BEFORE THE HEARING COMMISSIONERS
AT CANTERBURY

IN THE MATTER	of the Resource Management Act 1991 ("**RMA or the Act**")
AND	
IN THE MATTER	of Variation 2 to the Proposed Canterbury Land and Water Regional Plan – Section 13 Ashburton

---

MEMORANDUM ON BEHALF OF HORTICULTURE NEW ZEALAND

4 AUGUST 2015

ATKINS | HOLM | MAJUREY

Helen Atkins
PO Box 1585
Shortland Street
AUCKLAND 1140

Solicitor on the record	Helen Atkins	Helen.Atkins@ahmlaw.nz	(09) 304 0421
Contact solicitor	Helen Atkins	Helen.Atkins@ahmlaw.nz	(09) 304 0421

MAY IT PLEASE THE COMMISSIONERS:

INTRODUCTION

1. The purpose of this memorandum is to:

   (a) Confirm Horticulture New Zealand's position on the rules relating to farm enterprises in the Lower Hinds/Hekeao Plains area and in particular whether a date of 1 January 2017 should be included in rule 13.5.18.

   (b) Provide the Commissioners with the information requested by Commissioner van Voorthuysen regarding the amount of root stock protection water likely to be required in the Hinds catchment.

   (c) Provide the Commissioners with the information requested by Commissioner van Voorthuysen regarding the seasonal N Leaching rates on farms.

HORTICULTURE NZ POSITON IN RELATION TO THE RULE FRAMEWORK

2. In its submission on Var2 Horticulture New Zealand, Horticulture New Zealand sought that rule 13.5.18 be deleted and that farming enterprises instead be included in rules 13.5.15 – 13.5.17. These rules provide for farming activities as permitted and restricted discretionary activities until 1 January 2017 provided certain conditions are met.

3. In oral evidence at the hearing, Ms Wharfe stated that Horticulture New Zealand was seeking that farming enterprises be treated the same as farming activities and that the farming enterprise rule (13.5.8), be amended to refer to the 1 January 2017 sunset date.

4. Horticulture New Zealand wishes to clarify that:

   (a) It would prefer not to have the date included in rule 13.5.8 and instead for farming enterprises to be included in rules 13.5.15 – 13.5.17;

   (b) However, if the rule is to be included it there would also need to be an associated permitted activity rule, similar to those applying to farm activities.

5. The reasons for this position are that:

   (a) It reflects the relief sought in the Horticulture New Zealand submission;

(b) It is more consistent with the relief sought by Horticulture New Zealand in the Variation 1 proceedings (which sought similar relief to that in these proceedings)[1]; and

(c) It is more consistent with the Variation 1 decision which does not provide a separate permitted activity rule for farming enterprises. Although it is noted that contrary to Horticulture New Zealand's submission on that Variation, farming enterprises have not been included in the existing permitted activity rules (11.5.7 and 11.5.9).

ADDITIONAL INFORMATION REQUESTED

6. The information requested on crop survival water is included in the supplementary statement from Nic Conland attached as an Appendix 1.

7. The information requested on seasonal N leaching relates is included in the supplementary statement from Stuart Ford attached as Appendix 2.

DATE: 4 August 2015

Helen Atkins
Counsel for Horticulture New Zealand

[1] Refer paragraph 5.2 of the Horticulture New Zealand submission on Variation 1.

BEFORE THE HEARING COMMISSIONERS

IN THE MATTER	of the Resource Management Act 1991 ("**the Act**")
AND	
IN THE MATTER	of the Resource Management Act 1991 and the Environment Canterbury (Temporary Commissioners and Improved Water Management) Act 2010
AND	
IN THE MATTER	of the hearing of submissions on Variation 2 of the Proposed Land and Water Regional Plan

---

SUPPLEMENTARY STATEMENT OF EVIDENCE OF NICHOLAS CONLAND FOR HORTICULTURE NEW ZEALAND

31 JULY 2015

[redacted] ATKINS | HOLM | MAJUREY

Helen Atkins
PO Box 1585
Shortland Street
AUCKLAND 1140

Solicitor on the record Helen Atkins Helen.Atkins@ahmlaw.nz (09) 304 0421

INTRODUCTION

1. The purpose of this short supplementary statement of evidence is to present requested information to the Commissioners.

