Before the Expert Panel appointed under the Fast-track Approvals Act 2024

Under	the Fast-track Approvals Act 2024 (**Act**)
And	
In the Matter of	an application for approvals by Matakanui Gold Limited to establish, operate, rehabilitate and ultimately close an open pit and underground gold mining operation known as the Bendigo-Ophir Gold Project

Statement of Evidence of **Gregory Ian Ryder** on behalf of **Matakanui Gold Limited** in response to Section 53 Feedback

Ecotoxicology

Dated: 17 April 2026

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INTRODUCTION

1. My name is Gregory Ian Ryder.

2. I work as an independent Environmental Scientist and RMA commissioner, and have worked as a consultant for over 35 years undertaking investigations and studies throughout New Zealand. My technical work is largely in the fields of surface water quality and aquatic ecology. I have presented evidence as an expert witness at many resource consent hearings, plan or plan change hearings, boards of inquiry, Environmental Protection Authority (**EPA**) and Water Conservation Order hearings, as well as Environment Court hearings. I am also a certified independent commissioner and have sat on resource consent and plan change hearings throughout the country as well as several EPA boards of inquiry.

3. I hold the qualifications of BSc. (Hons, 1st class) (Zoology) and PhD., (Zoology), both from the University of Otago. Both my honours dissertation and PhD thesis focused on stream benthic invertebrate communities in Otago streams and rivers. Specifically, my PhD thesis examined the effects of fine sediments on benthic macroinvertebrates.

4. I am a member of the New Zealand Freshwater Society and the New Zealand Plant Conservation Network. I was a Board member of the EPA from February 2020 to November 2023, and was appointed as a Freshwater Commissioner in September 2020, which expired in December 2024. I am accredited under the Making Good Decisions Program to sit on RMA hearing panels (chair certification).

5. I have a long history of assessing and monitoring the effects of gold mining operations on surface water throughout New Zealand, particularly in Otago. For example, in the 1980s, I was involved with baseline surveys of the aquatic ecology in surface waters associated with the Macraes Gold Mine in North Otago, New Zealand's largest gold mine, prior to the commencement of modern mining operations. After mining commenced, I was involved in regular monitoring of surface waters from 1995 up until 2022. Both the Macraes and the Bendigo-Ophir Gold Project (**BOGP**) are located in catchments that have similar geology dominated by schist rock.

6. I am also familiar with the lower Lindis River, having undertaken extensive low flow investigations on it in 2017 and periphyton monitoring in 2019. I am a regular visitor to the lower Lindis River, as I reside 30 minutes away, and often go there to inspect the lower river or fish the Clutha River near its confluence. I am also very familiar with the Clutha River / Mata-Au and Lake Dunstan, having undertaken numerous assessments and reviews of the ecology and water quality of these waterbodies over many years.

7. This statement is given as part of Matakanui Gold Limited's (**MGL**) response to comments on the BOGP made under Section 53 of the FTA. This statement responds to specific comments and issues raised by:

   (a) Otago Fish & Game;

   (b) Environmental Defence Society (**EDS**);

   (c) Iwi Authorities and Treaty Settlement Entities;

   (d) Owners and occupiers of land (Folding Hill Wine Company Limited, Matakanui Station, Ross Hannan, Bruce Lambie, Trevathan Family)

   (e) Otago Regional Council (**ORC**).

8. My original findings are provided in full in the report I prepared for MGL, which is document B.07 Greg Ryder Consulting - Recommended Water Quality Compliance Limits for the Bendigo Ophir Gold Project (Ryder 2025),[1] provided in Part B of the Substantive Application.

9. I also prepared a memorandum dated 27 January 2026 in response the Otago Regional Council RFI. The memorandum is Appendix 12 of ORC's overall feedback on the Substantive Application that was sent to the Panel and dated 10 April 2026.

10. My assessments have relied in part on information contained in reports prepared Mine Waste Management (**MWM**) and Kōmanawa Solutions and appended to the Substantive Application, in particular:

    (a) B.06C Mine Waste Management Limited Mine Impacted Water Overview Report.

    (b) B.03 Kōmanawa Solutions Limited - Groundwater Existing Environment and Effects Assessment.

    (c) B.04 Kōmanawa Solutions Limited Surface Water and Catchment Existing Environment Effects Assessment.

11. I have prepared this statement in the limited time available for MGL to respond to comments under the Act. If the Panel requires elaboration on any of the matters raised in this statement, I am available to provide further information on request.

[1] *Bendigo-Ophir Gold Project: Recommended water quality compliance limits for the Bendigo-Ophir Gold Project.* Prepared by Greg Ryder, Greg Ryder Consulting.

12. Although this is not an Environment Court proceeding my confirmation of compliance with the Code of Conduct for Expert Witnesses in the Environment Court Practice Note 2023 is included in Substantive Application Document A0.2B.

OTAGO FISH & GAME

13. Fish & Game witnesses have raised a range of issues associated with potential effects on water quality and freshwater ecosystems, and I have grouped these to respond to key points. Issues raised by Fish & Game have also been raised by other submitters and I will not replicate my responses in such situations, however I will cross-reference the relevant response to Fish & Game.

14. I have also listed the issue or comment number prior to presenting my response. These issue numbers are the same as those provide in the tabulated comments document that accompany MGL's responses to submitters (provided as Part 3 of this comment response package).

Issue 3. The Project relies very heavily on water quality limits to ensure appropriate environmental outcomes, yet the proposed limits are not based on accurate analysis of the site's waterbodies and ignore wider receiving environments.

