

**BEFORE INDEPENDENT HEARING COMMISSIONERS APPOINTED BY  
THE CANTERBURY REGIONAL COUNCIL**

**IN THE MATTER OF**      The Resource Management Act 1991

**AND**

**IN THE MATTER OF**      Submissions and further submissions by Irrigation  
New Zealand on Proposed Plan Change 5 to the  
Canterbury Land and Water Regional Plan

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**SUPPLEMENTARY EVIDENCE OF IAN MCINDOE**

**5 AUGUST 2016**

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## SUPPLEMENTARY EVIDENCE OF IAN MCINDOE

### Introduction

- 1 My name is Ian McIndoe.
- 2 I am a Soil and Water Engineer, currently employed as Managing Director of Aqualinc Research Ltd (**Aqualinc**).
- 3 Irrigation New Zealand (**INZ**) has asked me to provide supplementary evidence in respect of its submission on Plan Change 5 to the Canterbury Land and Water Plan (**PC5**).
- 4 My evidence relates to Schedule 28 of PC5 and the rule for “Irrigation and water use” (**Irrigation Rule**).

### Qualifications and Experience

- 5 My experience and qualifications are set out in paragraphs 5 to 7 of my primary evidence of 22 July 2016.

### Background to this Evidence

- 6 In Annexure A of my primary evidence, I presented a set of alternative irrigation rules that I stated would, if implemented, ensure irrigation systems meet Good Management Practice (**GMP**).
- 7 In paragraphs 76.2<sup>1</sup> and 77<sup>2</sup> I concluded my alternate rules would require some current irrigation systems to upgrade.
- 8 At the time I prepared my primary evidence, I did not have information enabling me to quantify the area of irrigation that would need to upgrade to meet either the Portal or my alternative rules, nor to estimate the costs associated with doing so. That information has now been supplied to me.
- 9 The areas of irrigation involved and the costs of upgrades will help to put the size of the issue into a better context in terms of the effect of the proposed Portal rules compared with the effect of my alternative rules.

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<sup>1</sup> They will require a step-up in performance for many irrigation operators.

<sup>2</sup> Implementation of the alternative rules will require investment by many irrigators in improved systems design, maintenance and irrigation management.

### Source of Information

- 10 Canterbury Regional Council commissioned Aqualinc to prepare a report on the current areas of irrigation in Canterbury. The areas were defined by irrigation method within each Canterbury Water Management Strategy zone. The final report (Brown, 2016)<sup>3</sup> was supplied to Canterbury Regional Council on 5 July 2016.
- 11 Quantifying the area of irrigation that – in the opinion of my colleagues and I – would not meet the GMP rules outlined in my evidence required further analysis of the data used to compile that report.
- 12 The analysis was completed by Dr Peter Brown (the key author of Brown (2016)), but was not available in time for me to include it in my primary evidence.

### Irrigated areas in Canterbury

- 13 The following table, derived from Brown (2016), provides current irrigated areas for Canterbury:

Irrigation method	Area (ha)	Percentage (%)
Border dyke	26955	5%
Drip/micro	2513	0.5%
Gun	30782	6%
K Line/ Long lateral	43460	9%
Lateral move	31124	6%
Linear boom	9683	2%
Centre-pivot	224492	44%
Rotary boom	80477	16%
Side roll	254	0.1%
Solid set	4009	1%
Unknown	52855	10%
<b>TOTAL</b>	<b>507474</b>	<b>100%</b>

<sup>3</sup> Brown P, 2016. Canterbury detailed irrigated area mapping. Report No. C16010/1. Prepared for Environment Canterbury by Aqualinc Research Limited.

- 14 The “unknown” category covers areas where precise system type was unable to be identified, but is most likely to be K Line or long lateral.
- 15 The table shows that 44% of irrigation in Canterbury is ‘centre-pivot’, which means that 56% are systems other than centre-pivots.

