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

FURTHER REBUTTAL OF EVIDENCE OF JONATHAN WILLIAMSON

Block 2 Hearing Topics

Dated: 17 May 2019

REBUTTAL OF EVIDENCE OF JONATHAN WILLIAMSON

Block 2 Hearing Topics

1 My name is **Jonathan (Jon) Williamson**. 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 comment on the effects of farming activities on water quality raised by other expert witnesses:

Dr Cox for Beef and Lamb NZ

Catchment Modelling of Land Use and Water Quality

4 I have read the Block 2 evidence by Dr Cox for Beef and Lamb New Zealand (B+LNZ) and make the following comments that I consider are important when comparing and contrasting the key outputs and messaging from the NIWA and B+LINZ model to that of the Ruahuwai Decision Support Tool (**RDST**), presented in evidence for Wairakei Pastoral Limited (**WPL**).

5 In paragraph 11 of Dr Cox's evidence he explains how the nitrogen attenuation coefficients were re-calibrated to the most recent river water quality data available for the period 2017 to 2018. Dr Cox also explains that the land use was updated to reflect that prevailing during the same period.

6 While I would agree that using the most recent water quality and land use data should provide an improvement in the overall accuracy of the model, an issue remains with this model (and the NIWA model) in that it does not consider:

6.1 Spatial variability in attenuation rates within sub-catchments; and

6.2 The time it takes for the effects of land use change to manifest.

7 This is because neither Dr Cox's model nor NIWA's model considers groundwater flow and transport processes with any degree of hydrogeological rigour (i.e. they lack consideration of the hydraulic and biochemical behaviour of the aquifer systems, which

is essentially the missing link between the concepts of "export" and "discharge" discussed in the evidence of Dr Cox and NIWA.[1]

8 An implication of not considering the time it takes for effects of a land use change to fully manifest is that the "attenuation coefficients" used in the model may not be fully cognisant of the short-term load still to discharge (in transit) following the land use change. The significance of this reduces with time after land use change. From my own experience in the Ruahuwai catchments, I would estimate that Dr Cox's model probably does not suffer from a significant impediment given the passage of time since the majority of land use change occurred between 2005-2012.

9 A significant implication of not considering the spatial variability in attenuation rates within catchments is that scenario modelling is constrained in that it can not consider different land use intensity across different parts of the catchment.

10 It therefore follows that the conclusion Dr Cox reached in para 47 of his Block 2 EIC is logical given the modelling tool available to him. However, a different outcome or conclusion can be obtained with a more sophisticated model that considers the different assimilative capacity and in particular nitrogen vulnerability of the land. This is discussed in my Block 2 EIC starting at paragraph 167.

11 Furthermore, I consider Dr. Cox's conclusion in para 47 of "an equal allocation of nitrogen export "allowances" across all land use types" to be unrealistic in the real world. This effectively implies that all farming would need to change to a lower level of leaching, akin to sheep and beef farming, which is not an effects-based proposition.

Jonathan Williamson

Williamson Water & Land Advisory

17 May 2019

[1] Dr Cox in para 34 of his EIC uses the terms "export" and "discharge" to differentiate between pre-attenuation losses from farm to surface or sub-surface pathways vs. post-attenuation loading to receiving waters, respectively.