

**IN THE MATTER**

of the Resource Management Act 1991

**AND IN THE MATTER**

of resource consent applications to take and use  
water for irrigation in the MacKenzie Basin

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**STATEMENT OF ROSS MONAGHAN**

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**Rebuttal of Evidence**

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My name is Ross Martin Monaghan. My qualifications and experience are set out in my evidence in chief dated 4 September 2009.

The purpose of this statement is to rebut some of the statements made in the evidence of Dr Matt Ryan and in the report of Dr Brent Clothier.

**Nutrient Caucus 12 October 2009**

1. Nutrient caucusing between technical experts from MWRL and Meridian was undertaken on 12 October 2009. The purpose of this exercise was to address points of clarification raised in written evidence provided to the Hearings Panel, identify points of agreement and discuss remaining points of disagreement. Meeting notes were taken and circulated accordingly. A copy of the notes is attached as Annexure A of this statement. This caucus was attended by Dr Melissa Robson, Dr Val Snow, Dr Matt Ryan, Dr Brent Clothier, Dr Rob Potts and myself).
2. Here I respond to a few of the key points arising from these caucus discussions and the technical evidence prepared by Dr Matt Ryan (dated 16 September 2009) and Dr Brent Clothier (Report 4B: Cumulative effects – technical report).

### **Technical evidence of Matt Ryan**

3. In paragraphs 21 and 22 of his evidence, Dr Ryan questions the accuracy of the nitrogen leaching estimates derived by Snow et al. (2008) for existing irrigated sheep and beef land under the developed soil setting and suggests this figure is too low.
4. As is highlighted in the record of the nutrient caucus discussions, agreement was not reached on the N leaching loss values used for irrigated beef and sheep land use. Dr Ryan raised concern about the leaching loss value used (9 kg N/ha loss was modelled) and instead proposed using a value of 11 kg N/ha. The reason for this discrepancy arises because of the different input assumptions used in the OVERSEER modelling undertaken by Dr Snow and Dr Ryan; this issue is addressed in more detail in the rebuttal evidence prepared by Dr Snow. I should point out, however, that the difference between 9 and 11 kg N/ha on the irrigated areas is relatively small and well within the range of experimental noise that would be expected in field measurements of nitrogen leaching losses from grazed pastoral systems.

### **Technical evidence of Dr Brent Clothier**

5. In Table 1 and paragraphs 40 and 44 of his report, Dr Clothier states that the nitrogen leaching losses provided by Snow et al. (2008) are very likely to be underestimates, and for some (shallow) soils, significant underestimates. While Dr Snow and myself have some concerns over the validity of the input assumptions and the SPASMO modelling (these are outlined in paragraphs 29 and 30 of the rebuttal evidence of Dr Snow (dated 30 October 2009) and relate to how irrigation, farm management systems and urine patches are handled by the SPASMO model), we do agree that the nutrient estimates in the AgResearch modelling are likely to be low for the lighter soils and probably under-states the soil-to-soil variation. The spread of the leaching estimates in Dr Clothier's Table 1 might give a better indication of the spread across soil types. Properties are unlikely to have only one soil type, so considering the average of the two lighter soils compared to the two heavier soils gives a range of about 15 kg N/ha /yr. As a worst-case scenario, the leaching from the dairy farms on the lightest soils might be 7-15 kg N/ha/yr higher than that modelled and presented in Figure 7 and Table A3 of Snow (2009). There was agreement that, as the report by Snow et al. (2008) was not used to derive nutrient loadings in the WQS and was used only as a passive crosscheck, concerns about this aspect of the report do not need to be further addressed. This is especially relevant for Dr Clothier's S42a report that focused on this report (Snow et al. 2008).

## **Conclusions**

6. I do not have a strong opinion on whether the nitrogen leaching estimate for irrigated beef and sheep land use should be 9 (as suggested by Snow et al (2008) or 11 (as estimated by Dr Ryan) kg N/ha/year; these values are practically similar from agronomic and experimental points of view. However, my preference would be to use the value derived by Snow et al., as it was derived using credible modelling tools that were run using much farm systems information derived from surveys of local land owners/managers.
  
7. Based on current knowledge, I concur with Dr Brent Clothier that nitrogen leaching estimates derived using the OVERSEER nutrient budgets model will be underestimated for shallow soil types. This was highlighted in my evidence in chief dated 3 September 2009. As the leaching values documented in the report by Snow et al. (2008) were not used to derive nutrient loadings in the WQS, and were significantly lower than the values used in the WQS, I suggest that concerns about this aspect of the report do not need to be further addressed.

## **References**

- Snow, V. 2009. Section 42A evidence prepared in the matter of resource consent applications to take and use water for irrigation in the MacKenzie basin. 49p.
- Snow, V., Smeaton, D., Houlbrooke, D. 2008. Upper Waitaki Farm Systems and Nutrient Assessment. Stage 4: Irrigated nutrient assessments. 8p.

R Monaghan

9 November 2009

## **Annexure A: Notes from the Nutrient Caucus - 12 October 2009**

Attended by - Brent Clothier, Matt Ryan, Ross Monaghan, Rob Potts, Val Snow, Melissa Robson

### **Preamble**

It was agreed that this discussion was without prejudice and that notes taken would be circulated and signed off before they were released.

