



SPECIAL TRIBUNAL

WATER CONSERVATION ORDER: TE WAIKOROPUPŪ SPRINGS AND ASSOCIATED WATER BODIES

IN THE MATTER

of the Resource Management Act 1991

AND

IN THE MATTER

of a Special Tribunal appointed under s202 of the Resource Management Act 1991 to consider an application for a Water Conservation Order made by Ngāti Tama Ki Te Waipounamu Trust and Andrew Yuill (the applicants) in relation to the Te Waikoropupū Springs and associated water bodies

TRIBUNAL

Camilla Owen (Chair)
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EXPERT CONFERENCING JOINT WITNESS STATEMENT TO THE SPECIAL TRIBUNAL

TOPIC: WATER CLARITY AND ECOLOGY

DATE: 27 APRIL 2018

Expert conferencing joint report to the Special Tribunal

INTRODUCTION

1. This Joint Witness Statement is written in response to the Tribunal's Minute and Direction 3 dated 20 April 2018 (refer to www.epa.govt.nz/waikoropupu).
2. This Joint Witness Statement relates to the conferencing topic of **WATER CLARITY AND ECOLOGY**.
3. A conferencing meeting was held via teleconference on **23 April 2018** from 10am-1.05pm and 1.35pm-4pm.
4. Participants were:
 - Dr Graham Fenwick – Applicant/Tasman District Council
 - John Russell – Fonterra

- Hilary Lough – Fonterra [*Ms Lough declined to substantively engage on questions (i)-(iii), because Mr Russell, in his role with Fonterra, was tasked with review and advice relating to water quality limits at the springs for the draft WCO.*]
 - Klaus Thoma – Personal [*Mr Thoma declined to substantively engage on question (i)*]
 - Annabeth Cohen – Royal Forest and Bird Protection Society of NZ
 - Joseph Thomas – Tasman District Council
 - Andrew Fenemor – Tasman District Council
 - Dr Roger Young – Tasman District Council (left teleconference at 12.45pm)
 - Chris Hickey – Tasman District Council (left teleconference at 2.30pm)
 - Peter Lilley – Trustpower [*Mr Lilley declined to substantively engage on question (i) to the extent it relates to water clarity limits, however Mr Lilley did engage on question (i) with respect to monitoring methodology*]
5. In preparing this statement, the experts have read and understood the Code of Conduct for Expert Witnesses as included in the Environment Court of New Zealand Practice Note 2014.
 6. The experts have read and considered the four questions posed at paragraph 3 of Minute and Direction 3 by the Special Tribunal. This Joint Witness Statement sets out the responses to those questions, in particular those issues agreed or disagreed amongst the experts.
 7. The initial draft wording of this Joint Witness Statement was prepared by ChanceryGreen.

RESPONSE TO QUESTIONS BY THE SPECIAL TRIBUNAL

Question (i): Clarity – post receipt of the NIWA/Gall report, what water clarity limit is recommended for the main spring, for inclusion in Schedule 4 in respect of water clarity. Please explain the reasons for the recommended limit and how it should be measured. Provide any other information necessary to help the Tribunal understand the recommendation.

Limits

8. Subject to paragraphs 10-11 below, all experts (with the exception of Dr Fenwick and Ms Cohen) agree that the following limits are appropriate:

Water clarity in the main spring of Te Waikoropupū Springs shall not be less than either of:

 - (a) 65m (5th percentile); or
 - (b) 70m (median).
9. The experts consider that the above dual limit approach is appropriate, rather than a single limit. The limits are based on the data in the NIWA Report “*Continuous Water Clarity Monitoring in Te Waikoropupū Springs, April 2018*” prepared by Mark Gall, reduced to take account of the “systematic (method) error” of 8m that is specified in the NIWA/Gall Report in circumstances where water clarity is above 50m.

10. Dr Fenwick and Ms Cohen consider that the following limits are appropriate:

Water clarity in the main spring of Te Waikoropupū Springs shall not be less than either of:

- (a) 68m (5th percentile); or*
- (b) 73m (median).*

11. Dr Fenwick and Ms Cohen consider these limits are more appropriate because they are based on the comment in the NIWA/Gall Report that a “bias of about +/- 5m is realistic”.

