BEFORE COMMISSIONERS ON
BEHALF OF SOUTHLAND REGIONAL COUNCIL

IN THE MATTER	**Applications for resource consents**
BY	**T AND J DRISCOLL FOR T AND J DRISCOLL FAMILY TRUST**
	Applicant

EVIDENCE OF
MONIQUE (MO) MARIE TOPHAM
20 JANUARY 2020

BACKGROUND AND QUALIFICATIONS:

1. My name is Monique (Mo) Marie Topham. I hold a Bachelor of Agricultural Science Degree with First Class Honours (Dairy Systems) from Lincoln University. I am a member of the New Zealand Institute of Primary Industry Management (NZIPIM) and have been involved in the dairy industry in consultancy, facilitation and practical farming since 2013.

2. I am qualified to complete farm systems appraisals. I have developed my skills through my university studies followed by seven years working within the dairy industry in Southland, including operating our own dairy farm business with my husband. I am a Certified Dairy Farm Systems Consultant (certified in 2017) under the NZIPIM certification scheme.

3. I have completed the Sustainable Nutrient Management Courses (Intermediate and Advanced) and am a Certified Nutrient Management Adviser (certified in 2018). I have also completed a course in Greenhouse Gases and am a certified Greenhouse Gas Advisor (certified in 2018).

4. I am a Director and Shareholder of two dairy farming businesses - Fast Track Dairies Limited and Hedgehope Grazing Limited. These businesses operate two dairy farms in Southland totalling 470ha (dairy platforms and support area). My involvement with these properties, with my other business partners, has been to develop profitable and sustainable farming businesses in all facets, including environmental.

5. I was previously employed by DairyNZ as a Consulting Officer in the Southland, South Otago regional team. In this role I facilitated discussion and information transfer from dairy farmer to dairy farmer and from technical experts to dairy farmers. This resulted in the adoption of new practices and technologies on farm (including environmental).

6. Since resigning from DairyNZ in December 2016, I have been working as a farm systems and environmental consultant with LIC FarmWise and more latterly with my own company AgriAce Consulting Limited. I work with dairy farmers throughout Southland and Otago supporting them to design, analyse and implement dairy farm systems that meet their environmental, financial and personal goals. I am also involved in projects supporting the development and implementation of good management practices for farmers.

7. I have read the Code of Conduct for Expert Witnesses within the Environment Court Consolidated Practice Note 2014 and I 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 omitted to consider any material facts known to me that might alter or detract from the opinions I express.

SCOPE OF EVIDENCE

8. This evidence addresses the following issues raised in the s42a report:

   (a) Commentary around the use, uncertainty and accuracy of the Overseer model (section 7.2.1)

   (b) An error in the report in paragraph 29 stating that cows wintered off farm will increase in the proposed system.

   (c) Losses from the Oxidising physiographic zone

BACKGROUND

9. These consent applications are part of a proposal to expand the applicants current dairy farm operation onto a recently purchased piece of land. For clarity, the recently purchased land has been called the “East Block” and the original farm has been called the “Current Platform”. They combine to form the “Proposed Platform”.

10. I have been involved in producing nutrient budgets for this application since late 2017.

11. The nutrient budgets were prepared using “Overseer Best Practice Data Input Standards, March 2018). No deviations from these protocols were made during the modelling assumptions. Farm systems information was provided by Tim Driscoll for the current milking platform. Information for the East Block was not available from the previous owner, assumptions were made from visual assessment, Google Earth imaging, Tim Driscoll knowledge, Beef and Lamb monitoring data and professional judgement. Soils areas were obtained from soils mapping provided by Beacon and soils settings from SMap. Climate settings were obtained from the Overseer climate station tool. This approach has been consistent throughout all of the nutrient budgets modelled. All assumptions have been discussed in detail with Tim Driscoll. Tim

displays a good level of understanding of the inputs and assumptions that have been used.

12. The applicant purchased the East Block in late 2016. Detailed information regarding the management of this block prior to 2016 was unavailable, although the applicant was able to give some information about the block as it neighbours the current platform. This included information around stock type and numbers.

