Josephine Laing

From: Graham Fenwick <graham@akomoana.co.nz>
Sent: Friday, 18 September 2020 3:00 PM
To: Plan Hearings
Subject: RE: Final Hearing Schedule - Amendment to Week 1 times - Proposed Plan Change 7 to the CLWRP and Proposed Plan Change 2 to the WRRP
Attachments: Submitter 339 Rebuttal evidence of Graham Fenwick FINAL.pdf

Hi Tavisha & team.

Please find attached my rebuttal evidence for PC7.

Thank you.

Cheers

Graham.

Graham Fenwick

On 2020-09-15 13:57, Plan Hearings wrote:
> Kia ora Graham
>
> Unfortunately the document server for ECan is down at the moment,
> internally and externally, which means I can't access the document to
> send you either.
>
> The IT team are working as hard as they can on a fix, I will let you
> know when it is back up again.
>
> Kind regards
>
> Josephine Laing
>
>
> On behalf of
> Tavisha Fernando
>
> -----Original Message-----
> From: Graham Fenwick [mailto:graham@akomoana.co.nz]
> Sent: Tuesday, 15 September 2020 9:35 AM
> To: Plan Hearings <planhearings@ecan.govt.nz>
> Subject: Re: Final Hearing Schedule - Amendment to Week 1 times -
> Proposed Plan Change 7 to the CLWRP and Proposed Plan Change 2 to the
> WRRP
>
> Hi Tavisha.
>
> Please email me the most recent hearings schedule for Plan Change 7;
> the link in your email and on the webpage appears broken.
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BEFORE THE PROPOSED NATURAL RESOURCES PLAN HEARINGS PANEL

IN THE MATTER	of the Resource Management Act 1991
AND	
IN THE MATTER	Proposed Plan Change 7 to the Canterbury Land and Water Regional Plan

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STATEMENT OF REBUTTAL EVIDENCE OF GRAHAM DAVID FENWICK

SUBMITTER 339

18 September 2020

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1. INTRODUCTION

1.1 My name is Graham David Fenwick. I am a biologist with over 40 years' experience as a practicing researcher. My academic qualifications are a BSc, MSc and PhD, all in aquatic ecology, and a post-graduate Diploma of Business Administration. I have worked for NIWA as a scientist for 20 years (since 1998), latterly in the role of Assistant Regional Manager, Christchurch, and now mostly retired. I have also worked as a biodiversity scientist involved in environmental investigations for Memorial University of Newfoundland (Canada), the Australian Museum (Sydney), and the University of Canterbury. My specialist areas are aquatic invertebrate biodiversity and the ecology of aquatic sediments.

2. CODE OF CONDUCT

2.1 I have read the Environment Court of New Zealand Practice Note 2014 and have prepared this evidence in accordance with it. My evidence in this statement is within my area of expertise. I have not omitted to consider all material facts known to me that might alter or detract from the opinions which I express. I have qualified my opinions wherever I consider there is uncertainty.

3. SCOPE

3.1 I have provided rebuttal discussion on the Officers' Section 42A Report and Recommendations Report on PC7.

4. RESPONSES TO OFFICERS' RECOMMENDATIONS ON MY SUBMISSION POINTS

4.1 **Section 2 (9):** 11. Definition of Water Body.
Response accepted, no further discussion.

4.2 **Section 2 (9):** 11. Definition of Indigenous Freshwater Species Habitat.
Response accepted: Changed to Critical Habitat of Threatened Indigenous Freshwater Species.

4.3 **Section 4 (Table 1):** 15-16. Lack of table of Freshwater Outcomes for Canterbury Groundwater.
Response partially accepted ("not "on" PC7").

4.3.1 I understand that this point cannot be redressed as part of PC7. I raise the matter because it reflects the need for a paradigm shift in policy for managing Canterbury's (and all/most other regions') groundwaters.

4.3.2 Current policy and management practice appears based on the proposition that groundwater is simply a physical resource (albeit a complex one) with chemical properties. Available evidence is clear that this is no longer true.

