BEFORE THE FAST-TRACK EXPERT PANEL

IN THE MATTER of the Fast-track Approvals Act 2024 (“FTAA”)

AND

IN THE MATTER of Bendigo-Ophir Gold Project (FTAA-2507-1089)

JOINT STATEMENT OF EXPERT WITNESSES:

RECONVENED GEOLOGY / GEOTECH / ENGINEERING

---

12 June 2026

INTRODUCTION

1. Expert conferencing on the topic of geology / geotech / engineering took place online via Microsoft Teams from 8.00am-5.30pm on 12 May 2026, following which a Joint Witness Statement ("JWS") was signed. To allow the experts to work through the remaining agenda items, conferencing was reconvened from 9.00am-5.15pm on 12 June 2026.

2. The conference was attended by the following experts:

   (a) Peter O'Bryan ("PO") (Applicant);
   (b) Eric Torvelainen ("ET") (Applicant);
   (c) Dr Trevor Matuschka ("TM") (Applicant). TM only attended conferencing between 9.00am-12.00pm, and was present only during agenda item A2;
   (d) Dr Paul Weber ("PW") (Applicant);
   (e) Alex McAlpine ("AM") (Sustainable Tarras);
   (f) Steven Emerman ("SE") (Sustainable Tarras). SE only attended conferencing between 9:00am-4:00pm, and was present during agenda items A2, D2, D3, D4, E1, (1), (2), (4) and (8);
   (g) Colin MacDiarmid ("CM") (Otago Regional Council); and
   (h) Mark Pizey ("MP") (Kā Rūnaka).

3. Professor Bernd Lottermoser ("BL") (Sustainable Tarras), who attended the first day of conferencing on geology / geotech / engineering did not attend this reconvened conferencing. BL provided a written statement in advance of conferencing, which is attached as **Appendix 1**.

4. Steve Mutch (ChanceryGreen) acted as independent facilitator.

5. Caitlin Todd (ChanceryGreen) assisted the experts to draft the JWS.

CODE OF CONDUCT

6. The experts confirm that they have read the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note 2023 and referred to in the Fast-track Approvals Act 2024: Panel Conveners' Practice and Procedure Guidance 22 July 2025, and agree to comply with it. The experts confirm that the issues addressed in this JWS are within their area of expertise, unless stated otherwise.

SCOPE OF JWS

7. In Expert Panel Minute 8 (4 May 2026), the Panel directed experts in the topic of geology / geotech / engineering to conference on identified focus areas. The Panel also provided a supporting paper, "Expert conferencing questions – geotech", which outlines additional topic-specific detail. Annexure 1 of Minute 8, together with that paper, has formed the basis of the conferencing agenda. The agenda item numbering in this JWS follows the numbering used in the Geology / Geotech / Engineering JWS dated 12 May 2026.

8. In this JWS, we report the outcome of our discussions in relation to each item (below), including by reference to points of agreement, disagreement, and unresolved matters or uncertainties. Where we are not agreed in relation to any issue, we have set out the nature and basis of that disagreement.

AGENDA ITEMS

Topic A – Slope design

<u>Question A2: Adoption of design Criteria</u>

Can the experts agree to a set of appropriate project slope design criteria, that if adopted, would give parties confidence in the design being proposed achieving successful closure - acknowledging slope stability design criteria for a project is subjective balancing:

- **Available data**
- **Level of conservativism or optimism in assumed ground and groundwater models**
- **Modelling methodologies and approach to analysis and how model variability and uncertainty is managed both in design and during operation as new data comes available.**
- **Consequence of exposure to slope instability for:**
    - **Open pit slopes**
    - **Natural and made (cut/ fill) slopes above or below critical infrastructure and amenities**
    - **Surface water management**
    - **Publicly assessable land – during active mining and post closure**
- **Published guidance where relevant (e.g. Worksafe, NZDSG, NZ Building Act)?**

Clarifying Notes:

1) Across NZ many land use consents are granted with conditions that stipulate design stability criteria in the absence of the above understanding leading to poor design risk communication.

