From:	Tami Woods
To:	Mailroom Mailbox
Cc:	Justin Kitto
Subject:	DairyNZ submission on Variation 3 to pLWRP
Date:	Monday, 25 May 2015 4:18:59 p.m.
Attachments:	DairyNZ submission V3 pLWRP Final.pdf Appendix 1 to Submission by DairyNZ on Variation 3 pLWRP.pdf

Dear Environment Canterbury Mailroom

Please find attached the Submission (including Appendix 1 attachment) from DairyNZ on Variation 3 to the proposed Canterbury Land and Water Regional Plan.

If you could please acknowledge receipt of the submission and its appendix, I would be very grateful.

Tami Woods
Policy Manager

DairyNZ

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Environment Canterbury
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25 May 2015

RE: SUBMISSION on Proposed Variation 3 to the Proposed Canterbury Land and Water Regional Plan

Dear Sir/Madam

DairyNZ appreciates the opportunity to submit on Proposed Variation 3 to the Proposed Canterbury Land and Water Regional Plan (Variation 3).

DairyNZ is the industry good organisation representing New Zealand's dairy farmers. Funded by a levy on milksolids and through government investment, our purpose is to secure and enhance the profitability, sustainability and competitiveness of New Zealand dairy farming. We deliver value to farmers through leadership, influencing, investing, partnering with other organisations and through our own strategic capability. Our work includes research and development to create practical on-farm tools, leading on-farm adoption of best practice farming, promoting careers in dairying and advocating for farmers with central and regional government.

DairyNZ strongly supports policy that is founded on rigorous and robust science. We believe that taking an evidence-based approach leads to the development of more effective and enduring policy, and, by extension, optimal outcomes for the community, economy and environment. Our policy positions are built on expert technical analysis of regional and farm-scale economic data, farm systems knowledge, farmer behaviour, water quality science and aquatic ecology. For more information, visit www.dairynz.co.nz.

DairyNZ understands that there has been a significant amount of work undertaken which has culminated in the notification of Variation 3.

DairyNZ supports the community aspirations to achieve improved environmental and cultural outcomes for the South Canterbury Coastal Streams Area. In this regard, DairyNZ generally supports the need to set outcomes and manage to limits or targets, such as those proposed in Variation 3. We recognise and acknowledge the considerable amount of technical work that underpins the numeric outcomes and limits/targets and their interrelationships. However, it is our view that the outcomes and frameworks that have been sought by the Nitrogen Allocation Reference Group (NARG) have not been adequately provided for in the provisions of the proposed Variation; specifically, the inclusion of maximum caps and flexibility thresholds that were derived from a philosophical debate using the nitrogen loss figures from the Look Up Table (LUT), with no mechanism for the numbers to be updated with matrix of good management numbers or with changes to OVERSEER®. In light of the considerable time and emotional resources that went into forming the NARG recommendation, the catchment modelling, maximum caps and flexibility thresholds should be re-calculated with the Matrix of Good Management (MGM) numbers and included into the Variation along with a mechanism to deal with changes to Overseer.

DairyNZ understands that a future 'Nutrient Management' Variation or Plan Change is proposed to introduce the Matrix of Good Management and deal with numbers living in the Plan as Overseer® changes. We understand the Variation or Plan Change is planned to be notified in September 2015. This new

Variation or Plan Change directly relates and may address a number of concerns raised by DairyNZ in its submission on Variation 3. DairyNZ therefore strongly encourages the Council to look at aligning the two planning processes and delay the hearing of Variation 3 so as to hear the two planning processes together.

DairyNZ wishes to be heard in support of the submission. If others make a similar submission, we will consider presenting a joint case with them at a hearing.

DairyNZ could not gain an advantage in trade competition through this submission.

Yours sincerely

Tami Woods
Policy Manager

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DAIRYNZ SUBMISSION

Dairy sector research, programmes and work to support water quality outcomes

Research and environmental programmes

DairyNZ recognises that beyond supporting the economic well-being of New Zealand's urban and rural communities, the dairy sector must responsibly manage its environmental footprint. The Strategy for Sustainable Dairy Farming 2013-2020 ("Making Dairy Farming Work for Everyone") signals the intent of dairy farming to be a part of New Zealand's future for the long term. One of the strategy's key objectives is "environmental stewardship" meaning the "responsible use and protection of the natural environment through sustainable practices and conservation. Wise use of resources means using them sustainably for the greatest good."[1]

To this end, the dairy industry has substantially increased the level of investment it is making in programmes and initiatives aimed at enhancing the environmental performance of dairy farms, through the adoption of good management practice. DairyNZ is committed to working with dairy farmers to support good management practices. The organisation is involved in a wide variety of extension activities to support good environmental management including providing advice to farmers on effluent management, nutrient use and efficiency, water and feed management.

DairyNZ's investment in environmental programmes is approximately $11 million per year. Through their levy, New Zealand's dairy farmers are investing in scientific research in next generation farm systems and studies which aim to advance our understanding of how to address the impacts of land use on water quality. Additionally, farmers are investing in research to explore the economic impacts of water quality and quantity limits on farm profitability and what this means for local and regional economies.

DairyNZ is involved in a range of national research programmes including Pastoral 21 which is a collaborative venture between DairyNZ, Fonterra, Dairy Companies Association of New Zealand, Beef & Lamb and the Ministry of Science & Innovation. Part of the Pastoral 21 research is being conducted on dairy farms in Canterbury. Initial results confirm that alternative farm management options support the programme's objectives of increased productivity and a lower environmental footprint including reduced nitrogen losses for both the milking platform and support land used for wintering. Although the research is part of a five year programme, the results are being used as a pilot for the development of extension and learning resources to support improvements in farming practices. Uptake of the results will require continued improvements in farming capability to make use of new practices including pasture management and grazing.

In Canterbury, DairyNZ has invested significantly in supporting the development of the Matrix of Good Management project (MGM) to define nutrient losses from different land uses under good management practices. DairyNZ supports the requirement for farms to reach good management practice nutrient loss targets, providing there continues to be significant primary sector involvement in the project. DairyNZ notes, however, that OVERSEER® is not adequate for developing farm-scale P limits. Until such time as the tools for quantifying P losses at the farm scale evolve to the point that the science community has sufficient confidence in our ability to monitor P loss more accurately, the focus for managing P loss should continue to be a risked based assessment that identifies appropriate management actions. In the case of the dairy sector, this is being achieved through the implementation of the Sustainable Dairying: Water Accord.

[1] http://www.dairynz.co.nz/page/pageid/2145862755/Dairy_Industry_Strategy

The Sustainable Dairying: Water Accord

The dairy industry is ready to take up the challenge of achieving community-determined freshwater objectives and their associated limits and bottom lines. Through the Sustainable Dairying: Water Accord, the industry has made a series of commitments that will improve water quality, as well as provide robust accounting systems to assist resource managers in decision-making.

DairyNZ is supportive of the requirements for freshwater accounting. In our view, timely and robust accounting for freshwater takes and contaminants is essential for effective management. It is extremely difficult to determine whether there is sufficient risk to require a policy response without understanding the current and potential future impacts of various pressures on freshwater. It is important, however, that this increased focus on accounting is implemented in a way that seeks to build upon, rather than duplicate, current efforts and investment in this area.

The Sustainable Dairying: Water Accord has a number of accounting requirements. For example, in collaboration with the fertiliser industry, DairyNZ has developed an audited nitrogen management system that will enable dairy companies to model nitrogen loss on supplier dairy farms in a robust manner, according to agreed protocols and consistent data collection systems. Dairy companies are now implementing sophisticated environmental management systems which include collecting information from every dairy farm and providing benchmarking and performance information back to farmers. DairyNZ is also undertaking on-farm trials to better understand the volumes of water being used for shed wash-down and milk cooling under different seasonal and geographical conditions. When coupled with industry requirements for water meters on farm, this will support much more accurate estimation of water use under permitted activity rules.

Among other requirements, the dairy industry has committed to monitor and report:

I. The length of stock excluded waterway/area of significant wetland and the length of any dispensations.
II. The percentage of regular stock crossings that have bridges or culverts and any dispensations.
III. The extent of riparian margin planted on-farm and through industry/community partnerships e.g. off-farm planting.
IV. The average nitrogen loss per hectare (by region and/or catchment) as modeled using OVERSEER®.

We consider these measures to be a major investment in accounting for freshwater takes and potential impacts from dairy farms. Because of this, we are seeking to avoid costly duplication of effort by working with regional councils to provide robust, auditable information about resource use at catchment and regional scales. In our view, it is clear that there will be little (if any) requirement for any additional freshwater accounting for the dairy industry. We recognise that there are key research gaps for non-consented freshwater use, but we are working to address these currently.

Effluent management initiatives

DairyNZ has recently led development of a range of initiatives to improve effluent management including an Institution of Professional Engineers New Zealand (IPENZ) practice note for the design of effluent storage ponds released in October 2011. Associated with this programme is a training course on the design and construction of effluent storage ponds developed in partnership with Infratrain. DairyNZ has also partnered with Massey University to develop a course on the design of effluent systems. Milk supply companies are involved in a number of initiatives to improve effluent management. The investment that the dairy sector is making to improve effluent management has been matched by farmer investment in

new infrastructure, training and technology. As a result, there continue to be significant improvements in effluent management and compliance across the Region (Figure 1). A warrant of fitness system for dairy effluent management systems has also recently been developed. This involves training and accreditation of rural professionals to support farmers' management of dairy effluent.