15. Fish & Game witnesses raise a number of concerns relating to the water quality compliance limits that I recommended in my report prepared for MGL, which is document B.07 Greg Ryder Consulting - Recommended Water Quality Compliance Limits for the Bendigo Ophir Gold Project (Ryder 2025),provided in Part B of the Substantive Application. In particular, Ms McArthur disagrees with my approach to limit setting and states that they are largely based on the Australia New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018)[2]. This is not an accurate statement and I addressed this point in my response to the Panel's RFI #27 "**Provide an assessment of whether applying different ANZG (2018) species protection levels (e.g., 95% vs 90%) for different contaminants is more appropriate given baseline conditions.**". Contaminants where ANZG (2018) default guidelines were recommended in my report for surface water compliance limits are aluminium, arsenic, cadmium, chromium, copper, molybdenum, zinc and cyanide. Other sources of water quality limits or guidelines were recommended for ammonia, antimony, cobalt, nitrate, pH, sulphate and turbidity.

16. The use of alternative sources for these contaminants were for a variety of reasons. For example, for sulphate, there is no relevant ANZG (2018) default guideline value, hence the adoption of an alternative limit, based on a combination of North American

[2] Para 122. Statement of Evidence of Kathryn McArthur.

water quality criteria and New Zealand ecotoxicity studies using the mayfly *Deleatidium* and an Otago non-migratory galaxiid species (Taieri flathead galaxias, or *Galaxias depressiceps*). For pH, I adopted the US EPA pH criteria as I considered it better reflects the variable nature of pH in streams as they respond to diurnal changes associated with algae and plant photosynthesis. For turbidity, I adopted the relevant numerical limit in Schedule 15 of the Regional Plan: Water for Otago, which I thought made sense to align with regional plan instruments. For ammonia and nitrate toxicity, I adopted concentrations at the bottom of their respective B band attribute states in Appendix 2A of the NPS-FM 2020. The B attribute bands provide 95% species protection level. For antinomy, I adopted the British Columbia Ministry of Water, Land and Resource 2023 acute and chronic guidelines, which are more recent guidelines than the ANZG 2018 DVGs, and the ANZG DVG has an unknown level of species protection. Finally, for cobalt, I adopted the Canadian Federal Environmental Quality 2017 acute and chronic guidelines, which are hardness dependent. I note that the chronic concentration (0.001 mg/L for waters that have hardness of 100 mg/L $CaCO_3$) is more conservative than the ANZG DGV of 0.0014 mg/L, which has an unknown level of species protection.

17. Ms McArthur recommends the water quality compliance and performance limits for the project are 'recalibrated' to a minimum 95 % species protection level. For some contaminants, it would appear that setting a compliance limit equivalent to the ANZG (2018) Default Guideline Value (DGV) for 95 % species protection may not be met currently in the existing environment (arsenic and zinc at the proposed RS03 compliance monitoring site). For example, in the years 2024 and 2025, arsenic concentrations on four occasions exceeded the DGV for 95 % level of species protection (0.013 mg/L), and was at or just below that DGV on 11 other occasions. Over the same period, zinc exceeded the DGV for 95 % species protection (0.008 mg/L) on two occasions. Both contaminants met their respective DGVs for 90 % level of species protection on all occasions

18. There seems little point in setting water quality limits that cannot be met under the existing environment.

19. For contaminants such as ammonia, nitrate and bioavailable phosphorus, that are capable of causing nuisance algae and plant growths in streams, macroinvertebrate monitoring has been proposed in the G.13 Freshwater Ecology Management and Monitoring Plan that has targets relating to the macroinvertebrate community health (which is strongly influenced by periphyton biomass and cover). In my opinion, these targets, if extended to stream sections immediately downstream of the Shepherds and Rise and Shine Creek stream diversions around mine activities, will provide an appropriate 'limit' that protects local stream communities.

20. I disagree that the 'wider environment' has been ignored when setting water quality compliance limits, in particular the Lindis River, the Clutha River / Mata-Au and Lake Dustan.

21. The Clutha Arm of Lake Dunstan is fed primarily by the Clutha River / Mata-Au, which has a median flow of 280 m^3/sec below the Cardrona River confluence (ORC data). One study found the hydraulic residence time of the Clutha Arm of Lake Dunstan ranged between 3 and 15 days, with an average of just over 7 days[3]. That means the entire volume of water in the Clutha Arm is turned over every 7 days on average, indicating a rapid exchange of water providing limited opportunity for soluble contaminants to accumulate.

22. The Lindis River has a median flow of 4.3 m^3/sec and a mean annual low flow of 0.252 m^3/sec at the Ardgour Road flow recorder. This river typically loses water in the reach between the flow recorder and the Clutha River confluence.

23. Rekker (2025[4]) estimated the mean flow in the lower Bendigo Creek as 0.120 m^3/sec and mean annual low flow as 0.033 m^3/sec, and also noted that surface flow in the lower creek is lost to the Bendigo Aquifer, which also connects to the Clutha River / Mata-Au via seepage through the aquifer.

24. The key point from the above hydrological data is that the Clutha River / Mata-Au provides a significant source of dilution for any flow (and associated contaminants) entering the Clutha River itself or Lake Dunstan from the Lindis River or from Bendigo Creek, or directly via groundwater.

25. Under normal operating and climatic conditions, there is a very low to no risk of particulate material and particulate-bound contaminants finding their way via surface (i.e., a 'wet connection') or ground water from the BOGP Project Site to the Lindis River, the Clutha River / Mata-Au or Lake Dunstan.

26. Despite the above, assuming soluble forms of contaminants do find their way into the aquifers, the lower Lindis River, or lower Bendigo Creek, they would be rapidly diluted by flow once they reached the Clutha River / Mata-Au, and in my opinion, comfortably meet ANZG (2018) DVG for 95 % species protection or better.