2) Design criteria, design approach, and operational slope stability management are largely issues for the applicant and their experts to agree and manage. However, given the consequences of instability it is important third parties understand the above and can have confidence in the project advancing broadly in line with concepts presented and most importantly have confidence closure stability can be achieved.

Open pit stability

9. PO notes that his recommended slope parameters have been based on results of analyses and experience-based engineering judgement.

10. PO states that sensitivity analysis has considered variations in shear strengths and has also accounted for variations in the position and profile of the phreatic surface relative to wall positions.

11. PO states that fixed conservatism has been built into the analysis by moderating the material shear strength of the core of the Thomson Gorge Fault (TGF). Variations of the TZ3 and TZ4 units were performed in two ways: first, by modifying Geological Strength Index (GSI) values; and second, by increasing the assumed mining-induced disturbance (defined as Generalised Hoek-Brown materials).

12. PO notes that, in the analyses, the northeast wall was modelled at 210m height, based on a continuous sequence of 15m high, 60-degree face angle batters separated by 6m wide berms. Analyses were conducted for dry, partially saturated and saturated slopes under static and pseudo-static loading.

13. PO states that the partially saturated model, based on recommendations, is inferred to be representative of the planned final highwall slope, reflecting the combined influences of unloading (by excavation), natural drainage, dewatering and depressurisation measures, and time, as likely to exist at the time the pit reaches the modelled depth.

14. PO notes that for partially saturated and saturated slopes, the far-field phreatic surface (SWL) was at 50m beneath the local ridge line. In partially saturated models, the SWL was set at 50m behind the slope at 50m below surface and

tapered to 30m behind the slope at 75mbs (metres below surface) and 0m behind the slope at 150mbs; from that elevation, the SWL was at the slope surface. In saturated models, the SWL dipped from 50mbs from 50m behind the slope to 60mbs at the slope face; below that elevation, the SWL followed the slope surface. All materials beneath the SWL were subject to hydrostatic pressure corresponding to the local depth.

15. PO considers that the factor of safety (FOS) for dry slopes under static and pseudo-static loading all meet design acceptance criteria (DAC), with DAC FOS of 1.30 and 1.10, respectively. The FOS for partially saturated slopes under static loading using assumed shear strengths meets DAC requirements. However, partially saturated slopes do not meet DAC when mining disturbance increases and/or GSI values are reduced.

16. SE considers that the recommendations of the *Large Open Pit Project* should be followed, especially *Guidelines for Open Pit Slope Design* (Table 9.9), and *Guidelines for Mine Closure*. Considering the lack of knowledge of rock properties, and consequences of failure, the FOS should be 1.5 during operation and could be as high as 2.0 after closure.

17. ET notes that in the Geology / Geotech / Engineering JWS dated 12 May 2026 comments on closure objectives for slope stability were provided. These comments related to the long-term geotechnical erosion and hydrological performance of the final slopes. These comments pointed to the importance of a monitoring system which addressed these matters so there is no unacceptable risk to the environment or public safety in closure. PO, TM, MP and CM agree with this paragraph.

18. CM notes that there is WorkSafe guidance[1] available for open cast mining which provides some recommended factors of safety for high walls. MP notes that this guidance is focused principally on the provision of a safe working environment rather than geotechnical engineering advice.

19. PO states that under pseudo-static loading, slopes with increased disturbance and reduced GSI values fail to meet DAC.

20. PO notes that management of open-pit slopes will be based on data from near-real-time monitoring of slope displacement over time and advancing mine

1 https://www.worksafe.govt.nz/assets/dmsassets/WKS-4-health-and-safety-at-opencast-mines-alluvial-mines-and-quarries-gpg.pdf

development, and from piezometers measuring groundwater pressures at multiple levels in specifically designed boreholes.

21. PO states that need for amendment of the wall design will be based on a program of ongoing reassessment of expected stability conditions using wall monitoring, groundwater data, and information obtained from mapping of mine exposures.

22. PO states that electro-optical distance measurement (EDM) methods will automatically monitor the positions of the prisms installed on the pit walls. The prisms will be distributed variously in uniform arrays or in selected positions around critical structures or areas of pit walls.

