IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of the submissions and further submissions by Rangitata Diversion Race Management Limited to the Proposed Canterbury Land & Water Regional Plan.

STATEMENT OF EVIDENCE OF ANDREW MACFARLANE ON BEHALF OF RDRML LIMITED (HEARING 2)

02 APRIL 2013

INTRODUCTION

1. My name is Andrew Webster Macfarlane.

2. I graduated from Lincoln College in 1981 with a Bachelor of Agricultural Science degree. I have 32 years' experience as a farm management consultant, 31 of which have been in private practice. I am a registered member of the New Zealand Institute of Primary Industry Management and am a past New Zealand President of that Institute.

3. I am a director of Ag Research, ANZCO Foods Ltd, a Lincoln University Councillor and Chairman of Deer Industry NZ.

4. I have been farming on my own account, with both border-dyke and spray irrigation, for 23 years. My home property was awarded the "Ballance Farm Environment Award" (for setting a high standard in environmentally sustainable farming) in 2003, and our second farm, in which our family has a major equity share, recently won the dairy farm award, energy excellence award, and integrated management award in the 2013 finals. Our families farming interests include dairy, dairy support, sheep/beef/deer and arable farming.

5. My advisory work, through my company Macfarlane Rural Business ("MRB"), involves crop and animal systems, the impact of soil fertility and water availability on them, and the financial analysis of such systems. I have been advising farmers on the development and management of their on farm and off farm irrigation systems for 29 years. In recent years a significant amount of my time has been involved in assisting farmers:

(a) re-develop existing irrigated areas (both spray and border-dyke) to enhance efficiency of resource use and hence profitability;

(b) develop sound design and management practices for proposed water use, both individual and group schemes; and

(c) manage production and financial risk around water enhancement schemes, both group and individual.

6. In preparing this evidence, I acknowledge that I have read the Code of Conduct for Expert Witnesses in the Environment Court Consolidated Practice Note (2011). I confirm that I have complied with the Code of Conduct in preparing this evidence.

7. SCOPE OF EVIDENCE

My evidence will outline:

a) An overview of the main soil types in the RDR area

b) An indication of a typical range of water use rates

c) An overview of the typical land uses in that area

d) An overview of the typical management systems employed within those land uses

e) An indication of a typical range of modelled nitrogen loss rates (using Overseer experience)

f) An indication of typical capital investments to take farms from "past practice" to "current average practice" to "good practice".

8. The soils within the scheme range from "very light" Lismore Stoney silt loam, to light Ruapuna silt loam and Lismore silt loam, to medium Wakanui silt loam (typically along rivers) to medium heavy Templeton. Very few very heavy soil exist in the RDR catchment.

Appendix I demonstrates visually the spread of soil.

9. The moisture holding capacity is summarised as:

	Plant available water (mm water/100mm soil depth)	Example soil
Very light	10.0mm/100mm	Lismore Stoney silt loam
Light	13.5mm/100mm	Ruapuna silt loam
Medium	16.2mm/100mm	Wakanui silt loam
Medium/heavy	18.3mm/100mm	Templeton silt loam
Heavy	17.5mm/100mm	Temuka silt loam

Note that the water holding capacity per 100mm is accentuated by soil depth (typically, depth to stones). For the lighter soils, 300mm is available, but for heavier soils, over 1m. Pastures typically do not root below 500mm soil depth.

10. Historically, the flood irrigation (via borderdyke) has been on the lighter soil types with the heavier soils along the fringes of the scheme (river) soils, or to the north west or east spray irrigated.

11. The historic water duty (expressed in mm/week) for the three schemes is similar, at

Mayfield Hinds	25mm/week
Valletta	28mm/week
Ashburton Lyndhurst	25mm/week

12. Annual water use from the scheme has typically utilized 7,000-8,000m^3/ha with many farmers having to top up via wells in mid summer or when autumn restrictions apply. As a result, many farmers historically utilized 8,000-9,000m^3/ha, with drainage therefore approaching 4,500m^3/ha/yr.

13. Over the past decade, major changes have and are continuing to be made, in both delivery of water, and on farm efficiency.

The first efficiencies have occurred on farm with a combination of on farm storage (typically around 350m^3/ha) and spray irrigation, dominated now by pivots with a 3 – 4 day return period.

14. New efficiencies have come off farm, with remediation work on large races to minimize leakage in races, and pressurisation of Valetta (almost completed), Ashburton Lyndhurst (25% completed three years ago, and the balance to commence construction in June), and Mayfield Hinds (in design planning and pricing stage).

Further reliability has been achieved with construction of the Carew ponds (6Mm^3) and potential to build more storage at Klondyke (100Mm^3 land purchased and in storage design feasibility stage).

15. The net result of these massive investments has been an increased instantaneous application rate for peak evapotranspiration periods, much higher reliability, a much lower annual volume used, and much improved application efficiency.

