in the matter of: the Resource Management Act 1991

and: submissions and further submissions in relation to proposed variation 1 to the proposed Canterbury Land and Water Regional Plan

and: **Central Plains Water Limited**
Submitter

Statement of evidence of Hamish Lowe (OVERSEER®)

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STATEMENT OF EVIDENCE OF HAMISH LOWE

INTRODUCTION

1 My name is Hamish Lowe.

2 I am the Principal Environmental Scientist at Lowe Environmental Impact Limited.

3 I am part of the multi-disciplinary consultancy team advising Central Plains Water Limited ("CPW") in relation to the proposed variation 1 to the proposed Canterbury Land and Water Regional Plan.

4 I have the following qualifications and experience relevant to the evidence I shall give:

4.1 Bachelor of Agricultural Science (Honours); and

4.2 Master of Agricultural Science (Honours in Agricultural Engineering).

5 I am a member of a number of relevant associations including:

5.1 Soil Science Society of New Zealand;

5.2 New Zealand Institute of Agricultural and Horticultural Sciences (NZIAHS);

5.3 Environmental Institute of Australia and New Zealand (EIANZ);

5.4 Water New Zealand; and

5.5 New Zealand Land Treatment Collective.

6 A key focus of my work involves the sustainable management of nutrients, wastes and environmental impacts in agricultural systems. This includes nutrients in farming systems, animal and processing water supplies and wastes being applied to production agricultural land and their resulting impact on soil and water quality.

7 I regularly undertake nutrient assessments and while there are many techniques available, OVERSEER® Nutrient Budgets (Overseer) is a key tool for use. While a lot of my Overseer modelling work has involved modelling individual farms, a significant component of my farm modelling work has been modelling complex

farming operations and developing and modelling scenarios to assess land use change.

8 I am a Certified Environmental Practitioner, in accordance with the EIANZ accreditation programme. I am a certified Practicing Agriculturalist, in accordance with the NZIAHS accreditation programme. I am also a certified Hearing Commissioner in accordance with the Ministry for the Environment's Making Good Decisions programme.

9 In preparing my evidence I have reviewed:

9.1 Lilburne et al (2013): *Estimating nitrate nitrogen leaching rates under rural and uses in Canterbury*. Report No R14/19 for ECan. (Lookup Table Report)

9.2 AgriBusiness Group (2014). *Report on Collection of Nutrient Baseline Data for CPWL*. Prepared for Central Plains Water Limited.

10 I have also read the evidence of **Mr Stuart Ford**.

SCOPE OF EVIDENCE

11 My evidence focuses on providing a commentary with issues as they relate to Overseer and proposed variation 1 (*Variation 1*) to the proposed Canterbury Land & Water Regional Plan (*pLWRP*).

12 In my evidence I have been asked to provide an outline of:

12.1 the evolution of Overseer;

12.2 the impact of changes to (different versions of) Overseer;

12.3 the use of Overseer as a compliance tool;

12.4 the scope for additional mitigation alongside the Overseer framework;

12.5 issues around baseline rolling averages;

12.6 the appropriateness and accuracy of the Agribusiness Group modelling; and

12.7 catchment and Overseer relationships.

13 Although this is a Council hearing, I have read the Expert Witness Code of Conduct set out in the Environment Court's Practice Note 2011. I have complied with the Code of Conduct in preparing this

evidence and I agree to comply with it while giving oral evidence before the hearing committee. Except where I state that I am relying on the evidence of another person, this written evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in this evidence.

BACKGROUND - EVOLUTION OF OVERSEER

History

14 In the early 1990's a database of fertiliser trials in New Zealand was established[1]. The information from the databases was developed into a computer model called Outlook. From 2003, the model changed to a farm system model, resulting in the release of Overseer version 5. This model captured the movement of nutrients around the farm, and modelled the losses for each process. The model has evolved over time, starting as a nutrient budget linked to fertiliser advice through to a decision support tool that used nutrient budget information, to produce environmental indicators.

15 Overseer is jointly owned by the Ministry for Primary Industries (MPI), Fertiliser Association of New Zealand and AgResearch, with MPI and Fertiliser Association of New Zealand providing substantial investment in maintaining and improving the model. The Owners have developed a vision for Overseer: *A robust, science-based decision support tool and policy support tool that is widely used for improving farm profitability, optimising nutrient use and minimising impacts on air, soil and water quality*[2].

