

**IN THE MATTER OF**

the Resource Management Act  
1991

**AND**

**IN THE MATTER OF**

applications by Central Plains Water  
Trust to:

Canterbury Regional Council for  
resource consents to take and use  
water from the Waimakariri and  
Rakaia Rivers and for all associated  
consents required for the  
construction and operation of the  
Central Plains Water Enhancement  
Scheme

Selwyn District Council for resource  
consents to construct and operate  
the Central Plains Water  
Enhancement Scheme

**AND**

**IN THE MATTER OF**

a notice of requirement by Central  
Plains Water Limited to:

Selwyn District Council for the  
designation of land for works  
associated with the construction and  
operation of the Central Plains  
Water Enhancement Scheme

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**EVIDENCE IN REPLY OF WALTER LEWTHWAITE  
FINAL HEARING**

**March 2010**

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## **Qualifications and experience**

1. My full name is Walter James Lewthwaite, and the basis on which I am preparing this brief was set out in my previous evidence for this hearing.

## **Scope of Evidence**

2. I have prepared this evidence to address the following issues:
  - 2.1 Fish screening
  - 2.2 Bywash discharges
  - 2.3 Access to river

## **Fish screens**

3. For consents CRC061972 and CRC021091 (to take water from the Waimakariri and Rakaia Rivers) Environment Canterbury (ECan) submitted draft conditions for fish screens in February 2010. CPW indicated in its report of February 2010 that it accepted all those conditions except the specification of screen slot sizes.
4. My evidence now amends that position, as noted later, as a result of the information I have obtained in preparing this evidence. Essentially I see that several matters, and not just slot size, should be the subject of a design process rather than prescribed at this point in conditions.
5. I have submitted evidence previously about fish screening on behalf of CPWES. See my evidence-in-chief, January 2008, # 47 to 62; my response to the s42A officer reports, February 2008, #47 to 52; and my evidence in reply, September 2008, #24 to 30. I would invite the commissioners to re-read those comments.
6. Essentially my evidence recommended conditions that specified a process of design rather than details of design. My fundamental reason was that I considered it was premature to specify design details when there has not been a needs assessment and agreement on protection objectives for the fisheries of the Waimakariri and Rakaia Rivers. That is, I considered there should be an effects-based approach to fish screen design.
7. By contrast the recommendation from Environment Canterbury is to specify design details, including a slot width of 2 mm. Previously CPW has indicated that, while it prefers an open design process it would accept a slot

width of 5 mm. From the evidence to this hearing of Mr Bejakovich (for Fish and Game) and the March 2010 s42A report from Dr Meredith it appears that the ECan preference for a 2 mm slot width assumes that the aim of fish screening is to prevent the loss of any fish. To my knowledge it has never been established or accepted at this hearing or any other hearing that I have been associated with that this should be the aim.

8. In my previous evidence I gave the reasons for coming to my conclusions and I will not repeat them here. I will instead provide further information that reinforces my opinion.
9. Firstly I note that condition 6(a) requires conformity to the NIWA fish screening guidelines of 2007. There is an element of contradiction in quoting that document as a condition and then stating specific design parameters. I say that for two reasons: (a) The guideline, among other points, states it is intended to apply to intakes of up to 10 m<sup>3</sup>/s capacity (section 1.4), and that larger intakes 'will require extra design consideration'; and (b) it recommends (section 4.3.1 and following) a process that follows a number of steps to establish fish protection objectives before settling on specific design parameters. Neither the extra design consideration nor establishment of fish protection objectives has been done and therefore the guideline itself implies that it is inappropriate to specify slot sizes at this stage. I agree the document is helpful as a guide, and in promoting a design-process based condition I consider I have been applying it properly.
10. Secondly I point out that this topic has considerable cost implications for CPW. I have recently been shown preliminary design assessments for the Ngai Tahu Property Limited (NTPL) intake off the Waimakariri River. These indicate an increase in cost of about \$100,000 for each cumec intake capacity if the fish screen slot width is reduced from 5 mm to 2 mm. With an intake capacity at the Waimakariri River of 25 m<sup>3</sup>/s that factor would increase the cost of the Waimakariri intake by \$2.5 million. With a capacity of 30 to 40 m<sup>3</sup>/s at the Rakaia intake, that factor would increase the cost of the Rakaia intake by \$3 to \$4 million. While these are only rough orders of cost they demonstrate that the topic is of significance to CPW.
11. Thirdly I consider that my recommendation of a design-process based condition is reinforced by a recent application for funding to investigate the performance of fish screens. On 28 February 2010 Irrigation New Zealand

(INZ) lodged an application for support from the Sustainable Farming Fund of the Ministry of Agriculture and Forestry for research into the performance in the field of a range of operational fish screens in New Zealand. The application was supported by ECan, Fish and Game and Department of Conservation, among other parties. The rationale for the application included the following statements: 'very limited monitoring data exists on the effectiveness of operational fish screens in NZ ... for NZ, no comprehensive analysis of fish screen performance has been undertaken'. In my view that reinforces that it is too early to stipulate specific design parameters by way of condition.