27. To demonstrate that, I note that MWM has prepared a memorandum that tabulates the modelled annual contaminant loads exported from the Project Site for the next

[3] Schallenberg, M. & Burns, C.W. (1997) *Phytoplankton biomass and productivity in two oligotrophic lakes of short hydraulic residence time*. New Zealand Journal of Marine and Freshwater Research, 31:1, 119-134, DOI: 10.1080/00288330.1997.9516749

[4] Rekker, J. (2025). *Bendigo – Ophir Gold Mine Project – Surface Water & Catchment Existing Environment & Effects Assessment.* (Report Series No. Z24002BOG-2). Kōmanawa Solutions Ltd, Christchurch.

199 years (after the commencement of passive treatment)[5]. Table 3 of their memo (see my Table 1 below), which I have modified to include ANZG 9+(2018) default guidelines, sets out estimated concentrations associated with the maximum annual load (year 85) under median river flow conditions for the upper Clutha River / Mata-Au and the Lindis River at Ardgour Road. That assessment shows that contaminant contributions that may enter these rivers under median flow conditions do not threaten ANZG (2018) DVGs for 95% or even 99% level of species protection.

Table 1: Estimated concentration associated with maximum annual load (year 85) for median flows (source: MWM with guidelines added). * = unknown level of protection

PARAMETER	ANZG DGV 95% SPECIES PROTECTION	ANZG DGV 99% SPECIES PROTECTION	CLUTHA RIVER (SC01 + RS03)	LINDIS RIVER AT ARDGOUR ROAD (SC01)
Median flow m^3/s			279.4	4.3
Al (mg/L)	0.055 (pH >6.5)	0.027 (pH>6.6)	0.000006	0.0003
As (mg/L)	0.013	0.0008	0.000002	0.00005
Cd (mg/L)	0.0002	0.0006	0.00000003	0.000001
Co (mg/L)	0.0014*	0.0014*	0.0000001	0.000003
Cr (mg/L)	0.0067 (CrIII)	0.00095	0.0000001	0.000005
Cu (mg/L)	0.0014	0.001	0.0000002	0.000006
Fe (mg/L)	0.280	0.140	0.00005	0.0007
Mn (mg/L)	1.9	1.2	0.0000032	0.0002
Mo (mg/L)	0.034*	0.034*	0.000004	0.0002
NO_3-N (mg/L)	2.6 (mod hardness)	1 (mod hardness)	0.0001	0.002
Pb (mg/L)	0.0034	0.001	0.00000007	0.000003
Sb (mg/L)	0.009*		0.000003	0.0001
SO_4 (mg/L)	-	-	0.03	1.7
Sr (mg/L)	-	-	0.0001	0.006
CN (mg/L)	0.007	0.004	0.0000003	0.00002
U (mg/L)	0.0005*	0.0005*	0.000002	0.0001
Zn (mg/L)	0.008	0.0024	0.0000003	0.00001

[5] MWM memorandum. Appendix D - RFI Comment Number #28.

28. The MWM analysis was based on median river flows. I have taken the worst- case year (year 85) and converted the annual load for nitrate to an average rate of discharge and assumed all of it reaches the Clutha River / Mata-Au. Under a mean annual low flow (**MALF**) scenario of 111 m^3/sec (as estimated by the ORC for the river downstream of the Cardrona River confluence), nitrate from the mine would increase the Clutha's nitrate concentration by 0.00032 mg/L. Table 1 in Ms McArthur's evidence reports the median nitrate concentration for the Clutha at Luggate Bridge as 0.03 mg/L, so the potential nitrate contribution from the mine would have a *de minimus* contribution, even under low flow conditions.

29. I undertook a similar exercise for the lower Lindis River using the worst-case year load export from the Shepherds Creek catchment (Compliance Monitoring Site SC01). Under that scenario, the mine would contribute an average concentration of 0.0284 mg/L nitrate to the Lindis River under mean annual low flow conditions (252 L/sec). Table 1 in Ms McArthur's evidence reports the median nitrate concentration for the Lindis River at Ardgour Road as 0.033 mg/L (based on ORC data), so the nitrate contribution from the mine would increase the nitrate concentration in the river to 0.0614 mg/L, which is still much lower than the 0.231 mg/L total nitrogen concentration Ms McArthur cites as a recent nutrient criterium for Otago and Southland, and consistent with the National Policy Statement for Freshwater Management (**NPS-FM**) B band state for periphyton. It is also lower than the Regional Plan: Water for Otago Schedule 15 limit/target of 0.075 mg/L.

30. I have undertaken similar exercises for the other potential contaminants that might reach the Lindis River, Clutha River / Mata-Au and Lake Dunstan, as listed in Table 1, and found that their contributions do not threaten ANZG (2018) DVGs for 95% or 99% level of species protection under low flow conditions, except for uranium in the Lindis River. However, the ANZG DVG for uranium (0.005 mg/L) has an unknown level of species protection. The Canadian Water Quality Guidelines for the Protection of Aquatic Life have a freshwater long-term exposure limit for uranium of 0.015 mg/L and a short-term exposure limit of 0.033 mg/L. Both of these limits would be comfortably met (by an order of magnitude) in the modelled worst case year.

31. I also note that, apart from nitrate, I have not accounted for possible existing concentrations of these contaminants in either of the rivers immediately upstream of where water from the Project Site may make its way to them, and I am unaware of any data on these contaminants in the Lindis River. However, I expect metal concentrations, cyanide and sulphate to be very low (at or below laboratory detection limits for metals and cyanide).

Table 2: Estimated concentration associated with maximum annual load (year 85) for mean annual low flows (MALF). * = unknown level of protection. Yellow shaded cell indicates possible exceedance of ANZG DGV with an unknown level of species protection but meets other international guidelines.

