Consents Hearing
4 September 2018

White Waters Limited – APP 20181247

Appendices

Policies

Relevant planning provisions from the regional plans.

Proposed Southland Water Land Plan

The objectives and policies of the pSWLP that are relevant to this application have been grouped according to topic. Comments on these objectives and policies have been included in the s42A recommending report.

Ngai Tahu

Objective 3 — *The mauri of waterbodies provide for te hauora o te tangata (health and mauri of the people), te hauora o te taiao (health and mauri of the environment) and te hauora o te wai (health and mauri of the waterbody).*

Objective 4 — *Tangata whenua values and interests are identified and reflected in the management of freshwater and associated ecosystems.*

Policy 1 — *Enable papatipu rūnanga[1] to effectively undertake their kaitiaki (guardian/steward) responsibilities in freshwater and land management through the Southland Regional Council:*

1. *providing copies of all applications that may affect a Statutory Acknowledgement area, tōpuni (landscape features of special importance or value), 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 Murihiku (includes the Southland Region); and*
3. *reflecting Ngāi Tahu values and interests in the management of and decision-making on freshwater and freshwater ecosystems in Murihiku (includes the Southland Region), consistent with the Charter of Understanding.*

Policy 2 — *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 — *To manage activities that adversely affect taonga species, identified in Appendix M.*

Physiographic Zones

Policy 6 — *In the Gleyed, Bedrock/Hill Country and 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 artificial drainage, and overland flow where relevant; and*

[1] *Papatipu rūnanga are defined in the Introduction to the Plan on page 9.*

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 Farm Environmental Management Plans.*

Effluent Management

Objective 9A *Surface water is sustainably managed to support the reasonable needs of people and communities to provide for their social, economic and cultural wellbeing.*

Objective 13 *Enable the use and development of land and soils to support the economic, social, and cultural wellbeing of the region.*

Objective 13A *The quantity, quality and structure of soil resources are not irreversibly degraded through land use activities or discharges to land.*

Objective 13B *The discharges of contaminants to land or water that have significant or cumulative adverse effects on human health are avoided.*

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.*

Policy 14 *Prefer discharges of contaminants to land over discharges of contaminants to water, unless adverse effects associated with a discharge to land are greater than a discharge to water. Particular regard shall be given to any adverse effects on cultural values associated with a discharge to water.*

Policy 17

1. *Avoid significant adverse effects on water quality, and avoid, remedy, or mitigate other adverse effects of the operation of, and discharges from, agricultural effluent management systems.*

2. *Manage agricultural effluent systems and discharges from them by:*
   - *(a) designing, constructing and locating systems appropriately and in accordance with best practice; and*
   - *(b) maintaining and operating effluent systems in accordance with best practice guidelines; and*
   - *(c) avoiding any surface run-off or overland flow, ponding or contamination of water, including via sub-surface drainage, resulting from the application of agricultural effluent to pasture; and*
   - *(d) avoiding the discharge of untreated agricultural effluent to water.*

Note: *Examples of best practice referred to in Policy 17(2)(a) for agricultural effluent include IPENZ Practice Note 21: Farm Dairy Effluent Pond Design and Construction and IPENZ Practice Note 27: Dairy Farm Infrastructure.*

Note: *Examples of best practice guidelines referred to in Policy 17(2)(b) for agricultural effluent include DairyNZ's guidelines A Farmer's Guide to Managing Farm Dairy Effluent – A Good*

Practice Guide for Land Application Systems, 2015 and A Staff Guide to Operating Your Effluent Irrigation System, 2013.

Water Quality

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 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 water bodies, established under the Freshwater Management Unit process 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.

Policy A4

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. 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 fresh water; 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 fresh water resulting from the discharge would be avoided.

Policy 13

1. Recognise that the use and development of Southland's land and water resources, including for primary production, enables people and communities to provide for their social, economic and cultural wellbeing.

2. Manage land use activities and discharges (point source and non-point source) to enable the achievement of Policies 15A, 15B and 15C.

Policy 15A

Where existing water quality meets the Appendix E Water Quality Standards or bed sediments meet the Appendix C ANZECC sediment guidelines, maintain water quality including by:

1. *avoiding, remedying or mitigating the adverse effects of new discharges, so that beyond the zone of reasonable mixing, those standards or sediment guidelines will continue to be met; and*
2. *requiring any application for replacement of an expiring discharge permit to demonstrate how the adverse effects of the discharge are avoided, remedied or mitigated, so that beyond the zone of reasonable mixing those standards or sediment guidelines will continue to be met.*

Policy 15B

Where existing water quality does not meet the Appendix E Water Quality Standards or bed sediments do not meet the Appendix C ANZECC sediment guidelines, improve water quality including by:

1. *avoiding where practicable and otherwise remedying or mitigating any adverse effects of new discharges on water quality or sediment quality that would exacerbate the exceedance of those standards or sediment guidelines beyond the zone of reasonable mixing; and*
2. *requiring any application for replacement of an expiring discharge permit to demonstrate how and by when adverse effects will be avoided where practicable and otherwise remedied or mitigated, so that beyond the zone of reasonable mixing water quality will be improved to assist with meeting those standards or sediment guidelines.*

Policy 16

1. *Minimising the adverse environmental effects (including on the quality of water in lakes, rivers, artificial watercourses, modified watercourses, wetlands, tidal estuaries and salt marshes, and groundwater) from farming activities by:*
   - *(a) discouraging the establishment of new dairy farming of cows or new intensive winter grazing activities in close proximity to Regionally Significant Wetlands and Sensitive Waterbodies identified in Appendix A; and*
   - *(b) ensuring that, in the interim period prior to the development of freshwater objectives under Freshwater Management Unit processes, applications to establish new, or further intensify existing, dairy farming of cows or intensive winter grazing activities will generally not be granted where:*
     - *(i) the adverse effects, including cumulatively, on the quality of groundwater, or water in lakes, rivers, artificial watercourses, modified watercourses, wetlands, tidal estuaries and salt marshes cannot be avoided or mitigated; or*
     - *(ii) existing water quality is already degraded to the point of being overallocated; or*
     - *(iii) water quality does not meet the Appendix E Water Quality Standards or bed sediments do not meet the Appendix C ANZECC sediment guidelines; and*
   - *(c) ensuring that after the development of freshwater objectives…*

2. *Requiring all farming activities, including existing activities, to:*
   (a) *implement a Farm Environmental Management Plan, as set out in Appendix N; and*
   (b) *actively manage sediment run-off risk from farming and hill country development by identifying critical source areas and implementing practices including setbacks from waterbodies, sediment traps, riparian planting, limits on areas or duration of exposed soils and the prevention of stock entering the beds of surface waterbodies; and*
   (c) *manage collected and diffuse run-off and leaching of nutrients, microbial contaminants and sediment through the identification and management of critical source areas within individual properties.*
3. *When considering a resource consent application for farming activities, consideration should be given to the following matters:*
   (a) *whether multiple farming activities (such as cultivation, riparian setbacks, and winter grazing) can be addressed in a single resource consent; and*
   (b) *granting a consent duration of at least 5 years.*

Term and consideration of Consent

Policy 39A — *When considering the cumulative effects of land use and discharge activities within whole catchments, consider:*

1. *the integrated management of freshwater and the use and development of land including the interactions between freshwater, land and associated ecosystems (including estuaries); and*

2. *through the Freshwater Management Unit process, facilitating the collective management of nutrient losses, including through initiatives such as nutrient user groups and catchment management groups.*

Policy 41 — *Consider the risk of adverse environmental effects occurring and their likely magnitude when determining requirements for auditing and supply of monitoring information on resource consents.*

Regional Water Plan

The objectives and policies of the RWP that are relevant to this application have been grouped according to topic. Comments on these objectives and policies have been included in the s42A recommending report.

Iwi management plans

Policy 1A — *Any assessment of an activity covered by this plan must take into any relevant Iwi Management Plan.*

Water quality, Agricultural effluent, Land use and Soils

Objective 1 — *To maintain the quality of water where it is in its natural state.*

Objective 2 — *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).*

Objective 4 — *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

Objective 8

(a) to maintain groundwater quality in aquifers that already meet the 'Drinking Water Standards for New Zealand 2000'; and
(b) to enhance groundwater quality within 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.

Objective 9A — *To manage discharges onto or into land so that the quality and structure of soil resources are maintained.*

Objective 9B — *To manage discharges onto or into land so that adverse effects on human health are avoided.*

Policy A4

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. 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 fresh water; 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 fresh water resulting from the discharge would be avoided.

Policy 6

(a) Use non-regulatory methods, in addition to rules, to maintain and enhance surface water and groundwater quality, and to avoid, remedy or mitigate adverse effects on soil quality.

(b) Assess on an ongoing basis whether the adoption of non-regulatory methods has resulted in improvements to water or soil quality, and consider the introduction of other inventions id improvements have not resulted.

Policy 7 *Prefer discharges to land over discharges to water where this is practicable and effects are less than adverse.*

Policy 13 *Avoid the point source discharge of raw sewage, foul water and untreated agricultural effluent to water.*

Policy 25 *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.*

Policy 31A *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) Soil's current physical, chemical and biological characteristics and its potential to leach nutrients
(j) Natural hazards (for example, flooding and erosion)

Policy 31C *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

Policy 31D	*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.*
Policy 41	*Adverse effects of agricultural effluent ponds. Avoid adverse effects on water quality, and avoid as far as possible adverse environmental effects, associated with the location, design, construction, operation and maintenance of agricultural effluent ponds.*
Policy 42	*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*

Water quantity

Objective 7	*To maximise the efficiency of water use.*
Objective 9	*To ensure that the total volume and rate of groundwater abstraction is sustainable.*
Policy B7	*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.*
Policy 21	*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.*
Policy 22	*Require, where appropriate, the installation of water measuring devices on all new permits to take and use water.*
Policy 23	*Impose a condition enabling the review of consent conditions in accordance with Sections 128 and 129 of the RMA 1991 on all new permits to take and use water.*
Policy 28	*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*
Policy 29	*(a) Manage the stream depletion effect of any groundwater abstraction with a rate of take exceeding 2 litres per second ….. [Policy abbreviated]* *(b) Minimise the cumulative stream depletion effect of groundwater… [Policy abbreviated].*

Policy 30 *(a) … [not applicable]*

(b) …

(c) …

(d) Provide for:

i. a level of permitted groundwater abstraction where this is a minimal risk of adverse effects;

ii. a primary allocation for consented water abstraction and use; and

iii. …

(e) Require resource consent application for groundwater abstractions to be supported by a level of information that corresponds to the level of risk of adverse effects. [Policy abbreviated]

(f) …

(g) …

(h) …

(i) …

Policy 31 *Limit the interference effects [policy abbreviated].*

Regional Effluent Land Application Plan

The objectives, policies and rules of the RELAP that are relevant to this application have been grouped according to topic. Comments on these objectives and policies have been included in the s42A recommending report.

Soil Health and Fertility

Objective 4.1.1 *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.*

Policy 4.2.1 *Protect the sustainability of the soil ecosystem from adverse effects of effluent and sludge discharges onto or into land.*

Policy 4.2.2 *Utilise land treatment of effluent and sludge where this can be undertaken in a sustainable manner and without significant adverse effects.*

Policy 4.2.4 *Adopt a precautionary approach to the discharge of effluent and sludge onto or into land where there are uncertainties regarding adverse effects.*

Policy 4.2.6 *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.*

Policy 4.2.7 *Promote good practice and regular maintenance of effluent and sludge systems.*

Water Quality

Objective 4.1.2	*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.*
Policy 4.2.3	*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.*

Other

Objective 4.1.4	*To ensure that amenity values are not adversely affected by discharges of effluent and sludge onto or into land.*
Policy 4.2.9	*Avoid where practicable, remedy or mitigate any adverse effects on amenity values from discharges of effluent and sludge systems onto or into land.*
Objective 4.1.5	*To recognise and provide for the relationship of takata whenua with ancestral sites, wahi tapu and other taoka.*
Policy 4.2.8	*Recognise and provide for takata whenua concerns related to the discharge of effluent and sludge onto or into land.*
Policy 4.2.10	*Monitor, as appropriate, discharges of effluent and sludge onto or into land and, where practicable, the effects.*

Te Tangi a Tauira

Te Tangi a Tauira is the Iwi Management Plan for Southland. The policies relevant to this application have been grouped according to topic. Comments on these objectives and policies have been included in the s42A recommending report.

Nga Kaupapa section 3.3.12 – Nga roto waimaori

Policy 3	*Maintain and protect the cultural, spiritual, historic and traditional association of Ngai Tahu ki Murihiku with nga roto waimaori in Fiordland.*
Policy 5	*Protect, and where needed enhance, the mauri or life supporting capacity of nga roto waimaori*
Policy 6	*Avoid the use of nga roto waimaori as a receiving environment for the discharge of contaminants (eg. Industrial, residential, recreational or agricultural sources).*

Nga Kaupapa section 3.3.14 – Customary Use

Policy 1 *All Ngai Tahu Whanui, current and future generations, must have the ability to access, use and protect mahinga kai resources, and the history and traditions that are part of the customary use of such resources, as guaranteed by the Treaty of Waitangi.*

Policy 3 *The cultural, spiritual, historic and traditional association of Ngai Tahu ki Murihiku with taonga species must be recognised and provided for within all management and/or recovery plans associated with those species. This includes taonga species as per the Ngai Tahu Claims Settlement Act and all other species considered taonga by Ngai Tahu ki Murihiku.*

Policy 7 *Work towards the restoration of key mahinga kai areas and species, and the tikanga associated with managing those places and species.*

Nga Kaupapa section 3.3.18 – Species Recovery

Policy 1 *The cultural, spiritual, historic and traditional association of Ngai Tahu ki Murihiku with native species must be recognised and provided for in all management associated with those species.*

Nga Kaupapa section 3.4.2 – High Country Pastoral Farming

Policy 1 *Encourage sustainable pastoral farm land management practices whereby impacts on soil, vegetation and water quality are minimised.*

Policy 2 *Support improvement of soil production levels by maintaining balanced nutrient levels and avoiding soil erosion and loss of organic matter.*

Policy 6 *Advocate for pastoral farm management decisions (including conversion to pasture) to take into account the protection and survival of indigenous species of flora and fauna in their natural habitats, particularly forest remnants.*

Policy 7 *Encourage development of riparian zones and buffer strips along both sides of all watercourses to minimise effluent and nutrient runoff and prevent stock access.*

Policy 12 *Promote at all times the protection of all native aquatic species.*

Policy 14 *Avoid any discharge of contaminants to water as a result of pastoral farming activity, including pest control poisons.*

Nga Kaupapa section 3.4.10 – Plant Pests

Policy 1 *Ensure protection and enhancement of the mauri or life supporting capacity of all high country and foothill waterways.*

Policy 2 *Advocate that all management decisions shall take into account the protection and survival of indigenous species of flora and fauna (rare and not rare, and including*

taonga species contained in the Ngai Tahu Claims Settlement Act 1998) in their natural habitats and ecosystems.

Policy 8 *Encourage long term solutions to aquatic plant pest problems such as riparian shading and reduction of nutrients flowing into waterways and drains.*

Nga Kaupapa section 3.4.12 – Mahinga Kai

Policy 1 *Acknowledge the link between the overall wellbeing of Ngai Tahu Whanui and the work associated with the collection of natural resources. The tools and methods used to obtain natural resources should be protected. Furthermore continued protection of natural resources ensures that such tools and methods contributing to wellbeing can be implemented.*

Policy 2 *Advocate for timely and appropriate consultation with Ngai Tahu ki Murihiku with respect to areas that are considered particularly significant in terms of mahinga kai. All endeavours should be taken to protect areas and avoid inappropriate use and development. Furthermore, management plans should recognise for taonga species as listed in the Ngai Tahu Claims Settlement Act 1998 and all other species considered taonga by Ngai Tahu ki Murihiku.*

Policy 3 *All Ngai Tahu Whanui, current and future generations, must have the capacity to access, use, protect high country landscapes, wahi tapu and mahinga kai sites and the history and traditions that are linked to these landscapes.*

Policy 4 *Promote the protection, restoration and enhancement of indigenous biodiversity.*

Policy 5 *Advocate for the protection, restoration and enhancement of waterways, riparian margins, wetlands, and tarns as a means of protecting and enhancing indigenous biodiversity.*

Nga Kaupapa section 3.4.14 – Protecting sites of significane in High Country and Foothill Areas

Policy 1 *Ensure that Ngai Tahu ki Murihiku are able to effectively exercise their roles as kaitiaki over wahi tapu and wahi taonga in Murihiku.*

Policy 3 *Work with local authorities and other statutory agencies involved in the protection of cultural heritage to ensure that Ngai Tahu perspectives and polices are reflected in statutory plans, best practice guidelines and strategies, and in resource consent processes (e.g. Prohibited activity status for whai tapu area).*

Nga Kaupapa Section 3.5.1 – Farm Effluent Management

Policy 1 *Promote the inclusion of Ngai Tahu ki Murihiku issues and policies in statutory plan provisions, best practice guidelines and industry standards for management dairy farm effluent.*

Policy 2 *Ensure that Ngai Tahu ki Murihiku are provided with the opportunity to participate through pre hearing meetings or other processes in the development of appropriate consent conditions for discharge consent, including monitoring conditions.*

Policy 4 *Sustain and safeguard the life supporting capacity of soils for future generations.*

Policy 5 *Avoid using high risk soils of high permeability, including Waikoikoi clay and peat, for spray irrigation of effluent.*

Policy 6 *Oppose the discharge of dairy farm effluent to water.*

Policy 7 *Require soil risk assessments (type and percolation of the soils) prior to consent for discharge to land, to assess the suitability and capability of the receiving environment. Effluent should be applied at rates that match the ability of land to absorb it.*

Policy 8 *Require best practice for land application of managing farm effluent, in order to minimise adverse effects on the environment. This includes:*

- *(a) application rates that are specific to region and soil types;*
- *(b) use of low rate effluent irrigation technology;*
- *(c) use of appropriate irrigation technology to avoid irrigating over tile drains (eg. K-line);*
- *(d) storing effluent when the soil is too wet or heavy to irrigate;*
- *(e) storing effluent when heavy pugging by stock has occurred;*
- *(f) sealed storage ponds to avoid leaching of nutrients to groundwater;*
- *(g) avoiding ponding off effluent on paddocks;*
- *(h) monitoring of soils and groundwater (See policy 16);*
- *(i) developing contingency plans (e.g. For exceptionally wet years).*

Policy 10 *Advocate for the re-evaluation of existing discharge to land consents to develop better systems where needed.*

Policy 11 *Avoid any surface run off/overland flow, ponding or contamination of water resulting from the application of dairy shed effluent to pasture.*

Policy 13 *Require the establishment of appropriate buffer zones between discharge activities and waterways (including ephemeral and waterways less than 3m). The size of the buffer zone should reflect local geography (e.g. Size of the waterway, nature and extent of existing riparian area, boundary fence).*

Policy 16 *Require monitoring provisions as a condition of consent on any discharge to land. This should include monitoring water quality (e.g. Representative water samples upstream and downstream), and soil nitrogen loads.*

Policy 17 *Advocate for duration not exceeding 25 years for discharge of farm effluent to land consent applications with opportunities for review within that time. The duration of consents must reflect potential risk to soils and water.*

Nga Kaupapa Secition 3.5.10 – The water

Policy 1 *The role of Ngai Tahu ki Murihiku as kaitiaki of freshwater must be given effect to in freshwater policy, planning and management.*

Policy 2 *Work with local authorities and other statutory agencies involved in freshwater management to ensure that cultural values and perspectives associated with freshwater management are reflected in statutory water plans, best practice*

guidelines and strategies, and in resource consent processes for activities involving water.

Policy 3 *Protect and enhance the mauri or life supporting capacity of freshwater resources throughout Murihiku.*

Policy 4 *Manage our freshwater resources wisely, mo tatou a mo nga uri a muri ake nei, for all of use and the generations that follow.*

Policy 5 *Promote the management of freshwater according to the principles of ki uta ki tai and thus the flow of water from source to sea.*

Nga Kaupapa Section 3.5.11 - Rivers

Policy 3 *Continue to work with the Regional Councils to ensure that cultural values and perspectives associate with freshwater management are reflected in statutory water plans, best practice guidelines and strategies and in resource consent processes for activities involving water.*

Policy 4 *Management of our rivers must take into account at each waterway has its own mauri guarded be separate spiritual guardians its own mana and its own set of associated values and uses.*

Policy 5 *Adopt a precautionary approach for any activity involving a waterway where there is an absence of detailed knowledge of that waterway (ecology, flow regimes, species etc).*

Policy 7 *The cultural importance of particular rivers (e.g. Statutory Acknowledgements, rivers associated with whakapapa and identity) must be reflected in the weighting of Ngai Tahu responses and submissions on consents associated with these rivers.*

Policy 15 *Avoid the use of rivers as a receiving environment for the discharge of contaminants (eg. industrial, residential, recreational or agricultural sources).*

Policy 17 *Ensure that activities in upper catchments have no adverse effects on mahinga kai, water quality and water quantity in lower catchments.*

Briefs of Evidence -

Keri Johnston

Greg Ryder

IN THE MATTER	of the Resource Management Act 1991
AND	
IN THE MATTER	of a resource consent application
BY	**WHITE WATERS LIMITED** **Applicant**
TO	**ENVIRONMENT SOUTHLAND** **Local Authority**

BRIEF OF EVIDENCE OF KERI JOY JOHNSTON

MAY IT PLEASE THE COURT:

Qualifications & Experience

1. I hold a Bachelor of Engineering in Natural Resources Engineering from the University of Canterbury. I am a Professional Member of the Engineering New Zealand and a Chartered Professional Engineer (CMEngN).

2. I also hold a certificate from Massey University for Farm Dairy Effluent Design and Management, and a national certificate (level 4) in irrigation evaluation. I am a certified Resource Management Act decision maker.

3. Upon completion of my degree, I worked for Meridian Energy Limited as a graduate engineer, based in Manapouri and Twizel. After twelve months, I accepted a position with Environment Canterbury ("**ECan**") as a Consents Investigating Officer before taking on the role of Environmental Management Systems Engineer with the River Engineering Section of ECan. During my three and a half years with ECan, I was the Consents Investigating Officer for the applications associated with the Canterbury Regional Landfill at Kate Valley, and developed environmental management systems in accordance with ISO 14001 for several units within ECan.

4. I left ECan to join RJ Hall Civil and Environmental Consulting Limited as an Environmental Engineering Consultant. I was employed in this position for three and a half years.

5. Since 2007, I have been a director and principal of Irricon Resource Solutions Limited, a resource management and environmental engineering consultancy.

6. In preparing this evidence, I have reviewed the following material:

   (a) The application for resource consent prepared by RDAgritech Limited for White Waters Limited.

   (b) The request for further information and the subsequent response to this prepared by Dairy Green Limited.

   (c) The note regarding a site visit undertaken.

(d) The revised Massey Pond Calculations dated 15 May 2018 and 25 July 2018.

(e) S95-95G Recommending Report.

(f) White Waters pre-hearing further information dated July 2018 and the accompanying attachments.

(g) White Waters Ltd Effluent Operation Plan 2018 2019.

CODE OF CONDUCT

7. I have read the code of conduct for expert witnesses within the environment Court consolidated practice note 2014 and agree to comply with that code. This evidence is within my area of expertise, except where I state I am relying on what I have been told by another person. To the best of my knowledge I have not admitted to consider any material facts known to me that might alter or detract from the opinions I express.

SCOPE OF EVIDENCE

8. My evidence will answer the following questions.

(a) Is the effluent storage pond sufficiently sized to ensure deferred irrigation of effluent during wet conditions?

(b) Is the irrigation of effluent via slurry tanker appropriate with regards to the topography of the proposed discharge area and the number of freshwater springs present?

(c) Are there appropriate buffer distances in the proposed discharge area from the freshwater springs, if the springs have not been accurately mapped?

(d) Does the presence of freshwater springs provide a concern for determining soil moisture capacity prior to effluent irrigation?

(e) Is the transfer of effluent from the shed to the effluent storage tank consistent with good practice, what are the challenges arising from this and are the pumps sufficiently sized to transfer this effluent?

(f) Is the proposed purchase of 2 low rate sprinklers sufficient to mitigate the concerns raised for the effluent irrigation systems?

(g) Is the timeline proposed for depth testing the slurry tanker appropriate?

EFFLUENT STORAGE

9. Adequate storage is the basis for the successful implementation of deferred farm dairy effluent (FDE) irrigation. The Dairy Effluent Storage Calculator (DESC) was developed by Massey University and Horizons Regional Council in recognition of the fact that each farm will require a unique storage volume to practice deferred FDE irrigation.

10. The DESC uses long term daily climate data and individual farm details to calculate an effluent storage volume required. The volume of storage required is the difference between the rate (quantity) of effluent generated and the rate at which it can be applied to land.

11. The quantity of FDE produced depends on:

(a) Water used in the dairy shed to clean the milking plant and wash the yard.

(b) Excreta deposited while cows are on the yard, or other areas such as feed pads (driven by time spent on these areas).

(c) Rainfall and the rainfall catchment area including the shed roof, yard, and any other impervious areas that drain stormwater to the FDE storage facility, or whether any is diverted away from the storage facility when the catchment areas are not in use.

12. The rate at which FDE can be applied to land depends on:

(a) The soil moisture deficit (driven by rainfall and evaporation).

(b) The irrigation method.

(c) The volume of FDE applied each day. This is related to the irrigation method and management.

13. The DESC also assumes that effluent is applied to land when conditions suit. This is called deferred irrigation. Advantages of deferred irrigation include:

    (a) Effluent can be applied to land with it is more likely to meet plant and water requirements.

    (b) Storage allows effluent application to fit in when time or labour are available.

14. At present, White Waters Limited (the applicant) has the following FDE system on farm.

    (a) Water used in the dairy shed and yard wash is collected in a yard grating and sump, which gravity feeds to a pump sump. These have a total volume of 32 cubic metres.

    (b) Effluent is pumped from the pump sump to a tank. The tank has a total volume of 1,500 cubic metres.

    (c) Effluent is applied to land using a 12,000-litre capacity slurry tanker.

    (d) Effluent is able to be applied over an area of 103.5 hectares, with a minimum area of 70 hectares.

15. Subsequent to the application being lodged, the applicant provided a revised DESC which shows that the current volume of FDE storage on farm is sufficient (being a total pumpable volume of 1,238 cubic metres). The storage required is 886 cubic metres. This is a significant change (reduction in storage required) from the DESC that was provided with the application.

16. The revised DESC has used the following parameters.

    (a) A milking season from 25 August to 31 May.

    (b) Peak milking cow numbers of 599, but varied over the milking season as follows:

August	110
September	360

October	500
November	550
December-March	599
April	400
May	180

(c) Time the cows spend on the yard each day is as follows:

August	1 hour
September	2 hours
October – March	3 hours
April	2 hours
May	1.5 hours

(d) A calving pad is used with a maximum of 5 cows for 2 hours a day from August to October.

(e) Stormwater from the shed roof is always diverted. Stormwater from the year is diverted from 31 May to 25 August (outside the milking season). Stormwater from the calving pad is also diverted from 1 November to 15 May.

(f) Dairy shed wash water is 40 L/cow/day.

(g) Effluent is spread over 70 hectares of high risk soils and 10 hectares of low risk soils.

(h) There is a total pumpable storage available of 1,238 cubic metres.

(i) From winter to spring, effluent is applied at a rate of 3mm with a volume of 60 cubic metres.

(j) From spring to autumn, effluent is applied at a rate of 5mm with a volume of 96 cubic metres.

(k) No irrigation occurs between 10 June and 31 July.

(l) No emergency storage.

17. In summary, the differences between the application DESC and the later revisions of DESC relate to how peak cow numbers have been varied over the season, the application rates and volumes of effluent, the duration of the milking season, the amount of wash down water used (rate and time spent on the yard), the time when no irrigation occurs, and the volume of pumpable storage, the number of days of emergency storage, and the inclusion of low risk soils for the effluent discharge area.

18. In my opinion, some of the changes made to the now revised DESC are not appropriate. These are as follows:

(a) The DESC is a long-term model – it is not used to predict the amount of storage required over a single season, but rather over the life of the infrastructure (20+ years). Therefore, to model the monthly cow numbers as hugely varied over the course of the season as has been done may very well represent a single season, but not what could, or is likely to happen over a longer term. In doing this, it limits the Applicant's ability to, for example, hit peak milk a month earlier, or carry more cows through at the end of the season. The reality is that these are decisions that will vary from season to season. Wash water volumes may change throughout the season as milking routines and herd sizes vary. However, it is also not realistic to model this way when you consider plant wash stays the same, and yard wash will only have a minor reduction.

(b) The irrigation rates and volumes are considered appropriate for the soil conditions. However, the length of the irrigation season is from 1 August to the following 9 June. I have concerns over the Applicant's ability to apply effluent for that entire time given that the primary method of application is a slurry tanker which has limited abilities on slopes greater than 11 degrees due to the weight and length of the machine, as well as needing safe soil conditions to travel over. The slurry tanker will weigh over 50T when full of effluent.

(c) The dairy shed wash down water amount of 40 L/cow/day is a reduction from that specified in the application of 42.5 L/cow/day. The application figure is started to have been supplied by the client and is based on an effort to measure water use with a bucket test. It also aligns with the previous water use data from the applicant's bore. There is no justification in any of the documentation that I have read for why it has been reduced.

(d) The time the cows spend on the yard has been reduced from 5 hours at peak to 3 hours. No reason has been given for this change. As the shed is a herringbone shed, I would consider that 3 hours is on the "light" side. I have checked this using the DairyNZ herringbone milking shed efficiency calculator and a milking time of 5 hours would be reasonable for 599 cows in a 31 aside herringbone shed.

(e) The effluent irrigation area has been modelled as 70 hectares of high risk soils and 10 hectares of low risk soils. The original application and first DESC revision had considered all of the area as high-risk soils.

(f) The effluent area is 103.5 hectares. The DESC requires that the low risk soils be entered, and the minimum area of high risk soils is that required to meet the minimum discharge area requirements. In this case, Environment Southland require a minimum area of 8 hectares per 100 cows, which equates to 48 hectares required by the Applicant. Therefore, the minimum area of high risk soils is 48 hectares minus the 10 hectares of low risk soils = 38 hectares. The balance of the area (being 103.5 hectares minus 48 hectares = 55.5 hectares) is then allocated to the "area remaining for irrigation".

(g) The inclusion of 10 hectares of low risk soils in the discharge area makes a significant difference to the volume of effluent storage required. The DESC also splits the "area remaining" into low risk and high risk as a ratio of the areas used. In this case, the ratio is 10 hectares of low risk soil to 38 hectares of high risk soil, so of the 55.5 hectares of "area remaining", 11.6 hectares will be considered low risk, and 43.9 hectares will be considered

high risk. Given this, there needs to be a high level of confidence that there is sufficient area of low risk soils in farm.

(h) The amount of pumpable effluent storage has increased in the revised DESC. Given that the physical dimensions of the storage facility are fixed, the changes occur due to the sludge depth being reduced from 0.3m to 0.1m. In this case, there is also a thick crust that has formed on the effluent surface in the tank which will be limiting the pumpable volume available. I normally allow for a sludge depth equivalent to the freeboard depth, so 0.3m.

(i) To have no emergency storage is very poor practise. Emergency storage allows time for break downs to be fixed, or if there is a human or equipment error, or any other unforeseen circumstances. The minimum amount of emergency storage is 3 days.

19. I have re-run the DESC using the monthly milking cow numbers of 599 for all months except for August, which I have used 110 as it is only a part month of milking and the very start of calving. I have also used emergency storage of 3 days and factored a sludge depth of 0.3m each into the calculations. I have also modelled the irrigation area as described in my evidence at paragraph 17(e).

20. My calculations result in a current pumpable storage volume of 1,107 cubic metres, and storage volume required 90%[1] of the time of 1,109 cubic metres.

21. Therefore, whilst I don't agree with the Applicant's DESC calculation, the volume of storage currently on farm is <u>just</u> sufficient provided that the soil classifications and therefore, the inclusion of low risk soils as part of the discharge area, is validated.

22. The formation of the crust will also have to be managed. The depth of a crust decreases the volume of storage available.

---

[1] Minimum required by the FDE Design Standards and Code of Practice. This will mean that sufficient storage is available at least 9 out of every 10 years, based on a statistical analysis.

23. It is also noted that the DESC is not able to take into account freshwater infiltration, such as overland flow from springs or other sources that could get into the sump system at the dairy shed (as they are not bunded). Therefore, with the Applicant having "just enough" storage, there is no contingency for other potential sources of water that may be able to flow into the storage system.

24. My DESC is attached to my evidence as **Appendix One.**

25. Effluent is pumped to the existing storage tank. The pumps are sized appropriately, however, the entire system is manual which means it is reliant on a person to go and turn the pumps on to transfer effluent to the storage tank.

26. This system will require careful and precise management to ensure that effluent at the dairy shed does not overflow the sump system, but also to ensure that the decision is made to pump effluent to the storage tank at the most appropriate time.

THE EFFLUENT APPLICATION METHOD

27. The application states that the effluent application area slopes range from 0% to 20%, and that any steeper slopes are excluded. Approximately 70% of the total effluent discharge area has a slope of 7 degrees or less. Any land with a slope of more than 7 degrees (13%) presents a risk to the discharge of effluent.

28. There are also several small streams on the property, which are tributaries of the Whitestone River, and one stream contributes to the Upukerora Catchment. There is also a number of freshwater springs present on the farm as well.

29. The property is also located in a high rainfall area (greater than 1,300mm per year) and the soil classification for FDE is considered to be predominantly high risk. Drainage is installed on the flatter areas of the farm.

30. Overall, the property presents poorly drained or pugged soils with artificial drainage, slopes of more than 7 degrees, high rainfall and a

sensitive catchment. From an FDE design perspective, this requires a low rate application system, and storage as effluent is not able to be applied when soils are too wet.

31. The slurry tanker in use by the Applicant has a capacity of 12,000 litres. Effluent is dispersed by a deflector plate at the rear of the tanker. The application depth is adjusted by altering the speed at which the tanker is being towed. Therefore, to maintain a uniform application depth, a constant speed must be maintained for entire duration of spreading. The Applicant has stated an application depth test carried out in 2013 showed that a tractor speed of 10 km/hour resulted in less than 5mm depth applied per pass, and each pass takes less than 1 minute.

32. As with any equipment, wear and tear over time can change the way it operates. In the case of a slurry tanker, wear and tear on the pumps and plate can impact the application depth.

33. It is five years since the application depth of the applicant's slurry tanker was tested. The Applicant has proposed to repeat the test within a three-month time period, however, I consider that this should have formed part of the application. I understand that there are issues with an abatement notice, However, verification of the depth of application is a vital piece of information for the DESC, as well as being able to ensure that over-application and the effects associated with that, are unlikely to occur.

34. It is also my view that regular testing of equipment should occur as part of the maintenance schedule. Therefore, testing of the application depth of the slurry tanker should occur at least once per season.

35. Slurry tanker application is low application depth/high application rate. What this means is that the depth per pass is generally low, but the instantaneous application is generally high. This is due to area and time, for example, 5mm in 60 second = 300 mm/hour. This exceeds the soil infiltration rates for the those indicated on farm, which is 30mm/hour for the Te Anau soils and 15 mm/hour for the Kakapo soils.

36. With slurry tankers, irrigating enough volume can be an issue due to time. Therefore, issues arise with shifting enough volume, but also visual image and odour and damage to paddocks due to the weight of a

tractor and laden slurry tanker. In this case, it will take at least 80 loads to empty the current effluent storage facility, which is both a significant time and labour requirement.

37. Benefits of a slurry tanker include the ability to apply a low application depth, and the presence of a driver who is able to monitor how the discharge of effluent is going (for example siting where ponding may be occurring and being able to move on to another area).

38. Slurry tankers are also able to handle a higher solid content which many other application methods are not able to do. Therefore, solid separation of effluent is not required for a slurry tanker.

39. The topography of the White Waters farm and presence of waterways and springs will present a challenge for any FDE application system.

40. As high-risk soils are present on farm, a soil moisture deficit of equal to or greater than the application depth must exist for effluent to be able to be spread. The high rainfall at the site reduces the amount of time that such a deficit exists, and therefore, the opportunity to spread effluent. High rainfall also creates less than ideal conditions particularly on sloping, heavy soils, for being able to safely drive a tractor and fully laden slurry tanker. As the application depth is a function of the speed of the tractor, a safer, slow speed in these conditions could result in over-application of effluent.

41. There is also the concern about the time it will take to empty any storage on farm using a slurry tanker, bearing in mind that it will take at least 80 loads to empty the current storage, and the significant time and labour constraint associated with this. This exacerbates the issue as storage cannot easily be created by being able to discharge a large volume of effluent quickly when conditions do allow.

42. As it stands, I consider that the slurry tanker will be insufficient on its own to be able to adequately deal with the volume of effluent produced whilst ensuring that effluent is only spread in appropriate conditions.

43. The Applicant has proposed to install a low rate Larall Smart Hydrant irrigation system to assist with the discharge of effluent. This will be installed along the central lane to an area west of the farm storage pond

with the ability to cover an area of 25 hectares of the total effluent discharge area, of which 10 hectares is considered to be low risk soils.

44. The Applicant has stated that this system can be used in the shoulders of the season with soil moisture conditions can be variable. The slurry tanker will be used to apply effluent to the lowest risk areas outside of the low rate system area when the risk is lowest (typically the summer months). The low rate system could still be used during this time also, if required.

45. As with the slurry tanker, this system is able to tolerate a high solid content, so no solid separation system is required.

46. The proposed installation of a low rate irrigation system will most certainly improve the current situation, particularly as the proposed system is able to limit the amount of effluent applied per shift and to each paddock as well and therefore, the application rate can be set to cater for the circumstances (slope and soil moisture deficit). The question is whether it will completely\ mitigate the issues with the current FDE system?

47. The area covered by the low rate irrigation system is likely to be favoured over the use of the slurry tanker, which is labour intensive, This could lead to over application nutrients in this area as the Applicant has identified in respect of potassium (which affects cow health rather than having an environmental impact). For this reason, the application of effluent using the low rate irrigation system will have to be carefully managed, and regular effluent and soil tests carried out to ensure that optimum potassium levels are not being exceeded.

48. Because the sprinklers are located in the paddocks, they are prone to damage by stock, and therefore, management of this, and on-going maintenance and/or replacement of the sprinklers will need to be considered. It is this type of situation the reinforces the need for emergency storage to be considered in the DESC calculation.

THE EFFLUENT APPLICATION AREA

49. There are waterways on the farm, as well as freshwater springs. There is concern that the exact location of the springs is not well identified. It is

noted that in the Effluent Operation Plan the Applicant has provided an assessment of where they consider that these features are located, and that this exercise was carried out following a recent large rainfall event.

50. Part of any FDE system design should encompass carrying out a site assessment which identifies accurately the location of such features. This is to ensure that the appropriate separation distances for the application of effluent can be maintained.

51. Springs, even when dry, are a direct contaminant flow path to aquifers and therefore, application of effluent in and around these features requires prudent management.

52. Conversely, flowing springs can impact the ability to judge the soil moisture deficit in the vicinity of the spring. Therefore, in my view, a full site assessment must be carried out and these features accurately identified and managed accordingly.

53. Application separation distances to features such as waterways and springs have been proposed, but meeting these distances is reliant upon the operator of the tractor towing the slurry tanker, or the positioning of sprinklers. And again, the presence of these features with having to maintain appropriate separation distances, will limit the area available to discharge effluent if they the separation distances are complied with in conditions that are less than ideal.

54. In my view, a 20-metre separation distance is adequate on flat land (less than 3 degrees), but on sloping land, this is not enough to ensure that adverse effects do not occur. The Farm Dairy Effluent Design Standards (2013) state that a 90-metre separation distance should be maintained from any surface water bodies (which includes springs) on land with a slope of 5 to 6 degrees (approximately 20%). Therefore, separation distances need to be proposed based on the slope of the land and therefore, separation distances from features will vary across the effluent discharge area. This approach has not been taken by the Applicant to date and is not proposed in the Effluent Operation Plan.

CONCLUSION

55. The volume of effluent storage on farm at present is “just enough” when calculated using the DESC. However, this is on the premise that 10 hectares of low risk soils is validated as this impacts the required storage volume significantly.