12. Fourthly I consider the INZ application does not go far enough in that it is addressing performance of screens without assessing the needs of the fishery, i.e. before assessing the effects of the activity. Recent discussions with Mr Edwin Jansen of Ngai Tahu Property Limited (NTPL) indicate (pers comm. from his research) that existing consented water abstractions from the Waimakariri River (including NTPL) would entrain between 2% and 4% of the salmon fry in the river if intakes were completely unscreened, and less than 1% of salmon fry if screens were only 87.5% effective at screening salmon fry. We could extrapolate on a capacity basis to say that the CPW intake would remove less than 2% of the salmon fry. The loss of larger fingerlings and yearlings would be less again, and the loss of returning adults would be much less because of the high mortality of fry present in the lower reaches of the Waimakariri. Mr Jansen is not an expert in this subject, but Dr Martin Unwin, fisheries scientist with NIWA and co-author of the 2007 NIWA fish screening guideline, has accepted (pers comm.) that Mr Jansen has established that there is a case to answer. Dr Unwin has now proposed to INZ that there should be research into salmon migration and population dynamics to enable fishery scientists to assess the needs of the salmon fishery in rivers such as the Waimakariri. This proposal was directly related to fish screen design at irrigation intakes. This point further emphasises that to specify design details now would be trying to solve a problem that has not yet been defined.
13. Fifthly, it is clear that alternative forms of fish barriers might be effective. For example see the 2007 NIWA guidelines, Section 3.2. I also refer as one specific example to the fish barrier at the intake to the North Otago Irrigation Company (NOIC) scheme on the south bank of the Waitaki River. That barrier consists of a boulder bank across the intake channel, with no

screens in the traditional sense, see Figure 1. NIWA has reviewed the performance of this barrier and at the time of writing this evidence has a report in draft form. This report states that under the conditions in which NIWA reviewed its performance 'the barrier was effective for discouraging >95% of 39-60mm hatchery quinnat salmon juveniles from entering the canal'. The results, while being draft, only indicative and relating to tests over a limited range of conditions, show promise for this sort of fish barrier. Again this reinforces my opinion that it is inappropriate to specify design details for a single fish screening option for the CPW intakes.



**Figure 1: Boulder bank at intake to North Otago Irrigation Company Scheme**

14. Sixthly my discussions with fishery personnel indicate an opportunity, potentially more useful than traditional screening, for a different approach to fish protection. Dr Meredith alluded earlier in the hearing to the possibility of rearing fish in irrigation channels, and I indicated I would like to explore that possibility. Discussions with other fishery personnel indicate to me that the creation of some form of additional fish rearing habitat associated with the irrigation scheme, perhaps within the scheme or more likely as off-site mitigation, could well be a more effective form of fish protection than attempting to screen out all fish.

15. I therefore conclude that my 2008 opinion, that consent conditions should be based around a design process, is sound and is preferable to stipulating detailed design parameters at this point.
16. I will now comment on Dr Meredith's attachment to the s42A report from ECan of March 2010. Dr Meredith was not persuaded of the relevance of my use of the NTPL consenting outcomes as one of the precedents for CPW. He cited three reasons:
  - 16.1 There would be likely to be a delay in implementing the NTPL intake, allowing alternative designs and approaches to develop. I agree with that principle, and events since 2007 show the wisdom of that statement. But I note that the same argument applies to CPW, and even more so as preliminary design of the NTPL intake is now under way.
  - 16.2 There is a need to consider a wider range of fish than just salmonids. I agree.
  - 16.3 He supports an approach credited to Fish and Game of opposing 'an ad hoc incremental destruction [of the fishery] especially without substantial mitigation and compensation'. I agree. I consider it is crucial that we do not act in an 'ad hoc' manner but do a proper scientific needs assessment and then design fish screens and other mitigations to address that. Such mitigations could include off-site mitigations as one option.
  - 16.4 Therefore I conclude that the mediated solution in the NTPL case has relevant lessons for CPW fish screen requirements.
17. In conclusion these further developments have reinforced my opinion that there is a need to assess the dynamics and needs of the fishery as a starting point. That should be the source of a fish protection and exclusion specification that will in its turn lead to specific mitigations and design parameters.
18. So I attach as Appendix A two alternative proposed fish screen conditions. Option 1 is for a condition based purely on a design process with no specific design parameters. I accept this is going further than in CPW's February 2010 report on the conditions proposed by ECan, but in preparing this evidence it has become clearer to me that this is the best process to follow so that is the version I recommend. I consider that with the certification proposed and the need for ECan approval there are sufficient environmental safeguards.

