Evidence regarding the Central Plains Water Trust applications for Resource Consent to take and use water from the Rakaia and Waimakariri Rivers, and related applications.

By Tony Ward-Holmes.
On behalf of the New Zealand Recreational Canoeing Association.
Hearing Date 10 June 2008

1 Introduction

1.1 My name is Anthony Ohau (Tony) Ward-Holmes. In this evidence I speak on behalf of the New Zealand Recreational Canoeing Association (NZRCA), of which I hold the position of South Island Conservation Officer. I have been involved with the NZRCA as editor, vice-president and conservation officer for 5 years.

1.2 I have been whitewater kayaking for over 20 years. I have kayaked about 100 different river sections mostly in the South Island but also many in the North Island and some in Australia, Nepal, China and Tibet. These include a hand-full of first descents, numerous day trips and some multi-day trips of up to 8 days. Mostly my interest is in moderate (grade 3-4) whitewater, although I have some experience of the Waimakariri in a previous life and am probably still course record-holder in one of the more obscure Coast-to-Coast race categories.

New Zealand Recreational Canoeing Association

1.3 Formed in 1957, the NZRCA is the national representative organisation of canoe clubs and recreational kayakers throughout New Zealand. The NZRCA is a voluntary, non-profit, incorporated society and is affiliated to the NZ Canoe Federation. The NZCF is in turn affiliated to the International Canoe Federation. The NZRCA has delegated authority to represent the NZCF and all its member disciplines on advocacy issues.

1.4 The NZRCA was known as the New Zealand Canoe Association until 1995/6. At this time the competitive canoeing disciplines were spun off into their own associations, the new umbrella body the NZ Canoe Federation was formed, and the NZCA renamed itself to the NZ Recreational Canoeing Association to reflect its non-competitive advocacy role.

1.5 The NZRCA represents both club and individual members and further affiliated clubs. Currently there are 30 member or affiliated Clubs with a combined membership of around 2,500 kayakers plus another 65 individual members. The figure of 2,565 in no way adequately represents the sum total of kayakers in New Zealand, as there are many who do not belong to clubs, and who have not joined the NZRCA as individuals

Structure of this evidence

1.6 In section 2, I will discuss the effects that the CPW water-take may have on the kayaking amenity on the Waimakariri River. This has been difficult to determine due to the lack of information provided by the applicant. There is also an impact on the kayaking amenity of the Rakaia river. In this evidence however I will concentrate on the Waimakariri because the effects

on the Rakaia are not so severe and also as I do not have personal knowledge of the Rakaia. For the purposes of this evidence please note that 'paddling', 'kayaking' and 'canoeing' are essentially one and the same activity.

1.7 Ken Livingston and Ian Huntsman have spoken of the physical damage that would result to kayaks and paddles should one paddle in the depth of water recommended by the AEE. There is no mention in the AEE of the well-known Coast-to-Coast nor any other events or usage data. Hugh Canard has demonstrated the safety issue posed by the water intakes and the inadequacy of the CPW response that a warning sign would mitigate the hazard. There is a theme here, which is that CPW have done little research into some effects. This theme deserves further exploration, which I will undertake in Section 3.

1.8 Section 4 summarises the overall kayaking case, as already presented in some detail by Ken Livingston, Ian Huntsman, Graeme Wilson, Ian Gill-Fox and Hugh Canard.

1.9 Lastly, I will state our conclusions.

2 Effect of the CPW take on kayaking amenity

2.1 CPW have not provided any information in their Assessments of Environmental Effects for how much water they will actually take from the Waimakariri. All we know is how much they are applying to take. This makes it extremely difficult for the NZRCA or any other effected parties to forecast the impacts of CPW on the kayaking of the amenity Waimakariri. In this section I am fortunate to be able to use a model already presented by an Officer for the Council to show the likely impact of CPW on the kayaking amenity.

2.2 In order to analyse the effect of CPW on the kayaking amenity, first we must define the kayaking amenity. The only mention of kayaking at all in CPW's Assessment of Environmental Effects is this single sentence in point 6.4.7 of the Dec 2001 and June 2005 AEEs: *"Reducing the mainstream riffle depth is possibly of greater concern to activities that require longer lengths of river, such as the jet boaters and canoeists / kayakers, who require a minimum water depth of 0.2 and 0.1 metres respectively"*. There is no mention of the iconic Coast-to-Coast event, or of the hundreds of paddlers that attend the other events on the Waimakariri, or of the many thousands of padder-days spent training and otherwise recreating in kayaks each year.