16. Typical annual volumes have reduced to between 4,000 and 5,000m^3 where short return period application systems are associated with storage and/or ability to increase application beyond 25mm/week.

17. LAND USE

Approx. land use across the schemes is summarised as:

Scheme	Area	Dairy	Dairy Support	Sheep/Beef/ Deer	Arable
Mayfield/Hinds	33,000	53%	23%	13%	11%
Valetta	8,000	70%	22%	5.5%	1.5%
ALIS	25,000	47%	18%	15%	20%
Total	66,000	53%	21%	13%	13%

18. These figures are as supplied by scheme surveys over 2011 and 2012. The area of dairy and dairy support is growing at the expense of sheep/beef/deer, but the rate of growth is slowing as the rate of conversion from flood to pivot also slows in line with the majority (approx. 75%) having already occurred.

19. LAND USE SYSTEMS

Typical dairy systems within RDR are based on a milking platform, stocked at 3.4 – 4 cows/ha, producing 1,400-1,800kgMS/ha from 12,000 to 15,000 kgDM pasture utilized, (assuming nitrogen use per ha of 150-280kgN/ha) and 1,100-4,000kgDM/ha of supplement imported from off farm in the form of grain, pasture silage, maize silage, Palm Kernel Expeller and straw. All heifers are reared off farm till calving, and in calf cows wintered off for an average 65-70 days.

20. Typical dairy support systems involve 25-50% of the farm in winter feed for heifer and cow wintering, 15 – 30% in grain and/or maize cereal silage, and 40 – 50% in pasture.

In our experience, the pasture production utilized ranges from 8 – 10,000kg/ha on borderdykes, up to 12,000kg/ha with boom irrigators, and up to 13,500kg/ha under short return period systems like pivots. As a result, heifer stocking rates vary from 4/ha to 5.5/ha.

21. Typical mixed and arable systems vary a little depending on soil type, with the majority (approx. 60%) of arable in the ALIS area.

Three main systems exist within the RDR farms.

a) Process crop orientated, growing process peas, potatoes, sweet corn or maize, with wheat as a break crop and grass seed for organic matter retention. Any green feed grown is often utilised by lambs.

b) Small seeds orientated, growing grass seed, white clover seed, vegetable seeds, with wheat or barley as break crops. Most of these farms suit lamb finishing systems in preference to dairy grazing.

c) Mixed livestock and grain orientated farms, where winter feed crops, cereals, peas, brassica seed crops and grass seed are alternated with a short (3-5 year) pasture rotation which can support sheep, beef, deer, or dairy heifers and may have some dairy cows in winter on kale or fodder beet crops.

22. Based on extensive Overseer modelling of the above systems with "Overseer 6, build 2" in recent months by Macfarlane Rural Business consultants for Environment Canterbury and individual farm clients, I believe typical current N losses from those systems, based on the range of soils and current irrigation systems, to approximate:

sheep/beef/deer	30kgN/ha/yr
arable	27kgN/ha/yr
dairy support	75kgN/ha/yr *
dairy	55kgN/ha/yr

* 25-30% winter feed, with the balance in pasture for heifer grazing.

23. MRB also know that based on historical management practices and flood irrigation systems, losses as calculated by Overseer 6, build 2, from the systems approximated:

sheep/beef/deer	50kgN/ha/yr
arable	50kgN/ha/yr
dairy support	120kgN/ha/yr
dairy	70kgN/ha/yr

24. MRB have also analysed some farms utilizing current known irrigation and nutrient management technology, and very good management practices, without dramatically changing management systems to include more capital intensive items that completely change farm systems, such as wintering barns. Such practices include short return interval irrigation, associated telemetry, good nutrient management, good effluent storage, best practice nitrogen application use of DCD. Annual nitrogen loss results for those properties approximate:

sheep/beef/deer	20kgN/ha/yr
arable	20kgN/ha/yr
dairy support	65kgN/ha/yr
dairy	25kgN/ha/yr

I note for completeness that the range of numbers that I set out in paragraphs 22 to 23 of this statement is still being analysed, and may be subject to some variation as additional information comes to hand.

25. CAPITAL INVESTMENT

In order to achieve the large gains in water use efficiency and savings in nutrient loss, RDR shareholders have invested significant capital sums.

Typical capital investments to move from flood irrigation systems to high end spray irrigation systems are $6,500/ha.

Typical capital investment to convert from non dairy to dairy systems is around $28,000/ha (including Fonterra shares).

Off farm investment into “off farm”, but “in scheme” storage, approximates $20M, with investment in pressurisation likely to be around $330M.

On farm storage (averaging 318m^3/ha) across RDR has cost farmers around $42M.

I estimate that investment in current technology with a high likelihood of success will result in further investment around $1,000/ha to $1,500/ha.