2. Commissioner van Voorthuysen requested information regarding the amount of root stock protection water likely to be required in the Hinds catchment. I have included the assessment in the next section of my evidence.

3. In terms of this evidence I reiterate and confirm my qualifications and experience as set out in my evidence in chief dated 15 May 2015 with one amendment. I am no longer employed by Jacobs and am a director and senior environmental consultant with Awa Environmental Limited.

4. I also confirm my continued compliance with the Code of Conduct.

ROOT STOCK PROTECTION WATER

5. I was asked by Commissioner van Voorthuysen to provide a quantification of the root stock protection water that might be envisaged for the Hekeo Hinds catchment.

6. In the following paragraphs I outline a method for calculating the root stock protection water. This is based on known crops types and irrigation practices for the Hekeo Hinds catchment and estimates for the extents for these crops in terms of area.

7. To determine the relative use for the catchment I have considered three different assessments.

8. Firstly, an explicit use based on farm data and horticultural landuse. This provides a conservative estimate for crop survival water as irrigation demand on known values for blackcurrant and potato crops.

9. I note that in Dr Brown's land use layer (prepared for Dairy NZ) there were only 5 properties that explicitly listed what crop they were growing. I used these and the irrigation demand for crop survival provided as mm/day by the growers (apples, blackcurrants and potatoes).

10. Given the small data set available for this assessment I have used a low, medium and high range to show a triangle type distribution.

11. However, it likely underestimates the need for root stock protection demand in the Hekeo Hinds catchment given only a small number of farms were surveyed.

12. Secondly, a peak root stock protection estimate. This is based on the fertile soils (layer presented in my evidence, LUC 1, 2 and 3) which occurs in the low rainfall band. The soils are given a root stock protection range based on the horticultural crops in the Hekeo-Hinds catchment.

13. Thirdly, an adjusted peak root stock protection estimate. This is based on the fertile soils in the low rainfall band and root stock protection (as above) which occur outside the irrigation scheme boundaries.

14. The use of these three assessments provide a confident range for the Hekeo Hinds catchment for determining a reasonable allocation for root stock protection water both immediately and for the future distribution of land use types.

15. For the first scenario the range for root stock survival water is presented in table 1.

Table 1: Scenario 1 Identified Horticulture Crops

Property	mm/day	Area (ha)	L/S
Apple Trees	1.3	15.8	2.4
Blackcurrants	1.3	95.8	14.4
Potatoes	3	129.8	45.1
Potatoes	3	0.02	0.0
Potatoes	3	192.1	66.7
Total			**128.6**

16. The first scenario provides a minimum of ca. 130 Litres/sec for root stock survival water.

17. In the second scenario, I have calculated a maximum potential demand or allocation for root stock survival water based on the likely growing areas (fertile soils) and the known root stock demand figures from the horticultural growers in the catchment.

18. The fertile soils have been restricted to the low rainfall band in the eastern extent of the catchment. This is where the majority of the horticultural cropping occurs and the low rainfall band provides a likely need for root stock protection allocation.

19. Table 2 below provides the results from the second scenario for fertile soils in the low rainfall band.

20. The results are presented as a range meaning that between 1500-3700 l/sec would be required to protect the root stock of plants for the entire fertile soils in the lower rain band.

Table 2 : Scenario 2 Fertile Soils in 650mm rain band

Property	mm/day	Area (ha)	L/S	Scenario
Fertile Soils (650)	1.3	10571	1590.5	*(low)*
Fertile Soils (650)	2	10571	2447.0	*(med)*
Fertile Soils (650)	3	10571	3670.5	*(high)*

21. In the third scenario the assessment is restricted to the fertile soils in the lower rainfall band that fall outside the irrigation schemes.

22. The scheme boundary areas where excluded as it was considered possible that they would be able to buy water during a drought and therefor not qualify for root stock protection allocation.

23. As in scenario 2 the results are presented as a range. The shows that between 1100 and 2500 litres/sec would be required to protect the root stock of plants in the fertile sol areas outside irrigation schemes in the low rainfall band.