13. During the course of these consent applications there have been multiple version changes to the Overseer model, including the introduction of OverseerFM. There has also been a change in the interpretation of the Proposed Southland Water and Land Plan. As a result, updates and further mitigations were modelled for the applicant. The most recent of these modelling reports was written in December 2019. It should be noted that the Overseer modelling was reviewed internally by a Certified Nutrient Management Advisor, and was then audited by Irricon. Irricon found the nutrient budgets to have been completed with **High** robustness.

14. All four Overseer modelling reports have been appended in their entirety to the s42a hearing report in a document titled "2. 2020 February 3 - Appendices - Driscoll Consents Hearing.pdf". For ease of understanding, I recommend the reports are read in the chronological order. A summary of the results is given below (page numbers refer to those used in the appendices):

(a) Original modelling – 1st Oct 2018

(pg 120-141)

Overseer modelling was completed using Overseer version 6.3.0. Summarised results from this modelling are in Table 1 and show a slight decrease in N loss (1.4%) and an increase in P loss (6.1%)

Table 1. Predicted nitrogen and phosphorus losses in the current and proposed systems under Overseer version 6.3.0

	Current system	**Proposed system**
Total Farm N Loss (kg)	11,503	11,345
N Loss/ha (kgN/ha/yr)	51	51
Total Farm P Loss (kg)	262	278
P loss/ha (kgP/ha/yr)	1.2	1.2

(b) Further information: T and J Driscoll Family Trust consent Application - 18th December 2018

P loss calculations outside Overseer version 6.3.0 (pg 144 – 152)

Following the original modelling (Oct 2018), council raised concerns that the predicted Phosphorus losses using Overseer were higher in the proposed system than the current system. A file note was completed to quantify the impact of mitigations that are not accounted for in Overseer. Results including the phosphorus mitigations modelled outside of Overseer 6.3.0 are shown in table 2. Red figures indicate a number that has changed compared to the previous modelling. The file note concluded that P loss is expected to also decrease slightly (by 1.3%).

Table 2. Predicted nitrogen and phosphorus losses in the current and proposed systems, including phosphorus mitigations modelled outside of Overseer 6.3.0

	Current system	Proposed system
Total Farm N Loss (kg)	11,503	11,345
N Loss/ha (kgN/ha/yr)	51	51
Total Farm P Loss (kg)	229 (262 minus 33kg P mitigation modelled outside of Overseer)	226 (278 minus 52kg P mitigation modelled outside of Overseer)
P loss/ha (kgP/ha/yr)	1.0	1.0

(c) File note: T and J Driscoll Family Trust consent application – 22nd August 2019

Modelling of further mitigations in Overseer version 6.3.1 - (pg 96 -119)

In August 2019, the applicant instructed that further mitigations be modelled for the proposed dairy system. The applicant felt that Environment Southland was seeking greater decrease in losses from the proposed system and wanted to explore options to achieve this. A file note was completed to quantify the impact of implementing these further mitigations on the property. Adjustments were also calculated outside of OverseerFM to quantify:

- Off-site nutrient loss of young stock grazing
- Baleage grass wintering on the platform
- Laneway mitigations to reduce phosphorus loss

Between Dec 2018 and Aug 2019, there was updated Overseer version released (6.3.1). Overseer files were reopened in the new version. There were small changes in predicted losses shown below in red.

Table 3. Predicted nitrogen and phosphorus losses in the current and proposed systems, including phosphorus mitigations modelled outside of OverseerFM 6.3.1

	Current system	Proposed system
Total Farm N Loss (kg)	11513	11348

N Loss/ha (kgN/ha/yr)	51	51
Total Farm P Loss (kg)	230 (263 including 33kg P mitigation modelled outside of Overseer)	226 (278 including 52kg P mitigation modelled outside of Overseer)
P loss/ha (kgP/ha/yr)	1.0	1.0

The results of the addition modelling, including the adjustments made outside of Overseer is shown in the table below. Red figures indicate a number that has changed compared to the previous modelling.

