BEFORE THE CANTERBURY REGIONAL COUNCIL

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of Proposed Plan Change 5 to the Canterbury Land and Water Regional Plan

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STATEMENT OF EVIDENCE OF BRIAN NEIL ELLWOOD
ON BEHALF OF MERIDIAN ENERGY LIMITED

22 JULY 2016

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1 My full name is Brian Neil Ellwood.

2 I am a Senior Environmental Engineer with Lowe Environmental Impact Limited (LEI); a role I have held since Feb 2016. Prior to joining LEI, I held CEO and Technical Manager roles for the Hunter Downs Development Company Limited (HDDCL); from 2013 - 2016 and held the role of Project Manager for Hunter Downs Irrigation Scheme (HDI Scheme) from 2006 - 2013. I have worked in the area of irrigation and water infrastructure since 1998, in both consultancy, SOE and regional council roles. I was employed by Meridian Energy Ltd (Meridian) from 2003 - 2013.

3 I have the following qualifications: a MApplSC (Hons) (1997) in agricultural engineering and a BTech (Hons) (1996) in environmental engineering; both from Massey University, and a post graduate certificate in Irrigation from Charles Sturt University of New South Wales (2007). I also hold an intermediate level certificate in Sustainable Nutrient Management (the 'OVERSEER® qualification') from Massey University and I am currently studying towards the advanced level certificate in Sustainable Nutrient Management.

4 My wider roles and experience relating to irrigation and nutrient management include:

(a) Consent Manager and Engineering Advisor to Amuri Irrigation Company Limited scheme piping upgrade project;

(b) Project management of all aspects of the HDI Scheme since 2006, which included;

(i) an application for resource consent to take and use water for irrigation;

(ii) nutrient management planning and consent application preparation for landuse in the HDI scheme area;

(iii) overseeing engineering design – concept to developed design;

(iv) trial investigations (and concept designs) for the HDI Scheme; and

(v) overseeing the prospectus development and issue.

(c) Advisor to Meridian during the Mackenzie Irrigation Company shareholders' consent application, hearing and Environment Court meditation processes;

(d) Various other matters (especially while employed by Meridian) concerning the consideration of irrigation options across Canterbury.

5 I have read and agree to comply with Code of Conduct for Expert Witnesses (Environment Court Practice Note 2014). This evidence is within my area of expertise except where I state that I am relying on facts or information provided by another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

6 In preparing my evidence I have reviewed:

(a) Canterbury Regional Council's (ECan) proposed Plan Change 5 (PC5) to the Canterbury Land and Water Regional Plan (CLWRP);

(b) Meridian's submission and further submissions on the proposed Plan Change 5 (PC5) to the Canterbury Land and Water Regional Plan (CLWRP);

(c) Upper Waitaki limit setting process. Predicting consequences of future scenarios: Lake water quality; Clarke, (2015);

(d) The Generation of nitrogen and phosphorus loss estimates in the Waitaki Catchment; Mojsilovic et al. (2015); and

(e) The Officers' Section 42A Report.

SCOPE OF EVIDENCE

7 In my evidence I provide an outline of the following:

(a) Calculation of Nitrogen Load Limits;

(b) Permitted activity thresholds; and

(c) Impact of adaptive management regime on farm practices.

CALCULATION OF NITROGEN LOAD LIMITS

8 In my view an error has been made with Schedule 27 in relation to the future allocation calculation of the unutilised portion of the Haldon Zone Load Limit, currently expressed as 66 tonne N/yr (E1). An adjustment to

the available allocation is required to account for activities which exceed the property allocation loss of 1.6 kg N/ha/yr and which have a consent application in progress or where consent has been granted between 1 December 2013 and 13 February 2016. The adjustment is currently calculated to result in a 14 to 32 % reduction in unutilised load for allocation, which in my view is significant in relation to the headroom available to allocate.

9 PC5 has divided the Waitaki Catchment into four Freshwater Management Units (FMU) for managing water quality in the Waitaki Sub region. For the Upper Waitaki, the Freshwater Management Unit encompasses all of the catchments above the Waitaki Dam. The FMU is further divided into four Nutrient Allocation Zones. The Ahuriri Zone, Upper Waitaki Hill Zone, Haldon Zone, and Mid Catchment Zone. These zones are used to manage nutrient allocations.