Option 2 is a hybrid that the Commissioners could consider if they are reluctant to adopt Option 1. It describes a design process but also specifies some bottom line design parameters as a backstop. It includes a 5 mm slot width.

### **Bywashes**

19. Bywash discharges are addressed in consent CRC102335 under the heading: 'Discharge surplus water and contaminants from canals and distribution network to water and to land'. In its report on ECan's proposed conditions of February 2010 CPW indicated it agreed with the conditions as proposed. However I would like to indicate a minor correction and comment on Mr Maurice Duncan's report attached to ECan's s42A response of March 2010.
20. There should be a correction to Table 1 about discharges into water. The first column lists maximum operational flows, and CPW intends that they should be discharged to land, not to water. It is only the emergency peak flows to the Waimakariri and Rakaia Rivers that would discharge to water. That has been proposed all along by CPW; see my original evidence in chief, #246, and Appendix H.
21. I turn now to Mr Duncan's memorandum of 1 February 2010, attached to the ECan s42A officer's report of 5 March 2010. I want to clarify four matters.
22. Firstly in paragraphs 4 and 5 Mr Duncan refers to the 'sudden appearance' of an emergency bywash. I refer the commissioners to my response of February 2008 to the s42A officer reports, #10 to 21. In #16 of that evidence I stated 'the peak emergency flows, should they ever occur, will build up gradually to their peak in the riverbed over a period of at least 2 to 3 hours'. The mechanisms that could trigger a peak emergency discharge would make it impossible for the flow to appear suddenly. I concluded that the risk to public safety would be minor or less than minor, and should be mitigated by signs at points of public access to the rivers below the bywash points.
23. Secondly it is now further proposed that the emergency discharges should be to land in the case of the Hawkins, Waianiwaniwa, Selwyn and Hororata River locations. Depending on the final design it is possible that seepage flows could appear in these streams below the discharge points. These flows would however be even more thoroughly attenuated than described in

the paragraph above, and would be significantly reduced in both peak flow rate and total volume and, in my opinion, there would be no danger to the public. Mr Duncan has confirmed to me by telephone that when he wrote his memorandum on 1 February he was not aware that CPW is now proposing land discharge for these bywash flows, and has confirmed that he has no further concern about danger to the public.

24. Thirdly, and turning to the method of disposal, Mr Duncan favours surface flood irrigation of farmland adjacent to the channels. In my s42A response of February 2008, #20, I favoured wetlands for ecological reasons and ease of construction and maintenance. This will need to be reviewed for the larger emergency discharges and I would now favour consideration of surface flood disposal as one contribution to the solution.

I will however correct a statement of Mr Duncan in case the Commissioners were of a mind to require surface flood disposal as a whole or part solution. Mr Duncan states that 'All but one of the emergency peak flows listed in Mr Lewthwaite's table (following para 12) is of the order of the size of conventional borderdyke headrace flows and should pose no design problems'. I have to advise that typical flood (i.e. borderdyke) irrigation headrace flows are of the order of 0.35 m<sup>3</sup>/s, compared with CPW bywash emergency peak flows ranging from 1.0 m<sup>3</sup>/s up to 8.5 m<sup>3</sup>/s (for the Selwyn and tributary locations). This does not mean that surface flood disposal cannot be used but it indicates this method would not as simple as Mr Duncan assumes. I consider it is one of the options to be considered at the time of final design.

25. Finally Mr Duncan is concerned to see that monitoring be done. I refer to conditions 16 to 20 in ECan's proposed conditions of February 2010. I consider they will fulfil the requirement for monitoring.