16 The Overseer model is built on robust published science and uses logical farming systems. While not all farming systems can be described, most can be covered, albeit with some limitations. By this I mean not all grazing and feeding solutions have been anticipated and this requires assumptions to be made; ultimately contributing to greater variability and uncertainty in the accuracy of the output. This is discussed further below.

Key Principles

17 Overseer is a quasi-equilibrium state model that relies on averaged input data to generate annual average nutrient budgets. It also requires a balancing between inputs, site resources and characteristics and farm production.

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[1] Sourced from: http://www.overseer.org.nz/OVERSEERModel/OVERSEERHistory.aspx

[2] Sourced from: https://secure.overseer.org.nz/live/About

18 Overseer should not be used to cover transition periods, or assess one off management decisions in response to an abnormal seasonal event, such as a drought.

19 For reasons I explain below, I believe Overseer's benefit is only as a relative model and not an absolute model.

20 An absolute model is one that produces an output that has a high degree of certainty and a low level of variation. It describes the impact of an event at a particular point in time.

21 A relative model by comparison can be used to assist with noting trends and considering approximate cause and effect relationships. By virtue of using annualised average data Overseer cannot be used to produce absolute outputs that reflect exactly what is happening at a point in time, including specific seasonal events.

Land Uses Covered

22 Overseer was initially established to assist with developing fertiliser application regimes in the pastoral agriculture sector, with a focus on dairying and sheep and beef. It can now be used to assist with prescribing fertiliser regimes for most grazed pastoral farming and cut and carry operations. Recent additions have allowed arable, forestry and non-productive land used to be incorporated. Also allowed for now are a range of management options, including deferred grazing, non-grazing periods, crop grazing and application of a range of fertilisers and soil amendments.

23 One of the most significant developments in the Overseer model is an additional focus of assessing nutrient loss from farming systems, with the focus on the fate nitrogen (N) and phosphorus (P) passing below the plant rooting zone or passing directly into surface waters. It also has capabilities to assess greenhouse gas contributions.

24 This evidence focuses on Overseer for managing nutrient losses, and in particular N.

Good Management Practices

25 There are a range of Good Management Practices (GMP) that are inherently assumed to apply within Overseer. These include, but are not limited to:

25.1 Fertiliser being applied according to the industry Code of Practice (FANZ, 2013);

25.2 Compliant effluent systems;

25.3 Stock exclusion from water ways;

25.4 Irrigation efficiency greater than 80 %; and

25.5 Farm race and bridge/culvert water directed to paddocks.

26 Accordingly, within the Overseer framework, the GMP are essentially the 'tools' available to a farmer that are practical and usually affordable.

Calibration and Variability in Results

27 Overseer is an averaged annualised model. Climatic factors are important for determining nutrient losses; and Overseer uses annual average rainfall, annual average temperatures, and annual average potential evapotranspiration. These inputs do not reflect seasonally wet years or periods within a year (i.e. months). For example, to generate accurate irrigation losses, an average irrigation year needs to be used and not a design or dry year.

28 The modelled relationships between inputs and outputs have been validated against a range of farm systems and scientific trials from which the raw input data has been sourced. This process has allowed for the developed relationships to be adjusted so that the calculated output approximates the measured values. This effectively means that average climate data (in some cases over a 30 year data set) has had to be calibrated against observations over a much shorter period, and in some cases less than two years.

29 Overseer has the capability to model multiple very complex dynamic biological systems. Such models will always have some degree of uncertainty, primarily as it is difficult to foresee and accurately describe the output of a multitude of input parameters, many of which have no actual site specific research data to validate and calibrate predictions.

30 It has been reported[3] that the prediction error in an earlier version of Overseer for N losses in pastoral systems where there is validation data can be as much as 25 – 30 %. It is possible that a similar prediction error for N leaching losses can still occur in the current Overseer version 6.0[4]; although as I discuss later in my evidence improvements to the model continue to be made.

31 Modelling variability is primarily related to the ability to generate a theoretical relationship with actual data. Where more data is available there is typically greater accuracy, and where there is less data the variability increases. Some modelled functions in Overseer

[3] Ledgard, S.F., and Waller J.E. (2001). Precision estimates of nitrate leaching in OVERSEER. Client report to FertResearch.

