriate will apply by way of consent conditions environmental flow and level regimes established under:

 (i) the operating guidelines for the levels of Lakes Manapōuri and Te Anau referred to in Section 4A of the Manapōuri Te Anau Development Act 1963;
 (ii) any Water Conservation Order;
 (iii) Policy 16(b); and
 (iv) Policy 17.

(b) Except for surface water bodies subject to an environmental flow and level regime established under any Water Conservation Order, establish environmental flow and level regimes for surface water bodies taking into account the following matters where appropriate:

 (i) mauri and healthy ecosystems of indigenous species, including mahinga kai species;
 (ii) wāhi tapu sites or areas, and wāhi taonga;
 (iii) natural character, landscape, and visual amenity;
 (iv) indigenous vegetation within and adjacent to the water body;

(v) habitats including spawning and nesting areas for invertebrates, birds and fish;
(vi) fish passage, including facilitating the passage of native and salmonid fish where appropriate, and limiting the introduction of undesirable species and the spread of non-native species into areas where they are not normally found;
(vii) undesirable periphyton and sediment accumulation;
(viii) maintenance of groundwater flows;
(ix) the potential for establishment of invading exotic vegetation;
(x) bedload and sediment transport processes;
(xi) shoreline or bank erosion;
(xii) functioning of the river mouth;
(xiii) recreation opportunities;
(xiv) accessibility to water bodies and their margins;
(xv) existing flow and level regimes, physical resources and activities;
(xvi) the positive effects resulting from the use and development of the water resources; and
(xvii) Policy 19 in the case of the Waiau catchment.

(c) Except for water permits for community water supplies and water bodies subject to minimum flow and level regimes established under any Water Conservation Order, the Council will apply where appropriate a condition specifying a minimum flow/level in accordance with Appendix I "Methods for determining minimum flows and levels" to all new resource consents for:

(i) surface water abstraction, damming, diversion and use; and
(ii) groundwater abstraction where there is direct or high degree of hydraulic connection in accordance with Policy 29 "Stream Depletion Effects" and the stream depletion effect exceeds two litres per second.

Explanation
This policy identifies how environmental flow and level regimes will be applied and the matters that will be considered when setting environmental flow and level regimes.

A key component of an environmental flow and level regime is the minimum flow or level. The policy requires minimum flows/levels to be applied to all new consents for surface water abstraction, damming, diversion and use and new consents for groundwater abstraction with a direct or high degree of hydraulic connection in accordance with Policy 29 "Stream Depletion Effects", where the stream depletion effect exceeds two litres per second.

The application of minimum flows/levels to water abstractions allows for the maintenance of aquatic ecosystems, natural character and other instream values under low flow conditions. When minimum flows/levels are reached, the majority of abstractions and diversions must cease. Policy 17 "Instigate appropriate water conservation procedures" details the management interventions that will be used to prevent flows falling below minimum flows.

Appendix I "Methods for determining minimum flows and levels" sets out five methods for determining the minimum flow or level for a surface water body. The default method applies where there is a low level of allocation on a river or stream. It has low information requirements and therefore produces a very conservative minimum flow. For that reason, consent applicants may choose to use methods 2 and 3, which determine minimum flow requirements based on scientific assessments. These methods have higher information requirements. As the volume of water allocated from each river or stream increases, the level of information also increases.

Critical values form the basis for determining minimum flows for rivers and streams using the scientific methods detailed in methods 2 and 3. As described in Section 4.2 "Resource Management" and the explanation to Policy 15 "Surface water abstraction, damming, diversion and use", the region's surface water bodies have been grouped into management units with similar physical and biological characteristics. Significant values have been derived for each management unit and "critical values" identified across a range of flows for each management unit. The concept of critical values is that by providing sufficient flow to sustain the most flow sensitive value, the other significant values will also be sustained. It should be noted that the critical value may not be the most significant value present in a water body. However, the flow required to sustain this value will also sustain the other values.

Once the appropriate critical value is identified using the table in Appendix I "Methods for determining minimum flows and levels", a habitat maintenance level must be established taking into account the relative importance of instream and out-of-stream values. The flow that corresponds to this habitat maintenance level is the minimum flow.

Method 4 specifies the minimum flow for abstractions from the supplementary allocation, which is a much higher flow than the minimum flows for abstractions from the primary allocation.

Method 5 specifies how the minimum water level will be determined for surface water bodies other than river and streams (i.e. lakes, wetlands and backwaters). A case-by-case assessment of the appropriate minimum water level will need to be undertaken for each of these water bodies having regard to the water level needed to sustain the minimum flows in any downstream point in the catchment and the relevant policies of this Plan. Critical values for maintaining habitats in lakes, wetlands and backwaters have not been specified because there are many different types of these water bodies and thus specifying generic critical values is inappropriate. It should be noted that a large number of lakes and wetlands are in the "Natural State" management unit and will therefore need to be maintained in their natural state as far as practicable.

In addition to the five methods specified in Appendix I "Methods for determining minimum flows and levels", Appendix A "Information to be Submitted with a Resource Consent Application" sets out further flow assessment requirements for abstractions and diversions from rivers and streams that are spring-fed where the abstraction or diversion may affect the river or stream temperature and for abstractions and diversions from small streams where water quality is likely to be a limiting factor.

Abstractions for community water supplies are exempt from the minimum flow and level requirements set out in Appendix I "Methods for determining minimum flows and levels" as imposing minimum flows/levels on community water supplies may compromise human health and safety. Notwithstanding the above, community water supplies may be subject to restrictions during low flow conditions. It should also be noted that Objective 7 "Efficient Water Use" and Policy 21 "Reasonable use of water" apply to community water supplies as well as to abstractions and diversions for other purposes.

Abstractions and diversions from water bodies subject to minimum flow and level regimes established under any Water Conservation Order are also exempt from the minimum flow and level requirements set out in Appendix I "Methods for determining minimum flows and levels". Environment Southland will apply the minimum flow and level regimes set out in Water Conservation Orders through the consent process. A copy of the Mataura Water Conservation Order is contained in Appendix J "Water Conservation Orders" to assist Plan users.

The consents held for the Manapōuri Power Scheme have been through a process similar to that contained in Method 4 of Appendix I "Methods for determining minimum flows and levels" to determine an environmental flow regime for the Waiau River. While this flow regime will need to be reviewed at the time the current consents for the Manapōuri Power Scheme expire and new consents are applied for, the assessment of environmental effects included in the application for the current consents will be taken into account by the Council as far as it is relevant at that time.

The operating guidelines for Lakes Manapōuri and Te Anau referred to in Section 4A of the Manapōuri Te Anau Development Act 1963 set the lake levels in these lakes and are recognised in the current conditions of consent for the Manapōuri Power Scheme. It will therefore be unnecessary to carry out a minimum lake level assessment for Lakes Manapōuri and Te Anau using Method 5 of Appendix I "Methods for determining minimum flows and levels" at the time the current consents for the Manapōuri Power Scheme expire and new consents are applied for.

Objectives 3, 9
Issues 2, 5
Rules 18-21, 23
Section 2.3

Policy 17 – Instigate appropriate water conservation procedures

Instigate appropriate water conservation procedures at times of low flow, including:

(a) advise abstractors to conserve water and limit non-essential use of water as far as practicable;
(b) other than for the Waiau River at the Manapouri Lake Control Structure, implement a one-to-one flow sharing regime when flows reach the sum of the minimum flow or level and the total volume of water allocated through current resource consents[45] for the relevant surface water body. Methods to achieve this include, but are not limited to:
  (i) rationing;
  (ii) rostering;
  (iii) the use of water user groups;
(c) require consent holders to cease abstraction in accordance with the minimum flows/levels specified as conditions of their resource consents; and
(d) in extreme situations, consider the need to issue a water shortage direction under Section 329 of the Resource Management Act 1991.

Explanation
During periods of limited rainfall, river and stream flows and lake levels may drop to low levels. Aquatic ecosystems are adapted to cope with periodic low flows; however, there will be times when there is a need to reduce and sometimes cease water abstraction in order to maintain flow and level regimes set to protect instream, lake and wetland values.

At these times, the Council will instigate measures to ensure that water users conserve water as far as practicable. This will involve the provision of advice to the community to ensure that water is used as efficiently as possible and non-essential takes are minimised or suspended.

In order to prevent flows falling below minimum flows/levels, the Council will implement a flow sharing regime when flows reach the sum of the minimum flow or level and the total volume of water allocated through current resource consents for the relevant surface water body. This is best explained by way of an example:

> *It is determined that a minimum flow of 100 litres per second (the mean annual low flow) should be maintained in a river. There are several water users upstream of the minimum flow site taking a combined quantity of 50 litres per second. When the river flow reaches 150 litres per second, the Council will implement a one-to-one flow sharing regime as if there were no interventions and all users were*

[45] Including the stream depletion effect of each consented groundwater abstraction greater than 2 litres per second with a direct, high or moderate degree of hydraulic connection in accordance with Policy 29 “Stream Depletion Effects”.

to pump concurrently when the flow reached 149 litres per second, the flow would fall to 99 litres per second and the minimum flow would not be maintained.

A one-to-one flow sharing regime means that once the river reaches a flow of 150 litres per second, only 25 litres per second is available for abstraction as an equal proportion of the flow above the minimum flow must be retained in the river. As the flow decreases, so too does the amount of water available for abstraction. When the minimum flow is reached, all abstractions subject to a minimum flow requirement must cease.

A one-to-one flow sharing regime can be put into place by either requiring each user to reduce their rate of take on a pro rata basis or setting up a rostering system whereby groups of users have access to the resource at different times. The Council will encourage and promote the establishment of water user groups to assist in the development of suitable restrictions to implement the flow sharing regime. These restrictions will be imposed as conditions of consent in accordance with Policy 16(a).

Where a serious temporary shortage of water occurs, the Council may consider the need to issue a water shortage direction under Section 329 of the Resource Management Act 1991 to apportion, restrict or suspend the taking and use of water. Policy 24 "Priority takes" sets out the priorities for water use when a water shortage direction is issued.

Policy 18 – Fully allocated surface water bodies

Objective 5
Issue 2
Rules 18-21
Section 2.3

(a) Water from a surface water body will not be over allocated through the resource consent process.

(b) A surface water body will be deemed to be fully allocated when the total volume of water allocated through current resource consents[46] and permitted activities is equal to the maximum amount that may be allocated under the policies and rules of this Plan or the provisions of any Water Conservation Order.

Explanation

This policy provides that no further water will be allocated from a surface water body that is fully allocated and sets out how the Council will decide when a surface water body is fully allocated. This is necessary to ensure that surface water bodies do not become over allocated. Over-allocation of a surface water body can result in ecological values being adversely affected and the availability and reliability of supply for existing users being compromised.

There are no provisions in the Plan that establish the maximum amount of water that may be allocated from a surface water body as such, rather

[46] Including the stream depletion effect of each consented groundwater abstraction greater than 2 litres per second with a direct, high or moderate degree of hydraulic connection in accordance with Policy 29 "Stream Depletion Effects".

there are policies and rules that establish the process by which the maximum amount will be determined.

In terms of determining the maximum amount of water that can be allocated from a surface water body as part of the primary allocation, the relevant rules are:

(a) Rule 18(f), which stipulates that any abstraction or diversion where the total volume of water allocated is greater than 30 percent of the mean annual low flow at any downstream point in the catchment so estimated by the Southland Regional Council from measurements taken at that point is a non-complying activity;

(b) Rule 19(c), which provides that the damming of water on the main stems of the Aparima River, downstream of the Aparima Forks at NZMS260 D44 151919, and the Ōreti River, downstream of the forks at NZMS 260 E42 345450, is a non-complying activity; and

(c) Rule 17(b), which provides that any further or new water abstraction, damming and diversion from the Waiau catchment is a non-complying activity.

Section 104D of the Act provides that the Council may only grant a resource consent for a non-complying activity if it is satisfied that either the adverse effects of the activity on the environment will be minor or the activity will not be contrary to the objectives and policies of the relevant plan.

Where the adverse effects of a non-complying activity are likely to be more than minor, Policy 15(i) is the key policy Council will use to determine whether or not to grant resource consent for a non-complying activity under Rule 18(f), Rule 19(c) or Rule 21(b) of the Plan. When one of the two tests in this policy is unable to be met, the relevant surface water body will be deemed to be fully allocated under this policy (Policy 18) i.e. the primary allocation limit will have been established.

There is no limit on the supplementary allocation provided for in Rule 21(d)(ii) because of the high minimum flow.

Reallocation of water to new uses or other users may occur as consents expire or through the transfer of consents.

Objective 6
Issue 3
Rule 21
Section 2.3

Policy 19 – Existing hydroelectric generation facilities in the Waiau catchment

Recognise and provide for the use and enhancement of existing hydroelectric facilities in the Waiau catchment.

Explanation

The Manapouri Power Scheme utilises the water resources of the Waiau catchment for the generation of hydro-electricity. This policy recognises the national and local importance of the physical resources of the Scheme, both in its contribution to the nation's electricity generating capacity and to the operation of the New Zealand Aluminium Smelters facilities at Tiwai – the largest electricity user in New Zealand. It is appropriate to provide for the Scheme's continued use, and its enhancement, and for the continued use of water on which it relies. This policy is consistent with Policy 14.9 of the Regional Policy Statement for Southland and Section 7 (j) of the Act.

