IN THE MATTER of the Fast Track Approvals Act 2024 (FTA2024)

and

IN THE MATTER of the Application of Oceana Gold New Zealand Limited to extract minerals, namely gold and silver, in the Waihī and Wharekirauponga area

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STATEMENT OF EVIDENCE OF RUSSELL GEORGE DEATH ON FRESHWATER ECOLOGY ON BEHALF OF THE COROMANDEL WATCHDOG

22 August 2025

STATEMENT OF EVIDENCE OF RUSSELL GEORGE DEATH ON FRESHWATER ECOLOGY ON BEHALF OF THE COROMANDEL WATCHDOG

QUALIFICATIONS AND EXPERIENCE

1. My full name is Russell George Death.

2. I am an independent researcher and adjunct professor of freshwater ecology at the School of Biological Sciences at Victoria University of Wellington. Before that, I was a Professor at Massey University, where I worked between 1991 and 2023. I received a Doctor of Philosophy in Zoology from the University of Canterbury (1991) and was a Foundation for Research, Science and Technology postdoctoral fellow at Massey University (1991-93).

3. I have been a Quinney Visiting Fellow at Utah State University, USA and an International Distinguished Visiting Fellow at the Institute of Advanced Studies at the University of Birmingham, UK. I was awarded the 2017 New Zealand Freshwater Sciences Society Medal for outstanding contribution to our understanding and management of freshwater.

4. I have over thirty years' experience in professional ecology research, teaching, and management. My area of expertise is the ecology of stream invertebrates and fish. I have over 130 peer-reviewed publications in international scientific journals and books, including 6 invited reviews. I have written more than 45 consultancy reports and given over 80 conference presentations. I have been the principal supervisor for 58 post-graduate research students. I have been researching the invertebrates, periphyton, and fish of the lower North Island streams and rivers for the past thirty years.

5. I am a lifetime member of the New Zealand Freshwater Sciences Society. I have refereed scientific manuscripts for more than 30 scientific journals and numerous books. I am a member of the management committee for One Health Aotearoa, an alliance of New Zealand's leading infectious diseases researchers.

6. I have been commissioned by a number of governmental and commercial organisations to provide scientific advice on matters related to the management of freshwater resources. I have provided expert evidence at a variety of Resource Consent and Regional Plan hearings, Environment Court, and EPA hearings. These include the Horizons One Plan hearing and Environment Court case, Canterbury and Greater Wellington Regional Plan hearings, and the Board of Inquiry into the Ruataniwha Water Storage Scheme and Tukituki catchment.

7. I was a member of the Governmental Science and Technical Advisory Group (STAG) for the development of the National Policy Statement for Freshwater Management 2020.

8. I am on the management committee of my local Pohangina Catchment Care Group. I developed the Stream Health Check for Beef & Lamb and have worked with a wide cross-section of farmer, community, and iwi groups on education and understanding management options for their waterways.

CODE OF CONDUCT

9. I confirm that I have read the code of conduct for expert witnesses contained in the Environment Court Practice Note 2023. I have complied with the code in preparing my written statement of evidence and in expert witness conferencing, and I will also comply when I give oral evidence to the Environment Court.

10. Unless I state that I am relying on the evidence of another witness, my evidence is within my knowledge and expertise. The data, information, facts, and assumptions I have considered in forming my opinions are set out in my evidence below, along with the reasons for the opinions expressed. Where relevant, I have stated why alternative interpretations of data are not supported. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express. I specify the material that I have relied on in support of my opinions. I have described, and identified the person who carried out, any examination, test, or other investigation on which I have relied. I have identified the nature and extent of uncertainties in any scientific information and analyses I rely on, and the potential

implications of any uncertainty. I have applied any technical terminology used in my evidence according to its generally accepted meaning among experts in my field.

11. Where I consider that my evidence may be incomplete or inaccurate without some qualification, I have included such qualifications. I have identified any knowledge gaps I am aware of, and the potential implications of such gaps. If I consider that my opinion is not firm or concluded because of insufficient research or data or any other reason, I have stated this. I provide an assessment as to my level of confidence, and the likelihood of any outcomes specified, in my conclusions.

