

BEFORE THE CANTERBURY REGIONAL COUNCIL

IN THE MATTER OF the Resource Management Act 1991

AND

IN THE MATTER OF an application for resource consent
CRC071029 by the South Canterbury Irrigation
Trust and Meridian Energy Limited to take and
use water from the Waitaki River.

APPLICANT Meridian Energy Limited and the South
Canterbury Irrigation Trust.

EVIDENCE OF FRANK SCARF FOR RESUMED HEARING

23 February 2010

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Qualifications and Experience

1. My full name is Frank Scarf and I reside in Timaru. I am a hydrologist and hold a New Zealand Certificate of Engineering (Civil) and a Bachelor of Science (Mathematics). I am now retired but continue to provide hydrological advice from time to time to Fish and Game (Central South Island), particularly in relation to water resources assessment, modelling and management rules.
2. Throughout my working life spanning more than 45 years, I worked in hydrology, water resources management and related fields. During the 1990s, I was employed in various senior management positions within the Canterbury Regional Council, including Southern Area Manager and Group Manager (Regulations and Consents). Throughout the 1980s, I filled the position of Water Resources Manager with the South Canterbury Regional Water Board.
3. I confirm that I have read and agree to comply with the Code of Conduct for Expert Witnesses (31 March 2005). This evidence is within my area of expertise except where I state that I am relying on what I have been told by another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.
4. This evidence is based on my personal experience of managing water resources and my knowledge of the Waitaki River and its tributaries from living and working in the South Canterbury area for the past 30 years.
5. I have been asked by Fish and Game to provide evidence in relation to the following and the Hakataramea River:
 - a) 'Whole of catchment' approach in regard to water management;
 - b) my interpretation of the water management regime for the Hakataramea River as detailed in the Waitaki Catchment Water Allocation Regional Plan ("the Plan");
 - c) existing consent conditions and alignment with the Plan provisions; and
 - d) instream flow protection and diversion of water into storage.
6. In addition, I have been requested to address matters relating to the North Bank Tunnel and detailed in the Second Minute to Parties dated 4 December 2009.

North Bank Tunnel Concept Interim Decision

7. In preparing this evidence, I referenced the following documents:
- Environment Court Hearing (MRNAG et al) Interim decision (pages 171-177);
 - NBTC Hearing Interim decision Appendix 4 (pages 1-42); and
 - Meridian Energy Draft conditions (pages 1- 38)
8. I would agree that the final decision for NBTC should ideally be consistent with the Environment Court's albeit interim decision.

'Whole of catchment' Approach

9. River flow is a product of rainfall and catchment area. While flow may be lost to shallow unconfined aquifers and streambed shingles from site to site, particularly on emergence from tributary gorges on to the floodplain, such water is invariably recovered in part or in full at the upstream end of subsequent downstream gorges.
10. Except for some small losses to evaporation from the open surface water bodies involved, the water is generally retained to assemble as flow at the bottom of the catchment. Water taken from the river, its tributaries and/or its unconfined aquifers for irrigation purposes is redistributed onto crops and pastureland at low application rates to be evapotranspired back into the atmosphere, and therefore is regarded as a consumptive use.
11. Any application to take water for irrigation purposes impacts and generally derogates from either or both:
- a) the flow remaining instream and its ability to maintain aquatic wildlife values;
and
 - b) the reliability of supply and therefore the economic interests of other downstream consent holders.
12. For these reasons I support the 'whole of catchment' approach proposed by the Commissioners.

Water Management Regime

13. Examining Rule 2, Table 3 (xix) relating to the Hakataramea River, I interpret the September to March provisions as follows:
 - a) when flow is less than 500 l/s as measured at the Highway recorder site, 'A' block consent holders are totally restricted.
 - b) when flow is less than 1000 l/s but greater than 500 l/s only that portion in excess of 500 l/s may be abstracted by 'A' block consent holders.
 - c) when flow at the Highway recorder site exceed 1000 l/s, 'A' block consents may be exercised without restriction.
 - d) when flows are greater than 1000 l/s but less than 4500 l/s, 'A' block consents may be exercised without restriction, and 'B' block consents are limited to 50% (i.e 1:1 sharing between retention of flow in-river and abstraction) of that flow in excess of 1000 l/s. For example, at 2000 l/s, 'A' consents are block allocated 500 l/s, 'B' consents are block allocated 500 l/s and 1000 l/s remains in river. At 4500 l/s, the corresponding allocations are 500 l/s to 'A', 1750 l/s to 'B' and 2250 l/s in river.
 - e) when flows are greater than 4500 l/s, 'A' and 'B' consents are block allocated their maxima of 500 and 1750 l/s respectively, and any flow in excess of 4500 l/s may be diverted into storage, nominally as a 'C' consent.
14. With the recording site downstream from abstraction within the catchment, abstractive users are constrained in the knowledge that any liberties taken in respect of use today impacts the flow in the river and the restriction level that may be imposed on the following day. To obviate that risk, the Valley irrigators understandably operate a roster system during times of low flow to ensure they do not collectively induce the river to deplete below the minimum flow while at the same time providing for fair and equitable distribution of the water resource available to them.
15. Rule 2(1)(c) states that *'no more than half the water above or between the thresholds in Table 3 may be taken or diverted.'* Paragraph (13d) above assumes a 1:1 sharing; the maximum that can be afforded to abstractive use under this rule.
16. For the remaining months April to August, I interpret these provisions as follows:
 - a) when the flow is less than 750 l/s the taking of water is totally restricted.
 - b) when the flow is greater than 750 l/s but less than 4500 l/s, both 'A' and 'B' consent holders may access that flow in excess of 750 l/s under a 1:1 flow sharing provision. For example, at 2000 l/s, 'A' and 'B' consent holders may

