BEFORE THE ENVIRONMENT COURT

In the matter of	appeals under clause 14 of the First Schedule to the Resource Management Act 1991 concerning the proposed One Plan for the Manawatu-Wanganui region.
between	**FEDERATED FARMERS OF NEW ZEALAND ENV-2010-WLG-000148**
and	**MINISTER OF CONSERVATION**
	ENV-2010-WLG-000150
and	**HORTICULTURE NEW ZEALAND**
	ENV-2010-WLG-000155
and	**WELLINGTON FISH & GAME COUNCIL**
	ENV-2010-WLG-000157
and	**Mr ANDREW DAY**
	ENV-2010-WLG-000158
	Appellants
and	**MANAWATU WANGANUI REGIONAL COUNCIL**
	Respondent

ADDITIONAL STATEMENT OF REBUTTAL EVIDENCE OF DR OLIVIER AUSSEIL ON THE TOPIC OF WATER QUALITY ON BEHALF OF THE MINISTER OF CONSERVATION AND WELLINGTON FISH & GAME COUNCIL

Dated: 15th May 2012

INTRODUCTION

1. My full name is Olivier Michel Nicolas Ausseil. A full description of my qualifications and experience was provided in my evidence in chief dated 14 March 2012, which was filed with the Court. I repeat the confirmation in that statement that I have read and agree to comply with the Code of Conduct for Expert Witnesses.

PURPOSE AND SCOPE OF EVIDENCE

2. The statements of evidence in reply lodged by Dr Scarsbrook Dr Ledgard and Mr Willis on 18 April 2012 on behalf of Fonterra contained, or referred to, new technical evidence in relation to land use and water quality modelling which was not contained in their evidence in chief.

3. The purpose of this evidence is to respond to specific points relating to this new technical evidence.

4. Since I filed my statement of evidence in reply, I have also received and read Dr Roygard's supplementary statement of evidence, dated 27th April 2012, Dr Roygard and Ms Clark's statement of further information dated 9 May 2012 and Mr Hansen's supplementary statement of evidence dated 4 May 2012.

5. I comment on, or refer to, matters raised in those further statements to the extent necessary in this evidence.

ISSUES OF CONTENTON

6. In their statements of evidence in reply (dated 18 April 2012), Dr Scarsbrook and Mr Willis present comparisons of the outcomes of the landuse/N-loss scenarios presented by Dr Ledgard with the outcomes of modelling undertaken by Dr Roygard and myself. Based on the results of these comparisons, they then draw conclusions relating to the respective merits of different management regimes.

7. In my opinion, there are a number of fundamental issues with the attempt that Mr Willis and Dr Scarsbrook make at comparing the outcomes of different scenarios. These are set out below.

DR LEDGARD'S EVIDENCE IN REPLY

8. Appendix B of Dr Ledgard's evidence in reply presents a number of potential future dairy farm scenarios that may result from the approach put forward by Mr Willis. The key results of this modelling are region-wide average N-loss rates from dairy farms summarised in tables in paragraphs 5, 9 and 11 of Dr Ledgard's Appendix B.

9. I will not comment on the methodology and assumptions used by Dr Ledgard to arrive at these numbers as it is largely outside my area of expertise, but I do note that both Dr Roygard and Dr Dewes have raised concerns relative to the validity and applicability of these numbers.

10. Dr Ledgard's N-loss numbers are provided as region-wide average N-losses from dairy farms. From a water quality perspective, I am concerned that this will not allow for a robust assessment at the water management zone or sub-zone scale, particularly given the differences in the current average N losses from dairy farms and state of water quality in the different zones/sub-zones.

11. I note that Dr Ledgard's scenarios, in particular his "Option 1", outlined in paragraph 2 of his Appendix B, appears to be based on a "potentially achievable" scenario[1], rather than a worst case scenario. This point is elaborated further in Dr Dewes's further rebuttal evidence.

12. It is my understanding that Dr Ledgard is currently reviewing his modelling and will provide an updated set of numbers at some stage in the future. Given the limitations and concerns raised above and the further work being undertaken by Dr Ledgard, I have not at this stage modelled the water quality outcomes of Dr Ledgard's current numbers.

[1] Paragraph 2 of Dr Ledgard's Appendix B: "it was calculated that a reduction in N leaching of 7.6 kg N/ha/yr was **potentially achievable**" (emphasis added).

