

BEFORE THE INDEPENDENT COMMISSIONERS

IN THE MATTER of the Resource Management Act
1991

AND

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

**REBUTTAL EVIDENCE OF ALISON DEWES ON BEHALF OF NORTH
CANTERBURY, NELSON/MARLBOROUGH AND CENTRAL SOUTH
ISLAND FISH AND GAME COUNCILS
10 APRIL 2013**

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QUALIFICATIONS AND EXPERIENCE

1. My name is Alison Mary Dewes. My qualifications and evidence were set out in my Evidence in Chief, dated 2 April 2013.

2. In preparing this rebuttal evidence I have reviewed:
 - a. The reports and statements of evidence of other experts giving evidence relevant to my area of expertise, including:
 - i. Andrew McFarlane
 - ii. Antony Roberts
 - iii. Douglas Edmeades
 - iv. Benedict Curry
 - v. Matthew Cullen
 - vi. Gerard Willis
 - vii. James Ryan

3. I have again prepared this evidence in compliance with the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note 2011.

4. **The particular points that I consider is useful for me to discuss are set out below.**
 - a. Overseer and its suitability as a regulatory tool
 - b. DairyNZ Overseer Protocol

How a growing number of highly skilled professionals can reduce the risk of input error in to Overseer and support farmers through the required change.
 - c. Farm Environment Plans and change
 - d. Nitrogen Conversion Efficiency and the use of this measure as a “target”

- e. How Overseer accounts for a range of externalities from pastoral farming by default of the Best Management Practises it “assumes are in place”

OVERSEER AS A REGULATORY TOOL

- 5. Edmeades¹, Cullen² & Roberts³ have raised concerns around the accuracy of Overseer to model Nitrogen leaching from the farm. The main concerns are around the errors associated with the Overseer output due to inconsistent input methodology and use by inexperienced operators. While I support these concerns, it is my opinion that we are able to mitigate this as the following processes can be put in place through the pCLWRP:
 - a. Users of the Overseer model are competent operators that have a sound understanding of farm systems, nutrient management, the economics of change, and understand how a farm works – in real life;
 - b. To ensure that operators are competent they need to have undertaken the Intermediate and Advanced Nutrient Management Courses at Massey and have five years' experience in overseeing pastoral farm systems. Ideally operators should be able to show a high degree of competency with regards to farm system configuration and also be able to demonstrate a high degree of understanding with regards to the economic implications of scenario change to a farm system.
 - c. The input protocol used by operators should be as reflective of the farm system as is possible, it should deliver the most conservative estimate of the risk of N loss from a farm, and it should be as rigorous as possible without being prescriptive in a manner that reduces the accuracy. Input protocol should be audited by Environment Canterbury.

¹ Douglas Edmeades, Evidence in Chief, 2 April 2013, paragraphs 14, 21, 22.

² Mathew Cullen, Evidence in Chief, undated, paragraphs 8.9 & 8.10

³ Anthony Roberts, Evidence in Chief, 28 March 2013, paragraph 26.d

- d. Competent operators apply the model in the context of the farm system, farm management, and the validity of the farm's information within the context of the wider catchment.
 - e. Farm management information, nutrient plans, and input data is able to be scrutinised, and validated, and should be auditable by Environment Canterbury;
6. I agree that the Overseer model does not result in a perfect N leaching output, however it is the best available tool to model nitrogen leaching from the farm. The Overseer model is world leading, is currently utilised by farmers to perform a range of functions such as provision of a nutrient budget for the Assure Quality Inspector, and also to get a feel for their nutrient use efficiency. More recently, farmers are taking note of their farm's nutrient loss risk as awareness around this issue is being strongly pushed by industry, regional councils and the public. It is my opinion that Overseer provides a methodology for establishing output controls which negate the requirement for prescriptive and complex input control approaches.
7. Furthermore the Overseer model is like any other farm system model that our consultancy group uses amongst our suite of business services. We use it alongside other farm system, animal nutrition, and financial models, to guide strategic change at the farm level. As such the use of models is essential in understanding the farming operation and for farm business planning.
8. Models are a mathematical expression of complex biological systems and therefore may not always perfectly reflect reality. However modelling errors can be reduced by ensuring the following key criteria occur:
 - a. That the data used are as close as possible to reality and measurements in the field.
 - b. Any model should also be verified and validated so that the model simulations can be extended in time and space to conditions beyond the calibration.
 - c. The processes of calibration, verification and validation are key steps to ensure that model results are as close as possible to observed data and are best able to reflect changed conditions.