#### **Access to riverbeds**

26. ECan's Regional Engineer has submitted on access to the riverbeds in relation to structural standards. CPW has no concerns with this request.
27. Fish and Game has raised concerns over ease of access to the riverbeds. In consent number CRC102331 (to [do works in riverbeds] for the operation and maintenance of intake structures) ECan has proposed (Condition 23) that the works 'shall not *impede* access to and along' the rivers (my italics). In consent number CRC102330 (to [do works in riverbeds] for construction

of intake structures) ECan has proposed (Condition 25) that the works 'shall not *prevent* access to and along' the rivers (my italics). In its report of February 2010 CPW indicated it would prefer the word 'prevent' for CRC102331 as well as CRC102330.

28. The reasons for CPW's concern relate to both safety and practicality. Particularly during construction there will be extended times when it would be impractical to maintain existing access routes in their existing state, and there will be times when it would be unsafe for there to be public access through construction works. Access will therefore be impeded. This situation will apply to a lesser extent during maintenance and operation, but there will be times, for example when a terrace canal needs to be cleaned, that access through a normal route will be hindered.
29. However I consider it is realistic for CPW to provide access near existing access points at all times, during both construction and operation, and for this to be suitable for the sorts of vehicles that currently access the riverbed.
30. I propose that the condition for both consents should be either 'the works shall not *prevent* access to and along' the rivers, or alternatively for CRC102331 something like 'the works shall not *unreasonably impede* access to and along' the rivers.

**Appendix A**

**Alternative fish screen conditions suggested by CPW**

## As proposed by CPW: Option 1

1. Fish screens or deflection barriers shall be installed and maintained on the intake works.
2. The objectives of fish screening shall be to exclude all adult eels, galaxiids and salmonids and the majority of juveniles of these species and return them safely to the main stem of the Rakaia River downstream from the intake, or such other objectives as are established in consultation with Fish and Game New Zealand and Department of Conservation.
3. Fish screen approval process
  - (a) Prior to designing the fish screens the consent holder shall obtain a report from a suitably qualified expert/s on the needs of the fisheries of the river to confirm or amend the objectives in Condition 2. The consent holder shall consult with Fish and Game New Zealand and Department of Conservation in preparation of this report and shall forward the report to the Canterbury Regional Council.
  - (b) Prior to the taking of water pursuant to this consent, the consent holder shall install, operate and maintain a fish screen (“the screen”) or deflection barrier across the intake designed in accordance with the certified plans approved by a person duly authorised by the Canterbury Regional Council in accordance with Condition 3(f).
  - (c) The screen or deflection barrier shall, as far as practicable, achieve the objectives of Condition 2 and for the purposes of this condition this shall be achieved by installing, operating and maintaining a fish screen or deflection barrier in accordance with the certified design plans referred to in Condition 3(e).
  - (d) The design plans for the screen or deflection barrier shall be certified by: a suitably qualified engineer with experience in the design and operation of fish screens and deflection barriers; and a fisheries biologist with knowledge of salmonid and native fisheries (“the Certifiers”).
  - (e) Prior to the commencement of construction of the fish screen or deflection barrier, the consent holder shall provide to the Canterbury Regional Council:
    - (i) The certified design plans including the screen or deflection barrier slot/aperture size, sweep velocity, approach velocity and an effective by-pass which returns fish to an actively flowing braid of the river;
    - (ii) A report from the Certifiers which certifies the design and operation of the screen or deflection barrier:
      - Demonstrates best practice in achievement of Condition 3(c);
      - Takes into consideration regional or national guidelines in relation to fish screen and/or deflection barrier design and/or any international guidelines that the Certifiers consider relevant.
  - (f) A person duly authorised by the Canterbury Regional Council shall give written notice to the consent holder stating whether or not it approves of the certified design plans within 20 working days of receipt of the plans and the certifiers report referred to in Condition 3(e) and such approval shall not be unreasonably withheld.
  - (g) The consent holder shall, prior to commissioning, provide a certificate from a suitably qualified person confirming that construction of the screen or deflection barrier has occurred in accordance with the certified design plans approved in accordance with Condition 3(f).

4. Each fish screen shall be inspected at maximum intervals of two days for any damage causing openings greater than those specified in **Condition 3(e)(i)**, or once every 24 hour period when the flow in the **Rakaia** River is greater than **300** cubic metres per second, as estimated by Canterbury Regional Council, from measurements at either the gorge recorder site (at or about map reference NZMS 260 K35:015-424) or the recorder site at Fighting Hill (at or about map reference NZMS 260 K35:997-437).
5. In the event that a screen is damaged such that the screen mesh aperture is greater than those specified in **Condition 3(e)(i)**, the screen shall be repaired or replaced as soon as practicable or the damaged screen shut down. Any screen shut down shall not be opened again until a screen that complied with **Condition 3(e)(i)** is fitted.
6. The incidence of screen shutdowns shall be recorded and reported to the North Canterbury Fish and Game Council as soon as practicable. Records of screen failure shall be forwarded to Canterbury Regional Council at the end of each irrigation season, or as requested.

