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*In the matter of:*

Clauses 6 and 8 of Schedule 1 – Resource  
Management Act 1991 – Submissions on publicly  
notified plan change and variation – Proposed Plan  
Change 1 and Variation 1 to Waikato Regional Plan –  
Waikato and Waipa River Catchments

*And:*

**Wairakei Pastoral Ltd**

Submitter

*And:*

**Waikato Regional Council**

Local Authority

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**REBUTTAL EVIDENCE OF PHILLIP WILLIAM JORDAN**

**Block 1 Hearing Topics**

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*Dated:* 26 February 2019

## REBUTTAL EVIDENCE OF PHILLIP WILLIAM JORDAN

### Block 1 Hearing Topics

#### SUMMARY

- 1 Relevant to my expertise, I wish to rebut the evidence of the following expert witnesses:

Name	Submitter
Dr Timothy Jason Cox	<b>Beef + Lamb New Zealand Ltd ID 73369</b>
Dr Olivier Ausseil	<b>Waikato and Waipa River Iwi ID 74035</b>
Ms Gillian Holmes	<b>Horticulture New Zealand (HortNZ) ID 73801</b>
Dr Adam Canning	<b>Auckland / Waikato Fish and Game Council ID 74085</b>
Dr Craig Depree	<b>DairyNZ ID 74050</b>

- 2 I support Dr Cox's statement that, "The models, and modelling process, are lacking in transparency" (Evidence In Chief (EIC) paragraph 17).
- 3 In paragraphs 43 and 50 of his EIC, Dr Cox mirrors the concerns in my EIC (paragraphs 9 and 27 to 29), where I also pointed out the lack of objective evidence provided in Semadeni-Davies et al. (2015) with respect to setting "ultimate" attenuation factors for Total Nitrogen (TN). I therefore support Dr. Cox's concerns about "over-simplification and uncertainties associated with basin (sub-catchment) attenuation."
- 4 I support Dr Cox's statement that, "further refinement in this area of the modelling" (sub-catchment attenuation) "is required if the model is to be used to support mitigation decision making in the future. This refinement should be guided by site-specific measured data and a modelling platform capable of incorporating time-of-travel lags and dynamic basin exports" (EIC paragraph 50).
- 5 I support Dr Cox's statement that it was, "unclear how the model was used, if at all, to inform the policy recommendations of Plan Change 1" (EIC paragraph 48). I also support Dr Cox's

assessment, also in paragraph 48, that there appeared to be no “quantitative, model-based justification” for the spatial variation in the “long or short-term water quality targets” that were set in PC1. I agree with Dr Cox’s assessment (EIC paragraph 49) that an opportunity was missed to apply the model to demonstrate that the “goals” could be achieved within the stated timeframes, to “strengthen the plan change”.

- 6 I agree with Dr Cox that, “significant uncertainty exists in the parameterisation of land use areas, export coefficients, and attenuation coefficients, particularly given noted flaws in the model calibration process associated with nitrogen travel time lags” (EIC paragraph 52).
- 7 I support Dr Cox’s statement that, “Much of the model parameterisation is based on a coarse calibration process, which has not been fully detailed. It does not appear that this process effectively isolated key model parameters (e.g. exports vs. attenuation). Nor was there any sort of verification exercise performed. If possible, given available data, the model calibration process should be strengthened to improve confidence in model parameters. This would likely require modelling at a smaller spatial scale, supported by site-specific data. Independent studies of export and attenuation could also be used to refine, and/or verify, model parameterisation” (EIC paragraph 21).
- 8 I note that Dr Cox has developed another catchment scale model of the Waikato River catchment. During the time for preparing of rebuttal evidence statements, I have not had sufficient time to assess the fitness for purpose, or otherwise, of Dr Cox’s alternative model.
- 9 I support the matters summarised in paragraphs 9 and 13 of the EIC of Dr Ausseil, as explained in his summary (from paragraph 13) and in paragraphs 46-104 of his EIC. I support Dr Ausseil’s explanation that setting of the current state was “applied too rigidly”, which has led to a number of detrimental issues. I support Dr Ausseil’s view because, “(a) some processes, such as generation and transport of dissolved N via groundwater flow pathways occur over periods that may be longer than five years, and (b) the catchment responds to trends and variations in climate that are subject to periods that are longer than five years” (my EIC paragraph 10).
- 10 I support Ms Holmes’ statement that there are “a range of mitigations that can be employed” but would argue that this is broadly applicable across several agricultural land uses and not limited merely to horticulture. I also agree with Ms Holmes that severity of effects varies spatially between sub-catchments.