56. It is noted that the DESC does not take into account other sources of water that could enter the storage system such as infiltration water from springs present on farm, nor does it factor in the presence of a significant crust in the pond, which will be reducing the volume of effluent storage available, and if maintained, or a new crust is allowed to form going forward, will continue to impact on the storage availability.

57. On its own, the slurry tanker is not sufficient as an application method. The proposed addition of a low rate irrigation system covering 25 hectares of the farm will most certainly improve the situation from that which exists at present. However, this will require careful on-going management as the likely favouring of this area could lead to loading this area with high levels of potassium. Regular testing of the effluent itself as well as soil testing will need to be carried out.

58. In the event that this area is over loaded, then this may lead to effluent being discharged to land via the slurry tanker at times when it is not desirable to do so, and the use of a slurry tanker in wet conditions on sloping ground is not practical due to its weight. Consistent speed will not be able to be maintained and this will affect the application rate and depth.

59. This is a high-risk site overall. The presence of springs and waterways on the farm will mean that active management of any FDE system is required. In my view, the blanket proposed separation distance of 20 metres from these features is in adequate, and distances need to be set based on slope (the larger the slope, the larger the separation distances need to be).

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of applications by White Waters Limited (WWL) to the Southland Regional Council for resource consents

BRIEF OF EVIDENCE OF GREGORY IAN RYDER

August 2018

1 Qualifications and Experience

1.1 My full name is Gregory Ian Ryder. I reside in Dunedin.

1.2 I hold BSc. (First Class Honours) (1984) and PhD. (1989) degrees in Zoology from the University of Otago. Both my theses focused on stream benthic communities. I am a member of the following professional societies:

1.3 New Zealand Freshwater Society;

1.4 Society for Freshwater Science (North America);

1.5 Royal Society of New Zealand.

1.6 I am an Environmental Scientist at Ryder Environmental Limited and have worked as a consultant for approximately 25 years, and prior to that I worked at the Otago Regional Council and the University of Otago. I work largely in the fields of surface water quality and aquatic ecology. I have presented evidence as an expert witness at 38 council hearings, 8 plan or plan change hearings, 4 board of inquiry, EPA and WCO hearings, and 9 Environment Court hearings. I also fulfil the role of an independent commissioner and have sat on 29 resource consent hearings and one EPA board of inquiry. I am accredited under the Making Good Decisions Programme to sit on RMA hearing panels (chair certification).

1.7 I have undertaken or been associated with a large number of investigations and reviews throughout New Zealand that have assessed the effects of land use activities that produce point source and non-point source discharges.

1.8 I am familiar with Southland's freshwater environment. Between 1994 and 1995 I helped designed, and for a number of years help run, Environment Southland's State of the Environment Freshwater Monitoring Programme, and in 2012 I was engaged to review the data generated by this programme since monitoring commenced in the mid-

1990s[1]. I assisted Environment Southland in developing its initial regional water plan, and was the principal author in developing water quality standards for the Southland Regional Water Plan (Ryder 2004). I have undertaken a wide range of investigations and surveys in the Southland region, the majority of them on behalf of Environment Southland.

1.9 In 2013 I co-authored two reports for Environment Southland that relate to surface water runoff particularly in rural areas:

(i) "*Factors Affecting Contaminant Loss in Overland Flow: Technical Review*"[2].

(ii) "*Environmental Effects of Activities within the Riparian Zone: Technical Review*"[3].

Code of Conduct

2 I have read the Expert Witness Code of Conduct set out in the Environment Court's Practice Note 2014 and agree to comply with it. I have complied with the Code of Conduct in preparing this evidence and I agree to comply with it while giving oral evidence before the hearing committee. Except where I state that I am relying on the evidence of another person, this written evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in this evidence.

Scope of Evidence

3 Environment Southland asked me to present evidence on White Waters Limited's (WWL) resource consent application APP-20181247. Specifically, I was asked to comment on the following matters:

(i) Information on the water quality in surface water catchments that surround and drain the WWL farm.

(ii) Information on stream and river ecology in the area and the sensitivity of the receiving environment.

(iii) Potential effects on stream and river water and ecology as a

[1] Hamill, K. & Ryder, G.I. 2012. *A review of state of the environment data trend analysis and reporting for Southland's stream and river monitoring sites*. Prepared for Environment Southland.

[2] Goldsmith, R.J. & Ryder, G.I. 2013. *Factors Affecting Contaminant Loss in Overland Flow: Technical Review*. Prepared for Environment Southland by Ryder Consulting.

[3] Goldsmith, R.J., Olsen, D.A., & Ryder, G.I. 2013. *Environmental Effects of Activities within the Riparian Zone: Technical Review*. Prepared for Environment Southland by Ryder Consulting.

result of nutrient enrichment, and the relationship between water quality in the Upukerora River and Lake Te Anau.

3.1 In preparing this evidence, I have reviewed the following material:

(i) WWL's application for resource consents and associated assessment of environmental effects prepared by RDAgritech Limited.

(ii) Environment Southland's reporting officer's request for further information and the subsequent response to this prepared by Dairy Green Limited.

(iii) The reporting officer's notes regarding a site visit undertaken on 20 April 2018.

(iv) Environment Southland's S95-95G Recommending Report.

(v) WWL's pre-hearing further information report (Dairy Green Ltd.) dated 26 July 2018 and the accompanying attachments.

(vi) White Waters Ltd Effluent Operation Plan 2018 2019.

(vii) The evidence of Keri Johnston, which forms part of the Council's s42A report.

(viii) The written submissions of Fish & Game New Zealand - Southland Region, Te Ao Marama lnc., Public Health South on behalf of Southern District Health Board and the Department of Conservation.

(ix) Various publications and data relating to water quality and surface water ecology in the Southland region with particular emphasis on the Waiau catchment.

4 Background

4.1 As described in Emily Allan's (Environment Southland Consents Officer) report, the application is to renew discharge and water permits to abstract groundwater (for stock drinking and shed wash down) and to discharge farm dairy effluent (FDE) and calving pad effluent to land by using a combination of slurry tanker (the primary irrigation method) low rate pods and umbilical system.

4.2 The suitability of these methods, and the appropriateness of the area for land disposal using these methods, have been assessed by Keri Johnston on behalf of Environment Southland, and I rely on her assessment for assessing potential risks to local water quality and stream ecology.

5 Catchment setting

5.1 The White Waters Limited farm occupies land that straddles the Upukerora and Whitestone river catchments (Figure 1). These catchments form part of the larger Waiau River catchment, which includes the iconic Fiordland lakes of Manapouri and Te Anau and all of their tributaries. The Upukerora River flows directly into Lake Te Anau near Te Anau Township, while the Whitestone River flows into the Mararoa River, which in turn flows into the Waiau River at the Mararoa Control Gates.

5.2 The upper reaches of both the Upukerora and Whitestone catchments lie in upland country with no or only some low intensity land use activities, and hence water quality is very good.

6 Local setting

6.1 The farm is predominantly located within the Whitestone River catchment (89%), with a small proportion in the Upukerora River catchment (11%). I have prepared a more detailed map in Figure 2 that shows the farm in relation to tributaries of Upukerora and Whitestone rivers that are likely to receive surface runoff and sub-surface drainage from the property. I have prepared an even more detailed map in Figure 3 that shows locations of surface and sub-surface drains on the farm in relation to the proposed FDE area and watercourses of the Upukerora and Whitestone catchments.

6.2 Dairy Green Ltd. provided further information on the application in response to the Council's request for further information and following a pre-hearing meeting held on 23 July 2018 at Environment Southland. I have used information contained in this report for describing the local environment.

6.3 Local topography has been described as having areas of flat to sloping land, with an estimated 70 percent of the proposed discharge area is under 70° slope. The applicant has described the soils on the property and has developed a proposed FDE area that is aimed in part to avoid particular land deemed unsuitable for effluent disposal (e.g., too steep for the tanker, soils that poorly drain and proximity for surface water features).

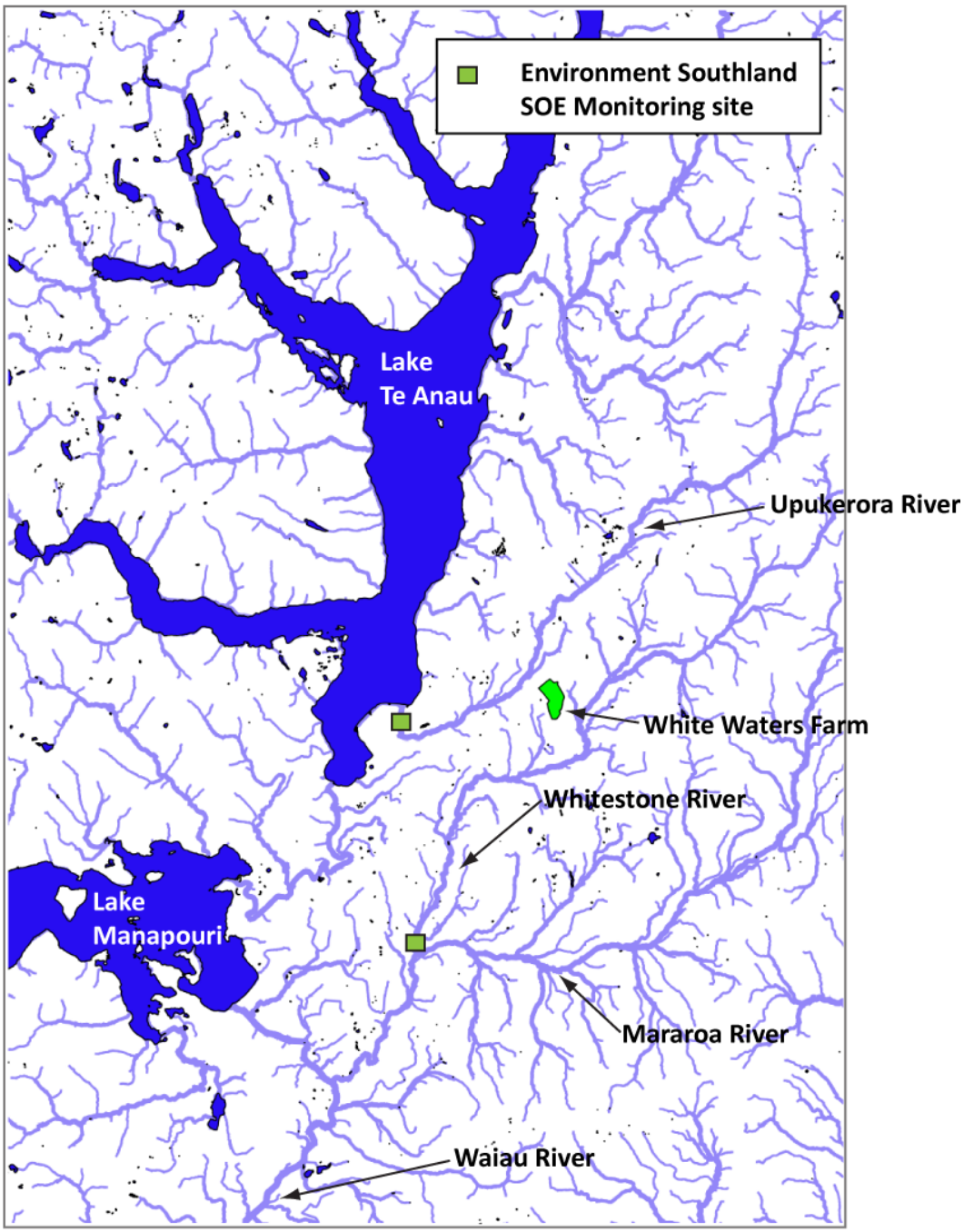


Figure 1. Map showing location of the White Waters Farm in relation to the Upukerora and Whitestone rivers and other key surface water body features. Coloured squares show the location of Environment Southland surface water quality monitoring sites on the Upukerora and Whitestone rivers.

6.4 I note that sub-surface drainage has been installed on the property to remove drainage or perched water during wet periods. I have identified these features in Figure 3 and how they relate to the proposed FDA area and small tributaries that drain to the Upukerora and Whitestone rivers.

6.5 There are a number of freshwater springs reported as being present on

the farm. Dairy Green's further information document states that there are no springs within the proposed discharge area, although there are sub-surface drains that discharge to surface drains and waterways on the property. These surface water features have been excluded or buffered from the discharge area. Keri Johnston in her evidence summarises the appropriateness of the site for effluent disposal as follows: "*Overall, the property presents poorly drained or pugged soils with artificial drainage, slopes of more than 7 degrees, high rainfall and a sensitive catchment. From an FDE design perspective, this requires a low rate application system, and storage as effluent is not able to be applied when soils are too wet.*".

6.6 The farm lies within the Bedrock/Hill Country physiographic zone, which is described as having bedrock or glacial till found near the surface, located below 800m above sea level, and with no significant areas of groundwater. It is considered that in this type of environment, surface runoff is the main concern with respect to water quality.

6.7 Dairy Green has noted that three major sub-surface drainage networks have been identified and it is proposed to monitor that outlets of these to assess the effects of the effluent discharge (Figure 3). In my opinion, these do not represent ideal sampling sites for assessing effects on tributary water quality because they lie well within the boundary of the farm, and I consider it is more appropriate that surface water monitoring sites lie at the farm boundary in order to ensure that all potential water quality contaminants from farm activities are captured, as shown in Figure 3.

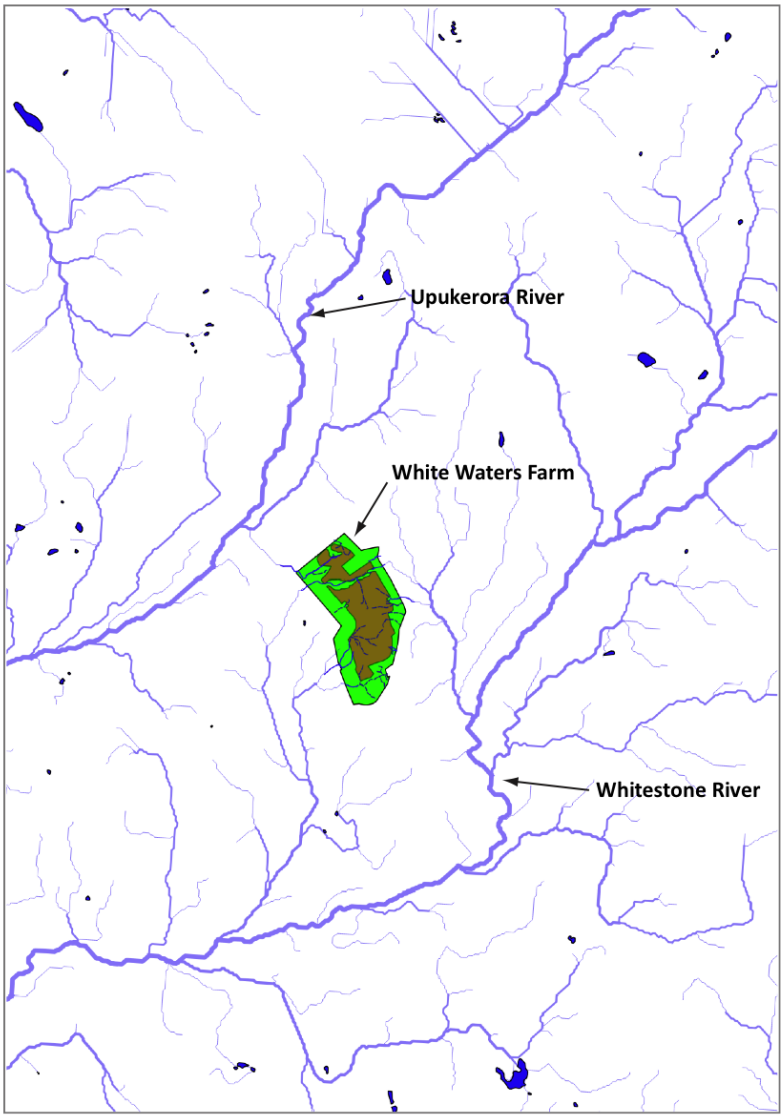


Figure 2. Map showing locations of tributaries of the Upukeroroa and Whitestone rivers that surround and drain land associated with White Waters Farm. Dark shaded land within the farm boundary indicate the proposed farm dairy effluent areas.

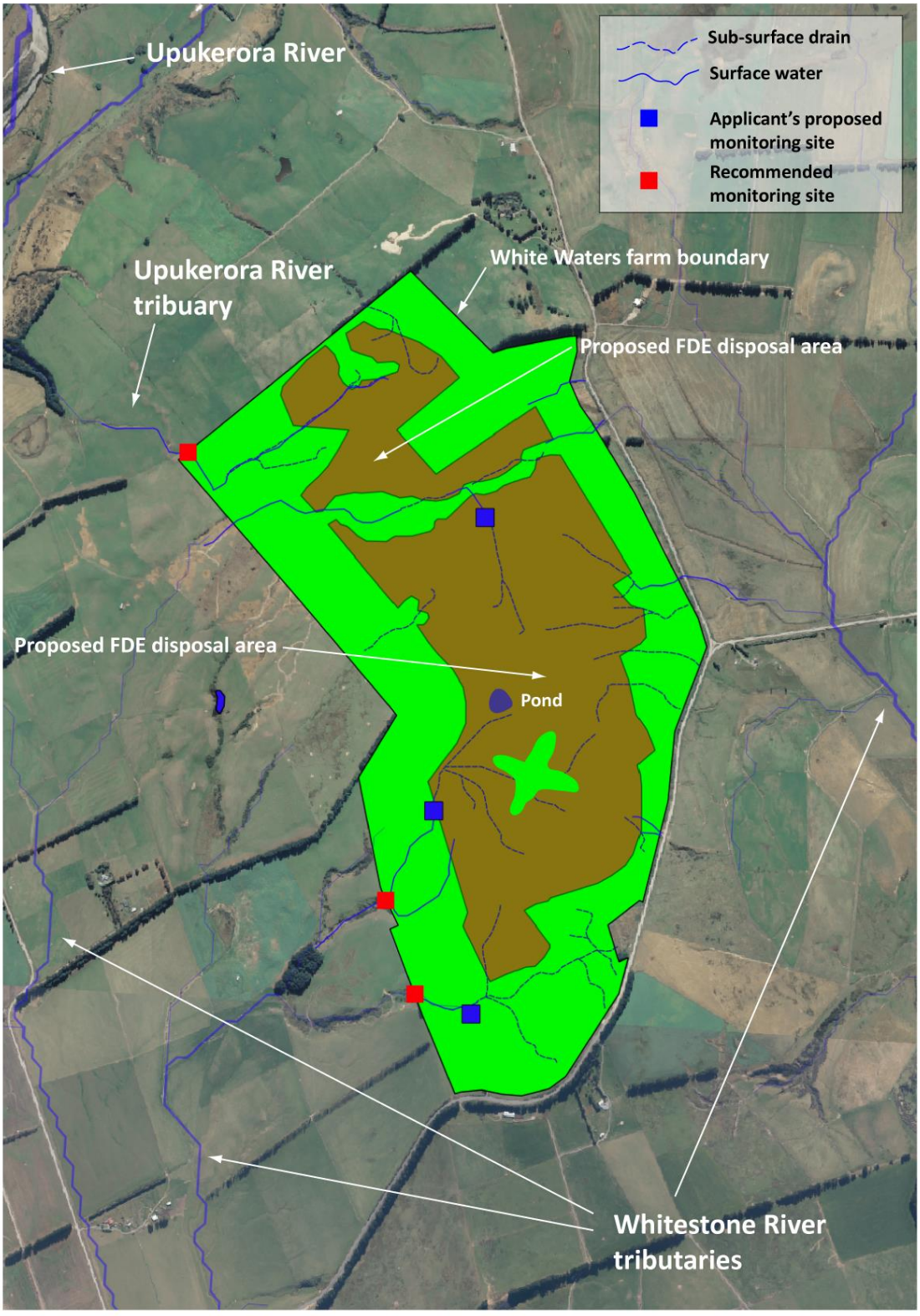


Figure 3. Aerial map showing locations of surface and sub-surface features that drain to tributaries of the Upukeroroa and Whitestone rivers. Dark shaded land within the farm boundary indicate the proposed farm dairy effluent areas. Blue squares indicate the applicant's proposed monitoring sites.

7 Water quality

7.1 In this section I present and discuss water quality data for the Whitestone and Upukerora rivers, Lake Te Anau, to which the Upukerora flows into, and make some general comments on local groundwater.

7.2 I note at this point that the applicant has not presented any water quality data for watercourses on or near its farm, and has relied on Environment Southland monitoring sites located considerable distances downstream of the farm, which I discuss in subsequent paragraphs below. In my opinion, the lack of local monitoring data presents some difficulties in determining the effects of the activity on local and downstream surface water quality and ecology, and as a result of this lack of information I have adopted a relatively conservative approach to assessing ecological effects.

7.3 Environment Southland has two long-term water quality monitoring sites downstream of the White Waters farm: Upukerora River at Te Anau Milford Road (approximately 9km downstream of the WWL farm) and Whitestone River d/s Manapouri-Hillside Road (approximately 23km downstream of the WWL farm). I am not aware of any other monitoring of surface (or ground) water monitoring closer to the farm and the applicant has not indicated that it has undertaken any monitoring of its own. This is unfortunate in my opinion, it would have been of benefit to assessing potential effects by having a better understanding of the existing environment.

7.4 I have accessed the Council's water quality monitoring raw data for these two sites. I also note that Environment Southland recently reviewed water quality trends across Southland including rivers, lakes and groundwater[4]. This report examines water quality data for the period January 2000 to December 2016 and includes the two sites above. It compares the water status of these (and other) sites by assessing them in relation to numeric water quality objectives , which I have summarised in Table 1.

[4] Hodson, R., Dare, J., Merg, M., and Couldrey, M. 2017. *Water Quality in Southland: Current State and Trends.* Technical Report. Publication No 2017-04.

Table 1. Water quality numeric objectives for the protection of human health and ecological values in New Zealand rivers, streams and groundwater. (redrawn from Hodson et al. 2017).

Parameter (units)	**Numeric objective**		
Surface water			
Nitrate nitrogen toxicity (mg/L)		Median	95th Percentile
	A	≤ 1.0	≤ 1.5
	B	> 1.0 and ≤ 2.4	> 1.5 and ≤ 3.5
	C	> 2.4 and ≤ 6.9	> 3.5 and ≤ 9.8
	D	> 6.9	> 9.8
Ammoniacal nitrogen toxicity (mg/L)		Median	Maximum
	A	≤ 0.03	≤ 0.05
	B	> 0.03 and ≤ 0.24	> 0.05 and ≤ 0.4
	C	> 0.24 and ≤ 1.3	> 0.4 and ≤ 2.2
	D	> 1.3	> 2.2
Human Health Recreation (*E.coli*) (CFU/100 mL)		Median	
	A		
	B	≤ 260	
	C	> 260 and ≤ 540	
	D	> 1000	
		Upland Median	Lowland Median
Water clarity (metres)		> 0.8	> 0.6
Ammoniacal nitrogen (mg/L)		< 0.01	< 0.21
Nitrate nitrogen (mg/L)		< 0.167	< 0.444
Total nitrogen (mg/L)		< 0.295	< 0.617
Dissolved reactive phosphorus (mg/L)		< 0.009	< 0.01
Total phosphorus (mg/L)		< 0.026	< 0.033
Groundwater			
		Median	
Nitrate nitrogen drinking water (mg/L)		> 11.3	
Ammoniacal nitrogen toxicity – surface water (mg/L)		Median	95th Percentile
	A	≤ 1.0	≤ 1.5
	B	> 1.0 and ≤ 2.4	> 1.5 and ≤ 3.5
	C	> 2.4 and ≤ 6.9	> 3.5 and ≤ 9.8
	D	> 6.9	> 9.8

7.5 Results for the downstream monitoring sites on the Upukerora and Whitestone rivers are presented in Table 2, accompanied by results from the Waiau River at Sunnyside.

7.6 Table 2 shows that most water quality parameters that are monitoring are meeting the water quality numeric objectives over the five years of monitoring. Indeed, the data indicate that water quality is generally very good at all three sites. The exception to this is organic nitrogen, which does not meet the water quality objective at the Whitestone River monitoring site, and is deteriorating over time at both the Whitestone River and Upukerora monitoring sites.

7.7 Tables 3 summaries the water quality monitoring data for Lake Te Anau and also indicates very good water quality as one would expect for this

lake. Water quality objectives for contact recreation are also met for this site.

7.8 In summary, these long-term monitoring sites indicate very good water quality with the exception of nitrogen concentrations in the lower Whitestone River.

*Table 2. State of the environment monitoring 2012-2016 - Environment Southland data (Hodson et al. 2017) for rivers. Data are median values with maximum recorded values in brackets. Green cells indicate that water objectives for the site are met, red cells indicate that the objectives have not been met. Grey cells in an indeterminate finding. * indicates deteriorating trend over time.*

Water quality parameter	Whitestone River d/s Manapouri-Hillside	Upukerora River at Te Anau Milford Road	Waiau River at Sunnyside
Clarity (metres)	4.1 (13)	3.21 (8.36)	2.9 (6.78)
E.Coli (CFU/100mL)	30 (7000)	30 (2,600)	30 (800)
Nitrate-Nitrite Nitrogen eco health (mg/L)	0.485 (1.62)	0.137 (0.300)	0.150 (0.36)
Nitrate-Nitrite Nitrogen toxicity (mg/L)	0.485 (1.62)	0.137 (0.300)	0.150 (0.36)
Total Nitrogen (mg/L)	0.65 (2.3)	0.24 (1.11)	0.26 (0.56)
Dissolved Reactive Phosphorus (mg/L)	0.002 (0.011)	0.002 (0.012)	-
Total Phosphorus (mg/L)	0.004 (0.21)	0.006 (0.107)	0.004 (0.03)
Organic Nitrogen (mg/L)	0.126 (1.683)*	0.075 (0.913)*	0.085 (0.36)*
Ammoniacal Nitrogen eco health (mg/L)	0.003 (0.037)	0.003 (0.018)	0.002 (0.011)
Ammoniacal Nitrogen toxicity (mg/L)	0.003 (0.037)	0.003 (0.018)	0.002 (0.011)

Table 3. Summary of Lake Te Anau water quality data (2012-2016) in relation to National Objectives Framework (NOF). Data are median values with maximum recorded values in brackets. Green shading indicates A-band which is highest band. Source: Hodson et al. 2017.

Water quality parameter	Lake Te Anau at Blue Gum Point Top	Lake Te Anau at South Fiord Top
Total Nitrogen (mg/L)	0.075 (0.170)	0.055 (0.110)
Total Phosphorus (mg/L)	0.002 (0.006)	0.002 (0.005)
Chlorophyll-*a* (mg/m^3)	0.6 (1.5)	0.7 (1.5)
Ammoniacal Nitrogen toxicity (mg/L)	0.002 (0.003)	0.002 (0.007)

Table 4. Summary of Lake Te Anau recreational contact data (E. coli) in relation to primary and secondary contact attributes of the National Objectives Framework (NOF). Data are median values with maximum recorded values in brackets for the period 2012-2016. Green shading indicates A-band which is highest band. Source: Hodson et al. 2017.

Water quality parameter	Lake Te Anau at Boat Harbour Beach
E.Coli (CFU/100mL) primary contact	43 (170)
E.Coli (CFU/100mL) secondary contact	43 (170)

8 River ecology

8.1 Environment Southland monitors the health of benthic macroinvertebrate and periphyton communities at sites well downstream

of the WWL farm, but nonetheless this information provides a general guide on mainstem river health in these catchments. In Figure 4 I have presented Council chlorophyll-*a*[5] monitoring data for these monitoring sites. Environment Southland has assessed this data against the National Objectives Framework (NOF) attribute states for periphyton[6].

8.2 Based on recent monthly chlorophyll-*a* data assessments (2015 – 2017), the Whitestone River d/s Manapouri-Hillside recorded a 92nd percentile chlorophyll-*a* exceedance value of 39 mg m^{-2} (NOF band A), while the Upukerora River at Te Anau Milford Road recorded a 92nd percentile chlorophyll-*a* exceedance value of 65 mg m^{-2} (NOF band B). However, assessment of 95% lower and upper levels of state revealed that the uncertainty in classified Whitestone River d/s Manapouri-Hillside into NOF band B (upper 95% confidence limit – 66 mg m^{-2}), while uncertainty in classified Upukerora River at Te Anau Milford Road into NOF band A (lower 95% confidence limit – 31 mg m^{-2}).

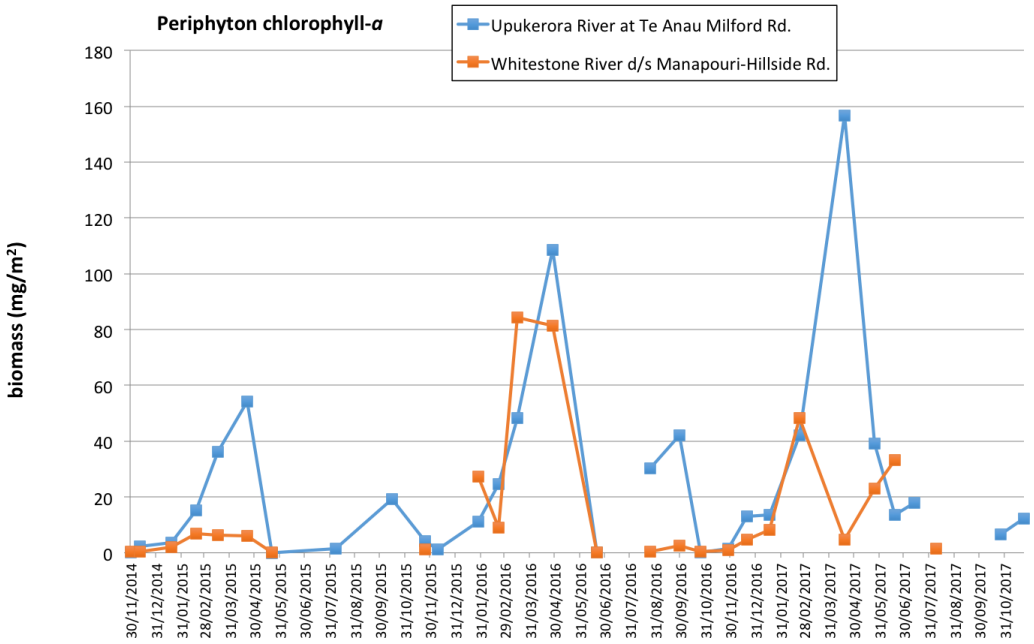


Figure 4 Environment Southland periphyton monitoring data (chlorophyll-a) for the Upukerora River at Te Anau Milford Road and the Whitestone River downstream of

8.3 In addition, Environment Southland staff have informed me that percentage periphyton cover (e.g., thick mat or long filamentous algae)

[5] Chlorophyll-*a* concentration from periphyton scraping off the bed of streams and rivers is used as a surrogate for periphyton biomass and there are national guidelines and NPS-FM attribute states to compare data against.

[6] The National Policy Statement for Freshwater Management requires councils to set freshwater objectives and limits in their regional plans. 'Freshwater objectives' are the intended environmental outcomes for a water body that will provide for the values the community considers important.

and ash free dry weight (AFDW) data indicate that both sites are under thresholds (i.e., good/acceptable environmental conditions) as defined for Southland Regional Water and Land Plan (2018) (Roger Hodson, pers. comm.).

8.4 In general, the Environment Southland SOE monitoring sites for Whitestone and Upukerora river indicate periphyton biomass is usually low and at acceptable levels. However, I do add a cautionary note here in that Environment Southland reported the presence of potentially toxic benthic cyanobacteria were found in the Upukerora River around the Te Anau-Milford Road in March 2017.

8.5 In Table 5 I have presented benthic macroinvertebrate MCI[7] scores for sites on the Upukerora and Whitestone rivers along with other river monitoring sites in the Waiau catchment for comparative purposes. Monitoring data for the Whitestone River is limited although there has been sampling in recent years.

8.6 The data in Table 5 show that Upukerora River site just passes Environment Southland's appropriate water quality criteria for MCI scores for this type of river (100). In my experience, I would have expected typical MCI scores for the Upukerora River to be higher than those recorded in recent years. There is insufficient data for the Whitestone River to determine the long-term state of its benthic invertebrate community, however the last two years of available data suggest that community health is only just meeting what would expected to be acceptable MCI scores for this type of river.

8.7 The NZ fisheries database was accessed (July 2018) to provide an overview of known fish species and their distribution throughout the Whitestone and Upukerora catchments and Lake Te Anau. This information is displayed in Figure 5. I have not attempted to display all records in the general area present in Figure, but rather have focused on sites close to or downstream of the WWL farm.

8.8 The fish fauna of the area is fairly typical of that expected for these catchments. Brown and rainbow trout are common, as are bullies and

[7] Macroinvertebrate Community Index which is a measure of the health of the benthic community and a general indicator of water quality and habitat conditions for river invertebrates.

longfin eel. Records for the 'Gollum' galaxias (*Galaxias gollumoides*) are relatively common in the area. This species is currently classified as 'nationally vulnerable' under the New Zealand Threat Classification System[8]. It can be found in a wide range of habitats from lowland wetlands near sea level to small headwater streams in high country tussocklands up to 1,100 m above sea level. The Department of Conservation identify main threats to populations of this species as habitat loss from land development, water abstraction, and predation by introduced fish species such as trout. Other threats include stock access to streams, reduction of native vegetation, and forest harvesting.

[8] Dunn, N., Allibone, R., Closs, G., Crow, B., David, B., Goodman, J., Griffiths, M., Jack, D., Ling, N., Waters, J., and Rolfe, J. 2017. *New Zealand Threat Classification. Series 24*.

Table 5. Benthic Macroinvertebrate Community Index (MCI) values calculated for Upukeorora and Whitestone rivers and other selected sites in the Waiau catchment from late summer 1997 to late summer 2017. Blank cells indicate sampling was not underrtaken for that year. Source: Roger Hodson, Environment Southland.

Monitoring Sites	**MCI values (summer)**																				
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Hill																					
Upukerora River at Te Anau Milford Highway				123	110	140	121	113	116	106	120	100	120		106	102	100	108	116	119	104
Whitestone River at Te Anau-Mossburn Hwy	138	158																		106	99
Lake-fed																					
Mararoa River at Kiwiburn		96	97	83	102		112	123	121	98	91		108		105	108	93	102	106	104	
Mararoa River at Mavora Lake	140		111	76	85	70	62	80	77	94	106										
Waiau River 100m u/s Clifden Bridge	112		108	126	131	118	126	116	113	100	114	110	110		95			89			
Waiau River at Duncraigen Road												112	104		104	102	105	97	100		
Waiau River at Tuatapere	104		80	77	100														89	84	
Waiau River u/s Tuatapere							109	111	100		96		100		85	103	100	107			
Natural state																					
Eglinton River at Mackay Creek Confluence	127	145	119	127	134	124	130	118	134	113	142	125	127					136			
McKay Creek at Milford Road	133	128	116	118	117	107	117	126	111	121	126	123	103					112			

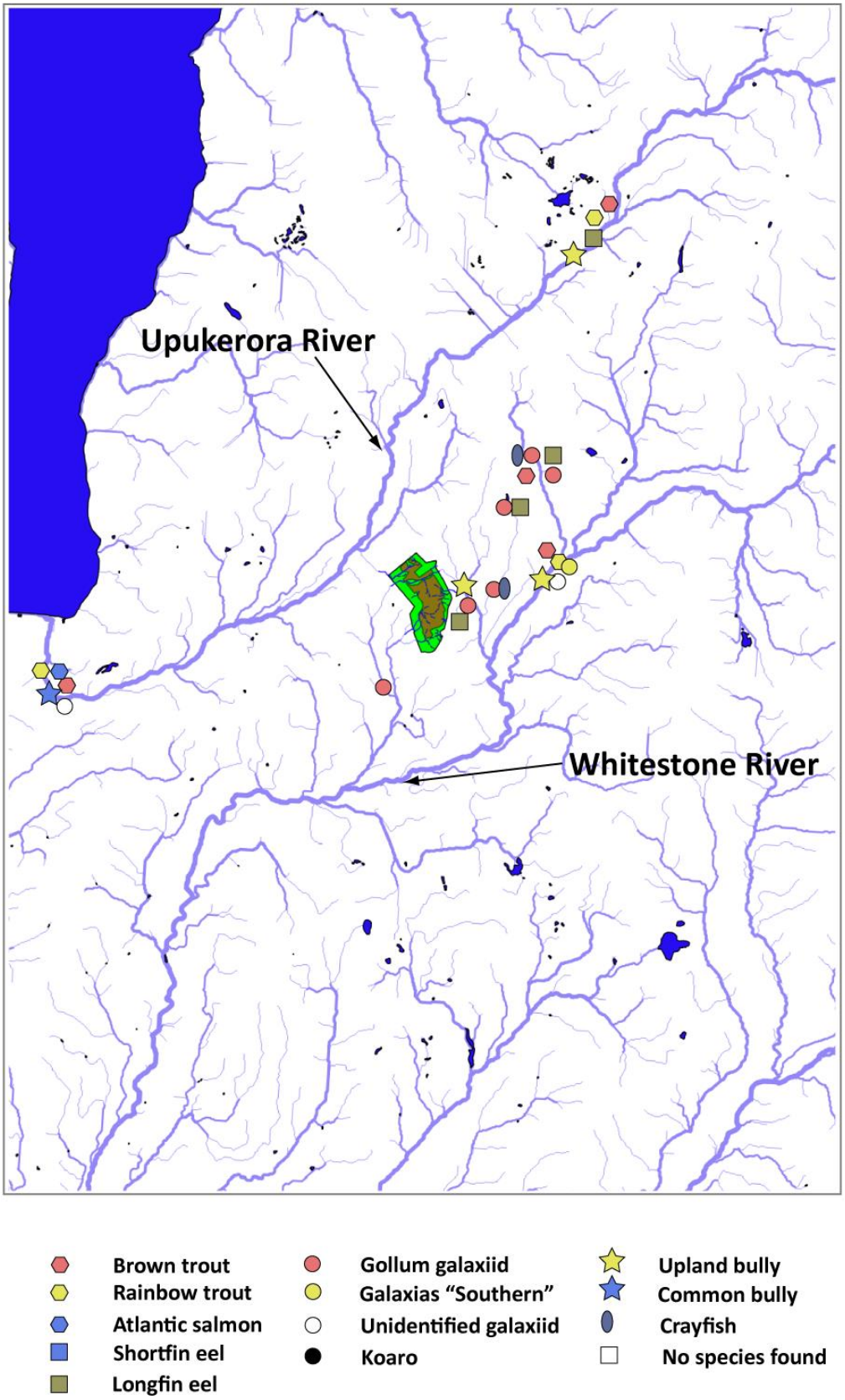


Figure 5. Map showing location of fish species known to be present in surface waters in the general vicinity of the White Waters farm. Information derived from the NZFFD. Note not all sites have been presented on this map.

8.9 The Fish & Game submission notes that the Whitestone River supports brown and rainbow trout fisheries with brown trout between 1 - 3kg in size and rainbow trout up to 2kg in size present throughout the river. Rainbow trout are more common in the upper reaches. The Whitestone and its tributaries provide spawning habitat for salmonid species.

8.10 The water quality of the upper Whitestone River is high, and water clarity can be very high, which in part characterises the upper Whitestone Rivers as headwater fishery.

8.11 Fish & Game state that the Upukerora River is fishable for virtually its entire length (50km). As noted, brown and rainbow trout are present and it is likely that a significant component of the adult population is derived from Lake Te Anau, and migrate into the river each year to spawn. Adults are reported to range between 1.5 and 2.5kg, and, as for the Whitestone River, rainbow trout are more common in the upper reaches.

8.12 The water quality of the upper Upukerora River is high, and water clarity can be exceptionally high. As such, the upper Upukerora River is characterized by Fish & Game as a headwater fishery. Both fisheries form part of the Waiau catchment fishery, which includes lakes Te Anau and Manapouri, and is considered to be of national significance (Unwin 2016)[9]. I have examined the latest national anglers survey data (2015-16) and can confirm that the Waiau catchment had a reported 43,210 ± 3,170[10] angler days for this period, with contributions from the Whitestone and Upukerora rivers being 490 ± 180 and 390 ± 120 respectively.

8.13 Angler's effort in both rivers appears to have declined significantly relative to when the survey was last conducted in 2007-08 (1,150 ± 400 and 1,370 ± 380 for the Whitestone and Upukerora respectively).

8.14 Fish & Game in its submission has stressed the importance of these two rivers for trout passage and I make further comment on the relevance of this attribute later in my evidence as it relates to this application.

