

## Plan Change 5 to the Canterbury Land and Water Regional Plan (Nutrient Management & Waitaki)

Responses to Further Questions of the Hearing Commissions in relation to the Evidence Statement of Dr Stewart Ledgard dated 22 July 2016.

Page	Para Reference	Question and Response
5	4.1, Line 7	<p><b>Is the reference to areas of a paddock that are “not under urine patches” a reference to “Nplant” in Schedule 28 Method 28.3?</b></p> <p><i>Response</i> Yes</p>
7	5.10, Line 2	<p><b>Is 400 kgN/ha/year a threshold below which you might not expect an increase in N-leaching on a typical grazed pasture?</b></p> <p><i>Response</i> No. This is referring to pasture yields increasing at rates up to (and above) 400 kg N/ha/year. The direct leaching of fertiliser-N (if applied in small regular doses and excluding winter) will be small up to about this total rate but then will increase exponentially at higher total N rates as the pasture response diminishes. However, in grazed pastures the use of N fertiliser increases pasture growth (and grass N concentration) and therefore if the extra growth is eaten by grazing animals it can lead to increased N excretion and an associated increase in N leaching, i.e. if increasing N fertiliser rates are associated with increased animal production and pasture intake, then they will lead to an increase in total N leaching (from the increase in excreta-N deposition).</p>
8	6.3, Line 4	<p><b>In Schedule 28 Method 28.3 which value equates to your “N losses”? Is it “NPlant”?</b></p> <p><i>Response</i> No. The “N losses” refers to the Fert&amp;InEff term. This is a simplification of the fuller equation which defined it as N losses. This is clearer in the derivation of this simplified formula in the report of Snow et al. entitled ‘Sheep, beef and deer modelling for the Matrix of Good Management – a technical summary’, see equations 2-4 on page 27 of that report.</p>
9	6.6, Line 6	<p><b>Can you describe the “inefficiencies of N fertiliser use” in layperson terms?</b></p> <p><i>Response</i> Plants do not recover all of the N fertiliser applied. Some losses of the applied fertiliser N can occur as gaseous losses soon after application to soil and a small component can potentially be directly leached, before the plants are able to take it up. Thus, the Fert&amp;InEff term attempts to account for this</p>

		<p>‘inefficiency’ associated with incomplete uptake of all added fertiliser-N by plants.</p>
10	7.2	<p><b>Will the PC5 fertiliser proxy disadvantage dairy farmers? If so, how?</b></p> <p><b>Response</b> Potentially, it might disadvantage some dairy farmers (e.g. those where their actual pasture growth without fertiliser-N is below the threshold constant value – where it could indicate a nil N fertiliser rate). In contrast, it could potentially indicate a relatively high N rate for farms with a relatively high pasture growth without fertiliser-N. These effects will be variable as noted in Dr Thorrold’s evidence, where he also gave examples.</p> <p>It may also result in lower than required N inputs if actual N responses are lower due to N being used in low response months because this is when feed is needed.</p> <p><b>What is a typical DM/ha/year figure for a dairy farm?</b></p> <p><b>Response</b> This is very difficult to define, since it is site and management dependent. In the evidence of Dr Thorrold, his Table 1 gave a number of published values for pasture growth in Canterbury in the absence of fertiliser N (about 6-13 tonnes DM/ha/year) or in the presence of fertiliser N use (about 14-18 tonnes DM/ha/year).</p>
12	8.2, First bullet, last sentence	<p><b>How?</b></p> <p><b>Response</b> The N surplus could potentially be calculated at a block level using input data specific to that block and using estimated or farm-average output data. However, a significant complication of this is that it needs to account for transfers of N away from the block, which can be difficult to calculate. For example, on a dairy farm the latter would refer to excreta-N from animals grazing the block that is transferred off the paddock(s) of the block onto farm lanes or to the dairy shed and effluent system. This is even more complex on a hill country farm since it may also need to estimate excreta transfer from pasture grazed on steeper areas and transferred to easy-sloping or flatter areas/blocks. Nevertheless, the rules regarding the timing and rate of N could still be applied at a block level.</p>
12	8.2, Third bullet	<p><b>Can you explain why?</b></p> <p><b>Response</b> The farm N surplus results in an estimated value for the ‘surplus’ of N (i.e.</p>

		<p>sum of external N inputs minus total N outputs in products). This value must be related (e.g. calculated by difference) to some threshold value to define the N-surplus fertiliser N proxy.</p> <p><b>What would a suitable threshold be in your opinion?</b></p> <p><b>Response</b>          Answer: I am unable to give a specific value. This would need to be defined in such a way as to result in acceptable and non-excessive N fertiliser values, and preferably not to lead to overall increases in N fertiliser relative to reasonable current use or to increase calculated N leaching. It is best estimated from actual farm data sets to meet these aspects and to be defined in a way that will be equitable across different farms.</p>
12	9.3, Line 2	<p><b>Do you agree with that indication?</b></p> <p><b>Response</b>          Yes, potentially it could depending on the defined threshold value and if it allowed increased N use up to the threshold. However, the proposed DairyNZ approach counters this by proposing that N fertiliser use on such farms with a low N surplus is restricted to the actual rate of N fertiliser being used on the farms and does not increase up to a higher threshold value.</p>
13	10.3	<p><b>Do sheep and beef farms in Canterbury routinely apply N-fertiliser? If so, when and how much?</b></p> <p><b>Response</b>          Data from the Beef+LambNZ survey farms indicates that average farm N fertiliser use on Canterbury sheep and beef farms is of the order of 5-20 kg N/ha/year (depending on farm system and year). Timing will depend on when feed is needed (e.g. it may be in early-spring or in autumn). In some cases, much of the fertiliser N may be largely used on forage crops or specific pasture blocks, in which case the specific per-hectare rate will be higher (perhaps up to about 100 kg N/ha/year).</p>
14	10.9, Line 1	<p><b>Which method do you prefer and why?</b></p> <p><b>Response</b>          I believe that the N surplus approach is preferable <u>providing that</u> it has a constraint on it, such as that proposed by DairyNZ, i.e. that the N fertiliser rate proxy does not allow the N surplus to increase up to the threshold. This N surplus approach is relatively simple, easy to estimate, and would appear to be less disruptive and more equitable (the current fertiliser N modelling proxy method appears to result in a nil N fertiliser value for many sheep and beef farms).</p>