Table 4. Predicted nitrogen and phosphorus losses in the current and proposed system after further mitigations were included, including phosphorus and nitrogen mitigations modelled outside of OverseerFM 6.3.1

	Current system	**Proposed system (following further mitigations)**	**Percentage change in losses**
Total Farm N Loss (kg)	11513	10507 (9908kgN plus 126kgN grass baleage plus 473kgN young stock adjustments modelled outside of Overseer)	8.7% reduction
N Loss/ha (kgN/ha/yr)	51	47	
Total Farm P Loss (kg)	230 (263kgP minus 33kg P mitigation modelled outside of Overseer)	212 (256kgP minus 52kg P laneway mitigation plus 7.8kgP young stock adjustment modelled outside of Overseer)	7.8% reduction
P loss/ha (kgP/ha/yr)	1.0	0.9	

Considering the further mitigations to the proposed farm system and the adjustments made to predicted nutrient losses, it is predicted that overall nitrogen will decrease by 8.7% and losses of phosphorus will decrease by 7.8%.

(d) File note: T and J Driscoll Family Trust consent application – December 2019

Update to include the 18/19 season in Overseer version 6.3.2 (pg 319-334 and pg 212 - 232)

The applicant requested that further modelling be undertaken so that actual data from the most recent season (the 18-19 season) is included. As a result, the "current" scenario reflects the previous four seasons (June 2015 – June 2019). Calculations outside of Overseer as described in (c) were also updated.

Between Aug 2019 and Dec 2019, there was another Overseer version released (6.3.2). Overseer files were reopened in the new version. There were small changes in predicted losses shown below in red.

Table 5. Predicted nitrogen and phosphorus losses in the current and proposed system as modelled by OverseerFM 6.3.2 including adjustments calculated in the file note dated August 2019 (in appendices)

	Current system	Proposed system	Percentage change in losses
Total Farm N Loss (kg)	11759	10792 (10193kgN plus 126kgN grass baleage and 473kgN young stock adjustments modelled outside of Overseer)	8.2% reduction
N Loss/ha (kgN/ha/yr)	52	48	
Total Farm P Loss (kg)	232 (265kgP minus 33kg P mitigation modelled outside of Overseer)	216 (260kgP minus 52kg P laneway mitigation plus 7.8kgP young stock adjustment modelled outside of Overseer)	6.9% reduction
P loss/ha (kgP/ha/yr)	1.0	1.0	

The results of the addition modelling (1819 season) and updates to the adjustments made outside of Overseer is shown in the table below. Red figures indicate a number that has changed compared to the previous modelling.

Table 6. Predicted nitrogen and phosphorus losses in the current and proposed system after modelling of the 18-19 season was included, including phosphorus and nitrogen mitigations modelled outside of OverseerFM 6.3.2.

	Current system	Proposed system	Percentage change in losses
Total Farm N Loss (kg)	11694 (11637 plus 57kgN grass baleage adjustments modelled outside of Overseer)	10620 (10193 plus 112kgN grass baleage and 315kgN young stock adjustments modelled outside of Overseer)	9.2% reduction
N Loss/ha (kgN/ha/yr)	52 (52 prior to adjustments outside Overseer)	47 (45 prior to adjustments outside Overseer)	
Total Farm P Loss (kg)	230 (264kgP minus 34kg P mitigation modelled outside of Overseer)	213 (260kgP minus 52kg P laneway mitigation plus 5.2kgP young stock adjustment modelled outside of Overseer)	7.4% reduction

P loss/ha (kgP/ha/yr)	1.0 (1.2 prior to adjustments outside Overseer)	0.9 (1.2 prior to adjustments outside Overseer)	

The modelling predicted that overall nitrogen losses would decrease by 9.2% and phosphorus losses would decrease by 7.4%.