Table 3 : Scenario 3 Fertile Soils in 650mm rain band -minus irrigation scheme

Property	mm/day	Area (ha)	L/S	Scenario
Fertile Soils (650)	1.3	7350	1105.9	*(low)*
Fertile Soils (650)	2	7350	1701.4	*(med)*
Fertile Soils (650)	3	7350	2552.1	*(high)*

24. My assessment as requested for the likely range for root stock protection water in the Hekeo Hinds catchment has demonstrated that the actual demand in 2015 for root stock protection water is between 130 and 1100 litres/second as a minimum allocation.

25. Where the lower value provides for the known farmers who responded to a brief survey and the higher figure provides for the likely growing needs for the catchment under the proposed Variation 2.

26. I recommend that the hearing panel request a thorough survey for the catchment growers who are likely to require root stock protection water as a mitigation against crop failure.

27. Alternatively I recommend a moderate figure as a mid point between the summed ranged of 615 l/sec is adopted by the plan as a restricted discretionary activity. This would allow the Council to ascertain the use based on location and crop demands for root stock protection.

28. I hope this supplementary evidence provides the information as requested to enable an informed decision to be made regarding root stock protection for the Hekeo Hinds catchment.

Nicholas Conland

31 July 2015

BEFORE THE HEARING COMMISSIONERS

IN THE MATTER	of the Resource Management Act 1991 ("**the Act**")
AND	
IN THE MATTER	of the Resource Management Act 1991 and the Environment Canterbury (Temporary Commissioners and Improved Water Management) Act 2010
AND	
IN THE MATTER	of the hearing of submissions on Variation 2 of the Proposed Land and Water Regional Plan

SUPPLEMENTARY STATEMENT OF EVIDENCE BY STUART JOHN FORD FOR HORTICULTURE NEW ZEALAND

31 JULY 2015

ATKINS | HOLM | MAJUREY

Helen Atkins
PO Box 1585
Shortland Street
AUCKLAND 1140

Solicitor on the record Helen Atkins Helen.Atkins@ahmlaw.nz (09) 304 0421

INTRODUCTION

1. The purpose of this short supplementary statement of evidence is to present requested information to the Commissioners.

2. Commissioner van Voorthuysen requested information regarding the seasonal range of N leaching rates on farms. I have included the information in the next section of my evidence.

3. In terms of this evidence I reiterate and confirm my qualifications and experience as set out in my evidence in chief dated 15 May 2015.

4. I also confirm my continued compliance with the Code of Conduct.

SEASONAL N LEACHING RATES ON FARMS

5. In order to provide this information we have taken some results from our MGM surveys which have been modified to reflect the soil and climatic conditions experienced in the Hinds Catchment. The Overseer work was carried out by Plant and Food. It reflects the results obtained from a Templeton soil type with rainfall at 716 mm, PET 769 mm and the temperature being 10.8 degrees. The results are calculated in Overseer Version 6.2 with the irrigation strategy modelled as 'Trigger point and depth applied to achieve target', trigger point = 70% PAW, target = 95% PAW.

6. The rotation used is for seven years as follows:

   Wheat > Green feed Oats > Process Peas > Turnips > Carrots > Barley > Grass seed > Wheat > Mustard > Potato.

7. The N leaching figures for the individual crops vary significantly as is shown in Table 1.

Table 1: N leaching results of the crops in a rotation (kg N / ha /year)

	N leaching
Wheat	68
Peas Process	26
Carrots	7
Barley	9

	N leaching
Grass Seed	5
Wheat	20
Potato	46

8. Because it is necessary to grow a balanced combination of depletive and restorative crops it is necessary to grow the crops in a rotation. If the farm were set up with each paddock being the same size then there would not be any variation between years in the N leaching figure and it would be 26 kg N /ha / year. However this is not the case in the Hinds Catchment so we have constructed a farm with paddock sizes as depicted in Table 2 ranging from 20 to 35 ha in size.

Table 2: Paddock sizes of constructed farm (ha)

	N leaching
Paddock 1	35
Paddock 2	20
Paddock 3	30
Paddock 4	20
Paddock 5	35
Paddock 6	25
Paddock 7	30
Total	195

9. The rotation was then run for the seven years using the paddock sizes as specified. The result of this exercise is shown in Table 3.

