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The Commissioners
Central Plains Water Hearing
c/- Environment Canterbury
P.O. Box 345
Christchurch

August 21, 2008

Dear Sirs,

Re: Boater safety at proposed intakes

The following tables are specific responses to quotes taken verbatim from Mr Lewthwaite's Supplementary Evidence in response to the NZRCA's Evidence on the specific issues associated with the two Waimakariri intakes.

There are some very brief comments on Mr Glasson's landscape Evidence following the tables. We have been remiss in not addressing landscape values in our Evidence to date.

The tabular layout is my attempt to take each point in isolation. My overall view however, is that the intakes remain a potential risk to life until we see the details. The upper intake is safer than the lower one, but neither is safe. We have consulted via URS and are open to continuing dialogue, but we seem to be in an eddy, as it were, recirculating around the big issue, which is that no-one really knows at this stage how the intakes will perform in the range of flows and random events that a wild and free river such as the Waimakariri, and for that matter, the Rakaiā will have in reality over time.

Our responses, therefore, are relative, not absolute, and there is a cumulative effect that one should not lose sight of. Each little detail is important, but the proof will be in the overall performance under real life conditions. Where I comment that the proposed changes by Mr Lewthwaite are 'better' than what was proposed before, this does not mean or imply that the proposed changes are sufficient, simply because I do not know for certain that the sum of the changes proposed will lift the overall safety of the intakes to an acceptable standard.

I also append, for tabling, submissions drafted by Ms Baker in respect of the requirements for a performance based condition, should the Commissioners decide to grant the consents on conditions. These submissions were drafted by Ms Baker who is unable to attend, so I may not be able to answer questions of law in respect of her submissions, but can assist with the general concepts of certainty and performance based certification

Mr Lewthwaite’s introductory paragraphs.

| Mr Lewthwaite’s Supplementary Evidence | NZRCA response |
|--|----------------|
| The Commissioners’ Minute, (No 4), #14, requested the provision of “Proposals to address kayaker and other boaters’ safety at the various intakes. This should include sufficient detail to satisfy us that boater safety can be adequately provided for, including a proposed condition and plans of possible arrangements to ensure safety (e.g. booms etc)”. | Agree |
| Refer to #3 to #9 in my evidence of February 2008, in response to the s42A reports of ECan and SDC officers. See also plans attached here in Appendix 4 | |
| Plans shown in Appendix 4 for the CPW scheme have been developed from the discussion and sources used in my evidence of February 2008, from using the ASCE (1995) Guidelines for design of intakes for hydroelectric plants, and from consultation with Mr Hugh Canard, an engineer who presented evidence to the hearing on behalf of the New Zealand Recreational Canoeing Association | Confirmed. |
| Addressing first the plans for the upper Waimakariri intake, the key features proposed are: | |

Upper Waimakariri Intake

| Mr Lewthwaite’s Supplementary Evidence | Better or Worse? | Comment |
|---|------------------|--|
| Signs upstream from the diversion channel and within the diversion channel. | Better | Need to be carefully worded and easy to read. |
| A wide entrance to the diversion channel (for scenario 1). This would reduce the water velocity and enable kayakers to more easily choose the main (northern) braid. | Better | At some flows the preferred route will be down the diversion channel. |
| A widened forebay upstream from the intake structure with gentle edge slopes. This would reduce velocities and allow easy egress by kayakers, and it would also allow jet-boaters to turn and travel back upstream to the main river braid. | Better | There will be times after freshes and floods that this feature will be absent. |
| A diagonal floating boom within the forebay. This would | Diagonal is | The boom can be both a |

