

Technical Advice – Freshwater Ecology by Dr Roger Young

Date	28 August 2025
To	Ellie Watson, Environmental Manager – South Island Renewables, Genesis Energy
From	Roger Young, Cawthron Institute
Project advice provided for	Tekapo Power Scheme – Applications for Replacement Resource Consents
Documents referred to	• Young R, et al. 2025. Tekapo Power Scheme Reconsenting: Assessment of Aquatic Environmental Effects. Dated 9 April 2025. Submitted as ‘Appendix L: Aquatic Assessment Tekapo Power Scheme Reconsenting’ with the substantive Tekapo Power Scheme Fast-track application. • McArthur K. 2025. Statement of evidence of Kathryn Jane McArthur – Aquatic ecology and water quality. Dated 22 August 2025. Prepared on behalf of Forest & Bird. • Bayer T. 2025. Appendix 4: Technical Advice – Lake Values. CRC memo dated 18 August 2025. • Meijer C. 2025. Appendix 8: Technical Advice – River Values. CRC memo dated 11 August 2025.
Qualifications and experience	• BSc (Hons) Zoology/Chemistry, University of Otago, 1992 • PhD Zoology, University of Otago, 1998 I am a freshwater ecologist and have over 30 years’ experience with improving understanding and management of freshwater ecosystems. This has included providing advice to local government, iwi, central government, community groups and industry in relation to policy development and consent applications. I have provided expert evidence to assist decision making at >20 council, Special Tribunal or Environment Court hearings.
Code of Conduct	As an expert witness I have read, and I am familiar with, the Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2023. This memorandum has been prepared in compliance with that Code. In particular, unless I state otherwise, this response is within my area of expertise and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.
Signature	

- I have reviewed the evidence prepared by Forest & Bird / CRC, and my assessment provided in the Tekapo Power Scheme Reconsenting: Assessment of Aquatic Environmental Effects report (Young et al. 2025) still stands.
- I note the following in response to Ms McArthur's evidence:
 - Ms McArthur has based her assessment on an existing environment that considers matters beyond the current operation of the scheme.
 - The Tekapo Power Scheme in its current configuration has been operating for nearly 50 years. Its construction involved some substantial changes to the environment; specifically, changes to the lake level regime within Lake Tekapo and construction of the Tekapo Canal, which diverted water that would have naturally flowed down the Tekapo River to the Tekapo Canal and subsequently into Lake Pukaki.
 - I understand that no changes are being sought to the scheme operation through the reconsenting process, and so no change to the existing environment is expected as part of continued operation of the Tekapo Power Scheme. Therefore, my assessment focused on the effects of the ongoing operation of the Tekapo Power Scheme on values currently supported by waterways influenced by the scheme. It does not attempt to compare current state with conditions that were likely present before the development of the scheme.
 - Ms McArthur considers that flow regulation in the Tekapo River contributes to, and exacerbates, didymo and periphyton bloom events and their persistence (e.g. Paragraph 40). She concludes that 'increased flow variability is likely to result in improvements in periphyton biomass, macroinvertebrate health, potential fish habitats and thereby ecosystem health values' (Paragraph 46).
 - In their natural state, lake-fed rivers such as the Tekapo River are more hydraulically stable than rain-fed rivers.¹ Similarly, the settling of sediment in upstream lakes means that sediment supply to lake-fed rivers is very low, which in turn means that large amounts of mobile sediment are not continually moving downriver. The relatively high level of flow and bed stability of lake-fed rivers contributes to their unique characteristics, but unfortunately also provides perfect conditions for didymo and other periphyton. Didymo is abundant in lake-outlet rivers, including ones that retain a natural unregulated outlet (e.g. Clutha River / Mata-Au, Hurunui River, Te Kauparenuui / Gowan River, Buller River). This is the case regardless of river size or flow since it is flow variability and associated bed mobilisation, rather than flow itself, that seems most important for controlling didymo.² If all the natural flow was allowed down the Tekapo River, it is very likely that there would still be abundant didymo and periphyton blooms that would affect macroinvertebrate communities and other aquatic life.
 - Ms McArthur considers a need for flushing flows to address the accumulation of high biomass of periphyton that occurs within the Tekapo River. The Tekapo River has relatively coarse substrates and wide channels, meaning relatively large floods will be required to mobilise the bed. Based on these broad geomorphological principles, we anticipate that a flow of between 6 and 10

¹ Jowett IG, Duncan MJ. 1990. Flow variability in New Zealand rivers and its relationship to in-stream habitat and biota. *New Zealand Journal of Marine & Freshwater Research*. 24:305–317.

² Cullis J, McKnight D, Spaulding S. 2015. Hydrodynamic control of benthic mats of *Didymosphenia geminata* at the reach scale. *Canadian Journal of Fisheries and Aquatic Sciences*. 72:1–13.

times the median flow would be required, which Ms McArthur agrees with,³ to cause periphyton and didymo scouring. As set out in my report, the effectiveness of individual flushes at removing periphyton and didymo is somewhat uncertain and the effects will be temporary. To have ecological benefits, the macroinvertebrate communities would need to recover faster from the negative effects of the flushing flow than periphyton biomass. It is uncertain if this would be the case.

- Ms McArthur states that 'aquatic life in the upper Tekapo River (upstream of the confluence with Fork Stream) is almost entirely absent due to the diversion of virtually all flow into the Tekapo canal' (Paragraph 57).
- This is largely correct but has been a feature of the operation of the Tekapo Power Scheme since at least 1977. As mentioned above, my assessment focused on the effects of the ongoing operation of the Tekapo Power Scheme on values currently supported by waterways influenced by the scheme. It does not attempt to compare current state with conditions that were likely present before the development of the scheme.
- I note the following in response to Dr Bayer's memo:
 - Dr Bayer states that 'no mitigation is proposed for current and ongoing impact of loss of > 30% of macrophyte habitat due to lake level variation caused by the operation of the TPS' (Paragraph 9).
 - Considering the current water clarity of the lake as the baseline, the effect of the Tekapo Power Scheme, through water level fluctuation of Lake Tekapo, removes 41% of the potential productive littoral zone. By comparison, 26% of the productive littoral zone was affected prior to commissioning of the scheme in the 1950s, and 88% was affected from the 1970s until the onset of the recent trend of reduced glacial silts. I understand that the ongoing operation of the Tekapo Power Scheme does not propose changes in the annual range of water level fluctuations. Therefore, I do not expect any change to the effects on Lake Tekapo.
- I note the following in response to Dr Meijer's memo:
 - Dr Meijer states that 'the prevalence of reduced stable flows has had ongoing detrimental impacts on the macroinvertebrate community in the Tekapo River. The excessive periphyton growth, including didymo blooms, and poor water quality over summer, such as high temperatures and lower oxygen concentrations, are likely underlying stressors for macroinvertebrates' (Paragraph 14).
 - As discussed above, and in my report, if a permanent baseflow over Lake George Scott weir was initiated, it is very likely that there would still be abundant didymo blooms that would affect macroinvertebrate communities and other aquatic life. Large flushing flows might provide short-term reductions in didymo biomass, but the effectiveness of flushing flows on improving macroinvertebrate communities is likely limited given the uncertainty regarding whether macroinvertebrates will recover faster from the negative effects of the flushing flow than periphyton biomass.

³ McArthur Statement of evidence, paragraphs 91 and 94.