BEFORE INDEPENDENT HEARING COMMISIONERS

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER Proposed Waikato Regional Plan Change 1: Waikato and Waipa River Catchment

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STATEMENT OF REBUTTAL EVIDENCE OF GRAEME JOHN DOOLE

FOR DAIRYNZ LIMITED

SUBMITTER 74050

10 May 2019

DairyNZ
Cnr Ruakura Road
& SH 26 Newstead
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1. Qualifications and experience

1.1 My full name is **Dr Graeme John DOOLE**.

1.2 I am currently the Principal Economist and Leader of the Economics Team at DairyNZ. I have the qualifications and experience set out in my primary evidence. In addition, I note that in my rebuttal evidence, I draw on some work I completed as an expert witness for Bay of Plenty Regional Council as respondent for an Environment Court Appeal on their Regional Plan Change 10 (PC10) for Lake Rotorua Catchment.

1.3 I have read the Environment Court's Code of Conduct for Expert Witnesses contained in the *Environment Court's Practice Note 2014*, and I agree to comply with it. In that regard, I confirm that this evidence is within my area of expertise except where I state that I am relying on the evidence of another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in this evidence.

2. Scope of evidence

2.1 My rebuttal evidence is provided in response to the Evidence in Chief filed by **Alec McKay** and **Alison Dewes** on behalf of **Beef and Lamb New Zealand Limited** (BLNZ) on 3 May 2019. Overall, in my professional opinion, I believe that these parties fail to consider several material limitations associated with placing greater pressure to mitigate on the dairy sector in the Waikato River catchment under Plan Change 1 and Variation 1 (PC1).

3. Historical intensification of the New Zealand pastoral sector

3.1 Dr Dewes outlines in paragraphs 41-70 of her Block 2 evidence how the New Zealand dairy sector has grown substantially over the last 20 years, with a subsequent impact on its environmental footprint. I agree with this general theme, but also highlight the substantial financial benefits for the region and the nation that have accrued due to this rapid growth. A summary of these benefits is provided in my primary evidence in Block 2; in particular, in section 8. The magnitude of the economic importance of the dairy sector within the Waikato River catchment emphasises the need for a careful and gradual transition from its current state, to ensure economic prosperity in the region and the attainment of the environmental targets in PC1.

3.2 Ms Dewes states in paragraph 67 that net productivity and profitability have both declined in the New Zealand dairy sector over the last 20 years, summarily referring to Table 1 and Figure 2 within her evidence. Both statements are incorrect. First, neither Table 1 or Figure 2 in her evidence shows a decline in profitability. Further, there is very limited empirical evidence to support this assertion (see, for example, DairyNZ, 2018). Second, Figure 2 presented by Dr Dewes shows a (slight) decline in *total* productivity, but not in *net* productivity. Economic theory provides clear definitions around total and net productivity (Dovring, 1979). Total or gross productivity is the ratio of all outputs over all inputs. In comparison, net productivity is the ratio of value added over inputs internal to a given industry. There is evidence that net productivity in the New Zealand dairy sector is significant and increasing, given its high contribution to value added at both regional and national scales and the efficient use of internal inputs to generate these benefits. Dairying generated around $2,200 million of value added in the Waikato region in 2017. The on-farm sector contributed around $1,600 million, while dairy processing contributed around a further $600 million (NZIER, 2018). Over the last six years, one approximate measure of net productivity for the New Zealand dairy sector—the 'profit from productivity' metric—has been highly volatile. However, it has increased at an average rate of $58 per ha per year for the last 20 years (DairyNZ, 2018).

