BEFORE THE ENVIRONMENT COURT
AT WELLINGTON

ENV-2010-WLG-000148
ENV-2010-WLG-000157
ENV-2010-WLG-000155

IN THE MATTER	of appeals to the Environment Court under clause 14 of the First Schedule to the Resource Management Act 1991
AND	
IN THE MATTER	of the Proposed One Plan Consolidated Regional Policy Statement, Regional Plan and Regional Coastal Plan for the Manawatu-Wanganui Region
BETWEEN	**FEDERATED FARMERS OF NEW ZEALAND**
AND	**WELLINGTON FISH AND GAME COUNCIL**
AND	**HORTICULTURE NEW ZEALAND**
	Appellants
AND	**MANAWATU-WANGANUI REGIONAL COUNCIL TRADING AS HORIZONS**
	Respondent

SUPPLEMENTARY STATEMENT OF EVIDENCE OF ANTONY HUGH COLEBY ROBERTS FOR RAVENSDOWN FERTILISER CO-OPERATIVE LIMITED
1 JUNE 2012

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1. INTRODUCTION

1.1 My name is Antony Hugh Coleby Roberts. I am the Chief Scientific Officer for Ravensdown Fertiliser Co-Operative Ltd, and have held that position since 2002.

1.2 I have outlined my qualifications and experience in my evidence-in-chief dated March 2012.

1.3 I understand there has been some discussion generally around fertiliser and especially nitrogen fertiliser use in horticultural production systems. I also understand that there have been questions concerning how nutrient management plans are prepared and nutrient budgets are calculated. Counsel for Ravensdown has asked I provide this supplementary statement for the assistance of the Court.

1.4 Through my role at Ravensdown I have increased my knowledge of the nutrient requirements, products and application techniques for a wide variety of farming systems. While I am by training and experience a pastoral agricultural scientist, my office is in the Pukekohe region in the heart of commercial vegetable production and I have worked with some local growers, horticultural shareholders and others in Gisborne, Ohakune and the South Island.

2. NUTRIENT MANAGEMENT PLANS AND NUTRIENT BUDGETS

2.1 A Nutrient management plan is defined in the One Plan (decisions version) as follows:

> **Nutrient management plan** means a plan prepared annually in accordance with the Code of Practice for Nutrient Management (NZ Fertiliser Manufacturers' Research Association 2007) which records (including copies of the OVERSEER® input and output files used to prepare the plan) and takes into account all sources of nutrients for *dairy farming** and identifies all relevant nutrient management practices and mitigations, and which is prepared by a person who has both a Certificate of Completion in Sustainable Nutrient Management in New Zealand Agriculture and a Certificate of Completion in Advanced Sustainable Nutrient Management from Massey University.

2.2 I understand that there was some discussion as to whether nutrient management plans (NMPs) are prepared as a matter of course by the

various industries represented in these proceedings. NMPs require specialist input as is clear from the definition and are not necessarily prepared as a matter of course in relation to all production systems. Currently, NMPs are prepared for many of Ravensdown's dairy farm shareholders who are serviced by our team of Account Managers. We have prepared NMPs for larger sheep and beef farms throughout the country and some for mixed livestock/arable farms. No NMPs have as yet been produced for commercial vegetable producers.

2.3 It is important not to confuse such plans with nutrient budgets, prepared using the OVERSEER software, which are generally prepared as matter of course for Ravendown's dairy shareholders in accordance with the Clean Stream Accord requirements. However, a farm nutrient budget does form a central part of one of our NMPs.

2.4 NMPs essentially bring together the farmer's goals and aspirations, historical soil fertility trends and fertiliser history, combined with farm physical resource and management (and in some cases financial) information to formulate a fertiliser strategy which seeks to optimise the cost/benefit of fertiliser use while meeting any laws, consent conditions or industry nutrient loss targets.

2.5 The term ‘nutrient budget” is not defined in the One Plan. A nutrient budget compares overall nutrient inputs to outputs in a farm system. It can help identify production or environmental issues arising from nutrient excesses or deficits. It can then be used to evaluate a nutrient recommendation and make adjustments before the recommendation is implemented. This can enable different nutrient management scenarios to be evaluated before finalising a nutrient recommendation. A nutrient budget can lead to a reduction in the fertiliser recommended and/or allow the farmer to prioritise what nutrients are needed where.

2.6 A nutrient budget is created based on the soil test results taken and an estimation of other nutrients that are added into the farming system, such as fertiliser nutrients, supplementary feed brought on, atmospheric additions, clover N fixation, irrigation water nutrients and contributions form soil reserves. Outputs are then taken into account, such as nutrient uptake

in pasture/crops, animal products leaving the farm, leaching, supplementary feed sold etc. Other considerations include the use of nitrification inhibitors (eg eco-n), soil type, topography, etc. Such budgets are generally undertaken by a fertiliser company account manager or private consultant in conjunction with the farmer providing details of important input parameters.. For more information on nutrient budgets and for a sample nutrient budget see the Ravensdown website (http://www.ravensdown.co.nz/nz/pages/services/planning-tools/planning%20tools/nutrient-budgets.aspx).

Levels of uncertainty in the use of OVERSEER

2.7 I have been advised that Dr Edmeades made comments on the levels of uncertainty in the use of OVERSEER during cross examination, citing a margin of error of + or – 20%.

2.8 This margin of error relates expressly to the estimate of nitrate concentration in the drainage water and is, in fact, expressly reported as +/- about 30% in parenthesis in the Summary Report from OVERSEER. The 'margin of error' reflects reality in that even if one were to attempt to empirically measure nitrate leaching in grazed pastoral soils there would at least be this ‘margin of error’ or in other words biological variability.