- d. Any model that reflects a system or a mosaic of systems, is then required to be operated by a competent operator or modeller who has sufficient background knowledge in order that the operator may critically scrutinise the results that the model generates, in order to ascertain if in fact the outputs reflect reality.
9. I had already considered the issues raised by Mr Edmeades,⁴ Mr Cullen⁵, Mr Ryan,⁶ and Dr Roberts⁷ in their evidence, when assisting Mr Percy in developing the farm management framework. To address the issue of type 1 errors (Operator Input Error) we proposed that:
- a. Overseer models are generated by suitably qualified and competent professionals that are able to scrutinise and validate the input data, against farm management practices.
- b. Overseer models are to be based on rigorous nutrient, farm system and economic data in order that they can be audited in a transparent manner by third party auditors that are answerable to the public/community.
- c. These requirements would be achieved by the controlled activity approach that Fish and Game is proposing, which ensures that operators are accredited and are regularly assessed for competency, and that farm management information, nutrient plans, and input data is able to be scrutinised, and validated, and is able to be audited by Environment Canterbury.
10. There are increasing numbers of highly qualified individuals and organisations that are able to service the professional need for more accurate reporting of farm nutrient loss risk in the field, both within the fertiliser industry and in private consultancy⁸. Professionals are rapidly up skilling in nutrient management in order to minimise any potential data input errors and ensure that robust farm nutrient loss risk, farm system and business assessments are able to be completed to a high

⁴ Edmeades, paragraphs 14, 21 & 22

⁵ Cullen, paragraphs 8.9 and 8.10

⁶ James Ryan, Evidence in Chief, undated, paragraphs 2.4 – 2.14

⁷ Roberts, paragraph 48

⁸ The Headlands consultancy group is just one of these. Headlands is a subsidiary of the Intelact Group of Companies.

standard. For example, Headlands as part of the Intelact Group has 50 pastoral consultants who work across NZ, Australia and South Africa. All of the 50 consultants are trained to competently use UDDER, Farm Performance Analysis, and Nutritional Models for on farm decision support. 30 of these consultants have completed the intermediate Sustainable Nutrient Management training and 20 will have completed the Advanced Sustainable Nutrient Management training by the end of 2013 with the view of becoming Accredited Nutrient Advisors. 50% of the NZ/Australian consultants are, or have been farm owners or operators in their own right so their ability to scrutinise the output from models is strong.

11. It is my view that the Overseer model is an effective tool for predicting the degree of risk that a particular land use or management strategy may pose to the receiving environment. It is fit for use as a comparative tool to denote N loss risk and the implications of changing management practises in order to reduce that risk. The model is reliable for showing ball park leaching at a point in time as it relates to the sustainable leaching rate, and then most importantly relative change from that point.
12. Overseer is able to provide a consistent benchmark for the magnitude of current leaching, is able to provide a measure of the reductions that can be achieved by changing management practices, and is able to provide a measure of relative change in leaching over time with changes in a farms management practices and also can provide a relative comparison between farms.
13. Environment Canterbury's and Fonterra/ DairyNZ approaches in regards to benchmarking farms against Schedule 8 makes the same assumptions in regards to the model's capabilities. I support its use within the regulatory framework proposed by Mr Percy.