10 The FMU structure allows for management of catchment specific water quality issues. In the Upper Waitaki, one of the key outcome is maintaining Lake Benmore in an oligotrophic state.

11 I agree with the approach ECan has established, i.e. to use "in-lake" nitrogen load limits for the Haldon and Ahuriri Arms of Lake Benmore. The use of these in-lake loads rather than "on-land" nitrogen load limits, avoids the effects of changing methods or versions of the OVERSEER® model used to characterise the nutrient losses from farming activities below the root zone and calculating what then arrives in the lake.

12 To develop the Lake Benmore in-lake loads, the modelling has looked at the current loads into Benmore, and current plus consented loads for irrigation and aquaculture via four future scenarios, as outlined in Clarke (2015) (Table 3-1) and summarised below:

(a) Current: Landuse as at December 2013;

(b) Scenario 1a: Current, realistic permitted, and consented discharges as at December 2013, all landuse operating at good management practice;

(c) Scenario 2a: As per Scenario 1a but with additional small blocks (approx. 100 ha each) of irrigated sheep and beef / dairy support (up to 25,000 ha), planned unconsented aquaculture, BIC expansion, + declined but appealed irrigation consents;

(d) Scenario 2b: As per Scenario 1a and parts of Scenario 2a, but with additional large blocks (approx. 500 ha each, up to 25,000ha) of irrigated dairy; and

(e) Scenario 2c: As per Scenario 1a with elements of 2a and 2b, but with additional small blocks (approx. 100 ha each) of irrigated sheep and beef / dairy support in Haldon Arm sub-catchment only (location of most headroom for water quality).

13 To maintain Lake Benmore in an oligotrophic state, as the basis of PC5 nitrogen load limits, Scenario 2a has been adopted for the Haldon Arm and Scenario 1a for the Ahuriri Arm.

14 In relation to agriculture, the adopted scenarios assume all landuse is operating at good management practice levels and allows for an increase in agricultural intensification and on-land loss in the Haldon Arm, while maintaining the expectation for the Ahuriri Arm of no net increased loss of nutrients from landuse change.

Overall Opinion on Appropriateness of the Haldon Arm Load

15 The in-lake load prediction for Scenario 2a is 737 t N/yr (Clarke 2015) which is modelled to maintain the Haldon Arm of Lake Benmore at a TLI of 2.7. This is the calculated in-lake after attenuation of on-land nitrogen loss and other point source nitrogen discharges. This figure becomes the Nitrogen Load Limit for the Haldon Zone within Table 15B(f).

16 A proportion of the Scenario 2a load is unutilised and available for allocation. Schedule 27 provides a mechanism for evenly allocating the unutilised portion of in-lake load to non irrigated land below 900 m elevation.

17 In Appendix 1, I set out my understanding of the steps involved in the use of Schedule 27.

18 Schedule 27 also provides a methodology to convert unutilised 'in-lake' load to a compatible OVERSEER GMP 'on-land' loss through the attenuation factor (G). Schedule 27 can be updated to account for the changes in the version of OVERSEER and GMP via the Matrix of Good Management:

19 For Schedule 27 to work, a clear demarcation of unallocated losses accounted for in the difference between Scenario 2a and 1a is required.

20 Scenario 2a accounts for, amongst other activities, the follow types of irrigation consents:

(a) Irrigation expansion consents granted post 2013;

(b) New or expanded Irrigation consent applications applied for post 2013 but prior to PC5 notification; and

(c) Consents recently declined but appealed to Environment Court.

21 From my review of the Technical and S42a Reports supporting PC5, the 267 t N/yr on-land headroom and its allocation via the Schedule 27 method (over 172,000 ha) has not taken into account the load increase that is greater than 1.6 kg/ha associated with activities described in my paragraph 20 above, which already have a resource consent applied for or granted between 1 December 2013 and 13 February 2016.

22 For these to be accounted for, they firstly need to be included in or added to the Scenario 1a load.

23 At the time of writing this evidence I am aware of the following applications or granted consents that are not included in the Scenario 1a calculations, as shown in Table 1. I consider that a subset (shown in green) of these consent applications or granted consents are not accurately accounted for in calculation of available headroom calculation.

Table 1: Consents and Consent Applications not included in Scenario 1a.