DR SCARSBROOK'S EVIDENCE IN REPLY

13. In his evidence in reply dated 18th April 2012, Dr Scarsbrook attempts to re-use some of Dr Roygard and Ms Clark's modelling results to draw conclusions on the likely water quality outcomes resulting from Dr Ledgard's analysis. In my opinion, the approach taken by Dr Scarsbrook is fundamentally flawed and his results are, in my opinion, invalid. The reasons are set out below.

14. In Table 2 of his rebuttal evidence, Dr Scarsbrook provides predictions of changes in in-river SIN loads resulting from Dr Ledgard's N-loss predictions under the three scenarios presented in paragraph 5 of Dr Ledgard's Appendix B (20.2, 20.6 and 21.0 kg N/ha/yr). These correspond to the current land-use, i.e. they do not account for any expansion of dairying

a. As explained in his paragraph 20.2, Dr Scarsbrook uses Roygard and Clark's modelled outputs for single number approaches to try and derive a change in in-river SIN load resulting from Dr Ledgard's N-loss numbers.

b. However, Dr Scarsbrook uses Dr Ledgard's paragraph 5 numbers (which do not account for any dairy expansion), whilst the Roygard and Clark's single number approaches (their scenarios 7-15) assumed an 11% dairy expansion over 20 year (point 150, Roygard and Clark 24 February 2012).

c. Dr Ledgard does provide average N-loss numbers under a dairy expansion scenario in his points 9 (5.5% expansion over a 10 years time frame) and 11 (11% expansion over a 20 years time frame). I believe Dr Scarsbrook should have used these numbers if he wanted to provide a useful comparison with the Roygard and Clark's modelling results.

15. Dr Scarsbrook tries to extrapolate predicted outcomes of modelling over a 20 years period (Roygard and Clark's modelling) to predict outcomes of a 10 year-based management regime (Mr Willis's approach). His explanation, in his point 20.3 is that he "multiplied the Y-intercept of the relationship by 0.945 for each river site". The basis for that is unclear to me, as I cannot see how the reason Dr Scarsbrook gives justifies this approach.

16. Another significant issue with Dr Scarsbrook's analysis is the inappropriate use of predicted regional average N loss numbers in specific catchments where the current average N-loss numbers is known to be very different from the regional average.

a. Dr Ledgard has calculated that Mr Willis's regime may result in a decrease in the regional average N Loss from dairy farms of 1.1 to 1.9 kg/ha/yr, or 5 to 8% decrease (when accounting for 5.5% expansion over 10 years);

b. Based on a current regional average of 22.8 kgN/ha/yr, the above reductions result in regional average N loss from dairy farms of 20.9 to 21.7 kg N/ha/yr (table in point 9 of Dr Ledgard's Appendix B);

c. However, by applying these latter numbers to zones where the current average N losses from dairy farms is much higher, Dr Scarsbrook has assumed a much larger reduction in N-loss than predicted by Dr Ledgard. For example, in applying these numbers to the Upper Manawatu above Hopelands, Dr Scarsbrook has assumed a 17% to 20% (4.4 to 5.2 kg/ha/yr) reduction in the average N loss from dairy farms in that zone (i.e. more than double the reductions – both in absolute and % terms- predicted by Dr Ledgard).

d. I note that Dr Roygard has re-modelled some of Dr Ledgard's scenarios for different water management zones and sub-zones in the Manawatu catchment, and predicts that the average N loss rate from dairy farms may reduce by 8 to 9% under Mr Willis's approach, not 17% to 20% as assumed by Dr Scarsbrook.

17. Lastly, I have re-modelled a number of scenarios to account for a shorter timeframe of 10 years (instead of the 20 years timeframe modelled in my EIC) to conform with the 10 year timeframe Dr Roygard and Dr Ledgard modelled for the approaches put forward by Ms Barton and Mr Willis. Assuming a 5.5% dairy expansion, the in-river SIN loads in the Manawatu at Hopelands are predicted to:

a. Decrease by 5.0% if the POP DV LUC N-loss limits are applied to all (existing + conversions) dairy farms (i.e. Ms Barton's approach). I note that Dr Roygard predicts exactly the same SIN load reduction for this scenario[2];

b. Decrease by 11.8% if the POP NV Year 10 LUC limits (Fish and Game/Minister of Conservation approach) are applied to all (existing + conversions) dairy farms;

c. Decrease by only 2.2% (not 9% as predicted by Dr Scarsbrook) if the average N-loss from dairy farms above Hopelands was to reduce to 23.75kgN/ha/yr (i.e. a 9% reduction in average N losses, which is at the upper end of the range calculated by Dr Ledgard at the regional scale). I note that Dr Roygard models a very similar outcome to mine assuming a 8.4% reduction in the average N loss from dairy farms in that zone[3].

