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**Request for further information under Section
92(1) of the RMA**

Silver Fern Farms Mossburn

1 MAY 2019

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1 May 2019

RE: Request for further information under Section 92(1) of the RMA – Application for discharge permit (Silver Fern Farms Mossburn APP-20191007).

This letter responds to Environment Southland's (*ES's*) request for further information dated 31 January 2019 (*RFI*) on matters relating to the renewal of consents to discharge to land at Silver Fern Farms Mossburn. We respond to each matter below.

1. Assessment of cumulative effects of the discharge to land on water quality

As outlined in the AEE¹ it was noted that Liquid Earth outlined that any down-gradient water would be significantly diluted by the larger water surplus in the area, and the potential effects to ground water are shown to be less than minor. Following receipt of the *RFI* from Environment Southland, Silver Fern Farms engaged Liquid Earth to provide a further assessment of the potential cumulative effects on water quality associated with the proposed discharge relating to the replacement consent being sought.

The below responses comes from that report².

a. Description of the current water quality in the wider receiving environment

- Overall, available groundwater quality data from the Castlerock groundwater zone indicates background groundwater nitrate concentrations are generally low to moderate (< 4 mg/L), but may be strongly influenced by localised contaminant inputs to the aquifer system, particularly down-gradient of intensive land use³.
- Approximately 60 percent of groundwater throughflow in the Castlerock groundwater zone is discharged to the Oreti River via spring-fed streams that originate along the eastern margin of the Castlerock Terrace⁴.

¹ AEE (Dec 2018), p.45-46

² Liquid Earth (5 April 2019): *Silver Fern Farms – Irrigation of Meat Processing Wastewater at Mossburn Plan*. Letter report prepared for Silver Fern Farms, 5 April 2019.

³ Liquid Earth (5 April 2019): s.2.1, p.5.

⁴ Liquid Earth (5 April 2019): s.4, p.12.



- Nitrate concentration are generally low at State of the Environment and National River Water Quality Network monitoring sites in the Oreti River (<1mg/L). Results over the period 2006 to 2016 suggesting water quality in the Oreti river is slightly improving⁵.
- Generally, nitrogen levels in the tributaries of the New River Estuary (NRE) have been increasing for the period 2000 to 2016⁶.

b. Assessment of cumulative effects on groundwater quality downgradient

- Available groundwater monitoring information does not indicate departure from background concentrations in the area west of Sutherland Road that would indicate a significant impact on nitrate concentrations associated with wastewater discharge from the Mossburn plant⁷.
- At an aquifer-scale, the annual average nitrogen excess on the Silver Fern Farms land disposal area (87 kgN/year/ha or 2,958 kg/year across the 34 Ha wastewater irrigation area) equates to a 0.17 mg/L increase in aquifer-scale groundwater nitrate concentration⁸.

c. Assessment of cumulative effects on water quality in the Oreti river

- Without attenuation effects - worst-case nitrogen losses from the Silver Fern Farms Mossburn wastewater discharge (1,770 kg/year) represent 0.1% of the cumulative nitrogen load in the Oreti River (1,815 t/year). Based on the mean flow of 28.44 m³/s the Lumsden Cableway monitoring site, the worst-case N load from the Mossburn wastewater discharge to the Oreti River (equivalent to 4.85 kg/day) via Murray Creek and the Roe Burn would equate to an increase of 0.002 mg/L in the concentration of dissolved inorganic nitrogen (DIN) in the Oreti River. Under low flow conditions (Q₉₅ = 5.523 m³/s), this discharge would potentially increase instream DIN concentrations by 0.01 mg/L⁹.
- With attenuation effects - assuming instream attenuation equivalent to 50% of the influent N load, potential water quality effects associated with the Silver Fern Farms Mossburn wastewater discharge (operating at the maximum

⁵ Liquid Earth (5 April 2019): s.2.2, p.5.

⁶ Liquid Earth (5 April 2019): s.2.3, p.7.

⁷ Liquid Earth (5 April 2019): s.2.1, p.5.

⁸ Liquid Earth (5 April 2019): s.3.1, p.8.

