

EXPERT CONFERENCE — HYDROLOGY – ORARI-TEMUKA-OPIHI-PAREORA SUB-REGION

Submitters — 382, 385

Topic: Proposed Plan Change 7 to the Canterbury Land and Water Regional Plan

Date of conference: 7 August 2020

Venue: George Jenkins Room, Breakfree Hotel, 165 Cashel Street, Christchurch





Facilitator: N/A

Recorder: Alanna Hollier

1. The Hearing Panel for Proposed Plan Change 7 to the Canterbury Land and Water Regional Plan (**PC7**) directed in its Minute of 19 May 2020 that expert witness conferencing shall occur in respect of Hydrology - Orari-Temuka-Opihi-Pareora Sub-Region in relation to submissions against PC7.

Attendees

2. Witnesses who participated and agreed to the content of this Joint Witness Statement (**JWS**):

Name	Employed or engaged by	Signature
Daniel Clark	Canterbury Regional Council	
Keri Johnston	Opihi Flow and Allocation Working Party	
Dr Tim Kerr	Adaptive Management Working Group	
Richard Measures	Adaptive Management Working Group	

Environment Court Practice Note

3. All participants confirm that they have read the Environment Court Consolidated Practice Note 2014 and in particular Section 7.1 (Code of Conduct) and Appendix 3 - Protocol for Expert Witness Conferences and agree to abide by it.
4. Daniel Clark acknowledges that he is an employee of the Canterbury Regional Council. Notwithstanding that, Daniel Clark confirms that he prepared and will present his evidence as an independent expert and in compliance with the Code of Conduct.
5. Keri Johnston acknowledges she is a member of Opihi Flow and Allocation Working Party. Notwithstanding that, Keri Johnston confirms that she prepared and will present her evidence as an independent expert and in compliance with the Code of Conduct.
6. Dr Tim Kerr acknowledges that he is engaged by the Adaptive Management Working Group. Notwithstanding that, Dr Tim Kerr confirms that he prepared and will present his evidence as an independent expert and in compliance with the Code of Conduct.
7. Richard Measures acknowledges that he is engaged by the Adaptive Management Working Group. Notwithstanding that, Richard Measures confirms that he prepared and will present his evidence as an independent expert and in compliance with the Code of Conduct.

Experts' qualifications and experience

8. These are set out in each experts' evidence. For Daniel Clark of the Canterbury Regional Council, this is set out in Appendix A of the Plan Change 7 section 42a report.

Purpose of expert conference

9. The purpose of the conference is to assist the Hearing Panel by responding to a series of questions, agreed by the experts as the conference progressed, relating to Hydrology – Orari-Temuka-Opihi-Pareora Sub-Region and associated issues.
10. For each section, the experts state matters on which they agree and on which they do not agree, with reasons.
11. The experts note that Ecology - Orari-Temuka-Opihi-Pareora Sub-Region is addressed in a separate JWS and the two need to be read together.

Proposed plan provisions relevant to this conference

12. The draft agenda drafted by the experts set out the following plan provisions which are stated as being relevant (at a high-level) to this conference.

- a. Table 14(m) (North Opuha)
- b. Tables 14(n) and (o) (South Opuha)
- c. Tables 14(p) and (q) (Upper Opihi)
- d. Tables 14(r) and (s) (Te Ana Wai)
- e. Table 14(ua)
- f. Tables 14(v) and (w) (Opuha/Opihi Mainstem)
- g. Table 14(x) (Alternative Management)
- h. Policy 14.4.35(e)

Definitions

13. The experts agreed and relied on the definitions set out below for the purpose of the topics discussed at this expert conference:
- a. 'Pro-rata partial restriction' – amount of water above minimum flow that is available for abstraction.
 - i. E.g. If minimum flow is 100L/s and the recorded flow is 110L/s then 10L/s is available for abstraction.
 - b. 'Water availability' – The proportion of the allocation that is available and does not include demand considerations. This can be calculated over different time periods and can be reported as volume, rate or percentage of time.
 - i. Preference is to use the term 'availability', rather than the broad term 'reliability'.
 - ii. The exact metric used to define 'water availability' is dependent on what you are trying to evaluate.

Preliminary matters discussed by the experts

General approach

14. Not all experts present will be commenting on each topic throughout the expert conferencing. Involvement of experts will be noted at the beginning of each topic section.

Environmental Flow, Allocation and Partial Restriction Regimes

15. Comments within this section (Environmental Flow, Allocation and Partial Restriction Regimes) have been discussed and decided by Daniel Clark and Keri Johnston. Richard Measures and Dr Tim Kerr provided no comment to the matters in this section.
16. Discussion does not include the hydrological benefits of specific minimum flow numbers. Comment is provided on the current consented allocation on each block rather than limits that may apply to tables within the Plan.
17. There is a large amount of complexity in the allocation, within the Opihi catchment. This is due to combinations of consented allocation versus shareholding agreements, dual minimum flows and combinations of consents sharing rates and volumes.
18. Also, it is currently possible for shares to be leased which impacts how consents are accounted for within the allocation. Discrepancy between expert evidence is due to access to up to date share information. The allocations agreed reflect the current shareholding and lease agreements as of today, 7 August 2020.
19. Agreement has been reached on the following tables of current allocations. Allocations are in l/s and have been rounded to the nearest l/s.

Waterbody	AA	BA	AN	BN	Community Supply	Total
North Opuha	61	7	187	20	8	283
South Opuha	0	634	0	200	97	931
Upper Opihi	0	423	97	202	122	844
Te Ana Wai	250	2	9	722	96	1079
Lake Opuha Tributaries	0	39	0	254	0	293
Lake Opuha	0	33	0	0	0	33
Opuha River and Opihi Mainstem	2922	4213	1161	264	581	9141
Total	3233	5351	1454	1663	904	12604

Waterbody	A	Currently not in a block	Community supply	Total
Milford Lagoon/ Clandeboye	222	87	0	309

20. The Milford Lagoon/Clandeboye allocation is not affected by the Opihi River allocation, and does not have the same categories of consents.