4.3.3 Because all groundwaters contain diverse forms of life (microbes to large crustaceans; collectively biodiversity) that comprise functional ecosystems that play a role in groundwater water quality and aquifer transmissivity (e.g., see Fenwick et al. 2018), they must be managed to sustain this biodiversity.

4.3.4 Therefore, groundwaters must be managed in much the same way as rivers and streams, with the top priority being sustaining their biodiversity and ecosystems.

4.3.5 This will require very substantial revision of Canterbury's entire approach to managing groundwater. Difficult and challenging as that may be, especially given the scarcity of empirical research on groundwater ecosystems, it is clear that NZ Government legislation and policy (see below) requires that this change is implemented. And that implementation is overdue.

4.4 **Section 4 (61A):** 18. Preserve indigenous freshwater biodiversity within water bodies.
Response partially accepted ("not "on" PC7"); see 4.3.1 - 4.3.5 and further discussion below.

4.5 **Section 4 (99):** 19. Managed aquifer recharge conditions.
Response <u>not</u> accepted.

4.5.1 As noted in my submission and evidence and acknowledged by the Section 42A Report, Canterbury aquifers contain substantial biodiversity and functioning ecosystems, as in most oxic aquifers elsewhere in New Zealand and world-wide. Much of this aquifer biodiversity appears endemic to individual aquifers. However, Policy 4.99 provides inadequate protection for this groundwater biodiversity, ecosystems and ecosystem processes from managed aquifer recharge (MAR).

4.5.2 The threats and risks identified in my submission were largely dismissed within the Section 42A Report. The primary reason given for not including consideration of groundwater biodiversity and ecosystems was that “proposed MAR provisions relate solely to the capture of clean surface water” (Section 42A Report, 7.56, pp. 147-148). “Clean surface water” remains undefined, but almost certainly does not include free from all invertebrate life and all substances known as potentially harmful to invertebrates and other organisms.

4.5.3 The Section 42A Report noted that the “proposed MAR provisions relate solely to the capture of clean surface water … Accordingly, the proposed rules only apply to the take and use of surface water for MAR” (7.56, p. 148). However, I note that PC7’s definition of MAR (“means an activity that is for the express purpose of improving the quality and/or quantity of water in a receiving groundwater aquifer or a hydraulically connected surface water body”) does not exclude using groundwater as a source for MAR water. Nor have I found any other definition or part of the policy that constrains the source of water for MAR to surface waters.

4.5.4 The Section 42A Report interpreted my submission points on MAR as concern only for biosecurity (or genetic) risks when MAR involved direct transfers of water between aquifers. It overlooked my explicit concern over indirect exchanges between aquifers (e.g., via surface water), which can facilitate the migration of invertebrates from one aquifer to another.

4.5.5 There is no explicit consideration or evaluation of any potential or actual effects of MAR on biodiversity and ecosystem processes.

4.5.6 Instead, the Section 42A Report considered that “information about the quality of the surface water used for recharge and an assessment of effects on groundwater quality” (based on technical advice received by the Officers) would be adequate for ensuring no potential adverse effects to groundwater biodiversity, ecosystems and ecosystem processes. However, I find the Policy is lacking in that respect. Its objective, “Improve the quality and/or quantity of groundwater” is the only mention of water quality in the recharged aquifer and offers an either or option, not just improving water quality.

4.5.7 Even if water quality is considered (as it is in Policy 5.191: “The application demonstrates that the proposal will not degrade groundwater quality” consolidated Officer Recommendations: 58), there is no

guidance on the water quality attributes (and acceptable concentrations) that must be considered in determining that groundwater quality will be improved and not harmful to groundwater biodiversity.

4.5.8 Further, it is well known that water quality measurement does not integrate over time (i.e., substances present at the time of sampling and their concentrations at that time only can be measured), whereas concentrations of most dissolved substances vary over time and some contaminants may appear as brief pulses only. Thus, unless the water quality data quality includes concentrations of numerous attributes at measured at close intervals over several annual cycles, water quality alone will provide an inadequate basis for assessing potential effects.