[4] Wheeler, D (2013): Tukituki Catchment Proposal, Applicants Evidence in Chief, paragraph 2.4.

have been developed from long term trials resulting in a high degree of reliability for the outputs. However, some modelled functions have been developed from a limited number of short term trials resulting in a high degree of variability. For example, soil conditions and nutrient transformation during a drought will be different to that in wet conditions, and if the trial is undertaken during the drought the transformations monitored would be different to that if it was wetter. This means that while transformations in drought conditions can be accurately described, those in wet conditions have to rely to a large extent on known theoretical principles.

32 Examples of limitations in specific knowledge are N losses in high rainfall areas, on stony soils and under varying irrigation regimes[5]. In the case of the upper plains areas, these limitations are likely to have material impacts as it relates to actual nutrient budgeting given the often stony soils in this area.

33 Again, it is therefore Overseer's value as a relative model (rather than an absolute model) that is of most assistance to planning regimes such as that proposed under Variation 1. In particular, what the modelling does do is provide an indication to the likely magnitude of change in nutrient loss as a result of input and management changes on that particular farm. This in itself is very valuable for managing nutrients but should not be assumed to result in an absolute value for nutrient loss.

34 The extent to which good management is assumed within Overseer and the fact it is a long-term averaging model provides important further context to its use in Variation 1.

IMPACT OF CHANGES IN OVERSEER

35 While the science behind Overseer is robust, it is not complete. Overseer relies on an interpolation of actual data to theoretical situations. This interpolation is constantly being refined and developed over time. The Overseer developers acknowledge that it *"…is still in a development stage and there are going to be changes between versions as new science becomes available, or inconsistencies or bugs are fixed."*[6]

36 In the last three years there have been regular updates and improvements made. These are detailed on the Overseer website[7] and features recent advisories in August 2012, August 2012,

[5] Wheeler, D (2013): Tukituki Catchment Proposal, Applicants Evidence in Chief, paragraph 2.10.

[6] Wheeler, D (2013): Tukuki Catchment Proposal, rebuttal evidence, paragraph 2.14.

[7] http://www.overseer.org.nz/OVERSEERModel/Information/ReleaseNotesandGuides.aspx

November 2012, March 2013, August 2013, August 2013 and April 2014. The last update was as recent as 21 August 2014.

37 These changes, and the evolving nature of the Overseer model, indicate there will be ongoing refinement and improvement with Overseer. The consequence is that the output values obtained from modelling today are likely to be refined and may very well be different in a year or so.

OVERSEER AS A COMPLIANCE TOOL

38 I am strongly of the view that Overseer is an excellent management tool. It is also, in my view, that it is of value for informing policy. However, particular care needs to be taken when considering its use as a compliance tool or a tool that might assist in informing a particular nutrient reduction regime. Ultimately what is actually occurring on farm and the extent to which recognised GMPs are being followed is the most critical factor in informing N loss management.

39 Because of the continued refinement and changing output values Overseer is often criticised. This criticism might well be appropriate if used for strict regulatory or compliance purposes, however it should be remembered that the intention is not one of deriving absolute data, but relative data (see paragraph 19 above). In my view the criticism is unwarranted and is often as a result of the model being used for purposes outside what it was intended for.

40 The reality is Overseer will evolve as new farming systems are added, management systems evolve, science is acquired and modelling techniques improved. Consequently there will be updated versions released. In my view care is needed to avoid limiting the operation of a farm based on the results of an analysis in one version when that version **will** be superseded. This creates the potential that the newly computed output will be different from the initial and, if a limit was set, non-compliance without changing any of the farm's input parameters.

41 While acknowledging the concerns above, there is the possibility that Overseer could be used in a policy context providing some key aspects are noted, being:

41.1 the setting of any catchment loading calculations are reconsidered when new versions are released (while ensuring that any individual load limits are recalculated on the same basis);

41.2 emphasis is not placed on absolute outputs, but relative changes; and

41.3 recognition given to outputs being based on annualised averages and not the result of a specific year or one off event.

42 These settings all again require the use of the outputs in a relative and not an absolute context.

SCOPE FOR ADDITIONAL MITIGATION

43 The notified provisions of Variation 1 anticipate further reductions occurring beyond 'GMPs'. It is therefore important to understand the extent to which Overseer can include further mitigation measures to show reduce N loss from a farm, or catchment.

44 As mentioned previously, Overseer inherently applies GMP. In my view these differ from Best Management Practices (BMP). GMP are what we would expect that all farms should be utilising in their daily operation.