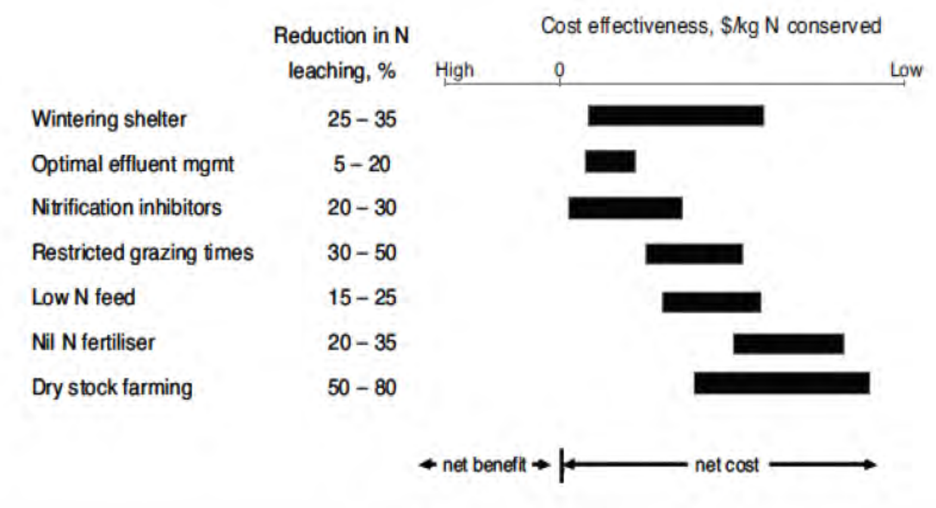
3.3 Dr Dewes suggests in paragraph 137 that "the drystock sector has been working on eco-efficiencies for over two decades now". It is important to note that while strong productivity gains have been experienced in this sector, empirical evidence shows that they have not yielded "an overall reduction in N leaching or GHG emissions per hectare" (Mackay et al., 2012, p. 11).

3.4 Dr Dewes provides an overview of the environmental impacts of pastoral agriculture in paragraphs 71-79, without highlighting the major contribution of the sheep and beef sector to water-quality degradation. Indeed, her evidence chiefly focuses on the low nitrogen-leaching footprint of this industry (e.g. paragraphs 28, 53). The sheep and beef sector generate around 28% of the nitrogen loss in the Waikato River catchment, but are also responsible for 36% of the phosphorus loss, 56% of the microbe loss, and 71% of the sediment loss (see paragraph 4.11 of my primary evidence). PC1 appears to contain a sharper focus on nitrogen, particularly through rules around intensification and the 75th percentile restriction for dairy farming. Yet, the responsibility for pastoral sectors to deal with all four contaminants within PC1 cannot be understated.

4. Cost of reducing nitrogen on New Zealand dairy farms

4.1 In paragraph 108 of her evidence, Dr Dewes states that "some studies" have shown that the most-effective approach for reducing nitrogen leaching in a dairy system is to change to a drystock system. However, she only provides the citation for one such study. She then presents a figure from this single study, that of Quinn et al. (2009). This graph is replicated in Figure 1 below. This figure does indicate high effectiveness—which is typically defined as the reduction in nitrogen leaching achieved by a given practice. However, Figure 1 also demonstrates another key point. It indicates how transition to drystock farming has a very low level of cost-effectiveness, given that these large reductions in nitrogen leaching are accompanied by high financial cost. (Also, an examination of the original source for this work indicates that it is evaluated for a South Island dairy farm, not one in the Waikato region.) The costs of transition from dairy production to drystock production are not considered in this evaluation, in sharp contrast to the economic evaluation of PC1 that appears in Doole et al. (2016a). Another omission of Figure 1 is consideration of the impact of this land-use transition on the capacity of the farmer to service debt, especially that associated with dairy assets.

Figure 1. An evaluation of options for reducing nitrogen leaching (Source: paragraph 109, Dewes evidence).



4.2 In paragraph 150, Dr Dewes goes on to state that "Quinn et al. (2009) showed that it may be more profitable to change production systems, in order to also have a "win win" of achieving lower N losses, the best mitigation may be to convert to a drystock system" (emphasis added). The previous paragraph and Figure 1 demonstrate that this statement is incorrect. In contrast, Quinn et al. (2009) show quite the opposite. That is, they show that the least-profitable means of achieving nitrogen reductions is through converting a dairy farm to a drystock farm. Further, the extent of cost associated with this action is actually underestimated in Figure 1, given that the cost of converting from one land use to another is not considered.