Application	Application type	Additional Load
Benmore Irrigation Company – CRC156320	New or expanded Irrigation consent applications	Application reporting net neutral/reduction in load, using improvements in farm practices to allow expansion of the area.
Balmoral – CRC157070 & CRC157071	Irrigation consent granted post 2013, commencement date 22 July 2015	Application reporting a baseline of 94 t N/yr and after development a net neutral/reduction in load
McIntyre CRC168850,	Landuse consent application to	The dryland loss baseline applied for is 81 t N/yr which is

landuse consent application	confirm baseline nutrient loss as a dryland dairy support block. 1,034 ha	30 times the Look Up Table (LUT)[1] rate for dryland dairy support and around twice that for irrigated dairy 34 t N/yr **0** to **47** t N/yr unaccounted for in scenario modelling
Bendrose – CRC154664	Irrigation consent granted post 2013, commencement date 7 October 2014	Nutrient discharge allowance (NDA) **18** t N/yr included on the consent. 1 December 2013 landuse in Map 1 PC5 is extensive sheep and beef with low losses so majority of this NDA is not accounted for in Scenario 1a
Ben Ohau (Cameron) - CRC100234	New or expanded Irrigation consent application	Application reporting net neutral/reduction in load
Black Forest - CRC164826	New or expanded Irrigation consent application	Application reporting net neutral/reduction in load
Haldon Station – CRC166429	New or expanded Irrigation consent application	Application reporting net neutral/reduction in load
Mt Gerald - CRC164953 and CRC164947	New or expanded Irrigation consent application	Application reporting net neutral/reduction in load
High Country Rosehips	Consent recently declined but appealed to	Increase in lake load NDA[2] for 500 ha irrigation is **9.5** t N/yr, current Schedule 27 allocation

[1] See Appendix 2 which includes the LUT used by Mojsilovic, et al. (2015), Dry Dairy support is 2.6 kg N/ha and the landuse consent modelled loss is 79 kg N/ha.

[2] Estimate using Ecan LUT, landuse dry sheep and beef leaching 2.6 kgN/ha/yr and irrigated sheep and beef leaching 21.7 kg N/ha/yr. Net increase 19.1 kg N/ha

	Environment Court	1.4 t N/yr
Rosehips	Consent recently declined but appealed to Environment Court	Increase in lake load NDA[2] **12** t N/yr, current Schedule 27 allocation 1.1 t N/yr
Load to be accounted for in Scenario 1a		**~35 to 86[3] t N/yr**
% of 267 t N/yr total headroom to be accounted for		**~14% to 32%**

24 As the above demonstrates, there are two potential issues with the calculations in Schedule 27. The first being the accuracy of the assumed land use pattern in Scenario 1a. The second is increased nutrient losses caused by consented land uses which postdate the scenario comparison but are not subject to the 1.6kg/ha/yr limit.

25 In terms of the first issue, the McIntyre CRC168850, landuse consent application is a good example of the difficulties in the catchment scale modelling and relating this back to individual properties for Nitrogen headroom calculation and allocation. The baseline nitrogen loss modelling in the landuse consent application predicts 81 t N/yr for dryland dairy support, while my assessment from the Map in Appendix 1 is that the catchment scenario modelling has modelled this block as irrigated dairy with an average nitrogen loss of 34 t N/yr. The difference is 47 t N/yr, which is not accounted for in Scenario 1a.

26 While the catchment modelling and property modelling are different because the catchment has used Look Up Table (Appendix 2) leaching losses and the property has used specific nitrogen loss modelling for the actual activities undertaken on farm, the consequences of the difference

[3] Wider range of on-land loss of 19 to 115.5 t N /yr is a possible interpretation of consented activity between 1 December 2013 and 13 February 2016 based on how McIntyre CRC168850 dryland is treated compared to the modelled Scenarios 1a and 2a, (Dryland dairy support or irrigated dairy) and how Bendrose – CRC154664 consented nutrient discharge allowance is treated in Scenario 1a.

in estimation of loses could be minor if the same load is in Scenario 1a and Scenario 2a.

27 In my view, the more significant issue is the second (increased nutrient losses caused by consented land uses which postdate the scenario comparison but are not subject to the 1.6 kgN/ha/yr limit), because it will result in the potential for the Haldon Zone Nitrogen Load Limit for the Haldon Catchment of Lake Benmore being exceed if the "equal allocation" approach across the 172,000ha is significantly taken up. This is because the assumed unutilised portion of the load limit of 66 tonnes has, in part, being allocated outside of the PC5 framework on a first-in-time basis.