45 In many cases GMPs are currently not met or implemented on a daily basis; and consequently in my view Overseer under estimates nutrient losses from farms. The consequence is the generation of a theoretical estimate as to what we would like to think should occur on a farm.

46 Not meeting GMP is supported by **Mr Ford** who indicates that he believes many irrigators are not adopting the GMP inherent within assumptions of Overseer. This example, and that of other activities that do not meet GMPs, means that Overseer underestimates actual losses.

47 Expressing this another way, there is room to adopt GMPs on farms that will result in effects more in line with Overseer predictions.

48 Better guidance from the Council (separate from the planning process) as to the use of GMP's and the development of farm environmental plans is an important step in terms of ensuring GMPs are effective. In the case of entities such as CPW, the scheme also has role to play in ensuring shareholder farmers are aware of their obligations and facilitating the exchange of information between individual farmers and the Council as the ultimate regulatory body responsible for the catchment.

49 BMPs are in my view distinctly different to GMP, in that they are activities which with additional input and possibly change of management, may reduce the effects of the farming operation.

50 They are often (but not in all cases) based on recent research and new farming systems, and in many cases the technology and theory

is still evolving. They are often idealistic and in many cases out of reach for a lot of farms, especially if those farms are struggling to meet GMP. Nevertheless they provide opportunities to mitigate effects.

51 Based on present knowledge I consider that care needs to be taken when considering or requiring further mitigation. More particularly, given the often significant expenditure required, a property owner needs to have confidence that the additional mitigation of N loss is actually likely to be achieved. This concern similarly applies when undertaking catchment scale modelling and when requiring further mitigations to occur.

52 If mitigation is simply too expensive, or there are uncertainties around the extent to which N loss reductions will occur, then there is a risk that there will be an unanticipated shift in catchment land use to and wider catchment outcomes will not be achieved to the extent anticipated.

BASELINE ROLLING AVERAGES

53 The CLWRP uses the notion of *nitrogen baseline* as a means of assigning an initial nitrogen allocation to existing landholders. This baseline is suggested to be either a first four-year rolling average period (2009 to 2013).

54 I have two issues with the approach:

54.1 firstly as Overseer is an annualised average model it should be static and not be changing. Therefore there shouldn't need to be an average of an averaging model;

54.2 secondly, if the average is of data that is trending upwards, then the average will reflect a nutrient loss less than the current farming operation.

55 The consequence of this will be the need for a sudden reduction in the farming operation in order to 'comply' with the average. Even worse, if a reduction from the rolling average is needed there will be a greater drop from the current year to less than the rolling average.

ACCURACY OF AGRIBUSINESS GROUP MODELLING

56 The following section comments on technical aspects of the Overseer modelling undertaken by the AgriBusiness Group.

57 Core components are discussed below.

58 **Typical farming systems**: Having been responsible for and having undertaken catchment based farm modelling I appreciate the difficulties experienced by the AgriBusiness Group in identifying typical farm systems. In the absence of a typical farm representing a type of land use, the option of averaging a large number of farms is a logical and a pragmatic approach. This is especially so for dairy support and arable farms which can each individually be unique and different.

59 **Climate**: With regard to specific climate input parameters, the AgriBusiness Group have used GeoOVERSEER spatial database developed by Aqualinc Research. It is known that the climate data used in the Overseer model had limitations, however as noted by AgriBusiness this has now been rectified.

60 **Soil information**: Soil information can be utilised in Overseer in a number of formats, with each of a relative scale/accuracy and providing different options. Despite the options, a number of the available soil types have aggregated properties, being representative of comparable soil units. I am unsure on the mechanics behind the scenes within Overseer, but I typically ensure the selection of soil description, being type, order or series, corresponds to the soil properties indicated during a desktop modelling exercise of a property. This appears to be what the AgriBusiness Group have done, by using SMap to confirm soil properties. I support this approach.

61 **Irrigation**: It is known for some time that Overseer has limitations when describing irrigated systems. This is partially a result of the limited availability of actual irrigated farm data to assist with model calibration. This was discussed in Paragraph 31 above. It is also partly due to the water balance approach used and the management of irrigation efficiency within the model.

62 In an ideal world irrigation is applied at sufficient quantities to avoid moisture stress and maximise plant growth. This typically requires soil moisture to remain sufficiently high to avoid growth limitations but not so high as to exceed field capacity and induce drainage. Should too little water be applied plant yield decreases, and if too much is applied water is wasted and potentially nutrients leached.