15. The key drivers of a decrease of 9.2% in nitrogen loss are shown below. In comparison to the current system, the proposed system has:

    (a) Increased the area that effluent is applied to – reduced N application in effluent to this area

    (b) Reduced nitrogen fertiliser use (although an increase on the East Block)

    (c) Change in the farms culling policy to one of culling earlier

    (d) Lower protein content supplementary feed (Barley modelled but this could be any low protein feed)

16. The key driver of the 7.4% decrease in phosphorus loss are shown below. In comparison to the current system the proposed has:

    (a) Improved laneway sediment loss mitigations (as detailed in the applicants Farm Environmental Management Plan)

    (b) A reduction in the Olsen P on the current dairy platform area (although an increase in Olsen P on the East Block)

    (c) Use of low solubility phosphorus fertiliser on the East Block (RPR modelled but could also be any other low solubility P fertiliser such as serpentine super)

17. Mitigations specific to the East Block were also modelled in the proposed system. These include:

    (a) No wintering on this block (June and July)

    (b) No grazing of livestock in the months of May to August, requiring less pasture cover May to August and a subsequent reduction in fertiliser N applications, and consequently overall lower pasture grown on this block

    (c) No supplements fed on block

(d) Baleage made on the East block due to distance from cowshed

(e) Low solubility P fertiliser is applied (assumed Reactive Phosphate Rock in the modelling, may also be serpentine super in practice)

OVERSEER UNCERTAINTY, LIMITATIONS AND ASSUMPTIONS

18. Overseer is designed as a decision support tool and allows comparisons between farm management scenarios. As with any model there are assumptions and limitations (as outlined report[1]).

19. Overseer Assumptions:

Long term annual average model - The model uses annual average input and produces annual average outputs

Near equilibrium conditions - Model assumes that that the farm is at a state where there is minimal change each year

Actual and reasonable inputs - It is assumed that input data is reasonable and a reflection of the actual farm system. If any parameter changes, it is assumed that all other parameters affected will also be changed.

Good management practices are followed - Overseer assumes the property is managed is line with a number of industry good management practices.

20. Overseer Limitations:

Overseer does not predict transformations, attenuation or dilution of nutrients between the root zone or farm boundary and the eventual receiving water body. A catchment model is needed to estimate the effects of the nutrient losses from farms on groundwater, river or lake water quality.

Overseer does not calculate outcomes from extreme events (floods and droughts), but provides a typical years result based on a long-term average.

[1] Overseer modelling report for the purposes of as part of a consent application for expanded dairying, T and J Driscoll Family Trust, October 2018, page 5

Overseer does not calculate the impacts of a conversion process, rather it predicts the long-term annual average nutrient budgets for changed land use.

Overseer is not spatially explicit beyond the level of defined blocks

Not all management practices or activities that have an impact on nutrient losses are captured in the Overseer model

Overseer does not provide for modelling of all farm systems in New Zealand

Components of Overseer have not been calibrated against measured data from every combination of farm systems and environment

21. Overseer Uncertainty

Overseer modelling uncertainties are acknowledged. This uncertainty centres around the model's ability to accurately determine nutrient losses, however these are practically impossible to measure accurately. Measured results from parts of paddocks or more rarely whole paddocks have been carried out using lysimeters, suctions cups and other collection technologies but it is not practicable to capture nutrient losses from a whole farm and across the multiple soil and landscape variations that may occur. This means there are few benchmarks to compare against.

Overseer is used for modelling a wide range of farm systems in many different geographical settings; validation or calibration data for all circumstances is not possible, therefore the issue is really the uncertainty associated with whole farm nutrient loss estimates will increase for situations that are well outside the calibration /validation range.

Pastoral blocks within Overseer have been through the most calibration and testing (most of which has been on dairy farms) but more data from calibration/validation of the Overseer model is required to reduce the uncertainty, most notably for:

- Cropping and Sheep and Beef
- Clay and shallow and light textured soils
- High (and low) rainfall locations >1200mm

Traditionally Overseer has been calibrated against a set of farmlet trials however Version 6 (2012) has also undergone a range of logic tests. The farmlet trials utilised in the calibration and validation of Overseer are outlined in Table 1 below:

Table 7 – Overseer Calibration and Validation (Parliamentary Commissioner for the Environment, 2018[1])