Methodology

12. All the experts agree that monitoring of the above limits shall include an initial monitoring campaign of at least three months’ duration, which shall take place within two years of the commencement of the Water Conservation Order. The monitoring campaign shall occur during the period from October to January, to achieve consistency with the timing of monitoring undertaken for the NIWA/Gall Report.

13. The experts disagree as to the frequency of ongoing monitoring:

- (a) Subject to (b) below, all experts agree that ongoing monitoring should be undertaken every five years if the data collected from the initial monitoring campaign do not exceed the above proposed limits. If the data collected from the initial monitoring campaign do exceed the above proposed limits, ongoing monitoring should be undertaken more frequently. This frequency reflects: that there is limited scientific value in monitoring if the above proposed limits are not being exceeded ; that the primary purpose of the proposed monitoring is for baseline purposes, rather than for extreme events; that other continuous/upstream monitoring is appropriate for monitoring other matters such as extreme events. This frequency also provides for refinement of monitoring frequency over time based on data collected; and recognises that being overly prescriptive with respect to monitoring frequency can be unduly limiting.
- (b) Dr Fenwick and Ms Cohen consider that ideally ongoing monitoring should be undertaken annually, and at least every three years. This is because more frequent monitoring will result in better information and will in part address lag times, including those associated with land use intensification.

Question (ii): The JWS on water quality recommended a set of limits for Schedule 4 for the Springs. Do the experts consider those limits are appropriate? [Part A] If so, why? Should any additional parameters be added (e.g.: iron, magnesium, total nitrogen) as limits, and if so, why? [Part B]

Part A

14. Subject to paragraphs 15-16 below, all experts consider that the limits set out in the table at paragraph 13 of the Water Quality Joint Witness Statement (10 April 2018) are appropriate. The nitrate-nitrogen limit of 0.55mg NO₃-N/L is considered to be appropriate because it is based on potential effects, as

opposed to the historic data record; and includes an appropriate safety factor (refer to the reasons at paragraphs 14-20 in the Water Quality Joint Witness Statement).

15. Mr Thoma referenced paragraph 12 of the Water Quality Joint Witness Statement where he stated he does not support the 0.55mg NO₃-N/L limit. Mr Thoma considers that the NO₃-N limit should be 0.45-0.47mg/L, which reflects lag times and land use factors affecting nitrate-nitrogen levels.
16. Ms Cohen considers a more conservative value is preferable based on the available data and supports a NO₃-N limit of 0.5mg/L, including because 0.55mg/L is high compared to the recent data, after removing outliers.

Part B

17. As a point of clarification, all experts consider that the reference in Question (ii) to “magnesium” should be interpreted as a reference to “manganese”.
18. With respect to the potential additional parameters listed in Question (ii), all experts agree that there is no basis for limits relating to iron; manganese (or magnesium); or total nitrogen at Te Waikoropupū Springs (however, see the below comments in response to Question (iv) from the Special Tribunal).
19. With respect to the suggested parameters in the third draft of the Water Conservation Order (attached as Appendix 2 to the Applicant’s opening legal submissions), all experts agree that ecosystem health, dissolved organic carbon, and total dissolved nitrogen should not be included in Schedule 4. Ecosystem health (which is a measure of integrated ecosystem health as opposed to a water quality limit) is difficult to appropriately measure in this context, including because Te Waikoropupū Springs does not contain typical riverine fauna meaning the MCI index (i.e., “Macroinvertebrate Community Index”) is not an appropriate measure; and measuring ecosystem health parameters will potentially require intrusive testing which may adversely affect the springs, given their sensitive nature. Dissolved organic carbon is not useful as a limit in this context because the water is very pure and unable to be measured by existing instrumentation.
20. All experts agree that flow should be assessed on an ongoing basis, based on Tasman District Council methodologies. It is suggested that this be included as a note following Schedule 4 of the Water Conservation Order, similar to Note 7 in the Water Quality Joint Witness Statement.
21. All experts agree that no other additional parameters should be added to Schedule 4. Turbidity as a limit was discussed, but the experts agree that it should not be included in Schedule 4 because any appropriate limit would likely be at or close to the limit of detection of instruments such that monitoring would likely return “non-detect” readings which are not helpful.

Question (iii): Regarding Schedule 5, the Tribunal would appreciate further help from the experts. Should any of the parameters in Schedule 5 be included as limits, and if so, why in Schedule 5 and not Schedule 4?