PARAMETER	ANZG DGV 95% SPECIES PROTECTION	ANZG DGV 99% SPECIES PROTECTION	CLUTHA RIVER (SC01 + RS03)	LINDIS RIVER AT ARDGOUR ROAD (SC01)
MALF m^3/s			111,000	0.252
Al (mg/L)	0.055 (pH >6.5)	0.027 (pH>6.6)	0.00001	0.0045
As (mg/L)	0.013	0.0008	0.000004	0.00075
Cd (mg/L)	0.0002	0.0006	0.00000008	0.00003
Co (mg/L)	0.0014*	0.0014*	0.000000019	0.0006
Cr (mg/L)	0.0067 (CrIII)	0.00095	0.000000031	0.00009
Cu (mg/L)	0.0014	0.001	0.0000004	0.0001
Fe (mg/L)	0.280	0.140	0.00012	0.01132
Mn (mg/L)	1.9	1.2	0.00001	0.00277
Mo (mg/L)	0.034*	0.034*	0.00001	0.00328
NO_3-N (mg/L)	2.6 (mod hardness)	1 (mod hardness)	0.0284	0.00032
Pb (mg/L)	0.0034	0.001	0.00000018	0.00005
Sb (mg/L)	0.009*	0.009*	0.00001	0.00191
SO_4 (mg/L)	-	-	0.072	28.4
Sr (mg/L)	-	-	0.00031	0.1044
CN (mg/L)	0.007	0.004	0.00000057	0.00025
U (mg/L)	0.0005*	0.0005*	0.00001	0.00214
Zn (mg/L)	0.008	0.0024	0.00000094	0.00025

32. Notwithstanding the low likelihood of water quality contaminants having a meaningful impact on the wider freshwater environment, I support the monitoring recommendations by Mr Rekker in relation to the Lindis River and Bendigo Creek[6]. In my view these monitoring actions can sit in a management plan and are not required to be included in the proposed updated conditions. I understand that updated management plans are not being provided at this time and will instead be reissued following expert conferencing.

[6] Rekker, J. (2026) *Instituting Water Quality Monitoring of Lindis River and Bendigo Creek.* Memorandum to Matakanui Gold.11 March 2026.

Issue 5. The Project is situated upstream of waterbodies that have good water quality and significant freshwater values, both in terms of their instream values (trout fishery, indigenous fish) and human use values (irrigation, frost control, drinking water). The applicant has not assessed the Project's impacts on those values.

33. Groundwater for drinking water purposes is protected by adopting the NZ drinking water standards for potable water as compliance limits. The risk of water quality affecting fish communities is low given the absence of fish in local streams and the available dilution of water closer to the Lindis and Clutha / Mata-Au rivers, as noted above.

Issue 6. The Project has overlooked critical impacts including the potential for bioaccumulation of contaminants in trout (or other fish) and game birds which may be harvested and eaten by people.

34. As noted above, there is a large volume of water that is constantly being turned over in the Clutha River / Mata-Au and Lake Dunstan providing little opportunity for bioaccumulation of soluble contaminants. However, I support extending the monitoring programme to include Bendigo Creek and the Lindis River, as referred to in paragraph 32.

35. Mr Paragreen, in his evidence[7], states; "*I would expect that there may be a risk of contaminant laden sediment and/or heavy metals settling out and accumulating in the reserve, potentially affecting the nearby ecosystem, its animals and any humans who harvest food from the area.*". I am unsure how Mr Paragreen has reached this conclusion, as the risk of this occurring is very low, as outlined in the evidence of Dr Paul Weber.

Issue 12. Partial revocation of the Conservation Covenant may result in effects on trout spawning or cause contaminant toxicity and bioaccumulation in trout and ecological damage to their habitats sufficient to impact the nationally significant trout fishery of the Clutha Mata-au River and Te Wairere Lake Dunstan, contrary to cl 45(1)(c) of Sch 6 FTAA.

36. My understanding of the Lindis River trout fishery is that the majority, if not all, of the spawning takes place in reaches upstream of the lower reach that interacts with groundwater from Shepherds Creek. Further, trout spawning migrations occur largely under higher flow events (freshes) in late autumn-winter, and so occur when flows in the Lindis River are elevated. While I consider the risk of elevated

[7] Para 46. Statement of evidence of Nigel Paragreen.

contaminants in the Lindis River due to the mine operation is relatively low, as demonstrated in previous sections of my evidence, it is even lower when the Lindis is flowing at above normal flow conditions which would be expected in late-autumn-winter. Consequently, I consider the risks to trout spawning, contaminant bioaccumulation of trout and toxicity, and habitat degradation, are very low, but, as noted above in paragraphs 32, support an extended monitoring programme be implemented to observe contaminant concentrations over time.

Issue 15. Fish & Game has outlined potential improvements to water quality limits, compliance and performance monitoring, completion criteria and bond and insurance provisions, should the Panel consider that it can grant the approvals.

37. Comments in previous paragraphs 15-36 relating to water quality limits and monitoring addresses my response to these issues. However, I would recommend that an additional condition relating to groundwater monitoring be considered, whereby if the concentration for a particular contaminant exceeds 50 % of the MAV value, that triggers an investigation response and an increase in the monitoring frequency. This recommendation recognises the concern expressed by some submitters regarding sufficient time to alert to a possible exceedance of a compliance limit, and potential effects on users of groundwater, or effects on the wider environment. I understand this condition has not been reflected in the amended conditions provided with the but will be discussed with relevant parties (e.g. regulators) at future anticipated consent workshops

Issue 16. Existing water quality within the Project site is described by the applicant as having "impacted" water quality. This description is based on results from a single sampling occasion, which is not reliable as an indicator of water quality condition – but in any event, the sampling results and subsequent monitoring of the Project site showed generally very good water quality, not impacted water quality.