2.3 Given that the applicant is required by law to assess such effects, kayakers have been astounded at the lack of research in the AEEs. The claim that kayakers require only 0.1m of depth is easily dismissed with a moment's thought, for example by picturing what a paddle looks like. To dispel any possible doubt I did my own in-depth research, conducted by dipping my paddle blade in 0.1m of water in a plastic bin. Let me assure the Commissioners this research did indeed confirm that substantially more than 0.1m is required even to just submerge the 0.45m long blade. This result was found to be independent of how much force was applied to the paddle, or of the temperature or turbidity of the water.

Paddle in 0.1m water test. Conditions of low downwards force, low temperature, zero turbidity.

2.4 A riverbed is not a flat surface of course and considerably more depth than a blade length is required to pull the blade through the water without risk of hitting protruding boulders.

2.5 Further research in a kayak shop reveals that many kayak paddles are made of carbon-fibre and/or kevlar and can cost more than some kayaker's cars. At this point I should add that I am not an economist, and for all I know CPW would claim that an increase in damage to gear results in more sales and more manufacturing, and therefore is of net benefit to the economy. I am however a kayaker and can state that most kayakers are not happy about paddling in an insufficient depth of water to protect their paddles, let alone their boats, from damage.

Quantifying the kayaking amenity

2.6 So, some of our own research was obviously in order. To help quantify the kayaking amenity on the Waimakariri, Arawa Canoe Club undertook a survey of usage and preferences by kayakers. One of the results was a trend towards two threshold flows. 50 cumecs was the median "minimum reasonable" flow, below which individuals would reconsider whether it was worth paddling the river at all. 70 cumecs was the median lower bound of the ideal flow range in which people preferred to paddle. I will refer to this threshold as the "minimum ideal" flow from here on.

2.7 The median preferred upper bound of the ideal flow range was 150 cumecs. The maximum for the ideal flow is much less sensitive than the minimum however, as the differences in river characteristics between 50 and 70 are much more marked than between 150 and 170. Hence I have concerned myself with analysing CPW effect on only the two minimum thresholds.

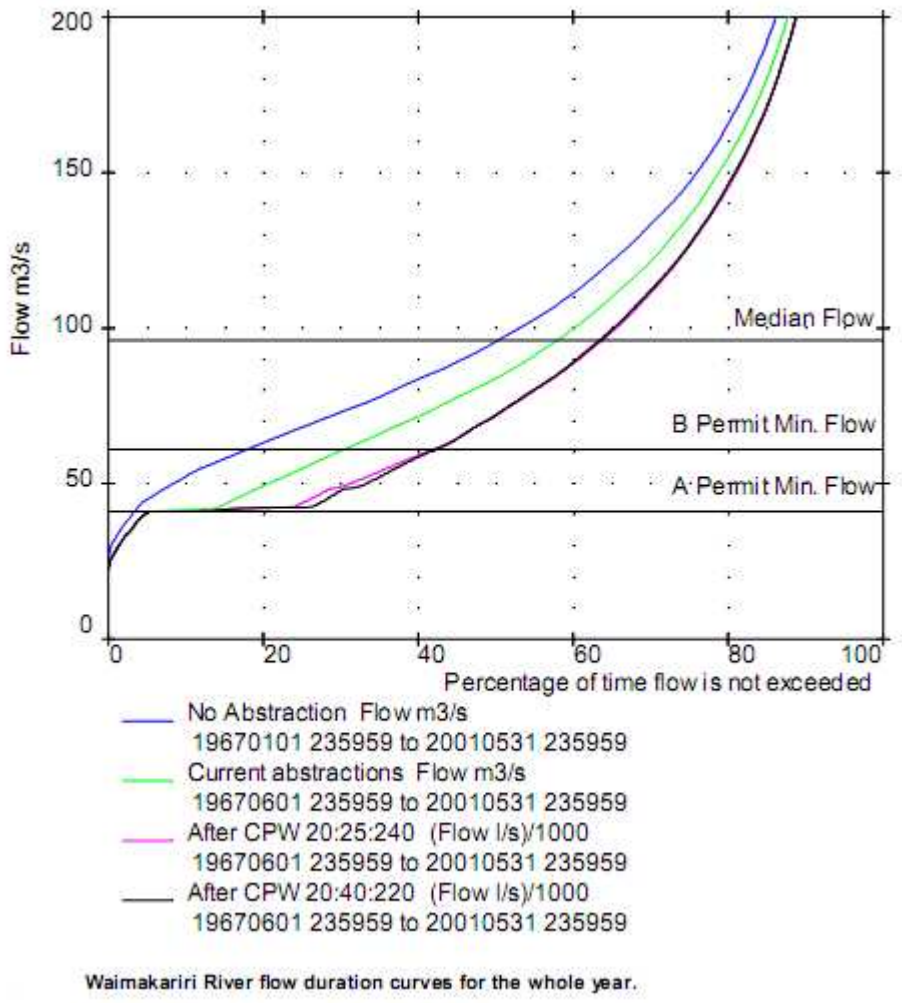
2.8 Whitewater Canoe Club also did a smaller survey, their median "minimum reasonable" and median "minimum ideal" flows were more like 60 and 80 respectively. Ken Livingston of Arawa Canoe Club commented to me that amongst more experienced paddlers, 60/80 were also the preferred flows. Ian Huntsman quotes approximately the same figures in his expert witness evidence. To err on the side of caution however, and without knowing the split of experienced vs. less experienced in the Arawa Club survey, I will use the lower values as 50 to be the minimum reasonable flow and 70 the minimum ideal flow.