8.15 In summary, the catchments that surround the WWL farm have a range

[9] Unwin, M. 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 client report 2016021CH.
[10] estimated annual usage as angler-days ± 1 standard error.

of native and salmonid species. The mainstems of the Upukerora and Whitestone are highly regarded recreational fisheries and the presence of a nationally vulnerable native species has been recorded near to the WWL farm. No information is available on the benthic invertebrate communities close to the site, and relatively little information is available further downstream except for the lower Upukerora River.

9 Factors potentially affecting downstream water quality and ecology

9.1 On-farm, the management of the FDE land disposal system will be critical to avoiding significant losses of contaminants to small watercourses draining the WWL farm. Nutrients and *E. coli* bacteria are probably the contaminants of greatest concern with this type of activity, although oxygen-demanding substances could also be present in surface runoff. Keri Johnston in her evidence has concluded that this is a 'high-risk' site overall, and that the presence of springs and waterways on the farm will mean that "active management of any FDE system is required". She is of the view that the proposed blanket separation distance of 20 metres from these features is inadequate, and distances need to be established based on slope (the larger the slope, the larger the separation distances need to be).

9.2 Land slope determines both the volume and velocity of overland flow, and the combination of elevated slope, low soil infiltration rates and wet soil conditions present a high potential for overland flow and contaminant loss. Slope length also influences contaminant loss (Goldsmith & Ryder 2013).

9.3 The presence of sub-surface drains will mean that nitrate is likely to be elevated at the points where these drains discharge to surface watercourses.

9.4 Water quality in surface waters of the surrounding catchments appears to be relatively good, however nitrogen is elevated in the lower Whitestone River and appears to be increasing. The potential effects of increases in nitrogen as a result of land intensification are typically insidious given the non-point, diffuse, nature of such discharges. In my experience, changes can be gradual and, even if well-defined and targeted monitoring is in place, it can take many years to conclude that

change is taking place.

9.5 Given the drainage pattern on the farm, it would appear that tributaries of the Whitestone River are at greatest risk of receiving contaminants from the WWL farm. The potential to impact on the Whitestone River is difficult to determine without more information on the nitrogen and phosphorus loads that may reach the mainstem.

9.6 If surface runoff from the proposed FDE area occurs, it is likely to carry nitrogen and phosphorus with it. Phosphorus levels are reported as being very low in the lower Whitestone River, however relatively little phosphorus is necessary to encourage the development of nuisance algae growths when nitrogen is already present in abundance. Hence my recommendation that any land disposal system has a high level of protection for surface water features to avoid surface runoff of nutrients reaching downstream tributaries that may support fisheries.

9.7 Most NZ freshwater fish species are relatively tolerant of some mild increase in nutrient concentrations, however even mild concentrations of N and P can change the habitat of small waterways through encouraging nuisance algae and plant growths. Further, there is evidence that elevated nitrate levels can be toxic to both fish and benthic invertebrates. There is no information on the existing nitrate levels in tributaries draining the WWL farm or further downstream where tributaries meet the mainstem of the Whitestone. There are records for the Gollum galaxiid in two tributaries of the Whitestone that drain the WWL farm (one approximately 500 m downstream of the north-east farm boundary and another 2.8km downstream of the south-west farm boundary). If consent is granted, I recommend that these surface waters be monitoring for nitrogen and phosphorus at the farm boundary.

9.8 As noted above, the risk of contaminants from the WWL operation reaching the Upukerora River would appear less likely given the area of the farm that drains to this catchment. However, I would recommend that the same level of protection is afforded any waterways that drain this section of the farm. At the most, the contribution of contaminants to this river from the WWL operation would probably be very small, unless effluent disposal was poorly managed, and while it could have a cumulative effect on the overall nutrient and *E. coli* contribution to the

river, it would be difficult to quantify without a targeted monitoring programme.

9.9 The risk of any contaminants from the WWL farm reaching the Upukerora River and adversely affecting Lake Te Anau water quality is also low in my opinion, given my comments above. However, Environment Southland monitoring data shows that *E. coli* levels can be elevated in the river upstream and immediately downstream of the Te Anau township sewage treatment plant discharge, and *E. coli* levels can be elevated around the foreshore the lake near the mouth of the Upukerora. Also, both nitrogen and phosphorus can be elevated downstream of the Te Anau township sewage treatment plant discharge. Effects on water quality are likely to be relatively localised to this area given the vast amount of dilution afforded by the lake.

10 Conclusion

10.1 Water quality in rivers surrounding the White Waters farm is good, but the monitoring site on the lower Whitestone River has elevated levels of nitrogen and these are increasing over time. Upukerora River also has good water quality although there are indications of elevated nutrients and *E. coli* levels in the very lower reaches, which may be linked to the discharge of treated effluent from the Te Anau townships sewage treatment plant.

10.2 The catchments that surround the WWL farm have a range of native and salmonid species. The mainstems of the Upukerora and Whitestone rivers contain valued recreational fisheries, and at least one nationally vulnerable species is present nearby. Fish and benthic invertebrates can be directly affected by elevated levels of ammonia and nitrate, and indirectly through habitat changes induced by nuisance algae and plant growths.

10.3 The proposed FDE disposal operation is to take place on a site with a high-risk profile when it comes to effluent runoff and contamination of local surface waters.

10.4 These factors indicate to me that conservative setbacks need to be employed along with a targeted monitoring programme for key watercourse that drain the property.

[Name]

[Date]

Application

Application for Resource Consent (PART A)

environment SOUTHLAND REGIONAL COUNCIL
Te Taiao Tonga

This application is made under Section 88 of the Resource Management Act 1991

The purpose of this Part A form and the relevant Part B form(s) is to provide applications with guidance on information that is required under the Resource Management Act 1991. Please note that these forms are to act as a guide only, and Environment Southland reserves the right to request additional information.

ENVIRONMENT SOUTHLAND
06 APR 2018
PAID

To: Environment Southland
Private Bag 90116
Invercargill 9840

Full name, address and contact details of applicant ***(in whose name consent is to be issued)***

ELECTRONICALLY $1650

Name: White Waters Limited

Address: 893 Kakapo Road
RD2 Te Anau 9672

Email: whitewater@farmside.co.nz

Phone: 021 2220533 *Preferred* _____ *Additional* Fax: _____

Consultant contact details ***(if different from above)***

Contact name/agent: Karen Ladbrook, RDAgritech Ltd

Address: PO Box 1711
Invercargill 9840

Email: karen@rda.co.nz

Phone: 027 530 4470 *Preferred* 0800 732 474 *Additional* Fax: _____

Please tick the box for the consent(s) you are applying for and complete the relevant Part B form(s) where available:

Land Use

- [ ] Bore/well
- [ ] New or expanded dairy farming
- [x] Effluent storage
- [ ] Cultivation
- [ ] Tree planting
- [ ] Gravel extraction
- [ ] Hill country burning
- [ ] Riverbed activity (incl. streams/creeks and stopbanks)
- [ ] Bridges and culverts

Discharge

- [ ] To air
- [ ] To water
- [x] To land

Water

- [ ] Take and use surface water
- [x] Take and use groundwater
- [ ] Dam water
- [ ] Divert water

Coastal

- [ ] Whitebait stand
- [ ] Structures/occupation of space
- [ ] Removal of natural materials
- [ ] Disturb foreshore/seabed
- [ ] Discharge/deposit substances
- [ ] Commercial surface water activity
- [ ] Reclaim/drain foreshore/seabed
- [ ] Marine farming
- [ ] Other coastal activities

1 Are there any **current** or **expired** consents relating to this proposal? ☑ Yes ☐ No

If yes, please provide consent number(s) and description:

301177 to Discharge FDE to Land
302514-01 to Take Groundwater

2 Are any other consents required from Environment Southland or **other authorities**? ☑ Yes ☐ No

If yes, please state the relevant authority and the type of consent(s) required:

Building Consent from Southland District Council.

3 For what **purpose** is this consent(s) required: (e.g. discharge of effluent, gravel extraction etc.)

Discharge effluent, take water, construct effluent storage.

4 **Location** of proposed activity

Address: 893 Kakapo Road
Te Anau

Legal Description: Sec 2 SO38507

Map Reference (NZTM 2000): 1198225 E 4960554 N

5 The name and address of the **owner /occupier:** (if other than the applicant)

Name: _____ Phone: _____

Address: _____

_____

6 **Please attach a map or a coloured aerial photograph, showing at a minimum, the location of the proposed activities.**

Refer to AEE.

7 Assessment of effects on the environment (AEE)

Please complete the applicable Part B form(s) for the proposed activities. For those activities where no Part B form is available, please attach a written statement that assesses the effects that your activities may have on the environment. An assessment of effects **must** include the following information:

(a) *If it likely that the activity will result in any significant adverse effect on the environment, a description of any possible alternative locations or methods for undertaking the activity:*
(b) *An assessment of the actual or potential effect on the environment of the activity:*
(c) *If the activity includes the use of hazardous substances and installations, an assessment of any risks to the environment that are likely to arise from such use:*
(d) *If the activity includes the discharge of any contaminant, a description of—*
  (i) *the nature of the discharge and the sensitivity of the receiving environment to adverse effects; and*
  (ii) *any possible alternative methods of discharge, including discharge into any other receiving environment:*
(e) *A description of the mitigation measures (safeguards and contingency plans where relevant) to be undertaken to help or prevent or reduce the actual or potential effect:*
(f) *Identification of the persons affected by the activity, any consultation undertaken, and any response to the views of any persons consulted:*
(g) *If the scale and significance of the activity's effects are such that monitoring is required, a description of how and by whom the effects will be monitored if the activity is approved:*
(h) *If the activity will, or is likely to, have adverse effects that are more than minor on the exercise of a protected customary right, a description of possible alternative locations or methods for the exercise of the activity (unless written approval for the activity is given by the protected customary rights group).*

You should also include:

(a) *An assessment of the activity against any relevant provisions of any relevant objectives, policies, or rules:*
(b) *Any information specified to be included in the application in accordance with the relevant regional plan:*
(c) *For an application to replace an existing consent, an assessment of the value of the investment of the existing consent holder:*

An assessment of effects **must** address the following matters:

(a) *any effect on those in the neighbourhood and, where relevant, the wider community, including any social, economic, or cultural effects:*
(b) *any physical effect on the locality, including any landscape and visual effects:*
(c) *any effect on ecosystems, including effects on plants or animals and any physical disturbance of habitats in the vicinity:*
(d) *any effect on natural and physical resources having aesthetic, recreational, scientific, historical, spiritual, or cultural value, or other special value, for present or future generations:*
(e) *any discharge of contaminants into the environment, including any unreasonable emission of noise, and options for the treatment and disposal of contaminants:*
(f) *any risk to the neighbourhood, the wider community, or the environment through natural hazards or the use of hazardous substances or hazardous installations.*

8 Affected Parties

Please attach written approval from parties who may be affected by your activity. *Written Approval of an Affected Party* forms are available on the Environment Southland website. During the processing of your application, Council may determine that additional approvals are required.

Checklist: Have you included the following?

- [✓] Payment of the required deposit *(see attached fee schedule)* Paid electronically by Applicant.
- [N/A] Written approval from all potentially affected parties *(forms available from the Environment Southland website)*
- [✓] Site plan/location map/sketch of the proposed activity
- [✓] A copy of the Certificate of Incorporation (*where applicant is a company*)
- [✓] Part B form(s) specific to your activity and/or a separate assessment of environmental effects (AEE)

Notes:

(a) If your application does not contain the necessary information and the appropriate fee, Environment Southland must return the application.

(b) Council cannot accept electronic lodgement of applications at this time.

Signature of applicant

I hereby certify that to the best of my knowledge and belief, the information given in this application is true and correct.

I undertake to pay all actual and reasonable application processing costs incurred by Environment Southland.

Name (block capitals) KAREN LADBROOK, RDAGRITECH

Signed _____ **Date** 06/04/2018

(Signature of applicant or person authorised to sign on behalf of applicant)

Application to Construct, Maintain and use Effluent Storage (PART B)

This application is made under Section 88 of the Resource Management Act 1991

A complete Part A form needs to be provided with this Part B form. The purpose of this Part B form is to provide applicants with guidance on information that is required under the Resource Management Act 1991. These forms are to act as a guide only and Environment Southland reserves the right to request additional information. **This form must be used when applying for consent to construct or reconstruct effluent storage, including waste-water, sludge or effluent from an industrial or trade processes or agricultural effluent (including treatment facilities, such as weeping walls and sludge beds).**

To: Environment Southland
Private Bag 90116
Invercargill 9840

1 Location of the storage:

Address: 893 Kakapo Road

Legal Description(s): Sec 2 SO38507

Map Reference (NZTM 2000): 1198225 4960554

2 What types of effluent storage are you proposing to construct, maintain and use?

☐ Effluent pond *(complete 2.2 below)* ☑ Tank

☐ Other, please describe:

2.2 Proposed method of lining the ~~pond~~: TANK

☐ Compacted clay ☑ Synthetic liner ☐ Concrete

☐ Other,please describe:

4 Construction Details:

Name of designer: Kliptank Ltd

Name of builder: Kliptank Ltd

Name of construction supervisor: Kliptank Ltd / Southland DC

Proposed timing of construction: May 2018

What is the total volume of the storage? (cubic metres) 2,291 m^3

5 For agricultural effluent storage and sludge design, is the storage to be constructed in accordance in accordance with:

IPENZ Practice Note 21: Farm Dairy Effluent Pond Design and Construction (2013); or

☑ Yes ☐ No

IPENZ Practice Note 27: Dairy Farm Infrastructure (2013)

☐ Yes ☐ No

If no, please advise what departure from the standards is proposed and why.

6 **Please provide details of the proximity of the storage to:**

Nearest surface watercourse:	245	metres
Nearest artificial watercourse:	370	metres
Registered drinking water supplies:	N/A	metres
Nearest underground drain:	125	metres
Property boundary:	300	metres
Dwellings on neighbouring properties:	620	metres
Coastal marine area:	N/A	metres
Historic heritage	N/A	metres
Urban areas	N/A	metres

8 **Please provide a description of all of the sources of waste-water, sludge or effluent to be treated and/or stored in the storage, including the storage capacity of the effluent storage in relation to the volume and nature of the liquid that will enter. For agricultural effluent, you must also attach a Massey Pond Calculator assessment of storage requirements.**

Dairy shed & yard washdown effluent.

9 **Please provide a description the quality of the waste-water, sludge or effluent. Please include all operational procedures, emergency response and proposed monitoring devices to match the scale and quality of the waste-water, sludge or effluent being stored and sensitivity of surrounding environment.**

Farm dairy effluent. Expected to be within normal quality parameters set out in Section 3.2 of the FDE Code of Practice.

High level alarms on tanks.
Refer also to AEE.

10 **Please include an operational management plan that includes:**

- Operational procedures:
  - *For example, how will the pond be managed day to day?*
- Emergency responses:
  - *For example, what will you do if the pond fails?*
- Monitoring and reporting you will undertake:
  - *For example, the frequency of visual inspections; the use of inspection ports or an alarm on the pond.*
- When pond drop tests will be completed

11 **Please include engineering drawings for the proposed structure(s). This will include, but not be limited to:**

- the height of the embankments; and
- placement and orientation of the effluent storage relative to flood flows and stormwater run-off.

12 **Please include a map or aerial photograph showing the following:**

- the location of the proposed storage;
- the total property area boundary;
- surface water bodies, artificial watercourses, installed subsurface drains and wetlands nearby;
- water supplies - bores, registered drinking etc.;
- the coastal marine area and the distance to it (if relevant);
- the location of any dairy sheds and residential dwellings; and
- any additional points of interest – historic heritage, places of assembly etc.

Please note that upon completion of the storage and prior to discharge, you will be required to provide certification of the design and build by a Chartered Professional Engineer.

END OF FORM

Resource Consent Application for the Discharge of Agricultural Effluent (Part B)

environment SOUTHLAND REGIONAL COUNCIL Te Taiao Tonga

This application is made under Section 88 of the Resource Management Act 1991

A complete Part A form needs to be provided with this Part B form. The purpose of this Part B form is to provide applicants with guidance on information that is required under the Resource Management Act 1991. These forms are to act as a guide only and Environment Southland reserves the right to request additional information.

Section A: Application details

1. **Please provide details of your existing resource consent to discharge agricultural effluent:**

   (a) Consent number: 30177

   (b) Expiry date: 26 June 2017

2. **What is the maximum number of animals from which you propose to collect effluent from under this resource consent application?**

   599 animals

Note: if you wish to increase the size of your milking herd, this form is not suitable for your use. Please contact Environment Southland staff for more information.

Section B: Location of discharge and description of surrounding environment

3. **Location of the proposed discharge:**

   Address: 893 Kakapo Rd Te Anau

   Map reference: 1198225 4960554

   Legal description: Sec 2 SO 38507

4. **Please complete the following tables which tell us about your property and effluent disposal area. Information can be found on the Environment Southland Website in the Beacon application, or by contacting Environment Southland.**

Property Details:-	
Total Farm Area (ha)	206
Effective Farm Area (ha)	226
Size of effluent disposal area (ha)	103
Stocking rate	2.9 cows/ha
Freshwater Management Unit	Waiau.

Refer to AEE section 1.2.

Effluent Disposal Area Details				
Soils	**Soil Type**	**Vulnerability Factors**		
		Structural Compaction	**Nutrient leaching**	**Waterlogging**
FDE land classification	Category A – Artificial Drainage or coarse soil structure			
	Category B – Impeded drainage or low infiltration			
	Category C – Sloping land (over 7 degrees)			
	Category D – Well drained flat land			
	Category E – Other well drained but very stony flat land			
Physiographic zone (s)	**Zone**	**Contaminant pathway(s) for Physiographic zone**		

5. **Are there are any permanent or intermittent rivers, streams, lakes, drains, ponds or wetlands within 20 metres of the discharge area?**

Yes ☐ (Go to question 6)

No ☑ (Go to question 7)

6. **Features of the rivers, streams, lakes, drains, ponds or wetlands within 20 metres from the discharge area include:**

	Yes	No
(a) signs of instream life (e.g. fish, eels, bullies, crayfish, native birds, frogs)		✓
(b) areas where food is gathered from a water body (e.g. watercress, eels, wildfowl)		✓
(c) bird nesting habitats		✓
(d) areas of particular aesthetic, cultural, heritage or scientific value (e.g. archaeological sites)		✓

7. **Are there are any bores or soakholes within 20 metres of the discharge area?**

Yes	
No	✓

8. **Are you proposing to discharge effluent within:**

	Yes	No
(a) 20 metres of any lakes, rivers, ditches, drains, wetlands, or the coastal marine area?		✓
(b) 200 metres of a house on a neighbouring property or a public place such as a school or community hall?		✓
(c) 20 metres of a property boundary?		✓
(d) 100 metres of a bore?		✓

8.1 If you are proposing to discharge effluent within these distances, what (if any) are the separation distances you are proposing?

	Metres from discharge area
(a) surface waterbodies	20
(b) artificial watercourses	20
(c) subsurface drains	20
(d) the coastal marine area	N/A
(e) residential dwellings and places of assembly	200
(f) landholding boundaries	20
(g) water abstraction points	100
(h) registered drinking water supplies	N/A

9. Please attach a scaled farm plan or a coloured aerial photograph, showing:

- farm boundaries;
- paddock boundaries;
- effluent disposal paddocks (numbered and size in hectares);
- irrigation system layout;
- tile drains/mole drains;
- streams, rivers, farm drains, springs and wetlands;
- bores within 100 m of the disposal area;
- any known water abstraction points within 100 m of the disposal area;
- buildings (houses, sheds, wintering pads) and/or other places of assembly;
- effluent storage pond(s) and any effluent treatment infrastructure;
- cow races;
- dairy shed location;
- any other discharge areas (such as whey);
- any areas prone to flooding;
- any swampy areas (i.e. where water builds up in the sediments close to the ground surface above layers of poorly draining soils) within the discharge area.

Section C: Description of proposed activity

10. Dairy shed effluent

(a) How many cows will be milked each day? 599

(b) How many times per day will you milk (maximum)? once/twice/three times per day

(c) What is the length of the milking season? (please include dates) 285 days

20/08 - 31/05 (dates)

(d) What is the volume of wash down effluent generated per day? 25,500 (litres/day)

11. Winter milking

(a) Does your milking season include winter milking? NO

(b) If yes, what is the number of cows to be milked in winter? cows

(c) How many times per day will you milk once/twice/three times per day

(d) Dates of winter milking season (provide dates)

12. Feed pad/wintering pad/stand-off pads

(a) Number of cows on feed/wintering/stand-off pad _____ cows

(b) What is the size of the area? _____ square metres

(c) Is the feed/wintering/stand-off pad roofed? _____ Yes/No

(d) Is rainwater diversion in place? _____ Yes/No

(e) Is it mechanically swept? _____ Yes/No

(f) If it is washed down, amount of water used _____ litres/day

(g) How is effluent from this facility disposed of? _____

(h) Intended length of time the area is to be used _____ days per year

13 Please describe any other sources of effluent that is collected for discharge e.g. stock underpasses and silage pads

NONE

14. **Total volume of effluent:**

Using your answers to questions 11-14 (above) what is the total volume of effluent to be discharged (in cubic metres/day)?

Average effluent generation up to 25.5 m³/d.
Up to 240m³/day may be discharged.

Effluent irrigation rate and method

15. **Please describe how effluent will be collected, treated and discharged to land and when it will be discharged to land:**

Gravity - fed to pump near shed.
Pumped to storage tanks.
Irrigated to Land with slurry tanker.

Proposed instantaneous effluent application rate* N/A mm/hr

Proposed effluent application depth 5 mm per application

*This is the depth of effluent that would be applied to a soil surface if the irrigation system was run continuously for one hour.

16. **Has the effluent irrigator discharge rate been checked and calibrated recently? This is particularly recommended for high rate irrigators.**

- [x] No
- [ ] Yes

If yes, then please include the results of the test.

Section D: Storage facility

17. What volume of effluent storage and treatment do you have on site (m^3)?
Please include a Massey Effluent Pond Calculation to show that you have, or will have sufficient effluent storage.

Effluent Pond/Tank	1,100	Cubic metres
Sump(s)		Cubic metres
Weeping wall/sludge bed		Cubic metres
Other (please specify)		Cubic metres

18. Are you increasing storage on site?

Yes ☑ (Go to question 19)
No ☐ (Go to question 20)

If you are increasing your storage then please complete the land use consent application form for effluent storage.

19. By how much and to what volume?

2063 Cubic metres

20. When was your effluent storage and treatment installed? 2013

21. Has your current effluent storage pond, tank or structure been certified by a Chartered Professional Engineer as being structurally sound?

No ☐ YES ☑

22. Have you undertaken an Effluent Pond Drop Test that has been certified by a Chartered Professional Engineer?
(Refer to Appendix P of the proposed Southland Water and Land Plan for the Effluent Pond Drop Test methodology (shown at the back of this form))

Yes ☐
No ☑

If you have certification from a Chartered Professional Engineer, please attach the certification to your consent application

23. Pond level drop

Information in this section will be known if you have had a drop test performed on your existing pond. Please contact the Consent Authority for advice as to whether or not you need to perform this test on your storage.

(a) What is the pond level drop for your storage facility? _____ (mm per 24 hours)

(b) What is the maximum depth of your pond (excluding freeboard _____ (metres)

(c) Does your pond level drop exceed the maximum allowable pond level drop (see table below)?

☐ No

☐ Yes

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

Section E: Assessment of Effects

24. Please describe any possible long term or short term effects the discharge may have on the quality of the receiving environment and including effects on water bodies, biota (plant and animal life), soil quality, and human health:

Please refer to the attached.

Section F: Good Management Practices and Mitigation Measures

Please include a description of the monitoring or good management practices to be undertaken to help avoid, reduce, remedy or mitigate the actual or potential effects on environmental features and values.

25. Are there any times when you will avoid disposing the effluent to land?

Yes ☑ No ☐

If yes, please indicate below the times you will avoid effluent disposal

(a) When there is snow on the ground ✓

(b) Areas where food is gathered from watercourses (e.g. watercress, eels, wildfowl)? ✓

(c) When rainwater or irrigation water has ponded on the land surface ✓

(d) When the soil temperature is at or below 5 degrees Celsius ✓

(e) When the soil moisture conditions as per Council's monitoring site, or my own soil moisture site say it is unsuitable ✓

(f) Other (please state)

To minimise the risk of adverse effects from odour and spray drift, it is recommended that effluent shall not be discharged within 20 metres of the property boundary or 200 metres of any residential dwelling other than those on the subject property. If you cannot adhere to this buffers, then please describe what effects there may be beyond the property boundary resulting from odour and/or spray drift.

26. **What contingency plans do you have in place in the event you are unable to discharge the effluent to land, including during bad weather conditions or if any equipment breaks down:**

Examples: The capacity of my storage facility is sufficient to defer irrigation in unfavourable weather conditions; or I plan to have the effluent taken off my property.

Deferred irrigation storage capacity.

27. **What good management practices will you use to avoid or mitigate the effects and the risks of your discharge to the environment? For example: low rate effluent discharge.** *These can be found on the Environment Southland website, including on the relevant Physiographic zone information sheets.*

Please refer to FEP.
My maintenance for my effluent system includes: Please refer to FEP.
The checks I will undertake on my effluent storage and treatment and disposal system to ensure it is not leaking or is not broken are: Please refer to FEP.
I monitor my effluent discharge by: Please refer to FEP.

Section F: Other matters

28. Please specify the duration sought for the resource consent:

10 years

Please say why you think this consent duration is appropriate for your operation:

Please refer to AEE section 5.8.

29. Do you have a current collected agricultural effluent management plan?

Yes ☑ No ☐

This plan can be part of the plan that you have prepared for your farm to meet the requirements of Appendix N of the proposed Plan. If you do have a plan which sets out how you manage your effluent then please include it in this application.

30. Have you identified any parties which may be affected by the activity?

Yes ☐ No ☑

If **yes**, please indicate below

(a) Neighbours

(b) Other consent holders in the immediate area

(c) Department of Conservation

(d) Iwi (Te Ao Marama Inc; Te Rūnanga O Ngāi Tahu

(e) Local authorities

(f) Fish & Game New Zealand

(g) Other (please state)

Please include evidence of any consultation undertaken for this application.

Section G: Planning Assessment and Declaration

The Resource Management Act 1991 requires you to make your own assessment of your proposal against relevant policies. A separate planning assessment sheet is available to use, or you can do your own assessment. The planning assessment can be found on our website, under the application forms. An assessment must be included with your application.

I hereby certify that to the best of my knowledge and belief, the information given in this application is true and correct.

I undertake to pay all actual and reasonable application processing costs incurred by Environment Southland.

Name (please print) KAREN LADBROOK, RDAGRITECH

Signed _____

Date 06/04/2018

END OF FORM

Application for a Water Permit (PART B) - To Take and Use Groundwater

environment SOUTHLAND REGIONAL COUNCIL Te Taiao Tonga

This application is made under Section 88 of the Resource Management Act 1991

A complete Part A form needs to be provided with this Part B form. The purpose of this Part B form is to provide applicants with guidance on information that is required under the Resource Management Act 1991. These forms are to act as a guide only and Environment Southland reserves the right to request additional information. **Please also refer to Appendix A of the Regional Water Plan for Southland, 2010 AND Appendix L of the proposed Southland Water and Land Plan 2018 .**

User Charges: Please note that annual User Charges will apply to all water permits. Schedule 6 of Environment Southland's User Charges and Fees document outlines the Annual Research and Monitoring Charges, which you should consider before applying for a water permit. Please refer to www.es.govt.nz/resource-consent/fees for more information on annual user fees and charges.

To: Environment Southland
Private Bag 90116
Invercargill 9840

1 What is this application for?

☐ a new groundwater take ☑ the renewal of existing consent no: 302514-01

2 What duration of resource consent is sought? 10 years

3 For what purpose(s) will the water be used?

☑ Stock water and/or dairy shed use ☐ Irrigation ☐ Community supply ☐ Commercial/industrial

☐ Other

If other, please describe: _____

4 Please provide details of the bore(s) from which you wish to take water. *If you do not have an existing bore, you will need to apply for a consent to construct a bore before you apply to take groundwater. Please refer to the relevant Part B form.*

Bore 1: NZTM 2000 1198277 E 4961692 N Bore number: D43/0108

Bore 2: NZTM 2000 _____ E _____ N Bore number: _____

	Bore depth (m)	Screen depth (m)	Diameter (mm)	Pump type	Pump capacity (l/s)
Bore 1	58.4	44.7	150		0.5
Bore 2					

5 How much water do you propose to take and at what rate will it be taken?

Maximum rate of take: <2 litres per second

Maximum daily volume: 40 cubic metres per day

Maximum weekly volume: 280 cubic metres per week

Maximum monthly volume: 1,240 cubic metres per month

Maximum annual volume: 21,000 cubic metres per year

6 What is the frequency of the proposed water take?

How many hours per day (maximum)? 24

How many days per week (maximum)? 7

How days per month (maximum)? 31

7 Please state the name of the aquifer that you propose to take water from.

Te Anau

8 Do you intend to store your water before subsequent use?

If yes, what/how much storage will be provided? 100 m^3

What type of storage facilities are proposed? 4x tanks

You may need a building permit and/or additional resource consents for the construction of storage facilities.

9 **What type of water metering system is installed or proposed to be installed?** Environment Southland prefers all takes for 5 l/s or more to be fitted with telemetry to report in line with the Resource Management (Measurement and Reporting of Water Takes) Regulations 2010.

☑ Water meter ☐ Data logger ☐ Telemetry

10 **If you propose to use water for stock and/or dairy shed use – please answer the following:**

(a) What type of animal and numbers of stock will be supplied with water for drinking?

☐	Sheep	Number:		Water required:	litres/head/day
☐	Beef cattle	Number:		Water required:	litres/head/day
☑	Dairy cows	Number:	599	Water required:	20 litres/head/day
☐	Other	Number:		Water required:	litres/head/day

(b) How much water do you require for your dairy shed? 50 litres/head/day

11 **If you propose to use water to irrigate land – please answer the following:**

(a) How many hectares of land will be irrigated? _____

(b) What is the soil type(s) of the land being irrigated _____

(c) What will you be irrigating (i.e. crop, pasture etc)? _____

(d) What type of irrigation system will be used? _____

(e) What is the target application rate (mm/day and mm/year)? _____

(f) How have you calculated the amount of water you need? (attach separate pages if required)

_____

12 If you propose to use water for industrial use – please answer the following:

(a) What type of industry will be using the water and how will the water be used?

_____

(b) How have you calculated the amount of water you need? (attach separate pages if required)

_____

13 If you propose to use water for commercial/domestic supply – please answer the following:

(a) What type of establishment will use the water?

☐	Households – number of households to be supplied: _____
☐	Camping grounds – maximum number of visitors and staff per year: _____
☐	Schools – maximum number of students and staff per year: _____
☐	Motel units – number and expected occupancy: _____
☐	Other: _____

(b) How have you calculated the amount of water you need? (attach separate pages if required)

_____

14 If you propose to use water for any other purpose, please describe the amount of water you will need and how this has been calculated (please attach a separate sheet to this application, if necessary).

15 **Please describe any other sources of water available for the property. Describe how much water is available and what it is used for.**

Refer to Section 1.3 of the AEE.

16 **Please also describe any measures you are proposing to minimise wastage of water and maximise its efficient use:**

Regular checks of tanks & water system for leaks.

17 **Does your proposed water take have any associated discharges? If yes, please describe.**

☑ Yes ☐ No

Please note that a discharge into the environment may require a resource consent application to be made specifically for the discharge (please refer to the relevant Part B form).

Discharge of FDE.

Existing Environment

18 **Are any of the following features found within the existing environment of the proposed activity? Describe these features in the space below, along with details of the assessment undertaken to determine the presence of these features.**

	Yes	No
(a) Signs of instream life (e.g. fish, eels, bullies, crayfish, native birds, frogs)?		✓
(b) Areas where food is gathered from a water body (e.g. watercress, eels, wildfowl)?		✓
(c) Wetlands, wildlife habitats or bird nesting habitats (e.g. swamp areas)?		✓
(d) Other activities occurring in the area (e.g. commercial activity, fishing, swimming, boating)?		✓
(e) Areas of particular aesthetic, cultural, heritage or scientific value (e.g. archaeological sites)?		✓
(f) Waste discharges and/or monitoring sites?		✓
(g) Other water takes?		✓
(h) Surface water bodies? Natural springs?		✓

Please also include a map or aerial photograph showing the following:

- the location(s) of the existing points of take;
- the location of proposed points of take(s);
- the location of water measuring device(s);
- the total property area boundary;
- the area(s) to be irrigated (if relevant);
- the area(s) of community supply (if relevant);
- distances to any discharge activities;
- other surface water bodies and wetlands nearby and the distance from the point of take(s) to them;
- the coastline and the distance to it (if relevant);
- the location of any dairy sheds (if relevant).

Please refer to AEE.

Assessment of Effects

19 Will the take and use of groundwater have any effects on the following:

	Yes	No
(a) Aquifer storage volumes		✓
(b) Existing bore or well yields		✓
(c) River and stream flows, including minimum flows and allocation levels		✓
(d) Wetland and lake water levels		✓
(e) Groundwater quality		✓

*For those answered **No** above, please describe why there will be no effects. For those answered **Yes**, please describe how these effects may occur.*

20 **Pursuant to Schedule 4 of the Resource Management Act, 1991, there are a number of matters that must be addressed by an assessment of environmental effects. Please discuss what effects the proposed activity will have on the following:**

(a) any effect on those in the neighbourhood and, where relevant, the wider community, including any social, economic, or cultural effects

Refer to AEE section 4.3.

(b) any physical effect on the locality, including any landscape and visual effects

as above

(c) any effect on ecosystems, including effects on plants or animals and any physical disturbance of habitats in the vicinity

as above

(d) any effect on natural and physical resources having aesthetic, recreational, scientific, historical, spiritual, or cultural value, or other special value, for present or future generations

as above

(e) any discharge of contaminants into the environment, including any unreasonable emission of noise, and options for the treatment and disposal of contaminants

as above

(f) any risk to the neighbourhood, the wider community, or the environment through natural hazards or the use of hazardous substances or hazardous installations

as above

21 Please include a description of the monitoring or mitigation measures (including safeguards and contingency plans where relevant) to be undertaken to help avoid, reduce, remedy or mitigate the actual or potential effects on environmental features and values.

Regular checks.
Prompt repair of leaks.
Read meter weekly.

22 **Please include a description of any possible alternative locations or methods for undertaking the activity and why these alternatives have not been selected.**

Refer to Section 1.3 of AEE.

23 **Please include evidence of any consultation undertaken for this application. This may include (but not be limited to) consultation with adjoining landowners, other consent holders in the immediate area, iwi (e.g. Te Rūnanga O Ngāi Tahu, Te Ao Marama Inc.), government departments/ministries (e.g. DOC), territorial authorities and recreational associations.**

24 **Appendix A of the Regional Water Plan for Southland, 2010, details the level of further assessment required as part of your application. This may include the following assessments (please attach as a separate report):**

- interference effects/drawdown;
- radius of influence;
- stream depletion effects;
- an assessment of the dynamic aquifer response to abstraction.

25 **Appendix L of the proposed Southland Water and Land Plan, 2016, details the level of further assessment required as part of your application. This may include the following assessments (please attach as a separate report):**

- aquifer test requirements;
- stream depletion effects;
- interference effects;
- calculation of seasonal groundwater allocation;
- establishing allocation volumes for confined aquifers.

Please note that in accordance with Schedule 4 of the RMA, you may also be required to provide an assessment of whether or not the proposed activity is contrary to any of the relevant provisions of the following documents.

(a) Regional Policy Statement for Southland, 1997
(b) Southland Regional Policy Statement, 2017 (and any proposed/subsequent versions)
(c) Regional Water Plan for Southland, 2010
(d) Proposed Southland Water and Land Plan, 2018(and any proposed/subsequent versions)
(e) Nationol Policy Statement for Freshwater Management, 2014
(f) National Environmental Standard for Sources of Human Drinking Water, 2007
(g) Resource Management (Measurement and Reporting of Water Takes) Regulations, 2010

Staff are able to advise whether this is required, as it is dependant on the location, scale and complexity of your proposal. We invite you to come in for a pre-application meeting with Environment Southland consents staff to discuss this.

END OF FORM

RESOURCE CONSENT APPLICATION
ASSESSMENT OF ENVIRONMENTAL EFFECTS
(SCHEDULE 4 RMA)

JOB TITLE	WHITE WATERS DAIRY
JOB NUMBER	50500
	6 April 18

APPLICANT	White Waters Limited
APPLICATION	To renew discharge and water permits for an existing dairy farm. Land Use Consent for Effluent Storage
SITE ADDRESS	893 Kakapo Road, Te Anau
LEGAL DESCRIPTION	Section 2 SO 385807
MAP REFERENCE	NZTM 2000 1198265 E, 496595 N

TABLE OF CONTENTS

Prepared by

Karen Ladbrook
NZCE (Civil), MEngNZ
Environmental Engineer

Reviewed by

Jarred Martin
General Manager

1. SUMMARY

1.1. PROPOSED ACTIVITES

White Waters Limited owns the subject property, which is used for dairy farming. The discharge and water permit expired on 26 June 2017.

The Applicant intends to renew the discharge permit, for a maximum of 599 dairy cows, milked through a 31 aside Herringbone shed. The applicant proposes to slightly amend the effluent application area.

In conjunction with renewing the above consents, the Applicant is seeking land use consent to construct additional effluent storage to meet the Farm Dairy Effluent Design Code of Practice (FDE COP) 90th percentile and comply with IPENZ Practice Note 21 - Dairy Effluent Pond Design and Construction 2013.

Effluent Storage

The additional storage is proposed to be an above-ground "Kliptank" effluent tank. The Kliptank is constructed from a series of HDPE Wall panels reinforced with galvanized wire rope. The tank is lined with a synthetic polypropylene liner.

This type of tank requires a Building Consent from Southland District Council and is subject to producer statements for both design and construction, that are issued by a Chartered Professional Engineer. The proposed tank site is shown on the Tank Site Map in Appendix A. The proposed tank is entirely above-ground. An updated Massey Dairy Effluent Storage Calculator (DESC) report has been included in Appendix B of this AEE. Plans for the proposed tank are included in Appendix C.

The current effluent system includes stone and sediment separation via the yard grating and pump sump. Raw effluent is gravity fed to a pump sump near the dairy shed and then pumped to a Hynds "Megapond" concrete storage tank located approximately in the centre of the farm.

The existing "Megapond" tank was constructed in approximately 2013 under the supervision of a Chartered Professional Engineer, (refer Appendix D). The tank is constructed from pre-stressed concrete panels jointed with a proprietary expanding sealant, (refer Appendix D drawings S01 and S03). The tank base is a minimum 125mm thick reinforced concrete slab poured in-situ, with a double-layer of polyethylene membrane and blinding sand under the slab (refer Appendix D, drawing S02). As the tank is concrete-lined a leak detection system is not required. The portion of the tank that is above ground level can be easily inspected for seal integrity and evidence of leakage at any time.

The intended life of both of these types of effluent storage tank is not less than 50 years (unless otherwise specified in the building consent application).

The Applicant will divert rainfall from the dairy shed and yard area to reduce effluent volumes.

The new effluent storage will be constructed approximately May 2018 however this is subject to supply availability and obtaining the required building consents, and may take until August 2018 if there are delays.

Discharge of Effluent to Land

Effluent is applied to land at depths not exceeding 5mm, using a slurry tanker. The total effluent application area is calculated to be 103.5 ha. The average annual effluent volume from the Massey DESC is 10,376m3. Assuming 80% utilization of the effluent area and even application across the area, results in an average application depth of 12.5mm/year across the utilized area. In practice, this would represent between two and three applications of 5mm over the course of the year to apply all effluent generated, (or a total of 10 to 15mm on any individual area). According to Massey DESC, there are approximately 200 irrigation days per year (on average).

The Applicant owns a "Joskin" slurry tanker (pictured below). This type of slurry wagon does not have nozzles, rather there is a deflector plate at the rear. Effluent exits the tank under pressure through a pipe and strikes the plate which causes it to spray out in a fan shape.