Policy 19A – Renewable energy

Objectives 5, 6
Issues 2, 3
Rules 18-21
Section 2.3

When:

(i) allocating surface water for abstraction, damming, diversion and use; and
(ii) considering all resource consent applications for surface water abstractions, damming, diversion and use

particular regard will be given to the benefits to be derived from the use and development of renewable energy.

Explanation
This policy is consistent with Section 7(j) of the Act, which requires particular regard to be had to the benefits to be derived from the use and development of renewable energy. Benefits associated with renewable energy, such as hydroelectricity, include but are not limited to reduced dependence on non-renewable energy resources and reduced greenhouse gas emissions. While the use and development of renewable energy resources in the region can have adverse effects on the environment that need to be avoided, remedied or mitigated, this use and development will help ensure New Zealand's electricity generation capability is sustainable and contribute to national initiatives under the Kyoto Protocol to reduce net carbon dioxide emissions.

Policy 19B – Natural state water quantity

Objective 7
Issue 2, 5
Rule 18-21, 23
Section 2.3

As far as possible, maintain water bodies in their natural state within conservation areas, reserves and national parks administered by, or on behalf of, the Department of Conservation for conservation purposes with the exception of the Upper Waiau and Monowai Rivers, Lakes Te Anau, Manapouri and Monowai, and the Tiwai groundwater zone.

Explanation
This policy provides for the maintenance of water bodies in their natural state within conservation areas, reserves and national parks administered by, or on behalf, the Department of Conservation for conservation purposes with the exception of the Upper Waiau and Monowai rivers and Lakes Te Anau, Manapouri and Monowai (these water bodies are excluded due to their modified flow and level regimes resulting from the Manapouri and Monowai Power Schemes) and the Tiwai groundwater

zone (this groundwater zone is excluded due to its long term use for the supply of water for industrial purposes). Water bodies within natural state areas have very high natural values and it is important that these values are protected as far as possible.

Policy 20 – Transferable water permits

Provide for the transfer of water permits to take and use water in accordance with Section 136(2)(b) of the Resource Management Act 1991 provided the transfer occurs in the same catchment or aquifer and is consistent with the provisions of this Plan.

Explanation
Section 136(2)(b) of the Resource Management Act 1991 provides for the transfer of a water permit, or part of a permit, to take and use water to another person on another site, or to another site, if both sites are in the same catchment or aquifer. An application to transfer the consent must be made to Environment Southland who will undertake an assessment of the effects of allowing the transfer including an assessment of whether or not the transfer is consistent with the provisions of this Plan such as the minimum flow and allocation regime applicable to the area that the permit is proposed to be transferred to.

The transfer of a water permit to take and use water to a subsequent owner or occupier of the same site does not require approval as it is allowed under Section 136(2)(a) of the Resource Management Act 1991. However, written notice of the transfer must be given to Environment Southland.

Transfers of water permits to take and use water are a means by which the beneficial and efficient use of the allocated resource can be achieved.

Policy 21 – Reasonable use of water

Objective 7
Issues 2, 5
Rules 18-21, 23
Section 2.3

To ensure that the rate of abstraction and abstraction volumes specified on water permits to take and use water are no more than reasonable for the intended end use.

Explanation
This policy seeks to ensure that only the amount of water needed for the efficient operation of each activity is taken to avoid wastage, help ensure the sustainability of the resource and maximise its availability.

Applicants for water permits to take and use water will be required to demonstrate that the volume of water applied for is reasonable for the intended end use. Determining what a reasonable volume for irrigation purposes is likely to involve consideration of the following factors:

(a) physical factors such as soil-water holding capacity;
(b) climatic factors such as rainfall variability and potential evapotranspiration;
(c) land use activity.

Where monitoring of existing water permits reveals significant overestimation of actual water use, the conditions of these permits will be reviewed to provide opportunity to better allocate the resource.

Policy 22 – Water measuring devices

Objective 7
Issues 2, 5
Rules 18-21, 23
Section 2.3

Require, where appropriate, the installation of water measuring devices on all new permits to take and use water.

Explanation
Measuring water use is a means of addressing the uncertainty associated with estimating water demand. Both the underestimation and overestimation of demand can result in adverse effects on other users and the environment. Generally water meters will be required on all takes greater than 20,000 litres per day. Measuring water use will assist to identify the actual demand for water and improve the overall management of the resource.

Policy 23 – Review of water permits

Objective 7
Issues 2, 5
Rules 18-21, 23
Section 2.3

Impose a condition enabling the review of consent conditions in accordance with Sections 128 and 129 of the Resource Management Act 1991 on all new permits to take and use water.

Explanation
The imposition of a review condition on consents to take and use water will allow the Council to deal with any adverse environmental effects arising from the exercise of those consents. It will also enable the

Council to ensure compliance with operative regional plan rules relating to maximum or minimum levels, flows and rates of use of water.

In addition to the above, the Council may specify in the consent other purposes for reviewing the conditions of consent such as addressing the results of monitoring, dealing with the cumulative effects of water extraction and ensuring efficiency of water use.

The consent condition must specify the time or times the review may be carried out.

Policy 24 – Priority takes

When issuing a water shortage direction pursuant to Section 329 of the Resource Management Act 1991, the Council will give priority to water abstraction for the following uses:

(a) reasonable domestic needs
(b) reasonable animal drinking needs
(c) fire-fighting purposes
(d) public health needs
(e) animal welfare needs

Explanation
This policy recognises the need to prioritise when issuing a water shortage direction pursuant to Section 329 of the Act. It is consistent with Section 14 of the Act, which gives priority for water to be taken for an individual's reasonable domestic needs, the reasonable needs of an individual's animals for drinking water and fire-fighting purposes.

In addition, the policy gives priority to the abstraction of water for public health and animal welfare needs over other uses of water. Abstraction for public health needs refers to the continuation of water supplies for public health and sanitation services. Abstraction for animal welfare needs refers to water requirements for animal welfare purposes (e.g. sufficient water to enable freezing works to slaughter starving stock during a drought.

The priority afforded by this policy does not mean that all the water available will be allocated to these uses when a water shortage direction is issued. Priority uses may also be subject to water restrictions.

5.2.2 Groundwater Policies

(see also Section 5.2.1 Water Quality and Quantity Policies)

Groundwater Quality

Policy 25 - Adverse effects arising from point source and non-point source discharges

Objectives 1, 2, 8
Issue 4
Rules 3, 23
Section 2.3

To avoid, remedy or mitigate the adverse effects arising from point source and non-point source discharges so that there is no deterioration in groundwater quality after reasonable mixing, unless it is consistent with the promotion of the sustainable management of natural and physical resources, as set out in Part 2 of the Resource Management Act 1991, to do so.

Explanation
This policy is aimed to allow for localised impacts resulting from point source and non-point source discharges provided there is no deterioration of groundwater quality in the receiving aquifer after reasonable mixing, unless it is consistent with the promotion of the sustainable management of natural and physical resources, as set out in Part 2 of the Resource Management Act 1991, to do so. Factors which may influence the significance of changes include existing groundwater quality, current and potential future use of the resource and steps taken to offset localised impacts.

Point source discharges are discharges from specific and identifiable sources (such as pipes) concentrated at a given point. Non-point source discharges are discharges from diffuse sources where there is no single identifiable discharge point. Where non-point source discharges to land leach down into groundwater, the extent of the adverse effect depends on the nature of the aquifer and the overlying strata, and on type and intensity of the land use itself. Shallow, unconfined aquifers are most at risk, particularly where the overlying land use involves the intensive application of contaminants. Studies have shown, for example, that intensification of agriculture usually increases nitrate levels in unconfined aquifers.

Land use activities therefore need to be managed in a way that avoids or mitigates adverse effects on the water quality of underlying aquifers. The Regional Effluent Land Application Plan for Southland and the Regional Solid Waste Management Plan address many activities that are the source of point source and non-point source groundwater pollution such as septic tanks, landfills and effluent application. Managing the effects of other land use activities that affect groundwater quality requires an understanding of site specific matters such as aquifer and soil characteristics. These activities are therefore best addressed in a non-regulatory framework through the promotion of best management practices. Best management practices will be developed, implemented and monitored through the implementation strategy process.

In order to determine the cumulative impact of point and non-point source discharges Environment Southland will monitor groundwater quality at representative sites distributed across the Region. This monitoring will be designed to establish "baseline" groundwater quality and enable identification of spatial and temporal trends.

Objectives 1, 2, 8
Issue 4
Rules 3, 22
Section 2.3

Policy 26 - Adverse effects of bores and wells

To avoid the adverse effects on groundwater quality and quantity arising from bores and wells by ensuring that bores and wells are appropriately designed, constructed and maintained in a way that adverse effects are avoided to the extent practicable.

Explanation
Bores and wells provide a conduit between aquifers and the land surface. Unless bores and wells are properly constructed, maintained and decommissioned when no longer required, contaminants can enter the head of the structure and be transmitted directly to groundwater. This has been identified as a significant cause of localised groundwater quality degradation in Southland. Uncapped or inadequately constructed bore headworks can also result in groundwater flowing to waste and a loss in artesian pressure.

The adverse effects of bores and wells can be readily avoided by the adoption of appropriate design and construction standards. For example, wellhead casing and plumbing can be sealed effectively to prevent contaminants from entering these structures and groundwater flowing to waste. Therefore, it is important that all new bores and wells comply with proper construction standards such as *NZS 4411:2001 Environmental Standard for Drilling of Soil and Rock*. In order to ensure compliance with appropriate standards and control adverse effects, the construction of all new bores and wells will require resource consent from the Council.

Where an issue arises (e.g. it is determined that an existing bore or well, including disused and decommissioned facilities, is resulting in significant localised groundwater contamination), the owner of the bore or well will be required to upgrade their structure in the interests of protecting groundwater quality and quantity.

Objectives 1, 2, 5, 8, 9
Issues 4, 5
Rules 3, 22, 23
Section 2.3

Policy 27 – Groundwater research and investigation

To continue to undertake research and investigation into:

(a) the causes and extent of groundwater contamination; and
(b) the extent of groundwater quantity and the effects of abstraction.

Explanation
Continued research and investigation is needed to:

(a) define the causes of groundwater contamination and to provide better information for groundwater quality management; and
(b) define aquifer capacities and the interaction between ground and surface water environments.

In particular, research and investigation efforts should focus on:

(a) identifying the current state and natural controls on groundwater quality;
(b) monitoring ongoing changes in groundwater quality;
(c) quantifying land use effects;
(d) improving definition of the hydrogeology of aquifer systems;
(e) aquifer yields and recharge rates;
(f) the degree of interconnection between aquifers and surface water bodies;
(g) the effects of abstraction on aquifers; and
(h) the hydraulic characteristics of aquifer materials.

Groundwater Quantity

Policy 28 – To manage groundwater abstraction

To manage groundwater abstraction to avoid significant adverse effects on:

- long-term aquifer storage volumes
- existing water users
- surface water flows and aquatic ecosystems and habitats
- groundwater quality

Explanation
Groundwater use, resulting in short-or long-term declines in aquifer levels, can have significant adverse effects on the environment. Fluctuating or lowered aquifer levels can cause a reduction in available groundwater yield and/or interfere with the bores or wells of existing users. In addition, declining aquifer levels can impact on surface water ecosystems and habitats by reducing surface water flows in rivers, lakes and wetlands. Changes in groundwater quantity and aquifer flow characteristics can also impact on groundwater quality.

The significance of the effects of abstraction largely depends on the characteristics of the aquifer, the rate and volume of abstraction, and, in some cases, the locality of the abstraction. For example, bores located in close proximity to existing users are more likely to cause interference drawdown effects while bores close to rivers or streams have greater potential to affect surface water flows than those further removed. Similarly, abstractions from bores located near the coast are more likely to result in groundwater contamination by seawater intrusion.

In order to avoid significant adverse effects, the volume and rate of abstraction needs to be set at levels that are sustainable and that avoid significant declines in groundwater levels. The staged management approach to groundwater allocation outlined in Policy 30 "Groundwater abstraction" has been developed to ensure that development of the region's groundwater resources is sustainable.

The location of the abstraction also needs consideration to limit adverse effects on nearby groundwater users or surface water bodies. Policy 31 "Interference effects" outlines how the interference effects of groundwater abstraction on existing groundwater users will be managed having regard to the construction and efficiency of existing bores and wells while Policy 29 "Stream Depletion Effects" sets out a framework for managing the stream depletion effects of groundwater abstractions that are hydraulically connected to surface water bodies.

Objectives 5, 9
Issue 5
Rules 18, 23
Section 2.3

Policy 29 – Stream depletion effects

(a) Manage the stream depletion effect of any groundwater abstraction with a rate of take exceeding 2 litres per second as follows:

(i) where there is a direct hydraulic connection between the groundwater source and an adjacent surface water body, the stream depletion effect will be determined as the maximum instantaneous rate of take and will be managed in the same manner as a surface water abstraction for flow and allocation purposes. The abstraction will therefore be subject to any relevant minimum flow regime;

(ii) where there is a high degree of hydraulic connection between the groundwater source and an adjacent surface water body, the stream depletion effect will be determined as the greater of:

1. the effect of 150 days pumping at the continuous pump rate required to deliver the seasonal volume;
2. the effect of continuous pumping at the maximum permitted pump rate over the period required to deliver the seasonal volume.