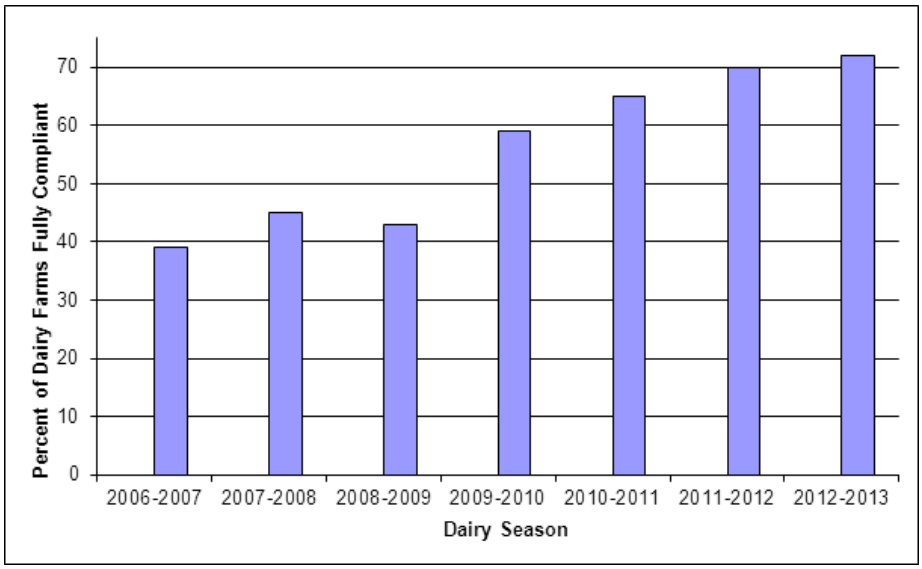

Figure 1: Fully compliant dairy farms 2006/07-2012/13 (Canterbury Region)
Source: Burns, M J 2013: Canterbury Region Dairy Report 2012–2013 Season Environment Canterbury (DRAFT) For previous year see: Beck, L B 2012: 2011-2012 Canterbury Region Dairy Report Environment Canterbury Report No. R12/80
http://ecan.govt.nz/publications/Plans/canterbury-region-dairy-report-2011-2012-season.pdf

Sustainable Milk Plans

DairyNZ has developed a flagship environmental farm planning tool described as a Sustainable Milk Plan. These plans will help improve nutrient management and include targets and actions by creating a farm specific, practical plan that helps landowners to focus on the actions that are essential to minimise their environmental footprint. A Sustainable Milk Plan will help farmers to achieve regulatory and/or milk company requirements but may also exceed them.

A key difference between Sustainable Milk Plans and other environmental farm plans is that Sustainable Milk Plans identify specific targets that focus on key environmental outcomes and performance measures that take account of the sensitivity of the local environment. These plans can help farmers focus on practical actions that they can take to improve issues such as effluent management, nutrient management, soil health and waterway protection. Examples of actions that might be highlighted could be the need to improve planting or fencing around a waterway, an upgrade to effluent infrastructure and soil testing to help optimise Olsen P levels.

One of the advantages of the development of the Sustainable Milk Plans is that through the process of their development, farmers' understanding of links between their farm business and environmental outcomes is increased. Additionally, through ongoing auditing and monitoring, valuable information is provided on environmental performance, rates of change and barriers to change. In this manner, improvements can be made to help the development and implementation of plans.

The DairyNZ Sustainable Milk Plan has been approved by Environment Canterbury's Chief Executive as meeting the requirements of a Farm Environment Plan as described in Schedule 7 Part A of the Proposed

Canterbury Land and Water Regional Plan. Sustainable Milk Plans are currently being implemented in the Hurunui and Selwyn catchments and will be rolled out across Canterbury over the next three years.

Concerns and relief sought on Variation 3

Table 1 below sets out DairyNZ's concerns with specific provisions of Variation 3 and the relief DairyNZ seeks in response to the concerns raised.

DairyNZ also supports the submission and adopts all the point raised and releif sought in the submission by the Nitrogen Allocation Reference Group (NARG).

Table 1 – DairyNZ's provision-by-provision submission points

#	PAGE NO.	PROVISION	SUPPORT / OPPOSE	COMMENTS	RELIEF SOUGHT
1	15-1 – 15-	Introductory narrative to Section 15	Oppose	DairyNZ submits that while the introductory narrative appropriately describes the physical characteristics and cultural values of both South Coastal Canterbury and the Lower Waitaki Coastal South Canterbury Zone Committee solutions package in its ZIP Addendum, it does not fully acknowledge the social and economic values and the importance of agriculture to the well-being of people and communities.	Add two new paragraphs to the introductory narrative before the description of the Lower Waikati South Coastal Canterbury Zone Committee process (i.e. between the first and second paragraphs on page 15-3) and key actions as follows: *The Lower Waitaki Coastal South Canterbury Area that is addressed in this section includes a diverse range of farming, industrial and township based activities. The sub-region is of significant economic, social and cultural importance to the wider Canterbury and Otago Regions.* *The South Coastal Canterbury area is an important area for agriculture and food production which provides significant employment, both on farm and in processing and service industries. The social and economic well-being of the community is reliant on the agricultural industry and associated processing and it is important that it is retained so that the community can thrive*
SECTION: Definitions					
2	15-4	Existing farming activity	Oppose	DairyNZ recognises what Variation 3 is attempting to achieve by defining "existing farming activities" and the intent to reflect the	Delete the definition of "existing farming activity"

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				recommendations of the NARG and the Zone Committee recommendations. However, DairyNZ does not consider the definition is workable in its current format and results in an extremely complex Rule 15.5.2. This is a level of complexity that does not appear to be necessary as it is difficult to envisage a new farming activity that would not exceed the nitrogen baseline. The obvious question is what is a "farming activity" that was in existence at 1 May 2015? Does it need to be precisely the same activity (for example the same type of stock, the same stocking rates, the same feed, the same crops over the same area/on the same paddocks etc.)? If not, what level of change is required before a farming activity is regarded as a "new activity".	
3	15-4	New farming activity	Oppose	Consistent with the above comments on "Existing farming activity", DairyNZ considers the definition of "New farming activity" unnecessary and unworkable. DairyNZ otherwise repeats its comments in respect of "Existing farming activity".	Delete the definition of "new farming activity".
4	15-4	New definition: Individual Farming activity	Support	In order to be able to simplify Rule 15.2.2 (in particular) it would be useful to define an "Individual farming activity". This will distinguish individual farming activities from those farms operating as part of farming enterprises or nutrient user groups	Insert a new definition for Individual farming activity as follows: ***Individual farming activity*** *means a farming activity undertaken on land that is not part of a Nutrient Management Group or Farming Enterprise nor a property that is supplied with*

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					water by an irrigation scheme.
SECTION: Policies – Managing Land use to Improve Water Quality					
5	15-5	15.4.2	Oppose	The water quality outcomes for the Northern Streams, Waihao-Wainono and Morven-Sinclairs Area are set out in Tables 15(a), 15(b), 15(c), 15(d), and 15 (e) (although in the latter tables the outcomes are described as "limits"). Appropriately, the tables cover a range of water quality attributes not directly related to the nitrogen load (including, for example, siltation, *E.coli*, temperature etc). Despite that, Policy 15.4.2 proposes to "achieve the water quality outcomes …by not exceeding the nitrogen load limits of Tables 15(o) and 15(p)". While the intent is supported, the policy does not appropriately reflect the wider matters that contribute to nutrient loss (noting, for example, the water quality outcomes sought under Variation 3 will not be met by restricting nitrogen alone).	Combine Policies 15.4.1 and 15.4.2 as follows: *Achieve the water quality outcomes for the South Coastal Canterbury Area by:* a) *Reducing losses of microbes, phosphorus and sediment;* b) *Enabling the Wainono Restoration Project; and* c) *Limiting the aggregate nitrogen discharge from farming activities to the load limits specified in Tables 15(o) and 15(p).*
6	15-5	15.4.3	Oppose	Policy 15.4.3 refers to "avoiding the movement of nitrogen between the Plains Areas and the Hill Areas." The expression "movement of nitrogen" is unclear and capable of multiple interpretations. For example, it could mean that nitrogen fertiliser is not to be moved	Clarify the intent of Policy 15.4.3 when it refers to "movement of nitrogen" and use alternative terminology in the policy to explain that intent.

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				between these areas or that stock feed containing nitrogen is not to be moved between these areas. Alternatively it could be referring to farmers shifting where nitrogen loss occurs by moving stock for wintering. Another interpretation might relate to the ability to share nitrogen loss entitlement across the Plains Area/Hill Area boundary through the use of the farming enterprise or nutrient user group mechanisms. In any event, nitrogen does move between these areas through natural hydrological processes and it is inappropriate to suggest that ECan can avoid that occurring.	
7	15-5	15.4.4	Oppose	Policy 15.4.4 and Policy 15.4.1 both focus on the actions that farming activities will need to do to improve water quality in the catchment. Rather than two policies, which both commence with identical wording ("*Improve water quality in the South Coastal Canterbury Area by…"),* DairyNZ suggests that it would be more logical to group all actions relating to farming activities into one single policy.	Redraft Policy 15.4.4 as follows: *Reduce the impact of farming activities on water quality of the South Canterbury Area by requiring:* a) *all farming activities to adopt the Good Management Practices set out in Schedule 24b unless alternative practices are more appropriate; and* b) *the preparation and implementation of a Farm Environment Plan for the use of any land by any farming activity requiring a resource consent; and* c) *the exclusion of intensively farmed stock from drains (in additional to the region-wide stock exclusion provisions).*

