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Southland

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File Note: Titipua Ltd Partnership – Overseer version change September 2021

1.0 Supporting information to this report:

This file note is not a standalone report. It is intended to be read in conjunction with:

- The Overseer modelling report, dated 23rd March 2021 titled “Titipua Ltd Partnership – OverseerFM farm system modelling to support a consent application for expanded dairy”.
- The File Note, dated June 2021 titled “File Note: Titipua Ltd Partnership – Pasture grown”

These reports have been attached to this file note.

2.0 Purpose of this report:

Since the completion of the nutrient budgeting report, and the subsequent audit, there has been a version change of Overseer. This has resulted in changes in the estimated losses of N and P. This file note seeks to update the nutrient loss figures so that Environment Southland have current loss estimates.

3.0 Overseer version change:

Periodically, Overseer releases a new version of the model. The version changes are generally a result of new science becoming available. The original report for Titipua Ltd Partnership was written using information calculated in Overseer version 6.3.5. On the 28th July 2021, after the consent application was lodged, Overseer released version 6.4.0. The update is as follows:

- *NIWA climate data - The climate data for OverseerFM has been updated to use NIWA data from 1991-2020.*
- *All climate data used in the model will be based on the location of the block. If the block does not have a location, the location of the farm will be used. Where farms do not have a location, the model will not run until a location is set. This ensures that each analysis is using the best representation of climate for their farm.*
(taken from the Overseer website)

Upon further reading of the Overseer version 6.4.0 release notes, I also note that there has been a change to using monthly climate data rather than annual. This climate data update has affected the modelled rainfall, average temperature, and potential evapotranspiration (PET). This in turn affects modelled drainage volumes and biological activity (particularly volatilisation).

4.0 Previously modelled losses:

The tables below show the losses as calculated using Overseer version 6.3.5 and presented in the Overseer modelling report, dated 23rd March 2021.

Table 1. Estimated nitrogen and phosphorus losses from the current system using Overseer version 6.3.5

	Current Dairy Platform	Schrama's block	Total current
Area (ha)	181.5	84.2	265.7
Total Farm N Loss (kg)	11,315	1,738	13,053
N Loss/ha (kgN/ha/yr)	62	21	49
Total Farm P Loss (kg)	455	190	645
P loss/ha (kgP/ha/yr)	2.5	2.3	2.4
Pasture Grown (tDM/ha)	16.8	11.2	

Table 2. Estimated nitrogen and phosphorus losses from the current and proposed systems including calculations outside of Overseer. This modelling utilises Overseer version 6.3.5

	Total current (same as above)	Proposed	
Area (ha)	265.7	265.7	
Total Farm N Loss (kg)	13,035	12,181 <i>(12,749 modelled plus 173 baleage grass wintering minus 741 wetlands calculated outside OverseerFM)</i>	6.7% decrease
N Loss/ha (kgN/ha/yr)	49	46	
Total Farm P Loss (kg)	645	572 <i>(615 modelled minus 43 wetlands calculated outside OverseerFM)</i>	11.3% decrease
P loss/ha (kgP/ha/yr)	2.4	2.2	
Pasture Grown (tDM/ha)		16.1	

Note:

1. Estimated pasture grown figures are higher than expected. This is discussed in section 4.1.1 of the "Overseer modelling report, dated 23rd March 2021" attached to this file note
2. Calculations outside of OverseerFM have been required in the proposed system modelling. These are explained in full in section 4.2. of the "Overseer modelling report, dated 23rd March 2021" attached to this file note.

5.0 Updated modelled losses:

Following the version update to 6.4.0, I have reopened the relevant Overseer budgets. There have been no other changes made to the budgets. The tables below show the updated Overseer outputs. For ease of reading, changes have been shown in red.