- 11 I support Ms Holmes' statement (paragraph 41) that, "a catchment collective approach to allocation" should be included within PC1. I would further argue that the "catchment collective approach to allocation" is not limited only to "commercial vegetable growers" but that it should apply to all land uses in the Waikato. As I have argued in my EIC (paragraphs 40 to 52), alternative modelling frameworks have been constructed for at least part of the Waikato catchment and these alternative sub-catchment models could provide the basis for consents to be assessed at a sub-catchment level.
- 12 Dr Canning and Dr Depree make underlying assumptions in their EIC that there are "long lag times for nitrogen" in "many catchments". Dr Canning appears to have based these statements in his EIC (paragraph 3.38 and Tables A2 and A3) on the lag time descriptions provided in Semadeni-Davies et al. (2015). I disagree with the assumption made by Dr Canning and Dr Depree because I agree with Mr Williamson (EIC, summary paragraphs 1 to 3), who makes the case that there is evidence that the "concept of groundwater N 'load to come' is conceptually flawed because it is inconsistent with scientific principles of redox chemistry and lacks scientific observation data and robust modelling support." In my EIC (paragraphs 9 and 27 to 29), I have also pointed out the lack of objective evidence provided in Semadeni-Davies et al. (2015) with respect to setting "ultimate" attenuation factors for Total Nitrogen (TN), on the basis of the expert panel assessment of "load to come".
- 13 I disagree with Dr Depree's statement that the models used for PC1 are "fit for purpose" (EIC, paragraph 3.2d and 5.12), for the reasons that I have explained in my EIC.

## REBUTTAL

- 1 My name is **Dr Phillip William Jordan**. I have the qualifications and experience recorded in my statement of evidence filed in relation to the Block 1 Hearing Topics.
- 2 My rebuttal evidence has been prepared in accordance with the Code of Conduct for expert witnesses as set out in Section 7 of the Environment Court of New Zealand Practice Note 2014.
- 3 Relevant to my expertise, I wish to rebut the evidence of the following expert witnesses:

<b>Name</b>	<b>Submitter</b>
Dr Timothy Jason Cox	<b>Beef + Lamb New Zealand Ltd ID 73369</b>
Dr Olivier Ausseil	<b>Waikato and Waipa River Iwi ID 74035</b>
Ms Gillian Holmes	<b>Horticulture New Zealand (HortNZ) ID 73801</b>
Dr Adam Canning	<b>Auckland / Waikato Fish and Game Council ID 74085</b>
Dr Craig Depree	<b>DairyNZ ID 74050</b>

### **Dr Cox for Beef + Land New Zealand Ltd (ID 73369)**

- 4 I support Dr Cox's statement that, "The models, and modelling process, are lacking in transparency. There is insufficient detail in the modelling reports for readers to fully understand critical steps in the modelling process. More importantly, the models themselves, and the supporting datasets, have not been made available to the public. In my opinion, this does not follow best practice for such an important study" (EIC paragraph 17).
- 5 In paragraphs 43 and 50 of his EIC, Dr Cox mirrors the concerns in my EIC (paragraphs 9 and 27 to 29), where I also pointed out the lack of objective evidence provided in Semadeni-Davies et al. (2016)<sup>1</sup> with respect to setting "ultimate" attenuation factors for

<sup>1</sup> Semadeni-Davies, A., S. Elliott and S. Yalden (2016), Modelling Nutrient Loads in the Waikato and Waipa River Catchments, Report No. HR/TLG/2016-2017/2.2A, Released 21 October 2016.

Total Nitrogen (TN). I therefore support Dr. Cox's concerns about "over-simplification and uncertainties associated with basin (sub-catchment) attenuation."

- 6 I support Dr Cox's statement that, "further refinement in this area of the modelling" (sub-catchment attenuation) "is required if the model is to be used to support mitigation decision making in the future. This refinement should be guided by site-specific measured data and a modelling platform capable of incorporating time-of-travel lags and dynamic basin exports" (EIC paragraph 50).
- 7 I support Dr Cox's statement that it was, "unclear how the model was used, if at all, to inform the policy recommendations of Plan Change 1" (EIC paragraph 48). I also support Dr Cox's assessment, also in paragraph 48, that there appeared to be no "quantitative, model-based justification" for the spatial variation in the "long or short-term water quality targets" that were set in PC1. I agree with Dr Cox's assessment (EIC paragraph 49) that an opportunity was missed to apply the model to demonstrate that the "goals" could be achieved within the stated timeframes, to "strengthen the plan change".
- 8 I support Dr Cox's statement that, "Despite noted significant uncertainties in many of the key model parameters, the models are not supported by uncertainty or sensitivity analyses of any sort. Consequently, the robustness of the model calibration and predictive power is unknown. This impacts model credibility and acceptance among stakeholders" (EIC paragraph 18).
- 9 I agree with Dr Cox that, "significant uncertainty exists in the parameterisation of land use areas, export coefficients, and attenuation coefficients, particularly given noted flaws in the model calibration process associated with nitrogen travel time lags" (EIC paragraph 52).
- 10 I support Dr Cox's statement that, "Much of the model parameterisation is based on a coarse calibration process, which has not been fully detailed. It does not appear that this process effectively isolated key model parameters (e.g. exports vs. attenuation). Nor was there any sort of verification exercise performed. If possible, given available data, the model calibration process should be strengthened to improve confidence in model parameters. This would likely require modelling at a smaller spatial scale, supported by site-specific data. Independent studies of export and attenuation could also be used to refine, and/or verify, model parameterisation" (EIC paragraph 21).
- 11 I note that Dr Cox has developed another catchment scale model of the Waikato River catchment. During the time for preparation of rebuttal evidence statements, I have not had sufficient time to

assess the fitness for purpose, or otherwise, of Dr Cox's alternative model.

