BEFORE THE HEARING COMMISSIONERS
AT HAMILTON

IN THE MATTER	of the Resource Management Act 1991 ("**the Act**")
AND	
IN THE MATTER	of the hearing of submissions on The Proposed Waikato Regional Plan Change 1 – Waikato and Waipa River Catchments: Block 2

PRIMARY STATEMENT OF EVIDENCE BY ANDREW BARBER FOR HORTICULTURE NEW ZEALAND

3 MAY 2019

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SUMMARY STATEMENT

1. This evidence addresses the Horticulture New Zealand ("**HortNZ**") submission, further submissions and the Waikato Regional Council's ("**WRC**") Section 42A Report responses to the submissions on the Proposed Waikato Regional Plan Change 1 – Waikato and Waipa River Catchments ("**PC1**").

2. In my opinion, PC1 rightly makes Farm Environment Plans ("**FEPs**") a key method to guide the implementation of a range of farm-specific actions to reduce contaminant losses.

3. Ensuring FEPs are adopted, and their mitigation measures implemented, requires their cooperative development.

4. WRC cherry picking a single mitigation measure and making it compulsory, as occurs with the use of a 5 meter buffer, cuts across this farm specific approach and in doing so will result in worse environmental outcomes.

5. With regards to Rule 3.11.5.2, I support Council's recommendation to increase cultivation to 20 degrees, noting clarification is required on how to determine the slope.

6. I also believe Rule 3.11.5.2 could apply to fruit production activities.

QUALIFICATIONS AND EXPERIENCE

7. My name is Andrew John Barber. I am a Director of Agrilink NZ and work as an Agricultural Engineering Consultant based in Auckland. I have a Bachelor of Horticulture (Tech) with first class honours from Massey University.

8. I have spent 25 years as a consultant in the agricultural industry, specialising in resource use optimisation. This includes resource use benchmarking in the form of national and individualised reporting to growers comparing their performance to regional and national benchmarks.

9. In my years as a consultant I have helped develop vegetable industry soil and erosion management guidelines, and individual cultivated property erosion and sediment control plans.

10. I was Project Manager on the Franklin Sustainability Project ("**FSP"**) and provided technical advice on managing soil erosion on cultivated land. This was a multi-stakeholder project that ran between 1996 and 2004 which, while having a broad goal of improving the overall sustainability of outdoor vegetable production in the Franklin region, had a clear focus on keeping soil on the paddock and mitigating any effects of off-site discharges. The

project directly involved the growers, Horticulture New Zealand, MfE, MPI, Auckland Council, Waikato Regional Council, and the Franklin District Council.

11. I managed and conducted research for the current MPI SFF Don't Muddy the Water Project ("**DMTW Project**"). This project has quantified the efficiency of Sediment Retention Ponds ("**SRP**") and vegetated buffers on vegetable properties. It has also developed an erosion and sediment control app, Erosion & Sediment Control Plans, and is currently linking this through to NZ GAP (Good Agricultural Practice) FEP audits (https://www.newzealandgap.co.nz/).

12. I have also worked on stormwater projects for the Franklin District Council where I designed the stormwater system for Pukekohe Hill and the Bombay Hills that ensured an integrated system between the council and grower drains that were sized to cope with high intensity storm events.

13. In 2014 I updated the Erosion and Sediment Control Guidelines for Vegetable Production. The DMTW Project was based largely on quantifying the efficiency of the SRP design in these guidelines.

CODE OF CONDUCT

14. While this is not a hearing before the Environment Court, I can confirm that I have read and agree to comply with the Code of Conduct for Expert Witnesses produced by the Environment Court and have prepared my evidence in accordance with those rules. My qualifications as an expert are set out above.

15. I confirm that the issues addressed in this brief of evidence are within my area of expertise.

16. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

SCOPE OF EVIDENCE

17. My evidence has been prepared in response to the Section42A Report prepared by Waikato Regional Council and the implications for Commercial Vegetable Production.

18. In paragraph 361, I support the Officers belief that FEPs should be flexible, outcome focused, and ensure implementation has occurred. This will only occur where the Good Management Practices ("**GMPs**") that the FEPs are founded upon have been cooperatively developed with the industry.

19. FEPs cannot be developed in isolation. The measures that they identify often need to be implemented with other measures. An example of this is the need for coordinated drainage networks.