38. Water quality data may indicate generally good water quality conditions, but not on all occasions. As noted above, some contaminants already exceed the ANZG (2018) DGV for 95 % level of species protection in some samples from the proposed Rise and Shine Creek monitoring site (RS03). The Shepherds Creek monitoring site (SC01) appears to exhibit consistently elevated pH (median of >8.1) and elevated nitrate and turbidity levels on occasions. These conditions suggest to me that this creek is impacted particularly when viewed in combination with historic stream 're-alignment', stock trampling and defecation, lack of riparian cover, willow encroachment and water abstraction.

Issue 17. Categorisation of the site's water quality as "impacted" has had significant ramifications for the applicant's proposed water quality limits, and the entire approach to managing effects on waterbodies.

39. In my report I concluded that, overall, the existing freshwater environment and freshwater ecological values associated with the BOGP can be considered to be relatively low. I based this finding on:

    (a) an absence of fish communities;

    (b) an absence of rare or endangered freshwater invertebrate species and some sections of watercourses having relatively poor invertebrate community composition; and

    (c) surface water quality and physical habitat, including riparian habitat, that is significantly impacted by historic mining activities, stock grazing and invasive species.

40. I still maintain that these conditions direct me to conclude that the local streams have relatively 'low' ecological values.

Issue 19. The provision of a minimum flow in the lower river from October 2026 is expected to reduce the impacts of abstraction in the Lindis River and improve fishery and angling amenity values. When considering the Project's effects, it is relevant to consider the future environment as modified by the full implementation of those consents (a less impacted river with improved fishery and angling amenity values).

41. It is good that Fish & Game acknowledge the expected improvements to the ecology of the lower Lindis River following the implementation of the revised minimum flow regime, as they argued strongly in the Lindis Environment Court hearing that this would not occur. I have already commented on this in previous sections of my evidence, noting that higher flows in the lower Lindis River will assist in the dilution of any contaminants entering the river via the Shepherds Creek/Ardgour Aquifer, and that trout spawning migration into the Lindis occurs under higher flow conditions.

Issue 27. The applicant's proposed water quality limits will not manage these adverse effects. Robust assessment of the effects of discharge contaminant concentrations must consider the existing background conditions of the receiving environment. The applicant has not done this.

42. I refer to my assessment under Issue 3 above and tables 1 and 2. The water quality of receiving water environments with significant ecological values will change very little under the potential contaminant loads that might reach them from the mine.

Issue 29. Water quality compliance limits are set at 'site exit points', purportedly to manage adverse effects from contaminants leaving the site. Surface and subsurface flows from the project discharge into a wider receiving environment that has not been thoroughly considered with some receiving environments completely overlooked.

43. My response to this comment has been largely addressed under Issue 3 above and tables 1 and 2. With recommended additional monitoring of waters in the wider receiving environment, as outlined in paragraphs 32 and 34, I consider this concern has been addressed.

Issue 30. The proposed limits allow for contaminant concentrations that, if fully implemented, would degrade water quality to the extent that there would be a risk of more than minor to significant adverse effects on aquatic life for surface waters within the site and for waterbodies in the wider receiving environment.

44. Within the Project Site, there is relatively limited aquatic life: no fish, no mega invertebrates (e.g., crayfish and mussels), just the typical array of benthic invertebrate taxa commonly found throughout most of New Zealand and particularly in modified catchments of Inland Otago. Coupled with the existing level of physical impact, it is my opinion that the proposed water quality limits will have minimal effects on the existing invertebrate community, and that monitoring of the invertebrate community, with triggers for response, as noted above, will be sufficient for addressing potential adverse effects. My recommendation noted above in paragraphs 32 and 34, for monitoring contaminants at the head of the Clutha Arm of Lake Dunstan, which is in addition to proposed conditions in the Substantive Application, should provide a suitable level of comfort that potential effects are being monitored and that there is a sufficient time to adapt mine operations for any unforeseen and unexpectable contaminant level.

Issue 31. The proposal, if discharging at the limit set out in the application will increase pollution of the existing environment, degrading water quality from what is generally a good state. This adds cumulative contamination impacts

to waterbodies that generally have good water quality but are at times stressed by over-allocation (excessive water extraction).

45. I have addressed this comment under Issue 3 and conclude there is a very low risk of such a scenario occurring.

Issue 32. Separate limits are set for surface and groundwater bodies, which do not protect the more sensitive systems, given the high degree of hydrological connectivity. Any limit should apply to both ground and surface waters to ensure the most sensitive system is protected.

46. The analysis under Issue 3 of contaminant loads, over time, reaching the lower Lindis River, Clutha River / Mata-Au and Lake Dunstan shows that ecological values will be protected. The proposed compliance limits, coupled water management and proposed compliance and performance monitoring programmes, should provide sufficient confidence that any unforeseen trends in contaminant concentrations or contaminant loads affecting receiving water environments are identified well before a potential adverse outcome occurs.

Issue 33. The limits have been set at 90% species protection – the level recommended for "highly disturbed" systems - based on an inaccurate depiction of the condition of streams within the Project site that is not even supported by the applicant's own sampling and analysis.

47. I have addressed this in previous sections of my evidence under Issue 3 above and at paragraph 38.

Issue 34. The "site exit point" limits operate as de facto limits for the wider receiving environment, without analysis of the receiving environment water quality; freshwater values; or recognition of ground and surface water interconnection, on the assumption that these limits plus dilution within receiving waterbodies will be suitable to protect the receiving environment beyond the site.

48. I acknowledge that dilution has been factored in when considering the effects on receiving environment water quality, however the analysis discussed under Issue 3 demonstrates that freshwater values of the wider receiving environment will be protected.