White Waters Slurry Wagon

Typical example of slurry wagon spreading

Application depth is primarily adjusted by altering the speed of the vehicle towing the slurry wagon, although the wetted width can be adjusted via the deflector plate and is affected by the pressure of the delivery pump. It is possible for almost any slurry tanker to achieve 5mm depth by simply travelling faster. Because they are driven or towed by a motorised vehicle, slurry tankers are less vulnerable to the risk of being stopped by uneven ground, or low pump pressure, (as can occur with travelling irrigators).

Best practice for slurry tanker application is to carry out several application rate tests at varying travel speeds and then develop an Application Depth Table that sets out the depth applied at various speeds. The Applicant proposes to undertake application rate testing within three months.

On slopes in excess of 11º (about 1 in 5, or 20%) use of a slurry tanker is impractical. In wet conditions, slurry tanker use is restricted to flatter areas because the risk of the vehicle sliding is greater. On heavier soils there may also be a risk of getting stuck and/or damaging the pasture cover and soil structure. This effectively self-limits slurry tanker use to suitable areas and conditions.

For low application depths, provided that there is no run-off of effluent, and there is a soil moisture deficit equal to or greater than the applied depth, the application rate of the land application system may exceed the expected infiltration rate of the soil. Because an Operator is required to be present to run the slurry tanker, effluent application can be continuously monitored and if ponding or runoff occurs, the application can immediately be adjusted, moved to another area or stopped. The Massey DESC accounts for soil moisture deficit and the White Waters DESC model does not program effluent irrigation on days where the deficit is likely to be less than 5mm.

Taking of Groundwater

The applicant proposes to continue to abstract groundwater from an existing bore at a maximum of 40 m^3/day. The farm is also supplied with water from the Southland District Council's Kakapo Rural Water Supply at a rate of 15 m^3/day. Average water use will vary throughout the year depending on the type and number of animals on the property.

The average volume required in the dairy shed is 42.5L/cow/day however there may be occasions when use is higher and up to 50L/cow/day. The consent application specifies the estimated maximum requirement; however it should be noted that the Massey DESC modelling tool has used average figures, in accordance with model user guidelines.

The peak daily and average annual water consumption requested is consistent with the water use figures quoted in Appendix L of the proposed Southland Water and Land Plan.

Grazing of replacement stock occurs year-round however the main dairy herd are wintered off-farm. There are no feed and/or wintering pads proposed.

Other Activities

There is a 5-bay implement shed at the southern end of the property (near the road frontage) that is used to house calves during the calving season. When used for calves the shed is to have a bark/chip or sawdust floor and there will be no discharge of animal effluent. This use is a permitted activity if solids are spread in accordance with Rule 38 of the proposed Water and Land Plan and Rule

The Applicant has established living quarters adjacent to the dairy shed. At present a portable toilet is used for black water, which is a permitted activity if disposed of at an approved dump station or via a consented wastewater network. The nearest such facilities are in Te Anau. A holding tank is to be installed for greywater, until a septic tank system has been installed to treat all domestic wastewater.

1.2. DESCRIPTION OF THE AFFECTED ENVIRONMENT

The farm is situated 14km northeast of Te Anau township in between the Upukeroa and Whitestone catchments. The farm consists of rolling hill country with terraces, ranging in elevation from 379m to 424m above mean sea level.

Total Farm Area (ha)	225
Effective Area (ha)	207
Bedrock/Hill Country	225 ha (100%)

The property is located within the Bedrock/Hill Country physiographic zone and contains several small streams, most of them feeding the Whitestone catchment with one stream contributing to the Upukerora catchment. The Bedrock/Hill country zone is associated with overland flow in steeper areas, and artificial drainage in flatter areas, both of which can allow the loss of nitrogen, phosphorus, sediment and microbes to waterways.

The property is outside the coverage area of both Topoclimate and Smaps soil mapping systems. Site investigations to assess soil types and soil properties were undertaken. These built upon prior work undertaken during the previous consent application in 2012.

The dominant soil types on the property are assessed as Te Anau and Kakapo, with small areas of Otanomomo Soils. Te Anau soils have a Landscape Classification of "C" – Sloping land (>7°) or "D"– Well-drained flat land. Kakapo soils have a Landscape Classification of "C" – Sloping land (>7°) or "B"– Impeded drainage or low infiltration rate. Both variants of these soils occur on the Gold Creek Dairy property. The Ontanomomo (peat) soils have a landscape classification of "A" – Artificial Drainage or coarse soil structure, however have been excluded from the effluent application area due to their poor nutrient-retaining capabilities.

	SOIL TYPE	CALCULATED INFILTRATION RATE	VULNERABILITY FACTORS		
			Structural Compaction	Nutrient Leaching	Waterlogging
	Te Anau	25 mm/hr	Very Low	Medium	Moderate
	Kakapo	15 mm/hr	Moderate	Severe	Slight
FDE Land Classification (% of effluent area)	Category C (sloping land >7º)				
Groundwater Nitrate Levels	100% pristine pre-european				

There are some areas of gently undulating and undulating Te Anau soil, which would normally receive a landscape classification of "D" – well-drained flat land, however due to the range of topography across the property, and the overall rolling profile, a conservative approach has been adopted and the entire property has been classified as high-risk for effluent application. The effluent application area slopes range from flat, 0% up to 20%. Any steeper areas are excluded.

The Te Anau soils on the property are a silt loam, with a measured saturated conductivity of 6mm/hr. The Kakapo soils are also a silt loam and have a measured saturated conductivity of 2mm/hr. Using Table 4 and Figure 2 of the FDE Code of practice, the estimated soil infiltration rate for the Te Anau soils is approximately 30mm/hr and the Kakapo soils is approximately 15mm/hr. Note that the watering time will be less than 1 minute when using a slurry tanker.

Photographs showing examples of topography across the effluent area are included in Appendix E.

Groundwater Nitrate levels across the entire property are mapped as "Pristine pre-European", which is consistent with the fairly low intensity of land use in the area.

Various waterways cross the farm and the Applicant has fenced most of the permanent waterways to prevent stock access. Further fencing will be carried out over the coming years.

The majority of the property (90%) is situated within the Whitestone catchment, which is a sub-catchment of the Waiau. Water quality management zones across the property are almost evenly split between Lowland Soft-bed and Hill Country.

Approximately 10% of the entire property is situated in the Upukerora catchment. Approximately 11% of the effluent area is within this catchment. This part of the Uupukerora Catchment is primarily classified as Lowland soft bed however flows into Lake Te Anau which is classified as Natural State.

Catchment Area	Total Dairy Farm Area	Effluent Area
Whitestone River Catchment	203 ha (90%)	92 ha (89%)
Upukerora River catchment	23 ha (10%)	11.5 ha (11%)
Water Quality Management Zone	**Total Dairy Farm Area**	**Effluent Area**
Lowland Soft Bed	116.4 (51%)	55.5 ha (54%)
Hill Country	109.6 ha (49%)	48 ha (46%)

The nearest surface water quality sites available are the Whitestone River at Hillside Manapouri Road, approximately 22km downstream of the farm, and the Upukerora River at Te Anau Milford Road, approximately 9.3km downstream of the farm.

The Whitestone River site is of overall good quality and meets the National Objectives Framework Attribute status "A" for nutrient indicators. The site is not showing any discernible trend in water quality factors over the past 5, or past 10 years. This site is, however, in the worst 50% to 25% of upland sites for Nitrogen and Oxidised Nitrogen. This may be reflective of land use in the area which is primarily pastoral grazing. When compared to the Upukerora site, the Whitestone is of lower quality however the two catchments differ in overall land use, the Upukerora has a higher proportion of undeveloped land.

The Upukerora River site is of overall good quality and meets the National Objectives Framework Attribute status "A" for nutrient indicators. The site is not showing any discernible trend in water quality factors over the past 5, or past 10 years. Overall ecological status is good, with MCI scores generally above 110 (most recently 119) and percent EPT richness consistently above 50% (most recently 60%).

The overall high quality of the Upukerora Site reflects the overall low intensity of land use, as farming activities are mainly pastoral grazing and the catchment is dominated by undeveloped native bush. One of the problems with using this site is that a significant proportion of the upper catchment is covered by natural-state native forest in the Fiordland National Park, and hence is relatively immune to land use impacts. This adds a significant dilution factor to any impact that may arise from land use activities in the lower catchment.

Neither site is sufficiently close to the White Waters farm to show any discernible long-term change as a result of the dairy farming activity and associated discharge of effluent.

The property abstracts groundwater from the Te Anau groundwater zone. This unconfined aquifer comprises glacial moraine and associated fluvioglacial outwash materials, mainly very poorly sorted gravel materials in a weathered silt and clay matrix. The glacial moraine and outwash materials form a thick stratified unconfined aquifer system which exhibits low to very low permeability. The Te Anau groundwater zone is primarily recharged by rainfall infiltration with limited groundwater/surface water interaction occurring along the riparian margins of the major rivers.

Annual Recharge (m^3/year)	255,800,000
Allocation Limit - Appendix L.5.1 SWLP (m^3/year)	118,250,000
Amount Currently Allocated (m^3/year)	3,522,316 (2.9% of allocation limit)

The closest water take to the dicharge area is the farm's own well, (refer to location plan). The nearby Kakapo Rural Water Supply is 1.2km from the discharge area and abstracts water from a shallow well in gravels associated with the nearby Upukerora River. This supply is classified as stock-only and is not supplied for drinking water.

1.3. ALTERNATIVES

An alternative method of discharge of effluent would be to water, however industry research has proven that this method causes significant adverse effects and is not a suitable option. The discharge of effluent directly to water is also contrary to the objectives and policies of the Regional Plan Water, 2010 (RWP), Southland Water & Land Plan April 2018 (SWLP), and Te Tangi a Tauira (2008).

The discharge area could be amended to exclude the small area that is within the Upukerora catchment, however if good management practices are followed and ponding/runoff does not occur, there will not be any noticeable or measurable effect from using this area to apply effluent. The Applicant wishes to maintain flexibility within the application area so that the lower-risk areas can be reserved for when conditions are marginal and allow the greatest number of irrigation days possible. Based on the calculations outlined in Section 1.1, there will be very few occasions where the land in the Upukerora catchment would need to be used. If the Applicant chose to cease use of this area there would be no noticeable or measurable difference on nutrient levels or habitat in the Upukerora River or Lake Te Anau.

Alternative supplies of water include surface water and rainwater collection. Surface waters in the area have insufficient quantity to support a take of this size and are of variable quality which may compromise the ability to comply with food safety standards in the dairy shed. Rainwater collection is impractical due to the variable rainfall and the size of collection areas and storage that would be required to ensure continuity of supply.

The property is supplied from the Kakapo Rural Water supply, which takes water from the Whitestone River and was originally developed in the 1970's to supply stock water to the Lands and Survey, (now Landcorp) Farms. The supply is now owned by Southland District Council and continues to supply stock water to the area. The supply's limited capacity means that it is unable to supply sufficient quantity to support a dairy milking operation at this location, therefore the property also has a bore to supplement the reticulated supply.

2. PLANNING FRAMEWORK

Consents are required under the RWP and the SWLP.

- The use of land for dairy farming of cows that existed as at 3 June 2016 is a permitted activity under rule 20 of the SWLP.
- The construction, maintenance and use of a new agricultural effluent storage facility is a controlled activity under Rule 32B(b) of the SWLP.
- The use of land for an existing agricultural effluent storage facility is a permitted activity under Rule 32D of the SWLP.
- The discharge of farm dairy effluent is a restricted discretionary activity under rule 50(c) of the RWP.
- The discharge of agricultural effluent to land is a discretionary activity under rule 35(b) of the SWLP.
- The taking and using of groundwater is a discretionary activity under rule 23(d)(ii) of the RWP.
- The taking and using of no more than 86 m^3 per day of groundwater is a permitted activity under rule 54(a) of the SWLP.

Overall, the proposed activities are consistent with the objectives and policies of the Regional Water Plan for Southland 2010 (RWP) and the proposed Southland Water and Land Plan 2016 (SWLP).

3. NOTIFICATION AND WRITTEN APPROVALS

As this application is for renewal of consents for the same activities that have previously been consented, and any environmental effects are not expected to increase, the Applicant requests that this application be processed as non-notified. No written approvals have been sought. Extensive consultation, including notification, was undertaken when the consents were originally granted in 2012.

4. ASSESSMENT OF EFFECTS ON THE ENVIRONMENT

The Applicant has an Environment Southland Farm Focus Activity Plan. This was prepared in July 2016 and is due to be reviewed July 2017. The Applicant intends to update and revise the Focus Plan to form the Farm's FEP and meet the requirements of Rule 20 and Appendix N of the proposed Southland Water & Land Plan.

Overall, given the mitigations proposed, adverse environmental effects associated with the proposed activity will be no more than minor. Specific mitigations associated with the ongoing discharge of effluent and taking of groundwater and construction of a new tank are addressed in the following sections.

4.1. USE OF LAND FOR EFFLUENT STORAGE

POTENTIAL EFFECTS	MITIGATION MEASURES	OVERALL EFFECTS
Inadequate storage volume or poor system performance because storage assessment was inadequate	RDAgritech have significant local experience and familiarity with Southland conditions, and have calculated the required volume of storage to suit the property and farming system using the Massey DESC tool. The storage assessment complies with PN:21 and the FDE Design Standards and Code of Practice (2015).	Effects negligible
Contamination of surface or ground water caused by structural failure or leakage from the effluent storage	The new storage tank construction will be overseen by a Chartered Professional Engineer and the Building Consent Authority to ensure that it is structurally sound and constructed according to the plans and specifications supplied.	Effects negligible
	Construction monitoring of the new storage will be undertaken by the Chartered Professional Engineer, and will also be separately undertaken by Southland District Council Building Control.	
	The Chartered Professional Engineer will issue Producer Statements for design and construction of the new storage tank.	
	The tank site area complies with the buffer distances set out in Rule 32B(a) of the Southland Water & Land Plan.	
	The existing tank was completed in 2013, and is fully lined with concrete and two layers of polyethylene. No leaks were visible between the wall panels and the wall panels and seals all appeared intact when checked in 2017.	
	The existing tank construction was overseen by a Chartered Professional Engineer and the Building Consent Authority, to ensure that it is structurally sound and constructed according to the plans and specifications supplied, and records have been attached to this application.	
	The existing tank is mostly above-ground.	

Contamination of surface or ground water caused by inadequate capacity or inadequate design	The existing tank has been designed and verified by a Chartered Professional Engineer.	Effects negligible
	The proposed tank design complies with the required standard (relevant parts of IPENZ PN:21 and the Building Code)	
	Storage size has been calculated using the Massey DESC model and meets the minimum 90th percentile for deferred storage required by the FDE Code of Practice.	

Overall, given the mitigations measured proposed, adverse environmental effects associated with the proposed activity will be no more than minor.

4.2. DISCHARGE OF EFFLUENT

POTENTIAL EFFECTS	MITIGATION MEASURES	OVERALL EFFECTS
Contamination of groundwater by deep drainage	The proposed disposal area is significantly larger than the required minimum for 150kg-N/year, so the soils will have sufficient capacity to hold N reserves and allow uptake by plants.	Effects no more than minor
	The average N loading rate as a result of effluent application is estimated as 41kg-N/ha/year.	
	The total effluent application depth across the effluent area is estimated to be 11mm/year.	
	Effluent will be applied at low depths (5mm per application or less).	
	Effluent will not be applied to land that has been grazed within the past 7 days.	
Contamination of surface water by direct drainage or overland flow	Effluent will be applied at a low depth that is less than the saturated conductivity of the soil so that ponding does not occur.	Effects less than minor
	No irrigation on slopes >20%. On slopes in excess of 11º (about 1 in 5, or 20%) use of a slurry tanker is impractical due to the weight and length of the machinery.	
	Soil moisture levels will be monitored using aquaflex tapes which have already been installed on the property.	
	The application depth will be no more than 5mm. If there is no run-off of effluent and there is a soil moisture deficit equal to or greater than the applied depth, the land application system may exceed the expected infiltration rate of the soil without causing adverse effects.	
	In wet conditions, use of the slurry tanker is restricted to drier, flatter areas to prevent the machine from sliding, becoming stuck, or damaging pasture/soils.	

	Tanker Operator can continuously monitor discharge and stop if ponding or runoff is observed.	
	An application rate test will be undertaken, and an application depth table developed, which will be carried in the vehicle to enable ready reference by the operator.	
	Effluent will not be applied within 20 metres of a waterway.	
	Critical source areas have been identified in the FEP, and irrigation of effluent on these areas will be avoided during wet conditions.	
Contamination of surface or ground water by leakage or overflow from effluent storage or the effluent irrigation systems	The existing storage tank design and construction was certified by a Chartered Professional Engineer and issued with a code of compliance certificate by the Building Consent Authority and meets appropriate standards.	Effects negligible provided the system is adequately maintained and operated
	The new storage tank construction will be overseen by a Chartered Professional Engineer and the Building Consent Authority to ensure that it is structurally sound.	
	The two storage tanks will be of sufficient size to enable deferred irrigation. The Massey DESC accounts for soil moisture deficit and the White Waters model does not program effluent irrigation on days where the deficit is likely to be less than 5mm	
	The storage tanks have 5 days emergency storage to allow for equipment breakdowns.	
	The stone trap will be cleaned out regularly and solids spread onto land.	
	The Applicant will prepare an Effluent Management Plan, and this will form part of the Farm Environmental Plan.	
	The effluent management plan will be based on the Dairy NZ "Staff Guide to Operating your Effluent Irrigation System" and will have system-specific information appended to it.	
	The effluent system will be checked for leaks and faults weekly.	
	The inlet to each tank has an air-gap to prevent siphoning of effluent in the event of a pipe failure.	
Over application of Effluent or overflowing pond due to inadequate deferred storage	Storage requirements have been modelled using the maximum number of cows (599). The Farm will operate at a lower herd number (approximately 470) until there is sufficient storage.	Effects less than minor
	The Applicant will monitor tank levels and if necessary take measures to reduce the tank level if storage becomes a problem before the new tank is implemented. For example, a second slurry tanker may be brought in to enable a higher volume of effluent to be applied each day.	
	The Massey DESC is a theoretical modelling tool and is considered to provide an overall risk-based approach to storage sizing so is not necessarily reflective of shorter periods, or any single year.	

	The new effluent storage will be constructed approximately March 2018 however this is subject to supply availability and obtaining the required consents, and may take until August 2018 if there are delays. The new storage will be brought into service as soon as it has been signed off.	
Reduction in stream health indicators used by tangata whenua to assess stream health, and adverse effects on the life-supporting capability of waterways	Effluent is applied to land only, and is not discharged to water.	Effects less than minor
	Mitigation measures to prevent contamination of surface and ground waters will be implemented as described above.	
Contamination of drinking water sources	There are no registered drinking water supplies within 1km of the effluent area. The nearest bore is the farm bore. The Kakapo Rural Water Supply source is 1.2km from the discharge area and is a stock supply only and is not supplied for drinking water.	Effects negligible
	A 20m buffer around the Kakapo Water Supply reservoir has been established. Effluent will not be applied to this area.	
	There will be no application of effluent within 100m of any water bore.	
	Mitigation measures to protect surface water will be undertaken (as described above).	
	Mitigation measures to protect groundwater will be undertaken (as described above).	
Adverse effects on Natural State waters in the receiving environment	A small proportion (approximately 11%) of the application area is within the Upukerora catchment.	Effects negligible
	Based on average effluent volumes and 80% utilization of the consented area, the "Upukerora Zone" of the effluent area will receive a maximum of 2-3 applications of 5mm of effluent per year.	
	Effluent applications will be undertaken according to the Good Management Practices outlined in the FEP.	
	The effluent application area is significantly larger than the minimum required, and deferred storage will be implemented, so that sensitive areas such as this may be avoided when conditions are unsuitable.	
	The two storage tanks will be of sufficient size to enable deferred irrigation and include 5 days emergency storage.	
Unpleasant or offensive odours outside the property	The storage tanks are more than 50 metres from the nearest property boundary.	Effects less than minor
	Effluent will not be applied within 200 metres of any dwelling (other than a dwelling on the property).	
	Effluent will not be applied within 20 metres of any property boundary.	

Damage to soils as a result of the application of effluent	Animals will not be grazed on land where effluent is being applied, or has been applied with the past 28 days.	Effects less than minor
Build-up of nutrients in soils as a result of the application of effluent	The application area is larger than the minimum required to achieve a loading of 150kg-N/year.	Effects less than minor
Adverse effects on human health	Appropriate buffer distances from dwellings and other properties will be observed.	Effects negligible
	Mitigation measures to protect recreational surface waters and drinking water sources will be undertaken (as described above).	

Overall, given the mitigations measured proposed, adverse environmental effects associated with the proposed activity will be no more than minor.

4.3. TAKING OF GROUNDWATER

POTENTIAL EFFECTS	MITIGATION MEASURES	OVERALL EFFECTS
Reduced water quantity or altered flows in surface water bodies	Take is at least 200m from the nearest surface water body.	Effects negligible
	Rate of take will be less than 2L/s.	
	Storage is used to reduce the impact of peak demands.	
Reduced quantity of water in the aquifer affecting current and future aquifer flows	The primary allocation limit for this aquifer has not been exceeded. No supply issues or restrictions have been experienced from this aquifer.	Effects less than minor
	Rate of take will be no greater than 2L/s.	
	Storage is used to reduce the impact of peak demands.	
Reduced availability of water for other uses	The primary allocation limit for this aquifer has not been exceeded. No supply issues or restrictions have been experienced from this aquifer.	Effects less than minor
Use of the water is inefficient and is inconsistent with resource values and tangata whenua principles	Dairy shed water use has been estimated as averaging 42.5 L/cow/day and maximum 50L/cow/day which is within efficient use guidelines.	Effects negligible
	The total volume requested represents efficient use of water and is within the SWLP limit for dairy farm use of 140L/cow/day peak. The volume requested represents 0.02% of the allocation limit for the aquifer.	

Overall, given the mitigations measured proposed, adverse environmental effects associated with the proposed activity will be less than minor.

5. STATUTORY MATTERS

5.1. PART 2 OF THE RESOURCE MANAGEMENT ACT, 1991

This application is consistent with the purpose and the principles of the Act, as set out in Section 5. The activities will have no more than minor adverse effects on the ability of the receiving environment to meet the reasonably foreseeable needs of future generations, or on the life-supporting capacity of the land or any ecosystem associated with it. Proposed good management practices and mitigation measures will ensure that any potential adverse effects of the activities will be avoided, remedied or mitigated.

There are no matters of national importance, as outlined in Section 6 of the Act, that may be affected by the activities. The application is also consistent with Section 7 of the Act, with particular regard given to the maintenance of the quality of the environment. With regard to Section 8 of the Act, the proposed activities are not inconsistent with the principles of the Treaty of Waitangi.

5.2. NATIONAL ENVIRONMENTAL STANDARDS/NATIONAL POLICY STATEMENTS

There are no National Environmental Standards that apply to this application.

The consent application is consistent with Objective A1 of the National Policy Statement for Freshwater Management 2014, (NPSFM) as the effects associated with the discharge of effluent are anticipated to be less than minor.

The proposed mitigation measures show that the discharge of dairy effluent will assist in maintaining or improving water quality, which is consistent with Objective A2 of the NPSFM.

5.3. OPERATIVE REGIONAL POLICY STATEMENT (1997)

The following objectives and policies in the Regional Policy Statement are of relevance to this application:

Objectives 1.2, 1.4, 5.4 and 6.2 and Policies 5.8, 6.4, 8.4 & 12.4

The above seek to recognise the relationship and provide for the values of Maori and associations with water, land and air. Te Tangi a Tauira has been considered when preparing this proposal.

Objective 2.2 and Policy 2.4

The proposal will not adversely affect any indigenous species. Reducing in the risk of nutrient loss to the waterways may lead to an increase in various aquatic species. There is some existing riparian planting in place.

Objectives 5.1 and 5.2 and Policy 5.5 and 6.6

The above seek to maintain existing water quality and enhance where practical. The irrigation of effluent onto land is not expected to enhance water quality, however proposed mitigation measures will ensure that water quality is, as a minimum, maintained.

Policy 5.4

The proposal is to discharge effluent to land, which is consistent with this policy.

Objectives 8.1 – 8.4 and Policy 8.1 and 8.5

The above seek to avoid contamination of soils and nutrient run-off and adverse effects on air quality. Provided that effluent is applied at the appropriate rate and depth, any adverse effects should be no more than minor.

5.4. PROPOSED SOUTHLAND REGIONAL POLICY STATEMENT (2012)

The following objectives and policies in the proposed Regional Policy Statement notified 23 May 2015 are of particular relevance to this application:

Objectives TW.1, TW.2 and Policy TW.3 and TW.4

The above objectives are met through Te Tangi a Tauira. Policy TW.3 requires that iwi management plans, such as Te Tangi a Tauira, be taken into account. The proposal is considered consistent with those policies and objectives contained within sections 3.5.1 and 3.5.11.

Objectives WQUAL.1 and 2 and Policies WQUAL.1, WQUAL.2, WQUAL.4, WQUAL.6, WQUAL.7

The proposed activity is consistent with water quality objectives and policies in maintaining, through management of discharges and land use, the existing surface and groundwater quality in the area. The applicant has outlined mitigations and good management practices for effluent, which will manage effects on water quality. The proposed activity meets the Council's preference for discharges to land.

Objectives RURAL.1 and RURAL.2 and Policies RURAL.1, RURAL.2 and RURAL.5

The application is largely consistent with objectives and policies for sustainable rural land use activities. The discharge will not give rise to more-than-minor effects on soil health.

Objective INF.1 and Policy INF.2

The effluent storage capacity has been assessed as insufficient however additional storage will be established. The existing storage tank has been visually inspected and all joints appear sound and no evidence of leakage was observed. The existing tank is approximately 5 years old and can be considered as "not leaking" and will ensure adverse effects on the environment are avoided, remedied, or mitigated.

Objective BIO.1, BIO.2, BIO.3 and Policies BIO.2, BIO.6, BIO.7 and BIO.8

The discharge of effluent is unlikely to cause adverse effects that would harm indigenous ecosystems and habitats.

Objective AQ.1 and Policies AQ.1, AQ.2, AQ.4 and AQ.5

Odour effects arising from the storage and discharge of effluent will be no more than minor, as all appropriate buffers will be observed.

5.5. REGIONAL PLANS

The Regional Water Plan for Southland, (RWP) and the Southland Water and Land Plan, (SWLP) are relevant to the application.

The objectives and policies that are relevant to this application have been grouped according to topic:

Water Quality

RWP Objective 2 and Policy 3

RWP Objectives 3, 4, 8 and Policies 4, 6, 7, 13 and 25

SWLP Objectives 1-4, 6, 8, 9, 13, 18 and Policies 6, 13-16

SWLP Objectives 1 and 2 promote the integrated management of land and water resources and recognition of water and land as an enabler of primary production, contributing to social and economic wellbeing. Objectives 3 and 4 recognise the relationship between Tangata Whenua and promote the protection of their values and interests. Overall the activities in this application represent sustainable management of land and water resources and the assessment of environmental effects recognises the relationships between land, surface and groundwater. Tangata Whenua values and interests relate mainly to protection of water quality and quantity, which are addressed in the assessment of environmental effects.

RWP Objective 2 and Policy 3 are concerned with maintaining water quality and RWP Objectives 3, 4 and 8, and Policy 4 with maintaining and enhancing water quality. The SWLP Objectives 6, 8 and 9 are also concerned with

managing and maintaining water quality. The activity is consistent with these Objectives through the use of good management practices to prevent contamination of water.

RWP Objective 8 and SWLP Objective 8 both require ground water quality to meet the Drinking Water Standards. It is not anticipated that the activity, if undertaken in accordance with the consent conditions and good management practices, will result in groundwater under the property exceeding the drinking water standards.

RWP Policies 7 and 13, and SWLP Policy 14 encourage discharges to land as a preference to discharges to water, where practicable and where effects are less adverse. The Applicant will continue to discharge effluent to land, and in accordance with Policy 6, has implemented mitigation measures and good management practices to reduce the risk of effluent entering water.

SWLP Policy 6 refers to the Bedrock/Hill Country physiographic zone. Artificial drainage and overland flow are the primary contaminant pathways within this physiographic zone. The activity is considered consistent with this policy as application depths will be managed according to the high soil risk category and effluent application is continuously monitored. There are existing riparian margins and all waterways are fenced, providing further mitigation of overland flow.

The SWLP Policies 13 to 16 are largely concerned with maintaining and improving water quality as well as managing land use, including farming activities and effluent management, such that adverse effects on water are avoided. The proposed application rates and depths are consistent with best practice and any runoff to surface water or leaching to groundwater will be avoided by ensuring that application rates and depths are matched to soil conditions.

Part of the property is within the Upukerora catchment, that contributes to the Natural State waters of Lake Te Anau, however the proportion of the property in this area is small, and the number of effluent applications per year will be low. Any nutrient loss originating from this area would add to the cumulative effect of other nutrient enrichment sources however in comparison to other sources, particularly the Te Anau township sewage discharge further downstream, the effects are negligible. If the Applicant chose to cease use of this area there would be no noticeable or measurable difference on nutrient levels or habitat in the Upukerora River or Lake Te Anau.

Cow numbers, and therefore the intensity of the farming activity, are not increasing therefore Policy 16 is not applicable.

Water Quantity

RWP Objectives 5,7, and 9 and Policies 21 and 22

SWLP Objectives 1-4, 7, 11 and 12 and Policies 20 - 22

RWP Objectives 5, 7, and 9 relate to sufficient water availability and efficient use, and sustainable abstraction. Policies 21 and 22 relate to the reasonable use of water and the installation of water measuring devices.

SWLP objectives 1-4 are discussed above. Objectives 7, 11 and 12 could be summarised as preventing over-allocation and promoting sustainable use of water resources

According to Appendix L of the SWLP and standard industry guidelines, the proposed volume of water is reasonable, and the Applicant already has a water meter in place. The abstraction rate is very low. The volume requested is reasonable for its' intended purpose and represents only 0.02% of the allocation limit for the aquifer.

Soil and Land Health

RWP Objectives 9A, 9B and 9C

RWP Policies 31A, 31C, 31D

SWLP Objective 13, 13A-B, and 18

RWP Objectives 9A, 9B, and 9C, and SWLP Objective 13 and 13A-B seek to manage discharges onto or into land so that adverse effects on soil resources, human health, habitats and ecosystems are maintained. This application will not increase effluent volumes, and the volume is well within the capacity of the effluent area to take up nutrients.

Policy 31A aims to match discharges onto land to risk, and Policy 31C is to manage discharges of contaminants onto land. The establishment of deferred storage capability is consistent with this Policy. The discharge area available has ample capacity to ensure that nitrogen loadings are not in excess of 150kg-N/year. The discharge area is buffered from watercourses, water abstraction points, property boundaries, and dwellings not on the property.

Policy 31D encourages the reuse of nutrients and water contained within the discharge. Matching the rate of application of effluent to the soil's ability to uptake nutrients and the ability to avoid irrigation when soils are at or above field capacity, will maximise the potential for the reuse of nutrients.

Agricultural Effluent Policies

RWP Policies 41, 42 and 43

SWLP Policy 17

RWP Policy 41 seeks to avoid adverse effects on water quality and minimise other adverse environmental effects by ensuring that agricultural effluent ponds, (or other storage) are appropriately located, designed and constructed.

RWP Policy 42 seeks to avoid adverse effects associated with the application farm dairy effluent to land by matching effluent management to risk.

RWP Policy 43 seeks to match consent duration and inspection and audit requirements to the level of risk of adverse environmental effects.

The SWLP Policy 17 is largely concerned with avoiding adverse effects on water arising from effluent management. This includes designing, constructing, locating, maintaining and operating systems appropriately, as well as avoiding overland flow and discharge of untreated effluent. The proposed application rates and depths are consistent with best practice and the size of the effluent area means that there is significant flexibility in effluent management, enabling irrigation to be managed such that the risk of overapplication or overland flow is minimized.

Overall the application is consistent with the above policies. The Applicant proposes to increase their deferred storage and expects that relevant consent condition/s will be included in the discharge permit. The risks of the activities applied for have been outlined in the assessment of environmental effects.

5.6. REGIONAL EFFLUENT LAND APPLICATION PLAN

The following objectives and policies in the Regional Effluent Land Application Plan are relevant to this application:

Objective 4.1.1 and Policies 4.2.1 and 4.2.2

The discharge is to land, and is being undertaken in a sustainable, manner and will be managed to safeguard the life supporting capacity of soil.

Objective 4.1.2 and Policy 4.2.3

The will be managed in a way to avoid or mitigate effects on water quality and to safeguard the life supporting capacity of water.

Objective 4.1.14 and Policy 4.2.9

The discharge will not affect amenity values as the minimum required buffers will be met or exceeded.

Policies 4.2.4 and 4.2.7

The Applicant has taken a precautionary approach and the potential effects of the activity, and the effectiveness of chosen mitigations are well understood. The Applicant has implemented good management practices and is developing a farm Environmental Plan.

5.7. OTHER STATUTORY DOCUMENTS

Te Tangi a Tauira

RWP Policy 1A requires that Te Tangi a Tauira is taken into account. SWLP Policies 1, 2 and 3 seek to strengthen the relationship of Ngai Tahu with the management of land and water resources through consultation, as well as consideration of relevant Iwi Management Plans and indicators of health.

This application is for renewal of existing consents. No additional adverse effects are anticipated and no specific consultation regarding this application has been undertaken with Ngai Tahu.

Te Tangi a Tauira is the Iwi Environmental Management Plan applicable to the Southland Region. The application for renewal of the consent has had regard to the policies and objectives within the Ngai Tahu ki Murihiku Natural Resource and Iwi Management Plan. The proposal is considered consistent with those policies and objectives contained within section 3.5.1, as they relate to the effluent discharge and section 3.5.14 as they relate to the taking of water.

Provided that the activity is carried out as described in this application and in accordance with the consent conditions, there will be no additional effects on any of the stream health indicators described in section 3.5.11 of Te Tangi a Tauira, (refer to page 150).

5.8. CONCLUSION AND CONSENT TERM

Overall, the activity is consistent with the principles of the RMA and of the relevant National and Local Planning documents that support it.

A period of 10 years is sought for the resource consent to discharge FDE and the associated taking of groundwater.

The term requested recognises the changeable nature of the environment and the level of certainty around the potential effects of the activity.

Policy 43 of the Regional Water Plan and Policies 40 and 41 of the SWLP set out the matters to be considered when determining the term of a discharge permit. These policies require the Council to match consent duration and inspection and audit requirements on resource consents to the level of risk of adverse environmental effects.

The explanation for this policy states that the duration of resource consents to apply farm dairy effluent to land will correspond to the level of environmental risk.

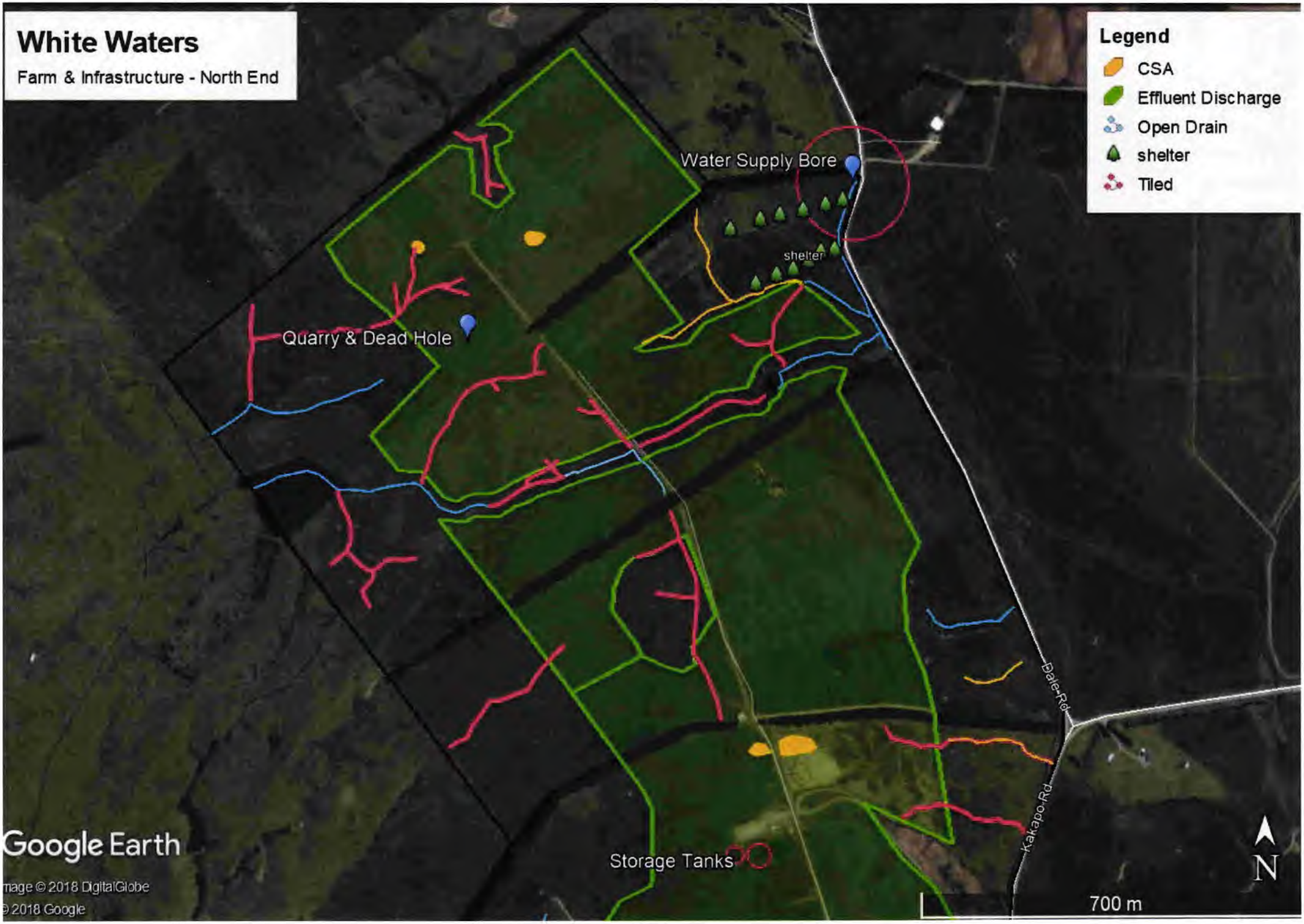
A 10 year consent term has been requested for the following reasons:

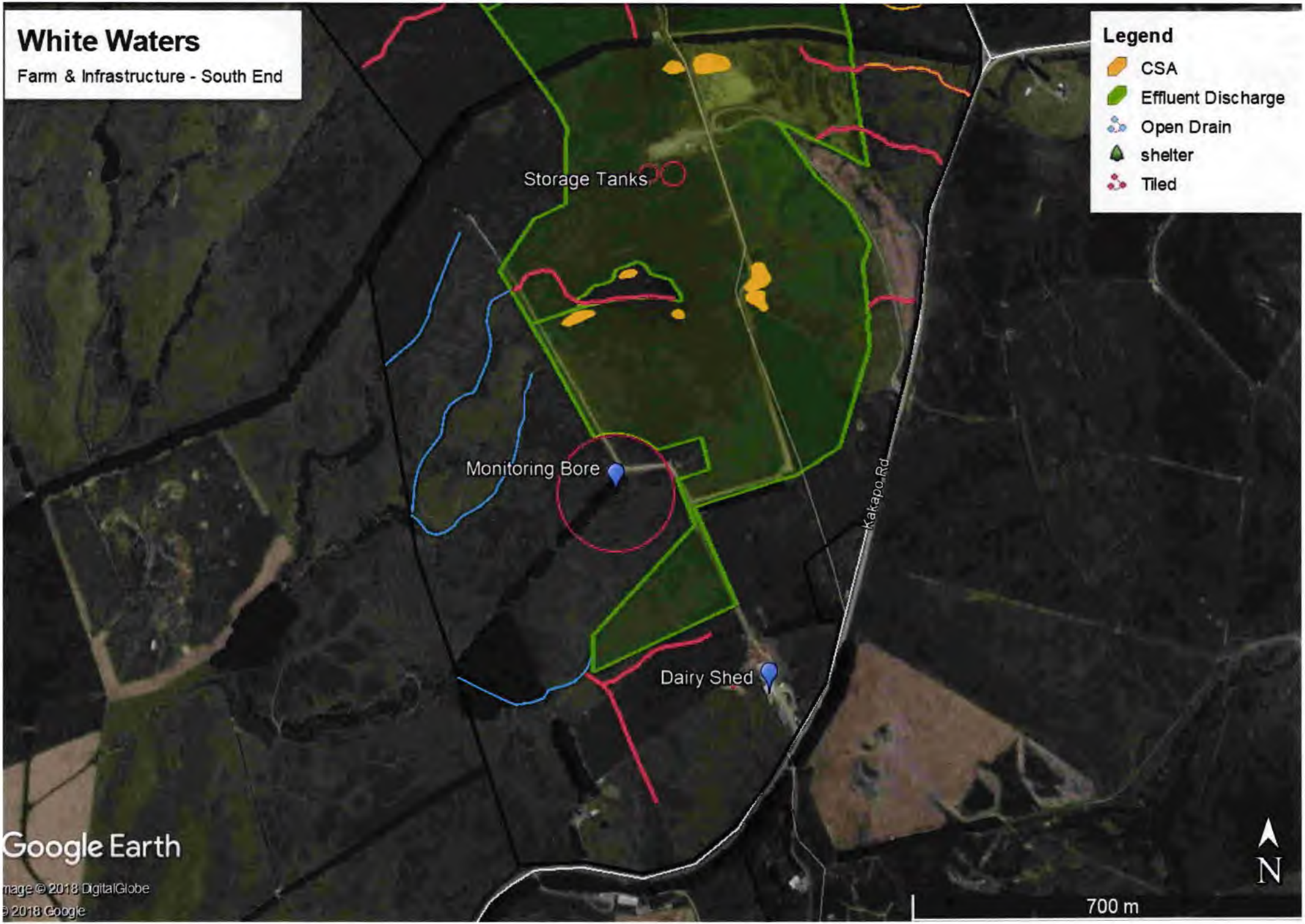
Whilst the activity should not have a more than minor effect on water quality, there is limited data available on the current state of the environment. The activity is within the recommended limit for the application of N to land, of 150kg-N/ha/year however there is still some level of uncertainty around the nature and extent of potential effects on water quality in the long term.