2.9 OVERSEER is to be used by properly trained and qualified people using long term average data appropriate to the regional or sub-regional area in which the farm lies. Currently, industry is developing an accreditation scheme for nutrient management advisors to provide even greater confidence to other interested parties that may use the information generated by a nutrient budget analysis of a particular farm. This will ensure a consistent and accurate approach is taken in undertaking a nutrient budget analysis and therefore in estimating N loss using the OVERSEER method. Furthermore, the OVERSEER analysis is auditable by third parties if an Input Parameter Report is supplied with the output reports. This ensures credibility and transparency of the OVERSEER modelled results. It is not physically and practically possible to measure N loss from commercial farming systems.

2.10 While normal caution should be taken with OVERSEER, as with any model that attempts to mimic biological systems mathematically, one of its purposes is to be used to establish a benchmark N loss figure, after which farm management practices can then be implemented to reduce this N loss value if necessary.

2.11 Further, OVERSEER is the best, if not the only, decision support model available to undertake the calculation of N loss. As discussed in section 4 of my evidence in chief, it is my experience that the LUC approaches are flawed and unhelpful, was not designed for this purpose and leads to distortions in allowable N loss. OVERSEER has now been in use for a number of years and has been constantly improved as a method to calculate N loss. I am confident that this, coupled with its application by trained persons and ability to audit, means that OVERSEER is a robust model that provides a credible N loss level for individual farms. The OVERSEER owners (Ministry for Primary Industries, FertResearch (Ballance Agri-nutrients and Ravensdown) and AgResearch) contracted AgResearch, the lead provider, to deliver OVERSEER 6 in July 2011. We still do not have a final, public version of OVERSEER 6, and the current expected delivery date is August 2012. I am advised by the AgResearch developers that OVERSEER 6 is a vast improvement from the current Version 5.4.10 that the fertiliser industry currently uses. It will have more flexibility to model mixed cropping systems and a monthly timestep around N inputs and outputs, among other improvements.

3. NITROGEN USE IN HORTICULTURE

3.1 Generally, the range of fertiliser products and application techniques differ between horticultural production and pastoral grazing systems. However there is an inevitable overlap.

3.2 The range of products available for horticultural use has not changed significantly in the last 10 years, apart from the addition of either urease or nitrification inhibitors as coatings. Most of the fertiliser products are imported and, with respect to Ravensdown, from the Nitrophoska range (manufactured by BASF, a German company) and are compound

fertilisers that are more uniform in particle size and intactness, making them ideal for the types of planting technologies employed by growers.

3.3 The formulation of nutrients used by growers is different from that of pastoral production. The horticultural sector primarily uses higher cost compound NPK prilled products, together with the use of a range of magnesium, boron, zinc, and manganese trace element additives as either soluble salts or even as foliar applied liquids. Often forms of N fertiliser used are potassium nitrate or calcium ammonium nitrate (CAN), which is rarely, if ever, used in pastoral agriculture. Other differences between grower and pastoral farmer practice is that whereas pastoral farmers commonly use broadcast ground or aerial spreading techniques, growers use banding application techniques for row crops, reducing the total amount of fertiliser used per hectare. The objective of this is to increase nutrient use efficiency by placing the fertiliser nutrients closer to the developing root systems of the emerging plants.

3.4 With respect to increasing the production of dry matter, Mr Grant stated in cross examination that higher inputs equal higher outputs. In my opinion, that is an overly generalised statement and needs to be put properly into context. For example, in pastoral agriculture, assuming that the basic soil fertility around P, K, S, Mg and lime was optimal to support dry matter production, if I were to alleviate summer moisture deficit (by irrigation) this would increase clover production, N fixation and eventually result in greater associated grass production. Once I had increased pasture production there would be a consequent small increase in the need for maintenance fertiliser. So, if Mr Grant was obliquely referring to fertiliser inputs this is only true in a minor sense in my example.

3.5 Further, in horticultural production dry matter is not always the ultimate end. The establishment of the optimal leaf area from the vegetative part of the plant is important to help optimise the production of the saleable organ of the plant i.e., the seed, head or flower (for example a broccoli head, bean or courgette). This also applies to root crops, such as carrots and parsnips. The establishment of the optimum canopy for light interception will be important, but the saleable portion is the root.

3.6 Significant time has been spent by the fertiliser companies compiling fertiliser application guidelines that set out the varying nutrient requirements and application timings for plant growth. This information is drawn from both New Zealand and overseas. Staff at Ravensdown use these guides in their advice to growers and they are available at our stores in commercial vegetable growing areas. It is unclear to what extent growers follow these tables, but some who I have talked to follow them religiously.

3.7 If the values in the tables are exceeded, then the consequences of this depend on the interaction between the particular nutrient and the soil. For example, if P is exceeded then because it is not prone to leaching, it will accumulate in that soil and show up as increased P levels in a soil test. This increases the risk of P runoff in a high rainfall event, as the P is attached to the fine clay particles and it is these clay particles that are transported in surface water runoff. Mobile nutrients such as N and S will remain in the topsoil if applied in excess and be at risk of leaching when the soil drains, particularly if there are no plants growing in the soil prior to and during the time of drainage.

3.8 In contrast, if growers do not apply what the plants require to achieve the production of a saleable product, then yield of that product will be lower unless the soil can provide the deficient nutrients from soil reserves, either through mineralisation of organic matter or desorption of nutrients held by soil colloids.

A Roberts

1 June 2012