BEFORE THE COMMISSIONER APPOINTED BY THE SOUTHLAND REGIONAL COUNCIL

IN THE MATTER OF	the Resource Management Act 1991
AND	
IN THE MATTER OF	A Resource Consent Application to resource consent to discharge agricultural effluent to land from milking up to 640 cows and housing up to 840 cows in winter barns, to take 85,800L/day of groundwater and to use land for two winter barns, a new agricultural effluent storage facility, and to establish a new dairy farm at 444 Springhills-Tussock Creek Road
REFERENCE NUMBER(S)	**APP-20222055**

EVIDENCE OF MARK PETER HAMER

(Water Quality Impacts on Freshwater Ecology)

2nd May, 2023

INTRODUCTION

Qualifications and experience

1. I am a Senior Freshwater Ecologist at e3Scientific Limited. I have been in this role since January 2023. I have 17 years' postgraduate work experience in freshwater ecology and hold a BSc and MSc in Ecology from Massey University.

2. I have worked as a freshwater ecologist undertaking stream, river and lake ecological assessments in the Waikato for the last 17 years. During this time, I have completed numerous ecological investigations helping develop new monitoring methods and procedures. I also undertook regional council state of the environment monitoring and reporting using stream periphyton, macrophytes, macroinvertebrates and freshwater fish as indicators of aquatic health.

3. I initially worked as a field ecologist before becoming Team Leader of the freshwater ecology monitoring team at the Waikato Regional Council. Prior to that I have undertaken contract work for the Bay of Plenty Regional Council, Greater Wellington, Massey University and Fish and Game. I have authored or co-authored over 20 scientific publications and technical reports with topics ranging from functional indicators such as microbial breakdown rates and metabolism to demonstrating new fish passage options at culverts.

4. I confirm that I have read the Expert Witness Code of Conduct set out in the Environment Court's Practice Note 2023. I have complied with the Code of Conduct in preparing this evidence and agree to comply with it while giving oral evidence before the Hearings Panel. This evidence is within my area of expertise, except where I state that I am relying upon the specified evidence of another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

Involvement in project

5. e3Scientific was engaged by Environment Southland to undertake a review of the consent application, as a freshwater ecologist I have reviewed the surface water information with regard to its ecological context.

Purpose and scope of evidence

6. The scope of my evidence is restricted to ecological effects on waterways.

Freshwater Ecological Review

7. The consent application assumes that because Overseer values suggest a reduced Nitrogen Loss (and a slight increase in Phosphorus Loss) that there would be no adverse effects on nearby freshwater ecosystems.

8. No information has been supplied by the applicant in relation to surface water ecological values or impacts.

9. However, a search of the New Zealand Freshwater Fish Database (NZFFDB) shows that there are 9 native fish present in the catchment and it is likely that four "At Risk" or "Threatened" fish have been recorded within the nearby streams. Three of these, Gollum galaxias, longfin eel and lamprey are likely to be present in adjacent waterways (Table 1). Torrentfish are unlikely to be present as the habitat is unlikely to be suitable.

Table 1: Summary of fish species recorded within catchment and their threat classification. Based on a New Zealand Freshwater Fish Database search 1/5/2023. Threatened native fish in bold.

Common name	Scientific name	Threat classification[1]
Gollum galaxias	***Galaxias gollumoides***	**Threatened – Nationally vulnerable**
Lamprey	***Geotria australis***	**Threatened – Nationally vulnerable**
Longfin eel	***Anguilla dieffenbachii***	**At Risk - Declining**
Torrentfish	***Cheimarricthys fosteri***	**At Risk - Declining**
Common smelt	*Retropinna retropinna*	Not Threatened
Black flounder	*Rhombosolea retiaria*	Not Threatened
Redfin bully	*Gobiomorphus huttoni*	Not Threatened
Common bully	*Gobiomorphus cotidianus*	Not Threatened
Upland bully	*Gobiomorphus breviceps*	Not Threatened
Brown trout	*Salmo trutta*	Introduced and naturalised
Perch	*Perca fluviatilis*	Introduced and naturalised

[1] Threat classification status from Dunn, et al., (2018).

10. Although not assessed in the application, it is likely that the waterways are of high value due to the presence of these "Threatened" and "At Risk" fish.

11. The addition of up to 840 dairy cows at the property will most likely increase the amount of nitrogen being lost to shallow groundwater and nearby surface water (see e3 Scientifics water quality assessment).

12. The elevated Nitrogen levels in the subsurface drainage and shallow groundwater will discharge to mix with surface water further down gradient. Increased nitrogen and phosphorus levels effect stream ecology by increasing algae, plant and cyanobacteria growth (Dodds and Welch, 2000, Dodds and Smith, 2016, McDowell et al., 2009), this in turn alters the macroinvertebrate fauna present (Allan, 2004), which are used as indicators of ecological health in New Zealand streams (Stark and Maxted, 2007).

13. Due to the subsurface drainage it is likely the adverse effects will largely be in waterways adjacent to the proposed activity.

14. It has clearly been demonstrated that the more intense the landuse the poorer the instream ecological health will be (Collier and Hamer 2010). Very highly developed in the figure below equates to dairy farmland.

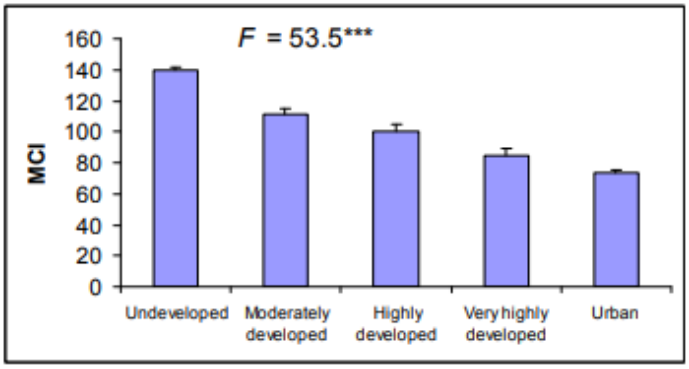

Figure 1: An example figure of how landuse intensification leads to poorer ecological health from Collier & Hamer (2010).

15. At high levels nutrients can be toxic to aquatic life and can promote toxic cyanobacteria growth (Dodds and Welch 2000).

16. In New Zealand freshwater should be managed in line with Te Mana o te Wai from the NPS-FM (2020) This refers to the fundamental importance of water and recognises that protecting the health of freshwater protects the health and well-being of the wider environment. With a hierarchy of obligations firstly; the health and well-being of water bodies and freshwater ecosystems, secondly; the health needs of people (such as drinking water), thirdly; the ability of people and

communities to provide for their social, economic, and cultural well-being, now and in the future.

17. The consent proposal by taking and using water and supplying an increased nutrient load to the land is inconsistent with Te Mana o te Wai in my opinion.

18. In summary, the application generally does not supply enough information about the surface water ecology to make an accurate assessment of the local ecology. However, based on a desktop analysis, the presence of threatened native fish suggest high ecological values are present. The increases in nutrient transport during wet periods that e3scientific suggest in the Statement of Evidence of Badenhop, McGlynn and Bloomberg are likely. Increased nutrients are known to have adverse ecological impacts on waterways. The adverse effects include promoting increased algae and aquatic plant growth which alters healthy instream communities of mayfly, stonefly and caddisfly dominated communities to poorer communities dominated by snails and worms.

References

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