Issue 35. Given existing good water quality and the interconnected nature of surface and groundwater of the site and the wider receiving environment, and the fisheries, ecological and cultural values of that receiving environment Ms

McArthur recommends a 95% species protection level (consistent with a slightly to moderately disturbed ecosystem) as a minimum.

49. There are limited ecological values in streams directly affected and immediately downstream of the mine footprint, as I have noted above. For example, Shepherds Creek is dry downstream from where exits the Shepherds Gorge and Bendigo Creek has limited surface flow downstream of State Highway 8 to the Clutha River / Mata-Au. There are no fish communities in reaches of Shepherds and Rise and Shine Creek within the mine footprint, or downstream in Shepherds Creek. Trout dominate the lower Bendigo Creek, but the population is constrained by limited flow and barriers to upstream fish passage. Refer to B.17 Water Ways Consulting - Assessment of Effects on Aquatic Habitat (Waterways 2025) for further details.

Issue 36. The applicant's proposed nitrate-nitrogen and ammoniacal nitrogen compliance limits are based on national bottom lines for nitrate and ammoniacal nitrogen toxicity attributes from the NPSFM (2020). The NPSFM (2020) recognises that more stringent limits are required to manage trophic state. Dr Ryder's single nutrient limitation concept approach has been discredited by published scientific opinion and has been rejected in freshwater planning.

50. As stated in my report, the recommended ammonia and nitrate compliance limits are intended to protect against the toxicity effects of these elements, not the proliferation of periphyton biomass. Periphyton is proposed to be monitored under the G.13 Freshwater Ecology Management and Monitoring Plan. This monitoring can easily be tied to a response trigger if nuisance growths exceeded a particular threshold, however, because benthic invertebrates are the only ecological community in the streams within or close to the mine footprint, and the health this group can be affected by periphyton, the indicative performance targets for invertebrate communities set out in Table 4 of the Freshwater Ecology Management and Monitoring Plan are, in my opinion, the most practical trigger for managing the localised effects of bioavailable nutrients.

Issue 37. Ms McArthur describes nitrogen limits recommended in scientific literature of between 0.2 and 1.0 mg/L, with 0.4 mg/L being broadly consistent with existing macroinvertebrate community health in the lower Lindis River (although still a substantial increase in nutrient concentrations) and 0.231 mg/L from Otago-based studies for periphyton outcomes.

51. I have addressed this issue in response to Issue 3 above.

Issue 38. The applicant is proposing nitrogenous compliance limits that are significantly higher (2.4 mg/L) than published recommendations and current nitrogen concentrations. The magnitude of the difference between published recommendations/current state and the compliance limits in the application increases the likelihood that significant adverse effects on aquatic life, ecosystem health and other freshwater values will occur.

52. The recommended compliance limits for ammonia and nitrate toxicity at the proposed compliance monitoring sites of SC01 and RC03 are broadly consistent with ANZG default guidelines, and my response under Issue 3 demonstrates that these are not an issue in wider receiving water environments.

Issue 44. Ms McArthur advises that reducing the range of contaminants or the frequency of performance monitoring in the water management plan over time increases the risk of not catching critical problems quickly.

53. The risk of mine contaminants reaching sensitive surface water environments (Lindis River, Clutha River / Mata-Au Lake Dunstan) is primarily through the aquifers. This pathway is not rapid. The proposed monitoring programmes will have adequate time to detect changes in water quality. As previously noted, these proposed monitoring programmes will be included in updated management plans that will be provided following expert conferencing.

Issue 47. The Lindis River at Ardgour Road ORC state of the environment monitoring site is within the area likely to be most affected by the plume of contaminants in groundwater emanating from Shepherds Creek. The future environment as modified by the full implementation of resource consents granted subject to minimum flow requirements coming into force in October 2026 should be considered. The addition of contaminants from the BOGP to the lower Lindis will create multiple stressor impacts (cumulative effects). These contaminants should be assessed as discharging to an important fishery with a reasonable minimum flow and improved fishery and angling amenity values.

54. This issue has been addressed under my comments under Issue 3.

Issue 65. It is not clear what the effects of the discharge of contaminants from the site may be on macroinvertebrate communities in the lower Lindis River or Bendigo Creek.

55. As discussed under Issue 3, nitrate inputs to the lower Lindis River from the mine will have a minor impact on downstream concentrations and not cause an increase that potentially exacerbates periphyton biomass. My experience with the lower Lindis River is that Didymo cover can be prolific and growth of this benthic diatom is unlikely to be affected by some additional nitrogen to the river. Didymo cover can significantly influence on benthic invertebrate community structure and abundance, and this, together with fine sediment cover and stable low flows in the warmer months of the year, seems to be key factors affecting the macroinvertebrate community of the lower Lindis River.

ENVIRONMENTAL DEFENCE SOCIETY INCORPORATED (EDS)

56. EDS witnesses have raised a range of issues associated with potential effects on water quality and freshwater ecosystems, and I have attempted to address key matters below, acknowledging that it is not possible to address all points raised in the short time available to respond. I further note that many of my responses cross-reference my responses to Fish & Game issues already addressed in my evidence.

Issue 11. Seepage of mine impacted water with levels of contaminants exceeding proposed water quality compliance limits for receiving surface water and groundwater systems, enduring for over a century and resulting in a high potential for long-term contamination of shallow groundwater and surface water receiving environments.

57. Under my response to Fish & Game's Issue 3 above, I note that MWM and myself have undertaken an assessment of mine-derived water quality on wider receiving surface water environments using an annual contaminant load from the worst projected year (year 85). This analysis found that water quality is protected to a high level (95-99% species protection), except in the Lindis River for uranium under low flow conditions. The uranium outlier is questionable given the ANZG guidelines have a low reliability for their recommended guideline, however the concentration is well below the Canadian Water Quality guidelines as noted in paragraph 30. However, it will be monitored (this will be included in the updated management plans proposed to re-issued after expert conferencing).