Table 3. Estimated nitrogen and phosphorus losses from the current system using Overseer version 6.4.0

	Current Dairy Platform	Schrama's block	Total current
Area (ha)	181.5	84.2	265.7
Total Farm N Loss (kg)	10,196	1,685	11,881
N Loss/ha (kgN/ha/yr)	56	20	45
Total Farm P Loss (kg)	456	191	647
P loss/ha (kgP/ha/yr)	2.5	2.3	2.4
Pasture Grown (tDM/ha)	16.8	11.2	

Table 4. Estimated nitrogen and phosphorus losses from the current and proposed systems including calculations outside of Overseer. This modelling utilises Overseer version 6.4.0

	Total current (same as above)	Proposed	
Area (ha)	265.7	265.7	
Total Farm N Loss (kg)	11,881	11,088 <i>(11,656 modelled plus 173 baleage grass wintering minus 741 wetlands calculated outside OverseerFM)</i>	6.7% decrease
N Loss/ha (kgN/ha/yr)	45	42	
Total Farm P Loss (kg)	647	574 <i>(617 modelled minus 43 wetlands calculated outside OverseerFM)</i>	11.3% decrease
P loss/ha (kgP/ha/yr)	2.4	2.2	
Pasture Grown (tDM/ha)		16.1	

Note:

1. Estimated pasture grown figures are higher than expected. This is discussed in section 4.1.1 of the "Overseer modelling report, dated 23rd March 2021" attached to this file note
2. Calculations outside of OverseerFM have been required in the proposed system modelling. These are explained in full in section 4.2. of the "Overseer modelling report, dated 23rd March 2021" attached to this file note. These calculations have NOT been updated in light of the update in Overseer version.

6.0 Updating the outside of Overseer calculations

The proposed system estimated losses included the use of calculations outside of Overseer. These calculations have been recalculated below utilising information from version 6.4.0.

6.1 Baleage grass wintering:

As explained in the March 2021 report "OverseerFM is likely to underestimate nitrogen losses as OverseerFM is not able to adequately reflect the on-farm realities of this system. OverseerFM assumes that the pasture plants will regrow post grazing and take up urinary N from the wintering

activity. However, due to the soil type and climate on the applicant’s property, the plants are not viable following the winter grazing. As a result, the area is cultivated and regrassed in spring. I am unaware of any research that has quantified the impact of baleage grass wintering in terms of nitrate and phosphorus loss. I have therefore completed a desktop modelling exercise that attempts to estimate the nutrient losses from this system more accurately.”

In the March 2021 report, I explained that I had created an Overseer file that showed the baleage grass area as a very low yielding kale crop. This allowed me to add a defoliation and regrassing event to Overseer and ensured that overseer would assume no uptake of urinary N between grazing of the crop and the resowing of the pasture. Further details on how this was modelled can be found in the March 2021 report in section 4.2.1. I have rerun the same calculation and summarised the results below:

	Total nitrogen losses for the kale or baleage/grass area (10ha)	
	OverseerFM version 6.3.5 (taken from the March 2021 report)	OverseerFM version 6.4.0
Pasture baleage system	523	433
Kale system	696	877
Difference	173	444

Therefore, it is predicted that the losses from the grass baleage wintering system will be 444kgN higher than estimated in the OverseerFM Proposed scenario.

6.2 Installation of a wetland

As per the March 2021 report, Titipua Ltd Partnership have sought advice from David Moate of Environment Southland regarding the installations of wetlands. Following this advice, they have agreed to install a wetland on the property. Calculations outside of Overseer have been completed to quantify the expected reduction in nitrogen and phosphorus loss because of the wetland. The catchment of the wetland is 50ha, although only 38ha of this is on the Titipua Ltd Partnership property.

The table below calculates the expected amount of nitrogen captured by the wetland. This has been updated following the Overseer version change. Updated figures are shown in **red**. The original figures are also shown for completeness.