| | | |
|--|--|--|
| <p>encourage boaters to move to the left of the forebay and away from the intake gates. But the value of this boom would need to be assessed in practice, as river debris could potentially make it ineffective or even increase the danger.</p> | <p>better.</p> | <p>position and a negative It needs to be in a zone of low velocity, and it needs to be visible from 100m at water's edge.</p> |
| <p>An inclined trash rack, plus a safety ledge and exit point. The trash rack would reduce the danger of entrapment on the intake structure through "suction" or entrapment. It would ensure any boaters who arrive at that location (including swimmers who have fallen from boats) would be floated up towards the safety ledge and a point of easy egress. The maximum velocity approaching the trash rack would be in the order of 1.0 m/s.</p> | <p>Angled is better.</p> | <p>The optimum gap between bars is critical. Probably work better as a trash track too. If it's safe for kayakers it's safer for staff</p> |
| <p>A kayak chute taking excess water from beside the intake gate and leading into a channel that would connect with a main braid of the river. The chute would be designed to not exceed, at the range of flows contemplated, International Grade 2 suitable for racing kayaks. That is, it would be a straight-forward channel, and have no hydraulic features capable of holding a swimmer. The entrance would be clear and, as far as practicable, the entrance would be the default option for kayakers arriving at the site, because one key characteristic of Grade 2 is an obvious channel.</p> | <p>Better, subject to details and actual full scale performance.</p> | <p>Thank you for noting kayakers' suggestions.</p> |
| <p>To safeguard the chute structure during times of higher river flow it would be necessary to build a sacrificial gravel weir at the side of the forebay, at a level that would (a) maintain water levels high enough to provide the flow needed by CPW and (b) overflow and breach when the river rose significantly</p> | <p>Worse, but probably unavoidable. This channel would have the advantage of being as wide as the river flow dictated.</p> | <p>At these flows racing kayakers would most likely be off the river. This feature could be dangerous if there are solid rock(s) or sharp concrete foundations and steel exposed by the washing away of the gravel weir.</p> |
| <p>Mr Hugh Canard has suggested that an appropriate specification would be the USA Class 2 definition "Straightforward rapids with wide, clear channels which are evident without scouting. Occasional maneuvering may be required, but rocks and medium-sized waves are easily missed by trained paddlers. Swimmers are seldom injured and group assistance, while helpful, is seldom needed."</p> | <p>Performance-based</p> | <p>Kayakers agree. This has been discussed amongst kayakers and there is agreement that this is an adequate description, and we would accept this wording.</p> |

Mr Lewthwaite's Proposed Conditions

| Mr Lewthwaite's Supplementary Evidence | NZRCA response |
|--|---|
| Produce a detailed design of safety features in consultation with the New Zealand and Recreational Canoeing Association and to the approval of a relevant officer of the Canterbury Regional Council or an expert or experts nominated by the Canterbury Regional Council, | Agree |
| Erect and maintain signs at two locations upstream from the intake, to details agreed with a relevant officer of the Canterbury Regional Council, | Agree, but needs kayakers' input into wording and location. |
| Provide and maintain a wide entrance to a diversion channel in situations where the main river braid is diverted along the right bank of the Waimakariri River below the bluff on Taeges' property, | Agree |
| Provide and maintain a widened forebay upstream from the intake gate, to lower the water velocity in the intake channel to about 0.5 m/s in median to low flow conditions when the full intake flow is operating | Agree |
| Trial a diagonal floating boom across the diversion channel upstream from the intake gate, and adopt this permanently if it proves successful in the opinion of a relevant officer of the Canterbury Regional Council, | |
| Provide and maintain an inclined trash rack on the upstream face of the intake gate, leading to a safety ledge and exit point: the size of the trash rack shall be such that water velocities approaching it do not exceed 1 m/s, | Agree, but stress the need to have some post construction modifications that may prove beneficial to either party, to be resolved through negotiations in good faith. |
| Provide and maintain adjacent to the intake gate a kayak bypass of International Grade 2, suitable for racing kayaks. | Agree. |

