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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SUPPLEMENTARY EVIDENCE OF GREGORY PETER BURRELL IN RESPONSE TO COMMISSIONER'S MINUTE NO. 4

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INTRODUCTION

1. My name is Gregory Peter Burrell. My qualifications and experience, and the basis on which I prepared this brief, are set out in my main brief of evidence prepared for this hearing (dated January 2008). I have prepared this supplementary brief of evidence to address matters raised in the the Commissioner's Minute, dated 6 June 2008.

2. The key area I have been asked by Central Plains Water (CPW) to comment on is the effect of proposed mitigation measures for the Waimakariri River take on ecological values.

FLOW SCENARIOS BEING COMPARED

3. I have looked at hydrological statistics for the Waimakariri River Old Highway Bridge site under five different flow scenarios. The flow series were provided by URS, and are as follows:

   A. **Unmodified.** River flow with no abstraction. This is the flow series that was computed by Mr de Joux, and is the measured river flow with known water takes added in.

   B. **Existing.** The above "No Takes" flow series with known water takes removed. It may also be thought of as the "pre CPW" river flow.

   C. **CPW1.** This is the 20-40-230 CPW abstraction scenario referred to in Mr Tipler's main brief of evidence. Its hydrological statistics are directly comparable to those presented in my main brief of evidence.

   D. **CPW2.** This is the 20-40-243 CPW abstraction scenario that involves CPW taking the first 10 m^3/s of Class B water (i.e., flows between 63 and 73 m^3/s), then 1:1 sharing for higher flows. It is the mitigation being offered by CPW and is discussed in Mr Tipler's supplementary evidence.

   E. **CPW3.** This is the water take scenario proposed by Mr de Joux, and involves a minimum flow of 100 m^3/s for Class B water.

EFFECTS OF THE DIFFERENT FLOW REGIMES

Habitat Availability

4. As discussed in my evidence in chief and in the evidence of others (e.g., Drs Hayes and Glova), habitat availability typically varies with flow, and median flow is the commonly used flow index to represent habitat availability under average, or most commonly occurring flow conditions. Examination of flow duration curves (Figure 1) shows negligible (<1 m^3/s) difference in median flow between flow scenarios CPW1 and CPW2 (i.e., the CPW base case and mitigation option). Thus, the proposed mitigation would, on average, result in no net change to habitat availability. However, when summer-only data (December to March inclusive) is included, median flow increases from 41 to 45 m^3/s (Figure 1). Thus, the proposed mitigation would result in a small increase in habitat availability for some species.

5. In Tables 8 to 16 of his evidence in chief, Dr Hayes compared the habitat available for various species under different water abstraction regimes. Due to time constraints, I was unable to compare habitat retention for the CPW2 mitigation option with the base case (CPW1) and Fish and Game mitigation option (CPW3) shown in Dr Hayes' evidence. However, I anticipate that this data will be presented later in the hearing.

Flow Variability

6. Further analysis of the flow duration curves attached show that for the important summer period (when biological activity is greatest), there is no difference between flow scenarios CPW1-CPW3 for flows ≥76 m^3/s. Given that biologically important floods most likely occur at flows well over 80 m^3/s (as discussed in my summary evidence presentation), there is no difference between flow scenarios CPW1-CPW3 in their effects on flood frequency.

7. Figure 2 attached to my evidence shows that following flood events, water abstraction (both existing and proposed) results in flows in the Waimakariri River declining more rapidly than would occur naturally. Figure 2 also shows that mitigation option CPW2 will have less of an effect on flows than the CPW1 base case, such that inter-flood accrual periods will be slightly shorter (giving less time for periphyton accrual). Mitigation option CPW3, put forth by Fish and Game, will have a similar, but more substantial effect on the hydrograph, with

flows more closely resembling the existing flow regime than CPW1 or CPW2 when flows exceed 76 m^3/s.

