IN THE MATTER	of the Resource Management Act 1991
A N D	
IN THE MATTER	of submissions and further submissions by Rangitata Diversion Race Management Limited on the proposed Canterbury Land & Water Regional Plan

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SUPPLEMENTARY STATEMENT OF EVIDENCE OF ANDREW WEBSTER MACFARLANE (HEARING 3)

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1. I have considered the issue raised by hearing commissioner van Voorthuysen, in regard to Mr de Joux's evidence in paragraphs 36 – 41. I wish to make several observations.

2. Mr de Joux's data, tabulated in tables two and three, shows the key months of cost reliability to be January to May. The impact in October to December is small.

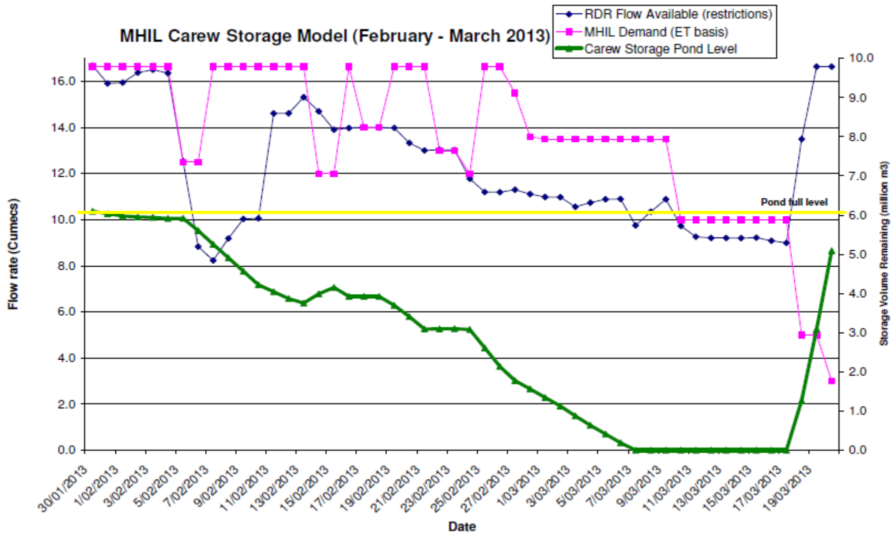
3. That data is consistent with my observations over years of consulting for farmers within the RDR irrigation schemes.

4. At an on farm level, in my experience, cuts from the Ashburton River are anticipated any time from Christmas, and cuts from the Rangitata River are anticipated from February. A cut in the Ashburton over the January to March months always results in a direct and contiguous cut in on farm delivery at a time when evapotranspiration typically exceeds supply. As a result, productivity suffers accordingly, especially with any irrigation return period greater than three days.

5. With the move from borderdyke irrigation (rostered take, consistent 85 to 115mm application per irrigation) to spray (continuous flow, variable application depth) and the consequent ability to match application to declining autumn evapotranspiration, April cuts have become less significant, other than the requirement to refill storage facilities prior to autumn diversion of water to electricity production.

6. Table 1 graphically demonstrates that effect, using actual 2013 data as an example. The purple line (ET) exceeds the blue line (water available Rangitata and Ashburton) through parts of January (not shown), and most of February/March, with recharge of storage only occurring on 18th March 2013 when ET was declining and a significant rainfall event occurred.

Table 1 (courtesy MHIS management)



7. I can therefore conclude, and it is corroborated from my own experience, and records, that any Ashburton cut before the end of March will directly impact at an on farm pasture and crop production level.

8. Conversely, April and May cuts will have less impact in most years now that the schemes are predominantly spray irrigated.

9. Mr de Joux's evidence, using monthly averages, understates the unpredictability of the moisture deficits. The high ET weeks are more predictable than rainfall or irrigation cuts. Hence farm systems are usually designed around feed predictability in January/February.

10. As a result farm policy will be driven around the 1 in 10 year events within a month, not the long term averages for the month.