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					Delete Policy 15.4.1
8	15-5	15.4.5	Oppose	As noted in the comments on the definitions of "Existing farming activity" and "New farming activity" (refer to Submission Points A2 and A3), DairyNZ has doubts about the workability and need for references to existing or new farming activities - and in particular, the lack of clarity regarding the point at which an on farm change will trigger reclassification as a "New farming activity"). Furthermore: • DairyNZ considers that the policy should focus on "managing nitrogen losses". Other policies already focus on "improving water quality"; • It would be helpful to more clearly differentiate between the pre-2030 and post-2030 regime; and • the policy needs to link to other policies providing guidance on when and how a departure from the general policy approach outlined in Policy 15.4.5 will be considered.	Reword Policy 15.4.5 as follows: *Manage nitrogen losses from farming activities ~~Improve water quality~~ in the Northern Streams Area and Waihao-Wainono Area by ~~requiring~~:* *(a) From 15 May 2015 enabling farming activities to operate in accordance with the greater of the nitrogen baseline or the flexibility cap relevant to the respective area except where provided for in accordance with Policy 15.4.6; and* *(~~a~~b) From 1 January 2030 reduce discharges of nitrogen in the catchment by requiring all ~~existing~~ farming activities that have a nitrogen baseline greater than the flexibility cap ~~to except those on extremely light soils as shown on the Planning Maps~~, to comply with the maximum ~~cap~~ annual nitrogen loss rate set out in Table 15 (n) except where provided for in accordance with Policy 15.4.7;*
9	15-5	15.4.6	Oppose	Policy 15.4.6 needs to more clearly state under what situations a farming activity will be able to operate above the greater of the baseline or flexibility cap in the period before 2030 as the notified version is unclear in this	Reword Policy 15.4.6 as follows: *In the Northern Streams Area and Waihao-Wainono Area, improve water quality while allowing for the continued operation of ~~existing~~ farming activities above the greater of their*

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				regard. DairyNZ believes that specific recognition should be given to those farms that may have lawfully increased their nitrogen discharge by up to 5kgs N/ha/yr over the past 18 months under the provisions of the pLWRP (on the basis that they are located in the Orange or Green nutrient allocation zones of the pLWRP). While DairyNZ accepts that such farms ought to be subject to consent under the general framework of the Plan, it considers that a pathway should be provided for those farms to commence within this new regime at whatever leaching rate that was lawfully established as at the date of notification (before they are required to reduce their nitrogen loss to be consistent with the maximum nitrogen loss rates that apply for the longer term).	*nitrogen baseline or flexibility cap where those activities are located within the Orange or Green nutrient allocation zone and lawfully increased their nitrogen loss above their nitrogen baseline and flexibility cap before 15 May 2015 provided:* *a) The increase in nitrogen loss beyond the nitrogen baseline does not exceed 5kg nitrogen per hectare ber annum; and* *b) the farming activity is operated in accordance with a Farm Environment Plan that sets out actions to be implemented to ensure long-term compliance with the maximum annual nitrogen loss rate in Table 15(n).*
10	15-5	15.4.7	Oppose	Come 2030, there are likely to be farms that have been unable to reduce their nitrogen loss rates from high baseline rates to the maximum loss rate. DairyNZ considers it appropriate that the policy framework sets out clearly how such farms will be dealt with at that time. DairyNZ considers it appropriate that those farms are subject to a restricted discretionary activity (RDA) consent requirement. Accordingly, the policy framework needs to	Delete Policy 15.4.7 and replace with the following *If the maximum annual nitrogen loss rates required in Policy 15.4.5(b) are unable to be achieved by 1 January 2030, any extension of time to achieve the reductions will be considered having regard to:* *a) The nitrogen baseline and the level of any enduring nitrogen loss rate reduction already achieved from that baseline; and* *b) The capital and operational costs of making nitrogen loss rate reduction and*

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				set out the matters that will be relevant for decision-makers to consider when determining such RDA consent applications. As proposed, Policy 15.4.7 fails to do that.	*the benefit (in terms of maintaining a farming activity's financial viability) of spreading that investment over time; and* c) *The nature, sequencing, measurability and enforceability of any steps proposed to achieve the nitrogen loss rate reductions.*
11	15-6	15.4.30	Oppose	Policy 15.4.30 states that transfers are only provided for through transfer to a new owner of the same property or for community water supply. DairyNZ opposes this policy. As a general principle, DairyNZ supports water transfers as an important mechanism to achieve allocative efficiency. While it is accepted that in fully allocated catchments/groundwater zones transfers (especially in relation to irrigation) ought not allow for previously unused water to be used or used more regularly, that ought not translate to a general prohibition on transfers Furthermore, it is inappropriate to signal that the means to meet environmental flow and allocation limits is to prohibit transfers. The Council is required under the NPSFM to provide for transfers. The means to meet environmental flow and allocation limits is to grant and decline consents to take water on the basis of those limits. Where there is a situation of over allocation the Council is required to consider the most effective and	Amend policy 15.4.30 to enable transfers provided that they do not result in additional water use on catchments/ zones that are fully or over allocated. DairyNZ seeks the following wording: *Enable the transfer of ground and surface water permits except to the extent that such transfers would result in environmental flow and allocation limits being exceeded or further exceeded.*

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				efficient means to reduce that over allocation. DairyNZ is not aware that such an evaluation has been undertaken.	
12	15-9	15.4.35	Oppose	Policy 15.4.35 proposes common catchment expiry dates and a ten-year consent duration (in fully allocated catchments). DairyNZ has two main concerns with this policy. First, it is not clear what activities this policy applies to. It is expressed without qualification and hence must logically apply to all consents granted with a fixed-term duration. This includes land use (and discharge) consents under rules 15.5.1 to 15.5.21. It is unclear why common expiry is proposed for land use consents or what benefit will be gained by common catchment expiry. Secondly, common catchment expiry is only necessary if there is some intention of changing the basis of allocation at the common catchment expiry date (i.e. ending the first in first served regime and prioritising amongst applications lodged at the same time). This is not proposed under Variation 3. The costs associated with common catchment expiry (and subsequent 10-year consents) are apparent but the benefit (or additional risk) associated with that proposal cannot be assessed because the approach to consenting at the common catchment expiry	Policy 15.4.35 should be deleted. In the event that Council determines not to delete this policy, DairyNZ requests the following amendment: *Integrated catchment management is facilitated by:* *(a) applying a common catchment expiry to all consents to take and use surface or ground water for irrigation of:* ... If the primary relief (i.e. deletion of Policy 15.4.35) is accepted, undertake consequential amendments to Policies, 15.4.20, 15.4.21, 15.4.23 as required to deal with concerns around common catchment expiry.

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				date is unstated. Furthermore, DairyNZ points out that ECan is obliged to process consents within statutory timeframes or provide discounts to consent applicants (*under the Resource Management (Discount on Administrative Charges) Regulations 2010*). The Co-operative is aware that this has dissuaded other councils from applying common catchment expiry dates when that would lead to large numbers of consents requiring processing at the same time.	
SECTION: Rules					
13	15-10	15.5.2	Oppose	The construction and application of this rule is extremely complex, and consequently it is very difficult to understand it. This complexity in part arises through trying to distinguish between existing and new farming activities. This is a level of complexity that does not appear to be necessary as it is difficult to envisage a new farming activity that would not result in a farming activity exceeding the nitrogen baseline and/or flexibility cap that applies to the existing farming activity (which is generally prohibited). As noted earlier, DairyNZ considers the definitions of those terms unworkable. Complexity also exists because of: • the need to be clear that the rule does	Redraft rule 15.5.2 into four separate rules as follows. **Rule 15.5.2** **The use of land for an Individual Farming Activity in the Waihao-Wainono Plain is a permitted activity provided the following conditions are met:** 1. The nitrogen loss calculation does not exceed the greater of the nitrogen baseline or a. 10kg nitrogen per hectare per annum; or b. When augmentation has occurred in the preceding year: i. 15 nitrogen per hectare per

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				not apply to Nutrient User Groups and Farm Enterprises; • The need to distinguish the activity status for those exceeding the nitrogen baseline in the Northern Streams Area; • the need to distinguish between the regime that applies in the Morven-Sinclairs Area and elsewhere; and • The need to ensure the correct limits from Tables 15(m) are applied. DairyNZ considers that these matters can be made clear by creating separate rules for each of the areas. DairyNZ also considers the rules contain a number of anomalies which may be unintended. These include: • The apparent ability of farms in the Waihao-Wainono Plains area that do not meet the (raised) flexibility caps in the year following augmentation to apply for consents as restricted discretionary activities, while failure to meet the flexibility cap from the same area before augmentation would be prohibited. DairyNZ has also noted that some farms are located in the "Orange" and "Green" nutrient management zones as identified in the pLWRP. Accordingly, it is possible that farms within these areas will have lawfully increased	annum; or ii. 17 nitrogen per hectare per annum if after 1 January 2030; and 2. From 1 January 2030, the nitrogen loss calculation does not exceed the maximum nitrogen loss rate set out for the relevant soil type set out in Table 15(n); and 3. The farming activity is operating at good management practice as set out in Schedule 24b. **Rule 15.5.2A** **The use of land for an Individual Farming Activity in the Waihao-Wainono Hills is a permitted activity provided the following conditions are met:** 1. The nitrogen loss calculation does not exceed the greater of the nitrogen baseline or 5kg N/ha/yr; and 2. From 1 January 2030, the nitrogen loss calculation does not exceed the maximum nitrogen loss rate set out for the relevant soil type set out in Table 15(n); and 3. The farming activity is operating at good management practice as set out in Schedule 24b.