“Addressing secondly the **lower Waimakariri intake**, the key design features should be to “

| Mr Lewthwaite's Supplementary Evidence | NZRCA response |
|---|---|
| <p>..... encourage a strong sweep velocity past the face of the structure, to reduce velocities onto the face of the structure as far as practical, and to ensure good exit features for any boats or people who might venture too close to the structure. A good sweep velocity would be easier to provide for at the lower intake than the upper intake, as the entire flow of the Waimakariri River would normally be passing the intake structure and the percentage off-take would not be more than about 40% of the adjacent river channel flow.</p> | <p>Better than the original proposal. Will be intrinsically safer, but still represents a hazard.</p> |
| <p>A further feature would be to recess the intake back into the rock face, and to ensure the alignment of the front of the intake is parallel to the passing river flow, as far as practicable. This would encourage a smooth flow in past the structure and reduce the potential for recreators to be snagged on protruding parts of the structure. This intake would also have warning signs, inclined trash rack, safety ledge and exit routes.</p> | <p>Better than the original proposal. Will be intrinsically safer, but still represents a hazard.</p> |
| <p>The trash rack design would need some additional attention to performance requirements compared to the rack at the upper intake. For example if it proves difficult, after detailed investigations, to find the lower edge on the rock by the recessed intake gates, it would still need to extend deep enough into the river bed to ensure objects, particularly people could not pass under its leading edge and be trapped beneath the rack. Depending on the depth of rock in the river bed this could be achieved by either (a) extending the lower edge to bed rock, or (b) by ensuring that whenever the river is likely to be used by recreationists, the lower edge would be below the level of the gravel bed.</p> | <p>Agree with the principle. Will require careful location to cope with fluctuations in water levels.</p> |
| <p>In my opinion a floating boom would not be practicable at the lower intake site as there is not a convenient place to anchor it, and debris, including large logs, would damage or clog it too frequently for it to be useful. It would also not be practicable to construct a widened forebay in this location, but one is provided naturally to a degree with the river flows and widths that occur in the vicinity of the proposed intake.</p> | <p>Agree. A boom would be dangerous in this location.</p> |

Lower Waimakariri Intake

Quoting Lewthwaite: "I recommend that should a consent be granted, the following conditions would be appropriate:

That the applicant....."

| Mr Lewthwaite's Supplementary Evidence | NZRCA response |
|---|----------------|
| <p>Produce a detailed design of safety features in consultation with the New Zealand Recreational Canoeing Association and to the approval of a relevant officer of the Canterbury Regional Council or an expert or experts nominated by the Canterbury</p> | <p>Agree</p> |

| | |
|---|---|
| Regional Council, | |
| Erect and maintain signs at two locations upstream from the intake, to details agreed with a relevant officer of the Canterbury Regional Council, | Agree, subject to wording and details |
| Recess the intake into the face of the rock cliffs that delimites, together with their supports, and at least the upper part of the trash rack are built behind the general natural line of the cliff face, | Better than the original proposed design. |
| Provide and maintain an inclined trash rack on the upstream face of the intake gate, leading to a safety ledge and exit point, with exit paths leading both back to the river and away from the river, at the choice of the user. The dimensions of the trash rack shall be such that velocities approaching it do not exceed 1 m/s. The trash rack shall extend to the bottom of the river bed, except that this condition shall not apply when the river is in flood. | Better. |

Comment on Landscape and Kayaking

We have not commented so far on the landscape values intrinsic to our activities. We ask the Commissioners to note that kayakers value most highly their visual surroundings on the river and are highly attuned to them while on the river for both aesthetic and safety reasons.

The experience on the river is of a constantly unfolding view. The phrase “a sense of adventure” means for me personally the unfolding landscape and “I wonder what’s around the next bend in the river?” It is the one of the principal pleasures I derive from kayaking and rafting. Indeed kayakers often refer to being able to access landscapes from the river perspective as being the principal reason they enjoy river running. The sense of adventure obviously includes the challenges of the rapids, but on easier rivers like the Waimakariri, the quality of the journey is in the majesty and continuity of the river landscape.

I would much rather paddle the Waimakariri over two days than race through it in four hours. Racers prefer racing through the wild and rugged landscape than up and down a gravel pit somewhere, hence the popularity and growth of outdoors multi-sport events, which almost uniquely to New Zealand include a kayaking leg.

Man-made intrusions on otherwise natural rivers detract considerably from this experience.

The constructions around the intakes will perforce need to be visible for safety. This is our “Catch 22”. The same applies to signage and booms.

