IN THE MATTER OF The Resource Management Act 1991

AND

IN THE MATTER OF Lake Rotorua Nutrient Management – **PROPOSED PLAN CHANGE 10** to the Bay of Plenty Regional Water and Land Plan

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ADDENDUM TO THE JOINT STATEMENT OF ECONOMIC EXPERTS

Evidence topic: (1) Allocation methods modelled in the Parsons et al. assessment

(2) Basing allocation on nutrient loss risk (para 20 in Joint Statement)

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(1) Allocation methods modelled in the Parsons et al. assessment. This is provided in response to Hearing Panel's request for information on this topic.

Professor Graeme Doole and Sandra Barns (19 April 2017)

Overview of economic modelling of allocation options *(Provided by Sandra Barns)*

The Section 32 report (p.49) identifies the options considered for the overall approach to nitrogen reduction. Following the decision to pursue the Integrated Framework (rules and incentives) approach (option 4), Council and StAG turned their attention to the form of the rules – including the need for an allocation method. Seven alternatives were considered (S32 report, p.75). The first five alternatives would set a nitrogen leaching limit at the property level, allowing landowners to

manage their farm practices within that limit. Alternatives 6 and 7 are regulation based, and would impose limits on (for example) the number and type of livestock, or the quantity of milk solids produced. Alternatives 6 and 7 were not modelled because (1) they are poorly correlated with leaching rate, reducing their capacity to protect and restore Lake Rotorua in the long term, and (2) alternatives that enable the landowner to make their own business decisions are generally considered more economically efficient than those where the Council makes decisions for landowners.

The Section 32 report (pp.77–79) summarises the evaluation of potential allocation approaches. The consideration of alternative allocation methods extended from January 2013 to March 2015, a period of more than two years. The evaluation included expert workshops, discussions in StAG meetings, and Council workshops and meetings. Through this process the application of the RPS principles[1] identified a preferred allocation method – sector averaging with ranges. Economic analysis undertaken to this point helped to inform the decision.[2]

This refinement of allocation options enabled more realistic economic evaluation which would test the sector-range allocation against alternatives. Consideration was given to what type of modelling would provide a robust comparison of allocation options. The economic modeling by Parsons et al. (2015) and Market Economics Limited (2015) assessed the impact of the range of allocation methods on landowners, sectors, the catchment, and the wider economy. The scenarios identified in Table 1 cover the range of allocation options, which are described more fully below.

Allocation options considered		**Allocation scenarios modelled against options**
1. Grandparenting with clawback	→	Scenario 3
2. Pastoral Averaging/Single value limit	→	Scenario 4
3. Sector averaging	→	Scenario 1 Scenario 2
4. Sector averaging with ranges	Preferred option	Scenario 6 Scenario 7 Scenario 8
5. Land use capability/Natural Capital	→	Scenario 5
6. Input based limits		N/A
7. Output based limits		N/A

Table 1 Matching the allocation options identified in the s32 report (p.75) with allocation scenarios modelled by Parsons et al. (2015).

[1] See also Appendix 2 of the memo provided by Stephen Lamb (Bay of Plenty Regional Council) to the Hearings Panel on 18 April 2017.

[2] For example Kerr and Lock(2009) Nutrient trading in Lake Rotorua: Cost sharing and allowance allocation; Timar et al. (2013) Potential impacts on nutrient discharge allowance allocation methods among heterogeneous farmers in the Lake Rotorua catchment; Perrin Ag (2014), Rotorua NDA impact Analysis.

Economic Modelling of Allocation Scenarios *(Provided by Professor Graeme Doole)*

The work outlined in the Parsons et al. (2015) report was performed throughout late 2014 and early 2015. Its broad goal was to provide insight into the implications of the different systems for economics, income distribution, farm management, and nutrient loss. Alternative allocation options had been considered broadly before this analysis was performed; this is outlined in the memo submitted yesterday by Stephen Lamb. The quantitative analysis at this point enabled screening of different allocation methods to provide more-specific insight into the potential outcomes of these policy instruments once they had been discussed extensively from a qualitative aspect by the collaborative group.