    Mr de Joux has supplied me with a breakdown of actual irrigation cuts for the years 1967/68 to 2010/11. I note that the years with the highest days of restriction on the Ashburton are not necessarily the years of highest water use, but do rank in drier years. That result is not unexpected as the Ashburton River is not an alpine fed river. The Ashburton River flow is therefore low when hot dry conditions prevail on the plains.

11. I have examined the data, and grouped the 43 years into the categories of full days of restriction, partial days of restriction, and consecutive days of restriction. I have grouped those categories for:

    a. Total days over the 43 years

b. Days greater than seven days of consecutive cuts

c. One in ten year cuts.

12. When examining the data it is clear that the years with cuts for more than seven consecutive days are a 1 in 2.5 year occurrence (17 years in 43) at present, but will increase to 1 in 1.65 years (26 years in 43) if the 900 l/sec is lost.

Seven consecutive days of restriction are a significant “cliff” to pasture and crop production, as seven days of evapotranspiration with no offsetting rainfall or irrigation takes most medium to light soils to stress point (that is, no readily available soil moisture). Once that position occurs, impact on crop yield is permanent, and on high intensity pasture production impacts on the feed balance for up to three months.

Table 2 Summary of days on restriction (over 43 years)

	Current	LWRP, no ADC cut	LWRP with ADC cut (560 l/s)
Average			
Full cuts (days)	17	28	20
Partial cuts	117	116	118
Consecutive days	11	16	13
For years > 7 days consecutive cuts	17	26	19
For those years:			
- days of full cuts	722	1155	834
- days of partial cuts	1894	2927	2165
- days of consecutive cuts	471	655	511
For 1 in 10 year type events (72/73, 73/74, 87/88, 89/90/ 00/01)			
- days of full cuts	339	714	472
- days of partial cuts	463	988	656
- days of consecutive cuts	220	388	299

13. Table 2 demonstrates, for the LWRP plan with no associated ADC cut.
Firstly, a 65% increase in average days of full restriction.
Secondly, a 52% increase in the number of years with cuts greater than seven days.
Thirdly, a 60% increase in the days of full restriction in those years.
Fourthly, a 55% increase in the days of partial restriction.
Fifthly, a 110% increase in the days of full cuts in 1 in 10 year type events.

Sixthly, a 113% increase in the days of partial cuts in 1 in 10 year type events

14. When looking at the monthly flows within those years, it is clear that cuts can occur in any month, but are particularly severe from mid December.

15. The cuts are of less productive significance in May, and while also of less productive significance in April, flows in that month are critical to refill of storage.

16. Weighing up that data, I have concluded that in light of the issue raised by hearing commissioner van Voorthuysen, it would be appropriate to exclude April and May, even though that tends to underestimate April demand required to refill storage.

17. On that basis, using Mr de Joux's average data, the drop in average reliability is 10.7% (was 12% including April) and in poorer seasons, 27.6% (was 30.5%).

    As a proportion of total water supply, that is an average of 1.42%, with 3.7% in the drier years.

18. As seen above, using that average data significantly underestimates the impact. Pasture growth and crop response is driven by average data, but farm policy, driven by behavioural response to the frequency of adverse events, will become more conservative.

19. I would therefore expect responses that mitigate risk such as a reduction in stocking rate, commissioning of extra storage, less confident decision making, and greater water use as "just in case" irrigation management rather than "just in time" was employed.

20. Such behaviour effectively drives a lower EBIT in years of little restriction, as feed use optimisation does not occur.

21. My observation of farmer behaviour of 32 years suggests that 1 in 10 year type events are tolerated without major changes to farm systems.

22. Conversely, 1 in 5 (or less) type events absolutely change farmer behaviour.

23. For that reason, and in the light of the additional information, I believe that my original calculation of the economic impact is too low because in those 1 in 1.65 years, 8% cuts to total RDR water supply occur.

    Relative to the 4.1% estimated in my evidence in chief, 8% cuts will severely inflate the cost per hectare and the requirement for stored water which I do not expect the impact to double, it will be significantly higher than the impact of the 4.1% cuts.

24. However, I otherwise conclude that the approach taken in Mr de Joux's evidence is a very conservative approximation of impacts on reliability (at an on farm level within the RDR irrigation schemes) for the reasons discussed.

AW Macfarlane
11/06/2013