20. The Erosion and Sediment Control Guidelines ("**E&S Control Guidelines**") for Vegetable Production, that the FEPs are based on, are backed by industry research and well tested.

21. Erosion and Sediment Control Plans ("**E&S Control Plans**") are based on applying the most appropriate tools to the specific situation. They ensure flexibility and that what is implemented is fit for purpose, as opposed to a universal blanket tool such as compulsory buffer strips.

22. I support the Officers recommendation to increase the cultivation rule 3.11.5.2(4) to a maximum of 20 degrees.

23. Paragraphs [773] and [774] of the S42A Report continues to support the use of vegetated buffer strips as a means to minimise sediment loss. While this reference relates to stock exclusion, I strongly oppose the compulsory use of a 5 metre buffer proposed in Rule 3.11.5.5 and associated Schedule 1. I will discuss this further in Block 3, but note now that by enforcing one mitigation measure this works against the very premise that FEPs are a key component of PC1 and that FEPs are intended to guide the adoption of a range of farm-specific actions (paragraph [314]).

COOPERATIVE GOOD MANAGEMENT PRACTICE DEVELOPEMENT AND IMPLEMENTATION

24. Based on my experience from the Franklin Sustainability Project ("**FSP**") and subsequent E&S Control Guideline Development, the best approach for affecting change is to achieve recognition of the problem, then cooperatively develop a solution, disseminate that information and then allow sufficient time for the practices to be implemented before finally following up with enforcement where changes are not occurring.

25. Enforcement without education is confrontational as the problem is not recognised and the solutions are disjointed and often inadequate. Likewise, voluntary control practices without enforcement, after an appropriate time, does not achieve widespread adoption and ultimately penalises the early adopters. The question arises: Where are we along that continuum? This has been an area of focus for a long time, wider implementation of the E&S Control Guidelines is now required. FEP's, specifically E&S Control Plans, will achieve that uptake where they are linked to NZ GAP accreditation.

COORDINATED DRAINAGE NETWORKS

26. When developing an E&S Control Plan the first step is a risk assessment followed by preventing water flowing onto your paddocks (discussed in more detail below). Growers' can't control what falls from the sky onto their paddocks, but large volumes of water from catchments above them will overwhelm any control measures.

27. This was dramatically demonstrated in a 21st January 1999 storm in Pukekohe when roadside drains overtopped and cascaded through recently cultivated paddocks.

28. In the aftermath and subsequent report by Landcare Research the conclusion was that "an integrated drainage system would be the single most effective practice to reduce erosion in large storms." Water will always flow downhill and will hit a roadside drain or culvert at some point. Undersized culverts and drains solely designed for road water ignores this reality, with potentially disastrous consequences.

Undersized entrance culvert that will not cope with a "large" storm.

29. I prepared integrated drainage plans for both Pukekohe Hill and Bombay Hill. Where implemented these systems work well, however better coordination between all agencies and growers is needed right across the region not only to cope with larger storms but to also understand what happens at all discharge points within the drainage network.

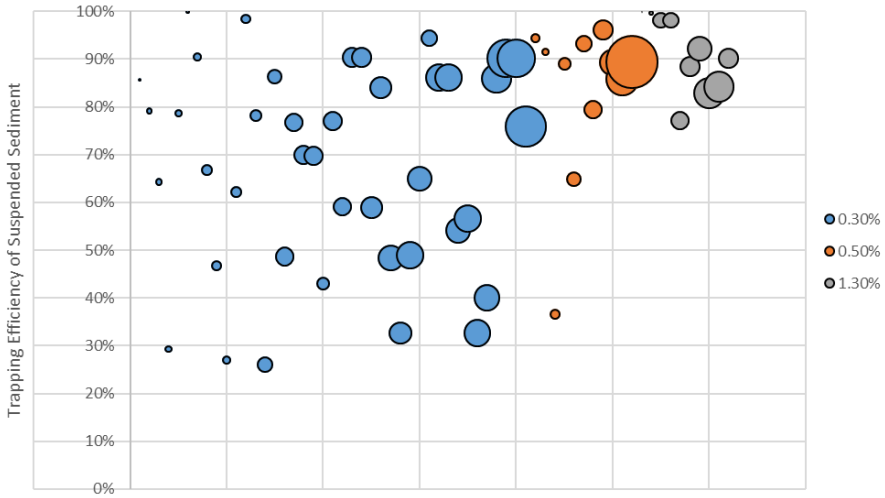
30. We have developed E&S Control Plans for growers that discharge into drains that are likely to overtop in a large storm.