22. Subject to paragraph 24 below, for the reasons in paragraph 21 of the Water Quality Joint Witness Statement, all experts consider that Schedule 5 serves no useful purpose and should be deleted. Notwithstanding the wide range of parameters listed in Schedule 5, there is no indication that any of them are likely to be of concern. Mr Lilley, Mr Russell, Mr Thoma, Dr Young and Mr Fenemor note that future activities will/should be tested in relation to a range of parameters as part of any resource consent (or similar) process, so it is not necessary to retain Schedule 5. Mr Lilley and Ms Lough further note the separate requirements pursuant to clauses 5, 6 and 7 of the Water Conservation Order.
23. All experts note that deleting Schedule 5 will require consequential amendments to the Water Conservation Order, for example Clause 9; and that the primary mechanism relating to proposed activities will be the water quality limits in Schedule 4.
24. Mr Thoma notes that many parameters in Schedule 5 are not relevant to Te Waikoropupū Springs, and further notes that an alternative could be to reduce the Schedule 5 list of parameters to only those that are relevant. Ms. Cohen agrees with Mr Thoma and notes that the values set for the parameters in Schedule 5 are not necessarily applicable as limits for Te Waikoropupū Springs as the ANZECC limits are set for 99% protection of species typically found in riverine systems, and that an appropriate response is to choose a select number of parameters which are known or suspected to affect species specific to Te Waikoropupū Springs and monitor those parameters to establish a baseline. This will be useful for understanding changes in the ecosystem by proxy.

Question (iv): Regarding the topic of upstream monitoring, and acknowledging that:

- a. **the Tribunal cannot impose a management regime (ie triggers and responses as opposed to limits); and**
- b. **acknowledging that the AMA is complex; and**
- c. **recognising the function that the biofilm and stygofauna play in terms of "cleaning" waters from the entry points to the point it discharges from the Springs; and**
- d. **the fact that the lag time for water varies,**

What sites do the experts suggest should be monitored, and at what frequency?

25. All experts record that there was some uncertainty regarding the interpretation of this question.

Monitoring Sites

26. Subject to paragraph 31 below, all experts agree that the priority area for upstream monitoring of groundwater is the area broadly between Uruwhenua; the confined/unconfined boundary north of Hamama; and east Takaka Springs. Dr Fenwick recommends an across-aquifer array of monitoring sites just upstream of the confining layer margin to better assess water quality within younger water

across the entire unconfined aquifer. He recommends a smaller set of similarly arrayed sites near Uruwhenua to sample older groundwater. He noted that water monitored should be at the interface of the gravel-Arthur Marble aquifers to better characterise inputs to the Arthur Marble Aquifer ecosystem and avoid high costs of bores into the marble.

27. Mr Thoma, Dr Young and Ms Cohen consider that surface and spring water should be included with this upstream monitoring. Dr Fenwick considers that the focus of upstream monitoring should be on groundwater because it is more directly connected to the Arthur Marble Aquifer, its ecosystem and to Te Waikoropupu water. In Dr Fenwick's view, monitoring surface water quality is less useful and largely covered by monitoring programmes already in place within the catchment."
28. In addition, all experts consider that achieving spatial separation of monitoring sites within the priority area is important to ensure a better assessment of overall aquifer conditions. This will likely require new monitoring sites in addition to existing bores.
29. All experts agree that future monitoring should be determined using the following criteria (not in priority order) suggested by Mr Fenemor (#1-5) and Dr Fenwick (#6):
- (1) **Existing data:** Sites with existing data are useful for earlier detection of trends.
 - (2) **Spatial variation:** This includes monitoring of river, groundwater and springs. Bores should be suitably spaced in order to ascertain trends, and should be located to detect gradients or differences in any inputs and groundwater age. There should be a focus on proximity to the confined/unconfined boundary, and consideration should be given to ongoing groundwater modelling for water management purposes.
 - (3) **Temporal variation:** Temporal variation is useful in order to ascertain trends, including responses to seasonal variation and climatic events, and should include run-off event sampling at selected sites.
 - (4) **Risk:** Risk factors should be considered, including risk of contamination from land use and land use change, and take into account leaching risk in relation to soil type.
 - (5) **Parameters to be selected:** A starting point would be consideration of the parameters in Schedule 4.
 - (6) **High value/sensitive/vulnerable** areas in the recharge area: Such areas should be considered, for example with respect to fauna.
30. All experts agree that the water quality limits for Te Waikoropupū Springs in Schedule 4 are not appropriate for the upstream monitoring sites.