Quantifying the CPW effect on kayaking amenity

2.9 Initially I modelled the effects of CPW takes on the kayaking amenity using the daily flow values for the last 40 years; a simple formula based on the consent for about 4 cumecs of A permit and 36 cumecs of B permit, and the Waimakariri Regional Plan rules; and two scenarios for how much of that consent CPW would actually take.

2.10 Recently I have been shown the s42a Officer's Report presented by Maurice Duncan. His modelling duplicates my own but with access to better data, e.g. the current water takes by Waimakariri Irrigation and others. Thus I will reproduce graphs from his report and analyse them with respect to the kayaking amenity. Please refer to the Duncan report for assumptions used in producing the graphs.

2.11 In particular bear in mind that Mr Duncan was unable to obtain data on the exact water-take regime proposed by CPW and had to make assumptions based on conflicting information: CPW's 40-cumec consent and Golder Associates 2007 report with only a 25 cumecs maximum.



Waimakariri River flow duration curves for the whole year.

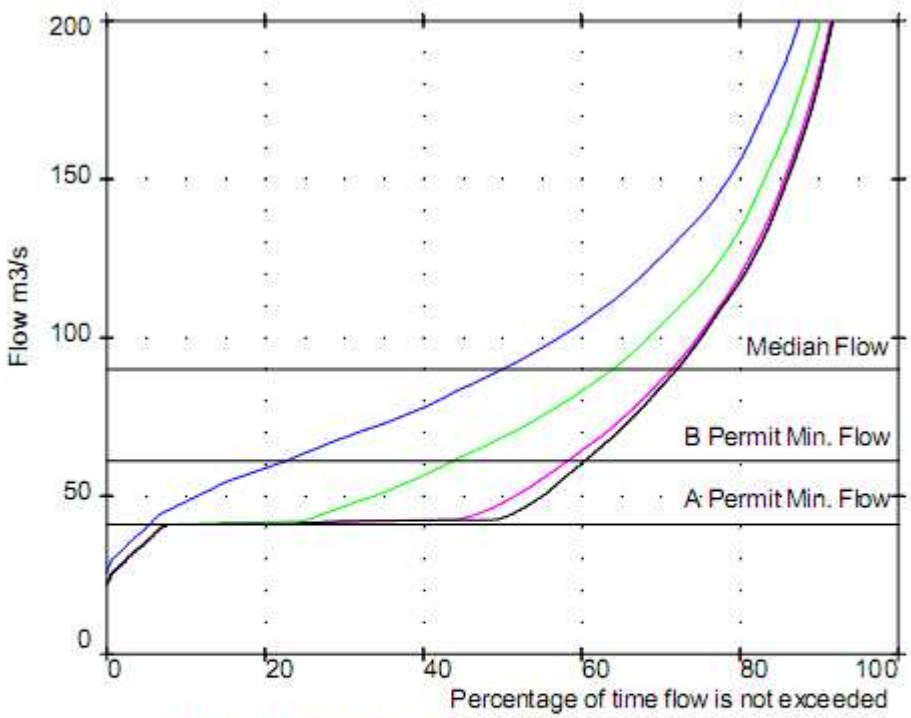
2.12 The above graph (from Duncan figure 2) shows flow duration curves from 1967 to 2005. This shows the effects on the kayaking amenity of CPW compared to the current abstractions to be approximately as follows:

	Pre-CPW %	Pre-CPW days p.a.	Post-CPW %	Post-CPW days p.a.	Increase %
< 50 cumecs	20%	73	33%	120	65 %
< 70 cumecs	38%	139	49%	179	29 %

- CPW increases the number of days less than reasonable for kayaking by 65%
- CPW increases the number of days less than ideal for kayaking by 29%. The end result is that half the year is less than ideal for kayaking.

2.13 The above figures are averaged over a long time span. Please note that annual variations in that time are significant. One year had a median flow of 49 cumecs. The standard deviation of the annual median is about 20 cumecs, meaning a substantial number will have medians less than 70 cumecs. In such dry years CPW will be forced to take more than they normally would to supply irrigation demand. So an already poor year in terms of kayaking amenity would be degraded by CPW by a larger percentage than shown in the table above.

2.14 In all cases I am assuming the terms of the consent currently being applied for; i.e. a maximum of 40 cumecs. I do not know the details of the recent 25 cumecs proposal. In most cases it does not make much difference, the smaller maximum just means a smaller amount is taken more often with a similar overall effect on the amenity.



Waimakariri River flow duration curves for the summer (1 November to April 30).

2.15 The above graph (from Duncan figure 3) shows duration curves for a 'summer' season, where summer is actually the 6 months from November to April inclusive. The effects on the kayaking amenity are as follows:

	Pre-CPW %	Pre-CPW days Per half year	Post-CPW %	Post-CPW days per half year	Increase %
< 50 cumecs	33%	60	55%	100	67 %
< 70 cumecs	50%	91	65%	119	30 %

- CPW increases the number of days less than reasonable for kayaking by 67%
- CPW increases the number of days less than ideal for kayaking by 30%. The end result is that two thirds of the season is less than ideal for kayaking.

The ratios of the effects are similar to the whole season but start from a higher number of days.

Cumulative Effects

2.16 The cumulative impact of all irrigators on the kayaking amenity is far greater of course. To give you a better idea of how the amenity is being degraded by successive consents, here is one more pair of tables showing the cumulative impact that all water-takes would have.

	Natural %	Natural days p.a.	Post-CPW %	Post-CPW days p.a.	Increase %
< 50 cumecs	8%	29	33%	120	312 %
< 70 cumecs	26%	95	49%	179	88 %

Whole year

	Natural %	Natural days Per half year	Post-CPW %	Post-CPW days per half year	Increase %
< 50 cumecs	11%	20	55%	100	400 %
< 70 cumecs	31%	57	65%	119	110 %

Nov - April

- A very significant result is that the number of days less than reasonable for kayaking has increased by 400%.

Potential Mitigation

2.17 There has been some suggestion that CPW could mitigate the effect of their water-take on the kayaking amenity by allowing natural flows on race days or even summer weekends, particularly for the Coast to Coast. This seems to have been picked up on by Nick Taylor in CPW's recreation supplementary evidence.

2.18 Here I will note that CPW has made various media releases along these lines, e.g. 4 Feb 2008 "Proposed Central Plains Water Scheme will not impact Coast to Coast". This is not an example of CPW being proactive however; it is kayakers who raised the issue of effects on kayaking. At no time has CPW proactively contacted Arawa Canoe Club, Whitewater Canoe Club nor NZRCA to discuss CPW's impact on them. Nick Taylor interviewed some kayakers for his supplementary evidence but I believe that was at the direction of the Commissioners and he has definitely never contacted NZRCA. Similarly, CPW have made claims in the media that they are a community scheme interested in building community assets such as an artificial whitewater kayaking course. This has never been discussed with kayaking organisations either so it is difficult to know if they were ever serious.

2.19 Returning to the suggestion that CPW could allow natural flows for events and selected weekends, we have been informed by a racing kayaking school owner that his clients spend only 10% of their time actually racing, and the rest is taken up with training. Much of this training time is taken during the week, usually after or before work. The implication is that the races are the highlights, but people must enjoy the 90% of the time they invest in training otherwise they would not do it. If CPW were to allow natural flows during weekends, they would necessarily compensate by taking more water mid-week. So they could mitigate for some kayakers, but only at the expense of further impact on the amenity for other kayakers who train mid-week.

