

In the matter of an application for approvals under the Fast Track
Approvals Act 2024 for the Barrytown Minerals
Project – Southern Block [FTAA-2605-1238]

By **Tāiko Critical Minerals Limited**

Applicant

**Statement of evidence in reply of Dr Michael George Fitzpatrick in
relation to water quality and toxicology**

3 October 2026

Applicant's solicitors:

Alex Booker

Anderson Lloyd

Floor 2, The Regent Building, 33 Cathedral Square, Christchurch 8011

PO Box 13831, Christchurch 8141

DX Box WX10009 Christchurch

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[REDACTED]

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lloyd.**

Introduction

- 1 My name is Michael George Fitzpatrick.
- 2 I provided a statement of evidence dated 17 March 2026, which outlines my experience at paragraphs 5 - 10.
- 3 I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court of New Zealand Practice Note 2023 and that I have complied with it when preparing this reply to comments.

Dr Richard Storey

- 4 Dr Storey, the freshwater ecologist for DOC, raises several issues relating to water quality at paragraphs 31 to 60.
- 5 In paragraph 31, Dr Storey seeks clarification regarding the use of the USEPA (1986) guideline for iron (1.0 mg/L), noting that while modelled values for iron concentrations in SB watercourses comply with this guideline, they do not comply with the default 95%-ile ANZG guideline (0.28 g/m³). Dr Storey seeks justification for the use of older guideline values or a reassessment of compliance using the current guidelines.
- 6 The current guidelines referred to are the ANZG (2025), 'Toxicant default guideline values for aquatic ecosystem protection: iron in freshwater', which were published in September 2025.
- 7 I conducted the modelling of iron concentrations in SB watercourses and reported my results to the Applicant in March 2025, i.e., before the ANZG (2025) guidelines were published.
- 8 ANZG (2025) states that the guidelines for iron are for the bioavailable fraction known as the 'weak acid extract' of an unfiltered water sample, and that filtered/dissolved fractions of iron should not be compared with the default guideline values (p.13).
- 9 This marks a major shift in how the effects of iron on aquatic biota are considered because the USEPA criterion for iron, which focuses on the effects of iron oxyhydroxide (known as iron floc), is a gold standard, having a 40-year record of successfully protecting freshwater aquatic biota.
- 10 My decision not to refer to the ANZG (2025) iron guidelines in my March 2026 evidence was well considered.

- 11 First, the leading water analysis laboratories in New Zealand (notably, Hill Laboratories, Hamilton) do not offer the 'weak acid extract' method, which makes it impractical to obtain the correct iron data or apply the ANZG guidelines retrospectively.
- 12 Second, the ANZG (2025) guidelines for iron are default guideline values (DGVs) that are generic for use across all of Australia and New Zealand. Therefore, DGVs require consideration before applying them to a specific location, i.e., by considering local water quality and species presence or absence.
- 13 According to ANZG (2025), the most sensitive species that is relevant to Barrytown South is *Ceriodaphnia dubia*, for which ANZG (2025) utilises a 7-day EC10 (reproduction) endpoint of 0.38 g/m³, at low hardness (10.6 g/m³ as CaCO₃), elevated pH (8.0), and low (0.3 g/m³) dissolved organic carbon (DOC), noting that "the lowest toxicity value from different endpoints" for the species was used.
- 14 In this case, the high sensitivity of iron to *Ceriodaphnia dubia* under ANZG's choice of conditions of elevated pH and low hardness reflects a 'double-whammy' effect since it corresponds to favourable pH for the formation of iron oxyhydroxides as well as amelioration at low hardness.
- 15 However, the predicted water quality in SB surface waters has elevated hardness. As discussed in my March 2026 evidence at paragraph 29, "tailings and slimes will require augmentation with lime before deposition in order to raise porewater pH and hardness and facilitate demobilisation of metals and metalloids". Lime augmentation also ameliorates the toxicity of metals such as iron in receiving surface waters.
- 16 I note ANZG (2025) also reports toxicity data for *Ceriodaphnia dubia* under water quality conditions that are much better aligned with Barrytown South. Specifically, the higher hardness (96.8 g/m³, as CaCO₃) at elevated pH (8.3) in the north and south sub-blocks compares more realistically with the ANZG (2025) 7-day EC10 for *Ceriodaphnia dubia* (2.2 g/m³) at a hardness of 84 g/m³ (as CaCO₃) at pH 8.0.
- 17 And a moderate hardness (34 - 42 g/m³, as CaCO₃) at pH 6.9 - 7.2 in the central sub-blocks is a better comparison with the ANZG (2025) 7-day EC10 for *Ceriodaphnia dubia* (1.2 g/m³) at a hardness of 25 g/m³ (as CaCO₃) at pH 6.3.

