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25 February 2010

Consents Project Leader
Environment Canterbury
P O Box 345
CHRISTCHURCH

Attention: Anita Warnock

Dear Anita

RE: REQUEST FOR FURTHER INFORMATION UNDER SECTION 41C OF THE RESOURCE MANAGEMENT ACT, IN RELATION TO VARIOUS RESOURCE CONSENT APPLICATIONS BY: SOUTHDOWN HOLDINGS LIMITED, FIVE RIVERS LIMITED AND WILLIAMSON HOLDINGS LIMITED

Further to the 17th Minute of Commissioners (10 February 2010), and the Memorandum from Dr. Michael Freeman (3 February 2010), please find attached to this letter the responses prepared to Environment Canterbury's request for further information (18 January 2010). As the Memorandum only requested that responses be provided in relation to matters 6, 9-16 and 18, none of the other specific information requests are addressed in this correspondence.

This response has been prepared on behalf Southdown Holdings Limited, Williamson Holdings Limited, and Five Rivers Limited (the Applicants) with input from Mitchell Partnerships Limited, Ryder Consulting Limited (water quality), and Aqualinc Research Limited (farm dairy effluent), to enable an understanding of the nutrient loads and associated cumulative water quality effects associated with the three development proposals.

It is noted that the information requests were identical for each of the properties, and as such, we have provided responses to the specific information requests that cover all three properties. Where more specific detail needs to be provided in relation to a particular property, then that property is identified and addressed.

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Yours sincerely,
MITCHELL PARTNERSHIPS LIMITED

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Email: craig.mckibbin@mitchellpartnerships.co.nz

cc:	Richard Peacocke	Southdown Holdings Limited	)
	Kees Zeestraten	Five Rivers Limited	)
	Kerryn Thomas	Killermont Station	)
	Melissa Robson	Ryder Consulting Limited	) by email
	Neal Borrie	Aqualinc Research Limited	)
	Christian Whata	Russell McVeagh	)

REQUEST FOR FURTHER INFORMATION UNDER SECTION 41C OF THE RESOURCE MANAGEMENT ACT IN RELATION TO VARIOUS RESOURCE CONSENT APPLICATIONS BY:
SOUTHDOWN HOLDINGS LIMITED – CRC100224, CRC100480, CRC100481, CRC100482, CRC101542;
FIVE RIVERS LIMITED – CRC100787, CRC100788, CRC100824, CRC100827 & CRC101540; AND
WILLIAMSON HOLDINGS LIMITED CRC100227, CRC100475, CRC100478, CRC100479, CRC101541

6. ***Clarification of the quantity of solids proposed to be produced and exactly how those solids are going to be stored and applied to land. The AEE description is very limited regarding the volumes involved, storage shed details, sealing, covers, etc.***

The solid fraction will be stored on a covered concrete pad or in a concrete bunker that drains to the effluent facility[1]. Any form of impermeable cover is acceptable and is likely to be a tarpaulin, similar to those used on silage clamps. The solids will be spread using a calibrated muck spreader[2]. The spreading of the solids will occur throughout the year except during periods of adverse ground conditions (i.e. during times of saturated or frozen ground conditions).

While facilities for the storage of the separated solids will be provided on each dairy farm it is not proposed to store solids for extended periods. The normal practice will be for the solids to be spread as soon as practicable after they have been separated from the effluent.

On the basis that the solids content of the raw effluent is 8%, and the solids separation removes 50% of the solids the volume of solids produced by a 1,000 cow dairy herd that is housed for seven months is approximately 500 cubic metres.

9. ***The information used to derive the Mackenzie Water Research Limited whole farm N loss threshold for the whole property and the derivation of the farm effluent loading rates used in the OVERSEER modelling. This should include a step by step explanation of how an initial N loss estimate is reduced to the eventual threshold value. This should also include an explanation of the steps and assumptions involved in the OVERSEER modelling, and specifically explain the derivation of the effluent nitrogen concentration used. Different nitrogen loading rates appear to have been used for the three properties, as illustrated below[3]:***

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[1] FEMP section 5.5 – Manure, effluent and silage storage

[2] FEMP section 5.5 – Manure, effluent and silage storage

[3] Please note that this table has been updated as shown since the further information request was made on 18 January 2010

Property	Nitrogen load (kg N/ha/yr)				File name
	Effluent	Fertiliser	Atmospheric/clover	Total	
Killermont	205	150	11	366	SHL KMT final 350kg MS animal weight
Glen Eyrie Downs	185	130	13	328	GED final 350kg MS animal weight
Ohau Downs (Two blocks)	154/154 153	130/150 100	103/90 106	387/394 359	OD 400kg MS Dryland sheep animal weight

The first part of this information request is not relevant to the effluent discharge applications, and would be better addressed through examination of the Mackenzie Water Research Limited (MWRL) Water Quality Study (WQS).