Conclusion on CPW effect on kayaking amenity

2.20 In addition to the effects noted for 50 and 70 cumec thresholds, there are other effects predicted by Mr Duncan that are worthy of mention

- The amount of time the river is ‘flat-lined’ at 41 cumecs approximately doubles over summer
- The annual median drops from 84 cumecs pre-CPW to 72 cumecs, i.e. by 14%.
- The median flow over summer drops from 69 cumecs pre-CPW to 44 cumecs, i.e. by 30%.

2.21 The point of the exercise was to determine if CPW’s effect on kayaking amenity was likely to be significant. I believe this adequately demonstrates it will be.

3 Robustness of CPW assessments and evidence

3.1 I have already commented on the inadequacy of the CPW AEEs in relation to effects on kayakers. I am sure other in-stream users such as jet boaters have made similar points. Hugh Canard has commented on the lack of appreciation of safety issues shown by CPW. There are other examples throughout the AEEs of very lightweight assessments, some of which are troubling to the general public as well as to recreationalists. I would like to explore one of those.

The question of recharge of the Christchurch City aquifers.

3.2 Much time in the CPW AEEs is spent analysing effects on the plains aquifers in general, particularly in respect to nitrate contamination. The Christchurch aquifers, which supply drinking water to the majority of Canterbury's population, only rate a passing mention. The 23 June 2006 AEE has section 8.6 (of only one page) devoted to Christchurch City Groundwater. The third paragraph notes that "*The dominant source for this groundwater is the Waimakariri River, with some rainfall contribution".*

3.3 The next paragraph notes that "*The modelling study of Aqualinc (2005b) showed that the CPWE Scheme will result in a small increase in flow in the spring-fed rivers that drain through Christchurch (The Avon and Heathcote Rivers, see Table 8-9 above). From the groundwater flow lines shown by Hayward (2002) the Avon River is unlikely to receive any water directly from the Scheme area, and the increased flow will be due to a pressure effect related to the increase in groundwater level. The small increase in Heathcote River flow may in part be Scheme water, although this will be a very small proportion given the peak irrigation rate on all the affected land will be only 200 L/s"*

3.4 The point of the page on Christchurch City aquifers is that the CPW impact on them will be so minor that there is likely to be no nitrate contamination. The elephant in the room, that goes unmentioned, is that most of this aquifer is being fed from the Waimakariri which CPW is applying to take a substantial volume of water from. In short, quality is discussed but not quantity.

3.5 Much further evidence on groundwater has more recently been released by CPW prior to the hearings. I have read as much of this as I had time to; i.e.: Tipler, Burrell and Bright. Mostly they do not mention Christchurch groundwater quantity at all. The only mention I found basically reiterated the AEE, i.e.: document "14.John Bright.pdf" from the CPW Evidence DVD circulated by ECan:

- Paragraph 32, Loe and Ford 2005 is quoted on the Christchurch Groundwater Recharge Zone: *"The northern extent is the Waimakariri River which is the predominant source of recharge to the upper layers"*
- Paragraph 39: *"By raising groundwater levels further out in the plains, CPWES will increase pressure in aquifers that supply Christchurch and that will lead to increases in flow in the Heathcote, Avon and Styx rivers."*
- Again, there is no mention of the effect of reducing the Waimakariri component.

3.6 At this point I would like to note that NZRCA usually limits itself to presenting evidence on which it is expert, i.e. kayaking. I do not pretend to be an expert on aquifers. I would however describe myself as experienced in the behaviour and characteristics of rivers, and I also have 30+ years experience of reading. I think this qualifies me to observe that reducing the flow of the Waimakariri is likely to impact the recharge of the aquifer, that this is implied in the AEE as noted above, but that there is no assessment of the effect in the AEE documents. This seems to me to be a major omission.

3.7 I do not know of the state of Christchurch aquifers so I do not know how major an omission it is. However each summer we are bombarded with advertisements in the newspaper and on billboards such as in the following picture, so presumably Christchurch is nearing the limit of what can be abstracted from the city aquifers.

3.8 To put Christchurch aquifer use in context with CPW's proposed water-take, the Christchurch City Council waterwise website says the average person uses about 333 litres per day. There are 350,000 people in Christchurch, adding up to a consumption of 117 megalitres per day, or an average rate of 1.35 cumecs.