between them take up to 625 l/s, leaving 1375 l/s in river. At 4500 l/s the corresponding values are 1875 l/s for abstractive use and 2625 l/s in river.

- c) above 4500 l/s, 'C' band consent holders may exercise their consents as described previously.

Existing consents and 'A' allocation block

17. Reviewing Attachment 2 presented by Claire Penman in the section 42A report indicates that there are 26 existing consents (including applications for renewals lodged by R.G and Z.L.Pringle and RPNZ Properties Limited, but excluding CRC930942.2 for which the application for renewal has been withdrawn) issued to take water from the Hakataramea River and its tributaries. The maximum rate of take for these consents totals about 879 l/s (say 880 l/s), leading the Commissioners to the conclusion that the Hakataramea River in terms of the Plan provisions is over allocated.
18. All authorise the taking of water for irrigation purposes. However I note that at least three of the 26 individual consents involved include a component of stockwater take. Most of the consents expire in 2029.
19. All of the existing consents (nominally 'A' block) contain a condition requiring the holders to reduce their rate of take to 50% when the flow at the Highway Recorder site reduces below 1500 l/s and to cease taking water when the flow reaches 500 l/s.
20. To comply with the Plan and subject to the agreement of consent holders, I favour the Commissioners' proposal to partition the existing consents into Band 'A' with the remainder being subject to Band 'B' rules. The proportion assigned to Band 'A' would be 57% (500/880). That portion of the consents would have priority and be fully exercisable when the flow at Highway Bridge was at or above 1000 l/s. Between 1000 l/s and the minimum flow of 500 l/s, the taking of water would be restricted on a pro rata basis. The remaining 43% of the existing consent would be assigned as the 'B' band.
21. To demonstrate the effect of this proposal I refer you to the following table:

Existing Conditions		Proposed A/B band apportionment	
Flow (l/s)	Take available (l/s)	Flow (l/s)	Take available (l/s)
500	0	500	0
1000	440	1000	500
1499	440	1499	750
1500	880	1500	750
1760	880	1760	880

22. Under the A/B band apportionment scenario, the full 880 l/s could be taken when flows were above 1760 l/s, compared to the existing conditions position that enables 880 l/s to be taken when flow exceeds 1500 l/s. However once the flow recedes below 1500, only 440 l/s is able to be taken under existing conditions, compared to 750 l/s available under a band apportionment.
23. In terms of water available for abstractive use, the apportionment scenario continues to offer marginally more down to 940 l/s. Between 940 l/s and 500 l/s, the minimum flow, the management regimes are the same.

Water storage and instream protection

24. In regard to diversion into storage, I support the reasoning and the position reached by the Commissioners as outlined in the Third Matter of the Minute to Parties dated 3 December 2009. This includes:
- a) diversion is confined to those times when flow at the intake exceeds the mean flow for the intake site as determined by the Canterbury Regional Council; and
 - b) the rate of diversion shall be limited to 50% of flow in excess of the mean flow; and
 - c) limiting the cumulative number of sites and rates of diversion into storage to ensure that the mean flow plus the 50% flow share is maintained downstream.

NBTC operating

25. I consider Condition 11(a) of the NBTC interim decision is marginally conflicting with Condition 10. For this reason I support the Environment Court’s interim decision to change Condition 10 to read:

The taking of water in terms of this permit shall cease whenever the flow rate in the Waitaki River as measured at the Kurow recorder falls below the sum of:

- a. the minimum river flow rates in the table below; plus*
- b. 11 m³/s; plus*
- c. mitigation flows in compliance with Individual Mitigation Plans relevant to the reaches Waitaki Dam to Stonewall as prepared under General Conditions 6 and 7.*

<i>Month</i>	<i>jan</i>	<i>feb</i>	<i>mar</i>	<i>apr</i>	<i>may</i>	<i>jun</i>	<i>jul</i>	<i>aug</i>	<i>sep</i>	<i>oct</i>	<i>nov</i>	<i>dec</i>
<i>Minimum river flow</i>	<i>140</i>	<i>150</i>	<i>145</i>	<i>125</i>	<i>120</i>	<i>110</i>	<i>110</i>	<i>110</i>	<i>120</i>	<i>125</i>	<i>130</i>	<i>140</i>

26. Condition 11(a) of the NBTC interim decision could then be deleted. The remaining conditions 10(b) and (c) should be retained. These describe the standard to be used for recording flow for compliance purposes, in this instance, a one hour moving average based on flow measurement at 5 minute intervals.