58. Dr Webster-Brown considers that iron and sulfide should have water quality compliance limits[8]. I defer to Dr Weber regarding recommendations for contaminants of potential concern that may warrant compliance limits. However, in my B.07 report, I recommended that iron be monitored at surface water compliance monitoring sites, and if a 20% increase in average concentration is detected, a review of the most recent water quality international guidelines be undertaken. This review would inform whether there have been any revisions of guidelines relevant to iron that indicate that adverse effects on surface water biota is occurring.

59. The proposed consent conditions include a proposed groundwater compliance limit for iron (0.34 mg/L). It is based on the US EPA 'Secondary Drinking Water Regulation' (non-enforceable Federal guidelines regarding cosmetic effects, such as tooth or skin discoloration, or aesthetic effects, such as taste, odour, or colour of drinking water). I note that is there is no New Zealand drinking water standard for iron.

Issue 21. Deficient water quality limits that would not prevent contaminants, particularly arsenic, moving offsite while bound to suspended solids or the contamination of downstream stream and possibly lake sediments.

60. Dr Webster-Brown states that the Project's impacts on sediment quality in downstream waterways and potentially in Lake Dunstan, does not appear to have been considered[9]. The risk of sediment-bound contaminants reaching downstream streams, or Lake Dunstan, is in my opinion, low, and only likely to occur during relatively high flow events (freshes and floods) when they are rapidly transported downstream and dispersed and diluted. As noted above, proposed monitoring of Bendigo Creek and the Lindis River will assess the potential for contaminant reaching Lake Dunstan.

61. Dr Webster-Brown states that the report recommending water quality compliance limits for the Project does not include guidance on how monitoring data should be compared to compliance limits for most of the trace metals[10]. Through discussions with ORC technical reviewers, I have recommended that compliance limits for metals that have ANZG DVGs with a 90% level of species protection, and groundwater limits with MAVs, are 'hard' limits. Compliance for other contaminants would be assessed in accordance with the protocols specified in the water quality compliance tables.

[8] Paragraph 81. Statement of evidence. J Webster-Brown, EDS.
[9] Paragraph 85. Statement of evidence. J Webster-Brown, EDS.
[10] Paragraph 88. Statement of evidence. J Webster-Brown, EDS.

IWI AUTHORITIES AND TREATY SETTLEMENT ENTITIES

Issue 47. By advocating for the adoption of standards derived from the ANZG and Drinking Water Standards for water quality at closure, the Applicant is accepting some degree of risk given the absence of a full data set reflecting baseline water quality.

62. In my opinion, adopting 'standards' derived from ANZG guidelines documents, other bespoke guidelines and guidelines or criteria from overseas, and NZ Drinking Water Standard MAVs for groundwater, is an appropriate approach to minimising potential long-term risks from water quality on the wider environment. Compliance and performance monitoring programmes, including recently proposed additions, provide a suitable level of 'scrutiny' regarding the transport of contaminants to the wider environment.

Issue 49. The evidence to support a lower National Standard is ambivalent, but it is considered that this presents an opportunity for the Applicant to take a precautionary approach and undertake to reduce nitrate concentrations below the current National Standards. Certainly, baseline nitrate concentrations observed in the surface and ground water are lower than the current National Standard.

63. Mr Mark Pizey notes that, while the National Standard for nitrate-N concentration in drinking water is 11.3 mg/L, there is significant debate as to whether this standard should be much lower[11]. I do not disagree with this comment, and I have recommended a review if the monitoring programme finds any groundwater contaminant to exceed 50 % of its MAV value.

OWNERS AND OCCUPIERS OF THE LAND

Folding Hill Wine Company Limited

Issue 6. We currently benefit from high-quality water with nil detectable arsenic content. This is contrary to public claims made by the applicant regarding water quality in the Bendigo/Mine area. Any reduction in water availability or changes to its chemical composition would have direct and material impacts on vineyard operations, winery production and the health and wellbeing of our family.

[11] Paragraph 30. Statement of evidence. M. Pizey, Kāti Huirapa Rūnaka Ki Puketeraki, Te Rūnanga O Moeraki, Te Rūnaka O Ōtākou, And Hokonui Rūnanga (Kā Rūnaka).

64. The water quality monitoring data relating to arsenic concentrations (and other water quality parameters) speaks for itself and I do not intend to comment on it further, other than to note that arsenic levels in Rise and Shine Creek appear to exceed the ANZG DVG for 95% level of species protection and would not meet the NZ drinking water (MAV) standard. The proposed water quality limits for groundwater (drinking water standards and, where appropriate, stock drinking water standards) are in my opinion adequate to protect users of the resource from unacceptable risk.

Matakanui Station

Issue 1. Thomsons Creek and the water that starts within Matakanui Station (Crown Lease Land):

- ***There are galaxiids in the mid reaches which have been part of a protection with DOC, ORC and TCG. Seeks assurances they are protected from mining activities which effect water quality.***
- ***A large number of farms that rely on water supply for stock water, irrigation and drinking water. Water quality or quantity cannot be compromised.***
- ***Mining activity cannot undermine the Orkney wetland project at the end of Thomsons Creek catchment.***

65. Water quality compliance limits, along with monitoring programmes, have been proposed in the consent conditions that protect users of the relevant sources of water.

OWNERS AND OCCUPIERS OF THE ADJACENT LAND

Ross Hannan

Issue 4. Because the LRA is hydrologically connected to the Lindis River, water quality compliance limits should use the strictest applicable, including surface water criteria.