28 Overall, from the assessment of consents and consent applications not included in Scenario 1a, it is my assessment that resource consent applications have been made for increases in on-land losses above Scenario 1a baseline losses of 14 to 32% (35 to 86 t N/yr) of the "E1" headroom. The allocation of these increased on-land losses needs to be accounted for in the 267 t N/yr headroom load before any further allocation across the basin is made via the Schedule 27 methodology.

29 To correct Schedule 27, an initial one-off adjustment should be added to the Schedule 27 calculation methodology as outlined below:

(a) Step one involves reviewing the Fixed Input "E1" the unutilised part of the Nitrogen Load Limit (E1 = 66 tonnes), being the difference between Scenario 2a and Scenario 1a to account for those activities recorded in Scenario 2a which as at 13 February 2016 have consent, an application in process or been declined but appealed to the Environment Court. For example, if 86 t N/yr is not accounted for between Scenarios, the new E1 would equal 44.7 t N/yr, a 32% reduction; and

(b) Implement Schedule 27 as proposed in PC5 using the newly defined input value for E1.

30 The specific amendments to Schedule 27 are limited to E1 and are as follows:

E1 = 66 tonnes N/yr (*the unutitlised portion of the Haldon Zone Limit in Table 15(f)* ~~*as at 13 February 2016*~~ *as at 1 December 2013*) * Z

Z = 1-(the amount of on-land based agricultural N load allocated in excess of 1.6 /kg/ha via resource consent granted after 1 December 2013 but before the Rules 5.53A, 5.54A, 15B5.19 to 15B.5.23 become operative) / (66 tonnes*G)

31 I have provided a formula for calculating E1 because there is uncertainty in the outcome of the several consent applications in Table 1 which are in process or before the Environment Court.

PERMITTED ACTIVITY THRESHOLDS

32 As I outline below, to avoid unanticipated increases in the loss of N from agricultural activities, I support the Officers' recommendation to retain the notified permitted activity thresholds in rules 15B.5.14 and 5.54A rather than to amend these as requested in some submissions to become property percentage.

33 As I noted earlier, four Nitrogen Allocation Zones are introduced into the Upper Waitaki FMU; the Ahuriri Zone, the Upper Waitaki Hill Zone, the Haldon Zone and the Mid Catchment Zone.

34 Rule 15B.5.14 is the permitted activity rule for the use of land in the Ahuriri and Upper Waitaki Hill zones. I support restrictions in Conditions 3 and 4 of the rule. These restrictions on further expansion under the permitted baselines are proposed because modelling in the Ahuriri sub-catchment indicates that even small increases allowed under the region-wide PC5 permitted activity rule would result in a higher risk of the catchment-specific TLI limits not being met.

35 Given the large size of most properties in the PC5 area, restricting the permitted activity status for expansion of the area in winter crop or irrigation is unlikely to change the property’s viability and many, if not all, would already have greater than 50 ha irrigation or 20 ha of winter grazing.

36 The cautious approach of Rule 15B.5.14 is warranted to support no net increase in N loss as the losses from winter crops and irrigation can be significant. For example, kale fodder crop on light soil (MacKenzie soils) under sheep and beef stocking regime can lose 40 to 100 kg N/ha/yr while a pasture block may only be losing 12 kg N/ha /yr. (OVERSEER 6.2.2. estimates).

37 The Haldon Zone and the Mid Catchment Zone are orange Zones and PC5 Rule 5.54A will need to be met for the use of land to be a permitted

activity. The rule includes a maximum irrigation area of 50 ha and 20 ha of winter grazing.

38 I support the application of the thresholds in Rule 5.54A as a pragmatic measure to allow properties to have some flexibility before requiring consent, but given the large scale of most properties in the Upper Waitaki, it is unlikely to make a material difference to the property's operations and consent requirements. The permitted activity threshold change in on-land nutrient loss from a sheep and beef property with 20 ha of crop could be 560 to 1,760 kg N, which is a minor amount of nutrient increase.

39 In addition to the above comments on the permitted activity threshold for the Haldon Zone and Mid Catchment Zone, I support the S42A Officers recommendations to retain the permitted activity threshold at 50 ha irrigation and 20 ha of winter grazing in the Haldon Zone. I agree that the suggested change to the permitted activity threshold to 25% of the property area irrigated and 10% of the property area used for winter grazing would introduce the potential for a significant increase in nutrient loss due to a potential increase in irrigated area of 116,200 ha. While the water allocation would not be available for this large area on a permitted activity basis, opportunities are available for existing consented water to be spread over a wider area. The proposed expansion by Benmore Irrigation Company Limited is an example of this.