- 18 Hence, an important perspective is gained, and I consider that the USEPA (1986) criterion of 1 g/m³ total iron provides greater site-specific protection to *Ceriodaphnia dubia* at Barrytown South than the EC10 data presented in ANZG (2025).
- 19 It is important to restate that the water quality models I constructed were conservative and under low flow conditions, i.e., they overestimate iron concentrations in SB watercourses.
- 20 In paragraph 32, Dr Storey seeks clarification concerning the potential for iron oxyhydroxide deposition on stream beds. The previously mentioned USEPA (1986) criterion specifically protects aquatic biota from such effects.
- 21 In paragraph 44, Dr Storey comments that the proposed treatment of tailings and slimes with hydrated lime “appears to be still somewhat experimental”. The use of hydrated lime as proposed is not experimental; it is a well-established method for treating mine water for the intended purposes, i.e., contaminant reduction and amelioration of toxicity to aquatic biota. However, the exact treatment regime will need to be clearly defined, and the Water Management Plan and Monitoring and Effects Management Plan (WMMEMP) requires this¹.
- 22 In paragraph 46, Dr Storey comments that the threshold for electrical conductivity (3,500 mS/cm) seems extremely high, but this is a misreading of the proposed threshold. The proposed threshold is 3,500 µS/m, not 3,500 mS/cm. The 3,500 µS/m threshold is based on the lowest ANZECC (2000) stock water total dissolved solids (TDS) limit for cattle (2,400 g/m³), which translates to an estimated electrical conductivity range of 3,500 µS/m to 4,800 µS/m.
- 23 In paragraph 47, Dr Storey comments on tables in the WMMEMP that the thresholds for most of the water quality parameters are based on annual medians, etc., which means a year’s worth of data is required to determine if a threshold has been crossed. This is incorrect. The thresholds should not be assessed as annual medians, etc., since they are guidelines. If a threshold is exceeded just once it will trigger a management response.
- 24 An exception to this approach is dissolved reactive phosphorus (DRP), for which the threshold is taken from the NPS-FM (2000) and, therefore, requires assessment as an annual median, etc. Notably,

¹ Condition 22.2.

the NPS-FM stipulates that the DRP attribute state can only be graded by a five-year data record, which is far too long for practical assessments of DRP status.