23. PO considers that consequences of open pit slope instability vary depending on the position, size and timing of instability. For significant wall instability, adjustments could include reduced batter face, inter-ramp or overall slope angles, re-excavation, or reduction of achievable pit depth. Instability at a lesser scale could, for example, require debris removal and minor earthworks.

24. AM considers that whilst it is good to have understanding of modelling work at Bendigo, AM reiterates the need to benchmark against the Macraes mine (i.e. comparison of design assumptions for parameters and how the mine development performance was predicted compared with the actual performance at the Macraes site). AM considers that the PSM report[2] on Macraes should be reviewed at a geotechnical workshop in some detail as a prerequisite for answering many of the adopted design criteria for Bendigo. AM considers this benchmarking requirement to apply not just to the open pit design but to the whole geotechnical foundation of the whole project as it affects, for example, ground stability, subsidence, groundwater movement in fractures, tailings storage facilities. SE agrees with this paragraph.

25. ET considers that the PSM report[3] that has been referenced is developed by personnel that have experience at the Macraes mine. Therefore, the experience in similar terrain has been applied in the development of the pit at Bendigo. Further, this does not take away from the need to undertake detailed assessment as the pit is developed and this is normal practice under the Ground Control Management Plan. Further, there are some differences between Macraes and Bendigo. For example, ore bearing material is beneath the Thomson Gorge Fault

2 Report Macraes MP4 Consenting Project
3 https://www.fasttrack.govt.nz/__data/assets/pdf_file/0018/24282/Part-3-02-PSM5131-003R-DRAFT.pdf

whereas at Macraes the ore bearing material is above the geological discontinuity (or the Footwall Fault) i.e. they are not the same from a geotechnical stability perspective and site-specific assessment is required. CM and TM agree with this paragraph.

Landslides

26. SE agrees generally with BL's written statement under Question A2 in relation to landslides, in particular where BL states that "*such a required assessment of land at-risk of landslides for the Bendigo-Ophir Project, and especially the Shepherd TSF area, is missing from the application. Consequently, project slope design criteria are of conceptual nature rather than at the feasibility stage of mine development*."

27. SE encourages the Panel to ask for examples of cases where wet tailings have been used as a buttress against landslide risk. SE is not confident that wet tailings can serve the function of buttress against landslide risk and he has never heard of such a thing.

28. AM is concerned that the description of landslides as being "ancient" is inadequate and appears to lack the necessary refinement that might come from discussions with Earth Science NZ landslide and ground movement specialists. SE agrees with this.

29. TM and ET consider the effects of landslides on the stability of the TSF, and the safe containment of tailings is an issue that will be addressed as part of the building consent process. It will need to be demonstrated that landslides will not adversely affect the safety of the TSF and safe containment of the tailings. There is considerable experience with landslide management in the Otago region, including experience with landslides in a reservoir situation for e.g. Clyde Dam. Based on current knowledge, they see no reason why this situation cannot be managed. They state that the assessment and design of the TSF and landslide features within the impoundment will follow the NZ Dam Safety Guidelines. CM agrees with this paragraph.

30. ET states that geotechnical stability or principal hazard is required to be assessed for elements like the portal by a competent person (geotechnical professional) as required under the Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2016.

31. ET notes that proposed condition NEW 9 under Schedule 2 D.04 requires the assessment of landslide risk for infrastructure. However, these conditions should be updated to require assessment <u>prior to construction</u>. The condition currently incorrectly states that this assessment timing be undertaken "*within 6 months of commencement of construction*". MP, TM, SE and CM agree with this.

Confidence in achieving successful closure

32. MP, ET, CM, TM and PO consider that the level of information available at this stage of the project's lifecycle is consistent with what one would expect for a pre-feasibility study, and that further detailed studies to be undertaken prior to commencement of operations, and during operations, will provide adequate input to final design for closure. SE agrees as this is consistent with recommendations from the Society for Mining, Metallurgy and Exploration's *Tailings Management Handbook* and *Surface Mining Handbook.*

33. AM has reservations that successful closure can be achieved with the current design concept not only in terms of slope stability but also successful closure on all other ground and environmental effects. SE agrees and does not understand why tailings backfill has not been considered as a closure option.