IMPACT OF ADAPTIVE MANAGEMENT REGIME ON FARM PRACTICES

40 In my view, adaptive management approaches can be applied to consents in the Waitaki Catchment as anticipated by Policy 15B.4.20(4) as now sought to be amended by Meridian without bringing into question the viability of the farming system on a property.

41 Meridian is seeking that Policy 15B.4.20(4) be amended to provide support for the general adaptive management approach recently applied to individual water permits for irrigation as outlined by **Mr Page** in his evidence. Adaptive management scenarios detailed in the technical supporting documentation, show that implementation of mitigation measures to the farming system can achieve significant nutrient reductions.

42 Phillips, (2014), reports nitrogen leaching savings in a dairy farm system from 7% for a simple wintering-off strategy to 40% reduction for a complex farm system change to incorporate housing of cows.

43 The wintering-off of cows achieves a reduction in nitrogen loss at both the farm level and at the catchment level, provided stock are transported out of the catchment.

44 The scope for changes in the dairy system reported by Phillips, 2014, supports the implementation of adaptive management conditions on water permits and landuse consents, so that nitrogen loss reductions in the order of 20% can be achieved. These changes progressively involve reducing nitrogen applications and stocking rates.

45 Further advanced mitigation can achieve greater reductions in nitrogen loss. These measures include soil moisture monitoring to inform a variable irrigation return rate for real-time irrigation, reduction in fodder crop grazing, the importation of feed onto a feed pad or in-shed feeding, and fully housing stock.

46 One practice currently being promoted by Benmore Irrigation Company is improved soil moisture monitoring and irrigation scheduling. OVERSEER modelling with the only parameter change being soil moisture monitoring to inform variable return period irrigation, reduced nitrogen loss of a dairy system by 22% in whole farm losses; a reduction from 46 kg N/ha/yr to 35 kg N/ha/yr. This system better matches the timing of an irrigation application to the soils' available water holding capacity to minimise drainage and leaching of nutrients.

47 A further advanced mitigation, but with higher capital cost, would be to use variable rate irrigation across the length of the pivot, allowing the matching of irrigation depth to plant growth stage and the differing soil types available water holding capacity within the pivot's rotation. Variable rate technologies further reduce excess soil moisture from irrigation and annual drainage volumes.

48 However, not all properties can easily reduce N loss. As shown by Ogle, (2014), the scope for nitrogen reduction on less intensive unirrigated farm systems is low without significant impacts on farm profitability. Reductions in stocking rate become increasingly less effective as catchments become dryer and where total leaching rates are low.

49 In my opinion adaptive management should be encouraged in systems where there is a range of farm system inputs and management practices which have the potential to be altered to reduce nitrogen loss.

50 A key to effective adaptive management is to give farmers time to adapt and certainty of the requirements they need to meet. Linking back to the earlier section of my evidence, fixing in-lake loads and lake TLI levels combined with the use of trigger TLI level will give a signal that nutrient levels are on the increase and that real changes to farm nutrient loss will be required. Having a progressive adaptive management regime which is not prescriptive in the type of mitigation but has certainty in the target, provides time for individual farm businesses to select the mitigation which best fits their farm system and capital expenditure cycle.

SUMMARY AND CONCLUSIONS

51 PC5 provides in-lake load limits for Lake Benmore and identifies that further nitrogen allocation is possible within the Haldon Arm of Lake Benmore. The detailed modelling of current and future development scenarios has identified an acceptable increase in Lake Benmore nitrogen Load of 66 T N/yr.

52 This evidence identifies an error in the future allocation method for the 66 t N/yr. An adjustment to the available allocation E1 is required to account for activities which exceed the property allocation loss of 1.6 kg N/ha/yr and which have a consent application in progress or where consent has been granted between 1 December 2013 and 13 February 2016. The reduction in unutilised load for allocation is calculated to be between 14 and 32 %, which in my view is significant in terms of the headroom available for allocation.

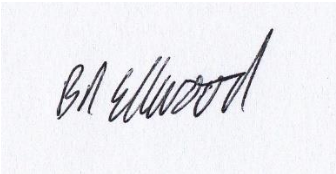
53 To allow for the uncertainty in the outcome of the several consents in Table 1 which are in process or before the Environment Court, I have provided a formula for recalculating E1.