ECOLOGICAL IMPLICATIONS

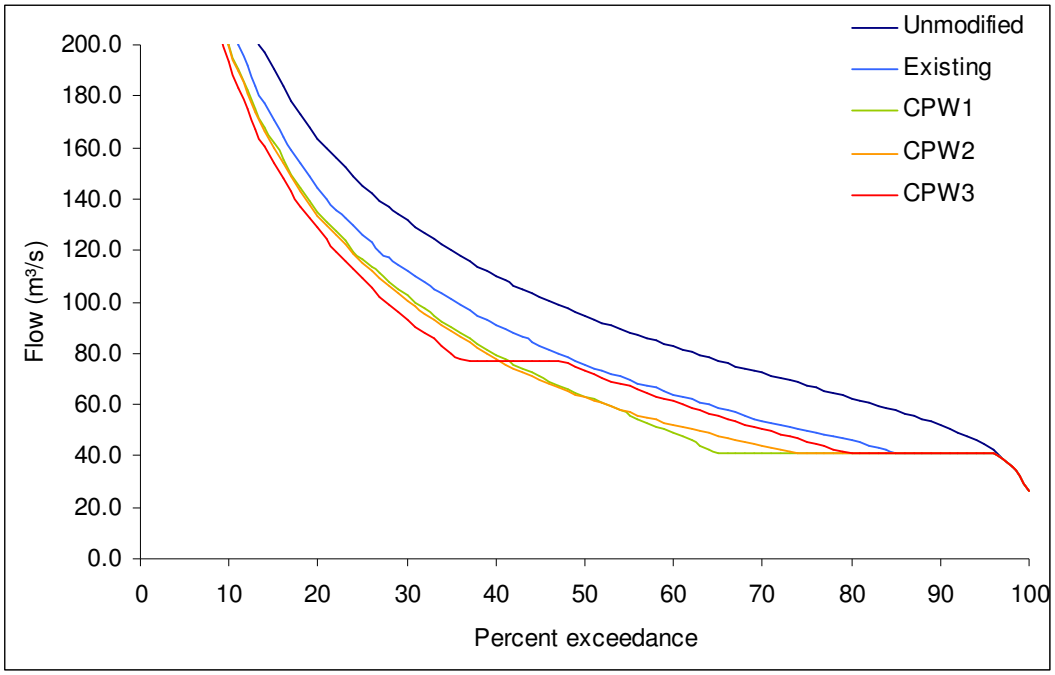
8. A key assumption when assessing the effect of water abstraction on habitat availability is that habitat is limiting. However, flood disturbance is typically the key factor limiting biological communities in braided rivers such as the Waimakariri River. Thus, periphyton biomass is low, and densities of invertebrates and fish are typically also low in braided rivers relative to the amount of potential habitat available. It is therefore not valid to assume habitat is limiting in the Waimakariri River. Similarly, it does not necessarily follow that reduced habitat availability will equate to reduced densities of invertebrates, fish or birds, when increased inter-flood accrual periods may in fact improve productivity (as discussed in my main brief of evidence).

9. Overall, the ecological implications of proposed CPW mitigation option CPW2 is that there will be some more habitat available for the biota to inhabit, principally during summer. However, as discussed above, this assumes that habitat is limiting, whereas it is my opinion that flood frequency and the length of inter-flood accrual periods are more important for the biota of the Waimakariri River.

10. As discussed in my main brief of evidence, the CPW1 base case scenario is expected to result in a minor increase in periphyton biomass, but not to nuisance levels, along with a minor increase in the abundance of chironomid midge invertebrates and an overall increase in invertebrate productivity. The CPW2 mitigation option will reduce the length of inter-flood accrual periods relative to the CPW1 base case scenario, which is expected to result in less periphyton accrual and less of a shift towards chironomids.