**Dr Ausseil for Waikato and Waipa River Iwi (ID 74305)**

- 12 I support the matters summarised in paragraphs 9 and 13 of the Evidence in Chief (EIC) of Dr Ausseil. Dr Ausseil goes on to explain his summary (from para 13) in paragraphs 46-104 of his EIC. In particular, I support Dr Ausseil's statement (paragraph 9) that, "The process and methodology used to define the "current state" of water quality in the catchment was not documented and should be made available by the Waikato Regional Council (WRC) for review by all water quality experts involved in this process."
- 13 I also support Dr Ausseil's explanation (paragraphs 13, 46-104 of his EIC) that setting of the current state was "applied too rigidly", which has led to a number of detrimental issues. I support Dr Ausseil's view because, "(a) some processes, such as generation and transport of dissolved N via groundwater flow pathways occur over periods that may be longer than five years, and (b) the catchment responds to trends and variations in climate that are subject to periods that are longer than five years" (my EIC paragraph 10).

**Ms Holmes for Horticulture New Zealand (ID 73801)**

- 14 In paragraph 40 (g) of her EIC, Ms Holmes points out that, "Horticultural land has a range of mitigations that can reduce the effects of the four contaminants used within PC1 (TN, TP, E. coli and sediment), however the severity of the effects really depends on the vulnerability of the receiving environment (which is different between each sub-catchment)". I support this statement. I would further argue that there are ranges of mitigations that can be employed across several agricultural land uses, so Ms Holmes' statement is more generally applicable and not limited merely to horticulture. I also agree that severity of effects varies spatially between sub-catchments.
- 15 I support Ms Holmes' statement in paragraph 40(i) that, "It is more effective to assess contaminant loads to achieve water quality outcomes, rather than yields and concentrations."
- 16 I support Ms Holmes' argument (paragraph 41) that, "a catchment collective approach to allocation" should be included within PC1. I would further argue that the "catchment collective approach to allocation" is not limited only to "commercial vegetable growers" but that it should apply to all land uses in the Waikato. As I have argued in my EIC (paragraphs 40 to 52), alternative modelling frameworks have been constructed for at least part of the Waikato catchment and these alternative sub-catchment models could

provide the basis for consents to be assessed at a sub-catchment level.

**Dr Canning for Auckland/Waikato and Eastern Region Fish and Game Councils (ID 74985)**

- 17 In paragraph 3.38 of Dr Canning’s EIC, he states that, “Given that many catchments have long lag times for nitrogen (time between nitrogen leaching soil to reaching the river), in these catchments the final targets for nitrogen loads leaving the root-zone will need to be achieved much sooner than the 80 years in stream objectives need to be met”.
- 18 Whilst I agree in principle with Dr Canning’s evidence, in that “long lag times for nitrogen” would require earlier achievements in reductions of root zone loads in order to achieve in stream objectives, I disagree with the underlying assumption that there are “long lag times for nitrogen” in “many catchments”. Dr Canning appears to have based these statements in his EIC (paragraph 3.38 and Tables A2 and A3) on the lag time descriptions provided in Semadeni-Davies et al. (2015). I disagree with the assumption made by Dr Canning, because I agree with Mr Williamson (EIC, summary paragraphs 1 to 3), who makes the case that there is evidence that the “concept of groundwater N ‘load to come’ is conceptually flawed because it is inconsistent with scientific principles of redox chemistry and lacks scientific observation data and robust modelling support.” In my EIC (paragraphs 9 and 27 to 29), I have also pointed out the lack of objective evidence provided in Semadeni-Davies et al. (2015) with respect to setting “ultimate” attenuation factors for Total Nitrogen (TN), on the basis of the expert panel assessment of “load to come”.

**Dr Depree for Dairy NZ (ID 74050)**

- 19 Dr Depree (EIC, paragraph 3.2d and 5.12) states that the models employed by HRWO are “fit for purpose”. However, he also admits that he is, “not a modeller” (EIC paragraph 3.2a). I disagree with Dr Dupree’s statement that the models are “fit for purpose”, for the reasons that I have explained in my EIC.
- 20 Dr Depree (EIC, paragraphs 3.4f and 6.12) refers to the difficulty in achieving long-term objectives with regard to nitrate-N and TN given the “load to come” of N. I disagree with the assumption made by Dr Depree with respect to the N “load to come”, for same the reasons set out in paragraph 18 above.

A handwritten signature in black ink, appearing to read 'P.W. Jordan', with a large, sweeping flourish at the end.

**Dr Phillip William Jordan**

*Principal Hydrologist, Hydrology and Risk Consulting*

26 February 2019