27. Referring now to paragraph 394 (page 175) of the Environment Court interim decision, the rewording is correct but in my opinion redundant. During exercise of the NBTC consent the minimum flows to be retained at Kurow necessary to protect abstractive takes between Waitaki Dam and the Stonewall is dictated by Condition 10. For those take consents downstream from Stonewall, these continue to be protected through the flow discharged from the tunnel tailrace at Stonewall. This is a minimum 65m³/s and in general will average around 200m³/s, as referred to in paragraph 397 of the Environment Court interim decision.

NBTC closed down

28. This is addressed in paragraph 395 and more particularly paragraph 396 of the Environment Court interim decision. I support the intent of paragraph 396 but suggest that Clause 18 of the NBTC interim decision should be amended to read as follows:

During the months of September to the following April inclusive, whenever this water permit to take water into the North Bank tunnel is not being exercised (other than for any minor flow required for tunnel power station auxiliary services), the flow rate in the Waitaki River at Kurow shall be maintained at a level in excess of 152m³/s plus 11 m³/s equal to 163 m³/s.

29. This may require a consequential amendment to the Hunter Downs decision to restrict taking of water in the event of NBTC closure for reasons of low flow.

Other comments

30. I note that the Meridian Energy Limited (MEL) draft conditions, and in particular Condition 10, identifies 12.3m³/s as opposed to 11m³/s shown in the Environment Court interim decision. If MEL insists on (say) 12m³/s then this is supported since it reserves a further 1 m³/s to the river. The margin of error by which the one hour moving average flow is recorded at Kurow is at best around +/- 5%, so I see little point in arguing the remaining 0.3 m³/s.
31. Attached (Table 1) is a summary of the 'bottom lines' which I have assessed would result from these provisions.
32. Based on the daily flow record from 1979 to 2007, modelling shows the following:
- a. The NBT would have been closed for about 3.4 % of the time.
 - b. The worst month was December, whereby closure would have occurred for 9.6% of the time.

- c. The only significant low flow event occurred during the winter of 1992 when the NBT would have been closed for 69 consecutive days due to low inflows into Lake Waitaki.
- d. The next highest number of consecutive day closure is 9 days in December 2003. Whilst I cannot be absolutely certain it is apparent that NBT closure is linked as much to induced low flow events to enable Waitaki power station maintenance or IFIM river surveys as it is to naturally occurring low flow events.

Frank Scarf

23 February 2010

Table 1: Lower Waitaki River – Minimum flow conditions under NBT consents

Environment Court interim decision (with NBT operating)	Month											
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Minimum flow (Condition 10)	110	110	120	125	130	140	140	150	145	125	120	110
Sum consented take (Condition 15)	11	11	11	11	11	11	11	11	11	11	11	11
Inflow (Table 3 Scarf HDI evidence)	14	14	14	14	14	14	14	14	14	14	14	14
Minimum flow in river (Kurow -BP)	135	135	145	150	155	165	165	175	170	150	145	135
Actual Take (Upper Waitaki -Potts)	0	0	6	8	11	11	11	11	8	5	0	0
Minimum flow in river (Black Point)	135	135	139	142	144	154	154	164	162	145	145	135
NBT discharge	65	65	65	65	65	65	65	65	65	65	65	65
Minimum flow in river (Stonewall)	200	200	204	207	209	219	219	229	227	210	210	200
Takes (Lower Waitaki -Potts)*	6	8	38	53	69	73	73	73	53	35	13	6
Minimum flow in river (Mouth)	194	192	166	154	140	146	146	156	174	175	197	194

Note: * includes HDI as NBT is operating at or above minimum flow of 65 m3/s

Environment Court interim decision (with NBT closed)	Month											
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Minimum flow (Condition 10)	110	110	152	152	152	152	152	152	152	152	120	110
Sum consented take (Condition 15)	11	11	11	11	11	11	11	11	11	11	11	11
Inflow (Table 3 Scarf HDI evidence)	14	14	14	14	14	14	14	14	14	14	14	14
Flow in river (Kurow -BP)	135	135	177	177	177	177	177	177	177	177	145	135
Actual Take (Upper Waitaki -Potts)	0	0	6	8	11	11	11	11	8	5	0	0
Flow in river (Black Point)	135	135	171	169	166	166	166	166	169	172	145	135
NBT discharge	0	0	0	0	0	0	0	0	0	0	0	0
Flow at Stonewall	135	135	171	169	166	166	166	166	169	172	145	135
Takes (Lower Waitaki -Potts)**	6	8	27	38	50	50	50	50	38	25	13	6
Flow in river (mouth)	129	127	144	131	116	116	116	116	131	147	132	129
Percentage time NBT closed	4.7	3.7	1.7	4.5	1.9	9.6	3.3	1.6	1.3	2.9	0.6	4.9
Total	3.4											

Note:** excludes HDI as NBT is closed down due to lack of inflow