A wide range of allocation methods was evaluated in the modelling work outlined in Parsons et al. (2015). In total, eight allocation methods were assessed. There were several reasons for limiting the number of methods:

1. To sharpen the focus on those allocation methods of greatest interest. People can become overwhelmed with model output, limiting the ability understand the implications. Indeed, even the number assessed by Parsons et al. (2015) led to the generation of much detail that could not be assessed by the STAG due to its sheer volume.
2. The allocation methods assessed were broadly representative of the many sub-variants that exist of these individual methods. It is prudent to limit the assessment to these representative mechanisms, given the general insight into the relative effects of different allocation systems that economic models provide.
3. The allocation systems of interest to the StAG membership and the Bay of Plenty Regional Council were carefully considered to meet the constraints of budget and time.

Eight allocation methods were analysed by Parsons et al. (2015) (Table 2). The matching of columns 1 and 2 is shown in Table 1 (above). Two variants of option 3 (sector averaging) and three variants of option 4 (sector averaging with ranges) were studied, given directions from the collaborative group that guided the modelling activity. While not a natural capital method, S6 does have an element of natural capital, with allocation being based on slope of land.

Table 2 Description of the allocation methods studied in the Parsons et al. (2015) report.

Scenario number Parsons et al. (2015)	**Scenario name**	**Method** (p.75, Section 32 report)	**Description**
S1	Sector averaging	**Option 3** in s32 *Variant #1 of sector averaging*	Dairy, drystock, and forestry are each allocated a constant amount of nitrogen per ha, based on average leaching and the level of reduction required for that sector.
S2	Sector averaging with consideration of zonal differences	**Option 3** in s32 *Variant #2 of sector averaging*	All farms are allocated a level of nitrogen that is a uniform percentage below their current levels of leaching. The percentage reductions differ for dairy and drystock, and are those required to reach the sector averages applied in Scenario 1
S3	Single range (grand-parenting with clawback)	**Option 1** in s32	All commercial grazing farms are allocated a level of nitrogen that is a uniform percentage below their current levels of leaching. The percentage reduction is the same for dairy and drystock farms, unlike in S2 above.
S4	Natural capital allocation	**Option 5** in s32	Allocation is based on the inherent capacity of each spatial zone in the model to grow pasture (based on soil type, rainfall, and slope). More productive areas are allocated more nitrogen. This includes the capacity for land that is currently forested to grow pasture, once pasture is deemed to have been adequately established.
S5	Equal allocation	**Option 2** in s32	All land with an average slope less than 26 degrees receives a constant level of nitrogen per ha. All land with an average slope greater than 26 degrees receives a constant level of nitrogen per ha. Steeper land gets less nitrogen, given that it is assumed to have lower natural capital.
S6	Range 0A	**Option 4** in s32 *Variant #1 of sector averaging with ranges*	Dairy and drystock sectors are each allocated an overall constant amount of nitrogen per ha (in line with S1 above). In contrast to S1, individual farms receive an allocation from *within a given range*, based on how their current leaching compared to the range. Final drystock range 15.5–31 kg N/ha; Final dairy range 43.5–58 kg N/ha.
S7	Range 1	**Option 4** in s32 *Variant #2 of sector averaging with ranges*	As in S6, but with a different range for drystock. Final drystock allocations are within a range of 15.5–43.5 kg N/ha.
S8	Range 2	**Option 4** in s32 *Variant #3 of sector averaging with ranges*	As in S6, but with a different range for dairy. Final dairy allocations are within a range of 40–53 kg N/ha.

(2) Basing allocation on nutrient loss risk (para 20 in Joint Statement). Statement from Carla Muller, DairyNZ

The following statement was provided by email during the caucusing, but time constraints prevented it from being added into the caucusing report.

An allocation system based solely on nutrient loss risk, creates a higher level of uncertainty for water quality outcomes and can potentially create perverse behaviour, relative to an allocation system based on actual nutrient losses. While nutrient loss risk is a significant predictor of nutrient loss, it is not a perfect relationship. For example, soil drainage (a significant risk factor for nitrogen loss) can be altered through artificial drainage, and anthropogenic factors, such as fertiliser timing and rates, can influence actual nutrient losses but are not captured in a natural nutrient risk matrix. The uncertainty of reaching water quality outcomes is increased under an allocation system based on risk factors relative to actual nutrient loss because it does not capture the difference between actual nutrient losses and those that may occur based on a risk assessment.