The calculated rate of stream depletion will be managed in the same manner as a surface water abstraction for allocation purposes with the remainder of the abstraction included in the allocation volume for the relevant groundwater zone. Where the calculated rate of stream depletion exceeds 2 litres per second, the abstraction will be subject to any relevant minimum flow regime;

(iii) where there is a moderate degree of hydraulic connection between the groundwater source and an adjacent surface water body, the stream depletion effect will be determined as the effect of 150 days of pumping at the continuous pump rate required to deliver the seasonal volume. The calculated rate of stream depletion will be managed in the same manner as a surface water abstraction for allocation purposes with the remainder of the abstraction included in the allocation volume for the relevant groundwater zone;

(iv) where there is a low degree of hydraulic connection between the groundwater source and an adjacent surface water body, the stream flow effect is considered to be minor and the individual abstraction will not be taken into account in determining surface water allocation but will be included in the allocation volume for the relevant groundwater zone.

For the purposes of this policy, the degree of hydraulic connection is classified as follows:

Direct: *Where the stream depletion effect of seven days continuous abstraction at the maximum permitted rate on an adjacent surface water body is greater than or equal to 80 percent of the maximum pump rate.*

High: *Where the stream depletion effect of seven days continuous abstraction at the maximum permitted rate on an adjacent surface water body is less than 80 percent of the maximum pump rate and the stream depletion effect of 150 days of pumping at the average continuous rate required to deliver the seasonal volume is greater than or equal to 60 percent of the average continuous pump rate.*

Moderate: *Where the stream depletion effect of seven days continuous abstraction at the maximum permitted rate on an adjacent surface water body is less than 80 percent of the maximum pump rate and the stream depletion effect of 150 days of pumping at the average continuous rate required to deliver the seasonal volume is either:*

(a) less than 60 percent but greater than or equal to 30 percent of the average continuous pump rate; or
(b) has an overall magnitude greater than 5 litres per second.

Low: *Where the abstraction is not classified as having a direct, high or moderate degree of hydraulic connection.*

(b) Minimise the cumulative stream depletion effect of groundwater abstraction by:

(i) imposing minimum flows on resource consents for groundwater abstraction where there is a direct or high degree of hydraulic connection and the stream depletion effect exceeds two litres per second in accordance with any relevant surface water minimum flow regime (including those established under any Water Conservation Order);

(ii) managing the total stream depletion effect of groundwater abstractions greater than two litres per second with a direct, high or moderate degree of hydraulic connection in accordance with any relevant surface water allocation regime (including those established under any Water Conservation

Order);

(iii) ensuring the total stream depletion effect of groundwater abstractions greater than two litres per second with a direct, high or moderate degree of hydraulic connection does not result in surface water flows less than prescribed minimum flows or surface water allocation regimes being exceeded.

Explanation
This policy applies to all groundwater abstractions with a rate of take exceeding two litres per second. The purpose of the policy is to manage stream depletion effects of groundwater abstractions to ensure:

(a) maintenance of flow regimes set to protect the instream values of surface water and the availability of surface water for existing users; and
(b) there is no significant increase in the duration and frequency of naturally occurring dry rivers or stream beds.

This policy classifies individual groundwater abstractions by the degree of hydraulic connection to a surface water body and sets out differing management approaches for varying degrees of hydraulic connection. It also sets out an approach for managing the cumulative stream depletion effects of a number of abstractions.

The stream depletion effect of a groundwater abstraction is directly linked to the degree of hydraulic connectivity between the aquifer the groundwater is being extracted from and the adjacent surface water body. The degree of hydraulic connectivity relates to the rate at which water is exchanged between the surface water body and the aquifer. This policy is not intended to apply to ephemeral surface water bodies (for example, transitory streams resulting from heavy rains) or surface water bodies not in hydraulic connection with underlying groundwater (for example a perched stream). Stream depletion effects of groundwater abstractions are to be calculated in relation to the nearest permanent surface water body in hydraulic connection with the aquifer concerned.

The policy provides that the stream depletion effect of any groundwater abstraction from a bore assessed as having a direct hydraulic connection will be managed as a surface water abstraction for flow and allocation purposes. This is because the effect of such an abstraction on the surface water body is immediate and equivalent to a surface water abstraction. Groundwater abstractions from bores with high and moderate degrees of hydraulic connection also need to be taken into account when determining surface water allocation although the stream depletion effects of these abstractions will be delayed to varying extents. Where the stream depletion effect of a groundwater abstraction is taken into account when determining surface water allocation, the remainder of the abstraction will be included when determining the allocation volume for the relevant groundwater zone.

The policy also provides that a groundwater abstraction from a bore classified as having a direct or high degree of hydraulic connection will be subject to any relevant surface water minimum flow regime where there is a significant stream depletion effect. The policy defines a significant stream depletion effect as that exceeding 2 litres per second.

Surface water bodies respond relatively rapidly to controls on groundwater abstractions from bores with a direct or high degree of hydraulic connection. Minimum flows will therefore be imposed on all groundwater abstractions where there is a direct or high degree of hydraulic connection and the stream depletion effect exceeds two litres per second in accordance with the relevant surface water minimum flow regime. The total stream depletion effect of these abstractions will also be managed in accordance with any relevant surface water allocation regime. However, it is not effective to impose minimum flows on groundwater abstractions where the effect of abstraction on the surface water body is significantly delayed although the stream depletion effects of these abstractions still need to be taken into account when determining surface water allocation. The Council will therefore manage the total stream depletion effect of all groundwater abstractions greater than two litres per second with a moderate degree of hydraulic connection in accordance with any relevant surface water allocation regime. Managing groundwater abstractions with a significant stream depletion effect in accordance with relevant surface water allocation regimes and imposing minimum flows on those abstractions with a relatively rapid response time will minimise the cumulative stream depletion effect of groundwater abstraction. The Council will also ensure that the total stream depletion effect of groundwater abstractions greater than two litres per second with a direct, high or moderate degree of hydraulic connection does not result in surface water flows less than prescribed minimum flows or surface water allocation regimes being exceeded.

Assessment of potential stream depletion effects will be undertaken using the most appropriate assessment methodology to the particular hydrogeological setting. Stream depletion estimates will be undertaken using the best available estimate of relevant hydraulic parameters but will also include a sensitivity analysis to account for the heterogeneity inherent in natural systems.

Policy 30 – Groundwater abstraction

Objectives 5, 9
Issue 5
Rule 23
Section 2.3

(a) Use a staged management approach to allocate groundwater for abstraction in Southland to allow the knowledge gained by the progressive development of the region's groundwater resources to be built into its future management.

(b) Recognise the different characteristics of the following aquifer types when managing groundwater abstraction:

- (i) riparian aquifers;
- (ii) terrace aquifers;
- (iii) lowland aquifers;
- (iv) confined aquifers;

(v) fractured rock aquifers.

(c) Use an assessment of available hydrogeological information from resource consent applications supplemented by investigations and monitoring undertaken by the Council, on a case-by-case basis, to determine if an aquifer is confined. Where an aquifer is determined to be sufficiently confined to warrant management as a separate groundwater resource a preliminary allocation volume shall be determined on the basis of aquifer throughflow.

(d) Provide for:

(i) a level of permitted groundwater abstraction where there is a minimal risk of adverse effects;
(ii) a primary allocation for consented water abstraction and use; and
(iii) a supplementary allocation for consented water abstraction and use.

(e) Require resource consent applications for groundwater abstractions to be supported by a level of information that corresponds to the level of risk of adverse environmental effects. Information to be supported by a conceptual hydrogeological model that corresponds to the level of allocation from the aquifer.

(f) Where appropriate, impose minimum level and/or flow cut-offs and seasonal recovery triggers on resource consents for groundwater abstraction.

(g) Impose monitoring on resource consents for groundwater abstractions that corresponds to the level of risk of adverse environmental effects.

(h) Where monitoring shows adverse environmental effects are occurring in a specific groundwater zone, remedy or mitigate those effects using one or more of the following methods:

(i) reviewing the conditions of existing groundwater abstraction consents for that groundwater zone in accordance with Section 128 of the Resource Management Act 1991;
(ii) ceasing any further allocation of groundwater from that groundwater zone; and
(iii) temporarily restricting the abstraction of water from that groundwater zone by issuing a water shortage direction under Section 329 of the Resource Management Act 1991.

(i) Ensure that groundwater abstractions that have a high risk of adverse environmental effects will not result in:

(i) a long-term decline in groundwater levels;

(ii) surface water allocation regimes being exceeded[47].

Explanation

This policy sets out a staged management approach for groundwater allocation and applies to all groundwater abstractions. It is designed to ensure that groundwater abstraction in the region is sustainable.

The traditional approach to managing groundwater abstraction in New Zealand is to set a fixed allocation volume for an individual aquifer system based on an estimate of the maximum sustainable allocation for that aquifer system. The level of confidence in this estimate depends on the level of knowledge and understanding of the aquifer. Generally, there is a higher level of knowledge and understanding of aquifers that have a long history of development.

For example, the aquifer systems in Canterbury, Marlborough and Tasman have a long history of development and a corresponding length of environmental monitoring record with which to correlate abstraction and any resulting environmental effects. Accordingly, fixed allocation volumes for these aquifer systems can be set with a reasonable degree of confidence. In contrast, aquifer systems such as those in northern Southland, where there has been significant development of the resource over a short period, only have a correspondingly short monitoring record and there is currently insufficient knowledge and understanding of these aquifer systems to develop fixed allocation volumes.

In order to address the uncertainty regarding sustainable allocation volumes for the region's aquifer systems, a staged management approach to groundwater allocation in Southland has been developed.

The approach maintains an appropriate level of management intervention to ensure adverse environmental effects remain within acceptable limits while allowing progressive development of the groundwater resource. The knowledge that is gained by the progressive development of the resource will be built into its future management. Such an approach is ideally suited to deal with the varying risk of adverse environmental effects resulting from the differing stages of aquifer knowledge and resource development in the Southland region.

In order to develop a staged management approach to groundwater allocation, the region's groundwater resources have been classified into five basic aquifer "types" aggregating together spatially separate aquifer systems on the basis of observed similarities in geology, geomorphology, aquifer response and groundwater-surface water interaction. Groundwater Map 2 of Appendix D depicts the lowland, riparian and terrace unconfined aquifer types, which overlie confined aquifers in parts of the region. Generally the areas outside of the identified aquifer types depicted on Map 2 of Appendix D consist of fractured rock aquifers, the

[47] Any proposed abstraction that is a non-complying activity under Rule 23(e) of the Plan is likely to have a high risk of adverse effects. Section 104D of the Act provides that the Council may grant a resource consent for a non-complying activity only if it is satisfied that either the adverse effects of the activity on the environment will be minor or the activity will not be contrary to the objectives and policies of this Plan.

fourth type of unconfined aquifer found in the region. The sensitivity of each hydrological setting to adverse environmental effects varies between the different aquifer types and reflects both the hydraulic properties and hydrogeology of the aquifer systems as well as the degree and nature of interconnection with other water resources.

Currently, it is difficult to determine a set of criteria to classify aquifers based on a certain 'degree' of confinement. This is because confined aquifers exhibit a wide range of hydraulic properties which influence the nature and extent of environmental effects associated with abstraction. To determine if a proposed groundwater abstraction is within a confined aquifer or not, Environment Southland should be contacted for known aquifer hydrogeology. This information is located outside of the Plan because it is continually modified to incorporate improved understanding of aquifer hydrogeology and supports a conservative management approach to aquifer sustainability. Plan users can use this information combined with the applicant users information (for example, well/bore pumping log) to determine if their abstraction is within a confined aquifer or not. Alternatively, Environment Southland staff will assist to determine the aquifer type.

Staged allocation volumes are prescribed for the various aquifer types based on the level of risk of adverse environmental effects (refer to Rule 23). This level of risk is directly related to the sensitivity of the hydrological setting to adverse effects and the level of resource development.

The policy permits groundwater abstraction where there is a minimal risk of adverse environmental effects. All other groundwater abstractions will require resource consent with the level of information required to support the consent application increasing as the level of risk of adverse effects increases. The information requirements for groundwater abstractions are specified in Appendix A. Minimum aquifer test specifications are not specified in Appendix A, but Environment Southland has guidelines available for aquifer testing that should be followed. Any consent applicant for a groundwater abstraction with a high risk of adverse effects will be required to supply detailed information that demonstrates that the proposed abstraction will not result in a long-term decline in aquifer storage volumes and surface water allocation regimes being exceeded. If the proposed abstraction will have either or both of these effects, it will be considered contrary to Policy 30(i). There are a number of methods that may be used to avoid, remedy or mitigate potential adverse effects, such as the application of a higher minimum flow or level than that applied to existing abstractions.

The primary allocation limit will be established by Policy 30. In addition, the policy makes available a supplementary allocation in cases where, for example, there is above average (or artificial) recharge of the aquifer through factors such as seasonal weather fluctuations. The availability of supplementary allocation may only be intermittent over time, however, this allocation provides access to water when groundwater monitoring indicates that aquifer storage is in excess of volumes required to maintain ongoing aquifer sustainability and existing levels of use either on an inter-annual or long-term basis. In these situations, sufficient groundwater storage is available to ensure that additional abstraction is unlikely to have more than minor effects on groundwater levels, hydraulically connected waterbodies, or the reliability of supply for existing users. The protection of hydraulically connected waterbodies will be established by Policies 16(c) and 29. Consent conditions will be used to manage supplementary allocations including the use of tools such as minimum level and/or flow cut-offs and abstraction duration.