Management block	Nitrogen calibration	Phosphorus calibration
Pastoral	Calibration (undertaken in 2012) used nutrient loss measurements from farmlet studies at eight locations. These were: Edendale, Southland (intensive beef); Tussock Creek, Southland (dairy); Kelso, Otago (dairy); Lincoln University Dairy Farm, Canterbury (dairy); Massey University Dairy Farm, Manawatū-Whanganui (dairy); Ruakura, Waikato (dairy); Scott Farm, Waikato (dairy); and Wharenui, Bay of Plenty (dairy). A recalibration exercise is currently underway.	Calibration (undertaken in 2005) used data from 23 sites: Canterbury (2), Otago (3), Southland (2), Manawatū (5), Northland (2), Waikato (4), West Coast (2), Wellington (1), Hawkes Bay (2).
Crop	Arable crops – very limited calibration (one Lincoln site).	Arable crops – none due to a lack of experimental sites. Forage crops – limited to 2 sites in Otago and 1 in Southland.
Fruit crop	None due to a lack of experimental sites.	None due to a lack of experimental sites.
Trees and scrub	None due to a lack of experimental sites.	None due to a lack of experimental sites.
Wetlands and riparian	Very limited calibration based on published studies.	Very limited calibration based on published studies.
House	Very limited calibration (based on one international study).	None.

Uncertainty around Overseer outputs tends to be much lower within the range of the calibration data set outlined in Table 1. Most of the calibration and validation data used to date is focused on flat, pastoral, dairy enterprises, with primarily free draining soils and moderate rainfall located in the Waikato, Southland, Canterbury and Manawatu. All of the modelling of the applicants property fits into the calibration range with the exception of the baleage grass wintering system.

The following steps were taken during the modelling process to minimise the impact of uncertainties:

(a) Adherence to Best Practice Data Input Standards (BPDIS)

(No deviations to BPDIS were made, no work arounds required)

(b) Use of Overseer is within the model's parameters (for soils, climate and farm system)

(Standard approach)

(c) Method and consistent methodology between scenarios

(Standard approach)

(d) Site visit to cross check information

(Standard approach - Understanding the property and the management blocks is critical to blocking in Overseer)

(e) Blocking completed taking into account land use, management systems, soils, topography and enterprise

(Standard approach – consistent with BPDIS)

(f) Consistency in modelling between the current and proposed files (Standard approach - "apples with apples")

(g) Expertise, experience and qualifications of the user

(Standard approach - Certified Nutrient Management Adviser and Dairy Farm Systems Expertise)

(h) Outputs are reviewed against expected results relative to soils, climate, land use and inputs

(Standard approach – reviewed against previous modelling results and research trials)

(i) Overseer files are internally peer reviewed (for adherence to BPDIS, feasible farm systems and data entry)

(Standard approach - Certified Nutrient Management Adviser and Dairy Farm Systems Expertise)

The use of Overseer as a modelling tool is recognised in the Proposed Southland Water and Land Plan[2] (PSWLP). Appendix N (of PSWLP) indicates that the latest version of the Overseer model (or an approved alternative model) should be used on properties over 20ha or when a material change in land use occurs. As far as I am aware no alternative to Overseer has been approved by Environment Southland.

22. Uncertainty around Overseer model estimates tends to be lower within the range of the calibration data set i.e. where we have the most information. Most of the calibration data used to date is focused on flat, pastoral, dairy enterprises, with primarily free-draining soils and moderate rainfall. Pastoral farms in the Waikato, Southland, Canterbury and Manawatu, form the OVERSEER calibration data set. Consistency in modelling when developing scenarios is a key to creating equivalence in uncertainty. When scenarios are compared focus should be on the difference in estimated outputs, rather than absolute numbers.