21. For the Unnamed Stream, that was previously accounted for within the South Opuha, it is agreed that this should be reflected within the Lake Opuha tributaries, and this is reflected within the agreed table above.
22. The Lake Opuha tributaries (Station Creek, Deep Creek and Unnamed Stream) will be dealt with separately. There are currently no consents associated with Ribbonwood Creek.
23. The allocation for Deep Creek is captured within CRC991991.1, and therefore does not need to be accounted for separately.
24. For Te Ana Wai flows, all gauging's undertaken by all parties show a loss downstream of Cave. Recent gauging done by the Opihi Flow and Allocation Working Party (FAWP) in 2019 indicates a lower loss downstream of Cave than previously recorded and estimated. The loss is variable, even across the same (irrigation) season.
25. As the Te Ana Wai has abstraction upstream and downstream of the minimum flow recorder site, the residual flow in the losing reach will be impacted by all abstractors, while the minimum flow restrictions are only impacted by the abstraction upstream.
26. Residual flows downstream of all abstractors are driven by both the losses and abstraction, Daniel Clark and Keri Johnston agree on these points, but cannot comment on the suitability of a partial restriction regime required to meet instream needs.

Compliance Monitoring

27. Compliance monitoring matters were discussed and agreed by all experts present.
28. As mentioned in paragraph 17 in regard to allocation, complexity is added to by the alternative mainstem flow regime put forward by both parties.
29. Tributary abstractors have restrictions on both the main stem and the tributary that they are abstracting from. It currently operates on a 24-hour (daily) time step. Using a different averaging time period on the mainstem compared to the tributaries creates additional compliance monitoring complexity.

Opihi FMU Allocation Limits

30. As described in the table in paragraph 19, Daniel Clark and Keri Johnston have agreed on the total current consented allocation but noting that there is some headroom in the notified BN allocation.

Artificial Freshes

31. Comments within this section (Artificial Freshes) have been discussed and decided by Daniel Clark, Richard Measures and Dr Tim Kerr. Keri Johnston provided no comment to the matters in this section.
32. Agreement was reached that the peak flow and volume of an artificial fresh decreases as it travels downstream from the dam. River reaches differ in terms of hydrological characteristics. The Opuha River is strongly controlled by the dam and has very few natural freshes. Artificial freshes have little attenuation in the Opuha gorge and attenuate gradually between the gorge and the Opihi River confluence. The Opihi River experiences natural freshes due to the large non-dammed tributaries that flow into the river. Artificial freshes are rapidly attenuated within the Opihi River.
33. The existing dam infrastructure limits the peak flow and how long that peak flow can be sustained. These limitations are influenced by the volume of water that can be stored in the regulation pond prior to a flush, the infrastructure of the downstream weir and the rate at which water can be released from the main dam into the regulation pond.
34. There is little evidence as to the effectiveness of artificial freshes for opening the river mouth. The flow reaching the mouth will be impacted by the attenuation upstream and the flow contribution from the tributaries.
35. Any requirement to calculate a peak flow or volume of an artificial fresh has to have a specific location due to the attenuation downstream. To capture the contribution from Opuha Dam, the peak flow or volume would be measured at the Downstream Weir Flow Recorder.
36. Flushing flows require large volumes of water. This volume has greater significance during times of water shortage.

Environmental Flow, Allocation and Partial Restriction Regimes: Alternative Management Regime Thresholds

37. Comments within this section (Environmental Flow, Allocation and Partial Restriction Regimes: Alternative Management Regime Thresholds) have been discussed and decided by Daniel Clark and Dr Tim Kerr. Richard Measures has only agreed to the matters in paragraph 40, and has no comments on other matters in this section. Keri Johnston provided no comment to the matters in this section.
38. There are two models that model the effect of the different flow regimes on lake levels, river flows and water availability. The two models are comparable but are based on different assumptions.

- a. A key difference is that the Canterbury Regional Council model assumes that abstractors use their full allocation, where available. Whereas the Adaptive Management model considers demand based on existing shareholdings.
 - b. We agree on the differences outlined in the paragraph 10.2 of Dr Tim Kerr's evidence, and that they capture the main differences in the models.
39. The experts agree that including a seasonally varying lake level trigger has advantages for adapting to periods of water shortage. Due to the historic and potential future changes in lake level management, the experts have not agreed on a preferred methodology for setting these triggers.
40. Artificial freshes have a significant impact on the duration that the lake is empty and exacerbate the extreme low flows modelled under the section 42a report flow regime. Different assumptions around how to interpret the artificial freshes rule would influence the significance of this effect.
41. The experts agree that increases in the Te Ana Wai and Upper Opihi tributaries equate to some increase at Saleyards Bridge. There is difference in opinion between the experts as to the magnitude of this increase.
42. The experts agree it is reasonable to have a consistent methodology for setting trigger thresholds, both methods use a similar approach but differ in terms of distributions chosen.
43. The experts agree that the requirement of two thresholds being met to enter a reduced flow regime captures the hydrological influences on the lake. If there is a two threshold requirement to remain in the regime then there is a risk of exiting the regime when inflows increase but the lake remains extremely low.
44. It is acknowledged that conditions in the catchment can change quite rapidly and there may be occasions where there is desire to exit a restrictive flow regime. The frequency of the assessment of trigger thresholds affects the adaptability to rapidly changing conditions.