66. As noted above in the response to Fish & Game comments, the risk of effects on Lindis River water quality are very low, and it has been predicted that any contaminants that may reach that river have very low likelihood of exceeding ANZG DGVs for the 95 % level of species protection. I note that additional monitoring has been proposed for these wider receiving environments.

Issue 5. Surface water monitoring is proposed only monthly and at limited locations, which is inadequate for detecting contamination events; additional monitoring sites along the Lindis River are required.

67. Monthly monitoring is a standard interval that fits with most water quality guidelines and protocols. Spill events are typically unanticipated (given design considerations), however proposed monitoring systems/protocols will detect these, and an appropriate response can be initiated. I note that monitoring in the Lindis River has been recommended by advisors to MGL, as noted in paragraphs 32 and 34.

Bruce Lambie

Issue 4. Raises concerns (including health risk concerns) about arsenic contamination of local water supplies from tailings dams and mine operations and other mine related discharges.

68. I have addressed this issue in previous responses, noting the proposed water quality limits for surface and ground waters, likely wider receiving environment contaminant concentrations as a result of the mine, and proposed monitoring programmes and their responses.

Trevathan Family

Issue 2. Arsenic - Effects on groundwater from TSF leakage.

69. Again, I defer to the proposed compliance limits for groundwater, which are based on the NZ drinking water standards.

ADMINISTERING AUTHORITIES AND RELEVANT LOCAL AUTHORITIES

Otago Regional Council (ORC)

70. The ORC comments reiterate a number of the comments presented by their technical expert Dr Greer.

Issue 47. The Applicant has proposed surface water compliance limits that allow for increases in contaminant concentrations far beyond what the proposed activities are expected to generate. The opinion of Dr Greer is that full implementation of these limits would degrade water quality to the extent that there would be a risk of significant adverse effects on aquatic life.

71. This comment fails to note the additional comments of Dr Greer that the proposed implementation of ANZG limits are "*arguably comparable in protectiveness against chronic toxicity effects as to applying the 95% species protection DGVs*"[12]. Consequently, there will not be risk of significant adverse effects to aquatic life.

Issue 48. Setting water quality limits substantially higher than necessary to undertake the proposed activity creates unnecessary risk of adverse effects and would not incentivise the Applicant to achieve a better water quality outcome, even where modelling indicates this is possible.

72. In my experience, there is always a need to set compliance limits higher than baseline values, in order to avoid the risk of 'false' exceedances. These exceedances can occasionally result from issues with sampling methodology, one-off events (e.g., high rain events) that have no long-term environmental implications, laboratory testing issues, or 'natural' variations in background concentrations.

Issue 49. The primary risk stems from the increase of nitrate-nitrogen and ammoniacal nitrogen allowed for by the proposed limits: median limits are approximately 30 times higher than the current state, approximately 10 times higher than MWM modelling indicates is necessary for Shepherds Creek, and for Rise and Shine Creek the proposed limits are approximately 88 times higher than the predicted average concentration after cessation of mining.

Issue 50. Dr Greer recommends that nitrate-nitrogen and ammoniacal nitrogen limits align with the modelled outcomes presented by MWM in Report B.06C Appendix N, with an appropriate buffer to account for model uncertainty. ORC supports this approach.

73. With respect to the above two issues, I am of the opinion that macroinvertebrate communities in streams within the immediate influence of the mine footprint represent the primary freshwater communities necessary to protect. Macroinvertebrate communities are strongly influenced by periphyton biomass and

[12] Paragraph 372. ORC s53 combined overview.

cover, and so are indirectly influenced by nutrients. There are no local fish communities and there are no other aquatic taxa that are threatened or endangered. Therefore, it is my recommendation that macroinvertebrate community health indices be assessed as a surrogate for nutrient enrichment, as proposed in the G.13 Freshwater Ecological Management and Monitoring Plan, but extended to sites downstream of the surface water compliance monitoring sites. I note that the proposed Freshwater Ecological Management and Monitoring Plan sets indicative 'triggers' for changes in the macroinvertebrate community health.

Issue 51. Dr Greer does not agree that Shepherds and Rise and Shine Creeks should be classified as highly disturbed systems. Instead, he considers them slightly to moderately disturbed, meaning good practice would be to adopt the ANZG 95% species protection DGVs as the default, or to derive site-specific guideline values.

74. This issue is discussed in various paragraphs above, in particular the comment above regarding 'hard' limits and my comments in paragraph 38 regarding current water quality and habitat conditions. In my opinion, sections of these creeks are impacted and the proposed water quality compliance limits and associated monitoring will provide appropriate protection of their ecological values.

Issue 55. Having the turbidity limit only apply to baseflow conditions does not control sediment inputs during rainfall events when sediment ponds are operating. It allows conspicuous changes in visual clarity when the discharge is operating and poses a compliance risk to the Applicant, as by the time the proposed limit is exceeded the discharge would have occurred and cannot be prevented.

Issue 56. An end-of-pipe total suspended solids (TSS) limit, paired with a narrative instream limit, is a better approach to managing sediment pond discharges on the site than the turbidity limit proposed in consent conditions.

75. Following a workshop consultation with ORC, amendments have been made to proposed conditions relating to turbidity limits from controlled stormwater outfalls and these are reflected in the revised proposed conditions provided in Part 4 of this response package.

Issue 74. Dr Greer recommends annual sediment sampling at surface water compliance sites with comparison of results to the ANZG (2018) Guideline Value-High thresholds as management triggers rather than compliance standards, and ORC invites the Applicant to consider this recommendation and respond via its s55 response.

76. I consider that this recommendation has merit and could sit within the Water Management Plan. Understanding the concentration of contaminants in surface waters will assist in the management of sediment and runoff.

Gregory Ian Ryder

17 April 2026