### **Points of clarification**

- 1) Melissa Robson to seek from GHD and provide the modelled dairy losses used for the proposed scenarios.
- 2) Melissa Robson to provide the area of dairy in each sub-catchment
- 3) Melissa Robson to seek from GHD the recalculated thresholds for river sub-catchment nodes (periphyton thresholds) from GHD

### **Points of agreement**

- There was agreement that as AgResearch report 4 was not used to derive nutrient loadings in the WQS and was used only as a passive cross check, concerns about the report do not need to be further addressed. This is especially relevant for Brent Clothier's S42a report which focused on this report 4 (referred to there as AgResearch 2009d).
- There was agreement that measuring, as well as modelling nutrient losses from farms (such as through the use of lysimeters and soil monitoring), would be useful. However that this need not be on all farms and that representative testing on some farms across soil types and farm system could be interpreted for use throughout the catchment.
- Ross Monaghan stated and repeated that in his opinion that there was no justification for using the Highly Developed setting of OVERSEER and that scientifically it should not be used as a default. Matt Ryan and Val Snow agreed to this last point. However Brent Clothier asserts that in terms of prudence that the highly developed setting of OVERSEER should be used in the FEMPs, especially given that there can be a large increase in predicted N leaching losses between the classification choices of 'Developed' and 'Highly Developed' for irrigated blocks in some farm systems. This was intimated in Val Snow's evidence.
- There was agreement that in the FEMPs there should be a higher burden of monitoring requirement for farms that were running more intensive systems with modeled nutrient losses closer to their NDA. It was agreed that, if the proposed farm system can meet its NDA using the Highly Developed setting, then they should not be required to monitor their soils for development status. Those farms that do not meet their NDA at Highly Developed but do at Developed should be required to undertake some

degree of soil monitoring of development status and use interpreted data from the representative lysimeters<sup>1</sup>. The greater the N immobilisation estimated by OVERSEER at the Developed setting the greater the burden of monitoring requirement should be.

- There was agreement about the magnitude of losses used for the dairy farming indicated verbally by Melissa Robson (Melissa Robson to seek from GHD and circulate dairy losses used to fully sign this point off).
- There was agreement in the use of OVERSEER as a tool for monitoring compliance.
- There was agreement that compliance with a threshold should be done annually, but as an average of the previous 3 – 5 years, depending on the sensitivity of the catchment.
- Brent Clothier expressed concern, also voiced by Rob Potts about the temporal variations of farm losses. It was agreed that those temporal variations would be much less of an issue if there was ‘smoothing’ in the groundwater caused by lag times. It was agreed that this issue would be deferred until the outcome of the hydrogeology caucus later this week.
- There was concern raised by Rob Potts about the scale of denitrification. Ross Monaghan stated that losses of this scale (although not necessarily just through denitrification) he thought were reasonable and probably low. Rob Potts disagreed especially for the catchments draining to the Northern Arm. It was agreed to leave the questions of denitrification and where it occurs to be answered at the hydrogeology caucus later this week.
- There was not agreement on the N loss used for irrigated beef and sheep, derived from the 7 modelled farms and used in current and proposed scenarios (9 kg N/ha loss was modelled). Matt Ryan raised concern about this figure and indicated that he thought that it was too low as it was based in part on modelling done on one station where high pasture growth rates (>14 t/ha) were inversely predicted by Farmax with no N fertiliser. Brent Clothier supported this concern. Matt Ryan proposed using the figure of 11 kg N/ha loss instead. Val Snow did not support this concern and felt that this growth was possible. Ross Monaghan stated that the difference between 9 and 11 kg N on the irrigated areas was not significant. Val Snow is to produce a defense of this figure next week.

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<sup>1</sup> This could be aided via other mechanistic modeling to extend and extrapolate the measured data to link it to OVERSEER (BC)

- In addition to having confidence in the figure itself, Val Snow stated that the establishment of farm NDAs and compliance testing against these should give the commissioners confidence that even if there were underestimates in the modeling, the risk is incurred by the farmers and not the environment. Matt Ryan accepted this but stated that it was important that the commissioners had as accurate an idea of what the possible impacts would be before granting consent.

### **Other discussions**

- There were questions about a trigger response level in the river nodes posed by Rob Potts. Melissa Robson briefly explained that a 75 % of the node load would trigger some response, however stated that these conditions would be fully laid out in John Kyle's evidence this week.
- Concern was expressed that submitters had not yet seen the FEMPs
- There was a discussion about the sensitivity of OVERSEER to rainfall. Matt Ryan thought that it was relatively insensitive to rainfall and Brent Clothier found from his work at Horizons that it was sensitive to rainfall. It is proposed in the WQS that a consistent source of rainfall data should be used for assessing compliance when using OVERSEER. NIWA weather data was suggested, however no further discussion took place on this topic.
- Brent Clothier expressed concern about the use of average values (which are exceeded 50% of the time) for loads at nodes and that a higher standard than this might be required. He stated the use of HD in the FEMPs would confer this higher standard. This fed back into the discussion of the use of Developed and Highly Developed in FEMPs and the consequent impact on further monitoring.
- In a review of the caucus notes, Matt Ryan notes that if a developed scenario is used in the WQS to predict nutrient losses, he recommends that a sensitivity analysis be conducted based on N losses from increased N fertiliser usage on irrigated sheep and beef and dairy farms.