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				their nitrogen loss rates by up to 5kgs N/ha/yr under the permitted activity rules of that plan. If that is the case they would become prohibited activities under the Variation. DairyNZ considers that unreasonable and it proposes that any such farms should become restricted discretionary activities. Finally, DairyNZ considers that the term "maximum cap" is an unnecessary new term and should be replaced by the term "maximum nitrogen loss rate".	**Rule 15.5.2B** **The use of land for an Individual Farming Activity in the Northern Streams Plains is a permitted activity provided the following conditions are met:** 1. The nitrogen loss calculation does not exceed the greater of the nitrogen baseline or, a. 15kg nitrogen per hectare per annum or b. 17kg nitrogen per hectare pr annum if after 1 January 2030; and 2. From 1 January 2030, the nitrogen loss calculation does not exceed the maximum nitrogen loss rate set out for the relevant soil type set out in Table 15(n); and 3. The farming activity is operating at good management practice as set out in Schedule 24b. **Rule 15.5.2C** **The use of land for an Individual Farming Activity in the Northern Streams Hill is a permitted activity provided the following conditions are met:** 1. The nitrogen loss calculation does not exceed the greater of the nitrogen baseline or 5kg nitrogen per hectare per annum; and

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					2. From 1 January 2030, the nitrogen loss calculation does not exceed the maximum nitrogen loss rate set out for the relevant soil type set out in Table 15(n); and 3. The farming activity is operating at good management practice as set out in Schedule 24b. **Rule 15.5.2D** **The use of land for an Individual Farming Activity in the Morven Sinclairs Area is a permitted activity provided the following conditions are met:** 1. The nitrogen loss calculation does not exceed the nitrogen baseline; and 2. The farming activity is operating at good management practice as set out in Schedule 24b. As proposed elsewhere in this submission, create a definition of "Individual farming activity" to differentiate farming activities that are part of a Farming Enterprise or Nutrient User Group.
14	15-11 15-32	15.5.3 and Table 15(n) (along with Rules 15.5.4 and 15.5.5)	Oppose	For the reasons discussed in respect of Rule 15.5.2, Rule 15.5.3 requires substantial amendment. In addition, DairyNZ notes that, similar to Rule 15.5.2. the construction of this rule is complex and by using the definition of *Individual farming activity* the rule could be simplified (as	Redraft Rule 15.5.3 as follows: **Rule 15.5.3** ***The use of land for an individual farming activity~~, except any land that is part of a nutrient User Group or Farming Enterprise, or land that is within the command area of an irrigation Scheme where the nutrient~~***

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				could Rules 15.5.4 and 15.5.5). Furthermore, the scope of this rule is unclear. In particular, while Rule 15.5.2 states that a farming activity can exceed its relevant flexibility cap as a permitted activity (provided it does not exceed its nitrogen baseline) Rule 15.5.3 appears to contradict that by requiring restricted discretionary consent when Column B, C, E, F flexibility caps (as set out in Table 15(o) are exceeded. This appears to be a drafting error (as is the reference to "Rule 15.4.2"). DairyNZ is also concerned that matter of discretion 1 refers to whether the catchment load will be exceeded. The loads are modelled and their continuing appropriateness is subject to improvements in modelling (including through OVERSEER® updates). DairyNZ is concerned that Rule 11.5.3 locks-in the loads of Table 15(p) effectively inhibiting the questioning and recalculation of the appropriate load through the consenting process. DairyNZ's relief with regard to this matter is partly set out in relation to Table (p). However, DairyNZ considers that matter of discretion 1 ought to be amended to allow current best information to be used regarding the appropriate leaching rate at the time of a consent application.	~~loss from the farming activity is being managed by the scheme~~ and any land within the command area of an irrigation scheme where the nutrient loss is not being managed by the scheme, that: 1. Does not meet any of ~~the conditions 1(a), 1(c) or 4 of Rule 15.5.2,~~ the following: a) Condition 2 or 3 of Rule 15.5.2; or b) Condition 2 or 3 of Rule 15.5.2A; or c) Condition 1, 2 or 3 of Rule 15.5.2B; or d) Condition 2 or 3 of Rule 15.5.2C; or e) Condition 1 or 2 of Rule 15.5.2D; or 2. Is within the Orange or Green nutrient allocation zone and does not does meet any of the following: a) Condition 1, 2 or 3 of Rule 15.5.2; or b) Condition 1 of Rule 15.5.2A; or c) Condition 1 of Rule 15.5.2C, **is a restricted discretionary activity provided the following condition is met:** *1. A Farm Environment Plan has been prepared in accordance with Schedule 7 Part A, and is submitted with the application for resource consent.*

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					The exercise of discretion is restricted to the following matters: 1. *~~Whether the nitrogen loss form the farming activity will result in the total catchment load limits as per table 15(p) or the flexibility caps in Table 15(m) being exceeded~~ The nitrogen loss rates to be applied to the property and rate at which they should reduce to achieve the maximum nitrogen loss rate; and* 2. *The quality of, compliance with and auditing of the Farm Environment Plan; and* 3. *The proposed management practices to avoid or minimise the discharge of nitrogen, phosphorus, sediment and microbiological contaminants to water from the use of land; and* 4. *The potential effect of the land use on surface and groundwater quality and sources of drinking water; and* 5. *The appropriateness of the actions and timeframes described in the Farm Environment Plan in achieving the maximum ~~cap loss rates~~ nitrogen loss rate in Table 15(n); and* 6. *The ~~soil type having regard to the~~ quality and appropriateness of any soil mapping carried out for the property;*

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					and 7. *The potential adverse effects of the activity on Ngai Tahu cultural values; and* 8. *The matters set out in Policy 15.4.5.* Or such similar wording that would allow for any updated load limit to be the relevant at the time of consent rather than (necessarily) those limits currently included in Table 15 (p). Make corresponding amendments to Rules 15.5.4 and 15.5.5. See also amendment proposed to Table 15(n).
15	15-11	15.5.5	Oppose	For reasons stated in relation to the changes made to Rules 15.5.2 and 15.5.3, consequential changes need to be made to Rule 15.5.5.	Amend Rule 15.5.5 as follows: ***The use of land for an Individual Farming Activity, ~~except any land that is part of a Nutrient User Group or Farming Enterprise, or land that is within the command area of an irrigation Scheme where the nutrient loss from the farming activity is being managed by the scheme~~ and any land within the command area of an irrigation scheme where the nutrient loss is not being managed by the scheme, that is within the Red nutrient allocation zone and that does not meet ~~one or more of conditions 1(a), 1(c) or 4 of Rule 15.5.2:~~*** 1. ***Condition 1, 2 or 3 of Rule 15.5.2; or*** 2. ***Condition 1 of Rule 15.5.2A; or***

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					3. Condition 1 of Rule 15.5.2C. ***Is a prohibited activity***
16	15-17	15.5.26	Oppose	Rule 15.5.26 prohibits certain groundwater takes and the take of surface water from waterbodies not listed in Table 15(f) to 15(j). Although the Rule is preceded by an advice note that "Rule 5.111, 5.112 and 5.115 apply", DairyNZ remains concerned that Rule 15.5.26 will over-ride the ability to lawfully take small volumes of water under rules 5.111 and 5.112 for rural domestic and non irrigation farm purposes.	Amend Rule 15.5.26 as follows: ***Except as provided in Rules 5.111, 5.112 and 5.115, the take and use of groundwater with a direct, high or moderat~~ione~~ stream depletion effect or the take and use of surface water from any waterbody that is not listed in Table 15(f) to 15(j) inclusive is a prohibited activity***
17	15-21	15.5.40	Oppose	DairyNZ opposes the making of transfers prohibited activities as it frustrates efficient allocation. DairyNZ considers that concerns about transfers contributing to over-allocation can be addressed by careful rule design. On the basis that transfers are contemplated under the Act, the NPSFM (Policy B3) requires councils to state criteria by which applications for approval of transfers are to be decided. Transfers should be similarly contemplated under Variation 3. The amendments proposed are intended to generally align with those provided for in Variation 1 to the proposed pCLWRP.	Draft Rule 15.5.40 as follows: ***The temporary or permanent transfer, in whole or in part, (other than to the new owner of the site to which the take and use of water relates and where the location of the take and use of water does not change) of a water permit to take or use surface water or groundwater ~~that does not meet condition 1 of rule 15.5.39 a prohibited activity~~ is a discretionary activity provided the following conditions are met:*** ***1. The volume of water to be transferred for annual take and use does not exceed the greater of:*** ***(a) the annual average volume taken and used over the period 01 July***

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					2009 – 30 June 2013 ; and ***(b) the annual average volume taken and used over the four-year period immediately preceding the application to transfer the water permit.*** ***2. In the case of a partial transfer, the total volume taken and used in all locations under the permit shall not exceed the volume described in 1 above.*** Add an additional Rule 15.5.40A as follows: ***The temporary or permanent transfer, in whole or in part, (other than to the new owner of the site to which the take and use of water relates and where the location of the take and use of water does not change) of a water permit to take or use surface water or groundwater that does not meet condition 1 or condition 2 of Rule 15.5.40 must not under section 136 of the RMA be approved, in the same was as if it were a prohibited activity.***
SECTION: Tables					
18	15-32	Table 15(m)	Oppose	For the reasons discussed in relation to Rules 15.2.2 and 15.2.3 (refer to Submission Point 13) DairyNZ considers that Table 15(m) should be deleted and the relevant limits included within Rule 15.2.2 itself.	Delete Table 15(m).

<table>
<tr><th>#</th><th>PAGE NO.</th><th>PROVISION</th><th>SUPPORT / OPPOSE</th><th>COMMENTS</th><th>RELIEF SOUGHT</th></tr>
<tr><td></td><td></td><td></td><td></td><td>For the reasons set out below the flexibility cap numbers should also be revised with MGM and following the release of new versions of OVERSEER®.</td><td></td></tr>
<tr><td>19</td><td>15-32</td><td>Table 15(n)</td><td>Oppose</td><td>Table 15(n) contains the maximum caps for each soil type (as noted earlier DairyNZ suggests these be referred to simply as “maximum nitrogen loss rates”).
DairyNZ supports the general concept of the maximum cap. DairyNZ understands that the maximum caps, as envisaged by the Nitrogen Allocation Reference Group (NARG), were intended to deliver a planning outcome that would, under the land uses/farming system anticipated, see the bulk of the required reductions in nitrogen loss fall on activities on extra light and light soils. Poorly drained and poorly drained light soils would generally be able to increase nitrogen loss - taking advantage of the flexibility cap.
However, based on preliminary modelling results carried out by DairyNZ, we are concerned that the maximum nitrogen loss rates set in Table 15(n) will have an unintended and perverse effect. That is, based on a study of nine farms in the area it appears that activities on poorly drained light soils will be required to make all the reductions. Appendix 1 provides information on DairyNZ’s farm system analysis for South</td><td>Amend Table 15(n) by adjusting the maximum caps following rerunning the models for determining the existing and required catchment load. This remodelling process should address the issues identified in this submission including the desirability of basing the initial maximum nitrogen leaching rates on the MGM.