4.3 In paragraph 114, Dr Dewes states that PC1 and the 80-year journey to give effect to the *Vision and Strategy for the Waikato River* are driven by the intensification of the dairy sector between 1990 and 2010. This statement is incorrect. The 80-year journey represents an attempt to address the water-quality impacts of broad-scale land-use change experienced across the catchment over the last ~150 years (Doole et al., 2016b). A chief driver of water-quality degradation over this extended period has been pastoral agriculture, including both dairying and sheep and beef activity (Doole et al., 2016b).

4.4 In paragraphs 141-146, Dr Dewes draws on several examples where nitrogen loss can be decreased on New Zealand dairy farms, but with limited financial impact. These contentions rely on a high level of operator efficiency, either assumed or real. With regards to the Scott Farm and Lincoln University Dairy Farm results, I would like to emphasise here that I agree with the concerns raised in the primary evidence of Dr Thorrold with regards to the general applicability of research-farm outputs. Overall, he outlines how the superior herd genetics, farm infrastructure, and pasture-management skills that are present on these farms will take much time and/or capital for many farmers to develop.

5. LUC allocation places undue financial pressure on the dairy sector

5.1 Dr McKay in paragraphs 59-65 of his evidence in Block 2 summarises the proposed nitrogen-allocation mechanism of Beef and Lamb New Zealand Limited (BLNZ). In my opinion, I believe the process they have used to estimate nitrogen levels to allocate to each land parcel lacks scientific credibility and transparency. An example is in paragraph 62, where Dr McKay describes how the proposed allocation system is materially based on the evidence of Dr Dewes and what she contends is representative of top farmers in each FMU.

5.2 In paragraph 83, Dr Dewes contends that Waikato dairy farmers leach an average of around 45-55 kg N per ha per year. (I am aware that substantial debate surrounds these numbers, due to diversity in OVERSEER output between different versions of this software.) Table 1 on page 19 of the evidence of Dr Alec McKay presents the nitrogen allocation levels proposed by BLNZ. Assuming that Dr Dewes is correct in the assumption of mean nitrogen loss on Waikato dairy farms, Table 1 of Dr McKay outlines an allocation system in which dairy farmers are required to reduce their current nitrogen load by substantial amounts. For example, this involves reductions of at least 40-50% on Class 1 land and up to 60-70% on Class 3 land. My primary evidence outlines how these restrictions would have significant impacts on the profitability and solvency of dairy farms. Further, these will have substantial flow-on impacts for the regional economy.

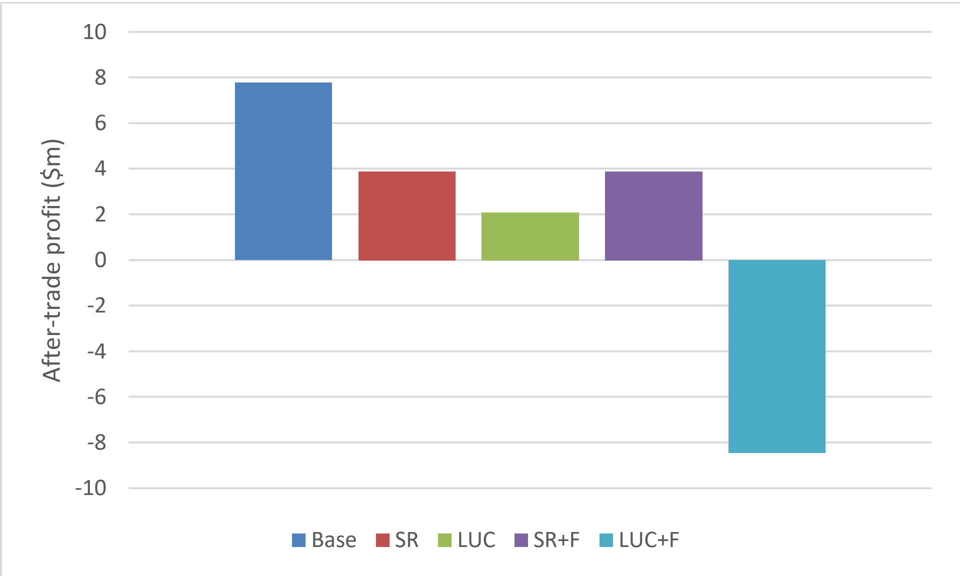
5.3 Dr Dewes proposes in paragraph 178d that allocating contaminants based on Land Use Capability (LUC), "[a]llows a more equitable and flexible allocation system based on the inherent capability of the biophysical asset". I disagree with this statement. First, LUC does not provide a more equitable allocation system. There is no equitable way to allocate property rights—it is a process that is both complicated and contentious. The supply of property rights for nitrogen is inherently limited. Hence, allocation requires making decisions around how a scarce resource should be divided between users, a process that usually involves trade-offs between sectors. Second, LUC allocation is not a more-flexible allocation system. It provides less nitrogen to the farmers that currently leach the most, in favour of those that leach the least. The profitability of farm land depends on the existing durable resources—commonly called 'capital' by economists—that accrue to the land and collectively determine its profitability and productivity. Key examples are financial capital (e.g. equity), human capital (e.g. management skill), physical capital (e.g. dairy shed), and natural capital (e.g. soil fertility). LUC allocation is inefficient because it divorces nitrogen from the capital resources that are required to best extract value from it.