- The mitigation measures for the discharge activity will meet the current expected best-practice requirements.
- The Applicant will implement the good management practices outlined in the Farm Environmental Plan (FEP). These practices are already in place or will be implemented before 1 May 2019. The mitigation measures will be reviewed annually as requested by Council.
- A 10-year term will provide a fair balance between the need for security of investment in farm infrastructure and the changing state of the receiving environment.
- The 10-year term takes into account today's technology, current understanding of the effects of the discharge activity and the current regulatory environment.

APPENDIX A. PLANS AND MAPS

1. Farm & Infrastructure Map
2. Tank Site Map
3. Farm Map
4. Soil Type Map (showing discharge area)


White Waters
Farm & Infrastructure - North End
Legend
CSA
Effluent Discharge
Open Drain
shelter
Tiled
Water Supply Bore
shelter
Quarry & Dead Hole
Storage Tanks
Dale Rd
Kakapo Rd
N
700 m
Google Earth
Image © 2018 DigitalGlobe
© 2018 Google

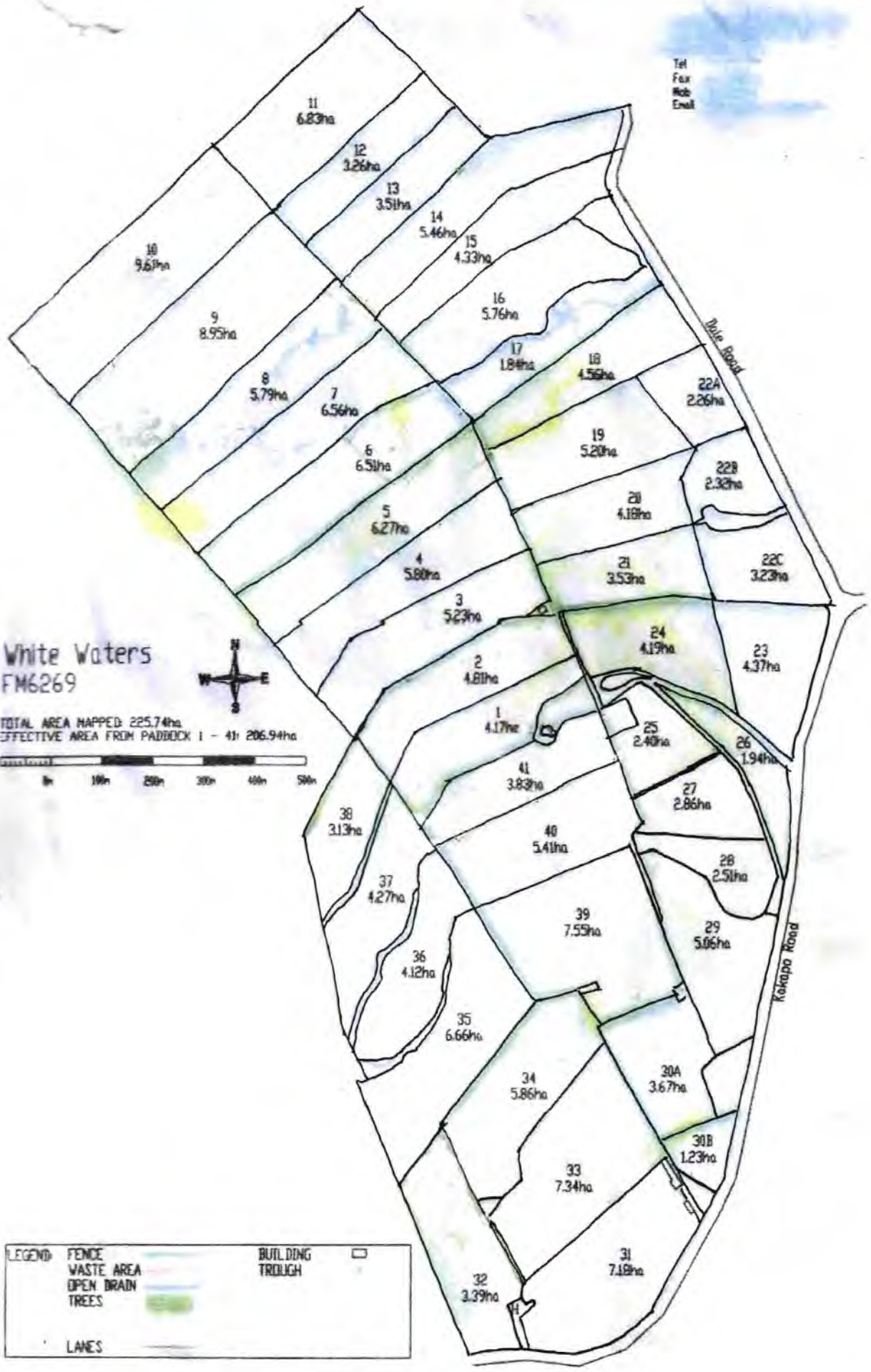

White Waters
Farm & Infrastructure - South End
Legend
CSA
Effluent Discharge
Open Drain
shelter
Tiled
Storage Tanks
Monitoring Bore
Dairy Shed
Kakapo Rd
Google Earth
mage © 2018 DigitalGlobe
© 2018 Google
N
700 m

Client: White Waters Limited

Site: 893 Kakapo Road

Te Anau

KLIPTANK


Tel
Fax
Mob
Email
11
6.83ha
12
3.26ha
13
3.51ha
14
5.46ha
15
4.33ha
16
5.76ha
17
1.84ha
18
4.56ha
10
9.63ha
9
8.95ha
8
5.79ha
7
6.56ha
6
6.51ha
5
6.27ha
4
5.80ha
3
5.23ha
2
4.81ha
1
4.17ha
22A
2.26ha
19
5.20ha
22B
2.32ha
20
4.18ha
21
3.53ha
22C
3.23ha
24
4.19ha
23
4.37ha
25
2.40ha
26
1.94ha
41
3.83ha
27
2.86ha
38
3.13ha
40
5.41ha
28
2.51ha
37
4.27ha
39
7.55ha
29
5.06ha
36
4.12ha
35
6.66ha
34
5.86ha
30A
3.67ha
30B
1.23ha
33
7.34ha
31
7.19ha
32
3.39ha
Duke Road
Kakapo Road
White Waters
FM6269
N
W
E
S
TOTAL AREA MAPPED 225.74ha
EFFECTIVE AREA FROM PADDOCK 1 - 41 206.94ha
0m
100m
200m
300m
400m
500m
LEGEND
FENCE
WASTE AREA
OPEN DRAIN
TREES
LANES
BUILDING
TROUGH


White Waters
Soil Types Map
Legend
Effluent Discharge
Kakapo
Otanomomo
Te Anau
Dale Rd
Kakapo Rd
N
900 m
Google Earth
Image © 2017 DigitalGlobe
© 2017 Google

APPENDIX B. MASSEY DESC POND SIZE CALCULATION REPORT

Dairy Effluent Storage Calculator
Summary Report

Regional authority: Environment Southland Regional Council
Authorised agent: RDAgritech - KL
Client: White Waters Limited
Program version: 1.48
Report date: Friday, 6 April 2018
General description:

Effluent Storage Tank Size Review for the Consent Limit of 599 cows.
Milking season 20/08 - 31/05, twice-a-day milking, change to16H as of 01/04 and OAD from 10/5.
Water use is as advised by the Client, approximately 42.5L/c/day.
Irrigation by slurry tanker at nominal 5mm depth per application of 12m3. Client advises average 10 loads per day Winter, 20 loads per day summer.
Existing Storage Tank Dimensions are as per Building Consent documentation.
Proposed new Tank dimensions are as per the Kliptank 2,026kL tank, however the Tasman Tanks 2000kL model is equivalent in dimensions, surface area and storage.

Climate

Rainfall site: Te Anau Downs
Mean annual rainfall: 1363 mm/year

Effluent Block

Area of low risk soil: 0.0 hectares
Minimum area of high risk soil: 52.0 hectares
Surplus area of high risk soil: 48.0 hectares

Wash Water

Yard wash:

- Milking season starts: 20 August
- Milking season ends: 31 May

Month	Number of Cows	Hours in Yard	Wash Volume (cubic metres)
January	599	5.0	25.5
February	599	5.0	25.5
March	599	5.0	25.5
April	399	5.0	20.0
May	333	5.0	20.0
June	0	0.0	0.0
July	0	0.0	0.0
August	310	5.0	20.0
September	599	5.0	25.5
October	599	5.0	25.5
November	599	5.0	25.5
December	599	5.0	25.5

Irrigation

Winter-spring depth: 5 mm
Spring-autumn depth: 5 mm
Winter-spring volume: 120 cubic metres
Spring-autumn volume: 240 cubic metres
Irrigate all year? No

Don't irrigate start:	01 June
Don't irrigate end:	31 July

Catchments

Yard Area:	1112 square metres
Diverted?	Yes
- diversion start:	01 June
- diversion end:	19 August
Shed Roof Area:	262 square metres
Diverted?	Yes
Feedpad Area:	0 square metres
Covered?	No
Diverted?	No
Animal Shelter Area:	0 square metres
Covered?	Yes
Diverted?	No
Other Areas:	0 square metres

Storage

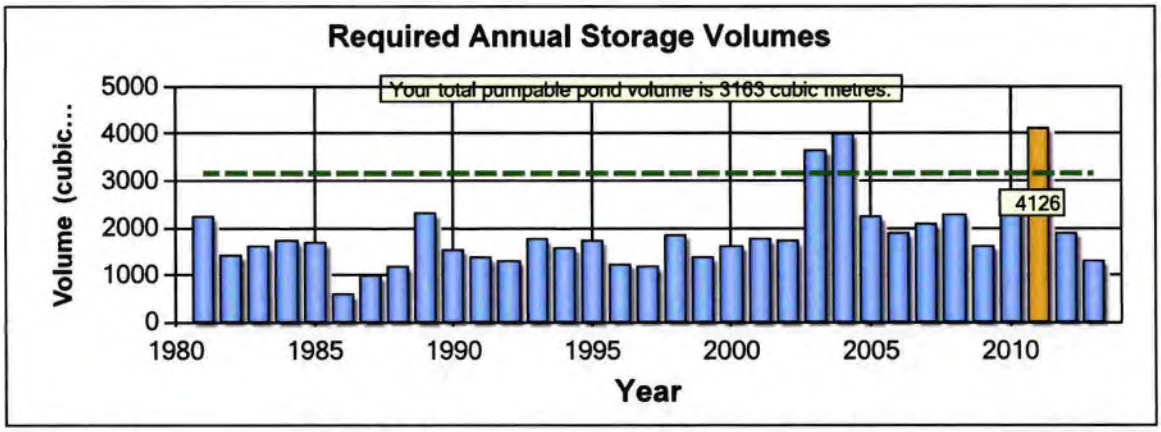
Pond/s present?	No
Tank/s present?	Yes
No. of tanks:	2 tank/s
Tank 1	
- total volume:	1359 cubic metres
- pumpable volume:	1100 cubic metres
- surface area:	647 square metres
- diameter:	28.7 metres
- total height:	2.1 metres
- pumped?	Yes
Tank 2	
- total volume:	2292 cubic metres
- pumpable volume:	2063 cubic metres
- surface area:	1146 square metres
- diameter:	38.2 metres
- total height:	2.0 metres
- pumped?	Yes
Emergency storage period:	5 days

Solids Separation

Solids separator/s present?	No

Outputs

Maximum required storage pond volume:	4126 cubic metres
90 % probability storage pond volume:	2885 cubic metres
During the period from:	01 July 1980
To:	30 June 2013


Required Annual Storage Volumes
Your total pumpable pond volume is 3163 cubic metres.
Volume (cubic...
5000
4000
3000
2000
1000
0
4126
1980
1985
1990
1995
2000
2005
2010
Year

APPENDIX C. PROPOSED NEW EFFLUENT TANK PLANS AND SPECIFICATIONS

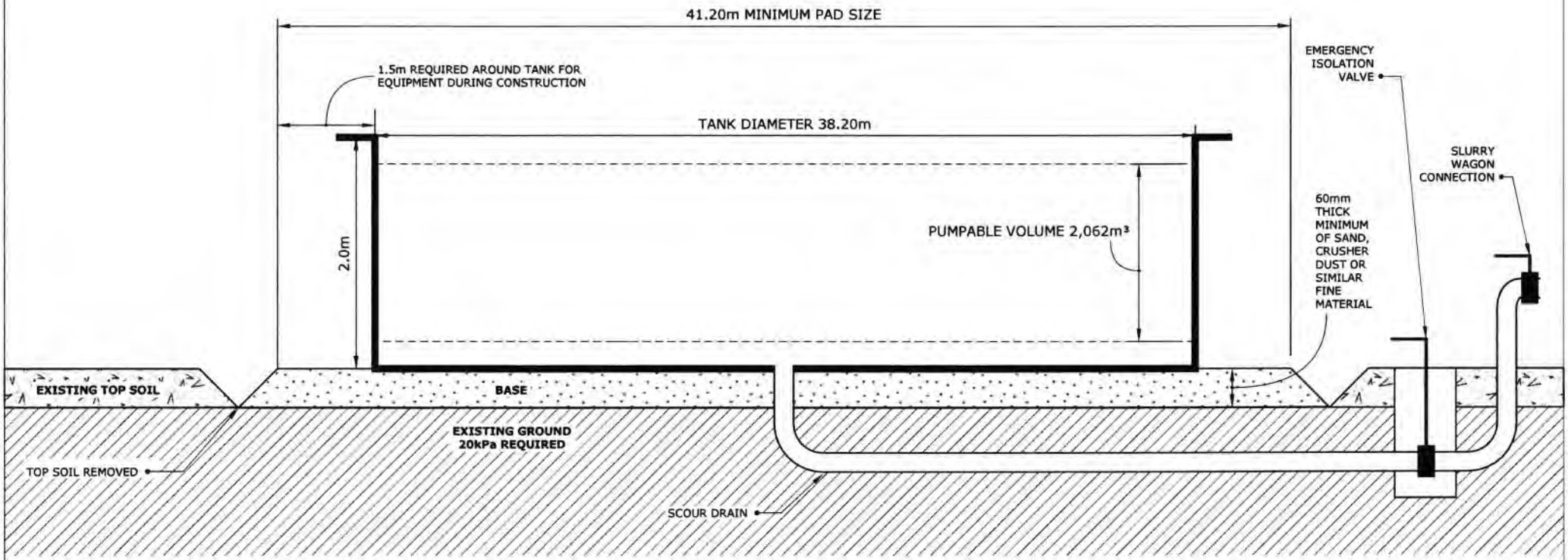
NOTES:

STRUCTURAL ELEMENTS OF TANK NOT SHOWN

INLETS, OUTLETS, OVERFLOWS AND VENTS NOT SHOWN

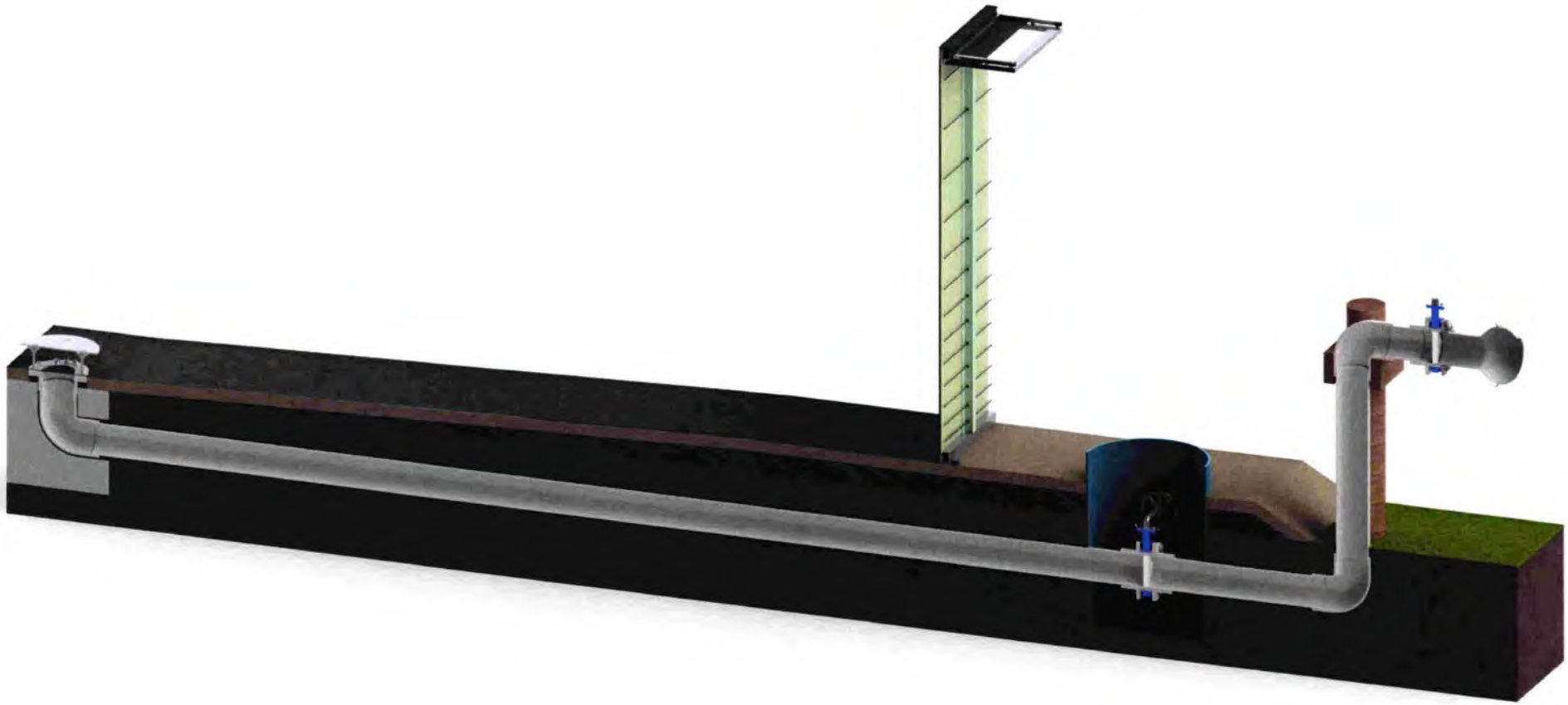
AFTER CONSTRUCTION GAP20-40 OR SIMILAR METAL MUST BE SPREAD AROUND THE PERIMETER OF THE TANK TO PREVENT EROSION

TANK CODE:	E1002N
SEGMENTS:	100
DIAMETER:	38.20m
HEIGHT:	2.0m
AREA:	1,146m²
TOTAL VOLUME:	2,291m³
PUMPABLE VOLUME:	2,062m³



Site:	White Waters Limited, 893 Kakapo Road, Te Anau
Date:	26-03-2018
Scale:	NOT TO SCALE
Author:	Chris Dingle, Kliptank Ltd.

KLIPTANK
THE BEST TANK STORAGE SOLUTION



KLIPTANK
THE BEST TANK STORAGE SOLUTION

	NAME	SIGNATURE	DATE
DRAWN	P.B		24/01/18
CHK'D			
APPV'D			

New Zealand Patent Number: 715505

TITLE:

Centre Drain to Slurry Tanker suction discharge

KLIPTANK™ SPECIFICATIONS

The Kliptank patented above ground tanks are the perfect engineered storage solution in both covered and uncovered tanks.

Standard sizes

Up to 1,100m³ tanks with trussed roofs
Up to 4,000m³ uncovered tanks or with floating cover

Materials

- HDPE Vertical Panel sheet walls
- PVC Vertical Extrusion joiners
- HDPE bottom panels for tank base ring and prevent rodent damage to liner
- Galvanised Wire Rope fastened with stainless steel swages and brass turnbuckles
- 1.0mm Flexible Polypropylene liner as standard (Food Grade). Others available on request
- Aluminium top & bottom ring to ensure seismic ratings are met
- Aluminium Roof Trusses
- PVC Aqualon Ripstop UV inhibited roof cover designed to be vermin & insect proof

Roof Cover - PVC Aqualon Ripstock GRK 1000 UV inhibited, vermin and insect proof.

Swages and Turnbuckles used to connect wire rope

Legal

Engineers Producer Statements (PS1, PS3 and PS4) supplied for each tank.

Building Consent process undertaken by Kliptank on your behalf from Application to Code Compliance stage

Warranty

We offer a 15 Year Warranty on our Kliptank tank range and 20 years on the liner.

Site Prep

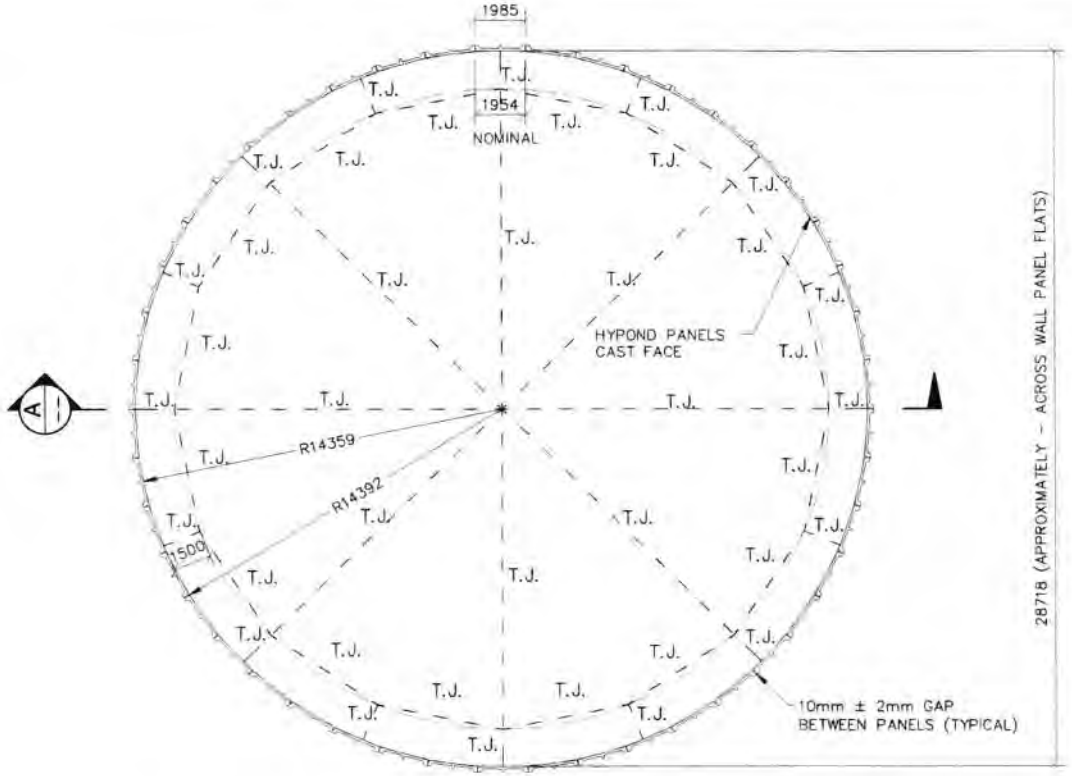
Minimal site prep is required as the Kliptank will happily sit on a prepared level surface with a sand base. Site preparation is the responsibility of the land owner and they can either do this themselves, or get a contractor to undertake this for them.

Specialist projects

Working with our engineers, we can adapt the Kliptank design to just about any size or height. Let us know your requirements.

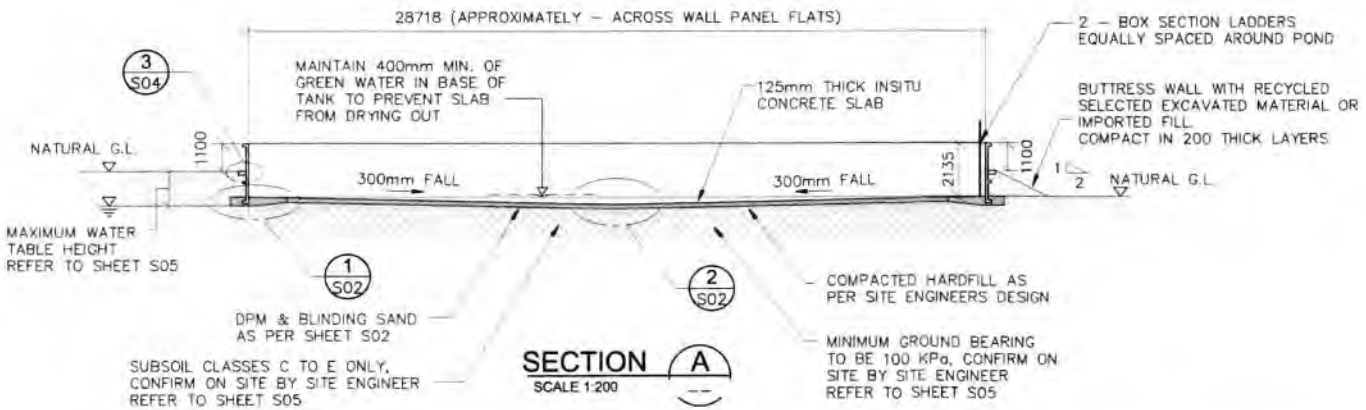
APPENDIX D. FARM ENVIRONMENTAL PLAN

APPENDIX E. EXISTING EFFLUENT STORAGE CERTIFICATION



PLAN AT FLOOR SLAB

SCALE 1 : 200



NOTES:

SITE ENGINEER
OPUS
OPUS HOUSE
65 ARENA AVE
INVERCARGILL
Ph 03 2113592
CONTACT Ben Melvin

COLES CONSULTING LIMITED
STRUCTURAL ENGINEERS
1st Floor - 62 Deveron St - Invercargill
Ph 03 214 0172 - Mbl 027 380 4362

REVISIONS

REV #	REVISION DESCRIPTION	DATE:	DRAWN
1	ISSUED FOR CONSTRUCTION	13/11/2012	JR

PO Box 58142, Botany, Auckland, 2163
Tel: 09-274 0316
Fax: 09-274 8393
email: technicalservices@hynds.co.nz

ISO 9001 CERTIFIED MANAGEMENT SYSTEM

PROJECT DESCRIPTION:
WHITE WATERS LTD (H VERNOOIJ)
MEGAPOND 1500
893 KAKAPO ROAD - TE ANAU
SOUTHLAND DISTRICT COUNCIL

SERVICE DETAIL:
MEGAPOND
1,500,000 LITRE EFFLEUNT TANK
FLOOR SLAB PLAN AND SECTION

REFERENCE/QUOTE NUMBER:

DRAWN:	DESIGN:	CHECKED:
Coles Consulting	Coles Consulting	
SCALE: As Shown PAPER SIZE: A3	Note: Do not scale drawing if in doubt ASK!!!	DATE: 13/11/2012

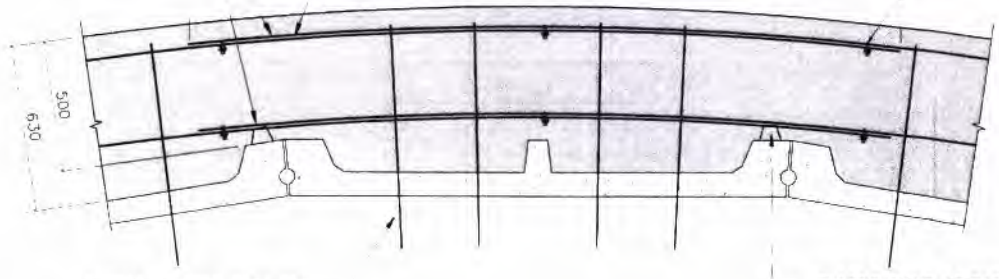
DRAWING NUMBER:	REVISION NUMBER:
0112060 - S01	1

2-12.7ø STRANDS, HOLD STRANDS IN PLACE BY TYING TO STARTER BARS AND SUPPORTING OFF PLASTIC CHAIRS AND SPACERS

REMOVE SAG IN STRAND BY HAND TIGHTENEING MAINTAIN CLEARANCE TO PRECAST WALL UNITS AND FORMWORK

WIRE ROPE GRIPS (BULLDOG GRIPS) TO SUIT 13mm CABLE TIGHTEN TO HOLD STRAND IN PLACE (DO NOT OVER TIGHTEN)

2800 LAP LENGTH MINIMUM

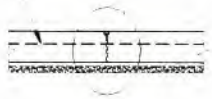


4-HD16 STARTER BARS PER PANEL 1250 LONG, 150 LEG THROUGH SLEEVES IN PANEL

PLASTIC CHAIR AT EACH PANEL JOINT TO SUPPORT STRAND

PLAN - BASE RING BEAM REINFORCING

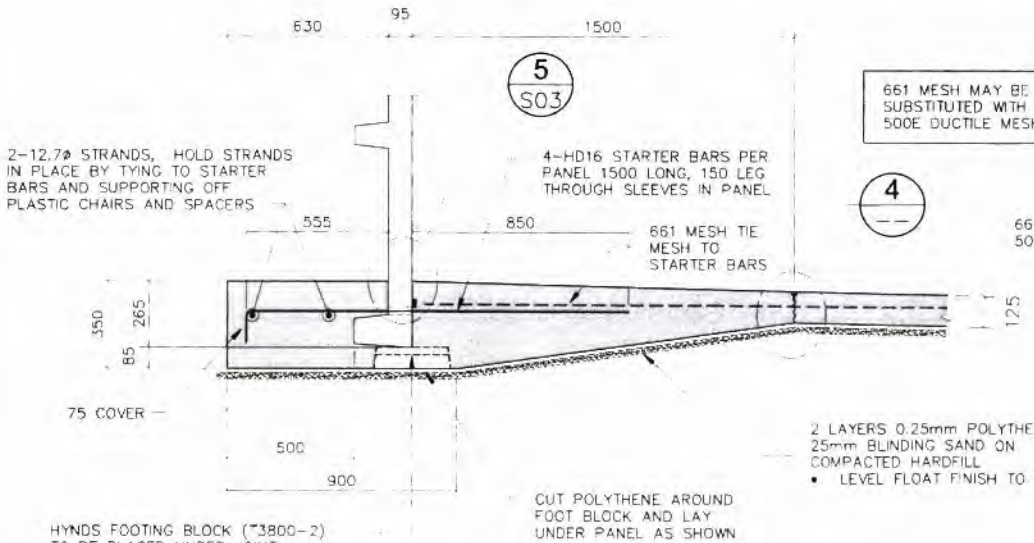
SCALE 1:20



661 MESH
50 TOP COVER

6
S03

DETAIL 4
SCALE 1:20
SLAB TIED JOINT



DETAIL 1
SCALE 1:20
BASE RING BEAM
S01

DETAIL 2
SCALE 1:20
SLAB CENTER
S01

NOTES:

COLES CONSULTING LIMITED
STRUCTURAL ENGINEERS
1st Floor - 62 Deveron St - Invercargill
Ph 03 214 0172 - Mbl 027 380 4362

REVISIONS

REV #	REVISION DESCRIPTION	DATE	DRAWN
1	ISSUED FOR CONSTRUCTION	13/11/2012	JR

PO Box 58142, Botany, Auckland, 2163
Tel: 09-274 0316
Fax: 09-274 8393
email: technicalservices@hynds.co.nz

HYNDS

ISO 9001 CERTIFIED MANAGEMENT SYSTEM

PROJECT DESCRIPTION:
WHITE WATERS LTD (H VERNOOIJ)
MEGAPOND 1500
893 KAKAPO ROAD - TE ANAU
SOUTHLAND DISTRICT COUNCIL

SERVICE DETAIL:
MEGAPOND
1,500,000 LITRE EFFLEUNT TANK
BASE RING BEAM AND SLAB DETAILS

REFERENCE/QUOTE NUMBER:

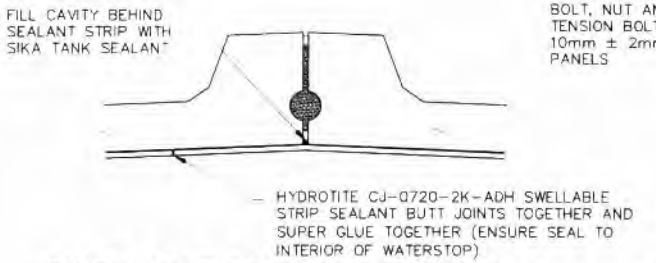
DRAWN:	DESIGN:	CHECKED:
Coles Consulting	Coles Consulting	

SCALE: As Shown
PAPER SIZE: A3
Note: Do not scale drawing if in doubt ASK!!!
DATE: 13/11/2012

DRAWING NUMBER: 0112060 - S02
REVISION NUMBER: 1

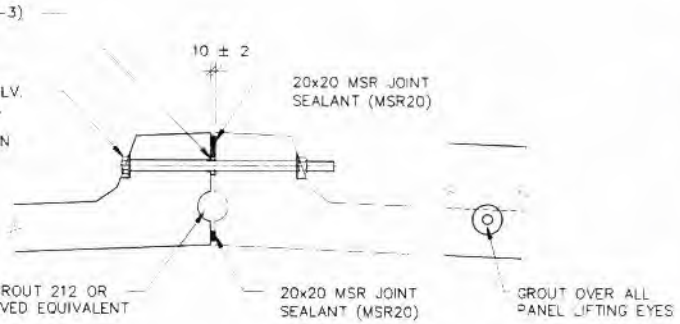
BENDING SCHEDULE – SITE POURED CONCRETE ONLY

BAR MARK	TYPE & SIZE	No of BARS	CHECK'D BY	SHAPE	CHECK'D BY	COVER	CHECK'D BY	CHECK'D BY
FLOOR SLAB & GROUND BEAM								
MESH	661 Mesh	651m2		NB: m² RATE SHOWN DOES NOT INCLUDE LAPS OR WASTAGE		50 Top		
STARTERS	HD16	184		150 / 1500		50		
STRANDS	ø 12.7mm	2		98.0m		50		
MID HEIGHT RING BEAM								
STRANDS	ø 12.7mm	3		97.0m		75		



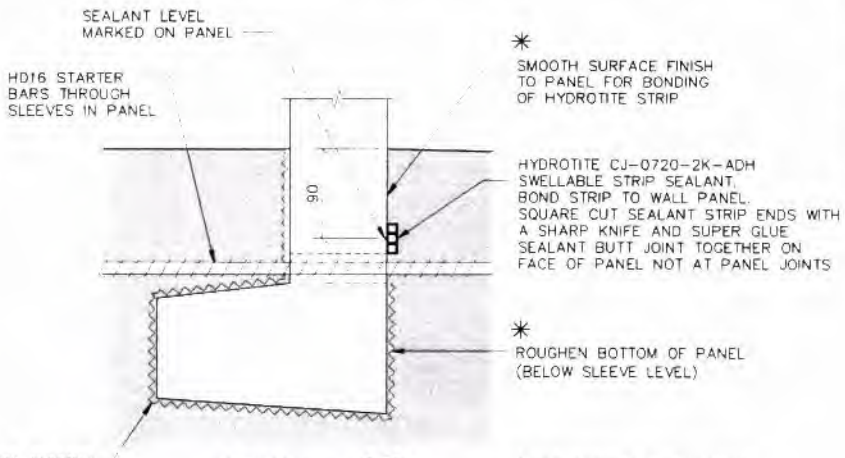
SWELLABLE SEALANT JOINT DETAIL

SCALE 1:10



WALL PANEL FASTENING AND SEALING DETAIL

SCALE 1:10



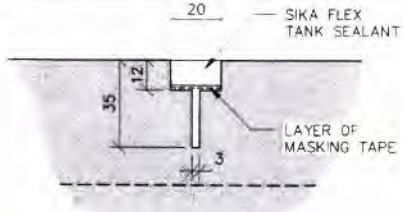
DETAIL 5 (SCALE 1:5, S02)

WALL - SLAB SEALANT JOINT DETAIL

✳ DENOTES WORK ACTIONED BY HYNDS DURING PRECAST MANUFACTURE

SLAB SEALANT SEQUENCE

- FIRST SAW CUT 3mm WIDE x 35mm DEEP (WITHIN 24 HOURS OF POURING SLAB)
- SECOND SAW CUT 20mm WIDE x 12mm DEEP
- COAT SIDES OF SECOND SAW CUT WITH PRIMER No 34
- PLACE LAYER OF MASKING TAPE ON BASE OF SECOND SAW CUT
- PRIME SIDES OF SAW CUT AS PER SIKA REQUIREMENTS (PRIMER No.3n)
- FILL WITH 10mm SIKA FLEX TANK



DETAIL 6 (SCALE 1:2, S02)

FLOOR SLAB SEALANT JOINT DETAIL

NOTES:

COLES CONSULTING LIMITED
STRUCTURAL ENGINEERS
1st Floor - 62 Deveron St - Invercargill
Ph 03 214 0172 - Mbl 027 380 4362

REVISIONS

REV #	REVISION DESCRIPTION:	DATE	DRAWN
1	ISSUED FOR CONSTRUCTION	13/11/2012	JR

PO Box 58142, Botany, Auckland, 2163
Tel: 09-274 0316
Fax: 09-274 8393
email: technicalservices@hynds.co.nz

ISO 9001 CERTIFIED MANAGEMENT SYSTEM

PROJECT DESCRIPTION:

WHITE WATERS LTD (H VERNOOIJ)
MEGAPOND 1500
893 KAKAPO ROAD - TE ANAU
SOUTHLAND DISTRICT COUNCIL

SERVICE DETAIL:

MEGAPOND
1,500,000 LITRE EFFLEUNT TANK
SAW CUT, SEALANT DETAILS AND REINFORCING SCHEDULE

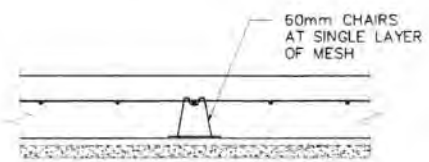
REFERENCE/QUOTE NUMBER:

DRAWN:	DESIGN:	CHECKED:
Coles Consulting	Coles Consulting	

SCALE: As Shown
PAPER SIZE: A3
Note: Do not scale drawing if in doubt ASK!!!
DATE: 13/11/2012