Derivation of farm threshold

Step 1: The losses from the proposed system were modelled. In general, the proposed losses would be calculated using the new irrigation area superimposed onto the LCDB map. In the case of these three farms simple OVERSEER nutrient budgets were constructed to give an indicative loss from the proposed farming systems on each farm.
Step 2: The nutrient mitigation requirements for each of the receiving environments for each of the farms were calculated.
Step 3: The area of planned irrigation was multiplied with the most stringent N and P mitigation requirements and subtracted from the modelled loss from the original proposed system, thus giving the farm threshold.

Assumptions in OVERSEER that impact on N management for Killermont and Glen Eyrie

- 3 calvings per year;
- 3.5 cow/ha constant over year;
- Maximum permissible dry matter cut for silage;
- All infrastructure housing stock is concrete based and is dry scraped. All raw effluent is collected in a central facility for each sub-divided farm;
- Any parlour washings are collected in the central effluent facility;
- Solid and liquid fraction of raw effluent separated. This was done for several reasons: i) to create a more uniform product to recycle back to land in the liquid fraction with a high degree of available nutrients simulating a liquid fertilizer ii) to allow excess nutrients to be removed from the farm and be in form that is relatively easily transported and applied elsewhere and that is a good soil conditioner and organic fertilizer;
- No net mineralization;
- All effluent (as opposed to solid manure fraction) is spread back to all irrigated areas through centre pivots;
- All solid manure is stored on concrete pads that drain to effluent facility and are covered; and

- Low clover contents maintained to achieve higher control over N inputs into the system. Going forward, clover contents could be monitored and increased and inorganic N reduced accordingly.

Assumptions in OVERSEER that impact on N management for Ohau Downs

- 3 calvings per year;
- 3.5 cow/ha constant over year;
- Maximum permissible dry matter cut for silage;
- All infrastructure housing stock is concrete based and is dry scraped. All raw effluent is collected in a central facility for each sub-divided farm;
- Any parlour washings are collected in the central effluent facility;
- All effluent is spread back to all irrigated areas;
- Pond sludge is spread back to all irrigated areas and dryland pasture (excluding QE2 land).
- All solid manure is stored on concrete pads that drain to effluent facility and are covered; and
- No net mineralization.

Steps in OVERSEER

Sequential steps

- The base model of the farm is constructed using the available physical information, such as land area and block set up.
- The stock information is entered.
- The winter management of the stock is entered.
- The effluent management information is entered
- Changes to default settings entered e.g. pasture utilization, clover levels
- Individual block information is entered such as soil type, soil analyses, climate, block management.

Iterative steps – check points

- Supplements removed and supplements imported
- Pasture cut for silage
- Fertiliser applications
- Animal intake (ME)
- Pasture growth and animal uptake
- Fertilizer applied/pasture grown relationship
- Changes in inorganic soil pool
- Mineralization/immobilization

Derivation of effluent N concentration used

This is calculated internally within OVERSEER and is a function of variables such as the number of stock, the housing, whether solids are separated, the type and quantity of supplements.

It is for the reasons listed above that there are different nitrogen loads for each property.

10. ***Clarification of whether any nitrogen loss as a consequence of wetland treatment and/or potentially poorly drained soils is included in the OVERSEER nutrient load modelling.***

There is modelled to be a nutrient loss as a function of wetland riparian margins and/or poorly drained soils and grass strips within the OVERSEER nutrient budget. However, these reductions have not been used to meet thresholds. The total nutrient losses given for each property is without any contributing effect of the wetlands or strips. If nutrient reductions are achieved by these features, this will lead to a greater margin under thresholds.

11. ***Clarification of the extent to which any nitrogen loading reductions are proposed to be achieved via methods outside those included in the OVERSEER modelling.***

Nutrient reduction methods not modelled in OVERSEER are not used to meet thresholds.