[Dr Young left the teleconference at 12.45pm and was therefore not able to participate in conferencing regarding this question. Therefore, Dr Young's response is set out separately below.]

31. Dr Young considers that while it would be beneficial to have upstream monitoring in surface and groundwaters, it is difficult to design a groundwater monitoring system given the complexities of a karst system like the Arthur Marble Aquifer. He considers that monitoring of key surface water inputs to the

aquifer, such as the Upper Takaka River near Lindsays Bridge, would be useful for determining any changes in the quality of water entering the aquifer, However, he acknowledges that monitoring of diffuse drainage of water into the aquifer along the Takaka valley floor will be problematic.

Frequency / limits

32. Mr Lilley, Mr Fenemor and Mr Thomas acknowledge that the Special Tribunal has not asked the experts to specify monitoring limits. They consider that it is not appropriate to specify monitoring limits or frequencies at this stage, including because the system is complex and such matters remain hypothetical (they will need to be based on particular sites and parameters), and they will be addressed in the regional plan process. In their view, monitoring requires flexibility to evolve over time. They also note that monitoring frequency is addressed in criteria (3) (Temporal Variation) above.
33. Dr Fenwick and Ms Cohen consider that groundwater quality should be monitored monthly at all locations, whereas Ms Lough and Mr Thoma recommend monitoring at least every three months. Ecosystem health also should be monitored at each site at least annually to ensure no ecologically significant declines with time. Dr Fenwick, Mr Thoma and Ms Cohen note that there are no established measures of groundwater ecosystem health, but one is in development and microbial and stygofaunal biodiversity measures may be useful interim indices. Ms Lough was of the view that it would be difficult to recommend ecosystem health monitoring for groundwater at the present time.
34. Dr Fenwick, Dr Hickey, Ms Cohen and Mr Thoma consider that concentrations of the following substances from Schedule 4 should be monitored: nitrate-nitrogen, ammoniacal-nitrogen, dissolved reactive phosphorus, and dissolved oxygen. Concentrations of three additional substances should also be monitored at these same locations on all monitoring occasions: dissolved organic carbon, dissolved iron and dissolved manganese. Concentrations of these substances naturally vary widely within and between aquifers, so there are no accepted concentration limits and the application of any such limits would be problematic. In place of concentration limits, Ms Lough, Dr Fenwick, Mr Thoma and Ms Cohen recommend that water quality should be managed to avoid any statistically significant increases (decreases, in the case of dissolved oxygen) in concentrations over some appropriate period.
35. Mr Thomas, Mr Lilley and Mr Fenemor consider that the upstream monitoring is more appropriately decided in the FLAG Regional Plan process and Council's state of the environment monitoring programme. In Dr Fenwick's opinion the existing monitoring regimes appear based on sampling too infrequently for timely management action.
36. Ms Lough considers that the most important parameters to monitor in the recharge area to the springs are nitrogen and phosphorus. A monitoring frequency of at least every three months would be appropriate but should be assessed on a case by case basis. In terms of location, Ms Lough was of the view that additional bores sited upgradient of the confined/unconfined boundary and spaced appropriately could be helpful. Ms Lough was of the view that some surface water monitoring in the Takaka and Waingaro rivers would also be appropriate. Ms Lough and Mr Lilley shared the view of Mr Thomas and Mr Fenemor that it may not be appropriate to set out a monitoring schedule in the WCO.

37. Dr Young considers that the details of upstream monitoring is more appropriately decided in the FLAG Regional Plan process and Council's state of the environment monitoring programme, and recommends that nitrate-nitrogen, ammoniacal nitrogen, dissolved reactive phosphorus, dissolved organic carbon and dissolved oxygen should be included in this programme. He also notes that it would be problematic to currently set limits for these parameters at upstream monitoring sites.

~~38.~~ Dr Hickey agrees with the position stated by Dr Young as recorded in paragraph 37.

DATE: 27 APRIL 2018



Dr Graham Fenwick



Hilary Lough



Annabeth Cohen



Joseph Thomas



Dr Roger Young



Andrew Fenemor



Chris Hickey



Klaus Thoma



John Russell



Peter Lilley