DairyNZ considers that the maximum rates should be set at levels that deliver the outcomes as agreed by the NARG and recorded in Appendix 22 of the South Canterbury Coastal Streams limit setting, Predicting consequences of future scenarios: Process Overview Report. Norton and Robson, 2015, Report No R15/29.
For the avoidance of doubt, it is DairyNZ’s understanding that amongst other things this would allow for existing land use intensity (of up to 5 cows/ha at GMP) on poorly drained and poorly drained light soils.
Amend Table 15(n) as follows:
<table>
<tr><td><s>Soil type as shown on Planning</s></td><td>Soil type (S-Map+ references)</td><td>Maximum cap nitrogen loss rate</td><td><s>Existing farming activities</s></td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>#</th><th>PAGE NO.</th><th>PROVISION</th><th>SUPPORT / OPPOSE</th><th>COMMENTS</th><th colspan="4">RELIEF SOUGHT</th></tr>
<tr><td></td><td></td><td></td><td></td><td>Canterbury Coastal Streams.
Given that such an outcome would be in direct conflict with the intent as recorded in Appendix 22 of the South Canterbury Coastal Streams Limit Setting Process Overview Report, DairyNZ considers that there needs to be a fundamental reconsideration at the levels at which the maximum nitrogen loss rates (and flexibility caps) are set.
DairyNZ is concerned, that the maximum loss rates (and the load limits from which they are derived – as discussed below) will currently be incorrect because of issues DairyNZ has identified with the modelling (see below) and because of the inherent uncertainties with current catchment modelling.
Furthermore, it is noted that the soil type classification used in the Variation does not appear to be the soil classification system applied by farmers through OVERSEER®. The relationship between these three soils types listed and those shown on S-Maps used in OVERSEER® modelling is not clear and hence there is the potential for confusion and inconsistency (particularly when S-map classifications do not accord with the soil types mapped in Variation 3). In DairyNZ's view, these issues could be assisted by Variation 3 referring directly to the soil types as shown on S-Maps and as applied to</td><td colspan="4"><table>
<tr><td><s>Maps</s></td><td></td><td></td><td></td></tr>
<tr><td><s>Extremely</s>
<s>Light and</s>
<s>Light</s></td><td>Timu_1a.2
Timu_1a.1
Omrk_8a.1
Benm_2a.4
Pentl_3a.1
Darn_6a.2
Darn_7a.2
Darn_1a.2
Raka_2a.1
Mayf_2a.1
Okuk_1a.1
Ruahi_3a.2
Waip_1a.1
Melf_1a.1
Eyre_3a.1</td><td><u>35*</u></td><td></td></tr>
<tr><td><s>Medium</s></td><td>Kaur_2a.1
Paha_5a.1
Waka_6a.1
Temp_2a.1
Waka_1a.1
Mayf_1a.1
Eyre_1a.1
Ngap_1a.1
Fris_1a.1</td><td><u>25*</u></td><td></td></tr>
</table></td></tr>
</table>

<table>
<tr><th>#</th><th>PAGE NO.</th><th>PROVISION</th><th>SUPPORT / OPPOSE</th><th>COMMENTS</th><th>RELIEF SOUGHT</th></tr>
<tr><td></td><td></td><td></td><td></td><td>OVERSEER® modelling, provided that the overall intent of the maximum loss rates is still met.</td><td>
<table>
<tr><td></td><td>Toka_1a.1</td><td></td><td></td></tr>
<tr><td><s>Poorly drained</s></td><td>Clar_1a.1
Clar_1a.2
Tait_6a.1
Clar_2a.1
Motu_3a.1
Flax_1a.1
Ytoh_1a.1
Ytoh_3a.1</td><td>20*</td><td></td></tr>
</table>
* Subject to amendment following remodelling as discussed above.

+ S-Maps are found at: http://smap.landcareresearch.co.nz/home.
</td></tr>
<tr><td>20</td><td>15-33</td><td>Table 15(o)</td><td>Oppose</td><td>Table 15(o) sets out nitrogen load limits for specific areas across the Northern Streams, Waihao-Wainono and Morven-Sinclairs areas. While DairyNZ accepts that these load limits have generally been calculated on best available information, DairyNZ is concerned that the basis upon which the current load was estimated (from which load limits were derived) contains some flaws which may have led to the current load being under-estimated.
In particular, DairyNZ has noted that Council's modelling was based on the predominant soil</td><td>DairyNZ requests that ECan revisit the catchment modelling, with a view to recalculating catchment loads on the basis of the comments in this submission point.
DairyNZ requests that the remodelling is undertaken using the latest version of OVERSEER® (6.2).
DairyNZ also requests that the MGM is used, as this will generate more reliable estimates of the existing load.</td></tr>
</table>

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				type being *poorly drained*. Those soils generate low nitrogen loss rates. However, since that modelling was undertaken Landcare has updated its soil information and the predominant soil type has now become *poorly drained light*. These soils are more "leaky" for nitrogen. Hence the model is likely to have under-estimated current nitrogen losses. Furthermore, DairyNZ is concerned that, as with the catchment modelling used elsewhere in Canterbury there is a reliance on the LUT with an OVERSEER® 6.0 patch, whereas farmers are currently required to use OVERSEER® 6.2. The flaws and limitations of these tools are well known. As these improve the numbers generated by modelling that relies on them becomes out of date and the outputs unreliable. DairyNZ prefers a management system where loads and limits are dynamic, changing as knowledge improves. DairyNZ is also conscious that the MGM process is due to release its output in September 2015. DairyNZ requests that decisions on the numbers in Tables 15 (m), (n) and (o) (and flexibility caps) be deferred (if necessary) to ensure they are based on best available information.	

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SECTION: Schedules					
21	Sch 3-1	Schedule 24b	Oppose	Item (e) in Schedule 24b includes reference to the application, separation distances, depth, uniformity and intensity of dairy effluent disposal being checked annually in accordance with Section 4 *'Land Application' in the Dairy NZ Farm Dairy Effluent Design Standard [2013]*. However, the document referred to in section (e) (ii) of this Schedule does not contain information regarding how self-assessment of effluent systems, is to be undertaken which is intended by this provision. DairyNZ considers the appropriate document to refer to is Section 4 of the *'Land Application' in the guideline "A Farmers Guide to Managing Farm Dairy Effluent – A Good Practice Guide for Land Application Systems" [2013]*. That document does provide practice advice on how farmers can reliably self assess the operation of their effluent systems. This has previously been accepted as the appropriate reference in relation to Variation1 to the pLWRP.	Delete item (e) from Schedule 24b and replace with the following: ***e) Collected Animal Effluent:*** *(i) Collection, storage and treatment systems for dairy effluent installed or replaced after after 1 October 2014 meet the Dairy NZ Farm Dairy Effluent Design Standard and Code of Practice [2013].* *(ii) ~~The application, separation distances, depth, uniformity and intensity of dairy effluent disposal is checked annually in accordance with Section 4 'Land Application' in the Dairy NZ Farm Dairy Effluent Design Standard [2013].~~ The animal effluent disposal system application separation distances, depth, uniformity and intensity are self-checked annually in accordance with Section 4 'Land Application' in the guideline "A Farmers Guide to Managing Farm Dairy Effluent – A Good Practice Guide for Land Application Systems" [2013].* *(iii) Records of the application, separation distances, depth, uniformity and intensity of dairy effluent disposal, in accordance with (e)(ii), are kept and provided to the Canterbury Regional Council upon request.*

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GENERAL: General and Consequential Amendments					
22	All	All	-	DairyNZ is conscious that it has sought numerous amendments, additions and deletions in this submission. It is likely that giving effect to these submission points will necessitate various consequential amendments to ensure consistency between policies and between policies and rules.	Make any and all consequential amendments necessary to give full and accurate effect to this submission while retaining the Plan's internal coherency.

Appendix 1: DairyNZ Farm System Analysis: South Canterbury Coastal Streams.

1 Background

This appendix summarises the methods, assumptions and summary results of an analysis DairyNZ conducted on nine farms in the South Canterbury and Coastal Streams area. This study was implemented to help DairyNZ understand the implications of nitrogen loss reductions on dairy farms and the impact on production and profit as the Variation has been written.

2 Methodology

2.1 Representation

Farms were selected for this study by DairyNZ based on the willingness of the farmers to be involved and the suitability of the farm in terms of availability of data, complexity of farm operation and ownership, and representation of different farm systems. Farms that were selected for this study were reasonably typical to the catchment (based on expert opinion) as this ensures other farmers in the catchment can identify with the results, while still covering a broad spectrum of farms. The number of farms represented in each cluster should be based on the trade-off between the reasonable representation of the farm types present in the sub catchments, the region as a whole and the resources available, especially time.

The key factors that were considered when choosing farms to model included biophysical characteristics and farm system characteristics. Soil type (and therefore drainage class) and rainfall were the particular biophysical characteristics that were considered as the interaction of these two features determines the nitrogen leaching vulnerability of an area. A geographical spread of farms from North to South in the catchment as well as from the Hunter Hills to the coast ensures a mix of rainfall and soil types were captured. Some soil types however were not represented as well due to a lack of available farm data for farms with those soil types. It was important given the small sample size that farms were selected that covered the range of maximum caps in the catchment e.g. extremely light, very light and light soils all had a maximum cap of 35, and while we had no available data for farms on very light soils 468 hectares of light soils was modelled.

The farm systems characteristics that were of importance when selecting farms were irrigation, size and intensity of farms, imported supplements, wintering practises and level of profitability. A mix of irrigated and dry land farms were chosen as well as a range of stocking rates. Farms chosen had wintering practices that are typical of the catchment. The farms chosen also captured a range of farm sizes, imported supplements (volume per farm and type) and profitability.