- 25 In paragraph 48, Dr Storey again expresses concerns that the treatment method for removing toxicants from tailings water appears to be somewhat experimental. This is incorrect; refer to paragraph 21.
- 26 At paragraph 57, Dr Storey considers that “meeting the specified guideline values in watercourses should be a condition of consent”. I disagree. The recommended thresholds are based on guidelines, which are conservative and based on chronic no-effects data. I consider that exceedance of a guideline should trigger a considered management action, not a breach of a consent condition. This is how the conditions of consent are structured. Less conservative thresholds based on acute toxicity effects, that can be utilised as hard consent limits, could have been proposed. But I consider the thresholds proposed are the most conservative and a better management tool.
- 27 At 60a, Dr Storey states that the application of thresholds to receiving waters is “impractical because the relationship between concentrations in mine discharge water and concentrations in the creek monitoring sites is not accurately known”. I disagree. Rather, setting thresholds for receiving waters is highly practical and widely used throughout New Zealand. While the relationship between concentrations in mine discharge water and concentrations in receiving waters is not absolutely known, receiving water quality has been modelled conservatively, and conservative thresholds to protect aquatic biota have been proposed.
- 28 At paragraph 60b, Dr Storey states that some of the threshold values in Table A [of the proposed resource consent conditions, appendix P1] are significantly higher than ANZG 2026 DGVs, notably for aluminium, copper, iron, nickel, and zinc. The iron threshold is discussed in paragraphs 5 to 20.
- 29 For aluminium, the ANZG 2026 DGV is based on outdated science (ANZECC, 2000). The proposed aluminium threshold is based on USEPA (2018) and reflects more up-to-date, higher-quality science.
- 30 For copper, nickel, and zinc, Dr Storey refers to ANZG 2026, but those guidelines (ANZG, 2026a; ANZG 2026b, ANZG, 2026c) were

published in September 2026, i.e., after submission of the Barrytown South proposal and after my previous evidence brief of March 2026.

- 31 For copper, nickel, and zinc, Dr Storey fairly compares the proposed thresholds with the ANZG 2026 DGVs but without taking into account the site-specific dependencies of hardness, pH, and DOC. The thresholds for copper, nickel, and zinc in the proposed conditions have been updated to better reflect the 2026 ANZG updates in a site-specific manner.
- 32 At paragraph 60c, Dr Storey considers the “final column in Table A [of the proposed resource consent conditions, appendix P1], and the footnotes, are not helpful” and reference should be made to ANZG technical briefs, which is a straightforward amendment which has now been made to the proposed conditions.

Dr Brian McGlynn

- 33 I have read the evidence of Dr McGlynn and I do not consider any matters raised in his statement are material to water quality which require a response.

Summary

- 34 I remain of the opinion that the potential adverse effects of mining due to the discharge of mine water will be avoided both during the operations and upon completion. Critical to my assessment is the need for augmentation of mine water with lime.
- 35 The effects of the mine water discharge are appropriately managed by the proposed conditions of consent which include the establishment of receiving water attribute states for visual clarity and DRP, appropriate water quality monitoring for a broad suite of parameters, and annual hydrological and water quality reporting.

Mike Fitzpatrick PhD
3 October 2026

References

ANZECC (2000). Australian Water Quality Guidelines for Fresh and Marine Water. Australian and New Zealand Environment and Conservation Council, Agriculture and Resource Management Council of Australia and New Zealand.

ANZG 2025, Toxicant default guideline values for aquatic ecosystem protection: Iron in fresh water. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. CC BY 4.0. Australian and New Zealand Governments and Australian state and territory governments, Canberra, ACT, Australia.

ANZG 2026a, Toxicant default guideline values for aquatic ecosystem protection: Copper in fresh water. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. CC BY 4.0. Australian and New Zealand Governments and Australian state and territory governments, Canberra, ACT, Australia.

ANZG 2026b, Toxicant default guideline values for aquatic ecosystem protection: Nickel in fresh water. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. CC BY 4.0. Australian and New Zealand Governments and Australian state and territory governments, Canberra, ACT, Australia.

ANZG 2026c, Toxicant default guideline values for aquatic ecosystem protection: Zinc in fresh water. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. CC BY 4.0. Australian and New Zealand Governments and Australian state and territory governments, Canberra, ACT, Australia.

NPS-FM 2020. National Policy Statement for Freshwater Management 2020. Updated December 2025 to incorporate amendments from the National Policy Statement for Freshwater 2025.

USEPA, 1986. Quality criteria for water. United States Environmental Protection Agency Office of Water EPA 440/5-86-001 May 1986.

USEPA, 2018. Final aquatic life ambient water quality criteria for aluminium 2018. United States Environmental Protection Agency Office of Water EPA-822-R-18-001 December 2018.