## As proposed by CPW: Option 2

1. Fish screens or deflection barriers shall be installed and maintained on the intake works.
2. The objectives of fish screening shall be to exclude all adult eels, galaxiids and salmonids and the majority of juveniles of these species and return them safely to the main stem of the Rakaia River downstream from the intake, or such other objectives as are established in consultation with Fish and Game New Zealand and Department of Conservation.
3. Fish screen approval process
  - (a) Prior to designing the fish screens the consent holder shall obtain a report from a suitably qualified expert/s on the needs of the fisheries of the river to confirm or amend the objectives in Condition 2. The consent holder shall consult with Fish and Game New Zealand and Department of Conservation in preparation of this report and shall forward the report to the Canterbury Regional Council.
  - (b) Prior to the taking of water pursuant to this consent, the consent holder shall install, operate and maintain a fish screen (“the screen”) or deflection barrier across the intake designed in accordance with the certified plans approved by a person duly authorised by the Canterbury Regional Council in accordance with Condition 3(g).
  - (c) The screen or deflection barrier shall, as far as practicable, achieve the objectives of Condition 2 and for the purposes of this condition this shall be achieved by installing, operating and maintaining a fish screen or deflection barrier in accordance with the certified design plans referred to in Condition 3(e).
  - (d) The design plans for the screen or deflection barrier shall be certified by: a suitably qualified engineer with experience in the design and operation of fish screens and deflection barriers; and a fisheries biologist with knowledge of salmonid and native fisheries (“the Certifiers”).
  - (e) Prior to the commencement of construction of the fish screen or deflection barrier, the consent holder shall provide to the Canterbury Regional Council:
    - (i) The certified design plans including the screen or deflection barrier slot/aperture size, sweep velocity, approach velocity and an effective by-pass which returns fish to an actively flowing braid of the river;
    - (ii) A report from the Certifiers which certifies the design and operation of the screen or deflection barrier:
      - Demonstrates best practice in achievement of Condition 3(c);
      - Takes into consideration regional or national guidelines in relation to fish screen and/or deflection barrier design and/or any international guidelines that the Certifiers consider relevant.
  - (f) As a minimum requirement and unless established otherwise by the expert/s referred to in Condition 3(a) the fish screen shall have the following provisions:
    - (i) the fish screen shall cross the full width of the irrigation canal to prevent fish bypassing the screen into the canal;
    - (ii) the screen material voids shall be a mesh with maximum width of 5 mm;
    - (iii) the screens shall have an approach velocity perpendicular to the screen surface of no greater than 0.12 metres per second;

- (iv) the sweep velocity across the screens shall exceed the approach velocity;
  - (v) an effective bypass system shall be maintained at all times that water is diverted into the scheme, to ensure unrestricted passage is maintained to and from an active braid of the river.
- (g) A person duly authorised by the Canterbury Regional Council shall give written notice to the consent holder stating whether or not it approves of the certified design plans within 20 working days of receipt of the plans and the certifiers report referred to in **Condition 3(e)** and such approval shall not be unreasonably withheld.
- (h) The consent holder shall, prior to commissioning, provide a certificate from a suitably qualified person confirming that construction of the screen or deflection barrier has occurred in accordance with the certified design plans approved in accordance with **Condition 3(g)**.
4. Each fish screen shall be inspected at maximum intervals of two days for any damage causing openings greater than those specified in **Condition 3(e)(i)**, or once every 24 hour period when the flow in the **Rakaia** River is greater than **300** cubic metres per second, as estimated by Canterbury Regional Council, from measurements at **either the gorge recorder site (at or about map reference NZMS 260 K35:015-424) or the recorder site at Fighting Hill (at or about map reference NZMS 260 K35:997-437)**.
5. In the event that a screen is damaged such that the screen mesh aperture is greater than those specified in **Condition 3(e)(i)**, the screen shall be repaired or replaced as soon as practicable or the damaged screen shut down. Any screen shut down shall not be opened again until a screen that complied with **Condition 3(e)(i)** is fitted.

The incidence of screen shutdowns shall be recorded and reported to the North Canterbury Fish and Game Council as soon as practicable. Records of screen failure shall be forwarded to Canterbury Regional Council at the end of each irrigation season, or as requested.