3.2.1 Soils

The SCCS Zone has a large range of soil types. The proposed ZIP Addendum has allocated maximum caps for nitrogen leaching based on this range of soils. Due to this variation it was important to ensure farms were selected that covered a range of soil types. However, it is important to note that not all soils have equal areas or equal proportions of dairying land. These figures are summarised in Table 1.

Table 1: Summary of soil types[1] [2]

Soil Type	Extremely light	Very light	Light	Medium	Deep and Heavy	Poorly drained light	Poorly drained
	Xl	Vl	L	M	D & H	PdL	Pd
Total Hectares in SCCS Zone (ha)	2,269	11,478	19,742	10,081	8,126	480	32,238
Total Dairy Hectares in SCCS Zone (ha)	219	2,870	1,723	1,052	2,147	95	4,154
Percentage of Dairy Land by Soil Type	2%	23%[3]	14%	9%	18%	1%	34%
Total Hectares Modelled (ha)			468	267		1,389	33
Percentage Modelled	0%	0%	22%	12%	0%	64%	2%

There is an inconsistency between proportion of poorly drained soils and poorly drained light soils modelled in this report and that identified as being in the catchment by ECan (Lilburne 2015). The proportion of soils classified as poorly drained light and poorly drained in the 2015 Lilburne Report are inconsistent with what is currently classed as poorly drained light and poorly drained in SMaps.

This work by DairyNZ has interpreted the rules in Variation 3 in a manner consistent with how we expect they will be interpreted for compliance by farmers. This involves finding the physical coordinates of a farm, these are then translated to SMaps in order to determine the soil types, these soil types have associated factsheets (created by SMaps and ECan) and these factsheets determine which maximum cap the soil type is associated with (for example poorly drained or poorly drained light). While this leads to inconsistencies in the amount of hectares that are in the catchment of poorly drained light soils and poorly drained soils between this report and the 2015 Lilburne Report, this DairyNZ work has used the rules presented in Variation 3 to determine soil type.

[1] Lilburne 2015
[2] Includes all of the SCCS Zone not just the two sub zones that are the focus of this report.
[3] This soil group is largely situated in the Morven/ Sinclairs sub zone (Figure 3) which is not being modelled in this report.

2.2 Modelling

Overseer[4] (Version 6.1.3) and Farmax[5] were used simultaneously as Farmax allows the user to ensure that viable farm scenarios are being represented and the financial impact of mitigation options is clear, while Overseer allows the impact of mitigation options on nitrogen loss to be modelled. The Overseer files were created for each case study farm using the Overseer Best Practice Data Input Standards. Once the farm's base Overseer file was finalised, a base Farmax file was created with the physical and financial data collected for each farm.

From this point mitigation options were discussed and a mitigation strategy was documented so that all farms followed the same overall process. The aim of modelling mitigations for nitrogen leaching were not to target the proposed maximum caps but to aim for a 10%, 20%, 30% and 40% reduction in nitrogen leaching from Good Management Practice (GMP).

For the purpose of this work, GMP has been defined as:

- No fertiliser applied in June and July,
- No more than 60 kg nitrogen applied per hectare in one month (can be in multiple applications as long as sum of all applications in one month are under 60kgN/ha),
- Cost of $2500 for nutrient budgets and farm environment plans per farm, and
- Effluent cannot be applied at a rate greater than 150 kilograms of nitrogen from effluent per hectare[6].

The definition of GMP does not attempt to predict what the Matrix of Good Management Practice (MGM) project will come up with but instead proposes some key parameters that are broadly accepted as good practice.

This modelling reports nitrogen loss as both total nitrogen leached from the system and nitrogen leached per hectare, both in kilograms. There is sometimes a subtle difference in these parameters, which can affect the impacts of mitigation options on key parameters, including nitrogen leaching, operating profit and production. Total kilograms of nitrogen leached is a more accurate number for a farm, but it is often more difficult to talk about in the wider context as it will vary depending on farm size. The proposed maximum caps are based on leaching per hectare and therefore all graphs in this report are as well.

This modelling only considered the impacts of nitrogen leaching mitigation on the milking platforms. This is significant as it will have an impact on the nitrogen leaching figures across the SCCS Zone. All the farms that were modelled incorporated a support block or a grazier into their farm management, with all cows being wintered off the milking platform in June and the majority were also off the milking platform in July. The destination of these cows in winter ranged from support blocks located away from the milking platform, at a third party graziers (no information was available on locations of third party graziers and if they were in the SCCS Zone) or on a separate crop block near (or

[4] OVERSEER® is an agricultural management tool that assists in examining nutrient use and movements within a farm to optimise production and environmental outcomes.
[5] Farmax is an energy based farm system model.
[6] Overseers recommended level.

adjacent to) the milking platform. Due to the lack of reliable and detailed data available, this modelling only considered the nitrogen leaching and financial implications on the milking platform.

The impact of this assumption is dependent upon how Variation 3 is worded. If the Variation considers the nitrogen leaching (averaged across the soil types present) on contiguous blocks, support land adjacent to the milking platform will be able to average its nitrogen leaching across the milking platform. If it looks at nitrogen leaching on all land owned by one enterprise and allows averaging across all land owned in the SCCS Zone this will also allow for averaging the nitrogen leached from the winter support land across the milking platform. There is also a question around if the land owner or the client will have to be responsible in a winter grazing situation. Due to this lack of clarity this work only looks at the impact on the milking platform and it needs to be clear that this does not include the associated winter support land which is likely to have higher nitrogen leaching figures, ceteris paribus.

When deriving maximum caps for each farm under the proposed ZIP Addendum[7], this report looked at the amount of hectares that fell under each cap and then took a weighted average cap. For example:

> *Farm 1 had 220 effective hectares of 'light' soils, 33 ineffective hectares of 'light' soils and 50 effective hectares of 'poorly drained light' soils. Light soils have a proposed maximum nitrogen leaching cap of 35kgN/ha and poorly drained light soils have a proposed maximum nitrogen leaching cap of 20kgN/ha. This equates to an average leaching cap of 33kgN/ha weighted by hectares.*
>
> *Farm 1's maximum cap= (((220+33)*35) + (50*20))/ 303*

This approach also includes ineffective land area. The reason this was included is that the Overseer Best Practice Data Input Standards advises that ineffective area is entered into a nutrient budget. Ineffective area is entered as a native trees and scrub block in Overseer (as per the Input Standards) and automatically assigned a nitrogen leaching amount of 3kgN/ha. This will act to reduce the average kilograms of nitrogen leached per hectare over the whole farm area (e.g. for Farm 1- 33 hectares ineffective out of 303 total hectares). If the ineffective area is excluded then the maximum cap becomes 32kgN/ha as opposed to 33kgN/ha.

When all the case study farms were included in the analysis the average ineffective area equates to 9% of the total area modelled. However this is not split evenly across the farms with one farm having 2 hectares ineffective area and one having 70 hectares. This will reduce the base average nitrogen leaching more significantly on farms with a higher proportion of ineffective area. This essentially creates a benefit for 'retiring land' from effective areas, such fencing off and strategically planting critical source areas.

[7] The nutrient allocation reference group recommended that farmers averaged maximum caps and nitrogen leaching across all soil types on a farm, this recommendation has not been included in Variation 3. This analysis used the farmers' recommendation as it is more practical to model this way in Farmax and Overseer.

2.3 Mitigation Strategies

While the broad mitigation process was similar, there were subtle differences in the mitigations between farms due to their individual characteristics. The mitigation strategies were developed based on experience and farm systems knowledge from the modelling team. Similar mitigation strategies have been applied and peer reviewed over time in other nitrogen mitigation projects.

The mitigation strategies used in this modelling are the most cost effective method of reducing nitrogen leaching within the assumptions used (detailed in Section 2.4 of this report). This report notes that this is not the only possible way to reduce nitrogen leaching but the least cost option given the modelling constraints (for example the constraints of using Overseer where certain things cannot be modelled).

The mitigation strategies can be broadly described as management changes within the current farm system first, followed by an infrastructure change.

Stage 1.0	De-intensification: A stepwise process in which reductions in farm inputs are sequentially applied on the base farm.
Stage 2.0	Restricted grazing: A stand-off pad is incorporated on each of the scenarios modelled in Stage 1.

In this work only stage one mitigations were pursued as these are normally able to achieve a 40% reduction in nitrogen leaching. However, one farm was selected at random to show the impacts of investment in a standoff pad on operating profit, production and nitrogen leaching. For the specific assumptions made around modelling this standoff pad, see Section 2.4. It is important to note that all mitigation measures are cumulative, i.e. mitigations applied in run 1.1 are carried forward to run 1.2.

The specific mitigation measures applied to each farm are discussed in more detail in the individual farm results, not provided in this report due to confidentiality issues. The mitigation strategies can be broadly described by Figure 1.