DAIRYNZ PROTOCOL

14. I have reviewed the Dairy NZ protocol in its current form as attached in the appendix to Mr Cullen's evidence, and generally support it. However, there are four areas of concern that I believe need to be addressed in order to narrow down the risk of under reporting of a farms nutrient losses to the receiving environments. These are

Fertiliser Application, Irrigation, Effluent Application, and Soil Profile. My concerns are detailed in **Appendix 1** to this evidence. Where the actual farm data is available it is my recommendation that this is used over the default values.

HIGHLY SKILLED PROFESSIONALS REDUCE RISK OF INPUT ERROR

15. In my view, there is a rapidly growing pool of professionals available to support change at the farm level across NZ. The perceived lack of professionals to support change as noted by Mr Ryan⁹ throughout his evidence is not reflective of the private NZ agribusiness consultancy firms in my view.
16. In addition to my EIC points 138 and 139, I have discussed this above in paragraph 10. Furthermore, I will illustrate that with an example of the type of up skilling that can occur in a very short time: Our group had only 8 professionals trained in Intermediate Sustainable Nutrient Management 2 years ago. In the past 2 years, the pool of Sustainable Nutrient Management Qualified Consultants increased by 300%. Within a period of 3 years (by end of 2013) it is anticipated that the group will have 20 professionals that have undertaken Advanced Sustainable Nutrient Management Training through Massey. That is a 500% increase on the 4 that were qualified 2 years ago. In my opinion, should a policy regime create a market that requires a higher level of support by agribusiness professionals for their clients, then business will respond to meet this demand.

FARM ENVIRONMENT PLANS AND CHANGE

17. Mr McFarlane¹⁰ discusses the implications to a farm business as a result of having to undertake Farm Environment Plans, and some of the changes that may need to result:
18. I endorse the sentiment of McFarlane in regards to ensuring that farmers are provided with clear messages around requirements to

⁹ Ryan, paragraphs 2.11 and 2.12

¹⁰ Andrew McFarlane, Evidence in Chief, 2 April 2013, paragraph 33

change farm systems or practices along with appropriate timeframes for those changes, and that Overseer “*is the tool of choices to inform practice change, and to inform indicative outcomes*”¹¹. Because the industry is faced with debt funded improvements in some cases, (as many Canterbury farms are carrying a higher level of debt than average), it is my opinion that it is essential that any policy regime is as transparent as possible about the following matters:

- a. The truest or most accurate output from the model in terms of the N loss risk to the receiving environment in order that farmers are clear on what their farms actual risk profile is, and also what the receiving catchment tolerance/limit is for nitrogen assimilation.
 - b. That all land users are clear at the outset of the policy, of the nutrient target they are to work towards in their environmental and farm system planning, in order that they may internalise the externalities in an equitable manner across the whole of the pastoral and arable sector, (rather than it just being shouldered by the innovators in the dairy sector.) This will also contribute to more meaningful change for all landholders, knowing that all landholders in the catchment are sharing the responsibility in an equitable fashion (level playing field).
19. Business needs certainty to plan, and time to plan. On this basis, clear targets with clear signals as to when change needs to occur is also essential for resilience of farming businesses. Having clear nutrient loss and water efficiency targets at the farm level, which are coupled with ecological limits at the catchment level, allows for timely adaptation by land users.

Farm Environment Plans

20. The Farm Environment Plans and Sustainable Milk Plans described by Willis¹², Cullen¹³ and Ryan¹⁴ in my view will not be effective at bringing about the level of change on farm that will be required in Canterbury in

¹¹ *ibid*

¹² Gerard Willis, Evidence in Chief, undated, paragraphs 9.11 – 9.13

¹³ Cullen, paragraphs 10.1 – 10.23

¹⁴ Ryan, paragraphs 2.14, 3.1 – 4.8

order to address water quality issues. In my view these approaches do not provide clear enough direction in regards to steps required to reduce leaching nor do they provide constructive information to a farm business in order to plan a strategy for change over time. If no clear targets are provided then it is difficult to plan.

