

**IN THE ENVIRONMENT COURT
WELLINGTON REGISTRY**

**I TE KŌTI TAIAO O AOTEAROA
TE WHANGANUI-A-TARA ROHE**

UNDER	the Resource Management Act 1991
IN THE MATTER	of appeals under sch 1, cl 14(1) against the decision of Manawatū-Whanganui Regional Council on Plan Change 2 to the One Plan
BETWEEN	TE RUNANGA O RAUKAWA ENV-2021-WLG-20 NGĀTI TURANGA ENV-2021-WLG-21 ANDREW DAY ENV-2021-WLG-22 WELLINGTON FISH AND GAME COUNCIL ENV-2021-WLG-23 Appellants
AND	MANAWATŪ-WHANGANUI REGIONAL COUNCIL Respondent

**WILL-SAY STATEMENT FOR EXPERT CONFERENCING – DR PAUL FREDERICK LE
MIERE**

Dated: 19 January 2024


Cooper Rapley Lawyers
227-231 Broadway Avenue
PO Box 1945
Palmerston North
DX PP80001

S Johnston / A J R Sinclair
 06 353 5210
 06 356 4345
 sjohnston@crlaw.co.nz

WILL-SAY STATEMENT – DR PAUL FREDERICK LE MIERE

- [1] My full name is Paul Frederick le Miere. My experience and qualifications are set out in my statement of evidence dated 6 October 2023 (**Evidence**).
- [2] This will-say statement is prepared for the purposes of expert conferencing with Dr Tavernet and other farm systems experts. It is intended to address the questions relevant to me from paragraph [8] of the Court's Minute, dated 6 December 2023.
- [3] I repeat the confirmation given in that I have read and will comply with the Code of Conduct for Expert Witnesses in the Environment Court Practice Note 2023, and that this will-say statement has been prepared in compliance with that Code.
- [4] I note that I have had the benefit of reading Dr Tavernet's will-say shortly prior to filing this statement. Other than the acknowledgement in paragraph [5] below, I do not respond directly to Dr Tavernet's will say at this time, and instead will respond as part of expert conferencing.

Confirmation from Dr le Miere of his oral evidence regarding the data in the model performance report ... together with any further evidence that Dr le Miere considers would be of assistance to the Court regarding the veracity of Overseer predictions.

- [5] During my oral evidence,¹ I outlined the apparent difference between Overseer-modelled and experimental nitrogen leaching rates by reference to Figure 6 of the Overseer model performance report. I used that data, as it was all that was available to me (and remains the only data readily available) to assess how Overseer's modelled outputs compared to real-world measurements. I made these observations only to demonstrate at a high level the uncertainty (or variability) associated with use of Overseer within a regulatory context, when considering the accuracy of the proposed risk tool.² I acknowledge the point raised by Dr Tavernet at paragraphs [11]-[16] of his

¹ Notes of Evidence, page 292, line 25.

² Notes of Evidence, page 293, line 9.

will say that the model performance report was assessing 'goodness to fit' against real world measurements rather than assessing input uncertainty.

[6] In response to the Court's Minute, I have assessed the variability in that data in more detail.

[7] I note first that section 3.2.1 of the Overseer model performance report sets out its limitations and risks. These are important to note. In the available time, I have also given some thought to additional issues that might impact on the conclusions that can be drawn from the report. In summary:

- (a) My understanding is that some of the studies relied on in the validation data were not designed to test Overseer. Some were historical field trials of nitrogen leaching, and Overseer files were subsequently created for the purpose of the model performance report. In creating Overseer files some years down the track, there are a number of assumptions that would have had to be made in order to populate the Overseer files where certain data had not been retained e.g. the specific land and block use. I am unable to assess what impact that might have had on the assessment of measured vs modelled nitrogen leaching for these data points.
- (b) As noted in the Overseer model performance report, the data comprised paddock scale comparisons of measured and modelled nitrogen leaching, as opposed to farm scale comparisons. Therefore, it is unclear how the uncertainty that was assessed at a paddock scale will correlate with uncertainty at a farm scale (which is the sum of paddocks or blocks in Overseer).
- (c) As noted in the Overseer model performance report, the experiments were mainly short term (1-2 year) studies. I am not aware of any work that has been undertaken to demonstrate whether the years in the study were representative of the 30 year average relied on by Overseer, which would be helpful to better understand the model's performance.

- (d) As the Overseer model performance report states (section 3.2.1, **301.0518**), most of the measurements come from moderate rainfall and free draining soils (not low and high rainfall areas or heavy soils).

[8] With these caveats in mind, I have re-examined the scatter plot contained in Figure 6. My assessment of the variability in modelled versus measured N leaching (as shown in Figure 6) is shown in Table 1 below.