12. ***What proportion of the total property area would be used for effluent application? For example, please provide specific calculations that incorporate the exact areas that would be irrigated rather than the total property area.***

It is intended that the effluent is recycled to all the irrigated parts of the property via the centre pivots except no spread zones bordering watercourses and bores.

Property & Area (ha)	Effluent Application Area (ha)	Effluent Application Area (%)
Glen Eyrie Downs (2135ha)	2068ha	97%
Ohau Downs (5149ha)	2000ha	39%
WHL Killermont (1184ha)	1049ha	89%

13. ***Clarification of the specific methods that would be used to match effluent application with plant nutrient uptake rates. The AEE states that effluent application rates would be matched to plant nutrient uptake rates. This should include clarification of how severe weather events and climate change scenarios would be managed. This should also include details relating to how soil moisture levels would be taken into account.***

Effluent application will be matched with plant uptake through the following means:

- Effluent will only be applied during active plant growth (i.e. when plants are actively taking up nutrients generally in spring and summer);
- The use of soil moisture monitoring[4] to determine soil moisture deficits and subsequent irrigation rates (irrigation plus effluent) to avoid summer drainage will retain the irrigation water plus effluent in the root zone and therefore available for plant uptake; and,
- The use of a recognised system of fertiliser recommendations and use of nutrient budgeting to ensure that the gross application of nutrients does not exceed the gross plant requirement.

[4] Monitoring will take place as part of the irrigation consents.

As stated above, the soil moisture deficit monitoring is used to assess how much irrigation can be applied while maintaining a minimum buffer. This serves to buffer against unexpected rainfall events and maximises effective rainfall. Climate change scenarios have not been accounted for within this application, but could impact on effluent collection and application. The possible impacts of climate change are considered as follows:

a) Increased rainfall would increase the volume of effluent to be collected (although this would be limited, as the majority of the yards would be covered and clean roof water will be used or discharged, but not routed into the effluent collection facility).

b) More rainfall events and annual rainfall would reduce the occasions suitable for applying irrigation and effluent. A greater percentage of effluent applied with the irrigation water to the top of the range quoted (10%) would allow greater volumes of effluent to be discharged during active plant growth.

c) More extreme rainfall events with unchanged annual rainfall would not decrease application opportunities and may lead to increased opportunities, however, the soil moisture deficit maintained may need to be increased to provide an increased buffer to accommodate larger events. In this circumstance, overland flow is also more likely and therefore additional surface runoff mitigations may be required (e.g. infield grass strips, sediment ponds and strategic sub-soiling). This will be picked up during the recommended wet weather surveys where appropriate.

d) Reduced rainfall would increase the available opportunities for effluent and irrigation application.

14. Clarification of the extent that pasture cut and carry and/or effluent export would be used to meet nutrient loading targets.

In the cut and carry systems proposed the cut silage is not removed from the farm, so the nutrient thresholds are not met by export of nutrients in this way. The nutrient reduction mechanism is predominantly through the stock not being on the paddocks through the winter period, thus reducing the patchy and high application rates associated with urine spots.

The solid manure export has not been used to meet farm nutrient thresholds. The export is modelled to avoid more than 200 kg N/ha of organic N being applied[5].

15. The proposed total nutrient loading from this property and other properties that currently have discharge permit or water permit applications being heard, to the Ahuriri Arm catchment of Lake Benmore. Could this total, together with the nutrient load from other land uses not involved in the resource consent process, be compared to the Mackenzie Water Research Limited proposed nutrient limits for the Ahuriri Arm.

[5] FEMP section 5.5 – Manure, effluent and silage storage

As with 9) above this request for further information is not relevant to the effluent discharge consents and is being addressed separate to these applications.

16. Detailed information that shows the total farm area and the blocks used in the OVERSEER modelling so that a comparison can be made to confirm that the total farm area has been modelled in OVERSEER.