Topic D – Shepherds seepage sump

<u>Question D2:</u>

Can the experts agree there is sufficient capacity and engineering design in the surface water management about the site to ensure the surface flows do not enter the sump. If not what additional measures may be required.

34. ET considers surface water can be prevented from entering the sump by a local perimeter channel around the sump. This minimises risk of run-off into the sump. This is indicated in the drawings in the Shepherds ELF report in cross section; however, it is not shown on the plan. ET recommends that this is constructed, and this is a detailed design item.

35. ET notes that the proposed seepage collection sump is primarily for operation. It may be retained in some form in the closure; however, it may also be rearranged depending on the final water management requirements.

36. ET considers a risk-based design is applied to the design level for the perimeter channel considering the consequences of overtopping of the sump into the silt pond and ultimately into Shepherds creek. The expectation is that this design

level for the perimeter channel would be a 1 in 100 AEP event. The consequence of potential discharge in excess of a 1 in 100 year AEP event should be considered by relevant experts in water quality in confirming the design level.

37. PW and ET note that in BL's written statement for Question D2, BL appears to be discussing first flush of run-off to the Shepherds silt pond which is an identified risk for the project but not directly related to the question provided by the Panel. This is risk is noted within the Water Management Plan.

Question D3:

Can the experts agree if a similar leachate mix and potential for contamination source (to both surface and groundwater) exist for the CIT backfill, Western ELF and SREK Backfill (given the dominance of TZ4 waste rock in these ELF sites) and can these be managed by the central treatment leachate sump system or will they require separate treatment.

38. PW notes that the general geochemical signature (e.g. neutral metalliferous drainage, elevated in sulfate, arsenic, and other trace elements) of these satellite mine domains will be similar to the Shepherds ELF but will be different in concentration due to, for example, differences in surface area, the amount of rock exposed, and the amount of rock within the rock waste stacks.

39. PW notes that further details on water quality are provided in B.06C Mine Waste Management Limited - Mine Impacted Water Overview Report - Appendix N: Water and Load Balance Model Report – Bendigo-Ophir Gold Project. MWM Report Number: JNZ0233-016-R-Rev1. Further information is provided in Joint Response to Panel Request for Information 4 – Geology, Geotech, Engineering dated 3 June at [77].

40. PW notes all mine circuit waters will be managed internally during operations via the central mining water circuit. At closure, mine circuit water will be treated through a central water treatment system as a single stream, except for water that goes through the SRX passive water treatment system.

41. On the basis of the above paragraphs, PW, ET, MP, SE and AM agree that leachate can be managed by a central treatment system.

Question D4:

Not a civil or geotechnical engineering question, but it is important that the treatment options selected are effective and enduring. Do the experts have additional information on treatment options etc. (Cross over questions for treatment rates, reliability and capacity on closure).

42. PW notes that discussions were held on water treatment during the "Water" conferencing (see JWS's dated 8 & 9, and 10 June). PW notes the following, rather than repeating the information within that JWS:

 (a) PW notes that further work is required to confirm the treatment processes, that are currently at a concept study level. The following is noted:

  (i) Consent conditions are proposed to undertake active water treatment studies to confirm the water treatment plant design (Consent D.04 New 6).

  (ii) Consent conditions are recommended to commence passive treatment trials ("Water" JWS dated 10 June at paragraphs [25]-[26]):

   1. "*Shepherd's Creek: studies would be required within 5 years of active treatment starting and needs to be commenced at least 5 years before passive treatment is required.*

   2. *Rise and Shine Creek: studies would need to commence at least 5 years before passive treatment is required. SRX Pit is anticipated to spill within 6 months of dewatering ceasing (which is currently planned to be at year 11 of the Mine Plan)."*

  (iii) MP notes that provisions will need to be made for the design, construction, and operation, for both the entity undertaking this work which will occur post-closure and for the inherent costs.

  (iv) MP and ET consider that, where possible, capital works to support long term water treatment are undertaken prior to final mine closure.

 (b) PW notes that the reliability of these systems could be confirmed by pilot plant trials before the operational treatment systems are constructed. These trials are explained in proposed consent condition D.04 NEW 6 for active treatment and a new condition is proposed for passive treatment systems to ensure pilot trials are also undertaken ("Water" JWS dated 10 June at paragraph [25]).