The minimum level and/or flow cut-offs and seasonal recovery triggers imposed on resource consents for groundwater abstractions will ensure maintenance of long-term aquifer storage volumes and security of supply for resource users. The protection of hydraulically connected waterbodies will be established by Policies 16(c) and 29.

The monitoring imposed on resource consents for groundwater abstractions will also increase in conjunction with the level of risk of adverse effects. The information that is obtained through this monitoring will be used in the future management of the groundwater resource including intervention actions to address adverse environmental effects where these are occurring.

Policy 31- Interference effects

Objectives 5, 9
Issue 5
Rule 23
Section 2.3

(a) Limit the cumulative interference effect of any new groundwater abstraction (in conjunction with other lawfully established groundwater takes) to no more than 20 percent of the available drawdown in any unconfined aquifer or up to 50 percent of the potentiometric head in any confined aquifer. The effects on any neighbouring bore will be considered where that bore is lawfully established and an assumption will be made that the bore fully penetrates the aquifer. An increased volume or increased pumping rate for any lawfully established groundwater abstraction will be considered a new groundwater abstraction under this policy.

(b) Limit the cumulative interference effect of any new groundwater abstraction on any bore that is notified to the Council and utilised for long-term monitoring of water levels to no more than 10 percent of the available drawdown in a unconfined aquifer, or no more than 20 percent of the available potentiometric head in a confined aquifer that exists 50 percent of the time during natural conditions when no pumping is occurring. An increased volume or increased pumping rate for any lawfully established groundwater abstraction will be considered a new groundwater abstraction under this policy.

(c) An exception to clause (a) and (b) above may be appropriate for aquifer testing and necessary infrastructure works, and in certain circumstances for mining activities where dewatering occurs for a short duration.

Explanation

Groundwater abstraction from a bore results in a cone of depression in the groundwater potentiometric surface which expands with time in a way that is largely determined by the abstraction rate and physical properties of the aquifer system. The lowering of groundwater levels as a result of abstraction may affect the ability of existing users to access the groundwater resource through:

(a) localised well interference effects; and/or
(b) a decline in the aquifer-wide groundwater level or potentiometric head due to the cumulative impact of abstraction.

Any new groundwater abstraction should not significantly affect the ability of an existing groundwater user to access the groundwater resource provided the existing bore has been lawfully established and fully penetrates the aquifer. In considering interference effects on lawfully established neighbouring bores Environment Southland will assume the bore fully penetrates the aquifer. This policy sets a figure of 20 percent of the available saturated thickness of an unconfined aquifer (or up to 50 percent of the potentiometric head in the case of a confined aquifer). In determining the actual percentage of potentiometric head reduction that is acceptable in any confined aquifer Environment Southland will consider the individual characteristics of an aquifer system to determine whether a cumulative interference effect is more than minor.

As good practice, bores should fully penetrate the entire saturated thickness of the source aquifer. However, a significant number of existing bores and wells in Southland are drilled to a depth not far below the limit of historical seasonal groundwater level variation and are therefore susceptible to groundwater level reductions induced by nearby abstraction. The interference effect of any new groundwater abstraction will only be assessed on existing neighbouring bores and wells that were lawfully established and it will be assumed that they fully penetrate the entire saturated thickness of the aquifer.

Environment Southland's monitoring bores characterise long-term trends in aquifer storage in response to the combined effects of groundwater abstraction and climate variability. They also ensure the reliability of supply for individual users who have pumping restrictions based on trigger levels in the monitoring bore. Bores used for long-term monitoring whether they are operated by Environment Southland or by other parties are an important tool in the effective management of the groundwater resource and the reliability of supply for users who have minimum cut-off levels. It is critical therefore that such bores are not significantly affected by localised interference effects arising from new groundwater abstractions. Policy 31(b) limits the cumulative interference effects of new groundwater abstractions on bores that have been notified to the Council and are used to monitor long-term aquifer levels. The Policy does not apply to bores required as a condition of a resource consent to monitor minimum cut-off levels set by that consent. In assessing whether there is likely to be a significant localised drawdown on a monitoring bore, 10 percent of the available drawdown in a unconfined aquifer that exists for 20 percent of the time and 50 percent the available potentiometric head in a confined aquifer that exists for 50 percent of the time during natural conditions when no pumping is occurring should be used.

However, situations, such as aquifer testing and dewatering for construction and mining activities, may arise where it may be appropriate to exceed the thresholds set for interference effects. Such cases are best dealt with on an individual basis to ensure such activities are undertaken under controlled conditions where appropriate monitoring and environmental safeguards have been established.

5.2.3 River Bed (including beds of streams and modified watercourses) and Lake Bed Use and Development Objectives

Policy 32 – Manage structures and bed disturbance activities in the beds of rivers (including streams and modified watercourses) and lakes

Objectives 10-13
Issue 6
Policies 33-37
Rules 1,2, 15-17, 24-44
Section 2.3

Manage structures and bed disturbance activities in the beds of rivers and lakes, to avoid, remedy or mitigate adverse effects on:

(a) water quality and quantity;
(b) habitats, ecosystems and fish passage where this is normally expected to occur;
(c) indigenous biological diversity;
(d) heritage, cultural and spiritual values;
(e) public access (except in circumstances where public health and safety are at risk) and amenity values;
(f) natural character and outstanding natural features;
(g) river morphology and dynamics, including erosion and sedimentation;
(h) flood risk;
(i) infrastructural assets;
(j) navigational safety.

Explanation
Many structures and activities that disturb the beds of lakes and rivers can have economic, social, and in some cases environmental benefits. However, these activities can also have a range of adverse effects on the environment. The adverse effects of the activities needs to be weighed against the benefits they provide. Where it is appropriate that these activities take place, any adverse effects on the environment need to be avoided or minimised.

Policy 33 – Provide for the extraction of gravel

Objectives 10-13
Issue 6
Policies 32, 36
Rule 41
Section 2.3

Provide for the extraction of gravel to meet the needs of the community, in a way that avoids, remedies or mitigates adverse effects on the riverine environment; and

(a) maintains or enhances aquatic and riparian habitat; or

(b) equates to no net loss of habitat in the river channel and floodplain; or
(c) maintains or enhances flood protection, erosion control or the integrity of physical resources.

Explanation
Gravel, being a raw material for roading, building and other infrastructure, is a very important resource within the region. Gravel is commonly extracted from river beds and adjacent floodplain deposits because of the high quality of the material and economic and access considerations. In addition, river gravels are sometimes removed to alleviate flooding and erosion problems and associated threats to infrastructure.

While river gravel is often viewed as a “renewable resource”, gravel extraction can be unsustainable and lead to adverse effects such as the lowering and destabilisation of river beds and the degradation or destruction of aquatic and riverine habitats. The extent of these impacts depends on site specific factors, such as habitat values and the quantity of gravel available, and activity specific factors, such as the method of extraction and the quantity of gravel removed.

Knowledge of the site and activity details is necessary in order to ensure that adverse effects are avoided or minimised and that habitat is maintained or enhanced. It is particularly important to define and stay within sustainable extraction rates to avoid adverse effects on river bed processes. Information on habitat values is also important, so that sensitive times and place, such as breeding and spawning areas, can be avoided wherever possible.

Some rivers, including the Makarewa, Lower Ōreti and Lower Mataura, are known to have limited gravel supplies within the bed due to natural factors or a history of over-abstraction. Gravel extraction in these areas needs to be carefully managed – it may not be appropriate to take gravel from places where supply is limited.

Policy 34 – Drainage maintenance

Objectives 10-13
Issue 6
Rules 32, 36
Rules 15, 46
Section 2.3

Ensure that drainage maintenance activities within the beds of modified watercourses are managed in a way that either:

(a) avoids, remedies or mitigates significant adverse effects on the aquatic environment; or
(b) maintains or enhances habitat value.

Explanation
Land drainage is an essential element of agriculture in many parts of Southland. Improved drainage and land productivity have been achieved through the construction of artificial watercourses (including open drains) and the straightening and modification of existing natural rivers and streams. Ongoing maintenance of the drainage system, including both artificial and modified watercourses, is carried out to remove the

build-up of sediment and vegetation and restore the original drainage capacity of the system. This policy applies only to drainage maintenance activities in the beds of modified watercourses in accordance with Section 13 of the Act, which does not impose controls over the beds of artificial watercourses. However, activities in the beds of artificial watercourses are still subject to the water quality and quantity provisions of this Plan.

Weed and sediment removal can have significant adverse effects on aquatic ecosystems, habitats and water quality. While there is a need to provide for appropriate drainage maintenance activities, these should be undertaken in a way that minimises adverse effects, or maintains or enhances habitat values. For this reason, Rule 46 makes the removal of aquatic weeds and plants and sediment from modified watercourses a permitted activity subject to conditions that seek to minimise adverse effects. Other measures to minimise adverse effects will be promoted through sustainable drainage management strategies/codes of practice/range of best management practices for drainage.

Policy 35 – Stock access to surface water

Objectives 10-13
Issue 6
Rules 32, 36
Rules 16, 17, 42
Section 2.3

(a) Encourage the exclusion of all stock from surface water bodies and artificial watercourses where practicable.

(b) Ensure that when stock access to surface water bodies and artificial watercourses occurs, this is managed in a manner that avoids significant adverse effects on:

(i) water quality;
(ii) bed and bank integrity and stability;
(iii) aquatic, riverine and riparian ecosystems and habitats.

Explanation
Stock access to surface water bodies and artificial watercourses has a number of adverse environmental effects. These effects include trampling and damage to beds and banks, disturbance of ecosystems and habitat, increased sediment and effluent inputs, and an associated decrease in water quality that can render the water unsuitable for consumption by farm animals and affect water for contact recreation purposes. The damage caused is dependent on a number of factors including the type of stock and density of stocking, the length of time spent in the water body, the frequency of crossing of the water body, and the size and type of water body.

Deer, cattle and pigs are attracted to water and tend to congregate in and around water bodies. These types of stock are therefore most likely to cause adverse environmental effects. Sheep are less of a problem, but can also cause adverse effects, particularly in higher densities. Activities such as mob stocking, supplementary feeding and fencing stock in beds of lakes and rivers are damaging and unacceptable practices. The adverse effects on bank stability and water quality are often worse in wet conditions and in erosion prone country.

Because of the practical difficulties associated with fencing stock out of water bodies in some situations, the Council has adopted the following strategy for managing the adverse effects of stock access to surface water:

(a) permitted activity rules with effects based conditions addressing the adverse effects of stock access to surface water;
(b) exclusion of stock within 3 metres of water in a lake, river, modified watercourse, stream or artificial watercourse when intensive winter grazing is being undertaken and within any natural state water body or regionally significant wetland; and
(c) education and enforcement of the permitted activity rules for other forms of stock access to surface water.

This strategy is seen as one means of achieving the water quality outcomes contained in Section 3.1 of this Plan. Landowners will be encouraged to adopt best management practices, and required as a minimum, to ensure that stock are managed in a way that does not reduce water quality below any water quality standards set for the relevant surface water body in Appendix G "Water Quality Standards" after reasonable mixing. In some situations, this will necessitate the placement of temporary or permanent fencing and alternative stock water supplies.

The Council will consider the introduction of further regulation if this strategy is shown to be a barrier to achieving the water quality outcomes set out in Section 3.1 of this Plan.

Objectives 10-13
Issue 6
Policies 32-35, 37
Rules 24-44
Section 2.3

Policy 36 - Promote good environmental practice

Use non-regulatory methods to promote good environmental practice in relation to structures and bed disturbance activities.

Explanation
Non-regulatory methods include approaches such as education, promotion and best management practices. These methods are a key tool in achieving the stated objectives and can be used independently of or in conjunction with rules. Non-regulatory methods are also necessary to promote environmental awareness and good practice given that many activities are permitted, and will not be formally assessed through the resource consent process.

Objectives 10-13
Issue 6
Policies 32, 36
Rule 34
Section 2.3

Policy 37 – Whitebait Stands

Restrict the allocation of space for whitebait stands in the beds of lakes, rivers, modified watercourses and streams to:

(a) stands lawfully existing as of 1 June 2003; or
(b) new stands used in lieu of previously lawfully existing stands, but as close as practicable to the former site where that site can no

longer be used because of either natural alterations to the course of the river, bank erosion or high-water mark alterations.

Explanation
This is an extension of Policy 13.17 of the Regional Policy Statement for Southland and applies to all rivers in the Region. The existing number of whitebait stands is considered to be sufficient to achieve the needs of present and future users. Lawfully existing stands may be repaired or reconstructed, as necessary, but no further space will be allocated. Replacement of existing stands would be compatible with this policy as would the allocation of a new site where either an old site can no longer be used, because of natural alterations to the course of the river, bank erosion, or high-water mark alterations.

5.2.4 Land and Soil Policies
(see also Section 5.2.1 Water Quality and Quantity Policies)

Policy 37A[48] – Matching discharges onto or into land to risk

Match the level of management that is required for discharges of contaminants onto or into land to the level of environmental risk posed by the following risk factors:

(a) Nature and quantity of contaminants in the discharge
(b) Sloping land
(c) Soils with artificial drainage or coarse structures
(d) Soils with impeded drainage or low infiltration rates
(e) Well drained soils
(f) Climate
(g) Proximity to groundwater
(h) Proximity to surface water
(i) Current soil fertility and consequent potential to leach nutrients.