54 The permitted activity threshold for landuse consent relating to irrigation and winter forage crop area for properties greater than 10 ha is supported. The restrictions in the Ahuriri arm is a precautionary approach and aligns with the PC5 principle of no net increase in nutrient load for this catchment, while in the remainder of the Upper Waitaki FMU, the permitted activity levels of 50 ha irrigation and 20 ha for winter forage crop is a pragmatic response to give some flexibility to

landowners before consent is required. Increasing these thresholds to a percentage area of the property is not supported.

55 Adaptive management approaches can be applied to consents in the Waitaki Catchment as anticipated by Policy 15B.4.20 as now sought to be amended by Meridian without immediately bringing into question the viability of the farming system on a property.

Dated: 22 July 2016



Brian Ellwood

References:

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Mojsilovic, O.; Duff, K.; Shaw, H.; Palmer, K.; Steel. K. (2015) Generation of nitrogen and phosphorus loss estimates in the Waitaki Catchment. Ecan Report No. R15/109

Ogle, G. (2014) Management strategies for mitigating nitrogen losses on a Dry Subhumid farm in the Upper Waitaki Catchment. Prepared for Environment Canterbury, Appendix F, Mojsilovic et al. (2015)

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Appendix 1

Schedule 27 Worked under

For the Haldon Zone, Schedule 27 is used to allocate unutilised in-lake Nitrogen load to agriculture. The following inputs, calculations and assumptions are used in Schedule 27 for agriculture.

1 Fixed Input “A” Reference Landuse pattern areas representing current and consented agricultural landuse at 1 December 2013 in the Haldon arm

2 Variable parameter “F” Matrix of Good Management Practice loss rates for individual landuse area type in “A” the Reference Landuse pattern

3 Variable input “H1” a calculated parameter, H1 = ∑ (A*F), it is the sum of the on-land N loss at Matrix of Good management practice loss rates for each landuse type area in the Reference Landuse pattern. (H1 = 1494 t N/yr)

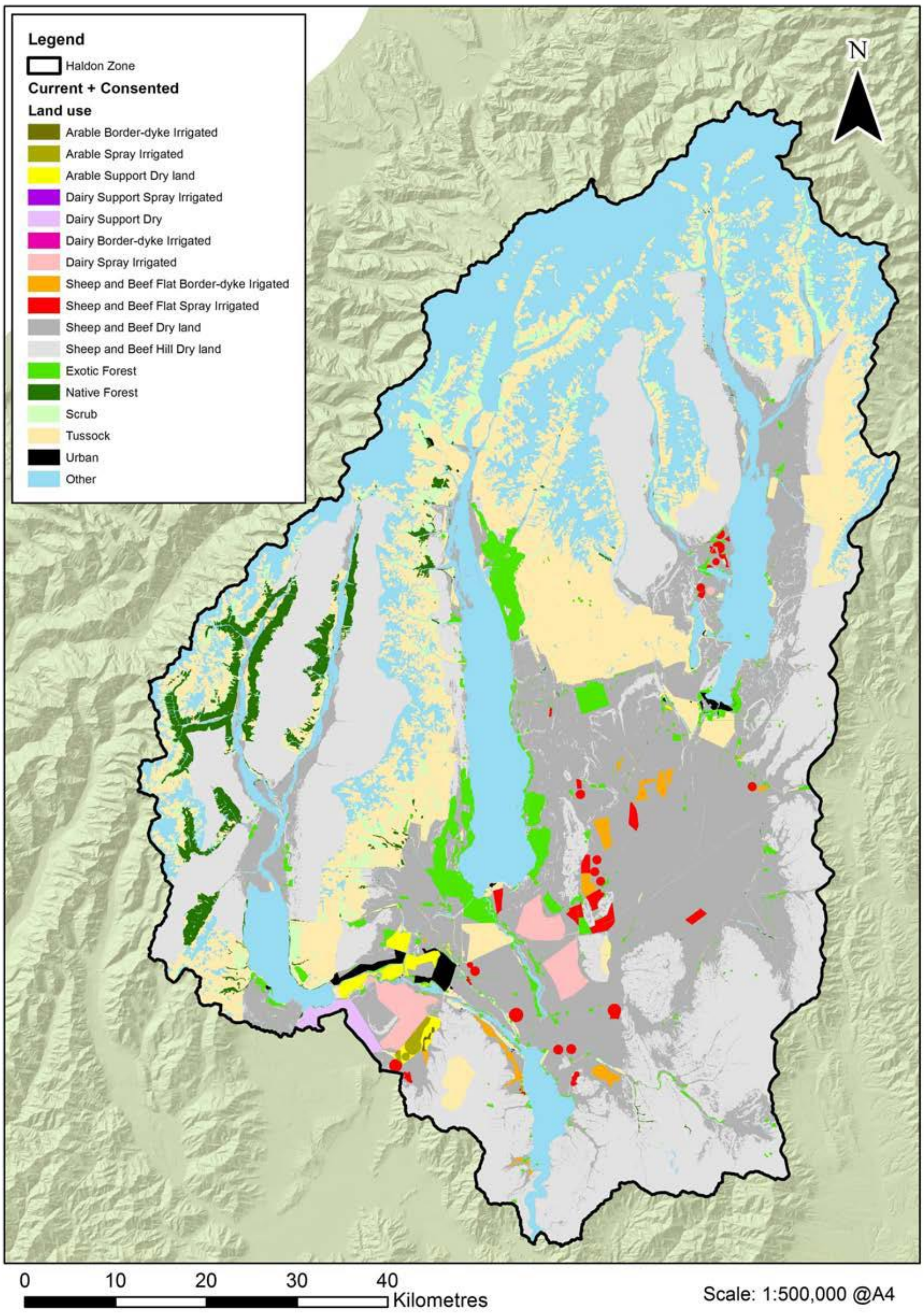
4 Fixed Input “C” proportion of the in-lake Nitrogen Load Limit for the Haldon Zone for all agriculture (“C” = 328 tonnes)