### **Converting to GMP**

- 16 Dr Brown’s analysis quantified the area of irrigation that would have to be upgraded to have the potential to operate at GMP, according to my alternative rules. The current irrigation that will not meet GMP according to those rules is where the irrigation method/ soil PAW falls outside of the parameters shown in Annexure A of my primary evidence.
- 17 The area of current irrigation that falls into the above categories – i.e. that would not be able to meet my alternative rules without a change to the irrigation system – is 42,000 hectares. It applies to K Line/ long lateral on soils less than 100 mm PAW (if shifted once daily), guns, linear booms, lateral moves and rotary booms on soils less than 80 mm PAW, and side roll on soils less than 60 mm PAW. Border dyke and wild flood irrigation has not been included in the 42,000 ha.
- 18 There are a number of options available to bring this area of irrigation up to GMP. They include:
  - 18.1 Doubling or tripling the number of K lines on a particular area and automating the operation.
  - 18.2 Adding additional travelling irrigators or guns.
  - 18.3 Converting guns and rotary booms to centre-pivots.
  - 18.4 Converting any of the systems to solid-set irrigation or perhaps sub-surface drip irrigation.
- 19 The cost of converting these systems to GMP depends on the design of the current systems and the type of system it is converted to. I have discussed the issues and likely conversion costs with Paul Donaldson, Director of WaterForce Ltd.

- 20 We cannot be certain about what kind of upgraded system would be adopted by specific farmers on individual properties, as some systems will suit some properties but not others. What we know is that doubling or tripling the number of K lines on a property will cost between \$3000 and \$5000/ha, converting guns and rotary booms to centre-pivots will cost about \$4000/ha, and upgrading to solid-set or sub-surface drip irrigation will cost from \$10,000-15,000/ha.
- 21 My estimate of the cost of upgrading irrigation systems so that GMP (as defined by my alternative rules) can be achieved is between \$170 million and \$220 million dollars.

### **Overseer and the Portal**

- 22 Because the Farm Portal overrides the Overseer inputs in situations where the irrigation rules entered into Overseer are not considered to be GMP, some irrigation systems would need to be upgraded to meet GMP according to the Portal rules.
- 23 While the Farm Portal applies blanket fixed depths of water for travelling irrigators and spraylines of 40 mm and 35 mm respectively on a fixed return interval, many travelling irrigators (Roto-Rainers for example), cannot easily apply 40 mm.
- 24 Irrigation systems that would need to be upgraded are:
- 24.1 travelling irrigators and spraylines on soils with PAW less than 40 mm;
  - 24.2 rotary booms that cannot apply 40 mm depth on soils less than 80 mm PAW;
  - 24.3 lateral moves that cannot meet centre-pivot operating specifications; and/or
  - 24.4 any system that cannot realistically operate with irrigation triggers between 50% and 90%.
- 25 Because of the way the Portal rules are set, the changes required for irrigation systems to operate within the Portal rules are wide and

varied. For example, to enable a Roto-Rainer to apply 40 mm of water, it would probably need to operate for about 16 hours per day and remain idle for the rest of the time. To cover the irrigated area of a farm in peak demand times would require another Roto-Rainer irrigator. While the Farm Portal allows 40 mm of water to be applied to a 40 mm PAW soil, in practice, it may not be possible or practical.

- 26 My estimate of the area of irrigation that would have to be upgraded is in the range of 30,000 to 45,000 hectares. The lower degree of certainty with this estimate, compared to my estimate for the alternative rules, is because the alternative rules already take into account the practical realities of operating irrigation systems, while the Farm Portal does not.
- 27 Using similar costs per hectare as I used for the alternative rules, my cost estimate for upgrading current irrigation to be consistent with the Farm Portal rules would be in the range \$120 million - \$234 million.

### **Conclusions**

- 28 Based on this information, the cost of upgrading irrigation systems to meet GMP according to the alternative rules and the Farm Portal rules are similar. Overall, the rules I recommend require about the same level of improvement/upgrade as the Portal (as evidenced by the financial figures). In substance then, they are not lowering the bar. The costs and improvements required will be about the same.
- 29 As I stated in my primary evidence (paragraph 91), I see value in setting the bar at a level that:
- 29.1 Is likely to achieve 80% application efficiency; and
- 29.2 Could be achieved by adopting the alternative rules for travelling irrigators or spraylines as a baseline.
- 30 While irrigation systems such as centre-pivots have the potential to exceed GMP (if it is defined by reference to a well-run travelling irrigator or sprayline), many irrigators with centre-pivots have already converted from less efficient systems. In this way they have already

spent the money others will be forced to spend by either the Portal or my alternative rules. Under the rules I recommend, the GMP number provided by the Portal would be lower than what they are able to achieve with their centre-pivot. This means they would have already reduced their N loss from GMP.

- 31 In summary, the rules I recommend will result in about the same level of improvement as the Portal. The principal difference is the “credit” given to irrigators already using centre-pivots. Under my rules they would be exceeding GMP. Under the Portal rules they would be at GMP.



**Ian McIndoe**  
5 August 2016