21. Furthermore, these input focused approaches can be overly prescriptive, may stifle innovation, and are likely to become a 'just tick the boxes exercise'. Adoption of input controls in the absence of clear output requirements and without a means of setting cumulative leaching standards, will not result in water quality improvements where individual farms may intensify and as such increase leaching, or further land use intensification may occur in the catchment.
22. For Farm Environment Plans to perform an effective role both in terms of achieving sustainable nutrient loss limits and articulating a viable business model, they need to be comprehensive and undertaken with a thorough understanding of the business and regulatory operating environment the farm is in. Failure to develop comprehensive plans specifically focussed to individual farming situations risks plans being dismissed or partially implemented by farmers because they aren't seen as compatible with where they wish to take their businesses.
23. Mr Ryan concludes that there might be 20 hours of work in preparing a farm environment plan at a potential cost of between \$600 to \$3000.¹⁵ I also believe this time could be used in a far more effective, focussed and efficient manner in order to deliver more in depth economic, farm performance and farm system strategy information to a farm business operator about the key challenges facing them.
24. In my experience, a high level of meaningful and strategic planning information can be delivered to a farm business in 20 to 25 hours for a similar expense to that stated by Mr Ryan. I illustrate the type of inclusions and services that can be delivered in a 20-25 hour parcel of consultancy time in **Appendix 2**.
25. I am of the strong opinion that as an agricultural and professional service industry we need to lift the bar. Farm Consultants need to be delivering a higher level of professional services that not only link to

¹⁵ Ryan, paragraphs 3.1 – 3.5

robust and repeated (historical) analyses on farm¹⁶, but also using the range of decision support tools¹⁷ available to guide farm system reconfiguration in order that scenario planning and strategic forward planning can take place. NZ agricultural consultants need to be thinking at a “higher level” than just at the operational level (that of cows and grass and the impacts of a single management strategy), but rather assisting our pastoral farmers to be thinking at a “systems level.” That is: configuring their businesses to be more profitable, lower risk and have a lower risk to the receiving environment.

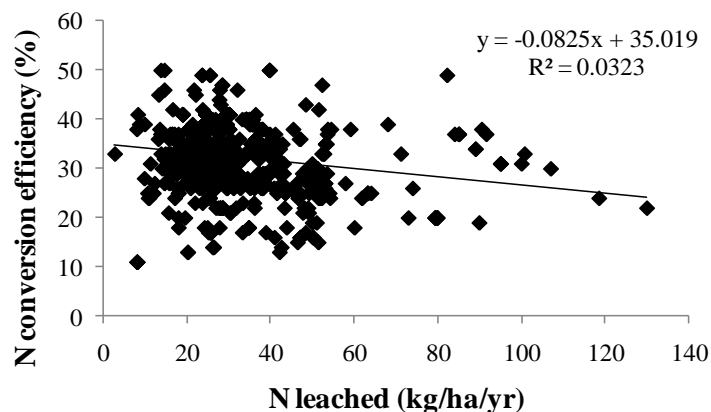
26. The historical consultancy role (1980-2005) was largely centred on delivering feed budgeting, animal health management and monthly operational advisory services. In my view this historical pattern of knowledge transfer needs to embrace the technology available, and become a more comprehensive service in order to assist with the present changes facing NZ farming.
27. This is also about recognising that farmers are time poor, and they do not want to invest valuable time and money into an exercise that is not going to be meaningful to them.
28. In my view, Farm Environment Plans that do not have a target, or a rigorous approach to assessing farm performance and the economic, environmental, and resource risks, facing them, simply will not bring about the required level of engagement nor change. Nor are Farm Environment Plans on their own the sole answer to the problem with which we are grappling. But done correctly, they could be part of the solution.

¹⁶ Historical analyses are important to inform consultants of potential landscape, climatic or animal, management limitations within a farm system.

¹⁷ Decision Support Tools for Agricultural Advisors include examples such as Overseer for Nutrient Management Decision Making. Farm Systems Software available: Farmax Pro & UDDER. Economic and Farm Performance Software includes Dairy Base and Red Sky for example. Nutritional Support Tools examples include Rumen8 and Camdairy. Effluent Management Tools include the Pond Calculator.