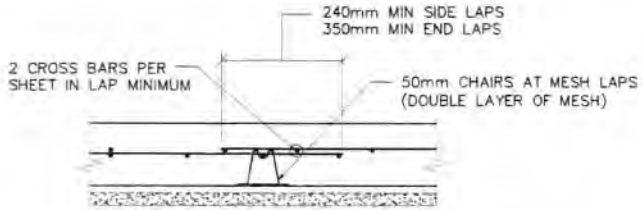
DRAWING NUMBER: 0112060 - S03

REVISION NUMBER: 1



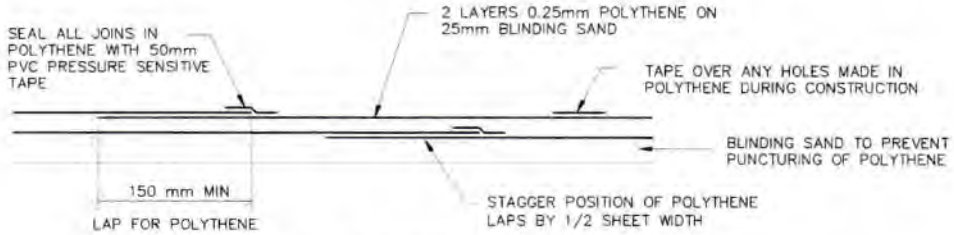
SINGLE LAYER MESH SUPPORT DETAIL

SCALE 1:10



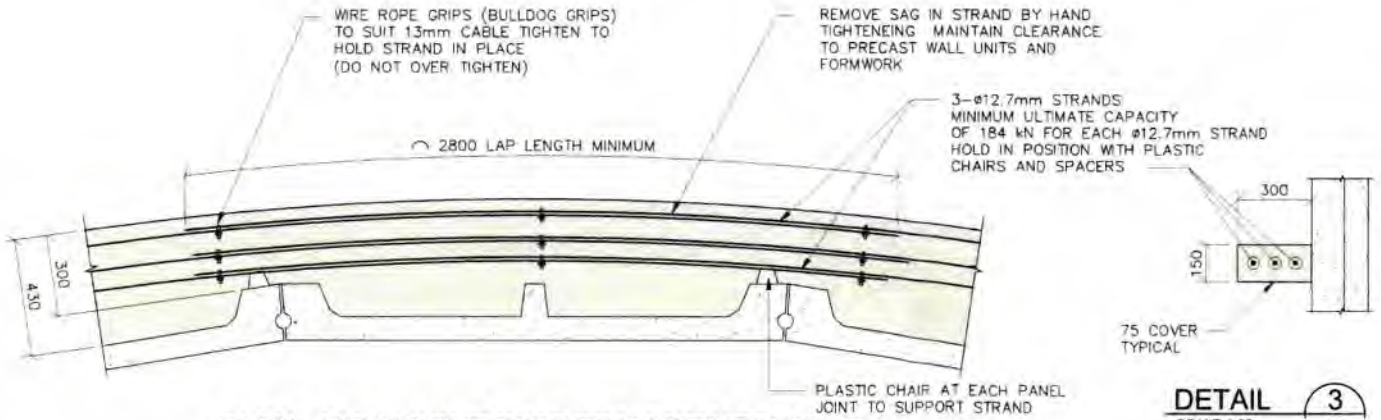
MESH LAP SUPPORT DETAIL

SCALE 1:10



POLYTHENE JOINING DETAIL

SCALE 1:5



PLAN - MID HEIGHT RING BEAM REINFORCING

SCALE 1:20

DETAIL 3

SCALE 1:20 S01

MID HEIGHT RING BEAM

NOTES:

COLES CONSULTING LIMITED
STRUCTURAL ENGINEERS
1st Floor - 62 Deveron St - Invercargill
Ph 03 214 0172 - Mbl 027 380 4362

REVISIONS

REV #:	REVISION DESCRIPTION:	DATE:	DRAWN:
1.	ISSUED FOR CONSTRUCTION	13/11/2012	JR

PO Box 58142, Botany, Auckland, 2163
Tel: 09-274 0316
Fax: 09-274 8393
email: technicalservices@hynds.co.nz

HYNDS

ISO 9001 CERTIFIED MANAGEMENT SYSTEM

PROJECT DESCRIPTION:

WHITE WATERS LTD (H VERNOOIJ)
MEGAPOND 1500
893 KAKAPO ROAD - TE ANAU
SOUTHLAND DISTRICT COUNCIL

SERVICE DETAIL:

MEGAPOND
1,500,000 LITRE EFFLEUNT TANK
MID HEIGHT RING BEAM
AND MESH SUPPORT DETAILS

REFERENCE/QUOTE NUMBER:

DRAWN:	DESIGN:	CHECKED:
Coles Consulting	Coles Consulting	

SCALE: As Shown	Note: Do not scale drawing if in doubt ASK!!!	DATE:
PAPER SIZE: A3		13/11/2012

DRAWING NUMBER:	REVISION NUMBER:
0112060 - S04	1

GENERAL NOTES

1. THE CONTRACTOR SHALL CONFIRM ALL DIMENSIONS AND LEVELS ON SITE PRIOR TO CONSTRUCTION.
2. ALL PROPRIETARY FITTINGS SHALL BE INSTALLED STRICTLY TO THE MANUFACTURERS SPECIFICATIONS.
3. ALL EXCAVATED MATERIAL SHALL BE DISPOSED OF OFF SITE UNLESS DIRECTED OTHERWISE. RETAIN SUFFICIENT EXCAVATED MATERIAL TO BACKFILL AROUND WALLS OF TANK AS SHOWN ON THE DRAWINGS, OR IMPORT FILL WHERE EXCAVATED MATERIAL IS NOT SUITABLE FOR RECOMPACTION.
4. ALL BACKFILL BENEATH SLABS AND FOUNDATION PADS SHALL BE AS PER THE SITE ENGINEERS DESIGN.
5. PROVIDE WATERPROOF MEMBRANE (DPM), 250 MICRONS THICK X 2 LAYERS, OVER 25mm MINIMUM OF BLINDING SAND OVER BACKFILL BENEATH ALL FOUNDATIONS AND SLABS. TAPE ALL JOINTS AS PER SHEET S04.
6. CONCRETE STRENGTH SHALL BE 35 MPa AT 28 DAYS WITH CEMENT CONTENT BETWEEN 350kg/m^3 AND 400kg/m^3. WATER CEMENT RATIO SHALL NOT EXCEED 0.45.
7. ALL STRUCTURAL CONCRETE SHALL BE READY MIX NORMAL CONCRETE.
8. BLINDING CONCRETE STRENGTH SHALL BE AS DIRECTED BY THE SITE ENGINEER.
9. REINFORCING LAP LENGTHS: 661 MESH – AS PER SHEET S04.
10. ALL FOOTING AND RING BEAM REINFORCING STEEL SHALL HAVE 75mm MINIMUM COVER, UNLESS NOTED OTHERWISE.
11. TT = TOP OF TOP STEEL; TB = BOTTOM OF TOP STEEL; BT = TOP OF BOTTOM STEEL; BB = BOTTOM OF BOTTOM STEEL.
12. BAR DESIGNATION: HD = GRADE 500E DEFORMED BARS; D = GRADE 300E DEFORMED BARS; R = GRADE 300E ROUND BARS; RB = GRADE 500 (REID BAR) DEFORMED BARS.
13. SHEAR KEY GROUTING – USE SIKA GROUT 212 OR APPROVED EQUIVALENT.
14. SURFACE FINISH (TO NZS 3114: 1987): FLOOR SLABS – U2 (WOOD OR BULL FLOAT) CONCEALED WORK (FOUNDATIONS) – F1 EXPOSED EDGES OF FOUNDATIONS – F4.
15. MAXIMUM WATER TABLE HEIGHT HAS BEEN ASSUMED BELOW THE FLOOR SLAB OF THE TANK. CONTRACTOR TO CONFIRM ON SITE. CONSULT SITE ENGINEER WHERE WATER TABLE WILL BE ABOVE THE FLOOR LEVEL OF THE TANK.
16. 100 kPa MINIMUM SAFE SOIL BEARING CAPACITY REQUIRED BENEATH FOUNDATIONS AND SLABS. SOIL BEARING CAPACITY HAS BEEN ASSUMED AS UNIFORM OVER THE BUILDING SITE. CONTRACTOR TO CONFIRM BOTH REQUIREMENTS ON SITE. CONSULT SITE ENGINEER WHERE SOIL BEARING IS LESS THAN 100KPa OR NOT UNIFORM ACROSS THE BUILDING SITE.
17. CURE CONCRETE FLOOR SLAB BY CONTINUOUS WETTING OR PONDING FOR A PERIOD OF 14 DAYS.
18. SAW CUT TIED JOINTS IN FLOOR SLAB AS SOON AS POSSIBLE BUT AT LEAST WITHIN 24 HOUR PERIOD AFTER CONCRETE HAS BEEN POURED.
19. ALL SEALANTS AND WATERSTOPS SHALL BE INSTALLED STRICTLY AS PER THE MANUFACTURERS SPECIFICATIONS.
20. ALLOW SIKATANK SEALANT 14 DAYS TO CURE BEFORE USING TANK FOR STORAGE OF DAIRY EFFLUENT.

DESIGN INFORMATION

1. THE FOUNDATION AND SLAB DESIGN DOES NOT COVER SEISMIC LIQUEFACTION, LATERAL SPREADING AND EXCESS PORE WATER PRESSURES CAUSED BY LIQUEFACTION AT SPECIFIC SITES. THIS MAY RESULT IN LOSS OF SOIL BEARING CAPACITY AND/OR UPLIFT OF THE POND IN HIGH SEISMIC EVENTS, RESULTING IN DAMAGE TO THE MEGAPOND.
2. MEGAPOND SUITABLE ONLY FOR AN IMPORTANCE LEVEL 1 STRUCTURE, AS DEFINED IN NZS 1170.5: 2004.
3. THE MEGAPOND IS NOT TO BE CONSTRUCTED ON SLOPING SITES WITHOUT APPROVAL FROM THE SITE ENGINEER.
4. DESIGN LIFE OF THE STRUCTURE IS 50 YEARS.
5. SPECIFIC DESIGN IS REQUIRED FOR SUBSOIL CLASES A & B (STRONG ROCK AND ROCK) WHERE SHEAR WAVE VELOCITY IS GREATER THAN 250m/s. SUBSOIL CLASSES AS DEFINED IN NZS 1170.5: 2004.
6. SPECIFIC DESIGN IS REQUIRED WHERE HAZARD FACTOR (Z) IS GREATER THAN 0.36, AS DEFINED IN NZS 1170.5: 2004

NOTES:

COLES CONSULTING LIMITED
STRUCTURAL ENGINEERS
1st Floor - 62 Deveron St - Invercargill
Ph 03 214 0172 - Mbl 027 380 4362

REVISIONS

REV #	REVISION DESCRIPTION	DATE	DRAWN
1	ISSUED FOR CONSTRUCTION	13/11/2012	JR

PO Box 58142, Botany, Auckland, 2163
Tel: 09-274 0316
Fax: 09-274 8393
email: technicalservices@hynds.co.nz

HYNDS

ISO 9001 CERTIFIED MANAGEMENT SYSTEM

PROJECT DESCRIPTION:
WHITE WATERS LTD (H VERNOOIJ)
MEGAPOND 1500
893 KAKAPO ROAD - TE ANAU
SOUTHLAND DISTRICT COUNCIL

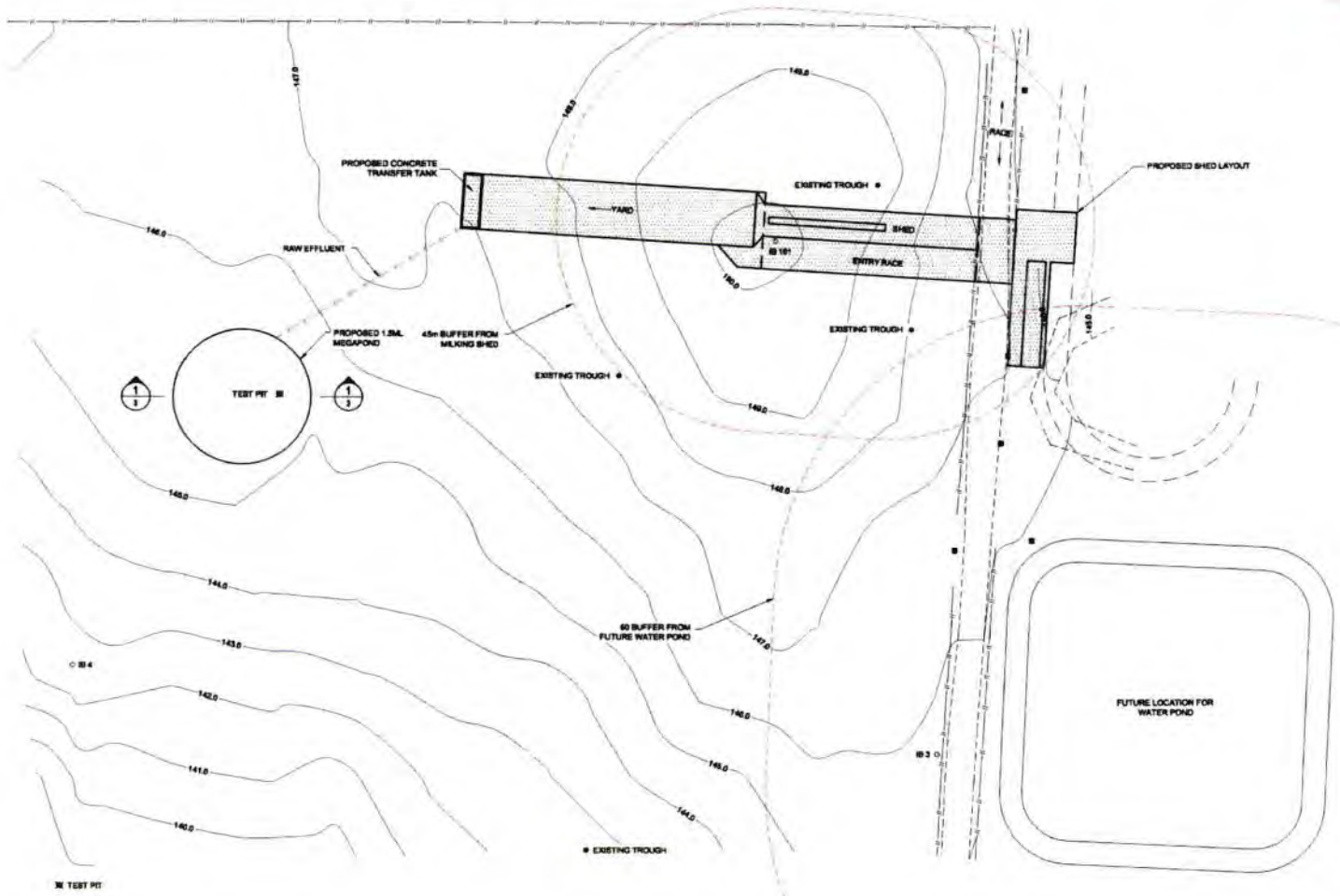
SERVICE DETAIL:
MEGAPOND
1,500,000 LITRE EFFLEUNT TANK
NOTES

REFERENCE/QUOTE NUMBER:

DRAWN:	DESIGN:	CHECKED:
Coles Consulting	Coles Consulting	

SCALE: As Shown	Note:	DATE:
PAPER SIZE: A3	Do not scale drawing if in doubt ASK!!!	13/11/2012

DRAWING NUMBER:	REVISION NUMBER:
0112060 - S05	1



Coordinate Schedule			
Northing	Easting	Level	Description
8094.08	4000.00	145.75	BS 2
7921.81	4084.89	145.45	BS 3
7845.89	3917.32	142.37	BS 4
8000.00	4000.00	150.00	BS 101

ALL CO-ORDINATES AND LEVELS ARE ASSUMED AND IN NO WAY RELATE TO A GEODETIC DATUM

LEGEND

- FENCE LINE
- EXISTING TRACK
- POST

ISSUED FOR CONSENT

Revision	Amendment	Approved	Revision Date

WHITE WATERS LTD

OPUS
Invercargill Office
PO Box 847
Invercargill, NZ
Tel: 03 211 3060

Drawn	Designed	Approved	Revision Date
J BURNS		E. C. McGRATH	19/12/11

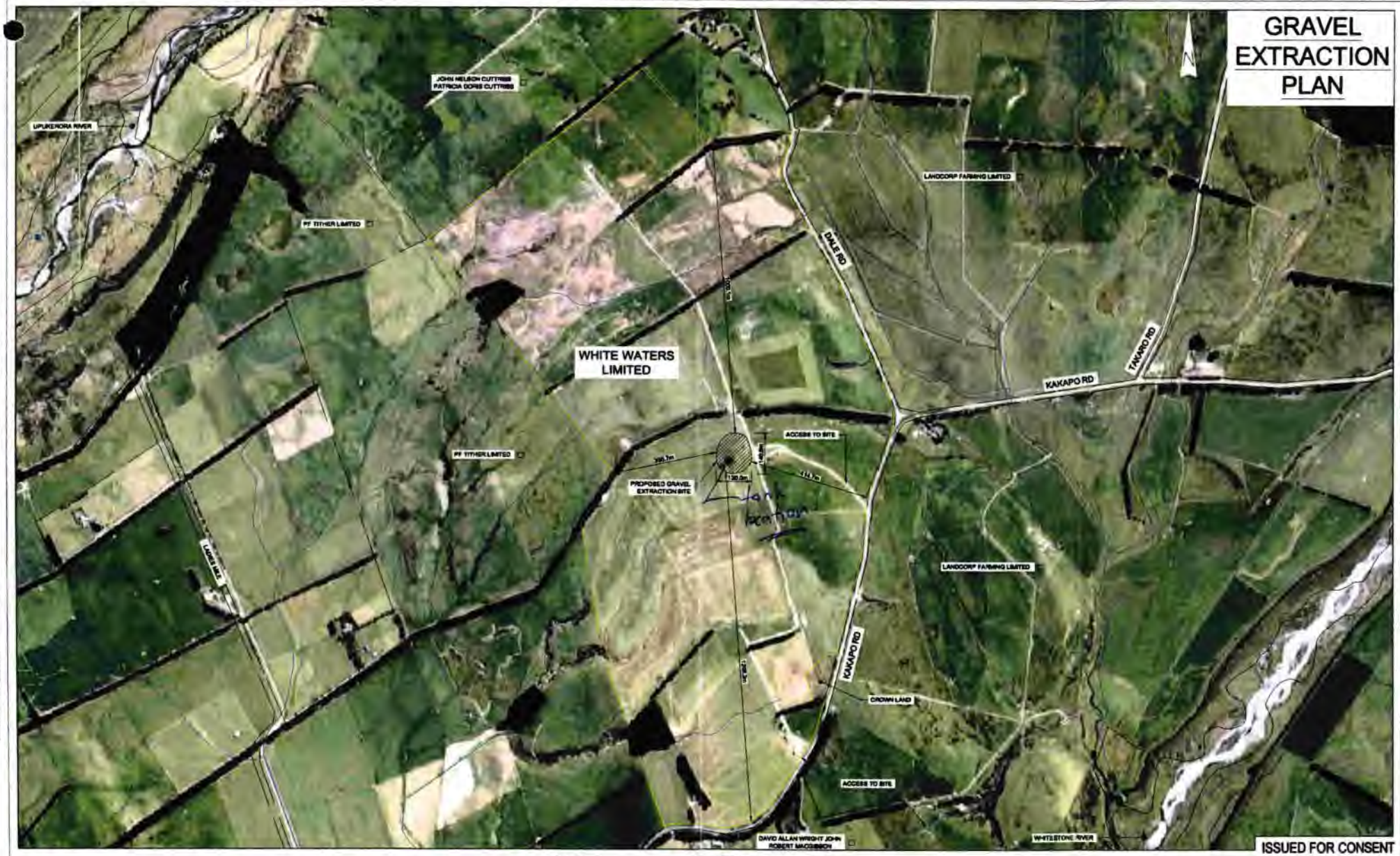
WHITE WATERS LTD
EFFLUENT SYSTEM UPGRADE
893 KAKAPO ROAD, TE ANAU

SITE PLAN

Project No.	Scale	Drawing No.	Sheet No.	Revision
VQ419.75	A1 1:500 A3 1:1000	7/808/556/5734	2	

Original Sheet Size A1 [841x594] Plot Date 19/12/11 @ 11:13 g:\projects\5367_8092_808_556_white waters\557_808_556_5734_1-3 r2.dwg - SHEET 2

GRAVEL EXTRACTION PLAN



ISSUED FOR CONSENT

NOTE: ALL BOUNDARIES SHOWN ARE APPROXIMATE ONLY.

WHITE WATERS LTD

OPUS
Invercargill Office
PO Box 847
Invercargill, NZ
Tel: 03 211 5000

Drawn: J.BURNS	Designed:	Checked: E.BARBEZE	Review Date: 21/12/2011
Project No.: VQ416.75	Date: N.T.S	Quality File: 7/808/557/5734	Sheet No.: 1

Project: WHITE WATERS LTD
GRAVEL EXTRACTION CONSENT
893 KAKAPO ROAD, TE ANAU

Name: ~~GRAVEL EXTRACTION PLAN~~ SITE PLAN

Original Sheet Size A1 [841x594] Plot Date: 21/12/11 @ 11:17 [illegible]

IPENZ ENGINEERS NEW ZEALAND | NEW ZEALAND INSTITUTE OF ARCHITECTS INCORPORATED | ACENZ | Building Code Clause(s) Name

PRODUCER STATEMENT – PS4 – CONSTRUCTION REVIEW

(Guidance notes on the use of this form are printed on the reverse side)

ISSUED BY: Opus International Consultants Ltd
(Construction Review Firm)

TO: White Waters Ltd
(Owner/Developer)

TO BE SUPPLIED TO: Southland District Council
(Building Consent Authority)

IN RESPECT OF: Construction of Megapond 1500
(Description of Building Work)

AT: 893 Kakapo Road, Te Anau
(Address)

..... **LOT** ..... **DP** ..... **SO** .....

Opus International Consultants Ltd (Construction Review Firm) has been engaged by White Waters Ltd

to provide ○ CM1 ○ CM2 ◉ CM3 ○ CM4 ○ CM5 *(Engineering Categories)* or ○ OL1 ○ OL2 ○ OL3 ○ OL4 *(Architectural Categories)*

observation ○ or other ..... services
(Extent of Engagement)

in respect of clause(s) B1/VM1 of the Building Code for the building work described in documents relating to Building Consent No. BLD/2012/48338/1 and those relating to Building Consent Amendment(s) Nos. ..... issued during the course of the works. We have sighted these Building Consents and the conditions of attached to them.

Authorised instructions / variation(s) No. ..... (copies attached)

or by the attached Schedule ☐ have been issued during the course of the works.

On the basis of ◉ this ○ these review(s) and information supplied by the contractor during the course of the works, I **believe on reasonable grounds** that ◉ All ○ Part only of the building works have been completed in accordance with the relevant requirements of the Building Consents and Building Consent Amendments identified above, with respect to Clause(s) B1/VM1 of the Building Regulations.

I, Thomas Francis O'Boyle *(Name of Construction Review Professional)* am: ☑ CPEng No. 1006767

☐ Reg Arch No. Name

I am a Member of : ☑ IPENZ ☐ NZIA and hold the following qualifications: BEng(Civil), MIPENZ

The Construction Review Firm issuing this statement holds a current policy of Professional Indemnity Insurance no less than $200,000*.

The Construction Review Firm is a member of ACENZ : ◉ YES ○ NO

SIGNED BY ..... ON BEHALF OF Opus International Consultants Ltd

Date : 14-3-13 Signature : .....

Note: This statement shall only be relied upon by the Building Consent Authority named above. Liability under this statement accrues to the Construction Review Firm only. The total maximum amount of damages payable arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in contract, tort or otherwise (including negligence), is limited to the sum of $200,000.*

This form to accompany **Forms 6 or 8 of the Building (Form) Regulations** 2004 for the issue of a Code Compliance Certificate.

GUIDANCE ON USE OF PRODUCER STATEMENTS

Producer statements were first introduced with the Building Act 1992. The producer statements were developed by a combined task committee consisting of members of the New Zealand Institute of Architects, Institution of Professional Engineers New Zealand, Association of Consulting Engineers New Zealand in consultation with the Building Officials Institute of New Zealand. The original suite of producer statements has been revised as at the date of this form as a result of enactment of the Building Act (2004) by these organisations to ensure standard use within the industry.

The producer statement system is intended to provide Building Consent Authorities (BCAs) with reasonable grounds for the issue of a Building Consent or a Code Compliance Certificate, without having to duplicate design or construction checking undertaken by others.

PS1 Design	Intended for the use by a suitably qualified independent design professional in circumstances where the BCA accepts a producer statement for establishing reasonable grounds to issue a Building Consent;
PS2 Design Review	Intended for use by a suitably qualified independent design professional where the BCA accepts an independent design professional's review as the basis for establishing reasonable grounds to issue a Building Consent;
PS3 Construction	Forms commonly used as a certificate of completion of building work are Schedule 6 of NZS 3910:2003[1] ; or Schedules E1/E2 of NZIA's SCC 2007 [2]
PS 4 Construction Review	Intended for use by a suitably qualified independent design professional who undertakes construction monitoring of the building works where the BCA requests a producer statement prior to issuing a Code Compliance Certificate. This must be accompanied by a statement of completion of building work (Schedule 6).

The following guidelines are provided by ACENZ, IPENZ and NZIA to interpret the Producer Statement.

Competence of Design Professional

This statement is made by a Design Firm that has undertaken a contract of services for the services named, and is signed by a person authorised by that firm to verify the processes within the firm and competence of its designers.

A competent design professional will have a professional qualification and proven current competence through registration on a national competence-based register, either as a Chartered Professional Engineer (CPEng) or a Registered Architect.

Membership of a professional body, such as the Institution of Professional Engineers New Zealand (IPENZ)or the New Zealand Institute of Architects (NZIA) provides additional assurance of the designer's standing within the profession. If the design firm is a member of the Association of Consulting Engineers New Zealand (ACENZ), this provides additional assurance about the standing of the firm.

Persons or firms meeting these criteria satisfy the term "suitably qualified independent design professional".

*** Professional Indemnity Insurance**

As part of membership requirements, ACENZ requires all member firms to hold Professional Indemnity Insurance to a minimum level.

The PI insurance minimum stated on the front of this form reflects standard, small projects. If the parties deem this inappropriate for large projects the minimum may be up to $500,000.

Professional Services during Construction Phase

There are several levels of service which a Design Firm may provide during the construction phase of a project (CM1-5)[3] (OL1-OL4)[2]. The Building Consent Authority is encouraged to require that the service to be provided by the Design Firm is appropriate for the project concerned.

Requirement to provide Producer Statement PS4

Building Consent Authorities should ensure that the applicant is aware of any requirement for producer statements for the construction phase of building work at the time the building consent is issued as no design professional should be expected to provide a producer statement unless such a requirement forms part of the Design Firm's engagement.

Attached Particulars

Attached particulars referred to in this producer statement refer to supplementary information appended to the producer statement.

Refer Also:

1 *Conditions of Contract for Building & Civil Engineering Construction NZS 3910: 2003*

2 *NZIA Standard Conditions of Contract SCC 2007 (1st edition)*

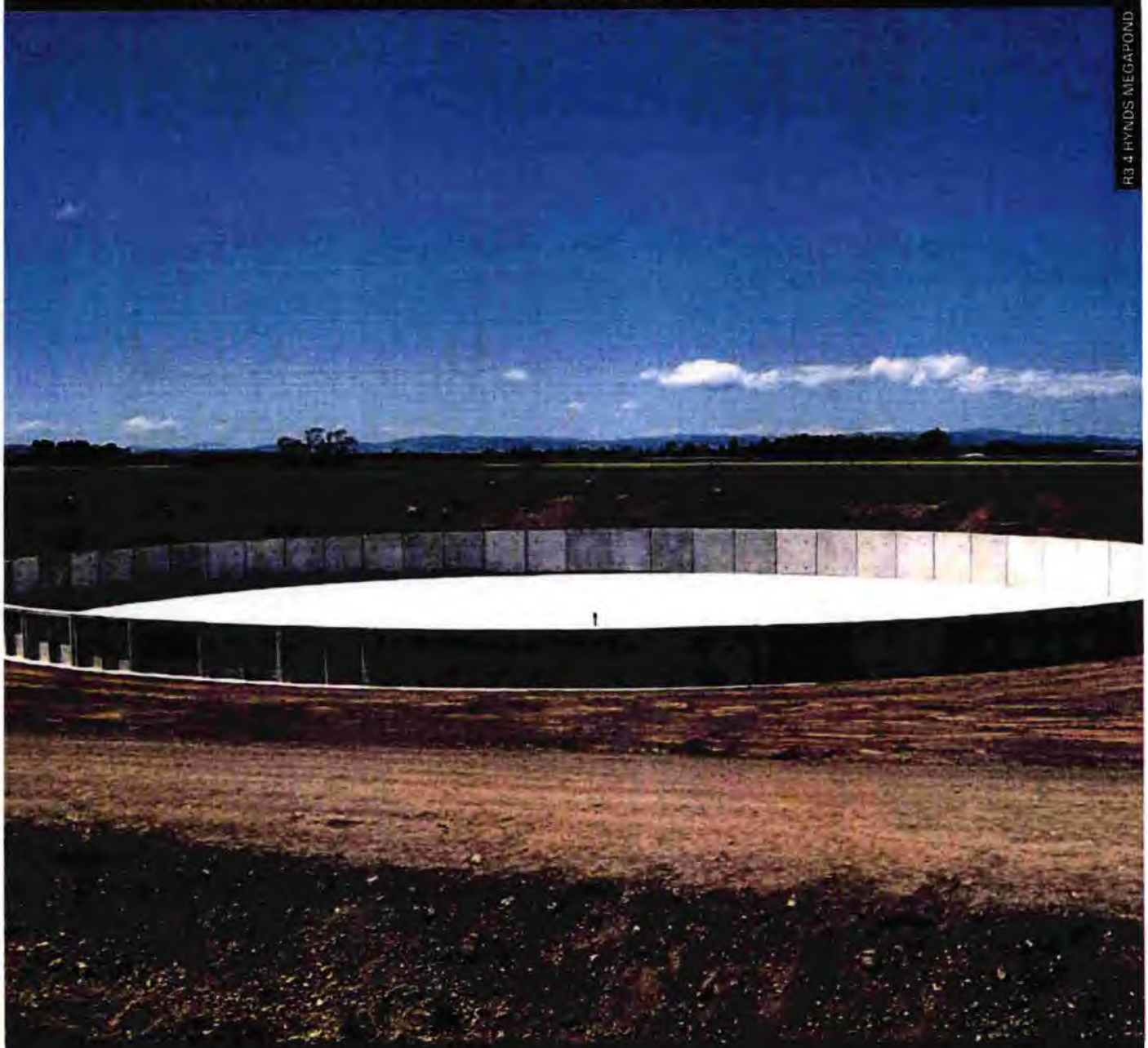
3 *Guideline on the Briefing & Engagement for Consulting Engineering Services (ACENZ/IPENZ 2004)*

www.acenz.org.nz
www.ipenz.org.nz
www.nzia.co.nz

48338/1 893 KAKAPO

MEGAPOND EFFLUENT STORAGE

Storage up to 4 million litres **Leak Free Precast Panel Construction**



R3 4 HYNDS MEGAPOND

0800 WE PIPE (93 7473)
www.**hynds**.co.nz

HYNDS
RURAL

The Megapond is a unique, site assembled, precast effluent tank that comes in 5 standard sizes.

The Megapond panels with mass of approximately 1600 kgs each, are easily handled and installed using a suitable excavator.

Applications

- Dairy effluent storage

Features

- Standard panel height used for all sizes
- Easily transported, lifted & assembled
- Robust Polygon structure
- Flanged base resists uplift of structure
- Precast construction ensures consistency and quality, minimises in-situ work
- Leach free result
- Environmentally compliant

Product Code	Nominal Volume (Litres)	Diameter (Metres)	No. of panels
MEGAPOND500	500,000	17.3	28
MEGAPOND1M	1,000,000	23.6	38
MEGAPOND2M	2,000,000	33.8	54
MEGAPOND3M	3,000,000	41.3	66
MEGAPOND4M	4,000,000	47.6	76

Megapond Installation

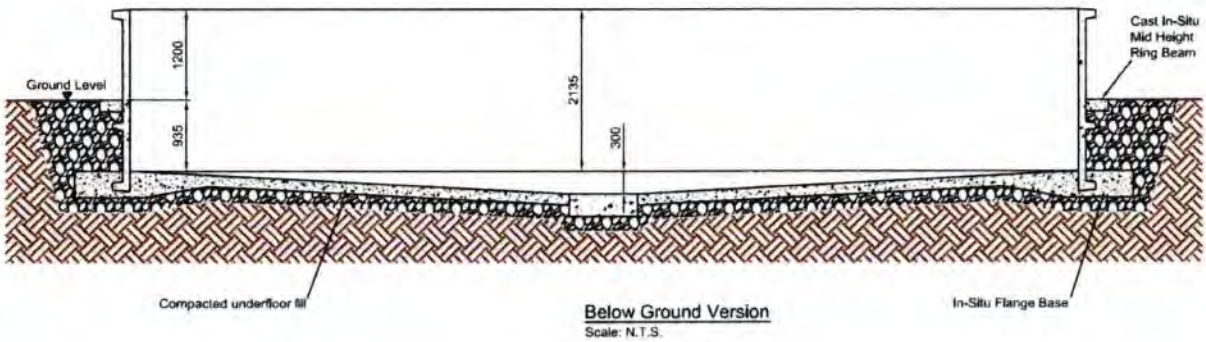
The Megapond installation is carried out by an experienced Contractor using the following key steps:

1. Excavation of the tank area to a minimum depth of approx 1500 mm below ground level (or deeper if in poor material) and shaping the floor to slope to the centre
2. Min 150 mm GAP 40 material placed and compacted to form the base to the floor and tank flange
3. Precast concrete panels installed and bolted together around the perimeter to form a large polygon
4. Steel reinforcement and mesh placed in the floor and flange
5. Concrete floor and flanged base cast, and floor joints cut at a very early age
6. Backfill placed and compacted in layers evenly around the perimeter of the tank to ground level
7. In-situ reinforced concrete beam cast just below ground level
8. Floor joints sealed and joints between panels grouted to form a watertight structure before the floor is flooded to complete the curing of the concrete floor

FENCING

The Megapond is designed to be fitted with pool fencing panels that meet the NZ Pool Fencing Safety Act.

R3.4 Hynds Megapond



Below Ground Version
Scale: N.T.S.

NORTHERN REGION		CENTRAL REGION		CAPITAL REGION		SOUTH ISLAND REGION	
Whangarei	09 438 7305	**Hamilton**	07 847 3193	**Hastings**	06 879 8989	**Nelson**	03 543 8330
Warkworth	09 425 9837	**Tauranga**	07 571 6955	**New Plymouth**	06 759 8157	**Blenheim**	03 579 1332
Albany	09 415 9259	**Rotorua**	07 348 9394	**Palmerston Nth**	06 357 2638	**Amberley**	03 314 8455
Avondale	09 820 0122	**Te Kuiti**	07 878 8326	**Masterton**	06 377 4474	**Christchurch**	03 344 3500
Penrose	09 579 5605	**Tsupo**	07 378 9915	**Kapiti**	04 296 1125	**Christchurch East**	03 376 4185
Manukeu	09 273 3053			**Petone**	04 568 0933	**Oamaru**	03 434 3062
Pukakoha	09 237 1274			**Kaiwharawhara**	04 472 4172	**Cromwell**	03 445 4760
						Winton	03 236 6044
						Invercargill	03 214 6470

JUNE 2011

IPENZ ENGINEERS NEW ZEALAND | NEW ZEALAND INSTITUTE OF ARCHITECTS | ACENZ

Building Code Clause(s) B1 / VM1

Project No. 0112060

PRODUCER STATEMENT – PS1 – DESIGN

(Guidance notes on the use of this form are printed on the reverse side)*

48338/1
3/12/12

ISSUED BY: Coles Consulting (2011) Limited
(Design Firm)

TO: White Waters Limited
(Owner/Developer)

TO BE SUPPLIED TO: Southland District Council
(Building Consent Authority)

IN RESPECT OF: Megapond 1500 (Design of concrete tank only. Excludes site selection, design of compacted hardfill foundation raft and water table depth assessment completed by others)
(Description of Building Work)

AT: 893 Kakapo Road, Te Anau
(Address)

LOT **DP** **SO**

We have been engaged by the owner/developer referred to above to provide structural engineering design services in respect of the requirements of
(Extent of Engagement)

Clause(s) B1 / VM1 of the Building Code for

☐ All or ☒ Part only (as specified in the attachment to this statement), of the proposed building work.

The design carried out by us has been prepared in accordance with:

☒ Compliance Documents issued by Department of Building and Housing AS/NZS 1170, NZS 3101 and 3106
(verification method / acceptable solution)

or

☐ Alternative solution as per the attached schedule

The proposed building work covered by this producer statement is described on the drawings titled White Waters Ltd Megapond 1500, 893 Kakapo Road, Te Anau and numbered 0112060 - S01 to S05 together with the specification, and other documents set out in the schedule attached to this statement.

On behalf of the Design Firm, and subject to:

(i) Site verification of the following design assumptions: Megapond tank is founded on 100kPa (minimum) allowable bearing capacity soils with water table below the base of the tank. Hardfill raft is constructed as per the Site Engineers design. Subsoil classes C to E soils only with seismic hazard factor (Z) less than 0.36 (Te Anau). Refer to Megapond drawings for details.

(ii) All proprietary products meeting their performance specification requirements;

I believe on reasonable grounds the building, if constructed in accordance with the drawings, specifications, and other documents provided or listed in the attached schedule, will comply with the relevant provisions of the Building code.

I, Graeme W. Coles am: ☒ CPEng 166888 #
(Name of Design Professional)

☐ Reg Arch #

I am a member of: ☒ IPENZ ☐ NZIA and hold the following qualifications: BE Civil (Hons), MIPENZ (Structural)

The Design Firm issuing this statement holds a current policy of Professional Indemnity Insurance no less than $200,000*.

The Design Firm is a member of ACENZ ☐ **YES** ☒ **NO**

SIGNED BY Graeme W. Coles ON BEHALF OF Coles Consulting (2011) Limited
(Design Firm)

Date 14 Nov. 2012 (signature) G W Coles

Note: This statement shall only be relied upon by the Building Consent Authority named above. Liability under this statement accrues to the Design Firm only. The total maximum amount of damages payable arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in contract, tort or otherwise (including negligence), is limited to the sum of $200,000.*

This form is to accompany **Form 2 of the Building (Forms) Regulations 2004** for the application of a Building Consent.

GUIDANCE ON USE OF PRODUCER STATEMENTS

Producer statements were first introduced with the Building Act 1992. The producer statements were developed by a combined task committee consisting of members of the New Zealand Institute of Architects, Institution of Professional Engineers New Zealand, Association of Consulting Engineers New Zealand in consultation with the Building Officials Institute of New Zealand. The original suite of producer statements has been revised at the date of this form as a result of enactment of the Building Act (2004) by these organisations to ensure standard use within the industry.

The producer statement system is intended to provide Building Consent Authorities (BCAs) with reasonable grounds for the issue of a Building Consent or a Code Compliance Certificate, without having to duplicate design or construction checking undertaken by others.

PS1 Design	Intended for use by a suitably qualified independent design professional in circumstances where the BCA accepts a producer statement for establishing reasonable grounds to issue a Building Consent.
PS2 Design Review	Intended for use by a suitably qualified independent design professional where the BCA accepts an independent design professional's review as the basis for establishing reasonable grounds to issue a Building Consent.
PS3 Construction	Forms commonly used as a certificate of completion of building work are Schedule 6 of NZS 3910:2003[1] or Schedules E1/E2 of NZIA's SCC 2007 [2]
PS4 Construction Review	Intended for use by a suitably qualified independent design professional who undertakes construction monitoring of the building works where the BCA requests a producer statement prior to issuing a Code Compliance Certificate. This must be accompanied by a statement of completion of building work (Schedule 6).

The following guidelines are provided by ACENZ, IPENZ and NZIA to interpret the Producer Statement.

Competence of Design Professional

This statement is made by a Design Firm that has undertaken a contract of services for the services named, and is signed by a person authorised by that firm to verify the processes within the firm and competence of its designers.

A competent design professional will have a professional qualification and proven current competence through registration on a national competence-based register, either as a Chartered Professional Engineer (CPEng) or a Registered Architect.

Membership of a professional body, such as the Institution of Professional Engineers New Zealand (IPENZ) or the New Zealand Institute of Architects (NZIA), provides additional assurance of the designer's standing within the profession. If the design firm is a member of the Association of Consulting Engineers New Zealand (ACENZ), this provides additional assurance about the standing of the firm.