63 There are three methods available for setting irrigation in Overseer, being: actively managed, nominating application method and nominating the method and application rate. The first option assumes that soil moisture is optimised on nominated months with an ideal irrigation system. The second method allows the user to nominate the type of irrigation system on nominated months, and the third option is to nominate the months of irrigation, type of irrigation and the volume applied. As you transgress through the

options there is the potential to use more water as the options move from ideal (theoretical) to actual water use.

64 While the ideal would be to never exceed field capacity and induce drainage following irrigation, the reality is irrigation results in a higher soil moisture which will likely result in greater drainage following a rain event. As actual uses more than the ideal volume of water, the consequence is there is the potential for greater losses. Expressed an alternative way, the ideal method may underestimate actual drainage volumes and leaching losses.

65 As an example, I have run a simulation for irrigation using the actively managed selection and not specifying the type of irrigation. This produced a N leaching rate of 36 kg/ha and drainage of 517 mm. By changing the method only selection to a gun system the N leaching increased to 40 kg/ha and drainage to 571 mm. If a pivot system was selected the rate decreased slightly, to 39 kg N/ha and 565 mm, but was still greater than the actively managed simulation.

66 In my view actual irrigation data should be preferred as it is more likely to reflect what actually happens. Failure to indicate actual irrigation method or water usage will under estimate leaching losses. If no actual water usage is available then the nominated irrigation system should be preferred to increase the accuracy of N loss associated with irrigation.

67 If actual water usage is used it is imperative that average monthly data is used and not worst case or design irrigation rates. As mentioned in paragraph 27, Overseer is an annualised average model and inputs should be average as well.

68 The discretion available for the method for selecting irrigation highlights a degree of uncertainty and is a further reason (to that provided in paragraphs 27 to 33) why Overseer should be used for relative purposes rather than calculation of absolute nutrient losses.

69 There is considerable opportunity to improve water use efficiency though better irrigation controls and technology. This will lessen drainage losses and the associated nutrient losses. This is essentially adopting what could be considered GMP and in some cases BMP.

70 I support the use of accurate irrigation estimates, as used by the AgriBusiness Group modelling as it provides a greater level of accuracy for what is actually happening at a farm level.

71 In summary, I believe that the approach used by the Agribusiness Group is credible and acknowledges several of the well-known limitations with modelling using Overseer.

CATCHMENT AND OVERSEER RELATIONSHIPS

72 I consider that there are two catchment considerations that need to be addressed when developing output information using Overseer; representation and accuracy.

72.1 **Representation**: Due to an array of farming systems, soil types and climatic conditions, it is not possible to monitor what is happening on all farms. Therefore some extrapolation is required between farms.

72.2 Overseer can be used to assist this exercise, but it should be remembered that this process not only produces average data from a farm, the extrapolation process to a catchment level also assumes average farms. This means some farms in the catchment have higher nutrient losses and others lower. Consequently when benchmarking and nominating what is considered to be a nutrient loss rate reflective of the catchment, the process implies by virtue of being an average, 50 % of farms will produce less and 50 % more. Therefore a catchment average should not be treated as a catchment maximum.

72.3 **Accuracy**: It is known that there can be difficulty in estimating N leaching rates for the main land uses on different soils and rainfall zones under Canterbury conditions[8]. While a combined modelling and expert knowledge approach was used by Lilburne et al (2013) they noted that more data on both drainage and N leaching rates is required, particularly on the shallow and stony soils.

73 In my view these two issues highlight limitations when using Overseer, or other farm level models, at a catchment scale. While they provide an indicative and relative indication of what may happen at a catchment level, they are not absolute and are not likely to be constant over time. Therefore their use for policy should be at a guidance level, or if used to set allocation policy should be able to evolve to allow a greater knowledge at some stage in the future.

[8] Lilburne et al: Estimating nitrate-nitrogen leaching rates under rural land uses in Canterbury (update).

74 Based on my earlier discussion surrounding GMP, I maintain the view that while improvements have been made not all farms are implementing the GMP as are assumed in Overseer modelling. Consequently the predicted nutrient losses developed by Lilburne et al (2013) are likely to underestimate actual nutrient losses. An example of such underestimation is the use of Method Only irrigation scheduling, which I understand (Stuart Ford, *pers comm*) was used rather than actual site quantification of irrigation applications. When this underestimation is extrapolated to a catchment scale it is likely to significantly underestimate nitrogen losses, in this case as a result of irrigation. Also, by virtue of being an average half of the farms will also generate a greater loss.