NITROGEN CONVERSION EFFICIENCY AS A TARGET

29. Improving Nitrogen Conversion Efficiency is a goal that is articulated by both Cullen¹⁸ and Ryan¹⁹ in their evidence and is being used as a target for farmers to assist with lowering their environmental impact. There is a perception that if a farmer drives up the Nitrogen Conversion Efficiency on their farm that there will be an economic benefit to the farmer and a reduction in the loss to the environment. No information has been provided in regards to what this assumption is based on, and I have not seen any literature to support this notion. My current understanding is that there is essentially very little correlation between increased nitrogen conversion efficiency and lowered N loss to the receiving environment.
30. The figures below illustrate the weak correlation between N Conversion Efficiency and N loss Risk. As stated by Dr Wheeler (Wheeler, 2011) *“Over the full range of N leaching values within the dataset, N conversion efficiency was weakly correlated with calculated N leaching. N conversion efficiency decreased as N leaching increased. However, within the normal range of N leaching values typical of the majority of each farm type, there was no relationship between N leaching and N conversion efficiency. In other words, high N conversion efficiency did not always imply lower per ha discharges.”*



¹⁸ Cullen, paragraph 10.17

¹⁹ Ryan, paragraph 7.2

OVERSEER ACCOUNTS FOR A RANGE OF EXTERNALITIES BY DEFAULT

31. Edmeades states in points 41 and 42 of his evidence that he is not aware of any evidence to support the conclusion that N is the primary factor limiting water quality in Canterbury, and it seems illogical that managing N leaching will manage sediment. I disagree with Mr Edmeades, and would like to point him to the following points in my EIC points 44 to 52. While I acknowledge that a focus on N alone may not emphasise the importance of the other externalities from land uses to farmers, I would like to highlight that through the use of a tool such as Overseer other externalities of concern are also managed, it is just that an output standard can as yet not be set for them. To gain a quantitative measure of the risk of N or P loss, Overseer assumes that best management is met in regards to a number of farm activities which when adopted reduce discharges of sediment, phosphorus, and faecal contaminants to surface water.
32. Through the preparation of an auditable Overseer file, one would assume that the accredited consultant will highlight to the farmer the importance of soil management, sediment control and the associated phosphate loss risk in ensuring that the N loss target or output generated from the model is credible, and stands up to public or third party scrutiny.

CONCLUSION

33. It is my view that overseer is fit for purpose and is world class. I acknowledge that we do not have all the science as robust as we would like it in order to use it as a decision support tool but this model is fit for the purpose of identifying the relative risk of a farm's risk of loss of nutrient to the receiving environment. I believe it is also suitable for indicating the relative risk of different farm practises. For this reason, I believe it is sound to use for the regime that Fish and Game is proposing.
34. I acknowledge that Overseer will be continually improved as more in field testing becomes available. This is especially relevant to the validation of the actual losses from the shallow, coarse, permeable soil

types and also how they behave under the effects of different irrigation technologies.

35. It is likely that this informative research will reduce the range of output error and lead to improved reliability of the model for use in the Canterbury region.
36. In order to reduce the scope of potential for input error in Overseer I am of the view that it is essential that operators are qualified and competent, that nutrient plans and input protocol and input data along with farm management can be reviewed and audited. These provisions should be provided within the pCLWRP.
37. Highly skilled professionals are increasing in number rapidly and are able to deliver useful strategies in order support farmers through change and in some cases a paradigm shift in the way they operate. Strategies to assist with change can be supported by a range of decision support tools. Overseer is one of these tools alongside farm system and economic tools. The degree of change that is required is not just about nutrient management, but in a lot of cases will involve the adaptation of whole farm systems to lower impact management systems that are profitable, resilient and future proofed.
38. I am of the opinion that farmers may be able to improve their nutrient use efficiency; however this will not necessarily reduce N loss to the receiving environment. We need to be clear that farmers are not confused by a target that does not necessarily result in improved environmental outcomes.
39. For Overseer to be used in a credible and auditable manner, Overseer assumes that the pathogen loss risk and sediment loss risk to the receiving environment is minimal and that Best Management Practises are in place for Effluent and Soil Management and that points of connectivity do not occur. For this reason it is my expert opinion that the credible and appropriate use of Overseer will incite a move to Better Management of all externalities by default. However this will only occur if the accredited professionals who are using overseer also have a way to account for these best management practises being in place on a farm.