Explanation
Along with the method of discharge, rate, depth and level of contaminant loading, the specific location or attributes of the receiving environment can determine the inherent level of risk that a discharge of contaminants onto or into land will cause adverse effects.

Soil types within Southland have been classified based on technical investigations, with Council holding information on the various soil properties that affect land uses, in particular farm dairy effluent (FDE) management. For example, a 2009 report on the influence of soil drainage characteristics on leakage risks associated with FDE application showed that well-drained soils represented the lowest risk of direct contamination.

48 The shaded provisions took legal effect from 1 December 2012 (the date of public notification of Plan Changes 14 and 15) in accordance with Section 86B(3) of the Resource Management Act 1991.

The risk factors listed in Policy 37A need to be recognised in order to effectively manage discharges and minimise the potential for adverse effects. The topography of the receiving environment can affect the distribution of a discharge, while climatic factors such as rainfall can impact through increased runoff or the saturation of soils. Current soil fertility can affect the potential for nutrients applied in discharges to leach through the soil to groundwater.

Discharges of contaminants onto or into land should also not be undertaken near any surface water body or at a location where overland or subsurface flow will result in contaminants reaching surface water. Additionally, in areas with a shallow depth to groundwater, there is limited opportunity for the removal of contaminants through the soil before direct contact with the groundwater.

The potential for effects on the receiving environment can be managed by matching the application method, rate, depth, time and loading of a discharge of contaminants to the corresponding environmental risks. The risk factors listed in Policy 37A have been taken into account when determining the rule framework for discharges of contaminants onto or into land and the information required with consent applications.

The risk factors will also be used when assessing consent applications. Accordingly, resource consents for discharges with low levels of environmental risk are likely to have longer durations and less stringent conditions than those discharges considered to have higher levels of environmental risk.

Managing discharge activities in accordance with the level of environmental risk as defined in Policy 37A will assist Council to achieve Objective 9B, through avoiding adverse effects on human health, and assist to achieve Objectives 3 and 4 in relation to water quality.

Policy 37C[49] - Manage discharges of contaminants onto or into land

Manage discharges of contaminants onto or into land to avoid, remedy or mitigate adverse effects, including on:
(a) soil quality;
(b) amenity values;
(c) habitats, ecosystems and indigenous biological diversity;
(d) historic heritage, cultural and traditional values;
(e) natural character;
(f) outstanding natural features.

[49] The shaded provisions took legal effect from 1 December 2012 (the date of public notification of Plan Changes 14 and 15) in accordance with Section 86B(3) of the Resource Management Act 1991.

Explanation
Discharges of contaminants onto or into land can have a range of adverse effects on the environment, and consequently need to be managed so that these effects are avoided, remedied or mitigated.

Policy 37C acknowledges that Council is obliged to recognise and provide for a number of important matters under Part 2 of the Act when managing discharges of contaminants onto or into land. These include the life supporting capacity of soil, the maintenance and enhancement of amenity values, significant habitats of indigenous flora and fauna, the intrinsic values of ecosystems, the protection of historic heritage, the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu and other taonga, and the protection of outstanding natural character.

Policy 37C will assist the Council in achieving Objectives 9A and 9C of the Water Plan.

Policy 37D[50] – Beneficial reuse

Encourage the beneficial reuse of materials where this is appropriate, and promote discharges of these materials onto or into land to maximise the potential reuse of the nutrients and water contained in the discharge.

Explanation
It is recognised that the discharge of certain materials, that might otherwise be considered to be contaminants, can enhance plant growth and have positive effects on the receiving environment, given the nutrient and water levels within the discharge. Encouraging beneficial reuse is an appropriate management technique for Council to employ, to recognise the value that can be derived from some discharges. Beneficial reuse can also reduce the overall amount of materials being disposed of at landfill as waste.

5.2.5 Wetlands Policies

Policy 38 - Adverse effects of activities

Objectives 1-5
Issue 7
Section 2.3

Avoid, remedy or mitigate the adverse effects of activities on wetlands through an integrated management approach with the Southland territorial authorities

Explanation
Any adverse effects of the use, development or protection of land or water resources on wetlands should be avoided wherever possible in a co-ordinated way through an integrated management approach. Wetlands contain both land and water therefore integration of all

[50] The shaded provisions took legal effect from 1 December 2012 (the date of public notification of Plan Changes 14 and 15) in accordance with Section 86B(3) of the Resource Management Act 1991.

methods of management is required to avoid duplication and/or inconsistency in the approaches taken to wetland management by regional councils and territorial authorities.

Given the above, Environment Southland and the Southland District Council jointly established the Southland Wetlands Working Party in 2004. The working party is comprised of a wide range of agencies with interests in wetland management as well as landowner representatives. The aim of the working party is to help private landowners to identify and sustainably manage wetland areas on their property and to promote the benefits of including wetland ecosystems as an integral part of the productive farming landscape.

Objectives 1-5
Issue 7
Section 2.3

Policy 39 – Promote best management practice

Use non-regulatory methods to promote best management practice in relation to retaining or enhancing the natural values of wetlands.

Explanation
The opportunity exists for the promotion and implementation of non-regulatory methods including approaches such as education, promotion and best management practices. These methods are a key tool in achieving the stated objectives and can be used independently of or in conjunction with rules. Non-regulatory methods are also necessary to promote environmental awareness and good practice, and when used in conjunction with incentives adopted through the Annual Plan process, can provide good environmental outcomes.

Objectives 1-5
Issue 7
Section 2.3

Policy 40 – Restoration of existing wetlands and the creation of wetlands

Encourage the maintenance and restoration of existing wetlands and the creation of new wetlands.

Explanation
The restoration of existing wetlands and creation of new wetlands is occurring in Southland. Wetlands can be created or modified using weirs, embankments or dams (that may be subject to rules elsewhere in the Plan). Examples of wetland creation include dammed wetlands, oxbow lakes, wastewater treatment systems, duck ponds, and stock water reservoirs. There are many benefits of these types of wetlands. As well as enhancing landscape values and providing habitat, created and restored wetlands assist with maintaining good water quality and water quantity during low flows.

5.2.6 Agricultural Effluent Policies

Objectives 2-4
Issues 1-4
Rule 49
Section 2.3

Policy 41 - Adverse effects of agricultural effluent ponds

Avoid adverse effects on water quality, and avoid as far as possible other adverse environmental effects, associated with the location, design, construction, operation and maintenance of agricultural effluent ponds.

Explanation
Agricultural effluent contains high levels of pathogens, nitrogen and other contaminants. This means that there is a significant risk to water quality and public health if deficiencies in the design and construction of an agricultural effluent pond result in a discharge to groundwater or surface water.

The adverse effects of agricultural effluent ponds on water quality can be avoided by the adoption of appropriate design and construction standards such as those contained in the *Environment Southland Code of Practice for Design and Construction of Agricultural Effluent Ponds*. To ensure these standards are met, agricultural effluent ponds need to be properly designed by persons with experience in the design and oversight of construction of this type of structure. In addition, the construction of an agricultural effluent pond requires an experienced contractor with adequate heavy equipment. In order to ensure compliance with appropriate standards, the construction of all new agricultural effluent ponds will require resource consent from the Council.

To further minimise risks to water quality and public health, agricultural effluent ponds should not be located in close proximity to surface water bodies, artificial watercourses, the coastal marine area or potable water abstraction points. Buffer distances have therefore been included in the relevant rule. The proximity of agricultural effluent ponds to registered drinking-water supplies, installed subsurface drains and groundwater will also be considered through the resource consent process.

Inappropriate use may result in adverse effects, for example if the pond is allowed to overflow, or the lining material is damaged during maintenance. It is therefore appropriate that Policy 41 makes reference to pond operation and maintenance, as these activities can also result in adverse environmental effects.

Agricultural effluent ponds can also have other adverse environmental effects such as the diversion of flood waters and odour problems. Buffer distances have therefore been included in the relevant rule to address these effects. Further consideration of these effects will occur through the resource consent process.

Policy 42 – Farm dairy effluent

Avoid adverse effects on water quality and other adverse environmental effects associated with the application of farm dairy effluent to land by matching farm dairy effluent management to receiving environment risk.

Explanation
Farm dairy effluent contains high levels of faecal microbes and nutrients and organic matter. Poorly managed farm dairy effluent land application

systems can therefore generate highly contaminated surface runoff and drainage waters and pose a significant risk to water quality and human and animal health. Direct losses of faecal microbes and nutrients can be avoided by matching application rate, depth, timing and loading to soil and landscape risk. The following table defines minimum management criteria for the five soil/landscape categories identified in Map 1 of Appendix 1 based on the inherent risk for each soil/landscape category:

Table 1: Minimum management criteria for a land applied effluent system to achieve

	Category A	Category B	Category C	Category D	Category E
Soil and landscape feature	Artificial drainage or coarse soil structure	Impeded drainage or low infiltration rate	Sloping land (>7°)	Well drained flat land (<7°)	Other well drained but very stony[X] flat land (<7°)
Application depth (mm)	< SWD*	< SWD	< SWD	< 50% of PAW#	≤ 10 mm & <50% of PAW#
Instantaneous application rate (mm/hr)	N/A**	N/A**	< soil infiltration rate	N/A	N/A
Average application rate (mm/hr)[i]	<soil infiltration rate	<soil infiltration rate	<soil infiltration rate	<soil infiltration rate	<soil infiltration rate
Storage requirement	Apply only when SWD exists	Apply only when SWD exists	Apply only when SWD exists	24 hours drainage post saturation	24 hours drainage post saturation
Maximum N load	150 kg N/ha/yr	150 kg N/ha/yr	150 kg N/ha/yr	150 kg N/ha/yr	150 kg N/ha/yr

* SWD = soil water deficit (The amount of water (mm) required to restore a soil to field capacity from its current moisture status)

PAW = Plant available water (The state of top 300mm of soil after rapid drainage has effectively ceased and the soil water content has become relatively stable)

X Very stony= soils with > 35% stone content in the top 200 mm of soil

** N/A = Not an essential criteria, however level of risk and management is lowered if using low application rates

If all the criteria in the above table are met, the valuable nutrients contained within farm dairy effluent will be kept in the root zone so they can be taken up by plants, instead of being lost into groundwater or surface waterways. Similarly, compliance with these criteria is necessary to prevent the loss of harmful faecal microbes to water. A high level of management will be required on some soils, and at some times of the year to ensure full compliance with consent conditions.

Farm dairy effluent that is treated to a high standard or applied at very low depths and/or application rates has less environmental risk and may have reduced storage requirements to those contained in Table 1.

Property specific calculations should include information that allows the volume of storage to be established ensuring that irrigation does not occur on soils under saturated conditions.

In order to provide flexibility in meeting the management criteria contained in Table 1, Environment Southland has established three approaches for potential consent applicants under associated Rule 50 as follows:

(1) Adoption of a default set of consent conditions designed to achieve the minimum criteria in Table 1, based on the

soil/landscape category shown on Map 1 of Appendix 1 for the effluent disposal area; or

(2) Refinement of the default set of consent conditions based on farm scale mapping of the soil/landscape categories within the effluent disposal area and/or a property specific calculation of storage requirements; or

(3) Property and effluent system specific consent conditions based on a plan supplied by the consent applicant containing detailed information on the effluent disposal area and proposed effluent system, demonstrating how the minimum criteria in Table 1 will be met.

In addition to potential adverse effects on water quality and human and animal health, the application of farm dairy effluent to land can also have other adverse environmental effects such as objectionable odour and spray drift beyond the boundary. Buffer distances are one means of managing these effects and are contained in the default consent conditions associated with Rule 50 and resource consents issued under this rule.

Policy 42A

Provide for the discharge of farm dairy effluent to land that is lawfully being undertaken up to and including 17 July 2010.

Explanation
It is considered appropriate to provide for the discharge of farm dairy effluent to land that is lawfully being undertaken up to and include 17 July 2010. This approach has been adopted because of the state and trend of water quality in some areas across Southland, and the potential for new activities (including an increase in intensity of an existing activity) to affect water quality.

Policy 43

Match consent duration and inspection and audit requirements on resource consents to apply farm dairy effluent to land to the level of risk of adverse environmental effects.

Explanation
The duration of resource consents to apply farm dairy effluent to land will correspond to the level of environmental risk. Resource consent for farm dairy effluent activities with low levels of environmental risk will have longer consent durations than those with higher levels of environmental risk. Factors that will be considered in determining consent duration include:

- Extent and nature of potential adverse effects of the activity
- Certainty of potential adverse effects and potential risks of the activity
- Water quality of the water resources that could be impacted by the activity

- Level of Council knowledge of the water resources of the area
- Monitoring and review requirements in consent conditions
- Permanence and economic life of the activity
- Capital investment in the activity
- Compliance history associated with the activity

Similarly, the inspection and audit requirements imposed on resource consents to apply farm dairy effluent to land will correspond to the level of environmental risk. Farm dairy effluent activities with higher levels of environmental risk will have increased inspection and audit requirements than those with lower risk. The information that is obtained through inspections and audits will be used in future farm dairy effluent management.

Objectives 2-4
Issues 1-4
Rule 51
Section 2.3

Policy 44 – Silage storage facilities

(a) Encourage the use of land as a silage storage facility such that there are unlikely to be adverse effects on any water or naturally occurring wetland, or noxious, dangerous, offensive, or objectionable effect beyond the boundary of the landholding on which silage is stored.