SCOPE OF MY EVIDENCE

12. My evidence covers the potential ecological impacts on the stream/river ecosystems of the Waihi North Project proposal.

EVIDENCE CONSIDERED IN PREPARING THIS EVIDENCE

13. In preparing my evidence, I have read and considered the following statements evidence:

    a. Boffa Miskell Limited 2025. Waihi North Project: Freshwater Ecological Assessment: Report prepared by Boffa Miskell Limited for OceanaGold (NZ) Ltd. OceanaGold Document reference: WAI-985-000-REP-LC-0007 Rev C.1dated 26 February 2025.

    b. Appendix E: Complex freshwater fisheries activity approval report Section 51(2)(e) complex freshwater fisheries activity approval report for – FT-0063 Waihi North Project dated 11 August 2025.

    c. I have also generally reviewed the first iteration of consent conditions. I have not reviewed, but seek an opportunity to review, the latest iteration of consent conditions, and related documents. Unfortunately these arrived too late in preparation of my evidence.

EVIDENCE

Executive Summary

14. I have examined the report “Waihi North Project: Freshwater Ecological Assessment” prepared for OceanaGold (NZ) by Boffa Miskell. I have serious concerns about the quality of the information provided and, consequently, the certainty of their conclusions regarding the potential adverse environmental effects of the proposed developments for WNP.
15. They provide virtually no information on the actual invertebrates present at the sampled sites, and it is thus impossible to know if any are of threatened or at-risk conservation status.
16. They assess ecological value and potential adverse environmental impacts by using the Macroinvertebrate Community Index (MCI) and Quantitative Macroinvertebrate Community Index (QMCI). This index is designed to identify potential organic enrichment and has been found to be **unsuitable** for identifying mining impacts. They should have used the Acid Mine Drainage Index (AMDI). Without information on the collected fauna, it is impossible to calculate this index.
17. In contrast to standard scientific protocols, they have not used any statistical tests to verify their conclusions. Instead, they rely on subjective “ecological value” assessments and/or their own interpretative narrative, e.g., the ecological value of the Ohinemuri River has remained “moderate”.
18. They base their assertion that the extirpation of an endangered and unique ecosystem, a warm spring, on **a single** sampling occasion and a cursory assessment of the biota present. Given the high probability of unique taxa being present, this does not seem adequate.
19. They provide no assessment of the uniqueness of the river types and/or their associated fauna with respect to the Department of Conservation Freshwater Environment Classification (FENZ). Is this the last remaining C6.2a type river in the Coromandel? We have no idea from their investigation.
20. They provide as “evidence” of no adverse effects of the current discharge that “there has been no resource consents breach”. However, **lack of evidence is not evidence of no effect**. They provide no literature and/or ecotoxicology tests (which could be easily and cheaply performed) to illustrate that some of the potential contaminants at the levels recorded in the receiving water body are not toxic and/or have sublethal effects on key taxa.

21. Furthermore, they provide **no evidence** of the lack of impact of these contaminants on the lower catchment and the receiving marine environment.
22. Finally, they assume their proposed mitigations of “reclaiming” 4,112 m of stream and “creating” 3,469 m of water course will be successful. This is, despite the fact that similar activities elsewhere in New Zealand and the world have virtually never been successful. You cannot just dig up an ecosystem and move it somewhere else; there is a loss of interconnections and recolonising individuals.
23. I think there is an extremely high probability that moving and/or recreating a stream ecosystem will not work. Furthermore, they provide no information on how they will assess if this has been successful. Moving a stream of running water from one place to another and/or putting it back **does not restore that ecosystem**.

EVIDENCE

Are there any threatened or at-risk invertebrates present?