23. The Section 42A report[3] comments that "To achieve the reduction in losses demonstrated, the applicant must be able to operate in accordance with the inputs and the relevant good management practices and mitigations proposed". This comment could be misinterpreted, and result in overly inflexible input based conditions for the applicant. The range of mitigations imposed on the proposed system, and in particular the East Block, are <u>one</u> possible system to achieve nutrient losses lower than the current system. The proposed system is also the preferred system of the applicant within the current environment. However, it is important that system flexibility is maintained where possible to allow the applicant to respond to a wide range of potential changes such as milk price, scientific developments, market changes, animal disease, climate and weather, etc.

24. The Section 42A report[3] correctly states that "The Overseer model assumes average and constant management and site characteristics which allows for the nutrient flows on farm to be compared. In a farming situation this is, however, problematic for the fluid nature of a farming activity, especially when land use is changing and/or intensifying, which will occur under the proposed activities should consent be granted." However, in relation to this consent application, I do not believe this to be

[1]Parliamentary Commissioner for the Environment (2018). *Overseer and regulatory oversight: Models, uncertainty and cleaning up our waterways.* Pg 31.
[2] Proposed Southland Water and Land Plan, Decisions Version, 4th April 2018
[3] S42A Report for the Hearing (complied by Alex Erceg)

relevant. Much of the development required to allow the East Block to function within the wider platform has already occurred. This includes installing laneways, increasing the Olsen P, regrassing and installing a new water scheme. All of these activities have occurred under permitted activity status. Should this consent be granted, the Driscoll's will not be developing the East Block further but rather be grazing it as part of the entire dairy platform. This is in direct contrast to a full system change where significant changes may occur each season.

25. "Overseer provides and overarching view at block (and far) scale, and does not account for the variation of landscape, soil and topographical types within that block (and/or farm)". This comment could be misinterpreted. As stated in the Overseer Best Practice Data Input standards, it is critical to get blocks within the farm defined as accurately as possible. Blocks should be based on land uses, management system (ie effluent, irrigation, support), soils, topography and enterprise. As per standard practice correct blocking procedures have been followed in the Driscolls Overseeer modelling.

26. "As Overseer uses annual averages, it also does not account for climate variation such as overly wet, or in contrast overly dry, years." This is correct. Overseer utilises 30year climatic average rainfall and temperature data in a long term steady state system. The BPDIS require that these climatic settings are not changed. Therefore, it is important that the farm system losses are also interpreted and compared to those consented as an average over multiple years rather than on an annual basis. This ensures that the impact of an especially dry or wet season is mitigated.

Paragraph 29 of the s42a report:

27. The staff report states that "under this proposal, the applicant will graze and intensive winter graze more stock at the grazier to correspond with the increase in the number of cows in the milking herd". This is incorrect. As detailed in the hearing appendices, page 214, the number of cows wintered off farm will decrease.

Cows wintered off farm	**Current platform**	**Proposed platform**
June	526 (average of 4 years)	516
July	483 (average of 4 years)	459

Losses from the Oxidising physiographic zone

28. The staff report raised a concern that the Overseer modelling completed was not blocked in a manner that allowed for a comparison of predicted nutrient losses in the Oxidising physiographic zone. All Overseer modelling was completed with adherence

to the Best Practice Data Input Standards. This requires that the farm is blocked according to soil type, farm management and topography.

29. Overseer is a farm scale model that is intended to be used to assess the farm system at whole farm scale. It is not intended to be utilised on a per block basis, and this use assumes an accuracy that isn't achievable. The staff report shows agreement with this where it says "The intent of Overseer is to provide outputs from farm-level nutrient models that form a basis in which nutrient stress on waterbodies can be investigated."

30. However, for completeness, the losses from the Oxidising physiographic zone have been calculated for comparative purposes. The physiographic zone boundary follows the soil type boundary on the applicants property, as shown in figure 1 and 2. Therefore, the losses from the Oxidising physiographic zone are the same as for the Waikiwi soil type.

31. Physiographic zones (from Beacon). The brown area is the Oxidising zone

Figure 1. Physiographic Zone map (from Beacon). Brown = Oxidising zone. Grey = Gleyed zone

32. Soil types (from Beacon). The brown area is the Waikiwi soil type

Figure 2. Soil type map (from Beacon). Brown = Waikiwi soil. Green = Pukemutu soil

33. The Waikiwi soils (Oxidising physiographic zone) form 62.3ha of the current and proposed platforms. I have pulled the relevant nutrient budgets from OverseerFM to calculate the total nitrogen lost from this area. These nutrient budgets are in Tables 2,3 and 4.