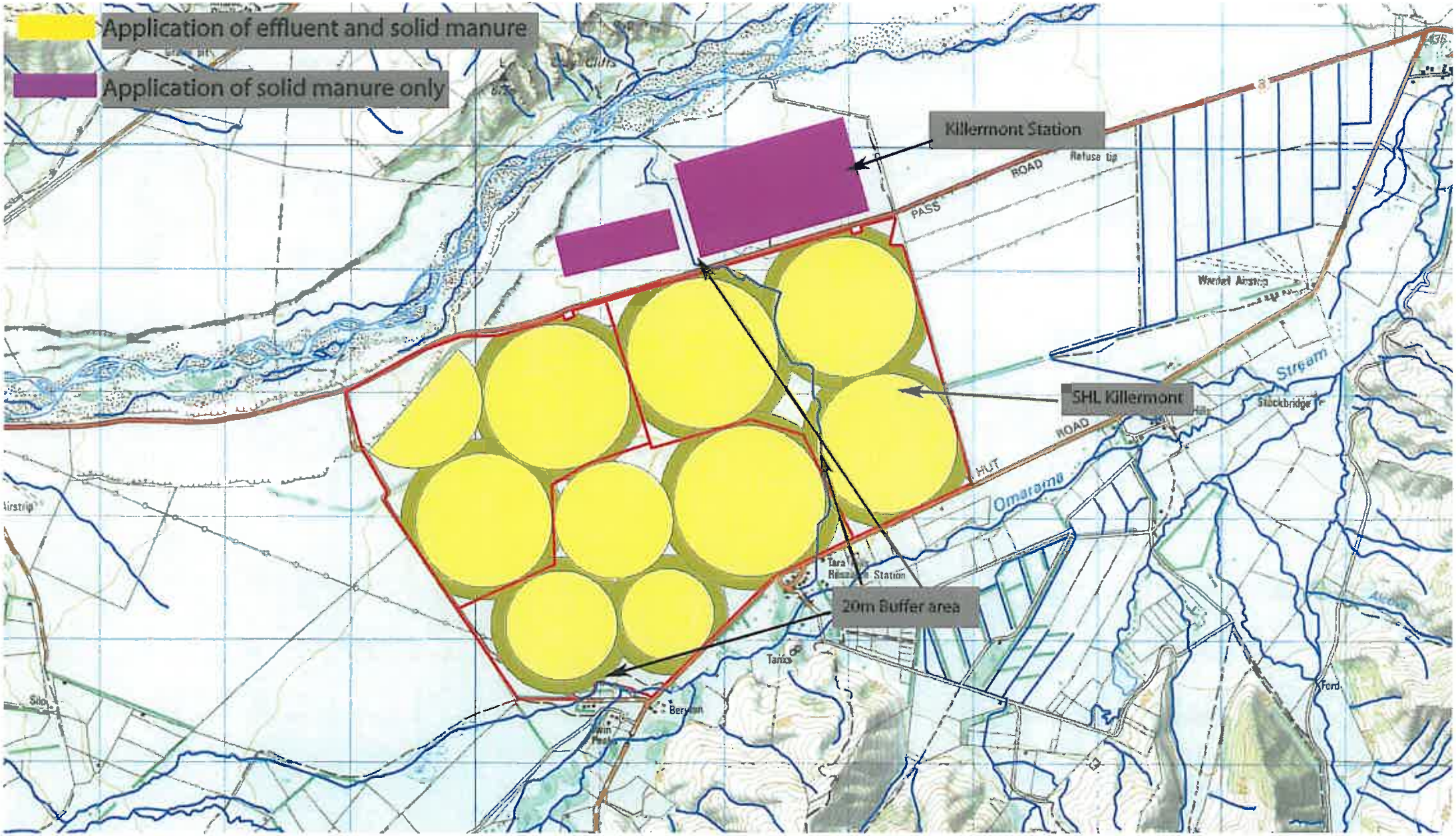
Maps are enclosed as **Appendix A** with this response showing the irrigation areas on each property. For Glen Eyrie Downs and WHL Killermont, the unirrigated areas are those around the watercourses and the infrastructure of each cubicle stable, and for the purposes of OVERSEER only 2 blocks have been used; irrigated and dryland as the soil types are relatively uniform across the properties. For Ohau Downs only a proportion of the farm is planned to be irrigated and this irrigated area has been broken up into 2 blocks in OVERSEER to reflect differing soil characteristics on each block, with the 'Isolation' irrigation to the east and the 'Wairepo' irrigation to the west.