⁹ Liquid Earth (5 April 2019): s.3.2, p.9.



proposed N application rate) would be an increase of between 0.001 and 0.005 mg/L in downstream DIN concentrations in the Oreti River¹⁰.

d. Assessment of cumulative effects on the state of the New River Estuary

- Without attenuation effects - assuming no attenuation within the Oreti River system, the estimated worst-case loss from the Mossburn wastewater discharge (1,770 kg/year) equates to 0.04% of the cumulative nitrogen load to the New River Estuary. More recent estimates of the cumulative nitrogen load to the New River Estuary range from 3,617 t/year to 3,736 t/year. Worst-case losses from the Silver Fern Farms Mossburn discharge represent 0.05% of these revised cumulative load estimates¹¹.
- With attenuation effects - assuming instream attenuation equivalent to 50% of the influent N load, potential water quality effects associated with the Silver Fern Farms Mossburn wastewater discharge (operating at the maximum proposed N application rate) would be a contribution equivalent to approximately 0.025% of the cumulative annual N loading to the New River Estuary¹².

In summary, meat processing wastewater has been discharged to land from the Silver Fern Farms Mossburn plant for an extended period so the discharge forms part of the existing environment. Nitrogen loading rates have been relatively modest, particularly when forage removed via cut and carry operations is accounted for. Overall, it is reasonable to conclude the potential contribution of Silver Fern Farms Mossburn wastewater irrigation to land at the maximum proposed nutrient loading of 250 kg N/ha/year is likely to result in only a minor effect on water quality at worst.

2. Description of the monitoring and management that will be undertaken for the tanks

All activities are managed on-site through a series of systems and procedures which make up the overall 'management plan'. The management systems provide living

¹⁰ Liquid Earth (5 April 2019): s.4, p.13.

¹¹ Liquid Earth (5 April 2019): s.3.2, p.9.

¹² Liquid Earth (5 April 2019): s.4, p.13.



documents that cover what is required to appropriately manage the relevant aspects across the operation.

Annual inspection of the tanks shall be maintained by an appropriately qualified person. This shall include a requirement to act to ensure that the holding tank system is maintained in accordance with the designer's instructions and whether the tanks require replacement. Copies of the field service reports shall be maintained and provided on request.

If the tanks are not used for more than a year, due to no processing occurring onsite, there will be no requirement for an annual inspection. However, an inspection by an appropriately qualified person shall be carried out prior to use.

3. Assessment of relevant policies in the regional air plan

Emissions generally associated with industrial and commercial activities are addressed in Stage 2 of the Environment Southland Air Plan 2016 (remaining framework from the Regional Air Quality Plan for Southland, 1999).

Odour is addressed specifically in Section 7 of the plan, with policies and rules pertaining to odour discharges from both discretionary and permitted activities covered in Section 5 of the plan.

- **Policies**

Policy 5.3.1 - Protection of the Environment - protect the environment from adverse effects from the discharge of contaminants into air from industrial or trade premises.

As outlined in the AEE¹³ the wastewater produced from processing is largely organic in nature and contains trace amounts of substances used for cleaning. The key potential effect from the discharge of this wastewater is odour. Buffer zones are used to provide appropriate separation between the irrigation area and neighbouring activities. It is considered that the current consent conditions and management of the activity is consistent with this policy.

Policy 5.3.2 relates to the upgrading or change in process of existing facilities where they are having significant adverse effects on ambient air quality. Silver Fern Farms consider that the wastewater irrigation activity at Mossburn is of a scale and nature and is managed so as not to have a significant adverse effect.

¹³ AEE (Dec 2018), s.4.1.1



Policy 5.3.3 relates to the reduction of greenhouse gases and ozone depleting substances. Given the nature of the activity and the material being discharged Silver Fern Farms considers this policy not relevant to the application.

Policy 5.3.4 has the aim to avoid localised adverse effects from discharges of contaminants into air which do not require a resource consent.

Silver Fern Farms consider that the wastewater irrigation activity at Mossburn is of a scale and nature, and managed as such, so it is not having a localised adverse effect. This is supported by there being no history of Silver Fern Farms or Environment Southland having been notified of a third party complaint relating to the activity over the term of the consent.

Policy 5.3.5 - Maori Culture and Traditions. As outlined in s.3.9, it has been indicated previously that the land use by tāngata whenua across the district was more for hunting and gathering in transit to Te Anau rather than as any permanent occupancy, with nothing culturally sensitive or significant identified nearby. It is therefore considered that the activity is consistent with the intent of the policy.

Policy 7.3.1 - The health of people and communities - Avoid, remedy or mitigate the impact on the health of people and communities from offensive or objectionable odours.

The irrigation of wastewater at Silver Fern Farms Mossburn is managed to minimise the potential for odour, and as such is consistent with this policy in that

- Wastewater is generally discharged on the day it is generated, therefore reducing the potential for development of anaerobic conditions that can lead to adverse odours.
- The wastewater irrigation area uses appropriate buffer zones as outlined in s.4.2.2 to minimise odour impact on neighbouring activities. A buffer of 100 m from the boundary with the Urban Zone (Residential Boundary) and 10 m from the property boundary adjacent to the road and neighbouring rural land.
- Wastewater lines are purged / flushed with fresh water, so no wastewater is left in the line to go anaerobic and potentially cause odour on start up when it is discharged.