(b) Ensure that when land used as a silage storage facility is located such that adverse effects on any water or naturally occurring wetland, or noxious, dangerous, offensive, or objectionable effects beyond the boundary of the property on which silage is stored are likely, that soil and landscape features, surface preparations, or other features exist to avoid or mitigate adverse environmental effects.

Explanation

Making, storing, and utilising silage may result in problems such as discharges of silage leachate or sediment to water or naturally occurring wetlands, or noxious, dangerous, offensive, or objectionable effects beyond the boundary of the landholding on which silage is stored or utilised.

Silage leachate has a very low viscosity and high contaminant loading, and must not be discharged to land in circumstances where it may enter surface water. In particular silage leachate has a very high biological oxygen demand, and even small quantities are harmful to aquatic ecosystems.

The use of land as a silage storage facility often results in localised accumulation of sediments, excreta and waste silage at the time silage is utilised. It is important that activities associated with the direct utilisation of silage are managed in a way that prevents the movement of these contaminants to water or naturally occurring wetlands, for example by ensuring that:

- stormwater cannot run into the silage storage facility;
- the silage is properly prepared to avoid excessive production of leachate;

- that structures and surface features are in place to reliably contain any silage leachate that is produced;
- that silage leachate is safely disposed of, through application to land, transfer to an effluent management system, or other method.

Because of the close relationship between appropriate site selection and preparation, and environmental risk, the Council has adopted a risk-based approach to manage the adverse environmental effects of silage making.

A low risk situation occurs where there is little risk of adverse environmental effects, for example where use of land as a silage storage facility and discharge of silage leachate to land complies with permitted activity rules included in this plan.

A medium risk situation occurs where there is a risk of adverse environmental effects but those effects can be safely mitigated or avoided through good practice. This might be achieved by surface preparations that ensure that any discharge to land cannot reach water, or through the conditions of a discharge permit.

A high risk situation occurs where there is a risk of adverse environmental effects, even with the exercise of good environmental practice. Non-complying activity status is appropriate in these circumstances because the Council will have the power to decline any consent application that is received, and will have to adhere to policy guidance if it accepts an application.

5.2.7 Contaminated Land Policies

Policy 46[51] – Discharge waste and cleanfill appropriately

Ensure the discharge of contaminants as waste or cleanfill occurs at an appropriate site.

Explanation

Discharges of waste, including soil from land that has a hazardous substance in or on it, can remain as residues in the land and continue to leach for many years. Cleanfill can either be disposed of as waste or discharged for a particular purpose, such as land-raising activities, and is inert. The adverse effects associated with cleanfill sites usually only occur when non-cleanfill material is discharged as cleanfill, or where a cleanfill site is located in or near a sensitive receiving environment. Without management, discharges of waste and materials as cleanfill are a risk to the environment and can restrict land use activities for present and future generations. It is preferable to manage the disposal of waste and

[51] The shaded provisions took legal effect from 1 December 2012 (the date of public notification of Plan Change 14) in accordance with Section 86B(3) of the Resource Management Act 1991.

cleanfill at the point of discharge but this is difficult to achieve when it occurs at numerous sites across the region, and in some cases, illegally.

Discharges of waste should be consolidated in the Regional landfill as far as practicable. In some circumstances, it is reasonable to allow discharges to occur elsewhere, such as at industrial landfills, farm landfills, cleanfill sites or dead holes (offal pits). Factors to consider include, but are not limited to, the existence of alternatives (for example, access to waste transfer stations or the availability of collection services) and the risk of transporting hazardous substances. Where possible, an existing landfill should be used over the development of a new landfill unless the new landfill is likely to have less adverse environmental effects or is necessary to support a new industry or waste stream.

The selection of a suitable site is critical to the management of discharges of waste and cleanfill. Possible sites should be assessed in terms of their environmental risk and, once selected, a site should be developed to address any potential adverse effects. In particular, regard should be given to a site's proximity to sensitive receiving environments, particularly potable surface water and groundwater resources and aquatic ecosystems. Other sensitive features include, but are not limited to, dwellings and places of assembly, property boundaries, the coastal marine environment, and areas or features with cultural and historic heritage values.

Discharges of individual waste streams must be directed to sites with the necessary environmental controls to deal with such waste. Hazardous substances, including soil from land that has a hazardous substance in or on it, may be disposed of at a Class A or Class B landfill[52] subject to its waste acceptance criteria. Non-cleanfill materials should be kept out of cleanfill sites because of the low level of environmental controls. Waste deposited at a farm landfill should only be that which is derived from that landholding and has a low environmental risk. Carcasses and offal should be disposed of separately from farm waste unless it cannot be avoided for cultural reasons.

Policy 47[53] – Assess contaminated land

Assess the environmental risk of a discharge from land that has a hazardous substance in or on it using guideline values that are appropriate to the discharge and the site.

Explanation

Contamination of land with a hazardous substance may have actual or potential adverse effects on the environment. In general, the risk to the environment will depend upon the nature of the hazard (the toxicity, extent, quantity and mobility of the contaminant), the existence of an

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[52] Refer to Module 2: Hazardous Waste Guidelines – Landfill Waste Acceptance Criteria and Landfill Classification (Ministry for the Environment, 2004)

[53] The shaded provisions took legal effect from 1 December 2012 (the date of public notification of Plan Change 14) in accordance with Section 86B(3) of the Resource Management Act 1991.

exposure pathway, and the sensitivity of the receiving environments. Adverse effects will not usually occur, however, unless or until there is a discharge from the land, either through groundwater, stormwater or the depositing of soil. Contaminant flow paths have a natural variability and land that has no discharge at present may still have a discharge in the future. To assess the environmental risk of a discharge from the land requires an investigation of the concentrations of suspended or dissolved contaminants in groundwater[54] or stormwater. To assess discharges of soil from the land it is necessary to investigate contaminant concentrations in the soil. All assessments should be carried out in accordance with the Ministry for the Environment Contaminated Land Management Guidelines.

There are a range of New Zealand and international guidelines that are commonly used for site investigations. New Zealand guidelines based on a risk assessment methodology should be used, but if no such sources are available then Australasian guidelines should be applied. Otherwise, either the most conservative guideline values available from an appropriate international source or a site-specific risk assessment may be used. In some cases it will be more appropriate to use industry guidelines because of a past or present land use activity. Guideline values are trigger values to indicate where a management response may be necessary, they are not standards. Discharges must also be assessed in the context of their surroundings. This includes, but is not limited to, the physical nature, conductivity / permeability and hydraulic connectivity of the soils (including macropore flow or the existence of natural or manmade preferential flow paths), and also the distance and gradient to groundwater, surface water, the coastal marine environment and other sensitive features.

Policy 48[55] – Manage contaminated land

Require that:

(a) the best practicable option is adopted to prevent or minimise adverse effects from land that has a hazardous substance in or on it as far as practicable; and

(b) monitoring and reporting is carried out to confirm that the option adopted in (a) is successful.

Explanation

A discharge from land that has a hazardous substance in or on it in circumstances which may result in contaminants entering water may have adverse environmental effects now and in the future. Where actual

[54] Effective groundwater monitoring of contaminants requires careful design and placement of monitoring wells and existing wells are not usually suitable for monitoring purposes. Environment Southland can provide guidance for groundwater investigations.

[55] The shaded provisions took legal effect from 1 December 2012 (the date of public notification of Plan Change 14) in accordance with Section 86B(3) of the Resource Management Act 1991.

or potential adverse effects are more than minor then the best practicable option will need to be implemented to manage these effects. Options will range from monitoring of the discharge to containment or remediation of the site. Land that is at least reasonably likely to have significant adverse effects is considered to be *contaminated land* for the purposes of this Plan and is likely to necessitate a high level of management intervention. Policy 48 only applies to those discharges that require a resource consent under Rule 58. Contaminated land and best practicable option are defined in the Glossary Section of this Plan.

An evaluation of the best practicable option for managing adverse effects will take account of, but is not limited to, the factors listed in the definition, such as the nature of the discharge and its adverse effects, the methods available, and their likelihood of success. It should take account of all relevant factors, although one or two factors may be more applicable than others in each set of circumstances. The weighting given to each factor will depend upon the facts of the specific case, and this should be done in full consultation with the landowner, particularly because of the possible financial implications involved.

Target contaminant concentration levels or other measures of success should be quantified in the conditions of any consent issued, and it is essential that adequate monitoring and reporting are carried out to show whether or not they are achieved. If a best practicable option is not as successful as anticipated in managing adverse effects, then it may be necessary to re-evaluate the best practicable option and possibly adopt alternative methods if warranted. Where the best practicable option is successful but a discharge does not meet the permitted activity in Rule 57 (a) then it may be necessary to undertake ongoing monitoring of the risk to the receiving environments.

Region-wide Objectives

Objective 1
Land and water and associated ecosystems are managed as integrated natural resources, recognising the connectivity between surface water and groundwater, and between freshwater, land and the coast.

Objective 2
Water and land is recognised as an enabler of the economic, social and cultural wellbeing of the region.

Objective 3
The mauri (inherent health) of waterbodies provide for te hauora o te tangata (health of the people), te hauora o te taiao (health of the environment) and te hauora o te wai (health of the waterbody).

Objective 4
Tāngata whenua values and interests are identified and reflected in the management of freshwater and associated ecosystems.

Objective 5
Ngāi Tahu have access to and sustainable customary use of, both commercial and non-commercial, mahinga kai resources, nohoanga, mātaitai and taiāpure.

Objective 6
There is no reduction in the quality of freshwater, and water in estuaries and coastal lagoons, by:

(a) maintaining the quality of water in waterbodies, estuaries and coastal lagoons, where the water quality is not degraded; and
(b) improving the quality of water in waterbodies, estuaries and coastal lagoons, that have been degraded by human activities.

Objective 7
Any further over-allocation of freshwater (water quality and quantity) is avoided and existing over-allocation is phased out in in accordance with timeframes established under Freshwater Management Unit processes.

Objective 8
(a) The quality of water in aquifers that meet both the Drinking-Water Standards for New Zealand 2005 (revised 2008) and any freshwater objectives, including for connected surface waterbodies, established under Freshwater Management Unit processes is maintained; and

(b) The quality of water in aquifers that have been degraded by land use and discharge activities (with the exception of those aquifers where ambient water quality is naturally less than the Drinking-Water Standards for New Zealand 2005 (revised 2008)) is improved.

Objective 9

(a) The quantity of water in surface waterbodies is managed so that aquatic ecosystem health, life-supporting capacity, outstanding natural features and landscapes, recreational values, natural character, and historic heritage values of surface waterbodies and their margins are safeguarded; and

(b) Provided (a) is met, water is available both instream and out-of-stream to support the reasonable needs of people and communities to provide for their social, economic and cultural wellbeing.

Objective 10

The national importance of the existing Manapōuri Power Scheme in the Waiau catchment is provided for, and recognised in any resulting flow and level regime.

Objective 11

Water is allocated and used efficiently.

Objective 12

Groundwater levels, and minimum surface water flows where these are derived from groundwater, are maintained.

Objective 13

Enable the use and development of land and soils, provided:

(a) the quantity, quality and structure of soil resources are not irreversibly degraded through land use activities and discharges to land;
(b) the discharge of contaminants to land or water that have significant or cumulative effects on human health are avoided; and
(c) adverse effects on ecosystems (including diversity and integrity of habitats), amenity values, cultural values and historic heritage values are avoided, remedied or mitigated to ensure these values are maintained or enhanced.

Objective 14

The range and diversity of indigenous ecosystem types and habitats within dryland environments, rivers, estuaries, wetlands and lakes, including their margins, and their life-supporting capacity are maintained or enhanced.

Objective 15

Taonga species, as set out in Appendix M, and related habitats, are recognised and provided for.

Objective 16

Public access to river and lake beds is maintained, except in circumstances where public health and safety are at risk.

Objective 17

The natural character values of wetlands, rivers and lakes including channel form, bed rapids, seasonably variable flows and natural habitats, are protected from inappropriate use and development.

Objective 18

All activities operate at "good (environmental) management practice" or better to optimise efficient resource use and protect the region's land, soils, and water from quality and quantity degradation.

Region-wide Policies

The Policies of this Plan implement the Objectives and must be read in their entirety and considered together.

Ngāi Tahu Policies

Policy 1 – Enable papatipu rūnanga to participate

Enable papatipu rūnanga to effectively undertake their kaitiaki responsibilities in freshwater and land management through Environment Southland:

1. providing copies of all applications that may affect a Statutory Acknowledgement area, tōpuni, nohoanga, mātaitai or taiāpure to Te Rūnanga o Ngāi Tahu and the relevant papatipu rūnanga;
2. identifying Ngāi Tahu interests in freshwater and associated ecosystems in Southland/Murihiku;
3. reflect Ngāi Tahu values and interests in the management of and decision-making on freshwater and freshwater ecosystems in Southland/Murihiku, consistent with the Charter of Understanding.

Policy 2 – Take into account iwi management plans

Any assessment of an activity covered by this plan must:

1. take into account any relevant iwi management plan; and
2. assess water quality and quantity based on Ngāi Tahu indicators of health.

Policy 3 – Ngāi Tahu ki Murihiku taonga species

To manage activities that adversely affect taonga species, identified in Appendix M.