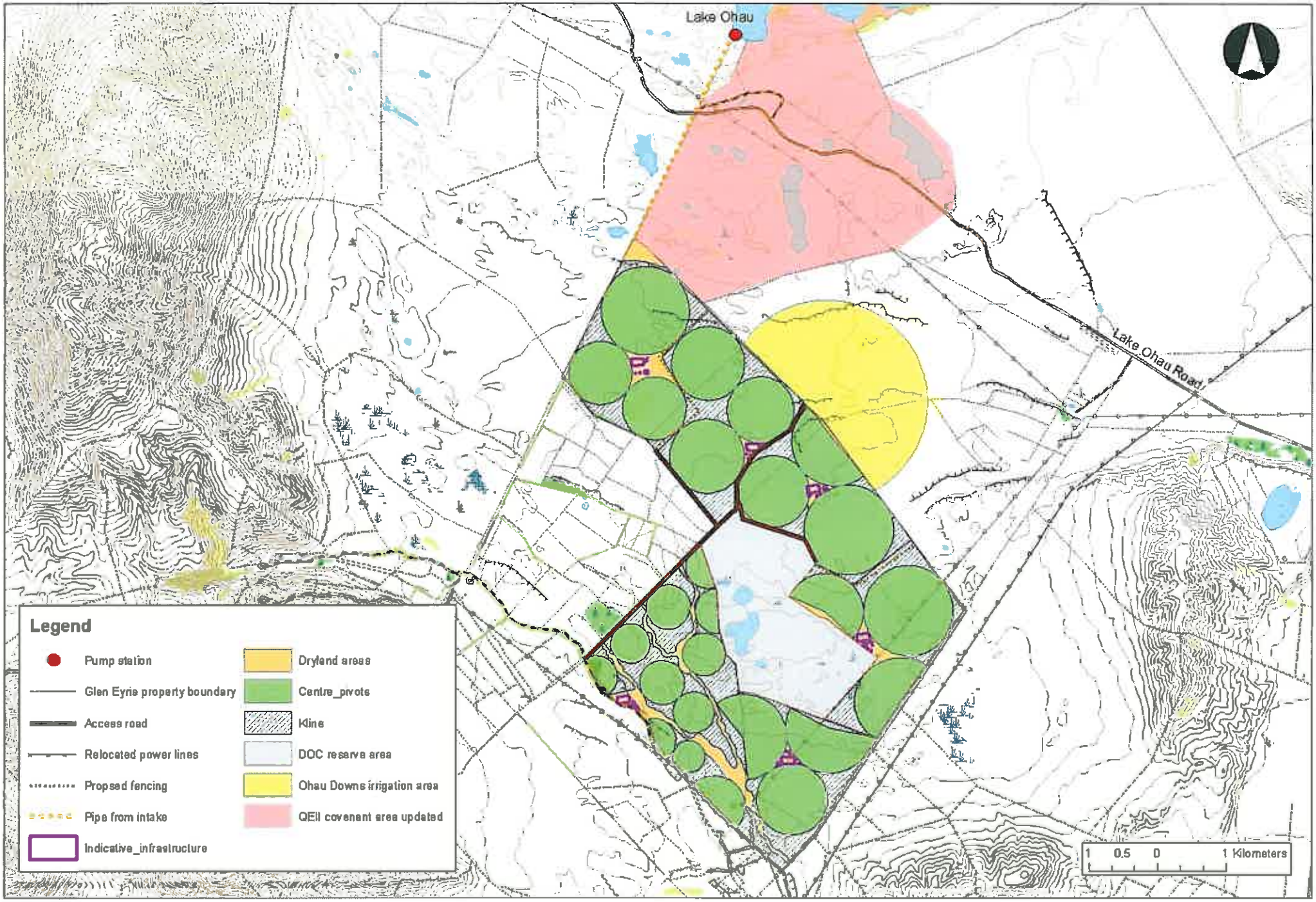
18. Clarification on the actual methods that would be used to ensure effluent cannot be irrigated into or immediately adjacent to streams. This should include specification of any proposed fail-safe control systems.