4.5.9 This approach of using water quality for assessing the likely effects on an ecosystem is very different from that taken by ECan and all other agencies when considering the potential effects of an activity on any surface water body. Biodiversity and ecosystem effects are considered very carefully for all activities in surface waters. Within the proposed provisions for managing MAR in Canterbury, however, some assessment of effects on some water quality attributes is deemed sufficient for groundwaters, even though much of the biodiversity is endemic to single aquifers, and “are vital parts of the natural environment” (Technical Advice within Section 42A Report: 148) in sustaining water quality and aquifer transmissivities.

4.5.10 The New Zealand Conservation Act 1987 and the New Zealand Biodiversity Strategy 2000 require regional councils to ensure that the intrinsic and other values of all biodiversity (including that of “underground aquifers”) are adequately maintained and safeguarded for future generations (DoC 2000: 45).

4.5.11 The Vision Statement for Canterbury’s biodiversity strategy states that the “Canterbury community values and cares for the region’s biodiversity and accepts the shared responsibility to work together to ensure it is sustained and enhanced, both now and into the future” (ECan 2008: 4). Its stated outcome is that “there is a full range of healthy ecosystems stretching from the mountains to the sea, reflecting the unique and diverse natural character of the Canterbury region” (ECan 2008: 4). No exception is made for aquifers or groundwater biodiversity or GEs.

4.5.12 Goal 1 of the Canterbury region’s biodiversity strategy (“Protect and

maintain the health of all significant habitats and ecosystems", ECan 2008: 5) similarly requires that aquifers and groundwater ecosystems are protected and their ecological health sustained.

4.5.13 Section 30 of the RMA requires "the maintenance of ecosystems in water bodies" and "the maintenance of indigenous biodiversity". It includes aquifers within its definition of Waterbody.

4.5.14 Similarly, the Canterbury Land and Water Regional Plan includes aquifers as one type of waterbody, and its Objective 3.8 states: "The quality and quantity of water in fresh water bodies and their catchments is managed to safeguard the life-supporting capacity of ecosystems and ecosystem processes, including ensuring sufficient flow and quality of water to support the habitat and feeding, breeding, migratory and other behavioural requirements of indigenous species".

4.5.15 The first objective of the NPSFM 2020 (so also the NPSFM 2017) seeks "to ensure that natural and physical resources are managed in a way that prioritises … first, the health and well-being of water bodies and freshwater ecosystems", and accords social and economic well-being lower priorities.

4.5.16 Given that aquifers are waterbodies and that these contain indigenous biodiversity and ecosystems which perform ecosystem processes, PC7's approach to managed aquifer recharge seems out of step with both national and ECan's regional policy and objectives for protecting and sustaining biodiversity, ecosystems and ecosystem processes in freshwaters. This is especially true when compared with the Plan and PC7's implementation of the above policies and objectives for protecting biodiversity, ecosystems and ecosystem processes inhabiting lakes, rivers and wetlands.

4.5.17 It appears even further out of step with the fundamental concept of the NPSFM 2020, Te Mana o te Wai, which explicitly prioritises "the health and well-being of water bodies and freshwater ecosystems" above all human needs, including economic needs.

4.5.18 For these reasons, I recommend adding a new condition to Policy 4.99 (Managed Aquifer Recharge, p. 19), the same as, or similar to, that proposed in my original submission: "*h. Adverse effects on the biodiversity, ecosystem and ecosystem processes within the recharged aquifer are eliminated*" [revised from that in my submission].

4.5.19 This additional condition probably should be the first in Policy 4.99's list

in order to be consistent with the top priority accorded “the health and well-being of water bodies and freshwater ecosystems” within the NPSFM 2020.

4.6 **Section 5 (Rule 5.191):** 52-53. Managed aquifer recharge conditions. Response not accepted.

4.6.1 See comments under 4.5.1 - 4.5.15 above.

4.6.2 The Section 42 A report, based on technical advice received, argued that biodiversity and ecosystem health could be managed via water quality. The recommendation is that MAR is discretionary provided that, among other conditions, “The application demonstrates that the proposal will not degrade water quality”. Following the Section 42A arguments, water quality is used as a surrogate for an assessment of biodiversity and ecological effects. I note two points.