Table 1: Assessment of variability in modelled vs measured N leaching

+/- difference between modelled vs measured	No. data points	% of data points
0 – 25%	16	35%
25% – 50%	14	30%
50% – >150%	16	35%

[9] In summary, Table 1 outlines that:

- (a) For 35% of the measurement points, the measured nitrogen leaching was 0% to 25% higher or lower than the Overseer modelled nitrogen leaching.
- (b) For 30% of the measurement points, the measured nitrogen leaching was 25% to 50% higher or lower than the Overseer modelled nitrogen leaching.
- (c) For 35% of the measurement points, the measured nitrogen loss was 50% to 150% (or more) higher or lower (the highest underestimation or lower being 82%) than the Overseer modelled nitrogen leaching. The measured nitrogen leaching for a few data points was more than 150% different from the modelled nitrogen leaching, with the greatest magnitude of difference being about a 500% overestimation and an 82% underestimation.
- (d) Breaking the 50% to 150% cohort down further, the measured nitrogen leaching for 11% of the data points were 50% to 75% different from modelled nitrogen leaching and 24% had a difference of plus or minus 75% to 150%.

- [10] In my opinion, there is a large spread in this dataset between the measured and modelled nitrogen loss, which is what I was attempting to demonstrate by pointing this out to the Court. However, I would highlight this analysis only reflects a review of this one dataset and any extrapolations from it to draw conclusions about Overseer's model outputs more generally needs to be considered with the caveats identified.

An analysis by the relevant expert(s) of what the data contained in both the model performance report and validation report can tell us in respect to the veracity of Overseer predictions.

- [11] Since giving evidence, I have given further thought to the context of the data presented in the Overseer model performance report and how that might impact on any conclusions that might be able to be drawn from the report. I have not been provided with the actual data points or any further information or data behind the Overseer model performance report (in particular, in the time available, I have not been able to obtain a copy of the Selbie et al., 2020 report that appears to be the main report sitting behind the Overseer model performance report). Instead, I am relying on my understanding of that report and the field trials that were conducted.
- [12] I want to be very clear that my evidence is not intended as a criticism of the work that has gone into Overseer. Overseer is trying to model a vast and incredibly complex set of processes. However, in my view, the model performance report does not take us very far in being able to pinpoint the degree of reliability or precision in Overseer, for the reasons outlined in the report itself and in paragraph [7] above.
- [13] The differences between the measured and modelled nitrogen losses I highlight at paragraph [9] above will be less of a concern if Overseer is used in conjunction with other tools, and is not the sole determinant of the mitigations that the farm is required to adopt (or the only consenting pathway), or if it is used to assess relative changes in N leaching rather than assessing performance against an absolute limit. The variability will also be less of a concern when farms are considered in aggregate, at a catchment

scale (in the sense that, on average, the positive and negative deviations in reliability (or imprecision) may roughly cancel each other out).

- [14] In my view, the issues raised do not mean that there is no place for Overseer in PC2. However, it reinforces the point that Overseer's limitations should be recognised in how it is used, and that it may work best in conjunction with other tools for assessing nitrogen leaching rates for regulatory purposes.

Confirmation from Dr le Miere or other relevant expert(s) that the example in Appendix 1 accurately or otherwise demonstrates an effect of Dr le Miere's calculations, ie:

Is there a likelihood that uncertainty in Overseer predictions means that some farms with predicted CNLMs greater than the relevant Table 14.2 limits have actual nitrogen losses that are less than the 4 relevant limits? If so, please quantify the extent of the issue, including numbers and scale of prediction errors, as far as possible.

- [15] Based on the Overseer model performance report, and my assessment above, it is possible that there will be some farms that are assessed using Overseer as being currently (or following the adoption of mitigations) above their CNLMs when their actual nitrogen leaching loss is in fact lower. Given the data available to me, it is not possible to measure how likely this overestimation will be. While the variability profile shown in Table 1 above is the best information I have to base any assessment on, any extrapolation from it should be viewed in context with the caveats identified above.

Is there a likelihood that uncertainty in Overseer predictions means that some farms with predicted CNLMs less than the relevant Table 14.2 limits have actual nitrogen losses that are greater than the relevant limits? If so, please quantify the extent of the issue.

- [16] Based on the Overseer model performance report, and my assessment above, it is possible that there will be some farms that are assessed using Overseer as being currently (or following the adoption of mitigations) at or below their CNLMs when their actual nitrogen leaching loss is in fact higher. Again, given the data available to me, it is not possible to measure how likely this underestimation will be, and while the variability profile shown in Table

1 is the best information I have to base any assessment on, any extrapolation from it should be viewed in context with the caveats identified above.

Confirmation or otherwise from the relevant expert that Overseer predictions for farms in the priority subzones are based on appropriate calibration either locally or in other areas with generally similar biophysical characteristics.

[17] The Overseer model performance report states that there is a large bias towards Waikato based measurements with over half the measurements coming from Waikato and four of the five experiments with the largest dataset coming from Waikato [301.0518]. On the basis of Appendix C of the report, it appears that only 2 of the 45 measurements from dairy experiments come from the Manawatū region. It is therefore hard to say if Overseer has been appropriately calibrated for the Manawatū region.

19 January 2024

Dr Paul Frederick le Miere