(c) PW considers risk associated with the change from active to passive treatment could be managed by retaining availability of the active treatment system for a period. MP agrees.

(d) PW notes that treatment capacity will be driven by the flow rate of the combined mine circuit water that requires treatment and is of fundamental importance to water treatment system design. This will be informed by future updates to the water and load balance model (proposed condition NEW6A in D.04).

(e) PW notes that these studies will assess all reasonable options for the management of mine impacted waters at BOGP to ensure the selected options are effective.

(f) PW notes that treatment options for passive and active treatment were discussed in the Water Treatment Report (B.06C Mine Waste Management Limited - Mine Impacted Water Overview Report - Appendix M: Water Treatment Study - Bendigo- Ophir Gold Project. MWM Report Number: J-NZ0464-002-R-Rev2).

(g) SE regards the term "enduring" as very problematic because these passive water treatment systems require continuous monitoring, testing, adjustment, maintenance and review.

(h) MP considers that a treatment system that is sufficiently resourced and has available the management and administration skills, may be maintained indefinitely. In this regard, it could be considered "enduring".

Topic E – Silt Dam, and Process Plant Platform

<u>Question E1:</u>

The current proposal is for design of surface water design elements to be based on the duration of work activity - with higher return flow events used for works that have longer duration, on the assumption that the consequences of design failure are broadly similar. Do the experts agree that the level of design proposed is appropriate in all cases, and if not, can they recommend a more risk based design criteria to ensure failure of key drainage elements does not have major consequence other design elements across the site.

43. ET recommends that the TSF in-flow design flood is based on 72-hour probable maximum precipitation allowing for climate change. For closure conditions, this should consider scenarios out to 2100 and beyond. This is being applied in detailed design.

44. ET recommends that the final sizing of diversion channels and ponds allows for climate change based on the likely design life of each element.

45. ET notes that high intensity rainfall depths up to a 1 in 250-year event are provided by NIWA. Beyond a 1 in 250-year event, ET recommends that the 1 in 250-year increase for climate change is applied unless other studies justify otherwise.

46. The current proposed design rainfall events for the diversion channels are shown in the Table below (and included in ET's Statement of Evidence in response to s53 comments).

TABLE 1: SUMMARY OF DESIGN RAINFALL EVENT CRITERIA FOR DIVERSIONS

Feature	Channel Capacity Design AEP and Duration - Operation	Channel Capacity Design AEP and Duration - Closure	Comment
North TSF CWDC	1 in 10-year, 24 to 72-hour storm	N/A decommissioned in closure	Flows in excess of design capacity will occupy freeboard before spilling to TSF
North ELF SD	1 in 20-year, all durations	1 in 100-year storm, all durations	Flows in excess of design capacity will occupy freeboard before spilling to Shepherds ELF Permanent stream diversion in closure
Shepherds ELF CWDC	1 in 20-year, all durations	1 in 100-year storm, all durations	Flows in excess of design capacity will occupy freeboard before spilling to TSF Permanent stream diversion in closure
South TSF CWDC	Nominal based on site water balance requirements	N/A decommissioned in closure	The requirement for this diversion is subject to the outcomes of the water balance model, and may not be needed.
Pipe across TSF Crest	1 in 10-year, 24 to 72-hour storm	N/A decommissioned in closure	
Shepherds Creek SD	1 in 100-year storm, all durations	1 in 100-year storm, all durations	Permanent stream diversion
Process Plant CWDC	1 in 100-year storm, all durations	1 in 100-year storm, all durations	Potential to decommission in closure
RAS SD	1 in 100-year storm, all durations	1 in 100-year storm, all durations	Permanent stream diversion
SRX CWDC	1 in 10-year, 24 to 72-hour storm	N/A decommissioned in closure	Flows in excess of design capacity will occupy freeboard before spilling to SRX Open Pit
SRX ELF CWDC	1 in 10-year, 24 to 72-hour storm	1 in 100-year storm, all durations	Permanent diversion in closure
Dirty water diversions – Shepherds ELF DWD Becomes South ELF SD in closure	Nominal, to be managed on site.	1 in 100-year storm, all durations	Design criteria managed nominally in operation due to constantly changing conditions. Permanent diversion in closure
Dirty water diversions –SRX ELF DWD	1 in 50-year storm, all durations	N/A decommissioned in closure	Wetlands are present below SRX ELF