Table 8. Nitrogen loss from the current dairy platform (15-16 to 17-18 seasons) – total area 210.6ha

Blocks

NAME	TYPE	AREA (HA)	N LOSS	N LOSS/HA
Waikiwi Effluent	Pasture	20.1	1030	52
Pukemutu Effluent	Pasture	41.9	2531	62
Waikiwi non effluent	Pasture	42.2	1831	44
Pukemutu non effluent	Pasture	98.4	4953	51
Fodder Beet	Fodder crop	2.8	636	227
Turnips	Fodder crop	1	113	113
Other sources	Other	-	417	-

Table 9. Nitrogen loss from the current platform (18-19 season) – total area 210.6ha

Blocks

NAME	TYPE	AREA (HA)	N LOSS	N LOSS/HA
Baleage winter - waikiwi non Eff	Pasture	2.2	142	64
Baleage winter Pukemutu Non eff	Pasture	6	453	75
Baleage wintering - Puke Eff	Pasture	4	366	92
Pukemutu Effluent	Pasture	37.9	2362	62
Pukemutu non effluent	Pasture	92.4	4644	50
Waikiwi Effluent	Pasture	20.1	1060	53
Waikiwi non effluent	Pasture	40	1737	43
Other sources	Other	-	437	-

Table 10. Nitrogen loss from the Proposed Platform – total area 224.5ha

Blocks

NAME	TYPE	AREA (HA)	N LOSS	N LOSS/HA
Baleage winter - Pukemutu Eff	Pasture	1.6	143	90
Baleage winter - Pukemutu Non Eff	Pasture	3.3	282	86
Baleage winter - Waikiwi Non Eff	Pasture	0.7	48	69
Baleage winter - waikiwi Eff	Pasture	1.4	106	76
East Block - Pukemutu	Pasture	13.9	191	14
Pukemutu Effluent	Pasture	49.2	2479	50
Pukemutu non effluent	Pasture	86.2	4014	47
Waikiwi Effluent	Pasture	41.1	1752	43
Waikiwi non effluent	Pasture	19.1	740	39
Other sources	Other	-	437	-

34. Using this information, I have calculated the total nitrogen lost from the Waikiwi soil area. This is shown in Table 5. It shows that nitrogen losses from the Oxidising zone are 7.9% lower in the Proposed platform when compared to the current platform.

Table 11. Losses from the Waikiwi soils/Oxidising physiographic zone

Block	Current Platform (15-16 to 17-18 seasons)	Current platform (18-19 season)	Proposed platform
Total losses from "Waikiwi" blocks (kgN/yr)	2861	2939	2646
Proportion of "other sources" losses (kgN/yr)	123	129	121
Total losses (kgN/yr)	2984	3068	2767
Average annual loss (kgN/yr)	3005kgN		2767kgN (-7.9%)

35. For completeness, I have also calculated the losses from the Pukemutu soils (Gleyed physiographic zone). The total losses in the current system are 8633kgN/yr compared with 7426kgN/yr in the proposed system, a reduction of 13.9%.

CONCLUSION

36. Overseer modelling uncertainties, assumptions and limitations are acknowledged, and steps have been taken to minimise the impact of these factors.

37. The number of cows wintered off farm in the proposed system is less than that in the current farm system.

38. Modelling using Overseer version 6.2.3 and adjustments outside of Overseer estimate that losses of Nitrogen and Phosphorus would decrease by 9.2% and 7.4% respectively. This modelled has been audited to be of a high robustness. Modelling has not been challenged in the s42a report.

39. Nitrogen losses from the Oxidising physiographic zone are modelled to decrease by 7.9% in the proposed system when compared to the current system.

Monique (Mo) Topham

AgriAce Consulting Limited

20 January 2020