Further to the Evidence of Mr Glasson, we note that the photo below of the Upper Waimakariri Intake does not show the view looking downstream, where all the intake constructions will be located. From a safety viewpoint, the visual clues that kayakers pick up on approaching the intakes will be far more

important than any signage. All the sign can do is to provide a warning to paddlers to be more vigilant ahead.

The intake canal looks relatively innocuous, but the regular lines do nothing for the visual experience.

Racing paddlers constantly strive for the fastest route. This canal may be the fastest route at low flows, but is likely to be a longer and slower route option as the LH braids gather volume.



Photo point (13) At 5.7 Years - Upper Waimakariri River Intake Structure - South Face

Man-made intrusions in this river will flash “danger” to any paddler with a modicum of experience. It needs to be very obvious which route should be taken. The design itself needs to provide visual clues as to the safe route.

For the **Lower Waimakariri Intake**, we have the photo simulation below.



Photo point (13) At 5.7 Years - Lower Waimakariri River Intake Structure

Landscape considerations would tend towards making this structure blend into the bluff wall, but safety considerations would in fact tend towards high visibility. From a paddling perspective such structures should be out of the main stream for safety and visual reasons. The location shown has the advantage of having the river's natural flow 'wrap' the face of the intake. As the flow increases at this location on the river, the main current shifts left, bringing this intake more in line with the route that most

paddlers will take to the Coast to Coast and Waimakariri Classic exit point just under the bridge downstream.

This location is better than the location 50m to the right of the indicated position but it still presents risks.

Debris

Our Evidence was possibly a bit light on the subject of debris in the river. In the natural river, floating debris tends to collect in 'forever' eddies. Paddlers avoid these and in the Waimakariri there is little debris compared with many of our rivers and those eddies that do accumulate debris are relatively easily avoided. That said, the picture below shows how nasty trapped debris can be to a paddler. Even the super smooth bridge piles of the Gorge Bridge can trap such debris when there is a shallow created as in this case.

Intakes are a perfect trap for debris, which is why screens are essential. Debris of this nature can trap and drown a kayaker whether the intake is drawing water or not.



Photo taken Monday 11th August at the Gorge Bridge

Lower Intake Site – Variability of the Main Flow Location

At times the main current flows across to the left bank and the bluff where the intake is proposed will be either very shallow or dry. We have no information on how this eventuality will be managed. If

mechanical diggers are used to make a channel across to the intake, this has implications for safety and the nuisance value of silt, noise and general intrusion of un-natural activities in a popular spot for tourists, kayakers, jet boaters and the general public.

Summary

1. Mr Lewthwaite's proposed changes to the intakes make a series of individual improvements to design features in responses to my Evidence.
2. The Applicant has adopted our suggestion of a performance-based Condition on the intakes which are likely to be deliverable and can be assessed against an international grading acceptable to kayakers.
3. The overall safety of the intakes remains in the realm of uncertainty.
4. Kayakers are now aware that landscape issues are a factor in the impacts of the CPW Scheme on kayaking.
5. The issues surrounding the options for location of the lower intake remain unresolved.

Yours faithfully,

Hugh Canard

For the NZ Recreational Canoeing Association (inc)