Persons or firms meeting these criteria satisfy the term "suitably qualified independent design professional".

*** Professional Indemnity Insurance**

As part of membership requirements, ACENZ requires all member firms to hold Professional Indemnity Insurance to a minimum level.

The PI insurance minimum stated on the front of this form reflects standard, small projects. If the parties deem this inappropriate for large projects the minimum may be up to $500,000.

Professional Services during Construction Phase

There are several levels of service which a Design Firm may provide during the construction phase of a project (CM1-CM5)[3] (OL1-OL4) [2]. The Building Consent Authority is encouraged to require that the service to be provided by the Design Firm is appropriate for the project concerned.

Requirement to provide Producer Statement PS4

Building Consent Authorities should ensure that the applicant is aware of any requirement for producer statements for the construction phase of building work at the time the building consent is issued as no design professional should be expected to provide a producer statement unless such a requirement forms part of the Design Firm's engagement.

Attached Particulars

Attached particulars referred to in this producer statement refer to supplementary information appended to the producer statement.

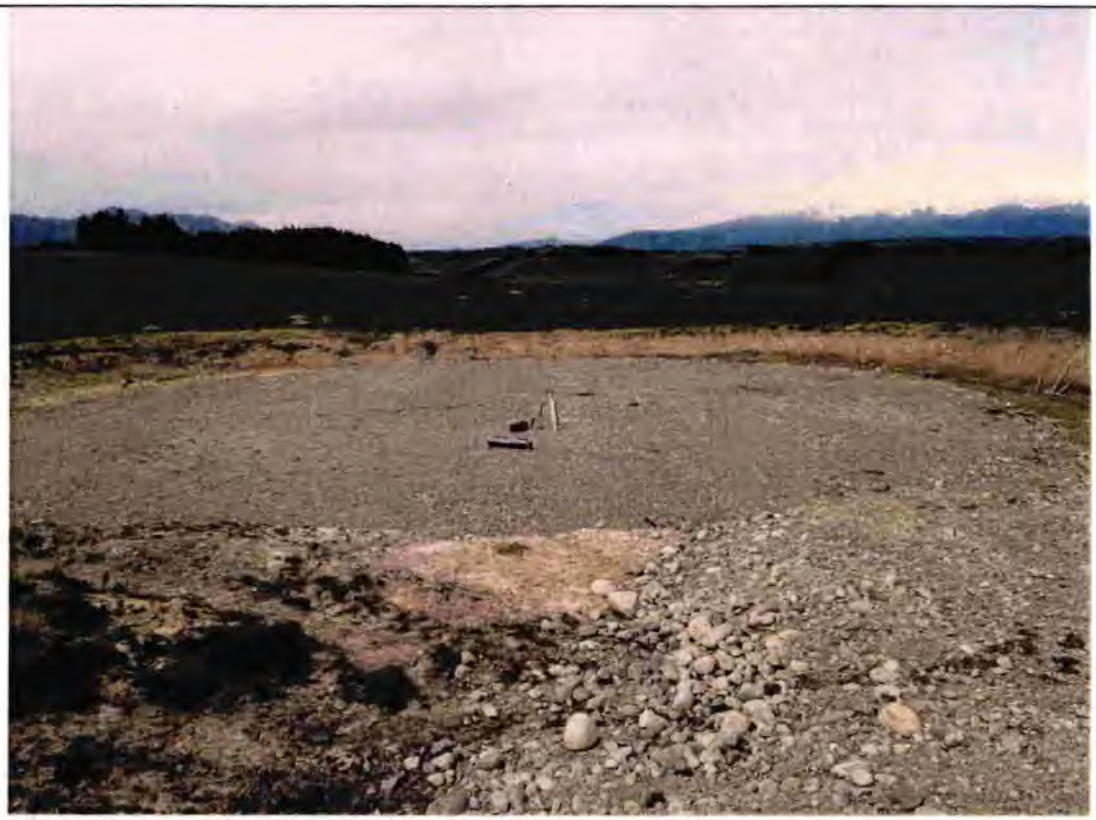
Refer Also:

1 *Conditions of Contract for Building & Civil Engineering Construction NZS 3910: 2003*

2 *NZIA Standard Conditions of Contract SCC 2007 (1st edition)*

3 *Guideline on the Briefing & Engagement for Consulting Engineering Services (ACENZ/IPENZ 2004)*

www.acenz.org.nz
www.ipenz.org.nz
www.nzia.co.nz



Foundation inspection 26/11/2012

Pre Pour Inspection – Flange footing 5/12/2012

Pre Pour Inspection – Panel jointing 5/12/2012

Pre Pour Inspection – Slab floor 5/12/2012

Final inspection –15/02/2012

Final inspection – Control joints 15/02/2012

APPENDIX F. EXAMPLES OF EFFLUENT AREA TOPOGRAPHY

Gently undulating area approximately the middle of the farm. This area is likely to be predominantly Kakapo soils therefore is high risk for effluent application.

Gently undulating area, this is also approximately the middle of the farm although on a higher terrace and northeast of the previous image. This area is likely to be predominantly Te Anau soils, therefore would actually be low risk for effluent application (the entire property has been categorised as high risk). There is an abrupt transition to a steep slope beyond the crest that is positioned across the centre of this image.

Proceeding towards the northern third of the farm – more sloping areas are evident.

Near the far northern end of the farm and application area, (looking in a northerly direction). This area has more sloping land.

North-western corner of the application area. A mix of gently undulating transitioning to sloping land.

Typical example of sloping land that is excluded from the effluent application area. This particular area is located to the east of the effluent area, towards the north of the property.

RDAgritech
ENGINEERED BY NATURE

FARM ENVIRONMENTAL MANAGEMENT PLAN

JOB TITLE	White Waters Dairy
ADDRESS	898 KAKAPO ROAD, TE ANAU
JOB NUMBER	50500
	6-April-18

Hans Vernooj
PO BOX 169
TE ANAU 9640

CONTENTS

Prepared by:

Gemma Scott
BASci, Environmental Management
Environmental Consultant

Reviewed by:

Karen Ladbrook
NZCE (Civil), MEngNZ
Environmental Engineer

1. SCOPE

This Farm Environmental Plan has been for White Waters Limited. The purpose of this Farm Environmental Plan is to:

- Document Good Management Practices that will be undertaken to minimise the environmental effects of dairy farming at O'Connor Dairy, in particular on water and soils.
- Demonstrate how the farm will achieve compliance with Resource Consent conditions and the rules of the proposed Southland Water and Land Plan.
- This management plan is designed to be consistent with the farm owner's values, and achievable for the farm manager to implement. This document will assist in keeping the farm manager focused on mitigating specific environmental risks and achieving long-term targets for improvement projects.

The plan includes the Good Management Practices that will be continued, or implemented over the next year, as well as some long-term targets for improvement projects

2. RESOURCE CONSENTS

Resource consents are required to:

- Discharge Effluent to the Land
- Take Groundwater

In addition to undertaking good environmental management practices, it is critical that the conditions of the resource consents are adhered to at all times.

In the event that a non-compliance occurs, or is suspected, Environment Southland should be contacted without delay. An incident reporting form is included in Appendix D, this should be used to document the circumstances that caused the non-compliance and the response/mitigations that were taken.

Copies of the Farm's Resource Consents are attached in Appendix A.

3. FARM MAPS

Various maps of the farm are included in order to identify and plan areas that require specific actions, and where Good Management Practices are recommended.

A subsurface drainage/tile network map has been developed which outlines where suspected and confirmed tiles are located. As tiles are identified or confirmed in future, they will be incorporated into the tile map.

4. GOOD MANAGEMENT PRACTICES

The White Waters farm comprises one physiographic zone, Bedrock/ Hill Country with an overland flow variant. The farm is located primarily in the Whitestone catchment, with a very small amount in the Upukerora catchment. The area is crossed by a network of branching waterways that flow to neighbouring lowland areas.

Good management practices will be undertaken to mitigate any environmental risk associated with the transport of nitrogen, phosphorous, microbes, and sediment to water bodies, which can commonly occur on this property via artificial drainage (open and tile drains), and lateral flow of phosphorous, microbes, and sediment to streams.

This property has an extensive tile drainage network linked to modified watercourses that drains excess water from productive land which means that the management of nutrient inputs and outputs is key to managing and mitigating environmental impacts.

A key concern in the Bedrock-Hill Country zone is contaminant loss to streams. Water quickly flows down-slope as overland flow to nearby streams following high or prolonged rainfall. Nitrogen, phosphorus, sediment and microbes are all carried with water, particularly during late autumn and winter. This zone generally experiences high rainfall zone due to its elevation, and in many areas a dense network of branching streams flows to neighbouring lowland areas.. A copy of Environment Southlands factsheets for the Bedrock/Hill Counctry physiographic zone is attached.

The following sections detail the good management practices planned to be undertaken on farm for the 1st June 2017 to 31st May 2018 period to mitigate the environmental risks associated with the property and its physiographic zones:

5. NUTRIENT MANAGEMENT

A Nutrient Budget is required in order to have a comprehensive view of nutrient balances across the farm and also to comply with the Southland Water & Land Plan. The Nutrient Budget should be prepared a Certified Nutrient Management Advisor. The Nutrient Budget must comply with the Overseer Best Practice Data Input Standards.

An annual review of the nutrient budget will be conducted to ensure it accurately reflects the farming system and this review will include:

- Data inputs that reflect the actual farming systems and practices in place; and
- Updated soil tests and fertiliser recommendations.

Good Management Practice:	Helps to Mitigate:	Target Date for completion (if relevant):	By When (or progress update):
Fertiliser and Nutrients			
Prepare a Nutrient Budget based on actual farm inputs and management practices, and identify any opportunities to reduce losses or optimise nutrient balances.	Loss of nitrogen and phosphorus to water. Inefficient use of fertlilisers.	Underway – to complete in 2018	Ongoing: Review annually Update 3-yearly
Fertiliser shall only be applied in optimum conditions, when soil moisture does not exceed field capacity and when soil temperatures are above 5 degrees. Environment Southland's "Whitestone Aquifer at Lynwood' soil monitoring network can be used to estimate soil moisture and temperature at the farm.	Fertiliser being spread outside of optimum conditions and not being taken up by pastures. Risk of losing fertiliser to Deep Drainage & Artificial Drainage	2018	Ongoing
Annual soil testing to determine soil nutrient levels and fertiliser requirements.	Inefficient use of fertiliser. Poor/inconsistent fertility.	2018	Ongoing - annual
Fertiliser application rates shall be based on soil and/or herbage tests results, and fertiliser recommendations made specifically for different nutrient blocks/crops.	Excessive application of fertiliser, above the agronomic requirements of the pasture/crop.	2017/18	Ongoing
Effluent irrigation is deferred when conditions are not suitable.	Risk of nitrogen losses to surface and ground water.	2017/2018	Ongoing

6. RIPARIAN MANAGEMENT

Riparian Management primarily addresses the risk of overland flow by filtering sediment and phosphorus, preventing erosion, and improving habitat. It also improves some aspects of artificial drainage.

Critical Source Areas (CSA): A CSA is a landscape feature like a gully, swale or a depression that accumulates overland flow from adjacent flats and slopes, and contributes a disproportionately large amount of nutrient or sediment to field tiles, artificial waterways and rivers.

An extensive tile drainage network throughout the property serves to drain excess soil water, minimising overland flow and erosion while making more useable and productive land.

Good Management Practice:	Helps to Mitigate:	Target Date for completion (if relevant):	By When (or progress update):
Riparian and Waterways			
Waterways are permanently or temporarily fenced with adequate buffers to ensure total stock exclusion.	Erosion, loss of sediment and nutrients via overland flow.	2019	Ongoing
All waterway crossings are either bridged or culverted throughout the property.	Erosion, loss of sediment and nutrients.	Current	Ongoing
Intermittently flowing, spring fed water ways are are fenced and left vegetated to stabilise soil structure, filter sediment and reduce phosphorus loss.	Erosion, loss of sediment and nutrients.	2022	Update annually
Use of ponds/sediment traps to trap any water and sediment movement and allow sediment to settle. An example of this can be seen in paddock 17.	Erosion, loss of sediment and nutrients.	Current	Ongoing
Some steep slopes have been retired from grazing and have been planted with hazelnut and blueberry orchards	Erosion, loss of sediment and nutrients.	Current	Ongoing
Open Drain cleaning is undertaken in a manner that minimises sediment losses by discussing systems and bank stability with contractors.	Erosion, loss of habitat for native flora and fauna.	Current	Ongoing

Weeds in Riparian Strips and within farm boundary are maintained.	Spread of unwanted and dominant plants	Current	Ongoing
Mark tile drain locations and outlets and record on the tile drain map, as these are found and when new drains are installed or existing drains replaced.	Loss of nutrients via direct drainage	Current	Ongoing

7. CULTIVATION MANAGEMENT

Cultivation management primarily addresses the risk of overland flow, although it can also improve aspects of artificial drainage.

Cultivation is recommended to be setback from waterways, critical source areas and sloping land. The buffer distances vary according to slope and are measured from the outer edge of the waterway bed (if present).

- 3m on slopes less than 4°
- 10m on slopes between 4° to 16°
- 20m on slopes between 16° to 20°

Good Management Practice:	Helps to Mitigate:	Target Date for completion (if relevant):	By When (or progress update):
Cultivation Management			
Tillage cultivation is minimised on farm. Direct drill is used to sow grass seed. Ploughing is generally avoided although may be selectively used where soil compaction has occurred.	Soil damage and erosion. Mitigating deep, lateral drainage.	Current	Ongoing
Avoid cutting silage from paddocks, to increase the organic material in soil.	Loss of organic material, air and water to be held within the soil	Current	Ongoing
Re-sow bare or damaged soil as soon as possible, vegetation and root systems assist with uptake of sediment and nutrients.	Contaminants lost via Overland Flow & Artificial Drainage	Current	Ongoing
Crop is limited to 30ha each year. Paddocks are sprayed in preparation, direct drilled followed by the harrows to level over the paddock, minimising the corrugation or pathway for overland flow to follow.	Soil damage and erosion. Mitigating deep, lateral drainage.	Current	Ongoing
Identify Critical Source Areas (low lying areas, swales) for management, e.g. fencing, leave vegetated.	Artificial Drainage, Deep drainage – leaching of contaminants	2018/19	Ongoing
Paddock selection for sowing crop considers slope and location of critical source areas.	Overland Flow	2018	Ongoing

8. EFFLUENT MANAGEMENT

Effectively managing the application of effluent to land addresses the risk of nutrient loss via deep drainage, lateral flow and artificial drainage. The most commonly encountered risk is overland flow caused by over-application or application of dairy shed effluent when soils moisture levels unsuitable. This can also cause effluent to drain through the soil and into tile drains, and can lead to excess amounts of nutrient to enter groundwater.

In general, the effluent system shall be operated according to the guideline "A Farmers Guide to Managing Farm Dairy Effluent – A good practice Guide for Land Application, Travelling Irrigator System". Copies are available from Dairy NZ or online at https://www.dairynz.co.nz/publications/environment/a-staff-guide-to-operating-your-effluent-irrigation-system-low-rate-system/

Good Management Practice:	Helps to Mitigate:	Target Date for completion (if relevant):	By When (or progress update):
Effluent Management			
Complete upgrades and improvements to the dairy shed access lanes and drains to prevent overflow of effluent to unsealed ground.	Overland flow, ponding of effluent	As soon as possible	2018
Avoid applying effluent over or near critical source areas and tile drains. These areas include low-lying swales where contaminants can accumulate during wet periods and waterways.	Overland flow and direct drainage of effluent to water	Immediate	Ongoing
Use tile drain outlets to assist assessment of soil moisture conditions before applying effluent. if they have water flowing in it then no irrigation shall take place.	Avoid any effluent entering a waterway via Artificial Drainage	Immediate	Ongoing
Use on-farm soil moisture tapes to assist assessment of soil moisture.: • Soil Moisture in below field capacity • Soil Temperature is above 6 degrees and, • Visual inspections of soil conditions as per DairyNZ recommendations	Avoid effluent entering waterways via Artificial Drainage, Overland Flow or over application. Mitigate excessive Nitrogen application leading to loss through overland flow and leaching	Current	Ongoing

Effluent Application does not exceed 5mm depth for each slurry tanker run and does not exceed 10mm depth per application on any area.	Artificial Drainage Overland Flow	Current	Ongoing
An alarm system on the effluent tanks monitors and warns of the risk of overflow due to high pond levels.	FDE being discharged to waterbodies.	Current	Ongoing
Ensure that staff understand the effluent system, discharge areas and risks and ensure that this Plan, the effluent map from Appendix G and the "Good Practice Guide for Land Application" from Dairy NZ are readily available to staff.	Over application, application when soils are near or at field capacity. Overland Flow and Artificial Drainage	2018	Ongoing
Any unauthorised discharge shall be reported to ES, and an incident report form used to identify the cause, so that lessons may be learnt and any required improvements to systems made. The Reporting form is included in the Appendices.	All	2018	Ongoing

9. WINTER GRAZING MANAGEMENT

This section details the good management practices that will be undertaken to minimise the discharge of nitrogen, phosphorus, sediment and microbiological contaminants to water through the use of land for intensive winter grazing. Refer to Appendix F for the winter grazing management map.

Good Management Practice:	Helps to Mitigate:	Target Date for completion (if relevant):	By When (or progress update):
Effluent Management			
Intensive winter grazing is restricted to 30ha, for replacement heifer cows and the shoulders of the milking season.	Soil disturbance and erosion, soil pugging, compaction and overland flow	Current	Ongoing
Dairy cows are wintered off the farm from June to mid-August.	Soil disturbance and erosion, soil pugging, compaction and overland flow	Current	Ongoing
Temporarily fence around critical source areas (CSA) keeping them vegetated when winter grazing occurs.	Contaminants entering waterways via overland flow and artificial drainage	Current	Ongoing
Maintining a minimum buffer of 5 metres between winter grazing crop and any waterway.	Contaminants entering waterways via overland flow	Current	Ongoing
Grazing from the top of the paddock down and leaving a last bite strip to allow vegetation to filter runoff.	Contaminants entering waterways via overland flow	Current	Ongoing

10. GENERAL RECOMMENDATIONS

The recommendations below may complement the Good Management Practices that are already planned for the farm and list above:

Potential Future GMP	Commentary
Provide formal staff training in Effluent Management and keep records of training and instructions given.	White Waters farm has a relatively high staff turnover. Provision of training and detailed record-keeping will aid in retaining knowledge as well as reducing the risk of non-compliances due to confusion or lack of instruction.

11. ANNUAL REVIEW CHECKLIST

- Update any newly discovered subsurface drainage or tile networks.
- Review the good management practices that were undertaken in the previous 1 June to 31 May period.
- Update fertiliser use and continue to monitor soil testing.
- Consider any additional Good Management Practices to be implemented over the coming 1 June to 31 May period.
- Check that the nutrient budget accurately reflects the farming system, record to be available for review.

Unless there has been a material change in the land use associated with the farming activities, then a nutrient budget is only required to be prepared every three years.

Physiographic Zone Map and Information

BEACON

Environment Southland Mapping Service

White Waters Physiographic Zones

November 15, 2017

polygonLayer

Override 1

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

ENVIRONMENT SOUTHLAND

FACTSHEET

WATER AND LAND 2020 & BEYOND

Physiographic zone: Bedrock/Hill Country

Southland's physiographic zones allow us to better understand why we have variations in water quality in different areas. We've divided Southland into nine different zones according to factors such as soil type, geology and topography. Through them we can target solutions to higher risk areas as opposed to a region-wide, generalised approach.

Understanding your zone

Each zone is different in the way contaminants build up and move through the soil, areas of groundwater, and into our streams and rivers. Physiographic zones allow us to target advice and management strategies to keep farm nutrients on the farm and out of waterways.

The Physiographics of Southland project was developed as part of *Water and Land 2020 & Beyond* so we can better understand:

- where our water comes from
- how water moves through the landscape
- why we have differences in water quality across the region

What does 'Bedrock/Hill Country' mean?

Land with bedrock or glacial till* found near the surface, located below 800m above sea level.
There are no significant areas of groundwater.

*Glacial till is a mixture of rock debris and sediment that has been deposited by a glacier. It is relatively impermeable, allowing little water to get through.

Key features of the Bedrock/Hill Country zone

- Mostly rolling to steep land, up to 800 metres above sea level (below the tree line).
- Prominent landforms.
- Soil overlies bedrock or glacial till.
- Either previously or currently densely covered with native forest, tussock or plantation forestry.
- Found throughout Southland.

Water source and movement

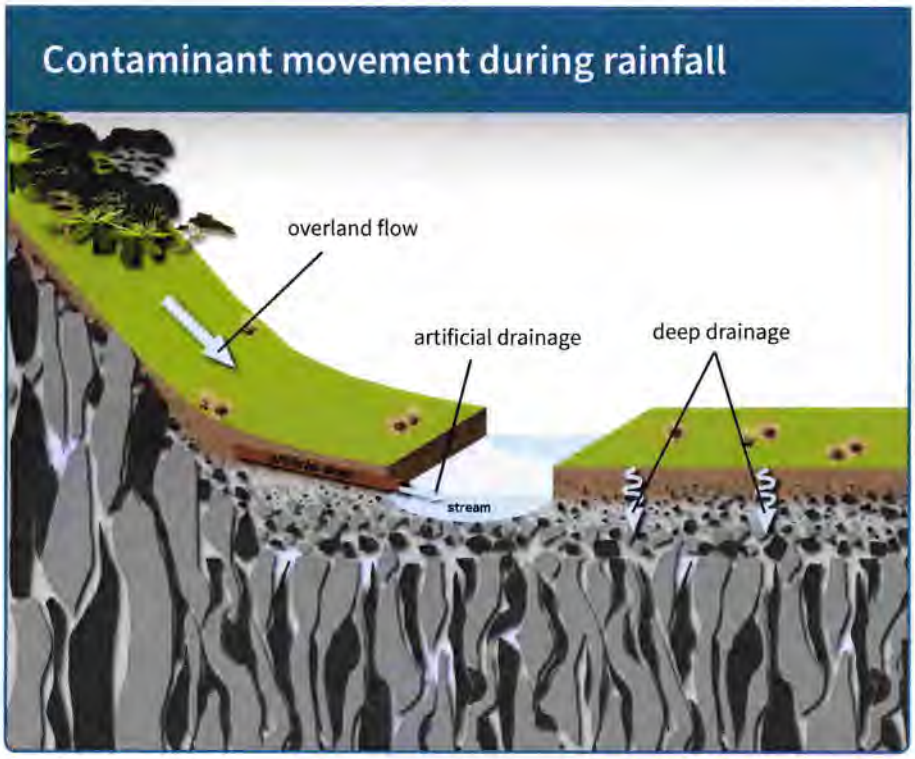
- High rainfall zone due to its elevation.
- Dense network of branching streams throughout the zone that flow to neighbouring lowland areas.
- No significant areas of groundwater.

Contaminant movement

Contaminant loss to streams is the main concern in this zone. Water quickly flows down-slope through wet soils and as overland flow to nearby streams following high or prolonged rainfall. Nitrogen, phosphorus, sediment and microbes are all carried with water, particularly during late autumn and winter.

In undeveloped areas Bedrock/Hill country streams can be a major source of recharge (top-up) water and dilution for lowland waterways and aquifers. However, in developed areas contaminants lost from Bedrock/Hill country streams contribute to the contamination loads in lowland streams in neighbouring zones.

Groundwater within the Bedrock/Hill Country zone is minimal and mainly found within rock fractures. Groundwater contaminants are typically not a concern for this zone.



Contaminant flow pathways for the Bedrock/Hill Country zone include overland flow (runoff) in the steeper areas, and artificial drainage where soils are poorly drained and deep drainage in flatter areas.

What does this mean for water quality?

√ Water from less developed areas of this zones provide a source of high quality water and dilution for downstream zones.

√ Little nitrogen build-up in groundwater due to denitrification in the soil zone.

X Water flowing over highly developed hills carries potentially large amounts of contaminants (nitrogen, phosphorus, sediment and microbes) to nearby streams, particularly following heavy rainfall.

X Water flowing through artificial drainage carries potentially large amounts of contaminants (nitrogen, phosphorus, sediment and microbes) to nearby streams, particularly following heavy rainfall.

Improving Southland's water quality

The following good management practices are applicable to all physiographic zones in Southland:

- Capture nutrients, sediment and microbes in wetlands and sediment traps
- Nutrient management
- Riparian management
- Effluent management

Good management in the Bedrock/Hill Country zone

In addition to the above, good management in the Bedrock/Hill Country zone includes measures for reducing the effects of overland flow and artificial drainage.

Reduce the effects of overflow by:

- Protecting soil structure, particularly in gullies and near stream areas
- Managing critical source areas (CSA)
- Reducing Phosphorus use and loss

Reduce the effects of artificial drainage by:

- Protecting soil structure, particularly in gullies and near stream areas
- Reducing phosphorus use and loss
- Reducing the accumulation of surplus nitrogen in the soil, particularly during autumn and winter
- Avoiding preferential flow of effluent through drains
- Capturing contaminants at drainage outflows

Physiographic zones and the Southland Water and Land Plan

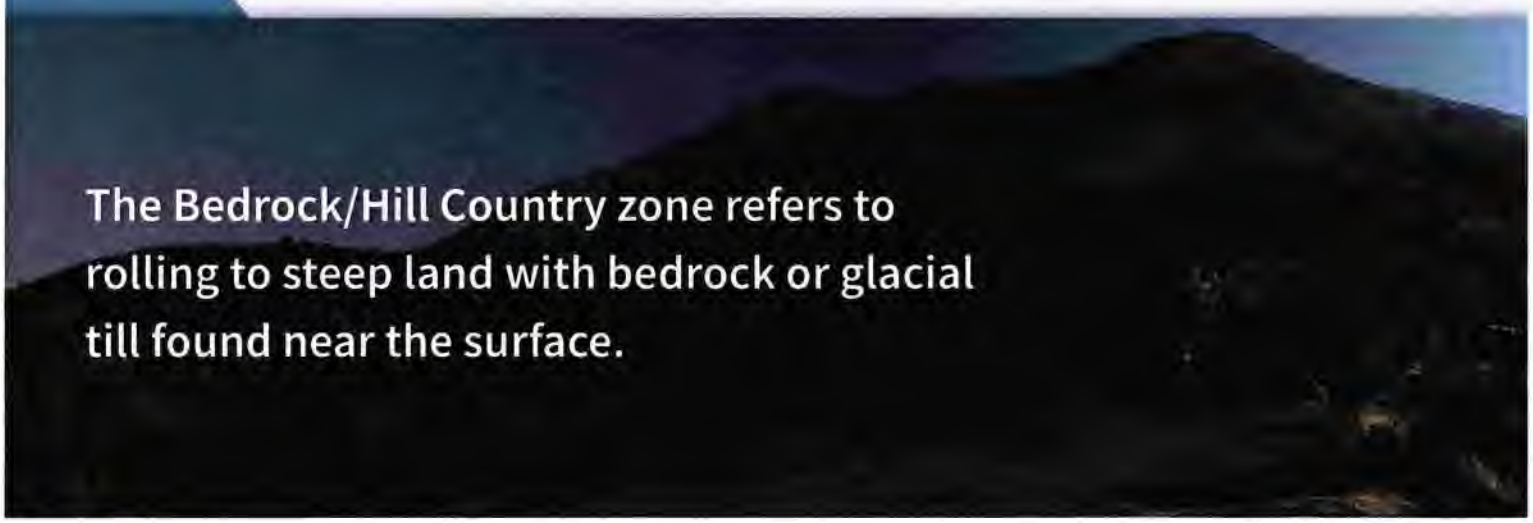
Environment Southland has developed a proposed Southland Water and Land Plan, using the science behind the physiographic zones to inform the plan and provide a tailored approach to particular issues that have been identified for each zone.

The main aim of the plan is to introduce new methods that help to halt any further decline in water quality by managing activities that we know adversely affect the quality of Southland's freshwater – such as land use intensification, wintering and stock in waterways. A key focus of the changes is to shift all land owners towards good management practices in ways that will give the best gains for maintaining water quality.

Further information

For more information about physiographic zones and good management practices contact Environment Southland. Phone 0800 76 88 45 or email service@es.govt.nz. You can also find out more about the Physiographics of Southland and your zone on our website, www.es.govt.nz.

What zone is your property in? View our map online: http://bit.ly/waterandlandmaps



environment SOUTHLAND REGIONAL COUNCIL
Te Taiao Tonga

Post: Private Bag 90116, Invercargill 9840 | Deliver: Cnr North Road and Price Street, Invercargill
Phone: 0800 76 88 45 | Email: service@es.govt.nz | Online: www.es.govt.nz

Soil Types and Effluent Area Map


White Waters
Soil Type and Effluent Area
Legend
Effluent Discharge
Kakapo
Otanomomo
Te Anau
Storage Tanks
Dale-Rd
Kakapo-Rd
Dairy Shed
Google Earth
Image © 2018 DigitalGlobe
© 2018 Google
N
800 m

Effluent Operations and Maintenance Plan

Farm Dairy Effluent Storage

Your Farm Dairy Effluent (FDE) tanks are designed so that you can store effluent when conditions are not suitable for irrigation. They have been designed in accordance with the FDE code of Practice and IPENZ Practice Note 21. The size of your effluent storage is sufficient to achieve "deferred storage", provided that you operate your farm and effluent system in accordance with the design parameters.

There are some important that you must do to ensure that you get the best out of your system and ensure that you can maintain sufficient storage.

Storage - Vital Statistics

Total Storage Volume	Hynds Tank 1,100 m^3
	Kliptank 2,062 m^3
Maximum Cow Numbers & Water Use	599, 45L/cow/day
Effluent Sources:	Shed, yards
Irrigation Depth	5mm Winter, 10mm Summer
Irrigation Volume	120 m^3/day Winter and 240 m^3/day Summer
Non-irrigation Period	1 June – 31 July
	** refer to your Tonk Design Report for further detail*

Tank Maintenance - At a Glance:

- U Check the tank level before every milking.
- U Irrigate whenever conditions are suitable, do not wait until the tank is full.

Monthly Checks and Maintenance

- U Check that the high level alarm is working correctly.
- U Check that all walls are stable, no slumping, cracks or holes.
- U Check area surrounding the tank for any signs of leakage, for example: wet patches, overgrowth of grass, tanking.
- U Check that fencing and gates/access are safe and secure.
- U Check that inlet pipe/s are running freely and are not blocked.
- U Check that access ladders and ropes are safe and secure.
- U Note any smell – does the effluent smell bad?
- U Check for any solid crust or grass growth on the effluent surface.

Periodic Checks and Maintenance

- U Fully empty the tank and remove any solids buildup once per year.
- U When the tank is empty:
    - o Check that internal walls are stable, no slumping.
    - o Check that the liner has no damage or holes.
    - o Check that concrete is not cracked or damaged.

Maintaining Storage Capacity - Irrigation

Your tank design does not allow for deliberate storing of effluent in the tank.

Your storage tank should be irrigated from daily, or when conditions are suitable. Your tank should not be used to defer irrigation when irrigation potential is present.

The tank design allows for no irrigation during June and July, as irrigation potential is generally minimal during these months, however you may be able to irrigate during these months if conditions are suitable and this is permitted by your consent.

Three days emergency storage has been allowed for in the design, so that you can attend to and repair any irrigation system failures. It is important to ensure that irrigation is restored as soon as possible after a failure.

Your tank is designed to only store effluent from the sources stipulated in your effluent design and is not intended to store stormwater, solids or additional effluent from other sources. If you are considering adding new sources of effluent, contact RDAgritech so that your storage size can be reviewed to ensure that it will still meet requirements.

Ensure that the liner is inspected each time the tank is emptied.

High Rainfall Events and How They May Affect Your Storage Capacity

Your tank design allows for collection of rainfall from the yards and feedpad as well as the surface of the tank and weeping wall beds. If you maintain an appropriate irrigation schedule, (refer above) then there should not be any problems with maintaining storage capacity.

Due to the size of your catchment area, a single high-rainfall event can cause the tank level to rise rapidly. If soil moisture levels are also high, or soils are already saturated, you may not be able to irrigate to address this.

The best way to manage the effects of heavy rainfall is to irrigate at every opportunity and keep the tank as low as possible. If your tank is already high and a heavy rainfall event is forecast, plan ahead for any contingency measures that may be needed to manage tank levels.

Tank Liner

Your Kliptank is lined with a synthetic (HDPE) liner. Synthetic liners provide a robust, long-term seal of the base and sides of the tank, to ensure that effluent does not leak out. The tank liner is designed to withstand the loading from effluent even when the tank is full.

- Your tank is not designed to be cleaned out using machinery, (such as a digger). There is a very high risk of damage to the liner even with a highly skilled operator.
- Your tank liner is vulnerable to damage from any heavy and/or sharp-edged objects.
- When using a slurry tanker, only use the designated draw-off point.
- Your tank must only be used with the specified stirrer.

Your Hynds tank is lined with concrete.

- Your tank is not designed to be cleaned out using machinery, (such as a digger). Whilst concrete is very robust, damage to the tank wall panels could result if these are struck by the bucket.
- Your tank must only be used with the specified stirrer.

Tank Stirrers

Your tank design allows for the specified stirrer only. You must not alter the stirrer in any way without first consulting the tank supplier to ensure that the tank liner will not be damaged.

Emptying the Tank

Provided that you irrigate whenever conditions are suitable, you should get your tank empty at least once per year. You may need to agitate the last of the effluent and solids with a hose, to ensure that they can be drawn up through the pump hose.

Leakage or Failure

In the unlikely event that leakage or tank failure occurs:

- Stop adding any more effluent to the tank (pump directly from sump or use the other tank, or alternative storage).
- Contact the tank supplier or RDAgritech to arrange for inspection and investigation of the source of effluent. This is likely to require the tank to be emptied.
- Contact Environment Southland, (refer to the contact details on your resource consent.

Irrigator run sheet

- ☑ Check the records to ensure effluent is due to be applied to that particular area
- ☑ Allow a minimum interval of 10 days between applications and grazing for animal health
- ☑ Ensure irrigator will be applying effluent to short pasture.

Date	Paddock	Run	Name	Comments

dairynz.co.nz

0800 4 DairyNZ (0800 4 324 7969)

You can use your Fonterra Dairy Diary as an alternative to this form, or photocopy a farm map – draw and date the runs on the copy then file it.

DairyNZ

EFFLUENT INCIDENT REPORTING

Date		**Time**	
Reported by		**Position (Person reporting)**	
Reported to;		**Position (Person reported to)**	
Farm Address			
Location of Issue			

What Happened?	
Cause, Circumstance and Contributing Factors	
Measures that were in place to prevent this type of incident.	

Type of Incident(s)

☐ Surface ponding;	☐ Irrigating when soil conditions are too wet;
☐ Exceeding nutrient application rates;	☐ Discharge without using irrigator (e.g. pipe end discharge);
☐ Exceeding effluent application depths/rates	☐ Sludge dumping where runoff is at high risk of entering water;
	☐ Discharge in breach of consent conditions or a plan rule;

Comments:

Was the problem fixed?	☐ Yes	**Are there any follow up actions or monitoring required?**	☐ No
☐ NO. If No – when will it be fixed?		☐ Yes. If Yes – what are they?	

What measures are recommended to be implemented to prevent/minimise this type of incident occurring again?

Cause Analysis			
People	**System**	**Management**	**External**
☐ Complacency	☐ Failure	☐ Procedure	☐ Weather
☐ Lack of Knowledge	☐ Inadequate for purpose	☐ Unforeseeable circumstance	☐ Electrical
☐ Poor attitude	☐ Breakdown	☐ Poor Planning	☐ Provider
☐ Experience	☐ Knowledge	☐ Poor Communication	☐ Other
☐ Lack of supervision		☐ Poor practice	
☐ Poor Training		☐ Other	
		☐ Lack of Monitoring	

Cause (s) Identified	Explanation / Recommendations	Who responsible for Follow up.	Date to be followed up

Summary Comments

Signed **Date:**

A staff guide to operating your effluent irrigation system

Travelling Irrigator

dairynz.co.nz
0800 4 DairyNZ (0800 4 324 7969)

DairyNZ

Acknowledgements

Thanks to the following who contributed to the development of this booklet

- Dairy farmers and farm staff throughout New Zealand
- Canterbury Dairy Effluent Group
- Synlait
- Fonterra
- Environment Canterbury
- Federated Farmers
- New Zealand Dairies Ltd
- Sefton Lonsdale - RootZone Effluent & Engineering Ltd

DairyNZ

For more information visit
dairynz.co.nz

DairyNZ
Corner Ruakura and Morrinsville Roads
Private Bag 3221
Hamilton 3240

Phone 0800 4 DairyNZ (0800 4 324 7969)

Version 2 – 04/2013

Operating your effluent irrigation system

Understanding how to operate your effluent irrigation system properly is an essential task on farm. This booklet helps take farm staff through the important parts of operating and maintaining a travelling irrigator effluent system. The book can be used as a training guide for those who are new to travelling irrigator systems, or for staff who are new to the farm to introduce them to the farm's effluent practices and policies.

Contents

Symbols

Throughout this booklet there are activities that you may wish to complete. Inside the back cover is a flip-out worksheet that has the space available for you to complete the small tasks. Once completed, you may wish to remove the worksheet and pin it up somewhere, as a guide for applying effluent on your farm.

This symbol means STOP IMMEDIATELY – throughout the book there are examples of problems that will arise on your farm related to effluent. In most cases if you see any of these issues you must STOP IMMEDIATELY and inform your manager or farm owner.

This symbol means WARNING – throughout the book there are examples of problems that will arise on your farm related to effluent. In most cases if you see any of these issues you must fix the immediate problem if you have permission or have been shown what is required to fix the problem. And then inform your manager or farm owner.

This symbol means CONTINUE – there are examples that show you conditions that are acceptable to continue irrigating effluent.

Our farm policy for effluent

We must ensure that:

1.	No effluent gets into waterways
2.	No effluent puddles in any paddocks
3.	The effluent system is checked daily (minimum)
4.	If there are problems with effluent, talk to the manager/farm owner
5.	Effluent irrigation events are checked and recorded against the Effluent Management Plan
6.	The Resource Consent is displayed in the shed
7.	The maximum application depth is not exceeded
8.	The maximum application rate is not exceeded
9.	Effluent is not applied if the soils are too wet

Potential hazards of effluent irrigation


Hoses and wires in paddocks whilst riding/driving farm vehicles


Rotating boom on irrigator


Falling into the effluent pond


Breaking the crust on the pond releasing gas


Crush warning


Electricity at the pump


No heavy lifting


Unstable pontoons

Why is effluent important?

Well managed and maintained effluent systems:

- Grow more grass for less cost
- Grow better tasting grass, therefore cows eat more
- Have fewer messy breakdowns
- Have cleaner water for the community
- Ensure regional council rules are met – no fines
- Obtain greater public acceptance.

What is effluent made up of?

- Wash down water
- Rain
- Faeces and urine
- Spilt milk
- Detergent
- Soil from feet.

What nutrients are in effluent?

- Nitrogen (N)
- Phosphorus (P)
- Potassium (K)
- Sulphur (S).

The value of the nutrients in effluent from 100 cows in an average New Zealand herd is **$3000 PA**

What shouldn't be in effluent?

Chemicals

Rubbish/afterbirth

Reject milk

Before every milking checklist

1. Stormwater

Is the stormwater or wash water diversion in the correct position?

2. Stone trap

Is the sump/stone trap clear of rubbish/afterbirth?

3. Storage

Is there enough room in the storage pond or tank for another milking? (Refer to pg 5)

4. Irrigator

Check the effluent plan. Is the irrigator in the right place? Is there enough run length left for the milking?

5. Pump/stirrer

Do you need to turn the stirrer or pump on?