VEGETABLE SEDIMENT RETENTION PONDS GUIDELINES SUPPORTED BY RESEARCH

31. Research conducted in the DMTW Project has shown that just about any sized Sediment Retention Pond ("**SRP**") will stop bedload leaving the property. Bedload drops out extremely rapidly as soon as the water velocity is reduced, be this along bunded headlands or in an SRP.

Bedload accumulating at the entrance to the SRP, showing just how quickly bedload drops out when the flow is slowed.

32. The guideline figure for an SRP to be 0.5% (50 m^3/ha) has been shown to reduce suspended sediment loss by an average of greater than 80%.



33. Small ponds (blue dots) produced a wide range of suspended sediment trapping efficiencies, averaging 68% over 2 years. The 0.5% (orange) and 1.3% (grey) ponds are much more tightly clustered around their respective average suspended sediment trapping efficiencies of 83% and 91% respectively.

EROSION & SEDIMENT CONTROL PLANS – DEVELOPMENT TO IMPLEMENTATION

34. E&S Control Plans have been developed for individual properties. They are based on the E&S Control Guidelines for Vegetable Production, with the addition of supporting information from the DMTW Project including the erosion rate app.

35. The E&S Control Plans work through a 4-step process for minimising soil erosion and sediment loss on cultivated paddocks:

    1. Paddock assessment – risk management.

    2. Identifying and then stopping or controlling water entering the paddock.

    3. Implementing in-paddock control measures to minimise soil movement within the paddock.

    4. Managing the water that flows off the paddock.

36. Mitigations are put into an action plan based on their priority ranking and scheduled for implementation over several seasons depending on the level of work required.

37. The E&S Control Plans firstly ensure where possible water is prevented from flowing onto the property, followed by in-field erosion control measures. The benefit of an E&S Control Plan over a blanket rule is that a tool box approach can be used that best suits the property.

38. Wheel track ripping is a classic example where a mitigation measure is normally extremely successful, with research conducted during FSP of an erosion reduction from 21 t/ha to 1 t/ha, and on the face of it could be mandated in rules like the proposed 5 metre vegetated buffer rule. However, just like vegetated buffers, it isn't applicable to all situations and may in fact increase erosion.

39. Wheel track ripping works by increasing infiltration in the wheel tracks, thereby minimising track scouring and beds frittering.

Ripped tracks to the right with high infiltration rates and no flow to generate erosion, vs un-ripped sprayer wheel tracks (sprayer tracks are un-ripped as this would otherwise cause stability issues.

40. However, in some situations, with light soils the rips form channels that increase rather than decrease the rate of erosion (see picture in paragraph 41 below).

41. Therefore, while most E&S Control Plans would recommend wheel track ripping to minimise erosion, it is certainly not a universal recommendation, and highlights the benefit of a tailored plan over a blanket rule. While recent trials conducted by Landcare Research showed lower erosion rates on ripped wheel tracks in light Onewhero soils, where issues had been raised by growers about this technique on these soils, the results were inconclusive as two replicates showed very different results. The pictures below show potential issues where wheel track ripping may exacerbate erosion.

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Deep scouring at the top of the row along a wheel track rip line (left) and the impact at the bottom of the row (right).

42. E&S Control Plans not only document current and future mitigations, they will provide evidence of improvements over time. A recently completed E&S Control Plan showed unmitigated sediment loss of 45 t/ha, current losses of 8.2 t/ha, reducing to 0.2 t/ha once the Plan was fully implemented.

43. A neighbouring property had unmitigated sediment losses of 93 t/ha, current losses of 0.6 t/ha, reducing to 0.5 t/ha once the E&S Control Plan was fully implemented. In this case the small reduction is all associated with improved suspended sediment trapping efficiency.

44. E&S Control Plans set out a construction plan and implementation timetable. The picture below shows an installed SRP following the guidelines, with a close up of the snorkel and stabilised emergency spillway.

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A new Sediment Retention Pond; installed following the preparation of an E&S Control Plan. The key components being, correct volume, primary and emergency spillway devices.