SUBMISSION ON CONDITION FOR INTAKE STRUCTURE

1. These submissions were drafted by Counsel for the NZRCA, who respectfully wishes to apologise for not being available to present them in person. The submissions primarily address the practicality of a performance based certification condition for the intake designs, in response to both Mr Lewthwaite's Supplementary evidence, and the draft conditions appended to Mr Tipler's Supplementary evidence that reflect condition 14 of CRC061925 (page 25).
2. These submissions are made without prejudice to the kayaking parties' position on the merits of the scheme in general, but are being put forward to assist the Commissioners should the Commissioners decide to grant the scheme subject to conditions. In saying so please also note that the kayaker's preference would have been to have the complete design to assess prior to consent being granted, but in the absence of that, as a fall back position, have no other option but to ask for a performance based certifier clause instead, as the details put forward by the applicant to date as still too general to provide the necessary level of certainty and safety.
3. Any condition setting performance objectives for later certification must itself set the bottom line objectives that the certification is to be measured against, otherwise there is no certainty that the condition will have the desired effect.
4. Also in this situation where the Applicant has not yet shown it is capable of designing a safe intake structure, such a performance related condition should clearly state that the construction of the scheme cannot commence until a safe intake design has been certified.
5. In respect of who should certify such a condition, in a case such as this where insufficient evidence has been presented regarding the Applicant's capability and depth of knowledge of designing on structures within rivers, a higher benchmark in terms of the certifier and key objectives needs to be set.
6. In our opinion the certifier should be an engineer with international experience in designing and operating whitewater parks and structures in rivers, as in our experience these are the only types of engineers who have specific experience in designing structures in moving water that are safe for kayakers and swimmers. As evidenced by the previous presentations engineered structures that have been designed without this expertise have created death traps.
7. While some of the specific proposals put forward by Mr Lewthwaite are improved, there is still no way of assessing the performance of the final decision, as warned by Mr Canard. Therefore, unless a complete and comprehensive design is being assessed and consented, the other approach is the setting of objectives for later certification by an expert. The type of wording that could address concerns raised by the kayakers in respect of performance based standards for intakes could be as follows:
 - (a) *The consent holder shall, prior to giving effect to this consent, consult with the New Zealand Recreational Canoeing Association and Awara Canoe Club in the development of designs for the intake structures.*
 - (b) *Prior to the commencement of construction of any element of the proposed scheme the Applicant shall obtain certification from an engineering expert with international expertise*

in the design and operation of whitewater parks and structures in rivers, that the proposed design will achieve the objectives set out below. The expert shall be chosen in consultation with the New Zealand Recreational Canoeing Association, and approved by the Canterbury Regional Council. The evidence of certification shall be provided to the Canterbury Regional Council.:

(i) That in the full range of natural flows of the river, each element of the proposed intake structure will pose no risk to kayakers, swimmers or other river users should they encounter a structure.

(ii) Any elements of the structure designed to collect debris or guide floating craft shall pose no danger to kayakers and other river users at any flow.

(iii) Any separate channel which kayakers or other river users could float into either purposefully or accidentally shall not exceed international grade II difficulty, at any flow.

(iv) Any intake of water shall be of such low intake velocity and/or cross velocity to ensure it does not impinge or entrap any kayaker, other river user or any piece of equipment associated with such river use for any period of time, at any flow.

(v) Any waves or hydraulic features created by the intake structure and associated structures and river modifications shall perform so as not to trap either temporarily or permanently any kayaker, river user or piece of equipment used for the same.

(vi) At any location near or within the structure where a kayaker, river user or swimmer may need to exit the water there shall be a practicable, safe, accessible means of exit for both the person and any equipment, at any flow.

(vii) There shall be signage sufficient to alert any river user, with appropriate notice to enable evasive action to be taken, of the intake structure.

8. As can be seen the drafting of a comprehensive performance condition is complex and clearly not ideal for such a significant proposal. No matter how carefully drafted it leaves an element of uncertainty that when dealing with such significant implications (injury or death) is unsatisfactory. The Applicant should have approached this Application having already designed intake structures that are safe and in line with international engineering best practice in the design of structures in moving water.
9. No matter how carefully designed and certified, there will always be an element of uncertainty regarding actual performance. Therefore there will not only need to be a certifying condition similar to the above, but also a corresponding condition requiring that the structure be tested, and that its actual real life performance is certified as meeting the requirements above, before the scheme can proceed fully authorised. If it does not perform as required, the condition should require re design, modification, testing and certification until the consent authority is confident the intake structure does not pose a hazard.
10. It is submitted there needs to be a corresponding, robust monitoring and maintenance condition to ensure that the intake structures continue to work safely through the duration of the consent, and post de-commissioning.

11. And finally, any relevant review conditions should be worded to ensure that if the intake does perform in an unsafe manner, that the consent will be reviewed to remedy this.

Dated this 22nd day of August 2008

Maree Baker

Counsel for New Zealand Recreational Canoeing Association