Physiographic Zone Policies

Policy 4 – Alpine

In the Alpine physiographic zone, avoid, remedy, or mitigate erosion and adverse effects on water quality from contaminants, by:

1. requiring implementation of good management practices to manage erosion and adverse effects on water quality from contaminants transported via overland flow;
2. having particular regard to adverse effects of contaminants transported via overland flow when assessing resource consent applications and preparing or considering management plans;
3. prohibiting dairy farming, and intensive winter grazing and strongly discouraging the granting of resource consents for cultivation.

Policy 5 – Central Plains

In the Central Plains physiographic zone, avoid, remedy, or mitigate adverse effects on water quality from contaminants, by:

1. requiring implementation of good management practices to manage adverse effects on water quality from contaminants transported via artificial drainage and deep drainage;
2. having particular regard to adverse effects on water quality from contaminants transported via artificial drainage and deep drainage when assessing resource consent applications and preparing or considering management plans.

Policy 6 – Gleyed

In the Gleyed physiographic zone, avoid, remedy, or mitigate adverse effects on water quality from contaminants, by:

1. requiring implementation of good management practices to manage adverse effects on water quality from contaminants transported via artificial drainage, and overland flow where relevant;
2. having particular regard to adverse effects on water quality from contaminants transported via artificial drainage, and overland flow where relevant when assessing resource consent applications and preparing or considering management plans.

Policy 7 – Bedrock/Hill Country

In the Bedrock/Hill Country physiographic zone, avoid, remedy, or mitigate erosion and adverse effects on water quality from contaminants, by:

1. requiring implementation of good management practices to manage erosion and adverse effects on water quality from contaminants transported via overland flow and artificial drainage where relevant;
2. having particular regard to adverse effects on water quality from contaminants transported via overland flow and artificial drainage where relevant when assessing resource consent applications and preparing or considering management plans.

Policy 8 – Lignite-Marine Terraces

In the Lignite–Marine Terraces physiographic zone, avoid, remedy, or mitigate adverse effects on water quality from contaminants, by:

1. requiring implementation of good management practices to manage adverse effects on water quality from contaminants transported via overland flow and artificial drainage where relevant;
2. having particular regard to adverse effects on water quality from contaminants transported via overland flow and artificial drainage where relevant when assessing resource consent applications and preparing or considering management plans.

Policy 9 – Old Mataura

In the Old Mataura physiographic zone, avoid, remedy, or mitigate adverse effects on water quality from contaminants, by:

1. requiring implementation of good management practices to manage adverse effects on water quality from contaminants transported via deep drainage;
2. having particular regard to adverse effects on water quality from contaminants transported via deep drainage when assessing resource consent applications and preparing or considering management plans;
3. strongly discouraging the granting of resource consents for additional dairy farming of cows and additional intensive winter grazing.

Policy 10 – Oxidising

In the Oxidising physiographic zone, avoid, remedy, or mitigate adverse effects on water quality from contaminants, by:

1. requiring implementation of good management practices to manage adverse effects on water quality from contaminants transported via deep drainage, and overland flow and artificial drainage where relevant;
2. having particular regard to adverse effects on water quality from contaminants transported via deep drainage, and overland flow and artificial drainage where relevant when assessing resource consent applications and preparing or considering management plans;

Policy 11 – Peat Wetlands

In the Peat Wetlands physiographic zone, avoid, remedy, or mitigate adverse effects on water quality from contaminants, by:

1. requiring implementation of good management practices to manage adverse effects on water quality from contaminants transported via artificial drainage, deep drainage, and lateral drainage;
2. having particular regard to adverse effects on water quality from contaminants transported via artificial drainage, deep drainage, and lateral drainage when assessing resource consent applications and preparing or considering management plans;
3. strongly discouraging the granting of resource consents for additional dairy farming of cows and additional intensive winter grazing.

Policy 12 – Riverine

In the Riverine physiographic zone, avoid, remedy, or mitigate adverse effects on water quality from contaminants, by:

1. requiring implementation of good management practices to manage adverse effects on water quality from contaminants transported via deep drainage, and overland flow where relevant;
2. having particular regard to adverse effects on water quality from contaminants transported via deep drainage, and overland flow where relevant when assessing resource consent applications and preparing or considering management plans.

Water Quality

Policy A4 of the National Policy Statement for Freshwater Management 2014

1. When considering any application for a discharge the consent authority must have regard to the following matters:
   (a) the extent to which the discharge would avoid contamination that will have an adverse effect on the life-supporting capacity of freshwater including on any ecosystem associated with freshwater; and
   (b) the extent to which it is feasible and dependable that any more than minor adverse effect on freshwater, and on any ecosystem associated with freshwater, resulting from the discharge would be avoided.

2. When considering any application for a discharge the consent authority must have regard to the following matters:
   (a) the extent to which the discharge would avoid contamination that will have an adverse effect on the health of people and communities as affected by their secondary contact with freshwater; and
   (b) the extent to which it is feasible and dependable that any more than minor adverse effect on the health of people and communities as affected by their secondary contact with freshwater resulting from the discharge would be avoided.

3. This policy applies to the following discharges (including a diffuse discharge by any person or animal):
   (a) a new discharge; or
   (b) a change or increase in any discharge of any contaminant into freshwater, or onto or into land in circumstances that may result in that contaminant (or, as a result of any natural process from the discharge of that contaminant, any other contaminant) entering freshwater.

4. Paragraph 1 of this policy does not apply to any application for consent first lodged before the National Policy Statement for Freshwater Management 2011 took effect on 1 July 2011.

5. Paragraph 2 of this policy does not apply to any application for consent first lodged before the National Policy Statement for Freshwater Management 2014 takes effect.

Policy 13 – Management of land use activities and discharges

Manage land use activities and discharges (point source and non-point source) to land and water so that water quality and the health of humans, domestic animals and aquatic life, is protected.

Policy 14 – Preference for discharges to land

Prefer discharges to land, rather than direct discharges to water.

Policy 15 – Maintaining and improving water quality

Maintain and improve water quality by:

1. despite any other policy or objective in this Plan, avoiding new discharges to surface waterbodies that will reduce water quality beyond the zone of reasonable mixing;

2. avoiding point source and non-point source discharges to land that will reduce surface or groundwater quality, unless the adverse effects of the discharge can be avoided, remedied or mitigated;
3 avoiding land use activities that will reduce surface or groundwater quality, unless the adverse effects can be avoided, remedied or mitigated; and
4. avoiding discharges to artificial watercourses that will reduce water quality in a river, lake or moidified watercourse beyond the zone of reasonable mixing;

so that:

1. water quality is maintained where it is better than the water quality standards specified in Appendix E "Water Quality Standards"; or
2. water quality is improved where it does not meet the water quality standards specified in Appendix E "Water Quality Standards"; and
3. water quality meets the Drinking-Water Standards for New Zealand 2005 (revised 2008); and
4. ANZECC sediment guidelines (as shown in Appendix C of this Plan) are met.

Policy 16 – Farming activities that affect water quality

1. Minimising the environmental effects (including on the quality of water in rivers, coastal lakes, lagoons, tidal estuaries, salt marshes and coastal wetlands, and groundwater) from farming activities by:
   (a) strongly discouraging the establishment of new dairy farming or new intensive winter grazing activities in close proximity to sensitive waterbodies identified in Appendix Q;
   (b) strongly discouraging applications to establish new, or further intensify existing dairy farming of cows or intensive winter grazing activities where the effects on the quality of water, including cumulatively, of groundwater, waterbodies, coastal lakes, lagoons, tidal estuaries, salt marshes and coastal wetlands cannot be avoided or fully mitigated or in areas where water quality is already degraded to the point of being over-allocated.

2. Requiring all farming activities, including existing activities, to:
   (a) either implement a Management Plan, as set out in Appendix N, or be listed on the Environment Southland Register of Independently Audited Self-Management Participants;
   (b) actively manage sediment run-off risk from farming and hill country development by requiring setbacks from waterbodies, riparian planting, limits on areas or duration of exposed soils and the prevention of stock entering surface waterbodies;
   (c) manage collected and diffuse run-off and leaching of nutrients, microbial contaminants and sediment through the identification and management of higher risk physiographic zones on a regional scale, and critical source areas within individual properties.

Policy 17 – Effluent management

1. Avoid adverse effects on water quality, and avoid as far as practicable other adverse environmental effects of the operation of, and discharges from effluent management systems.

2. Manage effluent systems and discharges from them by:
   (a) designing, constructing and locating systems appropriately and in accordance with standards;

(b) maintaining and operating effluent systems in accordance with best practice guidelines;
(c) avoiding any surface run-off/overland flow, ponding or contamination of water resulting from the application of agricultural effluent to pasture;
(d) avoiding the discharge of raw sewage and untreated agricultural effluent to water.

Policy 18 – Stock exclusion from waterbodies

Reduce sedimentation and microbial contamination of waterbodies and improve river and riparian ecosystems and habitats by:

1. requiring progressive exclusion of all stock, except sheep, from all waterbodies, including artificial watercourses, on land with a slope of less than 16° by 2025, and the management of sheep in critical source areas;
2. requiring the adoption of management plans that set out methods and timeframes to achieve these outcomes;
3. encouraging the establishment and enhancement of healthy vegetative cover in riparian areas, particularly through use of indigenous vegetation;
4. ensuring that when stock access waterbodies, including artificial watercourses, this is managed in a manner that avoids significant adverse effects on water quality, bed and bank integrity and stability, mahinga kai, and aquatic, river and riparian ecosystems and habitats.

Water Quantity

Policy B7 of the National Policy Statement for Freshwater Management 2014

1. When considering any application the consent authority must have regard to the following matters:
   (a) the extent to which the change would adversely affect safeguarding the life-supporting capacity of freshwater and of any associated ecosystem; and
   (b) the extent to which it is feasible and dependable that any adverse effect on the life-supporting capacity of freshwater and of any associated ecosystem resulting from the change would be avoided.

2. This policy applies to:
   (a) any new activity; and
   (b) any change in the character, intensity or scale of any established activity;

   that involves any taking, using, damming or diverting of freshwater or draining of any wetland, which is likely to result in any more than minor adverse change in the natural variability of flows or level of any freshwater, compared to that which immediately preceded the commencement of the new activity or the change in the established activity (or in the case of a change in an intermittent or seasonal activity, compared to that on the last occasion on which the activity was carried out).

3. This policy does not apply to any application for consent first lodged before the National Policy Statement for Freshwater Management 2011 took effect on 1 July 2011.

Policy 20 – Management of water resources

Manage the taking, abstraction, use, damming or diversion of surface water and groundwater so as to:

1. avoid, remedy or mitigate adverse effects from the use and development of surface water resources on:
   (a) the quality and quantity of aquatic habitat;
   (b) natural character values, natural features, and amenity, aesthetic and landscape values;
   (c) areas of significant indigenous vegetation and significant habitats of indigenous fauna;
   (d) recreational values;
   (e) the spiritual and cultural values and beliefs of tangata whenua;
   (f) water quality, including temperature and oxygen content;
   (g) the rights of lawful existing users;
   (h) groundwater quality and quantity;
   (i) historic heritage values;
   (j) mātaitai, taiāpure and nohoanga;

2. avoid, remedy or mitigate significant adverse effects from the use and development of groundwater resources:
   (a) long-term aquifer storage volumes;
   (b) the reliability of supply for existing groundwater users;

(c) surface water flows and levels, particularly in spring-fed streams, and aquatic ecosystems and habitats; and
(d) water quality;

3. ensure water is used efficiently and reasonably by requiring that the rate of abstraction and abstraction volumes specified on water permits to take and use water are no more than reasonable for the intended end use;

4. recognise the positive effects resulting from the use and development of water resources.

Policy 21 – Allocation of water

Manage the allocation of surface water and groundwater by:

1. determining the primary allocation for confined aquifers not identified in Appendix L.5, following the methodology established in Appendix L.6;

2. determining that a waterbody is fully allocated when the total volume of water allocated through current resource consents and permitted activities is equal to either:
   (a) the maximum amount that may be allocated under the rules of this Plan, or
   (b) the provisions of any water conservation order;

3. enabling secondary allocation of surface water and groundwater subject to appropriate minimum groundwater level cutoffs and/or seasonal recovery triggers, to ensure:
   (a) long-term aquifer storage volumes are maintained; and
   (b) the reliability of supply for existing groundwater users is not adversely affected.

Policy 22 – Management of the effects of groundwater and surface water use

Manage the effects of surface and groundwater abstractions by:

1. avoiding allocating water to the extent that the base flow of any waterway is depleted, in order to protect the mauri of that waterway and mahinga kai or taonga species;

2. ensuring interference effects are acceptable, in accordance with Appendix L.3;

3. utilising the methodology established in Appendix L.2 to:
   (a) manage groundwater abstractions with a daily volume exceeding 86 cubic metres per day on surface waterbodies; and
   (b) assess and manage the effects of groundwater abstractions with a daily volume exceeding 86 cubic metres per day in groundwater management zones other than those specified in Appendix L.5.

Policy 23 – Stream depletion effects

Manage stream depletion effects resulting from groundwater takes with a daily average rate of take exceeding 2 litres per second which are classified as having a Riparian, Direct, High or Moderate hydraulic connection, as set out in Appendix L.2, to ensure the cumulative effect does not:

1. exceed any relevant surface water allocation regime (including those established under any water conservation order);

2. result in surface water flows or levels less than prescribed minimum flows or levels or long-term baseflow.