Policy 7.3.2 - Areas of Cultural or Amenity Value - Avoid, remedy or mitigate the impact of offensive or objectionable odours on areas of cultural or amenity value.



Again, the irrigation of wastewater at Silver Fern Farms Mossburn is managed to minimise the potential for odour beyond the boundary of the property. The irrigation of wastewater occurs in a rural area and is consistent with the amenity value that may be expected.

As outlined in s.3.9, it has been indicated previously that the land use by tāngata whenua across the district was more for hunting and gathering in transit to Te Anau rather than as any permanent occupancy, with nothing culturally sensitive or significant identified nearby. It is therefore considered that the activity is consistent with the intent of the policy.

- **Rules**

Rule 5.5.2: Discharge of contaminants into air - outlines the performance standards for discretionary activity status activities and *Rule 5.5.3: Any discharges of contaminant into air from the following* - Permitted activity thresholds.

It is assumed that the wastewater irrigation activities of Silver Fern Farms Mossburn would be captured under either Rule 5.5.2 (16) or 5.5.3 (9) for the discharge of 'Foulwater'. The definition of *Foulwater* being "...liquid effluent from any industrial or trade process or municipal source."

The wastewater from Silver Fern Farms Mossburn has an average BOD₅ of 518g/m³. The consented maximum volume of wastewater discharge is 1,400m³ per week, the design capacity of the wastewater irrigation system is approximately 200m³ per day. This gives a maximum BOD₅ loading possible of approximately 103.6kg.

Using a Population Equivalent BOD₅ of 0.054kg/day/inhabitant, Silver Fern Farms Mossburn daily BOD₅ would equate to a population equivalent of around 1,919. Therefore, the maximum possible discharge would be well **within the permitted activity threshold** of *Foulwater* treatment processes with a design capacity population equivalent for BOD₅ of less than 10,000 people.

4. Explanation whether any tile drains present within the discharge area

To the best of our knowledge, Silver Fern Farms are unaware of tile drains existing in the irrigable area as outlined in the Assessment of Environmental Effects (AEE)¹⁴.

¹⁴ AEE (Dec 2018), p.9, Fig 2.4 – *Indicative operating areas of Silver Fern Farms Mossburn*



It is important to note the replacement consent being sought is not for either a new activity nor for a new irrigable area. The irrigable area in relation to the current consent replacement was consented for by Environment Southland by way of variation to consent existing in 1999, and again in 2006. The 2006 variation sought to delete the originally consented area, in favour of the existing irrigable area.

The only reference to tile drains Silver Fern Farms could find in previous documentation was in the 1997 AEE, where in the groundwater quality section it was outlined¹⁵:

“In light of the lack of suitable bores being available it is proposed to use the Deer Block tile drain discharge as the monitoring point for soil drainage.”

In 2006, the “Deer Block’ was deleted from the irrigable area allowed by the variation applied for and granted by Environment Southland, and therefore is not relevant to this consent replacement.

In light of the length of time that wastewater has been applied to the existing irrigable area, some 22 years, it is reasonable to expect if there were tile drains in the irrigable area that some evidence of effect on the environment would have shown by now.

Given that no indications of adverse effects have been observed by the operation, nor through the annually reported independent assessment of activities, over the intervening years it is not unreasonable to assume the risk of tile drains being present within the discharge area, and the risk of potential adverse effects from any unknown tile drains acting as a conduit for contamination, to be very low.

5. Assessment of effects of ponding as described in proposed condition 7

The existing consent¹⁶ provides that:

“There shall be no surface run-off, significant ponding, or contamination of surface water, resulting from the application of wastewater to land ...”

And,

“For the purpose of this consent, significant ponding is deemed to occur if wastewater remains on an area of more than 50m² for 24 hours after being irrigated.”

¹⁵ AEE (Sep 1997), p.13. Note, Figure 5.1 (between p.3 & p.4) shows the location of the previous ‘Deer Block’.