Table 3: Variation in N leaching results over the seven years of the rotation (kg N / ha / year)

	N leaching
Year 1	27
Year 2	27
Year 3	26
Year 4	27
Year 5	24
Year 6	25
Year 7	25
Ave	**26**

10. What these results demonstrate is that there is a variation between the average result and the highest result of 6% and a variation between the average result and the lowest result of 7% with an overall variation between the highest and the lowest result of 13%.

Stuart John Ford

31 July 2015

APPENDIX ONE: CHALLENGES RELATED TO MODELLING HORTICULTURAL CROPS IN OVERSEER 6.1

The Foundation for Arable Research[1] carried out an independent review of the use of OVERSEER in the arable sector, which incorporated consideration of the horticultural sector. It came up with the following conclusion:

OVERSEER® is the best tool currently available for estimating N leaching losses from the root zone across the diversity and complexity of farming systems in New Zealand. This review sets out a pathway for improving its fitness for this purpose in the arable sector (see
recommendations). It also highlights that the new challenges facing OVERSEER® place demands on the development team and model owners that need to be acknowledged and resourced appropriately.

The review came up with the following recommendations which are relevant to the horticultural sector:

OVERSEER® crop model estimates of N leaching should be evaluated against measurements of N leaching to identify whether there are any systematic errors in predictions.

OVERSEER® crop model estimates of N leaching should be evaluated against predictions of longterm leaching produced by established, detailed research models e.g. APSIM.

The testing outlined in recommendations (1) and (2) is likely to identify and justify areas for further development of OVERSEER® to improve N leaching predictions.

The following list of challenges identified in this modelling exercise is not new as they have been identified in previous modelling of horticultural crops. The challenges are listed here to allow consideration of the impact of these issues on the modeller's ability to correctly model the practices undertaken by the growers. In some cases these practices are undertaken to improve the efficiency of use of N and P, the impact of which are not shown in these results.

---

[1] FAR (2013) : A peer review of OVERSEER in relation to modelling nutrient flows in arable crops.

Crops that can be modelled

OVERSEER has a reasonable range of crops that can be modelled, however this is limited from a horticultural perspective. This has meant that the rotations used in Rotation 2 and the Traditional Market Garden were somewhat compromised by the range of crops chosen. This has meant that the rotation does not represent what would actually be grown. However, we have chosen a similar crop both in terms of inputs and outputs so the end result may not be much different. However it may not appear to be logical from a growing perspective.

Monthly time steps

OVERSEER works on monthly time steps of data entry for items such as cultivation, fertiliser applications and irrigation inputs. Horticultural operations work on much finer time steps which are unable to be incorporated into OVERSEER. Therefore the results would appear to be much more at a gross level than you would expect for horticulture.

Incorporating side dressings

It is not possible to incorporate the application of fertiliser as a side dressing in OVERSEER. This is a horticultural practice which directly applies the fertiliser into the root zone of the plant, which are predominantly grown in rows. Therefore this practice results in more efficient plant uptake and reduces the total gross amount of fertiliser applied.

Inclusion of total area under crop

It was not possible to select an option which would allow a lower proportion of the total area available being cropped at any one time as a result of an error in the programme. Once this error is fixed it will then be possible to represent the area cropped as a percentage of the total area available.

Limited range of irrigation options

The choice of irrigation options is limited to those that are available for pastoral farming. This means that options that are available to horticulturalists such as soak mats etc. cannot be modelled. This can be overcome by selecting the actively managed option which means that the correct amount of irrigation required can be

applied. However, this still would apply much more than would be applied if the alternative options were available which just apply water to the root zone of the crop.

Currently work being undertaken which will investigate and compare the way that irrigation is modelled in OVERSEER by including a daily time series for irrigation practice which will more accurately reflect the water balance of the soil.

Fertiliser options limited

One of the mitigation options which we wished to test in this exercise is the use of slow release fertilisers. The range of fertiliser options available is limited to the standard range from each of the two major companies. Therefore it was not possible to test the impact of the application of slow release fertilisers. However, slow release fertilisers may not be able to adequately meet the crops requirement as there are certain times when vegetable crops have very high demand on N.