3.9 I have not been able to find any studies on the recharge rate of the Christchurch Aquifers from the Waimakariri. All references including CPW's agree it is the major component though. I have also not been able to find anything on what Waimakariri flows are most important to that recharge rate. Some thought about the characteristics of the river can give us some pointers however.

Christchurch aquifer recharge region of the Waimakariri, at 46 cumecs. Photo: Greg O'Beirne

3.10 The above photo is during low flow in winter. A relatively small area of the riverbed is wetted at this flow. It seems obvious that the higher the wetted area, the more recharge there will be into the aquifer gravels.

3.11 The following is from a report by Golder Associates "WAIMAKARIRI RIVER FLOW, HABITAT AVAILABILITY AND ANGLING SUITABILITY:TWO-DIMENSIONAL MODELLING RESULTS. (2007):

"As river flow more than doubled across the range of modelled flows from 41 to 85 m³/s, mean water depth changed little, increasing from 0.34 to 0.41 m (Fig. 3.1). Mean water velocity followed a very similar trend, increasing from 0.51 to 0.62 m/s as river flow increased from 41 to 85 m³/s. The rate of increase of water depth and velocity with flow was greatest at flows <63 m³/s, and then the rate of depth and velocity increase became very gradual (Fig. 3.1). In contrast, mean wetted channel width varied greatly over the same flow range, increasing from about 230 to 320 m wide as flow increased from 41 to 85 m³/s (Fig. 3.2). These data show that in this heavily braided section of the Waimakariri River changes in flow are associated with relatively small changes in mean depth and velocity, but large changes in total wetted channel width."

And

"Overall, the Waimakariri River shows a similar relationship between flow and changes in depth, velocity and wetted width as other braided rivers, whereby substantial changes in river flow result in little change in mean depth and velocity, but significant changes in wetted width."

3.12 So as flow rises the wetted area increases at a higher rate than either the speed or depth of the river. Once the riverbed is full the wetted area will stop increasing, and only depth and speed will vary. It seems obvious that a higher head of water will pressure water into the aquifer gravels at a higher rate. However there will be diminishing returns for higher flows as the gravels get waterlogged and as increasing velocity carries water to the sea more quickly. These high flows are also comparatively rare. My informed guess is therefore that it is the mid-range

of flows, i.e. the most common flows capable of filling the riverbed, that would be the most important flows for aquifer recharge.

3.13 CPW is applying for approximately 4 cumecs of 'A' permit and '36 cumecs of 'B' permit water. The latter can only be taken above 63 cumecs, i.e. at times CPW would be lowering the river from 99 to 63 cumecs. They can't take much water when the river is low and not important for recharge, but they can lower it from a moderate flow which probably is important for recharge. So the most important flows for CPW seem to overlap with the most important flows for aquifer recharge.

3.14 I assume the Aqualinc model covers some of this. Aqualinc's report L 05248 says that for the area between the Rakaia and the Waimakariri, surface water (i.e. river) recharge amounts to 40% of the total inputs into the system. However more recent Aqualinc data shows surface water recharge to be 57% of the total inputs, obviously a major change. While I am aware the model has been extensively peer-reviewed and developed in consultation with ECan, its results do not appear to be unquestionable.

3.15 The Christchurch area is recharged by a higher proportion of surface water than the plains average due to its proximity to the Waimakariri. If we do a back-of-the-envelope calculation and choose 80% recharge from the Waimakariri (which I have been told by hydrologists is conservative), Mr. Duncan's calculated CPW average take of 11 cumecs, and the annual median flow of 84 cumecs, then we arrive at a ballpark figure of 10% of the aquifer recharge being lost to CPW.

3.16 I have very recently read evidence from Richard English on the aquifer question. In par. 93 he mentions that Aqualinc predict average flow in the river will decrease by approximately 10 cumecs (slightly less than Mr. Duncan's calculation, but in the same ballpark) and also that Aqualinc postulate a loss in aquifer recharge of 1 cumec. Please note this is almost as much as the abstraction for the entire Christchurch city water supply, 1.35 cumecs as mentioned earlier.

3.17 If Christchurch City Council is worried about a few dripping taps, I would have thought the loss of 10% of the recharge is significant. CPW evidence (e.g. "14.John Bright.pdf" par. 39) seems to say that any loss in recharge from the Waimakariri will be more than offset by an increase in recharge from irrigation on the plains. If this were so then nitrate contamination becomes an issue. CPW can't have it both ways. Either the quantity or the quality of the Christchurch water supply is threatened.