Alison Mary Dewes

10 APRIL 2013

APPENDIX

APPENDIX 1 CONCERNS REGARDING PROTOCOL FOR OVERSEER

3.6.10 Fertiliser

1. The preference to enter fertiliser application data on a monthly basis is considered good practice; however such a preference will require a significant effort by fertiliser companies (and farmers to an extent) to ensure fertiliser application data is consistently and accurately recorded. Presently it can be difficult to obtain accurate, month by month, fertiliser application data from fertiliser reps and unless the farmer has been diligent in recording such applications, inaccurate data inputs consistently occur.
2. Dividing the total fertiliser used over the months when the product was applied may give a reasonable approximation of fertiliser impacts when accurate data is unobtainable. There is however risks involved with such a move.
3. Because the extra time taken (and cost to the farmer) to attempt to find accurate, month by month, fertiliser data can be high where records are poor, there is a temptation by those constructing the overseer file to consistently use the division method as the primary means of inputting fertiliser data, rather than seeking out the accurate month by month data.
4. By not reporting exact fertiliser timing, there is opportunity for farmers to apply N at higher levels during high risk months and not have this detected as N loss due to applications being averaged over designated time frames. In essence, this clause provides an opportunity for abuse by those who either want to bend regulations, or are resistant to practice change.

3.6.11 Irrigation

5. While I acknowledge that there will be improvements to the model in order that it reflects as accurately as possible the N loss risk from the irrigation of high risk (coarse) soil types under different systems and management techniques in the next 3-5 years. There has been a lot of discussion by a range of experts over the most appropriate use of Overseer in its current form, in order to reflect the most accurate loss risk from an irrigated farm on coarse soils. I understand there is still

work to be done in this area. This has been noted by Sam Carrick from Landcare Research, and Mark Shepherd from Agresearch at FLRC Overseer seminar Feb 2013. It is my understanding that there has not been any long term field measurements of the N loss risk specifically on the high risk, coarse, shallow soil types that are reflective of 70% of dairying enterprises in Canterbury in order to more accurately validate the model outputs.

6. I understand that Irrigation NZ and the Overseer designers will be under discussion over how to improve the models ability to reflect actual irrigation techniques, allow more accurate input of applied volumes, and integrates the ability to input the use of precision technologies in a more appropriate manner. This is referred to in point 71 of Dr. Roberts Group 2 Evidence.

“Not everyone accepts that OVERSEER® adequately models the impacts of irrigation, and there are potentially the same errors (e.g., Type A and B errors discussed in Dr Edmeades evidence, paragraphs 10-25) associated with the way the model calculates the effects of irrigation, as with non-irrigated systems. Irrigation New Zealand have or will be involved in discussions with the OVERSEER® owners and science providers with a view to ensuring that irrigation practices are represented in future OVERSEER® releases in a way that reflects the latest in irrigation technology and management, in the most scientifically robust way possible.”

7. It is my view however, given the above limitations exist with regards to irrigation inputs, this is not a reason not to use overseer for the purposes that Fish and Game are proposing. There are a few cases I cite where overseer is not perfect, such as the inability of the programme in the current form to adequately cope with cows on crops for 24 hours for example, or adequately cope with dry cow intakes. As I understand it, these issues are being dealt with by the Overseer management team as the programme is continually upgraded and improved.