4.6.3 A “proposal” is unlikely to have an ecological effect until implemented. Therefore, this should read “The application demonstrates that the proposed activity …”.

4.6.4 As written, Rule 5.191 sets no explicit requirement for any consideration of any potential or actual harmful effects of the proposed activity on groundwater biodiversity and ecosystems. Following points 4.5.1 - 4.5.15 above, some assessment of ecological effects seems essential. That is what would be required for any activity involving diversion of water into any surface waterbody. It also is what is required to give effect to Te Mana o te Wai’s priority of protecting ecosystems above human needs.

4.6.5 The condition should be rewritten along the lines of my original submission: the application must explicitly demonstrate that that no adverse effects on biodiversity and ecosystems within the receiving aquifer. Yes, methods for assessing groundwater biodiversity and ecosystem health (e.g., Korbel & Hose) do exist, are in continuing development, and these approaches are being used, at least experimentally, in New Zealand. At worst, a desk-top assessment of available water quality data and biodiversity information by a suitably qualified ecologist to specifically identify and assess the potential for adverse effects on groundwater biodiversity and ecosystems for each proposed MAR could be used in the interim.

4.6.6 This requirement also should be covered within Schedule 32 (see below).

4.7 **Sections 6-14:** Review of other sections.
Largely accepted as out of scope for PC7. However, given the evident neglect to treat aquifers as ecosystems containing significant biodiversity performing important ecosystem processes (see 4.3 above), it seems prudent for ECan to review these sections again from a groundwater ecosystems perspective.

4.8 **Schedule 8 (Groundwater):** 201. Nitrate-N limits
Response not accepted.

4.8.1 The proposed concentration limits for nitrate-nitrogen in groundwater are far too high for sustaining its biodiversity and ecosystems, as explained in my evidence and reiterated above, and when compared to limits in the NPSFM 2020 for rivers. More conservative concentration limits for nitrate-nitrogen are required to protect groundwater ecosystems.

4.8.2 Following the NPSFM, ecosystem health takes priority over human needs. Therefore, the national drinking water limit for nitrate-nitrogen in groundwater (11.3 mg/L) proposed in PC7 is inappropriate.

4.8.3 The NPSFM 2020 nitrate-nitrogen concentration limits for rivers are probably the best available guidelines for this attribute in groundwaters.

4.8.4 These limits become more meaningful when the NPSFM 2020 Policy 13 is implemented: "*The condition of water bodies and freshwater ecosystems is systematically monitored over time, and action is taken where freshwater is degraded, and to reverse deteriorating trends*".

4.8.5 An alternative narrative limit could be set: there must be no trend of increasing nitrate-nitrogen concentrations. Powerful trend analysis methods are now widely accepted and the NPSFM 2020 specifies how trends should be assessed (3.19).

4.8.6 It is difficult to set numeric limits for nitrate-nitrogen concentrations in groundwaters because concentrations of this substance appear to differ naturally between aquifers, and because toxic concentrations are known

for no groundwater species. For these reasons[1], at least one regional council is adopting a narrative concentration limit for this attribute: "*Nitrate concentrations do not cause unacceptable effects on groundwater-dependent ecosystems or on aquatic plants, invertebrate or fish communities in connected surface water bodies*" (GWRC 2019. Proposed Natural Resources Plan, Table 3.6, p. 49).

4.9 **Schedule 32 (2.b.iv):** 218. Managed aquifer recharge plan: map separation limits.

I accept the response in part only.

4.9.1 My concern here is with the potential for creating direct and indirect hydrological connections between adjacent or more widely separated aquifers along which some invertebrates inevitably will migrate.

4.9.2 I agree that detailed mapping is onerous. However, overarching policy demands due caution. Thus, plotting the locations of the proposed water extraction and the proposed aquifer recharge point against know aquifer boundaries would help to ensure that source and recharge locations overlie the same aquifer. Geological and Nuclear Sciences (GNS) has published electronic maps of New Zealand's aquifer boundaries. ECan probably has even more accurate maps.