¹⁶ Condition 7, Consent No. 95498: *To discharge primary treated wastewater from a venison abattoir to land.*



As outlined in the AEE¹⁷ there are no surface water features on the wastewater irrigation blocks and the soil type is well suited to discharges to land reducing the potential for ponding or run-off. Whilst there have been no ponding issues over the term of the discharge consents held, following conversation with Environment Southland in preparing for this consent replacement, it was suggested the time duration in the definition of 'Significant Ponding' in the existing consent condition (as set by Environment Southland during the 2006 consent variation) was excessive. Silver Fern Farms took this advice and proposed an amended definition¹⁸ for 'Significant Ponding' to reflect this concern in the replacement consent:

"For the purpose of this consent, significant ponding is deemed to occur if wastewater ~~remains~~ results in contiguous puddling of water on an area of more than 50 m² for 24 four hours after being irrigated."

During the site visit with Environment Southland (31 Oct 2018) there was some discussion around what would be classified as "ponding". A 'squishy' paddock following irrigation was clearly not ponding, whereas 'splashing' through puddles would be, and if those puddles were to become such a large size and appear as visible sheets across the ground then that would likely exceed the significant ponding threshold.

a. Potential for induced drainage, where nutrients present in soil will be flushed below the root zone

Ponding conditions imply that irrigation (or rainfall) intensity exceeds the soil's surface infiltration rate, or the area contains fully saturated soil. When saturated soils are filled beyond capacity to the point that all large and typically air filled pores are filled with water, and the soil has no further capacity to infiltrate further water and therefore ponds it is at this time it is assumed that the Council is assuming there is potential for induced drainage and preferential flow conditions.

Well drained soils will not often achieve a state of saturation, and the potential for induced drainage and preferential flow conditions, as they lack the drainage impediment usually required. As outlined in the AEE, the Oreti soil type comprising the irrigation area is a free draining soil that is highly suited to wastewater irrigation due to the low potential for ponding or runoff ¹⁹.

¹⁷ AEE (Dec 2018), p.41

¹⁸ AEE (Dec 2018), p.67, proposed consent condition 7.

¹⁹ AEE (Dec 2018), p.18.



This was further confirmed by Liquid Earth:

*“Oreti soils are the dominant soil type of the irrigation area. These soils are characterised as highly permeable and well drained (sometimes excessively) ...”*²⁰

The more recent assessment by Liquid Earth outlined:

*“The potential for overland flow from the discharge area to nearby surface water ways is low due to well drained characteristics of the Oreti soils ...”*²¹

Given the above, there is limited potential for induced drainage and preferential flow conditions as there will be limited potential for ponding. Whether the macropore flow during rain events, rather than ponding, leads to rapid and far-reaching transport of contaminants through the root zone to receiving waters is largely addressed in the AEE and RFI Question 1 – the cumulative effects is likely to result in only a minor effect on water quality at worst.

b. Potential for overland flow or transportation through artificial drainage to surface water

The annual monitoring reports provided by SoilWork Ltd since the 2002/2003 season included an estimate of hydraulic loadings for each of the irrigated blocks based on a daily water model for the seasons the site was processing²². The model estimates the balance of water inputs (rainfall, wastewater applications), surface ponding, storage within the soil, and water losses (evapotranspiration, downward transmission through the soil). It is a daily model, and is used to estimate the effects of wastewater irrigation on soil water status, drainage ponding, and runoff. The reports provided generally outlined the number of days when soil water content exceeded field capacity as being low under all of the irrigated blocks.

The relatively low application rate increases the likelihood of retaining applied nutrients in the root zone, decreasing the likelihood of preferential flow. The applied wastewater moves through soil pores via matrix flow, thus allowing attenuation and minimal potential for drainage to surface waters.

This is further confirmed by Liquid Earth:

“the potential for overland flow from the discharge area to nearby surface water ways is low due to well drained characteristics of the Oreti soils, relatively flat

²⁰ Liquid Earth (5 April 2019), p.2.

²¹ Liquid Earth (5 April 2019), p.2.

²² Generally outlined in Section 6 – Hydraulic loading of the “Annual Monitoring and Performance Report”



terrain and set-back from the nearest surface water way (Murray Creek) which is located approximately 500m distant from the irrigated area at its closest point.”²³

And,

“The limited potential for overland flow combined with the likely attenuation of microbial contaminants associated with movement through porous media, and the significant distance (>600 m) to the nearest down gradient receptor mean the discharge of wastewater to land at the Silver Fern Farms Mossburn plant has limited potential to result in adverse effects on the microbial quality of down-gradient groundwater or Murray Creek”²⁴

Overall this confirms there is limited potential for overland flow or artificial subsurface drainage resulting in contaminants moving through soil pores to Murray Creek.

²³ Liquid Earth (5 April 2019), p.2.

²⁴ Liquid Earth (5 April 2019), p.3.