24. The report provides no details on the types and/or abundance of invertebrates collected in the assessment study. They do not mention if any invertebrates of threatened or at-risk conservation status are present. Although sampling of the juvenile life forms from the water, rather than their more easily identifiable adults, would make the task extremely difficult. Given the nature of the surrounding Conservation land, it seems highly likely that some are present. Furthermore, the use of eDNA makes it extremely easy and cost-effective these days to identify potentially rare species (McCulloch *et al.* 2025). **Why would the consultants not investigate if any at-risk or threatened invertebrate species were present?**

25. They also obfuscate the ability of anyone else to assess that by only presenting MCI/QMCI values. These bioassessment scores are used to determine potential organic enrichment and are in no way an assessment of biodiversity, although ironically, they also use the MCI as a criterion for ecological value. I assume then that a rare chironomid (midge) that lives in an organically enriched environment is thus not of ecological value, but one that lives in a less enriched one is? There is no scientific or philosophical justification for that. It is possible to have a

common mayfly present, which has a high MCI score, OR a very rare mayfly with a similar MCI score. The MCI tells you nothing of the conservation or biodiversity value of a species. **We are thus none the wiser from their report about whether rare taxa may be lost from New Zealand forever as a result of this development.**

26. Even the Department of Conservation's evaluation of the WNP proposal (Appendix E: Complex freshwater fisheries activity approval report) has focused entirely on the fish fauna of the waterways, with no consideration of any potential threatened or at-risk invertebrate species. Almost all stream invertebrates are endemic to New Zealand, and many are at-risk or threatened (Drinan *et al.* 2020; Weeks *et al.* 2016). **Both the applicant and DOC experts should have considered the potential for this project to impact any rare or at-risk species.**

The use of MCI/QMCI to assess potential mining effects is flawed.

27. Boffa Miskell assesses ecological value and potential adverse environmental impacts by using the Macroinvertebrate Community Index (MCI) and Quantitative Macroinvertebrate Community Index (QMCI). This index is designed to identify potential organic enrichment and has been found to be **unsuitable** for identifying mining impacts. For example, MCI/QMCI cannot differentiate any effects of heavy metals (Clapcott *et al.* 2016; Gray & Harding 2012). They should, at a minimum, be using an index designed to pick up potential impacts of mining, for example, the Acid Mine Drainage Index (AMDI). Professor Jon Harding (University of Canterbury) told me about a mine on the West Coast he was studying that had an MCI that was high (>120), but there were only 2 individual animals (that did have high MCI scores and probably drifted from upstream). Two animals in a sample is a dramatic sign that something is wrong; normally, you would have hundreds or thousands.

28. As they do not give any information on the collected fauna, it is impossible for anyone else to calculate this index. Thus, while the recorded MCI/QMCI give an indication that many of these streams are not affected by nutrient enrichment or organic contaminants, it cannot detect any potential mining and/or heavy

metal impacts. **It is unlikely that assessment of any potential adverse effects using an MCI/QMCI index will show any effects.**

They do not use any statistical tests of potential adverse effects.

29. As a scientist, I use statistical testing as a matter of practice to support or refute my assessment of what I observe. I find it incomprehensible **why Boffa Miskell would not use any statistical tests** in their assessment of effects. Instead, they rely on subjective "ecological value" assessments and/or their own interpretative narrative, e.g.*, the ecological value of the Ohinemuri River has remained "moderate"*.

30. I see no reason why they could not have used a simple t-test, Analysis of Variance, or similar nonparametric test to support their opinion that the "ecological value of the Ohinemuri River has remained "moderate". They do attempt to do this with a regression but seem to pool all the sites together and/or focus on seasonal differences. They state that they did "*find differences between years*" but there was "*no apparent trend*". A simple upstream/downstream test of discharges (point or non-point) with season as a covariate would surely assess any changes in MCI/QMCI?

31. However, as I pointed out above MCI/QMCI is not the appropriate index to assess potential mining effects. They do provide an ordination (although they do not state what type, what distance measure they use, or it's fit to the data) of the invertebrate communities to get around this, but again, they do not conduct any statistical test of whether there is an upstream/downstream effect of a seasonal change. They should have used a multivariate test of differences in sites/seasons, such as Generalised Latent Variable Model (GLVM) analysis (van der Veen *et al.* 2023). Just looking at the plots and saying they are not different is not accepted scientific protocol.