6. Yard

Wet the yard before cows come in

7. Be gentle

Reduce noise and be gentle with cows during milking

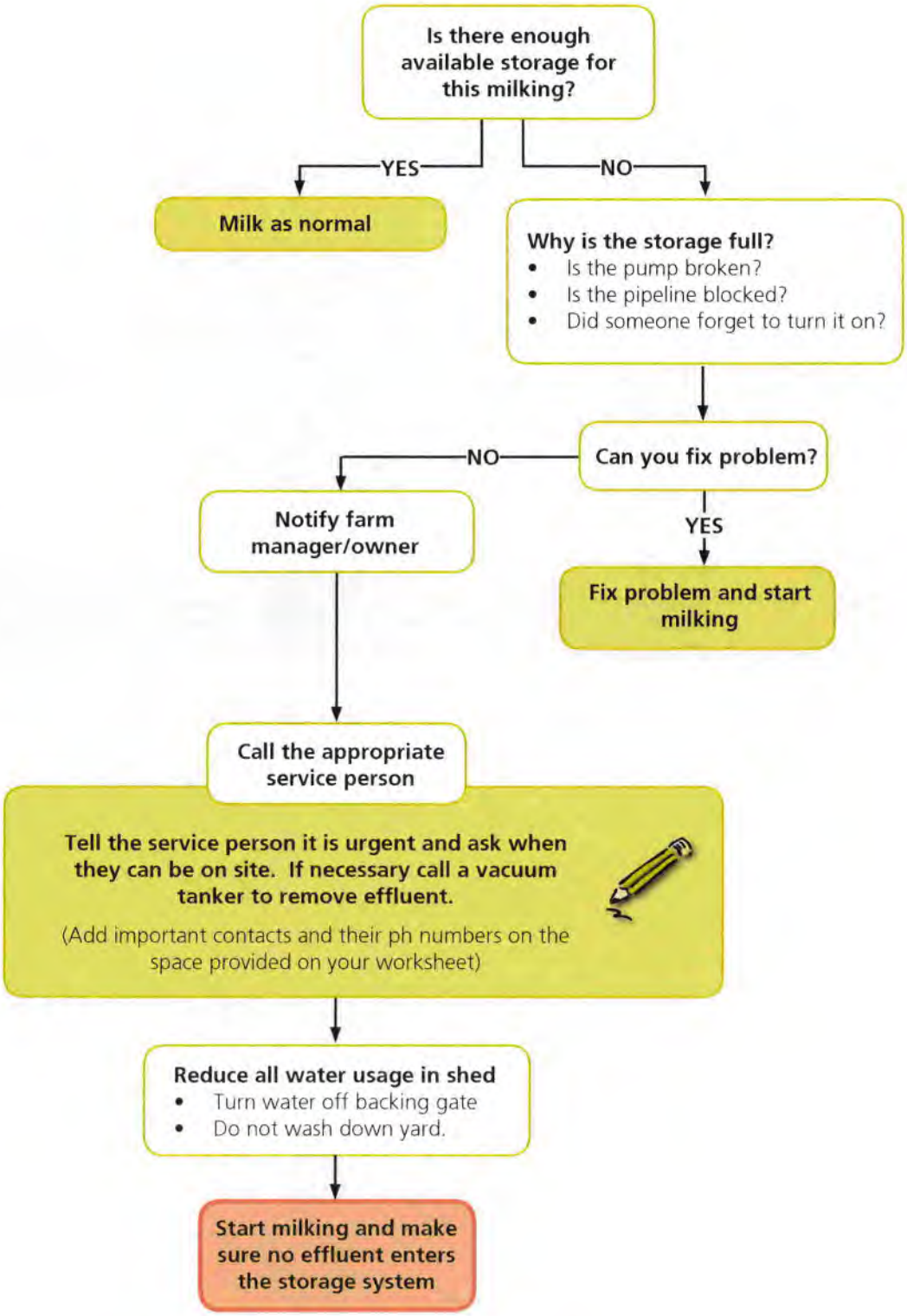
8. Turn hoses off

Use less water and turn off the hoses

9. Scrape the yard

After milking scrape yard with scraper before you hose down

Before every milking: check effluent storage



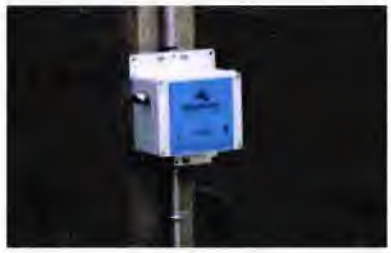
Before irrigating: is it too wet to irrigate?

Soil moisture deficit	>	Maximum application depth

Must be greater than

If measuring your soil moisture electronically

1. Check the soil moisture data logger or use a soil probe to get the soil moisture figure for the paddock being irrigated
2. Compare today's soil moisture figure against the farm's critical soil moisture figure. The critical soil moisture figure will be the number that decides whether you irrigate or not. Ask you manager/owner what the critical soil moisture figure is for your farm and write it in the space provided on your worksheet.



Check paddocks manually - look and listen. Do not irrigate if:

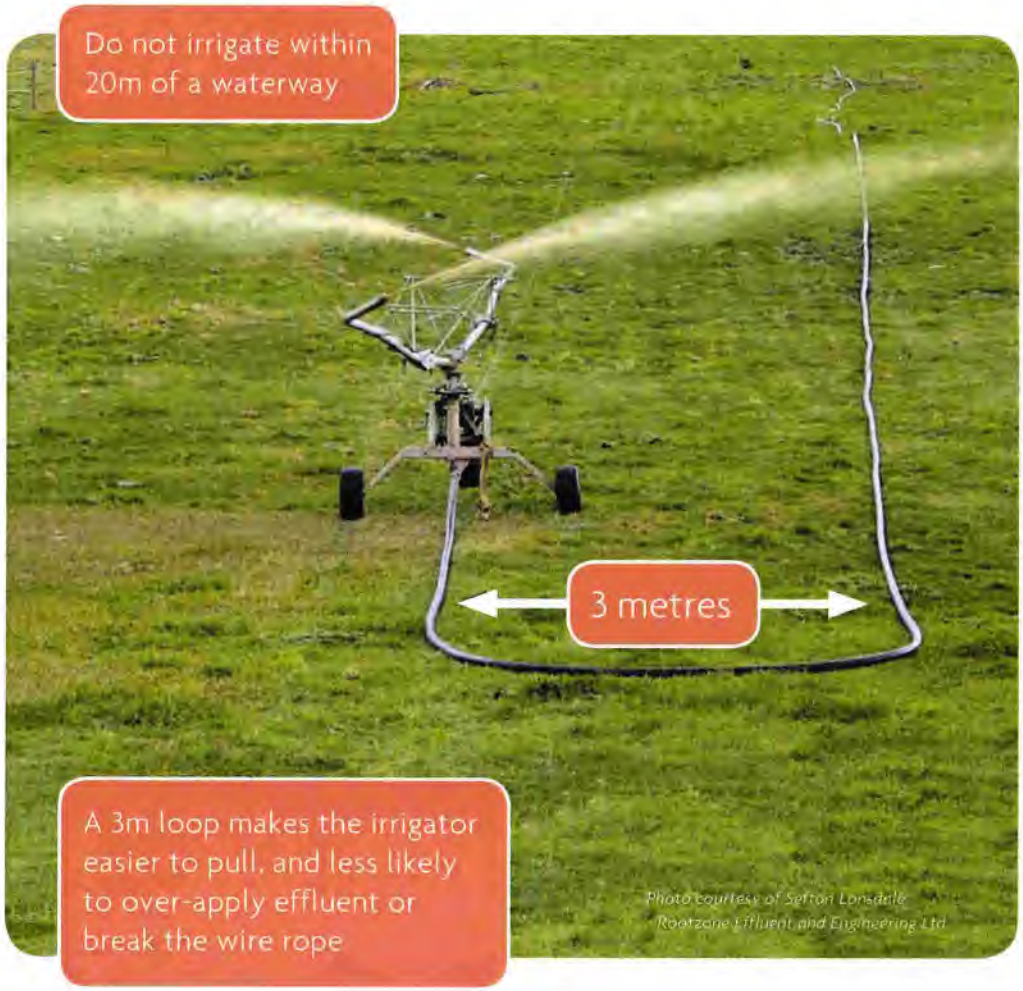
There is already water puddling on the ground/worms on surface.

You can hear/see water or wet mud under foot when you walk.

It has been raining a lot, snowing or the ground is frozen.

The soil makes a 'worm' when rolled, sticks to your thumb when rolled or free water appears when squeezed.

Before irrigating: hose layout for travelling irrigator



Cow and pasture considerations

- Apply effluent onto short pasture. If possible, graze the area 2-3 days before application
- Avoid grazing pasture within 10 days of spraying effluent, to reduce animal health risks and maximise pasture intake
- Avoid grazing springing or just calved cows on the effluent block - this will help avoid metabolic problems
- Avoid water troughs.

How to operate a travelling irrigator

1. Soil

Check the soil moisture. Is it too wet to irrigate?

2. Location

Check the irrigator is in the right location. Check run sheet. Make sure irrigator is away from waterways

3. Remove anchor

Remove the anchor from the post or ground

4. Gear/Brake

Take the irrigator out of gear and take the brake off

5. Wind wire

Wind wire rope slowly

6. Disconnect hose

Disconnect the drag hose from the irrigator

7. Attach

Reverse the bike/tractor towards the irrigator and hook onto the tow ball to move the irrigator to the new run

8. Move

Slowly move the irrigator to the new run. Turn boom lengthways and hang onto it at all times

9. Run the wire

Slowly run the wire rope down the length of the run. Do not go too fast or the rope will tangle

10. Secure anchor

Secure the anchor so it won't pull off/out

11. Hose

Disconnect the drag hose. Never pull more than 2 lengths (50m) at a time. Disconnect from the hydrant if necessary

12. Tow hose

Tie the rope around the pipe and connect to the tow bar. Tow the hose at the female end to avoid tearing the clips off

13. Connect hose

Lay the hose down the run within 3m of the wire to minimise drag. Re-connect the hose to the irrigator

14. Gear/brake

Put the irrigator back into gear (fast speed) and insert brake

15. Wind wire

Wind up the slack in the wire rope, and check the cut-off on the winch winder

16. Cover troughs

Cover any troughs

17. Record

Record run on the run sheet

18. Check irrigator

Is the irrigator moving forward at the fastest speed with the boom spinning? Is there any ponding?

Can you see a problem?

The following section illustrates the possible problems that may arise in all areas of effluent irrigation. Make yourself aware of these and the required actions of each problem.

STOP the irrigator immediately. Inform your manager or farm owner of the issue. It is important to stop the irrigator as the problems arising will have adverse affects on the farm and farm environment.

WARNING. If you have had prior experience or approval to fix the problem then do so. Inform your manager or farm owner of the issue or phone the appropriate service person.

With the irrigator?

Can I see a problem?		What should I do?
The irrigator pressure is too low, or the irrigator has stopped moving. This means the irrigator will apply too much effluent		STOP irrigating and tell your manager/ farm owner
Irrigator is dirty and needs to be serviced		Tell your manager/ farm owner or call the appropriate service person
No nozzle or broken nozzle will result in too much effluent being applied		STOP irrigating and tell your manager/ farm owner
Worn bearings on the irrigator		Tell your manager/ farm owner or call the appropriate service person

In the paddock?

Can I see a problem?		*What should I do?*
Effluent running off in to waterways, streams or rivers		STOP irrigating and tell your manager/ farm owner. Move the irrigator away from waterways
A bad connection between hoses, foaming or puddling leaking from connection		STOP irrigating and reconnect. If parts need replacing tell your manager/ owner
A leak in the pipe - effluent is pooling in and around the pipe in the paddock		STOP irrigating and fix the leak temporarily if possible, tell your manager/owner

With ponding in the paddock?

Can I see a problem?		*What should I do?*
Small puddles or ponding after irrigation that don't disappear for a while		Tell your manager/ farm owner
Large puddles, ponding or sludge remains for many hours and can be seen on pasture		STOP irrigating and tell your manager/ farm owner

Can you see a problem?

With the storage pond?

The following section shows the possible problems that may arise with the effluent storage pond. Make yourself aware of these and the required actions of each problem.

Keep the level of effluent in the storage pond as low as possible:

- To have storage space if you have a breakdown, bad weather or if you are too busy to irrigate
- Irrigate whenever the conditions are right, don't wait until the pond is full
- Check you have enough storage before every milking.

STOP what you are doing immediately. Inform your manager or farm owner of the issue. It is important to stop adding more effluent to the pond as the problems arising will have an adverse affect on the farm and farm environment.

WARNING, inform your manager or farm owner of the issue.

Can I see a problem?		What should I do?
Wet areas or greener areas around the pond may mean that the pond has a leak		Tell your manager/ farm owner and show them the wet/ greener area
Grass or solid crust on the top of the pond means too many solids in the pond		Tell your manager/ farm owner
Cracks in pond walls or the sides of the pond falling in		Tell your manager/ farm owner and show them where the problem is. Make sure there are no safety issues

Can I see a problem?		*What should I do?*
Pond level too high or high level alarm goes off		DO NOT PUT ANYMORE EFFLUENT INTO THE POND. Tell your manager/farm owner or call the appropriate service person
The pond never fills up. This may indicate that there is a leak		Tell your manager/ farm owner

Troubleshooting

Problem: Irrigator travels too slow	
Possible causes	**Fixes**
Irrigator is set on a slow speed	Set irrigator to a faster speed
Nozzle sizes are too big, which will reduce the pressure at the end of the irrigator. This will decrease the number of rotations of the boom	Replace nozzles with new or smaller holes. Recommended size is 11mm and a cone shaped nozzle
The drag hose has been laid out wrong	Lay hose out properly
Not enough pressure is coming from pump to operate the irrigator properly	Service pump or get a bigger pump
Arms at end of boom are pointing too high	Lower arms at end of booms
Irrigator is travelling up hill	Run irrigator downhill, but not toward waterways
Drag hose diameter is too small	Replace with a larger diameter hose if the irrigator can pull it and is the pump is capable

Problem: Irrigator travels too fast	
Possible causes	**Fixes**
Arms at the end of the boom are pointing too low	Raise arms at the end of the boom
Set in wrong gear	Change the gearing

Problem: Effluent ponding/puddles or runoff	
Possible causes	**Fixes**
Application rate too high	Speed up the irrigator and check nozzles
Soils at saturation point	Pump to holding pond and irrigate later

Problem: Blocked nozzles	
Possible causes	**Fixes**
Effluent contains solids that cannot be pushed through nozzle like fibre, feed or rubbish	Unblock nozzles
	Use a stirrer to break up clumps of solids in sump/pond
	Install a grate over sump and put a rubbish bucket in the shed

Problem: Irrigator stalled	
Possible causes	**Fixes**
Irrigator stuck on something	Check for problems remove any obstacles
Hose was laid out wrong	Fix hose and lay out as shown on pg 9
Pump broken	Call for pump service immediately
Irrigator broken	Pump to pond. Check wire, winch gearing, and irrigator components. Repair/replace as required

Problem: Effluent not spraying out of irrigator properly	
Possible causes	**Fixes**
Not enough pressure from pump to operate irrigator properly	Call for pump service
Nozzles blocked	Clear out/replace nozzles if needed. Avoid solids entering
Nozzle sizes are too big, which will reduce the pressure at the end of the irrigator. This will decrease the number of rotations of the boom	Replace nozzles
Blockage at pump	Remove blockage
	Install a debris basket before sump or stone trap
Silting up of mainline	Keep stone trap clean. Flush line with water

Problem: Effluent spraying into waterway, bores, boundaries	
Possible causes	**Fixes**
Irrigation run in the wrong place	Stop irrigating and move irrigator
	Check effluent management plan for correct run locations
	Mark run locations on fences

Problem: Hose blowout	
Possible causes	**Fixes**
Poor or worn couplings	Replace couplings
Pipe kinked	Layout pipe correctly
Couplings installed wrong way around	Put couplings the right way around.

Maintenance – monthly

At the shed

1. Empty weekly

Clean the effluent sumps and stone trap

2. Float switch

Check float switches are clear and working

3. Storage

Check level of storage ponds

At the irrigator

1. Grease

Grease all moving parts

2. Nozzles

Check nozzles are not blocked or damaged

3. Tyres

Check tyre pressure is firm

4. Battery

Battery of irrigator failsafe/ monitor

5. Winch and wire

Winch and gearing is operating and wire rope is not frayed

6. Hoses and joints

Clean connections and check hoses have no cuts, splits or bulges

At the storage pond

1. Pipes

Check pipes are running in and out are not blocked

2. Walls

Check pond walls are stable

3. Leaks

No signs of leaks

4. Fence

Check fence is safe and secure

5. Smell

Does the pond smell bad?

Maintenance – 6 monthly

At the shed

1. Pump

Strip pump, oil and clean and check the pump seals/impeller

2. Pressure

Check the pressure at the pump, compare against ideal

3. Flush

Flush clean water through delivery line to clean out pipes and irrigator

At the irrigator

1. Wheel bearings

Check the wheel bearings

2. Pressure

Check pressure in the paddock, and compare against ideal

3. Rate & depth

Measure application rate and depth (see page 23)

Pipes, hoses and nozzles

1. Hydrants

Check the condition of the hydrants

2. Couplings

Check the condition of the couplings

3. Replace nozzles

Replace the nozzles once a year

Sump/stone trap

1. Rubbish

Collect any rubbish out of the sump and/or the stone trap

2. Prepare

If sump/stone trap is wide enough use front end loader, otherwise use a shovel and wheel barrow

3. Scoop

Slowly scoop out the contents taking care not to spill it. Use the low ratio on the tractor to avoid ripping up the entry

Maintenance – annually

At the storage pond

1. Desludge pond (Recommendations do not apply to synthetically lined ponds, call a professional to desludge synthetically lined ponds)

1. Remove the crust with excavation machinery – warning: gases may be released when crust is first broken so keep clear and away from pond edge
2. Stir the pond to mix the solids before emptying
3. Never empty the pond completely
4. Be careful to not damage the sides/bottom or the liner of the pond when emptying
5. Pond sludge has more nutrient value than normal effluent, so apply to bigger area at lower rate
6. Repair any damage to the pond before putting any effluent back in.

2. Grass edges

Control/spray the grass and the weeds around edge of the pond

Maintenance – spreading effluent solids

Spreading direct to pasture

Muck spreader/slurry tanker

1. Transfer sludge to a muck spreader or slurry tanker
2. Check effluent plan for disposal location
3. Add water to the sludge to make it easier to spread
4. Avoid danger zones e.g. waterways, bores, boundaries, creeks etc.

Tractor

1. Check the effluent plan for disposal location
2. Add some water to the sludge to make it easier to spread
3. Spread the load lightly across as larger area as possible
4. Do not dump in one spot.

Stockpiling/composting

1. Check sealed storage area is ready and that the liquid will drain safely into the effluent system or be collected
2. Carefully transport sludge to the storage area
3. Empty sludge onto pile
4. Check that there is no run off.

Monitoring

Understanding application depth

Application depth is how much volume is going on to your soil – usually referred to as depth (mm) – similar to the rainfall you collect in a rain gauge e.g. 20mm.

Understanding application rate

Application rate is how fast it is going on – usually referred to as (mm/hr) similar to the intensity of rainfall e.g. 10mm in 1 hr.

Maximum application rate and depth for different soil types?

Maximum application rate and depth may be set by regional councils. Ask your manager/farm owner for this farm's maximum. It is not to be exceeded. If there are no figures from the council then the amount of effluent you can apply at one time, and the speed you can apply it at, is dependent on the soil type. Using the table below and having a discussion with your manager or farm owner, fill in the appropriate areas of the worksheet.

Soil type	Maximum application depth	Maximum application rate
Sand	15mm	32mm/hr
Loamy sand	18mm	32mm/hr
Sandy loam	22mm	20mm/hr
Fine sandy loam	24mm	17mm/hr
Silt loam	24mm	10mm/hr
Clay loam	18mm	13mm/hr

How to test application depth and rate

Test location

Test the application depth at the location which puts the pump under the greatest work load, e.g. at the greatest distance from the pump, or at the highest elevation above pump station.

Collection containers

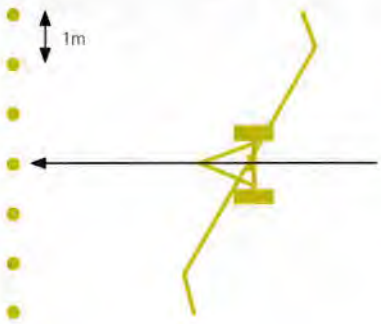
When testing you can use either rectangle trays with straight sides, rectangle trays with sloped sides or standard round buckets. You will need about 20 of these. You must use a different calculation depending on the type of collection container.

Step 1:

Containers

Before applying effluent, put containers in a line across the path of the applicator:

1. 1-2 metres apart
2. use enough containers across the spray width of the irrigator
3. put a stone in each container to stop it blowing over.



Step 2:

Run irrigator

Run the irrigator as normal:

1. record the actual amount of time that effluent is falling in the containers.

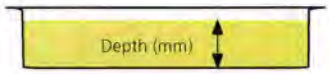
Step 3:

Measure the depth of effluent in every 'wet' container.

Tip: Make sure container is level (not on a slope) before you measure.

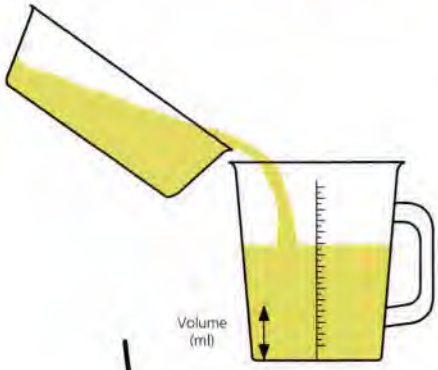
For RECTANGLE TRAYS WITH STRAIGHT SIDES:

1. use a tape measure
2. remove the stone
3. measure how deep the effluent is in each container (mm)
4. write down depth for each container.



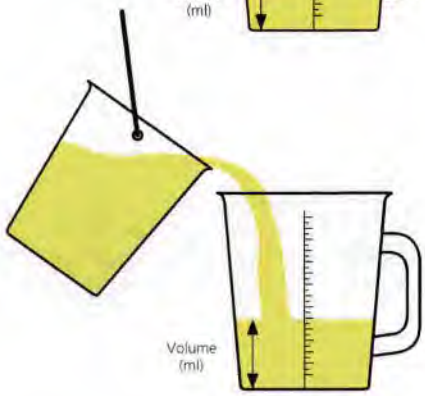
For RECTANGLE TRAYS WITH SLOPING SIDES:

1. remove stone
2. tip effluent into measuring jug record the volume (ml)
3. write down volume for each container.



For ROUND BUCKETS WITH SLOPING SIDES:

1. remove stone
2. tip effluent into measuring jug record the volume (ml)
3. write down volume for each container.



How to calculate application and depth rates

Rectangle trays with STRAIGHT sides

Record the depth from each container, e.g. on a sprinkler with a 40 m diameter wetted area, there may be 20-40 containers.

Container 1 Container 2 etc ...

	+	+	+	+	+	+	+

TOTAL (mm)

TOTAL (mm)	÷	**NUMBER OF CONTAINERS**	= **AVERAGE APPLICATION DEPTH (mm)**

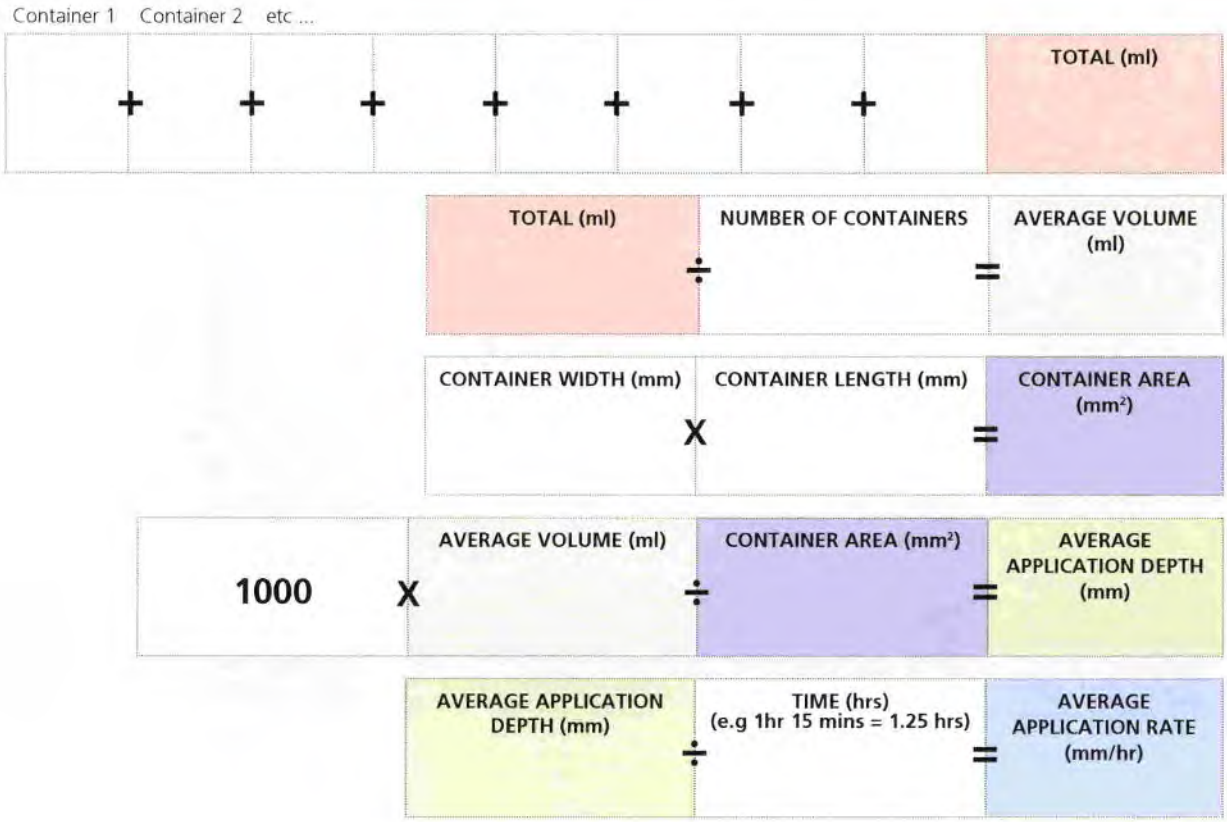
AVERAGE APPLICATION DEPTH (mm)	÷	**TIME (hrs) (e.g 1hr 15 mins = 1.25 hrs)**	= **AVERAGE APPLICATION RATE (mm/hr)**

Note: Maximum application depth = The CONTAINER with the deepest measurement.

Tip: To convert seconds or minutes to decimal, divide by 60 e.g. 21 mins = 21 ÷ 60 = 0.35 hrs.

Rectangle trays with SLOPED sides

Record the depth from each container, e.g. on a sprinkler with a 40 m diameter wetted area, there may be 20-40 containers.

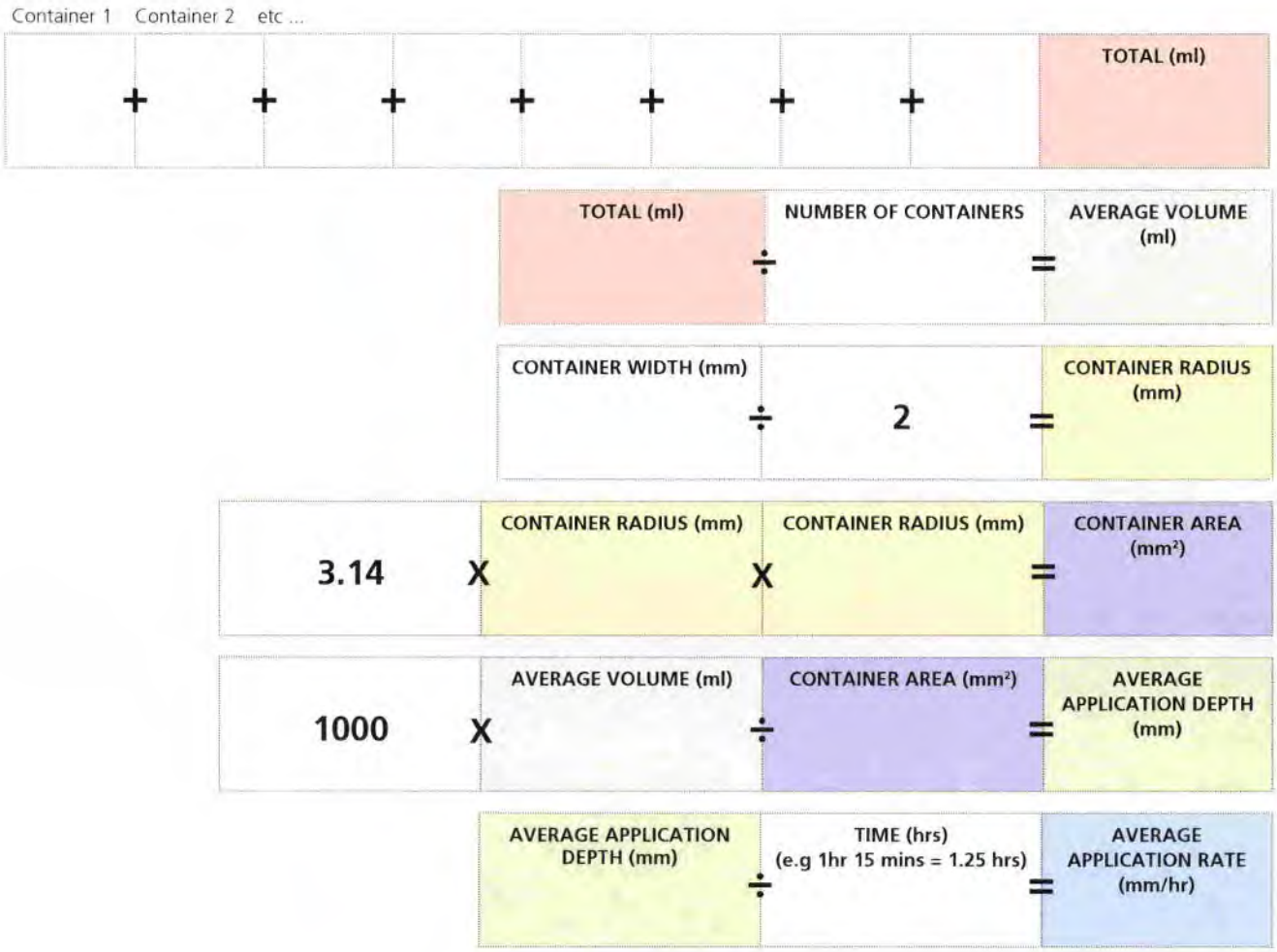


Note: Maximum application depth = The CONTAINER with the deepest measurement.

Tip: To convert seconds or minutes to decimal, divide by 60 e.g. 21 mins = 21 ÷ 60 = 0.35 hrs.

Round buckets with SLOPED sides

Record the depth from each container, e.g. on a sprinkler with a 40 m diameter wetted area, there may be 20-40 containers.



NOTE: Maximum application depth = The CONTAINER with the deepest measurement.

Tip: To convert seconds or minutes to decimal, divide by 60 e.g. 21 mins = 21 ÷ 60 = 0.35 hrs.

For assistance and advice on testing application depths and rates on pivot systems, please contact DairyNZ.

Worksheet

Important contacts

MANAGER _____

FARM OWNER _____

EFFLUENT SYSTEM SERVICE REPAIR _____

VACUUM TANKER _____

REGIONAL COUNCIL _____

Farm policy

1 No effluent gets into waterways

2 No effluent puddles in any paddocks

3 Effluent system is checked daily (minimum)

4 If there are problems with effluent, talk to the manager/farm owner

5 Effluent irrigation events are checked and recorded against the Effluent Management Plan

6 The resource consent is displayed in the shed

7 **Pg 22 The maximum application depth is not exceeded**

Our consented max application depth is.....mm

Based on our soil type .....our maximum application depth is.....mm

8 **Pg 22 The maximum application rate is not exceeded**

Our consented max application rate is.....mm

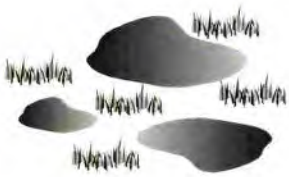
Based on our soil type .....our maximum application rate is.....mm

9 **Pg 6 Effluent is not applied if the soils are too wet**

Irrigate < Less than [ ] Write critical soil moisture figure here > Greater than *Do not irrigate*

Emergency

The pond is leaking



Puddles on grass

Burst pipes

Overflowing

Blockage

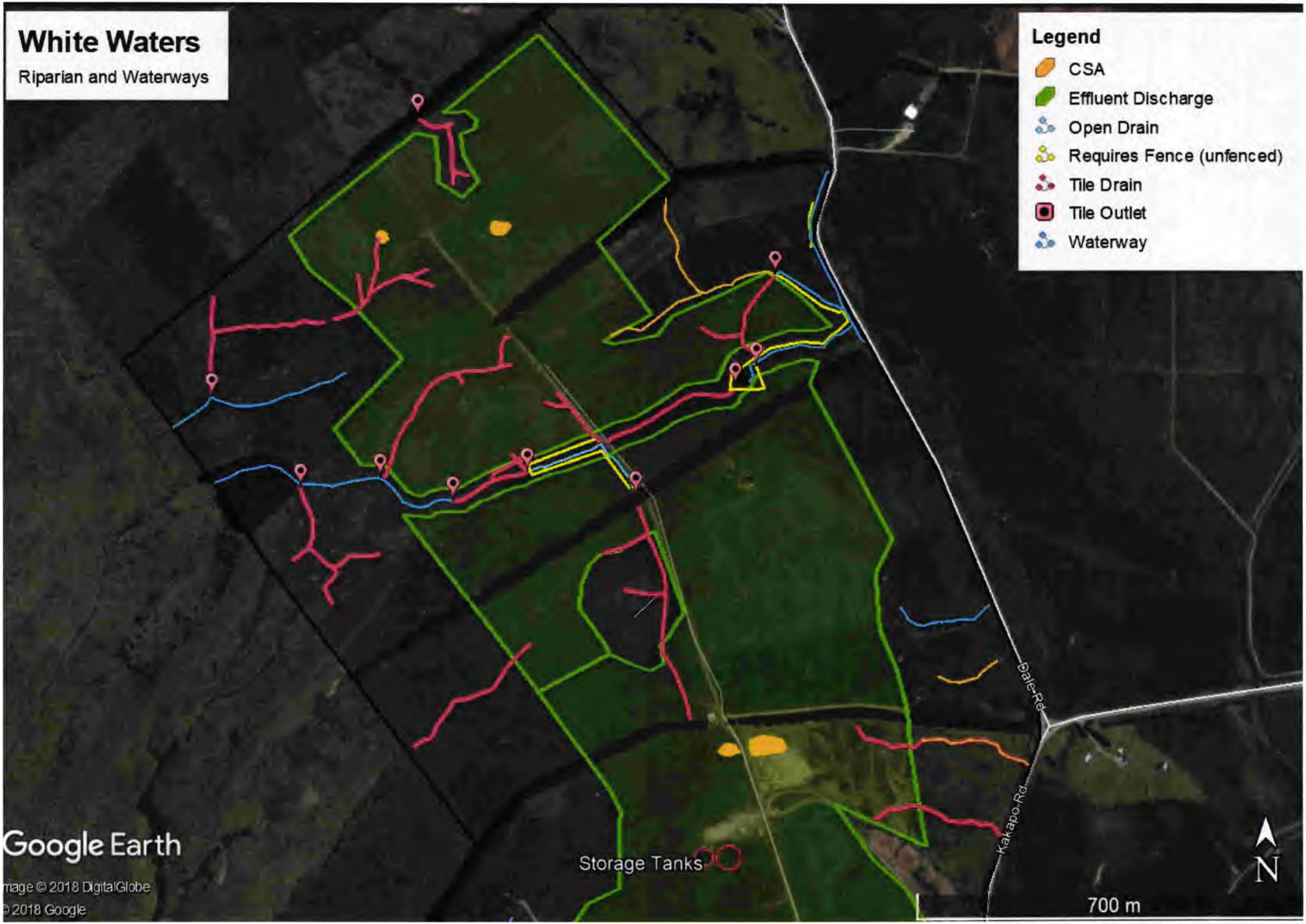
Emergency Numbers:

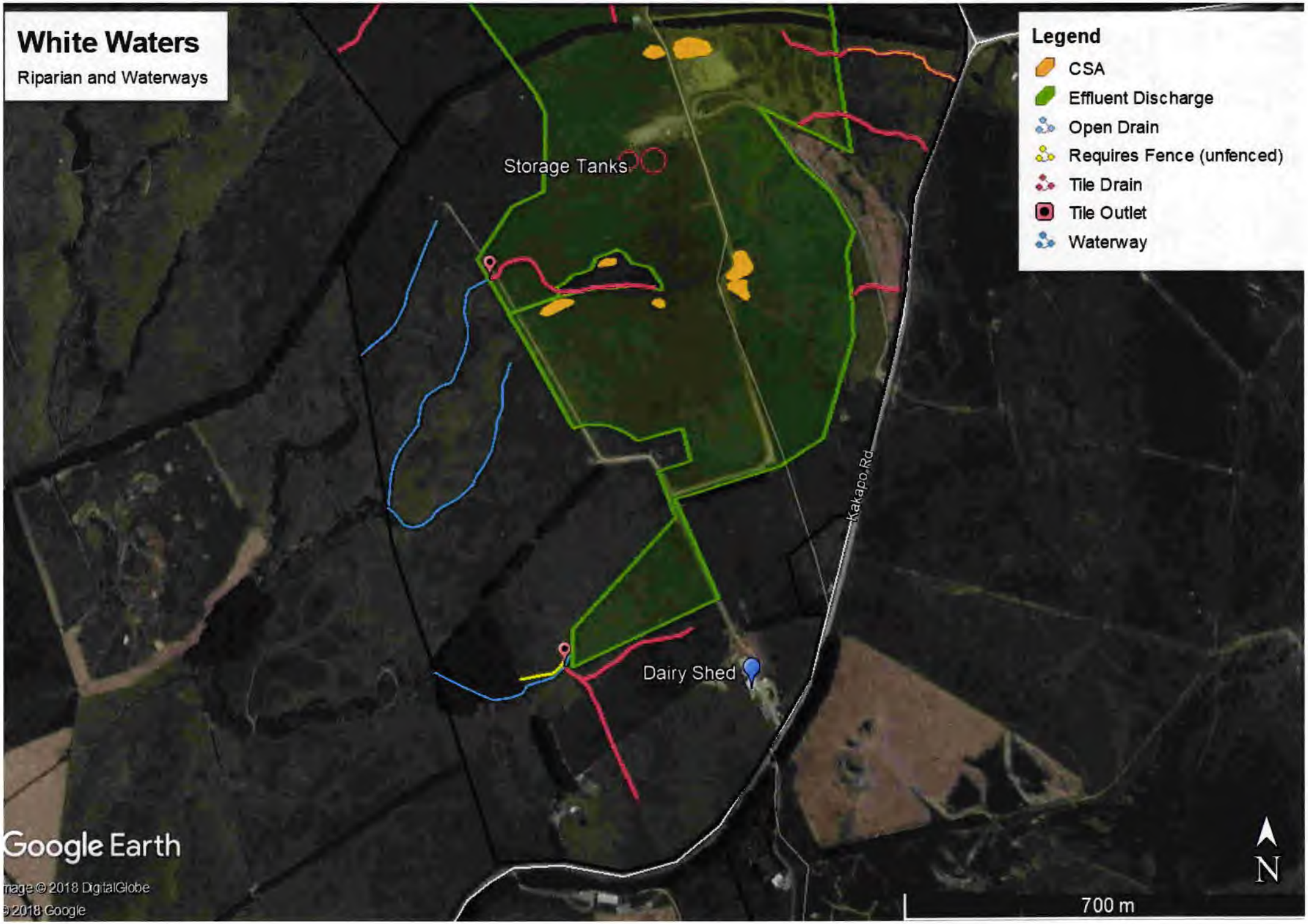
Farm manager/owner .....

Regional council .....

Effluent systems repairs .....

Riparian & Waterways Map


White Waters
Riparian and Waterways
Legend
CSA
Effluent Discharge
Open Drain
Requires Fence (unfenced)
Tile Drain
Tile Outlet
Waterway
Bale Rd
Kakapo Rd
Storage Tanks
Google Earth
Image © 2018 DigitalGlobe
© 2018 Google
700 m
N


White Waters
Riparian and Waterways
Legend
CSA
Effluent Discharge
Open Drain
Requires Fence (unfenced)
Tile Drain
Tile Outlet
Waterway
Storage Tanks
Dairy Shed
Kakapo Rd
Google Earth
700 m
N

Winter Grazing and Cropping Map


Crop Map
Legend
CSA
Direction to Graze
Open Drain
Tiled
Waterway
Crop 1
Crop 2
Crop 3
Crop 4
Crop 5
Crop 6
Google Earth
Image © 2017 DigitalGlobe
© 2017 Google
800 m
N