GP Burrell, 4 July 2008

All data



Summer data – December to March inclusive

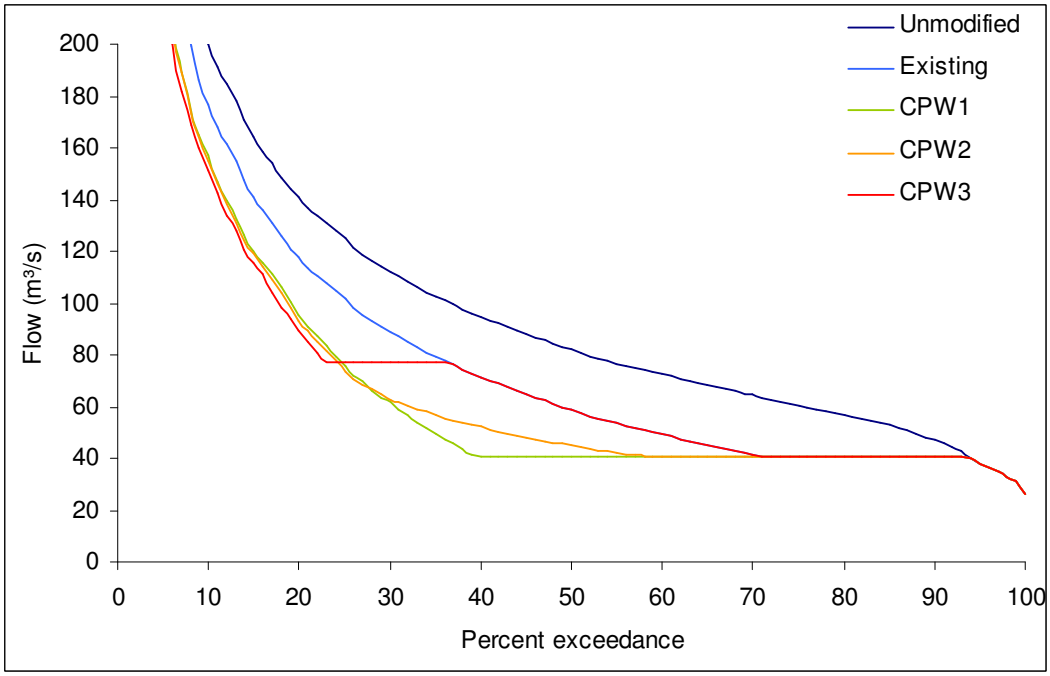


Figure 1: Flow exceedance curves for the Waimakariri River Old Highway Bridge site (1967-2001). Data provided by URS New Zealand Ltd.

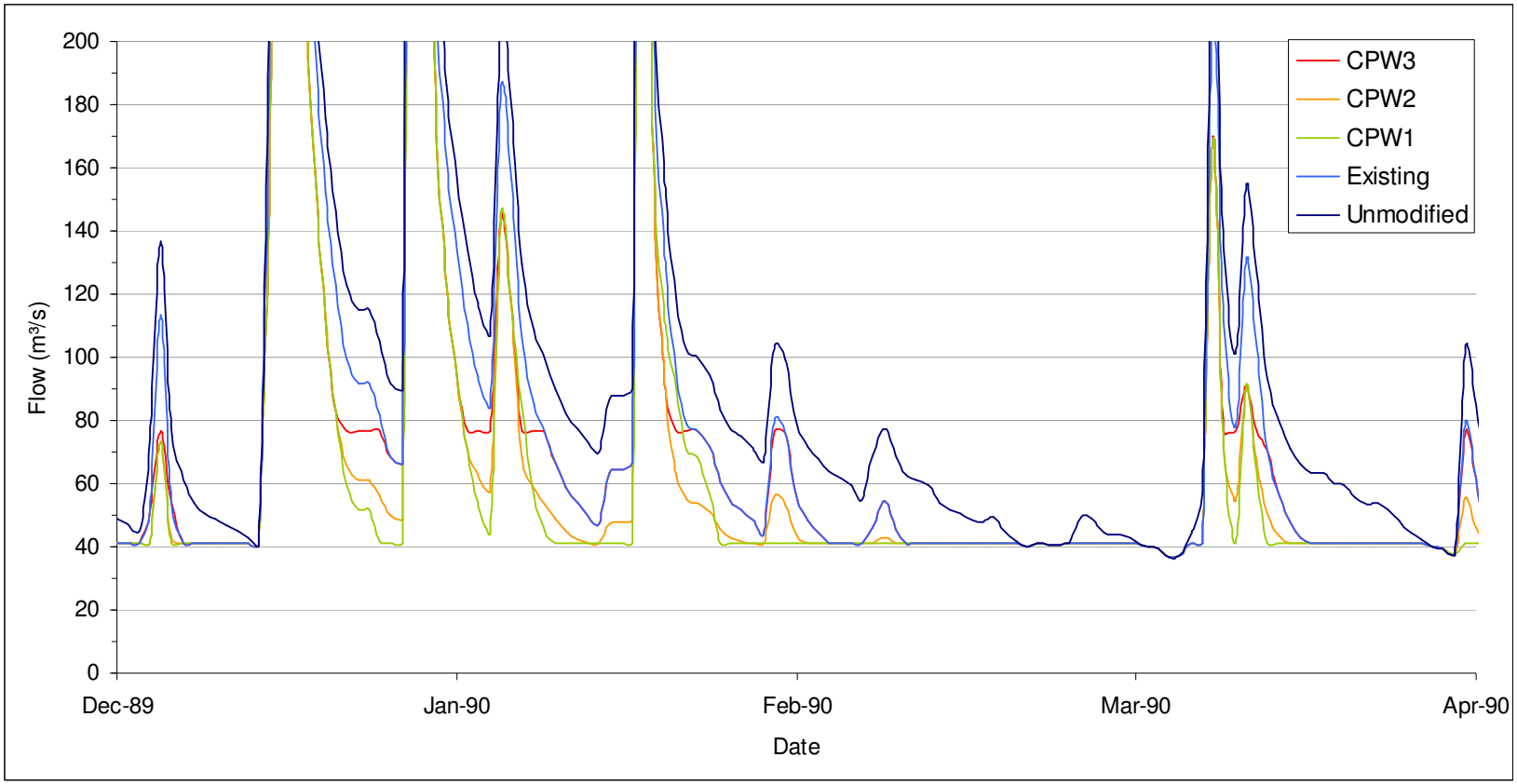


Figure 2: Hydrograph for the Waimakariri River Old Highway Bridge site for the summer period of a typical flow year (1989/1990). Data provided by URS New Zealand Ltd.