32. **The incorrect use, or complete absence of statistical tests to support the consultant's opinions of potential effects, is inappropriate**.

The proposed extirpation of an entire rare ecosystem (a warm spring) is based on a single cursory sampling.

33. Boffa Miskell base their assertion that the extirpation of an endangered and unique ecosystem, a warm spring, is acceptable on **a single** sampling occasion and a cursory assessment of the biota present. Given the high probability of unique taxa being present, this does not seem adequate.

34. Springs are an extremely threatened ecosystem in New Zealand and globally (Death *et al.* 2004; Stevens *et al.* 2021). Thermal springs are an even more threatened subset of those ecosystems. (Death *et al.* 2004). They appear to conduct a single sampling event and assess the algal communities, but they do not assess the microbial communities. There are many taxa of iron bacteria yet to be described (Hoagland *et al.* 2024; Pouder *et al.* 2025). Many microbial taxa from springs have been utilised for commercial biotechnology purposes (Oliverio *et al.* 2018). Given the low cost and availability of eDNA assessment, it seems an oversight that the diversity of microbial communities was not also examined.

35. Of the single invertebrate species they collected in their one sampling event, they concluded it was the ubiquitous snail *Potamopyrgus antipodarum*. However, there are 50-odd other species of Hydrobiid snails that superficially (even to the trained eye) resemble *P. antipodarum* (Haase 2008). Did they confirm the snails were *P. antipodarum* (again by simple DNA test) and not one of the many other endangered snails that look like *P. antipodarum*? For example, *Potamopyrgus oppidanus* (https://blog.tepapa.govt.nz/2019/07/25/save-wellingtons-unique-snail-from-extinction/?utm_source=chatgpt.com) only occurs in seepages on Te Ahumairangi Hill (formerly Tinakori Hill) in Wellington's Town Belt.

36. Finally, again, they use an MCI to assess the “ecological value” of the warm spring. It is totally inappropriate to use an MCI to assess a warm spring ecosystem.

37. **In summary, I do not believe Boffa Miskell has made an adequate assessment of the uniqueness and ecological value of the warm spring; and certainly not enough to conclude it can be so easily extirpated.**

Boffa Miskell has provided no assessment of the uniqueness of the freshwater ecosystems potentially at risk.

38. Boffa Miskell provides no assessment of the uniqueness of the river types and/or their associated fauna with respect to the Department of Conservation Freshwater Environment Classification (FENZ). The FENZ classification (Leathwick *et al.* 2010a, 2007, 2010b) was developed by DOC to provide different levels of classification of every stream and river in New Zealand with respect to its "non-anthropogenic" characteristics (e.g., size, typography, altitude). This allows one to easily assess what type of stream a reach is, and also how unique it is in a region or even the whole of New Zealand. It can also give you some idea of what types of biota are likely to be present (as sampling will usually underestimate what may be present), and these are all provided free to the public. **Why has Boffa Miskall not assessed what river types are potentially at threat here, and/or their associated biota? Is this the last remaining C6.2a-type river in the Coromandel or in New Zealand? We have no idea from their investigation.**

Boffa Miskell concludes that a lack of resource consent breaches is evidence that current activities are having no impact. However, a lack of evidence is not evidence of no effect.

39. Boffa Miskell provides as "evidence" of no adverse effects of the current discharge that "there has been no resource consents breach". However, **lack of evidence is not evidence of no effect**. They provide no literature and/or ecotoxicology tests (which could be easily and cheaply performed) to illustrate that some of the potential contaminants at the levels recorded in the receiving water body are not toxic and/or have sublethal effects on key taxa.
40. Dr Emerman, in his assessment of the WNP proposal, raises concerns about many of the speculations in the application on discharge and/or effects of heavy

metal contamination associated with the mining activity, for example, that mercury present will remain immobile during the mining process.