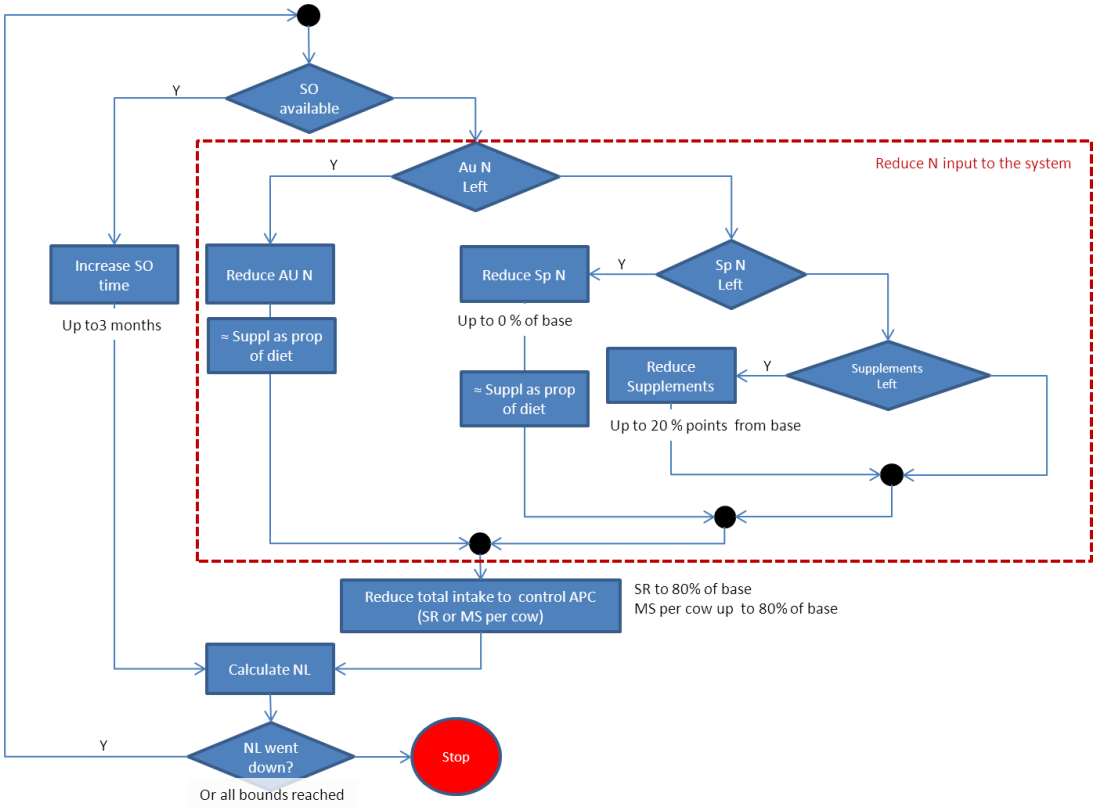

Figure 1: Flow diagram of mitigation options

Legend- Au N: autumn applications of nitrogen fertiliser, Sp N: spring applications of nitrogen fertiliser, SO: standoff pad, NL: nitrogen leaching, SR: stocking rate, MS: milksolids, APC: average pasture cover

Stage 1 follows a standardised sequence, where agreed measures are applied:

1. If the farm has an existing feed pad or standoff pad the use of this is optimised.
2. Autumn nitrogen fertiliser applications are reduced and then removed.
3. Spring nitrogen fertiliser applications are reduced and then removed
4. Reduce supplements imported (up to a 20% reduction from the base).
5. Reduce stocking rate (up to 20% reduction of cow numbers from the base).

If the farm has an existing standoff pad, its use time is increased if possible. In this modelling two farms had some form of existing standoff or feed pad. The one with a feed pad was unable to increase its use, while the standoff pad usage on the other farm was increased. The extent of utilisation of this mitigation option depends on the characteristics of the existing facilities. Where nitrogen fertiliser is reduced, autumn applications are targeted first, followed by spring fertiliser applications[8]. This is done in steps of 25% or removing whole dressings. Up to here, the use of purchased feed is maintained constant as a proportion of the total dry matter (DM) intake; however, high nitrogen content feeds are replaced by low nitrogen content alternatives. Finally, the proportion of purchased feed in the diet is reduced by up to 20 % relative to baseline.

[8] ROMERA, A.J., LEVY G., BEUKES, P., CLARK, D., GLASSEY, C. 2012. A urine patch framework to simulate nitrogen leaching on New Zealand dairy farms. Nutrient Cycling in Agroecosystems 92, 329-346.

If a farm utilises a crop area for cows during a proportion of the winter period, crops with a lower nitrogen leaching risk factor (as per Overseer) can be used as a mitigation option. This was applied to the case study farms which utilised crops in May, July or August. All farms had cows wintered off farm in June.

Each of these steps reduces feed supply further and further, and it is accompanied by a reduction in feed demand to achieve appropriate pasture covers and avoid feed gaps throughout the year in Farmax. This is done either by reducing stocking rate or the amount of feed eaten per cow, according to the judgment of the modeller. Either way, milk production per hectare will decline because this modelling uses the assumption of constant milksolids production per cow (see section 2.4). Reducing production per hectare may or may not impact on the farm profit but may have a much larger economic consequence for the sub-catchment and region. This mitigation process is continued until all the bounds (see Figure 1) have been reached.

These bounds are constraints on how much supplement is fed (as a proportion of total feed offered per cow), per cow production and stocking rate can be altered from the base farm system. This is because drastic changes in either of these variables are likely to disrupt farm management considerably, and it would be difficult to predict how farmers would cope. However, there are likely to be some farmers who dramatically change farm systems over time due to nutrient management and reduction requirements. At these bound it is also possible that land use change will occur which is beyond the scope of this report.

The results from these mitigation options are then analysed, particularly the impact on profit (measured by operating profit per hectare), production and nitrogen leaching. These points are then used to create abatement curves. Abatement curves estimate the impacts of change between nitrogen leached and farm operating profit per hectare (EBIT) from the original base point for each farm.

2.4 Modelling Assumptions

Underpinning this modelling are a range of assumptions. While each farm may have individual assumptions, there are some key assumptions built into the modelling that are consistent across all farms. For farms to be comparable the base Farmax file must have the same assumptions behind it.

- A milk price of $6.50 was used; this reflects a longer-term average price expectation.

- Fertiliser and feed prices were standardised across all farms and based on the volume and type each farm used multiplied by a standard price for different inputs. Standard feed and fertiliser prices are important as mitigation options change these farm inputs and farm financials are adjusted accordingly. For example nitrogen fertiliser was priced at $1.63 per kilogram of nitrogen[9].

[9] Not all costs are included here as they varied depending on each farms inputs (e.g. type of feed used and what crops were grown) and some of these costs are subject to confidentiality agreements between subscribers and Farmax and cannot be reproduced without prior approval.

- Changes in labour requirements for a dairy farm are non-linear. Therefore, labour was treated as a fixed cost unless cows dropped significantly resulting in one full time equivalent (FTE) employee being removed from the farm system. This means that if the number of cows is only reduced by a small amount, the farm would not reduce the number of labour units. In this area labour was defined as a fixed cost unless 165 cows were removed from the system at which point one labour unit would be removed from the system. This was based on the average cows per FTE for the Canterbury region. Only one case study farm reduced more than 165 cows as a set of mitigation options. In this case no labour was removed from the system as this farm was still milking a high amount of cows per FTE labour units, over 200 cows per FTE. If a labour unit had been removed this farm would have been milking close to twice the average amount of cows per FTE.

- For this modelling there was robust discussion on pasture growth rates (PGRs) that would be used in Farmax. This debate was necessary due to a lack of average PGRs for the SCCS Zone within Farmax (Farmax has PGRs for each region; however, the closest to the SCCS Zone was Lincoln and Tapanui). An average of these growth rates was used as a starting point and they were supplemented with AgResearch data from North Otago (their nearest recent test), the opinion from local consulting officers and the Whole Farm Model (run by the Farm Systems team at DairyNZ). Finally the PGRs were validated with a focus group of farmers from the area. The PGRs used in this modelling vary based on the farm context (for example irrigation) and are also cross checked against the pasture and crop eaten figure provided by farmers as part of their data collection process. The total pasture growth ranged from 12 tonnes DM/ha to 17.5 tonnes DM/ha. The simple average was 14.7 tonnes DM/ha.

- One of the criteria for GMP in this modelling was that dairy shed effluent cannot be applied at a rate greater than 150 kg of nitrogen from effluent per hectare. Farms that were doing this would have to increase their effluent area to the size that meets this nitrogen loading requirement. However, the caveat to this was that this increase could not be more than 10 hectares. Increasing the effluent area by more than 10 hectares would be considered as a separate mitigation option, not GMP, as this would likely require a large capital outlay for new pumps and other components. Effluent area increases of less than 10 hectares are likely to require some new piping, but this will be minor relative to new pumps. An increase in effluent area was priced for this modelling work at a one off cost of $450 per additional hectare[10]. This cost was included as an operating cost due to the relative size of this when averaged out into total operating profit per hectare. It is also likely that farmers would pay this cost as part of their cash accounts not as capital improvements to the farm (provided it was less than 10 hectares).

- Throughout this farm modelling, the assumption was made that milksolids production per cow would be held constant. The mitigation strategies employed in order to reduce nitrogen leaching in this modelling target nitrogen inputs. Nitrogen inputs (fertiliser and supplements) are reduced in successive steps. This creates a feed gap, which is addressed by reducing stocking rate to maintain the same comparative stocking rate. Milksolids production per cow cannot be

[10] DairyNZ Economics Group. Prepared from the Lincoln Farm Budget Manual, market prices and effluent specialists at DairyNZ.

increased when a feed gap is present on farm. If the modelling reduced stocking rate and maintained nitrogen input there would be an increase in production per cow, because there is more feed for each cow[11]. These assumptions depend on the level of farmer skill being maintained. While farmers can increase their skill level, the time and cost of this would vary for each farmer and is unable to be captured with any degree of accuracy in this modelling. Therefore milksolids production per cow is held constant as a proxy for farmers maintaining the same skill level.

- When a new standoff pad was simulated it was concrete with a bark covering. Consequences of all farms utilising a standoff pad and changing regional demand for bark and other inputs have not been considered in this modelling. The use of the standoff pad was allowed to be up to 12 hours a day during March, April and May by the entire herd and by cows after they had calved in August for 18 hours a day[12]. It was not used in June and July due to the cows already being wintered off farm.

  Cows were not fed on the standoff pad but the effluent collected was treated as dairy shed effluent and spread back on the existing effluent area provided it did not breach the recommended 150kgN/ha applied from effluent, if it did the original effluent area was extended.

- When a standoff pad was constructed, costs were adjusted accordingly. Additional costs for running and maintaining the stand-off pad were incorporated on a per cow basis. These costs included depreciation, repairs and maintenance (R&M), fuel and increasing the effluent holding pond size. The cost of increasing the effluent area was not considered in this modelling. Depreciation was based on dollars per farm and was from each farm's accounts. Depreciation was included over 25 years. R&M included costs related to the changing of the bark covering, treatment and spreading of solid and liquid effluent. The additional cost of incorporating a standoff pad into the farm system was calculated at $198 per cow[13]. The capital cost of the standoff pad was not included in operating profit. These costs were developed from DairyNZ.

