

Response to Hearing Panel Questions on Table 3.11.1 and the Joint Witness Statement.

A minute for the hearing panel was received on 24 July 2019. This set out specific questions for experts who participated in the expert conferencing sessions on Table 3.11.1 and were signatories to the Joint Witness Statement but were not able to attend the hearing on the 18 July 2019.

A number of questions were asked of Dr Hugh Robertson, namely:

1. In relation to Table 1, on page 97 of the Joint Witness Statement, why are bottom line (i.e., bottom of the C band) annual median thresholds for riverine and peat lakes 750 (stratified) and not 800 mg/m³ (polymictic) as found in the NPS-FM?
2. In relation Table 1, what data is the 625 mg/m³ threshold for TN in Volcanic lakes based on?
3. In relation to macrophytes, at page 192 of the Joint Witness Statement, what do you mean by your comment regarding "light attenuation effects on native macrophytes"?

Question 1 & 2 relate to the development of numeric targets for lake ecosystems. The Tables were prepared and presented by myself. Therefore, I consider it beneficial to the panel that I answer these questions directly. Dr Roberston will provide an answer to question 3.

Responses to questions

Question 1

In relation to Table 1, on page 97 of the Joint Witness Statement, why are bottom line (i.e., bottom of the C band) annual median thresholds for riverine and peat lakes 750 (stratified) and not 800 mg/m³ (polymictic) as found in the NPS-FM?

- The current Table 3.11-1 in PC1 has a value of 750 for peat lakes and 800 mg/m³ for riverine lakes.
- The TLG report (Scarsbrook, 2014) on river and lake attributes recommended using the seasonally stratified values for **all** lakes. However, I note that a draft table from 2016 (Curruthers, 2016), recommends values consistent with the current Table 3.11-1.
- At least some of the peat and riverine lakes stratify e.g. Lakes Ngaroto, Rotomanuka and Waahi (Lehmann et al. 2017), Lake Ngaroto (Dean-Speirs and Neilson, 2014), and Lake Millicich.
- On the basis of the above evidence I consider that this justifies the use of the value for stratified lakes, at least for peat lakes.

Question 2

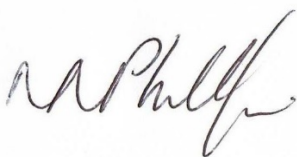
In relation Table 1, what data is the 625 mg/m³ threshold for TN in Volcanic lakes based on?

- The method for deriving these values was presented at the recent hearing on 18 July 2019.

- In his submission, the long term targets set by the Director-General of Conservation for the 2 volcanic lakes (Lakes Tutaeinanga and Ngahewa) were for NOF bands C and B, respectively for Total N.
- This target was based on an analysis of the current state of the water quality of the two lakes, using the Waikato Regional Council's data on annual medians for the 2010 -2014 period. This is the same data set that the TLG used for their calculations in 2015.
- To derive a numeric target for the volcanic lake grouping I simply took the average values for the B and C bands (500 and 750 mg/m³ respectively) to produce an average value of 625 mg/m³.

References

- Curruthers V. (2016) Draft table for CSG2-3, March 2016. Numerical attribute states – lakes. https://www.waikatoregion.govt.nz/assets/PageFiles/28959/24/478%20-%203711910%20-%20Numerical%20attribute%20states-%20lakes%20-%20Vicki%20Carruthers,%20WRC%20-%20CSG24_.pdf
- Lehmann, M. K., Hamilton, D. P., Muraoka, K., Tempero, G. W., Collier, K. J., Hicks, B. J. (2017) Waikato Shallow Lakes Modelling. ERI Report 94. Environmental Research Institute, University of Waikato, Hamilton, New Zealand. 223 pp.
- Scarsbrook M. (2015) State of the Waikato-Waipā Waterways. Report back from the TLG on analysis of river/lake state against attributes (CSG7 discussion). CSG8 – Pukekawa 2 December 2014. <https://www.waikatoregion.govt.nz/assets/PageFiles/28959/7/127%20-%203237698.pdf>
- Woodward, B., Hofstra, D, Gibbs, M. (2017) Waikato Shallow Lake Rehabilitation: Phase One. Report prepared for Waikato River Authority, NIWA Client Report No: 2017205HN, 85pp.



Dr Ngaire Phillips, 5 August 2019