41. Ryder (2021) appears to have examined some eels for mercury bioaccumulation, but makes no mention of the number of eels examined. Furthermore, they seem to conclude that no differences in eel populations above and below the discharge provide evidence of no effect of discharge. Even though eels are highly mobile fish and are likely to be moving regularly between upstream and downstream, a more relevant test would have been to compare mercury levels in these eels and those in an adjoining catchment. Finally, they seem to conclude that the actual testing of eels was leading to a declining population, and not chemical impacts from the mining.

42. Although selenium testing in plants and fish has been conducted, there is no mention of testing in invertebrates. **Why were invertebrates not tested for selenium?** It seems many invertebrates may be more sensitive to selenium (deBruyn & Chapman 2007; Hamilton 2004). At the very least, they could have conducted a simple aquarium ecotoxicology evaluation of the effects of selenium concentration on Cladocerans (waterfleas).

43. There is no mention of the potential for bioaccumulation of PFAS (Per and Poly-fluoroalkyl substances) in fish and/or invertebrates. This is a major issue in water sources globally and may be discharged from gold mining operations. **Will any be discharged from the operation?** Sampling in the Manawatu has indicated PFAS may be prevalent in New Zealand freshwater fish and invertebrates via bioaccumulation, and even in marine food webs (Foord *et al.* 2024; Stockin *et al.* 2021).

44. In summary, given both the severe lethal and sublethal impacts of several heavy metals and selenium from the mining activity, there has been inadequate investigation of the potential for adverse ecological impacts. Cheap and straightforward ecotoxicology tests could have reduced that uncertainty; however, relying on a lack of evidence of adverse effects is not evidence of no impact.

Boffa Miskell have not considered potential impacts on the lower catchment and the receiving marine environment.

45. The waterways impacted by the mining operation are close to the marine environment as the river flows. Will any of the potential contaminants flow out to the estuaries and marine environment to be potentially bioaccumulated by marine bivalves, fish and/or mammals (Stockin *et al.* 2021)? The majority of New Zealand's threatened and at-risk freshwater fish are amphidromous and move out to the sea and up rivers during their life cycle; even extremely low levels of heavy metal in solution have been shown to prevent such crucial migrations (Baker & Montgomery 2001).

I do not believe it is feasible to successfully relocate/reestablish a stream ecosystem.

46. The applicant proposes to create stream diversions that are ecologically functional, stating: "*The design of the diversion channel is planned to replicate aquatic habitat attributes with a range of suitable stable microhabitats for fish and invertebrates, including the creation of stable pool habitats, the inclusion of gravel and cobble riffle habitats, and provide for the passage of climbing fish, especially eels".* There are numerous examples in New Zealand and elsewhere that demonstrate that simply creating the physical habitat that appears to be a stream will NOT result in the fauna typically found in that waterway reestablishing itself (e.g., Barrett *et al.* 2021; Bernhardt *et al.* 2005). In Christchurch, after the earthquakes, extensive improvements in the physical habitat of the Avon River were conducted (https://www.doc.govt.nz/globalassets/documents/conservation/land-and-freshwater/freshwater/habitat/freshwater-habitat-restoration-riffle-habitat-in-the-avon-river.pdf). However, because there were limited colonisation sources in the urban environment for the river, there has been limited biological restoration. The applicant does not provide any evidence that restoration is possible with these streams, or even what the resulting "restored" biological community would comprise.

47. In fact, they even state that *"the stream gradient may make it difficult to maintain (upstream and downstream) fish passage for general fish species*". The Department of Conservation's assessment (Appendix E: Complex freshwater fisheries activity approval report) of the proposal seems to be limited to the impact on native fish passage, with no mention of its potential impact on other biological components of the stream ecosystems. Their assessment (as with the applicants) provides no assessment of the potential impact on threatened or at-risk invertebrate species.

48. **Where is the supporting evidence or studies that show stream ecosystems can so easily be moved as they imply?**

49. In conclusion, I believe the Boffa Miskell assessment of the potential environmental impacts of the Waihi North Project leaves a considerable number of issues either not addressed or only partly considered. Some of these uncertainties could have been avoided at minimum cost. Therefore, given the provided information, I think it is premature to conclude that the potential assessed effects and/or suggested mitigation are appropriate.

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