4.9.3 Plotting the proposed MAR source and destination locations relative to known aquifer boundaries could usefully be included as part of a broader assessment of ecological effects that should be part of Schedule 32 requirements.

4.9.4 Genomic technologies offer better approaches for comparing biodiversities between source and destination waterbodies. Such direct comparisons could quantify groundwater biodiversity similarities/differences at modest costs, facilitating more robust decisions on potential threats posed by a proposed MAR.

4.10 Schedule 32 (5): 218. Managed aquifer recharge: adverse environmental effects.

Reject the recommendation.

4.10.1 There are compelling reasons for accepting an emendment to Schedule

1 GWRC also recognises that toxicity concentration limits are based on few of the potentially affected organisms, limits are not known for any groundwater species, and that accepted concentrations have reduced substantially over the last 20 years as knowledge improved.

32.5 to require an assessment of potential effects and monitoring on groundwater biodiversity and ecosystems for all MAR Plans. That proposed in my original submission is better stated as "*An assessment of the actual and potential adverse environmental effects (including associated with the construction and operation of the managed aquifer recharge system on endemic groundwater biodiversity and ecosystem functioning*, *and a description of the proposed monitoring to avoid, detect, mitigate or minimise these risks …".*

4.10.2 Te Mana o te Wai and the NPSFM explicitly accords top priority to "health and well-being of water bodies and freshwater ecosystems" over human needs and uses. Several other national and regional policies demand protection of biodiversity and ecosystems, most frequently via assessments of potential effects before initiating an activity and through monitoring post implementation. This is the widely used and accepted practice for assessing the potential impacts of new activities in all other aquatic ecosystems in Canterbury and nationally and should be standard practice for activities affecting groundwater ecosystems also.

4.10.3 Yes, MAR may, on balance, benefit groundwater ecosystem health, but Te Mana o te Wai demands that we put biodiversity and ecosystems first. It is untenable today to not accord the same priorities and follow the same procedures as those used surface water to groundwater, Canterbury's largest freshwater ecosystem.

5. CONCLUSIONS

5.1 Canterbury's aquifers contain substantial biodiversity, comprising functioning ecosystems that help to sustain water quality and maintain aquifer transmissivities, yet PC7, as initially formulated, offers no protection of this biodiversity and ecosystems, especially protection from a regionally-new groundwater activity.

5.2 I accept that the thrust of my submissions and evidence may be novel and that implementing this perspective poses challenges. Certainly, the science of groundwater biodiversity and ecology is poorly developed as yet, but that is no reason for not following procedures that are standard for much better-known ecosystems. The NPSFM 2020 requires use of the best available information, to use uncertain information in a way that best gives effect to the NPSFM, and to "not delay making decisions

solely because of uncertainty about the quality or quantity of the information available" (NPSFM 1.6).

5.3 It is essential that PC7 embraces this new perspective now and is modified to ensure greater protection to sustain Canterbury's groundwater ecosystems for the region's future. Proceeding following the prevailing paradigm is no longer tenable: groundwater is a living ecosystem, which sustains the physical resource and modifies its chemical attributes.

5.4 This means that the NPSFM 2020 values, notably its Compulsory values, must be taken into account in PC7. Thus, we must manage groundwaters as carefully as we manage our stream, river, lake and wetland ecosystems, difficult as that may be.

6. REFERENCES

Fenwick, G., Greenwood, M., Williams, E., Milnes, J., Watene-Rawiri, E. 2018. Groundwater ecosystems: functions, values, impacts and management. Prepared for Horizons District Council. NIWA Client Report 2018184CH. 155 pp. http://www.envirolink.govt.nz/assets/Uploads/1838-HZLC143-Groundwater-Ecosystems-Functions-values-impacts-and-management.pdf

GWRC (Greater Wellington Regional Council). 2019. Proposed Natural Resources Plan. http://pnrp.gw.govt.nz/assets/Uploads/Proposed-Natural-Resources-Plan-Part-1.pdf

Korbel KL, Hose GC. 2017. The weighted groundwater health index: Improving the monitoring and management of groundwater resources. Ecological Indicators 75:164-181.