5 Variable Parameter “G” the attenuation factor, is a calculated parameter G = H1/C, this is calculated each time there is change in the Matrix of Good Management Practice loss rates “F” which apply to “A” (Landuse pattern) (G = 1494/328 = 4.5)

6 Fixed Input “E1” the unutilised part of the Nitrogen Load Limit (E1 = 66 tonnes), being the difference between Scenario 2a and Scenario 1a

7 Fixed allocation the amount of that unutilised proportion of “E1” available to agricultural intensification (90% of E1)

8 Define the on-land unutilised Nitrogen load for even distribution across the unirrigated land area. I1 = E1*G*90% (I1 = 267 t/yr)



Map 1: Haldon Zone land use reference map (Part B PC5)

Appendix 2

Look up Table values for catchment scale modelling. Mojsilovic, et. al. (2015)

Table 2-12: Summary of the modelled average catchment N loss rates for the current land use scenario, along with the range in the N root zone loss rates from freely draining, flat to rolling land (kg N ha^{-1} yr^{-1}). Asterisk (*) identifies the land uses adjusted in the CLUES calibration

Agricultural land uses	Average N root zone loss rates	Range in the N root zone loss rates for freely draining, flat to rolling land
	Upper Waitaki	
Arable	14.7	13.0 - 17.6
Dairy - Spray Irrigated	32.9	27.2 - 35.0
Dairy Support - Dryland*[4]	2.6	1.5 - 3.8
Dairy Support - Spray Irrigated	18.8	18.4 - 23.7
Dry-stock - Dryland*	2.6	1.5 - 3.8
Dry-stock - Border-dyke Irrigated	29.6	25.7 - 36.0
Dry-stock - Spray Irrigated	21.7	19.0 - 30.0
	Lower Waitaki	
Arable	17.4	4.0 - 26.0
Dairy - Dryland	11.8	5.7 - 25.1
Dairy - Border-dyke Irrigated	46.6	27.1 - 93.1
Dairy - Spray Irrigated	27.0	21.0 - 46.8
Dairy Support - Dryland	12.7	5.7 - 42.4
Dairy Support - Border-dyke Irrigated	29.7	20.1 - 38.2
Dairy Support - Spray Irrigated	22.7	16.2 - 56.6
Sheep and beef - Dryland	4.3	4.0 - 9.9
Sheep and beef - Border-dyke Irrigated	26.5	18.4 - 62.3
Sheep and beef - Spray Irrigated	17.6	13.3 - 42.7
Deer - Dryland	5.0	4.0 - 12.4
Deer - Spray Irrigated	12.9	14.9 - 30.4