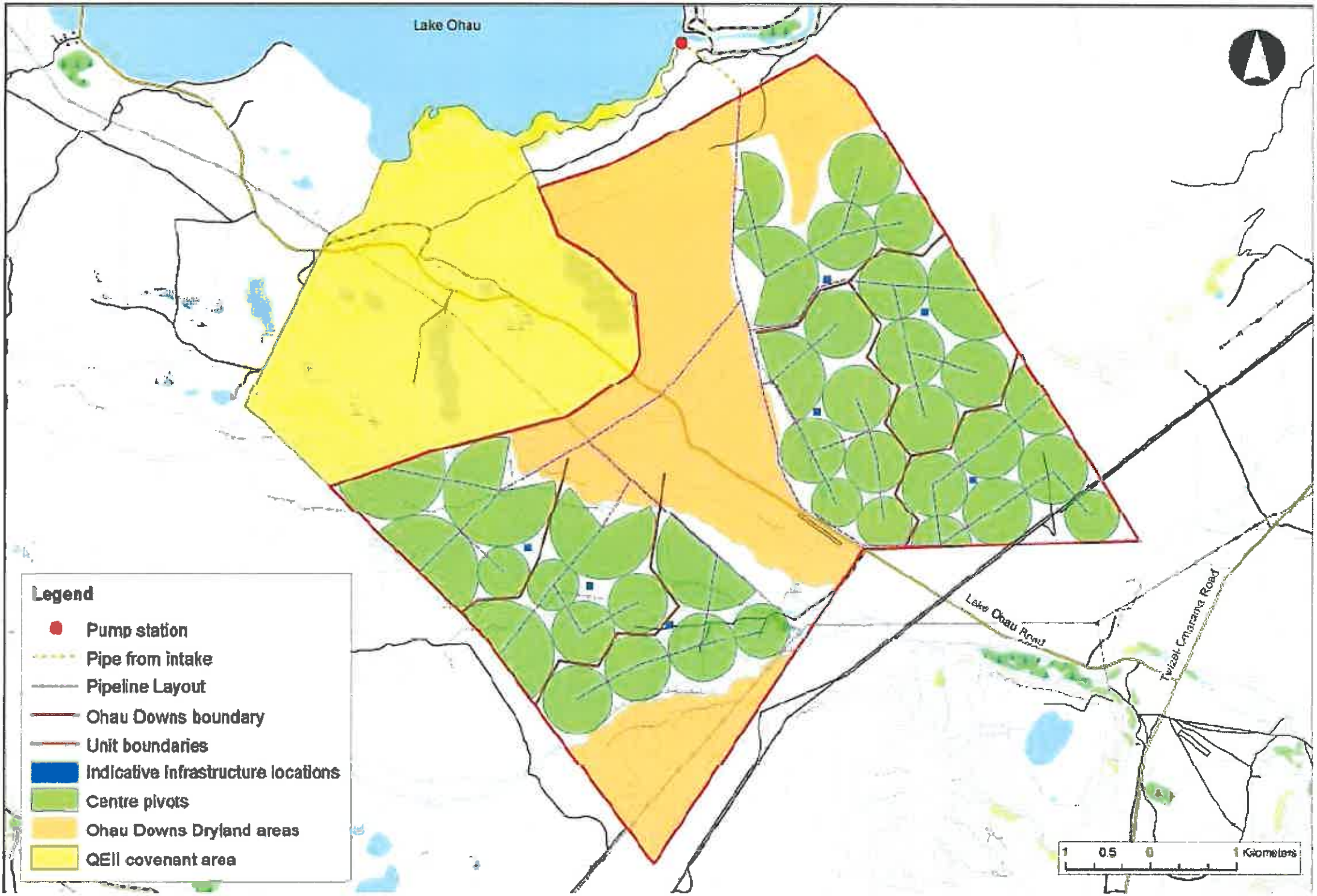
It is proposed that the effluent would be piped from the individual dairy farms to each centre-pivot irrigator where the effluent would be injected into the irrigation water. None of the centre-pivot irrigators used to irrigate the effluent will cross streams. Liquid effluent will be applied by tanker truck in those paddocks that have streams running thru the pivot circles.

APPENDIX A

Property Maps Including Irrigation Areas


Application of effluent and solid manure
Application of solid manure only
Killermont Station
SHL Killermont
20m Buffer area
Omarama
Stream
ROAD
PASS
HUT
Refuse tip
Stockbridge
Tara
Station
Tarras
Ford
Airstrip


Lake Ohau
Lake Ohau Road
Legend
Pump station
Glen Eyrie property boundary
Access road
Relocated power lines
Proposed fencing
Pipe from intake
Indicative_infrastructure
Dryland areas
Centre_pivots
Kline
DOC reserve area
Ohau Downs irrigation area
QEII covenant area updated
1 0.5 0 1 Kilometers


Lake Ohau
Lake Ohau Road
Twizel-Omarama Road
Legend
Pump station
Pipe from intake
Pipeline Layout
Ohau Downs boundary
Unit boundaries
Indicative infrastructure locations
Centre pivots
Ohau Downs Dryland areas
QEII covenant area
1 0.5 0 1 Kilometers