3.7.4 Effluent

8. The decision to compulsorily leave the “Applications Actively Managed” box unchecked as a default does not promote good effluent management.
9. Actively managed effluent systems avoid irrigating when soils are too wet for effluent application. Issues of compliance and N loss have

often been related to effluent being applied at the wrong times. It is important to encourage active management, and N losses do decrease when active management is used.

10. Additionally, with the promotion of the Pond Storage Calculator by several regional authorities, Dairy NZ, and Fonterra, it is important to promote effluent irrigation practices that support the Pond Storage Calculators foundations. Active management is similar to Soil Water Deficit (SWD) irrigation, a concept that the Pond Storage Calculator is based upon. If this programme is to be used to measure pond capacity by designers and promoted by industry bodies, then encouraging farmers to actively manage their effluent will help them get their thinking around irrigating to SWD, something all farmers that have used the PSC to calculate their current pond size will need to implement.

3.6.4 Soil Texture

11. The Soil Texture Group is noted to have a compulsory default to medium and there is no option to change this.
12. By giving the operator NO CHOICE as to the lower profile texture for soils to be anything other than a compulsory default to medium, I am of the view this will lead to under reporting of N loss risk for a farm where there is more accurate data available that can be used
13. I believe that the reporting protocol needs to represent the farm as accurately as possible, and where there is insufficient data, the protocol should reflect the more conservative estimate of N loss, reflecting the “worst case scenario” in terms of N loss to the environment. I have referred to it in my EIC in points and in my Appendix 3 – Farm System Modelling Examples²⁰, where I illustrated this 50% discrepancy in farm N loss outputs as a result of the use of the Dairy NZ Protocol where the Soil texture Group in the lower profile was noted to be a compulsory default to Medium and there is no options to change this, irrespective of more accurate data being present. Where a farm has a soil texture entered as “medium” when in

²⁰ Farm system modelling done using Overseer 6 version prior to 31st March 2013.

fact it is coarse (light) in the lower profile, this may lead to an under-representation of the N loss risk to the environment of up to 50-60%.

APPENDIX 2 WHOLE FARM PLANS

1. This is to illustrate what is included in the whole farm plan service to clients.
2. 70 Whole Farm plans were generated by our group in the past year.
3. These plans have been generated for between \$2500 and \$3600 per farm and this has included two visits to each farm: For the money and time spent, our consultants have delivered to farmers the following information:
 - a. Visit to collect annual farm performance data, set of accounts, overseer 6 information and farm inspection.
 - b. The report and visit back to the farmers has included most, or all of the following:
 - c. Full Economic + Farm Performance Analysis (example page is in Appendix 1 of my EIC) and comparison of performance against peers in their locale.
 - d. An updated Overseer 6 File and Full Reports, that has been aligned with their farm accounts, commodity sales dockets and annual fertiliser purchase documentation
 - e. A Quantitative Assessment of their Environmental Performance in a "Scorecard approach" that quantifies their farms risk to the receiving environment, taking into account waterway management, their N loss risk, P loss risk, soil protection and loss risk, effluent management + risk, greenhouse gas losses, water use efficiency and biodiversity support. The scorecard serves to highlight areas on the farm that are identified as a risk/threat and that Overseer 6 assumed were already in place.(i.e.: ID of critical source areas and areas for improvement to enhance ecosystem resilience)
 - f. Some of the 70 farms also received an Effluent System Risk Scorecard, and an estimate from the pond calculator for storage requirements. This effluent scorecard also quantified the key areas they needed to address in order to meet the Dairy NZ Code of Practise Standards.

- g. For 10 of the \$3600 plans provided, there was also farm system modelling done, in a similar manner to that detailed in Appendix 3 of my EIC. **This provided farmers in sensitive catchments the ability to better understand what farm system re configuration may be required in order ensure their N, P, sediment and pathogen loss risk was reduced. This was linked to economic and risk outcomes for their use.**
- h. A revisit to the farm to discuss the report's findings was included in this overall price of \$3600.