[11] ROMERA, A.J. & DOOLE, G.J., 2014. Integrated Analysis of Profitable Stocking-Rate Decisions in Pasture-Based Dairy Systems. *Grass and Forage Science*.

[12] BEUKES, P., ROMERA, A.J., CLARK, D., DALLEY, D.E., HEDLEY, M.J., HORNE, D.J., MONAGHAN, R.M., LAURENSON, S., 2013. Evaluating the benefits of standing cows off pasture to avoid soil pugging damage in two dairy regions of New Zealand. New Zealand Journal of Agricultural Research, 56, 1-15.

[13] DairyNZ Southern Wintering Systems.

3 Results

3.1 Comparative Results

Table 2 shows the base nitrogen leaching of each farm in this modelling comparative to the maximum cap (averaged by soil type present on farms). It also shows the required reduction to meet these proposed caps for kilograms of nitrogen leached per hectare and the resulting change in operating profit. Based on the maximum caps proposed under the ZIP Addendum some farms will require no change (four out of nine farms in this sample), some will have relatively minor changes (farm 9 in this sample) and others will have moderate to significant changes required (four farms in this sample).

Table 2: Summary Results

Farm	Soils on Farm		Maximum Cap (kgN/ha)	Base N Leaching (kgN/ha)	Required Reduction in N leaching (%)	Percentage Reduction in Operating Profit	Total Reduction in Operating profit
	Predominant	Secondary					
1	L 83%	PdL 17%	33	23			
2	PdL 100%		20	27	26%	18%	$119,944
3	PdL 100%		20	23	13%	5%	$48,858
4	M 56%	Pd 44%	23	19			
5	M 69%	L 31%	28	21			
6	PdL 100%		20	23	13%	6%	$24,009
7	PdL 100%		20	30	33%	19%	$74,183
8	PdL 62%	L 38%	23	21			
9	M 100%		25	26	4%	3%	$13,855

Figure 2 shows the range of abatement curves for the cost (operating profit per hectare) of mitigating nitrogen leaching. This graph shows the range of relative impacts. For example, while farm one is initially better off than the other farms, if it had to reduce nitrogen leaching by a significant percentage it would be relatively worse off than other farms as it has a higher abatement cost for the same percentage reduction in nitrogen leaching.

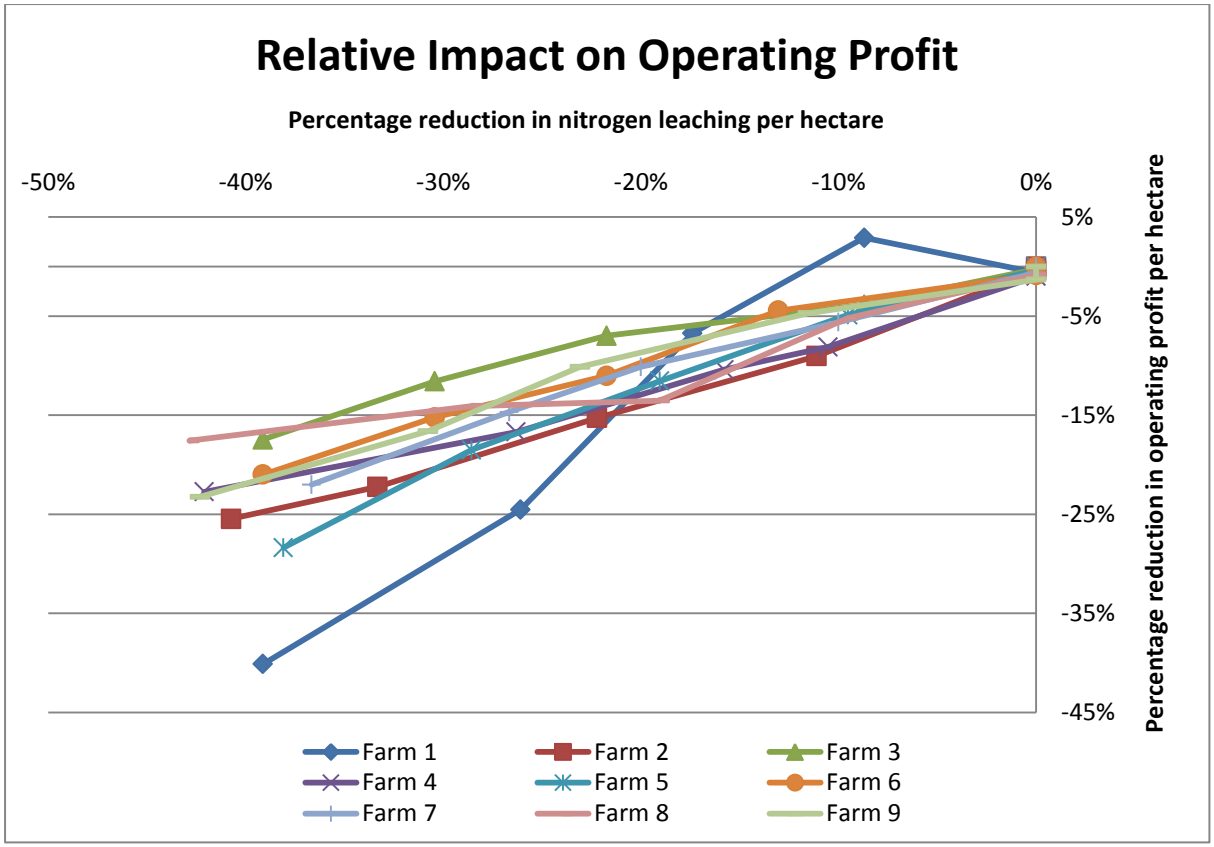

Figure 2: Relative impacts of reducing nitrogen leaching on operating profit

What figure 2 does not show are the absolute changes (figure 3 shows these graphically), these are very important as each case study farm operates from a different level of initial operating profit, it is also relevant when calculating how much operating profit is left after mitigation to pay tax, interest, term debt repayments, capital and for drawings. Figure 3 also shows that a 40% reduction in nitrogen leaching from a farm with a low base nitrogen leaching will remove less nitrogen from the environment as the same percentage reduction from a farm with a high base nitrogen leaching. However, figure 3 also shows that a 30% reduction in operating profit from one farm may be significantly different in absolute terms compared to another farm. For example, of the farms that could (under the scenarios modelled) remove 2,000 kg of nitrogen leached from the farm system, farm 3 would lose the most operating profit on absolute terms. Because each farm is going to have to remove different amounts of nitrogen and each farm has a different total operating profit it is important to know the relative costs as well as the absolute costs.

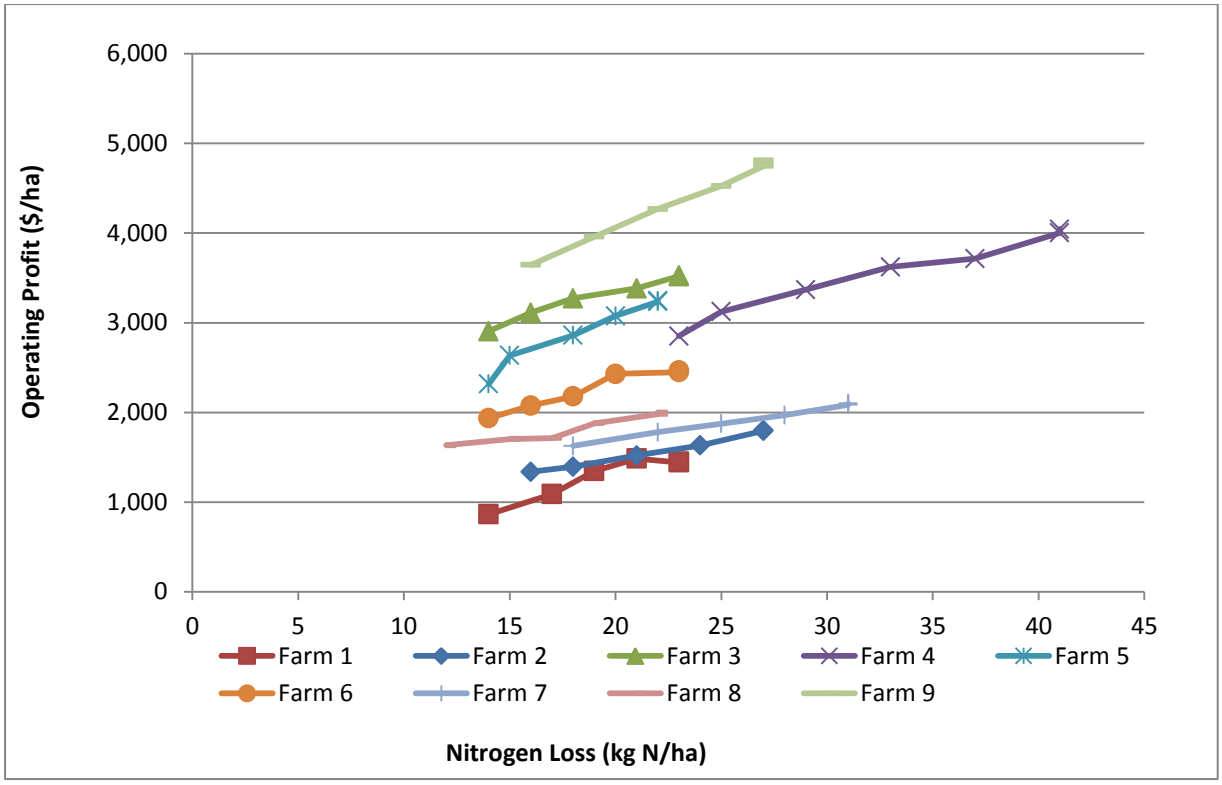

Figure 3: Absolute changes in nitrogen leaching and operating profit per hectare