3.18 I conclude from all this that CPW taking water from the Waimakariri may have a more than dripping-tap effect on the Christchurch City water supply. It does not seem that this effect has been reliably quantified by the applicant, and it is possible it has not been quantified by anybody else. If the Commissioners have not seen convincing evidence that there is no recharge issue, I ask them to require more investigation before making any consent decisions.

4 Summary of position from a kayaking perspective

4.1 You have now heard from many kayakers of the values provided by the Waimakariri. It is clean, safe, scenic, and conveniently local. It provides challenges in running rapids, route-finding and negotiating braided channels.

Brass Monkey Series

4.2 It is highly used. This usage is throughout the year, weekend and midweek, in large events and by individual kayakers. Single events often attract over 100 kayakers. Many thousands of kayaker-days per year are spent enjoying the river.

4.3 It has nurtured and helps support a local multi-sport and kayak racing industry. It is a very valuable training resource.

4.4 Hugh Canard has described the growth of kayaking and that trends point to even higher usage in future. He has also demonstrated that CPW has much work to do to ensure the safety of water intake and diversion structures.

Brass Monkey Series

4.5 I have shown that the CPW water-take is likely to have a major effect on this kayaking amenity. Kayaking will be slower and less interesting. Gear will be damaged more often. Events will be less well attended. As a result, people will not kayak as much. Some disciplines within kayaking may even move into a decline. Declining interest in physical activity is a trend which the government recognises and is attempting to fight via initiatives such as SPARC's Push-Play campaign.

4.6 Kayakers are expert on the subject of kayaking, and of the safety or otherwise of hazards in the river. The quality of CPW's assessments on these subjects has not been confidence inspiring. This has led me to question at least one other area of their assessment which does not lie in our sphere of expertise but appears to be lacking. I believe the recharge of the Christchurch aquifers needs far more analysis before any decisions are made.

5 Conclusion

5.1 Kayakers are not opposed to irrigation on principle. Many are of the opinion that a water-harvesting scheme is required for the Canterbury plains. This is because currently most farms are unsustainably drawing fossil water from depleting aquifers, i.e.: faster that they are naturally recharged from rain and streams. This cannot continue indefinitely, the water table is dropping each year and each year it costs more to pump water from deeper in the earth.

5.2 CPW does indeed tout a reduction in aquifer use as one of the benefits of the scheme. The economic benefit analysis that CPW has released assumes that all farmers in the scheme area will switch from aquifer to CPW supply. However it also assumes that those aquifer allocations will then be re-used to irrigate even more farms on the boundary of the scheme area. It is difficult to see how CPW can both reduce aquifer depletion and also depend on the use of those same aquifers in its economic forecasts. The CPW analysis also assumes much new land will be irrigated, and requires that farm productivity will rise across the board to pay the costs of the scheme, yet argues that this intensification will not result in increased nitrate contamination of groundwater, lowland streams and Lake Ellesmere. We argue that CPW risks increasing damage to the environment and therefore is not the right scheme to correct aquifer over-allocation.

5.3 Instead, we argue that a step back needs to be taken and a true community solution found. Much has been made in the media of how CPW is a community scheme, using the water for the benefit of all. We would argue if this were so, why did CPW not undertake a regional study to determine the best solution for all? In other words, why did CPW not do what the Canterbury Strategic Water Study has been doing? CSWS has found other options are available for Canterbury which does not involve inundating some of Canterbury's best farmland. It is unfortunate that the RMA first-in, first-served process does not allow for the best use of regional resources to be determined.

5.4 The CPW scheme is a major undertaking that exposes much of the rest of the community to adverse effects. In this hearing paddlers have demonstrated that the kayaking amenity will suffer significant adverse effects which will be difficult to mitigate.

5.5 CPW also exposes the community and environment to significant risk. We ask the Commissioners to bear in mind the precautionary principle when they make their decision.

5.6 We request that CPW consents be declined.

5.7 NZRCA and others have previously asked the Minister for the Environment to place a moratorium on future large water-take consents in Canterbury, on the basis that the RMA is not adequate to determine the best use of regional resources. I would like to state for the record that we believe such a moratorium is required and should be in place until such time as the Canterbury Strategic Water Study is completed and its findings incorporated in the regional plan.

Tony Ward-Holmes
6 June 2008