Overseer block name	Area (ha)	OverseerFM estimated nitrogen leaching loss (kgN/ha) (updated in red)	Reduction in N leaching due to wetland (from David Moate's report) (%)	Total reduction (kgN) (Ha x kgN/ha x %) (updated in red)
Non-Eff, Rolling – Puke, Apar	32.2	40.6 36.2	50	653.66 582.82
Eff, Rolling – Puke, Apar	2.1	43.0 38.6	50	45.15 40.53
Non effective area (laneways and tracks) – the losses from this area are accounted for in “other sources” below.	3.7			
Total block Nitrogen loss mitigated	38.0			698.81 623.35
Plus reduction in other sources losses	38/265.7	589 593	50	42.12 42.40
Total farm Nitrogen loss mitigated				740.93 665.75

The table below calculates the expected amount of nitrogen captured by the wetland. This has been updated following the Overseer version change. Updated figures are shown in **red**. The original figures are also shown for completeness. As there has been no change in the estimated Phosphorus losses at a block and other sources level, there is no change to the total loss mitigated.

Overseer block name	Area (ha)	OverseerFM estimated P loss (kgP/ha)	Reduction in P loss due to wetland (from David Moate's report) (%)	Total reduction (kgP) (Ha x kgP/ha x %)
Non-Eff, Rolling – Puke, Apar	32.2	2.14 2.14	48	33.08
Eff, Rolling – Puke, Apar	2.1	2.20 2.20	48	2.22
Non effective area (laneways and tracks) – the losses from this area are accounted for in “other sources” below.	3.7			
Total block Phosphorus loss mitigated	38.0			35.3
Plus reduction in other sources losses	38/265.7	114 114	48	7.83
Total farm Phosphorus loss mitigated				43.13

Therefore, it is predicted that the wetland will reduce nutrient losses from the proposed dairy system by 666kgN and 43kgP.

6.3 Cumulative effects of mitigations calculated outside of Overseer

Calculations outside of Overseer have been completed to quantify the impact of the baleage grass wintering and the wetland installation. The updated loss estimates are shown in the table below. Differences, as compared to Table 2 of this report are shown in red.

Table 3. Estimated nitrogen and phosphorus losses from the current and proposed systems including calculations outside of Overseer. This modelling utilises Overseer version 6.4.0

	Total current	Proposed	
Area (ha)	265.7	265.7	
Total Farm N Loss (kg)	11,881	11,434 <i>(11,656 modelled plus 444 baleage grass wintering minus 666 wetlands calculated outside OverseerFM)</i>	3.8% decrease
N Loss/ha (kgN/ha/yr)	45	43	
Total Farm P Loss (kg)	647	574 <i>(617 modelled minus 43 wetlands calculated outside OverseerFM)</i>	11.3% decrease
P loss/ha (kgP/ha/yr)	2.4	2.2	
Pasture Grown (tDM/ha)		16.1	

Note:

1. Estimated pasture grown figures are higher than expected. This is discussed in section 4.1.1 of the "Overseer modelling report, dated 23rd March 2021" attached to this file note
2. Calculations outside of OverseerFM have been required in the proposed system modelling. These are explained in full in section 4.2. of the "Overseer modelling report, dated 23rd March 2021" attached to this file note. These calculations have NOT been updated in light of the update in Overseer version.

7.0 Conclusions:

A version change of Overseer has resulted in changes in the estimated losses of Nitrogen and Phosphorus.

Table 4. Estimated nitrogen and phosphorus losses from the current and proposed systems including calculations outside of Overseer. This modelling utilises Overseer version 6.4.0

	Total current (same as above)	Proposed	
Area (ha)	265.7	265.7	
Total Farm N Loss (kg)	11,881	11,434 <i>(11,656 modelled plus 444 baleage grass wintering minus 666 wetlands calculated outside OverseerFM)</i>	3.8% decrease
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Note:

3. *Estimated pasture grown figures are higher than expected. This is discussed in section 4.1.1 of the "Overseer modelling report, dated 23rd March 2021" attached to this file note*
4. *Calculations outside of OverseerFM have been required in the proposed system modelling. These are explained in full in section 4.2. of the "Overseer modelling report, dated 23rd March 2021" attached to this file note. These calculations have NOT been updated in light of the update in Overseer version.*