MR WILLIS'S EVIDENCE IN REPLY

18. Table 1 in Mr Willis's evidence in reply dated 18th April presents a comparison of modelled percentage change in in-river SIN loads under different management regimes.

19. As indicated above, I believe that Dr Scarsbrook's results are flawed and any analysis or interpretation based on them should not be relied upon. However, it is my understanding that further modelling work is being undertaken by Dr Ledgard and Dr Roygard, which may lead to producing valid numbers to populate Mr Willis's Table 1.

20. If and when this occurs, then comparisons between modelled outputs should be undertaken with caution to ensure that they are undertaken on a level playing field.

21. As explained in my paragraph 11 above, Dr Ledgard's scenario modelling appears to be based on a "potentially achievable", (rather than a worst-case), N-loss reduction under Mr Willis's proposed regime.

[2] Table 5 and paragraph 21 of Dr Roygard's 27th April 2012 supplementary statement of evidence
[3] Table 5 of Dr Roygard's 27th April 2012 supplementary statement of evidence

22. By contrast, the modelling which Dr Roygard and I undertook and presented in our evidence in chief is based on the assumption that all the farms covered by the regulatory regime would operate at the maximum allowable N-loss limit. This is explained in point 8.16 of my evidence in chief and in Dr Roygard and Ms Clark's 24th February evidence (e.g. paragraph 149).

23. In essence, my modelling scenarios (and those of Roygard and Clark) represent a "worst case" or "maximum" N loss scenario, i.e. the maximum N-losses allowable from land regulated by a given management regime. One could realistically envisage that many dairy farms will actually operate some way below the N loss limits (LUC or single-number) imposed by the regional plan, leading to an overall lesser N loss than modelled.

24. In his evidence in reply (18 April 2012), Mr Willis compares the outcomes of "worst-case scenarios" under specific regulatory regimes proposed by Horizons, the Wellington Fish and Game Council and the Minister of Conservation (i.e. the modelling which Dr Roygard and I undertook and presented in our evidence in chief) with a "potentially achievable" scenario (i.e. the modelling undertaken by Dr Ledgard) that may or may not occur under his proposed regime. Comparing the outcomes of regimes on this basis does not, in my view, provide a balanced platform for comparing the merits of different management regimes.

25. In order to enable a balanced comparison of the water quality outcomes of different management regimes, it is my opinion that they should be compared on the same basic principles, for example by comparing "maximum" scenarios with "maximum" scenarios, and "possible" scenarios with "possible" scenarios.

26. My conclusion is not that Mr Willis's proposed approach can or cannot deliver certain water quality outcomes, as I am not in a position to form an opinion on this point until the results of further modelling by Dr Ledgard are known, but rather that the numerical conclusions reached by Dr Scarsbrook appear incorrect and that Mr Willis's comparisons with other approaches have not been carried out on a level playing field.

FURTHER MODELLING

27. I have not undertaken in-river N load modelling based on the average N-loss numbers provided by Dr Ledgard in his 18 April 2012 evidence in reply. Based on Dr Roygard's and Dr Dewes's evidence, I understand that there are a number of issues with the assumptions used by Dr Ledgard in deriving these numbers. Given the disparity in current in-river loads and current N-losses from dairy farms in different catchments/water management zones/sub-zones, I also do not believe that it would be appropriate to use regional average numbers to model in-river SIN loads in specific catchments/water management zones/sub-zones. It is my understanding that Dr Ledgard is currently reviewing his N-Loss modelling of Mr Willis's proposed management regime to provide numbers relevant to the different priority management zones.