26. Based on those figures, I estimate total investment by RDR shareholders to date, approximates:

Off farm storage	6Mm^3	$21M
On farm storage	21Mm^3	$42M

Storage to date	$63M
On farm conversion of flood to spray (incl associated costs) 50,000ha @ $6,500/ha	$325M
Dairy development (incl Fonterra shares) 35,000ha @ $28,000/ha	$980M
Pressurisation to date	$ 42M
Total investment to date	**$1410M**

Of that $1,410M, I estimate approx. $980M ($28,000/ha) exists as debt on dairy farms, $300M is debt on non dairy farms, and $130M is funded from new equity or retained profits.

27. Further investment to be expended includes:

Pressurisation	$238M
Completion of spray irrigation (16000ha)	$104M
Uptake of additional 0.5 mm/day water/ha on (average) 66,000ha	$57M
Additional 10% dairy 6,600 ha @ $28,000	$185M
	$584M

Of that $514M, I estimate debt funding on dairy units will account for $131M, debt funding on pressurisation ($238M) will be debt funded, with interest costs offsetting electricity savings, $70M from increased debt on other farms, leaving $145M to be raised as new equity into the scheme and its shareholders.

28. Further to that, I expect the schemes to expand by a minimum 10%, bringing around 7,000 ha additional land into the irrigated footprint.

That land would require investment of :

Irrigation shares	$ 7,000/ha (infrastructure)		
Irrigation development	$ 6,500/ha		
	$13,500/ha		
Over 7,000 ha		=	$ 95M
Assuming 50% dairy @ $28,000/ha		=	$ 98M
Further likely investment		=	$193M

Of that sum, $105M could be debt funded on dairy, $35M on non dairy, leaving $53M required from new equity.

29. In addition to the above sums, the $1,000 to $1,500/ha is a further $66M to $100M that is likely to be required for new technology.

30. As a practical example of how the move to a high productivity/high environmental outcome system has also made balance sheets more fragile, I give a dairy example:

Production 1500kgMS/ha @ payout (incl Fonterra dividend) of:

	$5.00	$5.50	$6.00	$6.50	$7.00
GI/ha	7,950	8,700	9,450	10,200	10,950
FWE/ha	6,500	6,500	6,500	6,500	6,500
EBIT/ha	1,450	2,200	2,950	3,700	4,450
Int on $30,000/ha debt @ 7%	2,100	2,100	2,100	2,100	2,100
Tax	-	-	50	270	500
Net profit after tax	-650	100	800	1,330	1.850
Capital Expenditure					
Fonterra (+2% production)	210	210	210	210	210
Plant replacement	125	125	125	125	125
Environmental & RUE upgrades	700	700	700	700	700
Cash Surplus					
(deficit)	-1,685	-935	-235	295	815
(Before Drawings)					
Over 210ha	-354,000	-196,000	-49,000	41,000	171,000

31. The above data shows that a payout around $6.25/kgMS at a production of 15,000kg/ha is required to break even in cash terms. Any lower payout will force new capital to be funded from additional debt.

32. The position of a dairy support unit is just as tight. As an example,

EBIT/ha	=	$1,200/ha
Int on $12,000/ha	=	$ 840/ha
Tax		$ 35/ha
Net profitable tax		$ 325/ha
Capex – plant		$ 125/ha
- environmental		$ 450/ha
Cash position	-	$ 250/ha

33. Those examples are illustrative of several points:

- Huge capital investment has been, or about to be spent on scheme upgrades that enhance productivity, EBIT, and environmental outcomes. The total sum of that investment approximates $2.3B
- Outside the farm gate, the reliability of that output has lead to huge investments in the processing sector (Five Star Beef, CMP, Silver Fern Farms, Talley's, Fonterra, Synlait, Westland Dairy, seed processors and exporters, van Zanten Bulbs etc).
- That investment, combined with better management is having a very positive environmental outcome, only a portion of which has been realised.
- Farmers will need to increase the speed of their move to optimise their current infrastructure within reasonable capital limits, and hence make the readily accessible environmental gains.

- Likewise, with most of the improvements debt funded, care will be needed not to force farmers to adapt new systems and infrastructure quicker than their ability to fund or understand them.

- Our work with Overseer indicates to us that while it has significant short term limitations that means its accuracy is still to be refined with back up from medium term trials, it is the tool of choice to inform practice change, and to inform indicative outcomes.

- The key to the success of the PL&WRP is to ensure that Overseer is used within its degree of tolerance, rather than an absolute number, and also create realistic time frames for producers to absorb the capital and running cost of upgraded infrastructures.

- Progress over the past decade has been astounding, and I am confident the current emphasis on integrated nutrient management will result in further major improvements as technology, associated management techniques, and availability of capital allow.

02nd April 2013