CULTIVATION RULE 3.11.5.2(4)

45. I support the Officers recommendation to increase the cultivation threshold to 20 degrees.

46. I agree with paragraph [50] of Mr Chris Keenan's evidence, that minimum cultivation is required for fruit production beyond initial preparation and consequently there is minimal risk of sediment run-off. I believe the proposed 20-degree threshold would adequately address any potential erosion and sediment risks for horticultural activities that met the other standards as a permitted activity.

47. Further clarification is needed on how slope will be determined. While Officers note that this has already been defined in the Waikato Regional Plan (C4.5.4 - 912), the tools used to measure the slope (clinometer or Abney Level), is not really the issue, but rather clarification on the distance over which the slope will be measured. There can be a significant difference between a paddocks average slope, versus the slope across its steepest 50m, or further still across its steepest 10metres.

FARM ENVIRONMENT PLANS VERSUS A COMPULSORY 5 METER BUFFER – SCHEDULE 1

48. I strongly oppose the use of a compulsory 5 metre buffer from water bodies as proposed in Rule 3.11.5.5 and associated Schedule 1 requirement. In paragraph [314] of the s42A Report the Officers state that FEPs are intended to guide the adoption of a range of farm-specific actions to reduce contaminant losses. A compulsory 5 metre buffer straight-jackets the ability to develop a farm-specific FEP with the best environmental outcomes.

49. The E&S Control Plans of FEPs are paddock specific, and tailor the best erosion and sediment control measures for that specific situation. Perversely a 5 metre buffer will often have a considerably worse environmental outcome than if other erosion and sediment tools had been used, such as cover crops, wheel track ripping, bunds and Sediment Retention Ponds ("**SRP**").

50. In the right situation a 5 metre buffer may be the best solution. This was proven to be the case in the DMTW Project where, in Levin, vegetated buffers were the best solution on flatter land, where other tools like bunds caused significant flooding across a paddock.

51. However in cultivated situations buffers may become ineffective due to channelised flow. The widest possible buffer still has no impact on sediment control if overland flow does not pass across it.

52. Overland flow does not pass across a buffer where it is alongside a water body that runs up and down the slope. A 1 metre setback from a water body will help bank stability and reduce frittering, however a 5 metre setback that water will not flow across provides absolutely no benefits whatsoever and wastes considerable valuable land area.

53. DMTW developed an app that calculates the rate of erosion on cultivated land where the user can select a range of mitigation measures, of which vegetated buffers are one of these measures. Their trapping efficiency was calculated on a case study property (paragraph 54) using the same Zhang et al (2010) paper that the Officers reference in their justification (paragraph [773]) for retaining a 5 metre buffer in Rule 3.11.5.2(4)(e).

54. On the case study commercial vegetable property, I compared the use of 5 metre buffers with a FEP that utilised a range of erosion and sediment control tools, with predominantly SRPs as their method of sediment control. The unmitigated sediment loss was 45 t/ha. The use of 5 metre vegetated buffers reduced sediment loss to between 9 to 39 t/ha, depending on the channelising factor (no channelising to significant 80% channelising). On the 24 ha property 1.8 ha would be lost to production due to the 5 meter buffer.

55. In contrast an E&S Control Plan was developed which dropped sediment loss to 0.2 t/ha, with the SRPs and 1 metre buffers either side of the open drains occupying just 0.3 ha. The outcome of the E&S Control Plan is between 45 to 200 times better than the 5 meter buffers, using just a sixth of the land.

56. Also, in their analysis and justification for retaining this rule the Officers reference Holmes et al (2016). This is a paper based on a pastoral study, so has no relation to the effectiveness of buffers in cultivated vegetable production.

57. I contend that the Officers justification for 5 metre buffers from water bodies is not supported by their own referenced papers. As has been demonstrated above, 5 metre buffers from water can be significantly less effective than other erosion and sediment control tools that can be tailored for each paddock's situation and documented in an E&S Control Plan.

FRUIT PRODUCTION AS A LOW INTENSITY ACTIVITY

58. I support the evidence of Mr Chris Keenan at paragraphs [48] – [51] where he states that fruit production is typically considered a low intensity activity.

59. This is because all four contaminants either are:

    i. non-existent in the case of *E. coli*;

    ii. extremely low levels in terms of sediment and phosphorous loss due to minimal if any cultivation; and

    iii. extremely low in terms of nitrogen leaching due to minimal inputs (e.g. grapes and pipfruit), and high producing deep-rooted permanent crops (e.g. kiwifruit).

Andrew Barber

3 May 2019