28. I have also been advised that Federated Farmers and Ravensdown are proposing an approach which defines different activity statuses (e.g. permitted/controlled/restricted discretionary) depending on the level of N losses from a dairy farm. However, I am not aware of any modelling undertaken by Federated Farmers/Ravensdown or any other parties that would provide an estimate of average N-losses from dairy farms in different priority water management zones that would result from this approach. As a result, I am not able to provide the Court with modelled water quality outcomes in relation to this proposed regime.

29. To provide a common time scale with the regime proposed by Mr Willis, I re-modelled the in-river N load outcomes of the management regimes put forward by Ms Barton and Wellington Fish and Game/ Minister of Conservation within a 10 year timeframe. I also modelled the in-river SIN load changes resulting from a range of average N-losses from dairy farms. This modelling has been undertaken assuming 5.5% and 9% dairy expansion over the 10 years modelling period (corresponding to 11% and 18% dairy expansion over 20 years), for two key proposed priority zones, the Manawatu at Hopelands and the Coastal Rangitikei. Results are summarised in Table 1 below.

30. For the Manawatu at Hopelands, the key points are:

a. I can confirm the 5% improvement calculated by Dr Roygard at the Manawatu at Hopelands, when assuming a 5.5% increase in land area used for dairying and that the DV POP LUC N-loss limits are applied to all dairy. A slightly lesser improvement (4.4%) is predicted when assuming a 9% increase in dairying;

b. The application of the Notified Version POP Year 10 (NV Yr 10) LUC N loss limits to all dairy farms (Wellington Fish and game/Minister of Conservation approach) is predicted to result in further improvements (11.5 to 11.8%, depending on the assumed dairy expansion scenario) compared with the application of the DV POP LUC limits (Ms Barton's approach);

c. Average N-loss numbers of less than 25 kg N/ha/yr are predicted to result in an improvement in in-river SIN loads. Conversely, average N-loss numbers over 25 kg N/ha/yr are predicted to result in an increase in in-river SIN loads.

31. For the Coastal Rangitikei:

a. The application of the DV POP LUC N-loss limits (Ms Barton's approach) may result in an increase (6 to 7%) in in-river SIN loads. This is consistent with the conclusion I reach in my evidence in chief for a 20 years timeframe (point 9.21 of my evidence in chief dated 14 March 2012);

b. The application of the NV POP Yr 10 LUC limits to all dairy farms (Wellington Fish and Game/Ministry of Conservation approach) is predicted to result in minor improvements in SIN Loads. This essentially corresponds to maintaining water quality in this zone;

c. Average dairy farm N-loss numbers of less than 21 kg N/ha/yr are predicted to result in reductions in SIN loads; conversely, average N loss from dairy farms over 21 kg N/ha/yr are predicted to result in increases in in-river SIN loads.

Table 1: Predicted % change in in-river SIN loads within a 10 year timeframe, assuming two levels of dairy expansion (5.5% and 9%) during that time, under different management regimes (positive numbers show an improvement, i.e. a decrease in SIN load; negative numbers show a degradation, i.e. an increase in SIN loads).

Management regime		Hopelands		Coastal Rangitikei	
		5.5% conversions	**9% conversions**	**5.5% conversions**	**9% conversions**
DV (Horizons)		+5%	+4.4%	-6.2%	-7.0%
NV Y10 (F&G/MoC)		+11.8%	+11.5%	+1.6%	+1.0%
Average N-loss (kgN/ha/Yr)	18	+10.6	+10.2%	+5.3%	+4.9%
	19	+9.1%	+8.7%	+3.7%	+3.3%
	20	+7.7%	+7.2%	+2.1%	+1.6%
	21	+6.2%	+5.7%	+0.5%	-0.1%
	22	+4.7%	+4.2%	-1.1%	-1.7%
	23	+3.3%	+2.7%	-2.7%	-3.4%
	24	+1.8%	+1.1%	-4.3%	-5.0%
	25	+0.4%	-0.4%	-5.9%	-6.7%
	26	-1.1	-1.9%	-7.5%	-8.3%
	27	-2.6%	-3.4%	-9.1%	-10.0%
	28	-4.0%	-4.9%	-10.7%	-11.6%
	29	-5.5%	-6.4%	-12.3%	-13.3%
	30	-6.9%	-7.9%	-13.9%	-15.0%

Dr Olivier Michel Nicolas Ausseil
15 May2012