75 While this underestimation is in itself not a problem when comparing farming systems, providing a consistent approach is used, it creates significant limitations when the data generated is used in absolute terms, or terms where the data forms a link used to accurately quantify a proposed catchment management regime.

76 A flow on effect of this underestimation is the generation of possible errors with catchment verification. In particular, the ground and surface water nutrient balance would utilise a lesser input than is actually occurring.

77 Alternatively at a mass balance level, if nutrient inputs and waterway outputs balance in a calibration exercise, the underestimation of nutrient loads may indicate that the attenuation within the surface water and groundwater systems is greater than initially thought. These large scale catchment processes are further discussed by **Mr Nic Conland**.

78 Further, if catchment water quality conditions have been calibrated with the modelling outputs that assume GMPs are adopted, when in fact they are not, then if/when GMPs are in fact adopted there is the potential for a further improvement or lessening of nutrient losses. This means that potential improvements may in fact be able to be made in water quality without implementing BMPs, which if insisted on at a regulatory level may necessitate a change in land use.

79 I acknowledge that when developing catchment solutions for nutrient management a tool is needed to estimate the nutrient yield from that catchment. Overseer can perform this task, so long as the accuracy of the information used is understood. It also means that over time as the modelling improves, as has occurred over the last 10 years, the use of the refined values are reconsidered in light of catchment management. This potentially means that catchment allocations, or the appropriateness of, may need to be reconsidered.

CONCLUSION

80 Overseer is an annualised average model that produces relative and not absolute outputs. It should not be used to describe a point in time (absolute), rather assess trends over time (relative). It can be used as a predictive tool at assess potential magnitudes of effects and consider impacts of alternative farming practices.

81 Overseer relies on the adoption of GMPs, and provides the opportunity to apply BMPs. Failure at a farm level to adopt GMPs will likely result in an underestimation of actual effects when modelled in Overseer. The effective implementation of current GMP's is an important component of ensuring the success of Variation 1.

82 The many dynamic relationships in farming systems within Overseer have been calibrated against actual research data. However, this data does not cover all situations or span long periods of time. Consequently the modelling requires extrapolation and a predictive process to identify likely situations and outcomes. Where less rather than more information is available, there is greater uncertainty about the accuracy of the predicted value, further supporting the view that the model should be used based on its relative output rather than in absolute terms. Irrigation and the effects of farm management on stony soils are examples of limitations within the model where further field data is needed.

83 Overseer utilises sound science and computer programming tools. This information and modelling techniques are evolving and improving. This has resulted in changes in predicted outputs as new versions are released. This is a consequence of continual improvements and further highlights the need to treat the outputs on relative terms and for it not be used in absolute terms.

84 Because of the refinement of Overseer outputs as more information comes to hand, I am strongly of the opinion that particular care needs to be taken when using Overseer output data as a means of setting compliance limits. There is simply too much variability and change within the modelling process to 'fix' limits at a particular point in time. Further, by virtue of being an annualised average model actual situations will be exceeded 50 % of the time.

85 Overseer has a base requirement that GMPs are adopted. Related to this is the use of the most appropriate input information, including nomination of irrigation rates. Failure to adopt GMPs and use correct input information will mean that Overseer outputs will likely under estimate actual nutrient losses.

86 The AgriBusiness Group have undertaken a modelling exercise to quantify nutrient losses across a selection of farms. Their approach to the exercise and the input information used is logical and appropriate.

87 When applied at a catchment level care is needed to ensure the range of actual parameters used on farming systems are captured. Failure to recognise GMPs have not been implemented and the use of idealistic input parameters rather than actual parameters, will likely result in an underestimation of potential nutrient losses from the catchment.

Dated: 29 August 2014

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Hamish Lowe

References:

AgriBusiness Group (2014). Report on Collection of Nutrient Baseline Data for CPWL. Prepared for Central Plains Water Limited.

Fertiliser Association of New Zealand (2013). Code of Practice for Nutrient Management.

Ledgard, S.F., and Waller J.E. (2001). Precision estimates of nitrate leaching in OVERSEER. Client report to FertResearch

Lilburne, L., Webb, T., Robson, M. and Watkins, N (2013). Estimating nitrate-nitrogen leaching rates under rural land uses in Canterbury (updated): Report No. R13/ISBN

Wheeler, D (2013): Tukituki Catchment Proposal, Applicants Evidence in Chief