5.4 In paragraph 178, Dr Dewes lists the "few choices for allocation [available] at present". It lists four proposed systems: averaging, grandparenting, cap and trade, and LUC. Dr Burger's evidence in Block 2 sets out the DairyNZ long-term view of land use in the Waikato River catchment in paragraphs 16-21. Here, he states that, in the long term, land use should reflect the suitability of each land parcel in its catchment context (Paragraph 19a). In my opinion, this list provided by Dr Dewes is incomplete and incorrect. Cap and trade is not a method of allocation, but a method of regulating contaminant loss. In a cap and trade system: (a) a limit on contaminant loss (or a cap) is established, (b) rights to contaminant loss are allocated, and (c) then trade in property rights is allowed to take place. Allocation within a cap and trade system can be done using a grandparenting or LUC approach; however, other options are available too. The failure of Dr Dewes to note this distinction highlights the absence of trade from the proposed LUC system of BLNZ.

5.5 The availability and efficiency of a trading system determines the economic impact of grandparenting versus LUC allocation. If the level of trade is low in a cap and trade system—as it typically is in many markets for environmental resources (Selman et al., 2009)—then prices for nitrogen will be high and it will be difficult for those users with a low allocation and high current levels of nutrient loss to access sufficient entitlements. Limiting the ability of farmers to access nitrogen through a market mechanism greatly magnifies the financial risk facing dairy businesses under a LUC allocation.

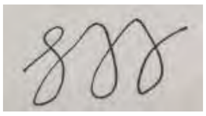
5.6 Figure 2 presents the estimated impacts of different policy outcomes on the dairy sector in the Lake Rotorua catchment. The policies include the current state (labelled ‘Base’), a modified-grandparenting allocation (labelled ‘SR’), LUC allocation (labelled ‘LUC’), and two cases where the SR and LUC mechanisms are enforced, but trade is subject to frictions (labelled ‘SR+F’ and ‘LUC+F’). Around half of the optimal level of trade is permitted to occur in the assessment of frictions, given that levels of trade in these systems are often low given risk aversion and uncertainty (Selman et al., 2009). Figure 2 shows how the LUC mechanism imposes a significant impact on an intensive sector. Further, it demonstrates that this effect is greatly magnified when trade is limited. This is evident in the large negative result reported in the ‘LUC+F’ case in Figure 2. In the case of Lake Rotorua, impaired market function would lead to broadscale insolvency within the dairy sector under a LUC allocation (Doole, 2018).

Figure 2. Estimated impacts of different policies on the Lake Rotorua dairy sector. Adapted from Doole (2018).



5.7 The Waikato River catchment is not the Lake Rotorua catchment. Yet, the principle is consistent across contexts. A LUC allocation requires dairy farms to make significant reductions in nitrogen loss and these introduce potentially insurmountable business risk. The size of this risk is magnified when a market for trading nitrogen is inefficient or does not exist, as in the case of PC1.

Dated: 10 May 2019



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