Policy 24 – Water abstraction for community water supply

Recognise the need for, and assign priority to, the provision of water for community water supply when allocating water:

1. provided that significant adverse effects on the following are avoided as a first preference, and if unable to be avoided, are mitigated:
   (a) the quality and quantity of aquatic habitats;
   (b) natural character values, natural features, and amenity, aesthetic and landscape values;
   (c) areas of significant indigenous vegetation and significant habitats of indigenous fauna;
   (d) recreational values;
   (e) the spiritual and cultural values and beliefs of the tangata whenua;
   (f) water quantity and quality;
   (g) long-term aquifer storage volumes; and
   (h) historic heritage values; and

2. provided that a water demand management strategy commensurate to both the scale of the activity and its potential effects is part of any application for:
   (a) a new or replacement water permit for a community water supply; or
   (b) an amendment to an existing water permit for a community water supply.

Policy 25 – Priority takes

When issuing a water shortage direction, Environment Southland will give priority to water abstraction for the following uses:

1. reasonable domestic needs;
2. reasonable animal drinking needs;
3. fire-fighting purposes;
4. public health needs; or
6. animal welfare needs.

Activities that affect water quality and quantity

Policy 26– Renewable energy

Recognise and provide for the national and regional significance of renewable electricity generation activities (including the existing Manapōuri hydro-electric facilities in the Waiau catchment), and the national, regional and local benefits relevant to renewable electricity generation activities, when:

1. allocating surface water for abstraction, damming, diversion and use; and
2. considering all resource consent applications for surface water abstractions, damming, diversion and use.

Policy 27 –Bore construction and management

Require minimum standards for the construction, operation and maintenance of bores and wells.

Policy 28 – Structures and bed disturbance activities of rivers (including streams and modified watercourses) and lakes

Manage structures and bed disturbance activities in the beds of rivers and lakes, to avoid, remedy or mitigate adverse effects on:

1. water quality and quantity;
2. habitats, ecosystems and fish passage;
3. indigenous biological diversity;
4. historic heritage;
5. the spiritual and cultural values and beliefs of the tangata whenua;
6. mātaitai and taiāpure;
7. public access (except in circumstances where public health and safety are at risk) and amenity values;
8. natural character values and outstanding natural features;
9. river morphology and dynamics, including erosion and sedimentation;
10. flood risk;
11. infrastructural assets; and
12. navigational safety.

Policy 29 – Provide for the extraction of gravel

Provide for the extraction of gravel to meet the needs of the community, in a way that avoids, remedies or mitigates adverse effects on rivers and their margins; and:

1. maintains or enhances aquatic and riparian habitat; or
2. ensures no long-term net loss of habitat in the river channel and floodplain; or
3. maintains or enhances flood protection, erosion control or the integrity of physical resources; and
4. does not adversely affect the cultural values associated with the river, including mahinga kai and taonga species habitat, mātaitai and taiāpure; and
5. does not adversely affect recreational values.

Policy 30 – Drainage maintenance

In recognition of the community benefits of maintaining flood capacity and land drainage, ensure that drainage maintenance activities within artificial watercourses and the beds of modified watercourses are managed in a way that either:

1. avoids, remedies or mitigates significant adverse effects on the aquatic environment; or
2. maintains or enhances habitat value.

Policy 31 – Whitebait stands

Restrict the allocation of space for whitebait stands in the beds of lakes, rivers, modified watercourses and streams to:

1. stands lawfully existing as of 1 June 2003; or
2. new stands used in lieu of previously lawfully existing stands, but as close as practical to the former site where that site can no longer be used because of either natural alterations to the course of the river, bank erosion or high-water mark alterations.

Policy 32 – Protect significant indigenous vegetation and habitat

Protect significant indigenous vegetation and significant habitats of indigenous fauna to improve soil health, water quality, water quantity and ecosystem health.

Policy 33 – Adverse effects on wetlands

Prevent the reduction in area, function and quality of wetlands, including through drainage and vegetation removal.

Policy 34 – Restoration of existing wetlands and the creation of wetlands

Recognise the importance of wetlands and indigenous biodiversity, particularly the potential to improve water quality, through encouraging:

1. the maintenance and restoration of existing wetlands and the creation of new wetlands; and
2. the establishment of wetland areas, including on-farm, in subdivisions, on industrial sites and for community sewage schemes; and
3. offsetting peak flows and assisting with flood control.

Policy 35 – Discharge waste and cleanfill appropriately

Ensure the discharge of contaminants as waste or cleanfill occurs at an appropriate site.

Policy 36 – Manage land contamination

Require the best practicable option be adopted to prevent or minimise adverse effects from contaminated land or a discharge of a hazardous substance.

Policy 37 – Climate Change

Avoid or mitigate adverse effects on the environment arising from climate change by recognising and providing for the development and protection of the built environment and infrastructure in a manner that takes into account the potential effects of rising sea levels and the potential for more variable and extreme weather patterns in coming decades.

Policy 38 – Natural hazards

Reduce the susceptibility of the Southland community and environment to natural hazards by improving planning, responsibility and community awareness for the avoidance and mitigation of natural hazards.

Consideration of Resource Consent Applications

Policy 39 – Application of the permitted baseline

When considering any application for resource consent for the use of land for a farming activity, Environment Southland will consider all adverse effects of the proposed activity on water quality, whether or not this Plan permits an activity with that effect.

Policy 39A – Integrated Management

To improve integrated management of freshwater and the use and development of land in whole catchments, including the interactions between freshwater, land and associated ecosystems (including estuaries).

Policy 40 – Determining the term of resource consents

When determining the term of a resource consent consideration will be given, but not limited, to:

1. granting a shorter duration when there is uncertainty regarding the nature, scale, duration and frequency of adverse effects from the activity or the capacity of the resource;
2. relevant tangata whenua values and Ngāi Tahu indicators of health;
3. the duration sought by the applicant, plus material to support the duration sought;
4. the permanence and economic life of any capital investment;
5. the desirability of applying a common expiry date for water permits that allocate water from the same resource or land use and discharges that may affect the quality of the same resource;
6. the applicant's compliance with the conditions of any previous resource consent; and
7. the timing of development of FMU sections of this Plan, and whether granting a shorter or longer duration will better enable implementation of the any revised frameworks established in those sections.

Policy 41 – Matching monitoring to risk

Consider the magnitude of environmental effects and risk when determining requirements for auditing and supply of monitoring information on resource consents.

Policy 42 – Consideration of water permit applications

When considering resource consent applications for water permits:

1. consent will not be granted if a waterbody is fully allocated, or to do so would result in a waterbody becoming over allocated or over allocation being increased;
2. consents replacing an expiring resource consent for an abstraction from an over-allocated waterbody may be granted with a lesser volume and rate or take proportional to the amount of over-allocation and previous use;
3. installation of water measuring devices will be required on all new permits to take and use water, and existing permits in accordance with the Resource Management (Measurement and Reporting of Water Takes) Regulations 2010;
4. where appropriate, minimum level and/or flow cut-offs and seasonal recovery triggers on resource consents for groundwater abstraction will be imposed;
5. conditions will be specified relating to a minimum flow/level, in accordance with Appendix L, to all new or replacement resource consents (except for water permits for

community water supplies and waterbodies subject to minimum flow and level regimes established under any water conservation order) for:

(a) surface water abstraction, damming, diversion and use; and
(b) groundwater abstraction where there is Riparian, Direct or High degree of hydraulic connection in accordance with Policy 23 "Stream Depletion Effects" and the stream depletion effect exceeds two litres per second.

Policy 43 – Transfer of water permits

1. Enable the transfer of water permits to take and use water provided the transfer occurs in the same surface water and groundwater management zone or aquifer, any other abstractor is not adversely affected, and the transfer is consistent with the provisions of this Plan, including the minimum flow and allocation regime.

2. Provide for transfer of water permits for groundwater abstraction between groundwater zones or aquifers in the same surface water catchment, provided the transfer does not increase cumulative stream depletion effects and effects of the new abstraction are consistent with the provisions of this Plan.

Freshwater Management Unit Process Policies

Policy 44 – Implementing Te Mana o te Wai

Te Mana o te Wai is recognised at a regional level by tangata whenua and the local community identifying values held for, and associations with, a particular waterbody and freshwater management unit.

Particular regard will be given to the following values, alongside any additional regional and local values to be determined in the freshwater management unit limit setting process:

- Te Hauora o te Wai/the health and mauri of water;
- Te Hauora o te Tangata/the health and mauri of the people;
- Te Hauora o te Taiao/the health and mauri of the environment;
- Mahinga kai/food gathering, places of food;
- Mahi māra/cultivation;
- Wai Tapu/Sacred Waters;
- Wai Māori/municipal and domestic water supply;
- Āu Putea/economic or commercial development;
- He ara haere/navigation.

Policy 45 – Priority of FMU policies and rules

1. In response to Ngāi Tahu and community aspirations and local water quality and quantity issues, FMU sections may include additional catchment-specific objectives and policies. These FMU objectives and policies will be read and considered together with the region-wide objectives and policies. Any policy on the same subject matter in the relevant FMU section of this Plan prevails over the relevant policy within this Regional Policies Section, unless it is explicitly stated to the contrary.

   As the FMU sections of this Plan are developed in a specific geographical area, FMU sections will not make any changes to the region-wide objectives or policies and will not deviate from the structure and methodology outlined in these Process Policies.

Note: *As the FMU sections are developed in a specific geographical area, it is unfair if changes are made to Region-wide objectives and policies, which apply in other parts of Southland, without the involvement of those wider communities.*

Policy 46 – Identified FMUs

The FMU Sections of this Plan are based on the following identified Freshwater Management Units for Southland, as shown on Map Series 7: Freshwater Management Units:

- Fiordland and the islands;
- Aparima;
- Mataura;
- Ōreti; and
- Waiau.

Policy 47 – FMU processes

The FMU sections will:

1. establish freshwater objectives for each catchment, having particular regard to the national significance of Te Mana o te Wai, and any other values developed in accordance with Policies CA1-CA4 and Policy D1 of the National Policy Statement for Freshwater Management 2014;
2. set water quality and water quantity limits and targets to achieve the freshwater objectives;
3. set methods to phase out any over-allocation, within a specified timeframe; and
4. assess water quality and quantity based on Ngāi Tahu indicators of health.

Dairy Effluent Storage Calculator
Summary Report

Regional authority:	Environment Southland Regional Council
Authorised agent:	J Scandrett
Client:	Woldwide one
Program version:	1.48
Report date:	Tuesday, 17 January 2017

General description:

Woldwide One, scenario 2
{Two Scenarios,} 1) 700 milked, 400 wintered inside 2017
and 640 inside 2018
2) 800 cows, new dairy shed,yard scraped, 640 wintered inside,

Note 1) there is a covered wintering shed on the farm and under feedpad I have included the stock details plus allowed for a small uncovered catchment of 180 sq m at the end of the shed.
2) the extended pond has dimensions of 49.5m x 46.1m with 2.5H:1V batters, 3.4m deep

Climate

Rainfall site:	Drummond Marson Rd
Mean annual rainfall:	1061 mm/year

Effluent Block

Area of low risk soil:	50.0 hectares
Minimum area of high risk soil:	190.0 hectares
Surplus area of high risk soil:	0.0 hectares

Wash Water

Yard wash:

- Milking season starts: 01 August
- Milking season ends: 01 July

Month	Number of Cows	Hours in Yard	Wash Volume (cubic metres)
January	800	4.0	35.0
February	800	4.0	35.0
March	800	4.0	35.0
April	800	4.0	35.0
May	800	4.0	35.0
June	400	2.0	20.0
July	50	1.0	2.5
August	800	4.0	20.0
September	800	4.0	35.0
October	800	4.0	35.0

November	800	4.0	35.0
December	800	4.0	35.0

Feedpad wash:

Month	Number of Cows	Hours on Pad	Wash Volume (cubic metres)
January	0	0.0	0.0
February	0	0.0	0.0
March	0	0.0	0.0
April	0	0.0	0.0
May	400	6.0	0.0
June	640	24.0	0.0
July	640	24.0	0.0
August	400	2.0	0.0
September	0	0.0	0.0
October	0	0.0	0.0
November	0	0.0	0.0
December	0	0.0	0.0

Irrigation

Winter-spring depth:	2 mm
Spring-autumn depth:	4 mm
Winter-spring volume:	80 cubic metres
Spring-autumn volume:	160 cubic metres
Irrigate all year?	Yes

Catchments

Yard Area:	1150 square metres
Diverted?	Yes
- diversion start:	01 July
- diversion end:	01 August
Shed Roof Area:	175 square metres
Diverted?	Yes
Feedpad Area:	180 square metres
Covered?	No
Diverted?	No
Animal Shelter Area:	0 square metres
Covered?	Yes
Diverted?	No
Other Areas:	0 square metres

Storage

Pond/s present?	Yes
No. of ponds:	1 pond/s
Includes irregular ponds?	No
Pond 1	

- total volume: 5323 cubic metres
- pumpable volume: 4241 cubic metres
- surface area: 2282 square metres
- width: 46.1 metres
- length: 49.5 metres
- batter: 2.5:1
- total height: 3.4 metres
- pumped? Yes

Tank/s present? No

Emergency storage period: 0 days

Solids Separation

Solids separator/s present? No

Outputs

Maximum required storage pond volume:	4567 cubic metres
90 % probability storage pond volume:	4238 cubic metres
During the period from:	01 July 1980
To:	30 June 2013