Feature	Channel Capacity Design AEP and Duration - Operation	Channel Capacity Design AEP and Duration - Closure	Comment
Shepherds Silt Pond	1 in 20-year storm, all durations	N/A decommissioned in closure	Not a diversion. Design event summarised here for context
Western ELF Silt Pond	1 in 10-year storm, all durations	N/A decommissioned in closure	Not a diversion. Design event summarised here for context

47. CM considers that the design levels for the diversion channels in the Table above are appropriate for detailed design.

(1) Effects of blasting and micro seismic activity on the stability

48. AM refers to paragraphs [34]-[36] of the Geology / Geotech / Engineering JWS dated 12 May 2026 which address the geotechnical effects of blasting and seismic activity on activities within the footprint of the mine.

49. AM refers to agenda item (8) below for comments on potential geotechnical effects outside the site boundary.

(2) Capture and management of contaminated leachates

50. This has been addressed in the previous Geology / Geotech / Engineering JWS dated 12 May 2026 and also addressed in the "Water" and Groundwater conferences.

51. AM has concerns that the groundwater flow scenarios being considered are for isotropic homogenous groundrock and considers this to be grossly misrepresentative of the fractured basement rock.

(3) PIC assessment for the Shepherds Silt Pond

52. ET notes that the application presents Shepherd Silt Pond as a Low PIC dam. Section 53 comments in review of the application have indicated that the pond could be medium or high PIC due to the population at risk onsite at the process plant, i.e. not because of population further downstream and off site.

53. ET further notes that it is equally possible that Shepherds Silt Pond ends up being not a large dam (as downstream slope may end up less than 4m high). This is because in detailed design it could end up being buttressed more by Shepherds Service Corridor infill. Therefore, the consequence of a breach could be lower than presented.

54. ET notes that changes in PIC are managed under the building consent processes under the Building Act (2004) i.e. any changes in PIC is already a controlled activity outside of the FTAA application. Further, any changes in PIC post construction due to changes in population at risk downstream, and therefore changes in the appropriate level of dam safety practice applied, is already required to be managed by the Building (Dam Safety) Regulations 2022. CM agrees.

(4) Diversion channel and sediment management conditions

55. ET notes that diversion channel design levels are outlined under Question E1.

56. ET notes that updates to management plans and conditions should include these design levels.

57. ET notes that proposed condition 40 in Schedule 2 D.04 requires update as noted in the comments in the conditions proposed April 2026 to include sizing of Shepherds Creek silt pond sediment retention control for a 1 in 20-year event.

58. ET notes proposed condition 41 in Schedule 2 D.04 is recommended to update the maximum volume at crest to allow for the potential to change the silt pond from a flow through structure to a collection pond for pumping back to the TSF. This was outlined in the “Water” JWS dated 8 & 9 June at paragraph [76].

59. ET notes proposed condition 21 Schedule 2 D.04 defines the design level for the diversion channel around the hills surrounding the northern margins of the ELF that intercept and divert water into Shepherds Creek.

(5) Post-closure exclusion barrier durability / governance in perpetuity

60. MP, PO, CM and AM agree that the post closure management regime may be undertaken through an entity (yet to be established) which may assume responsibility for the maintenance of any exclusion barriers. CM refers to proposed condition NEW 14, Schedule 2 D.04 which addresses this.

(6) Landslide consent conditions

61. ET notes that a proposed new landslide consent condition NEW 9 was included in Schedule 2 D.04. A recommended update to this consent condition is discussed in paragraph 31 above.

(7) Tailings Storage Facility operations, surveillance and maintenance manual

62. ET notes that an Operation Maintenance and Surveillance (OMS) Manual is required by the Tailings Management Plan Section 6.7 requiring the OMS Manual to be in general accordance with *New Zealand Dam Safety Guidelines*.

63. ET notes the Building (Dam Safety) Regulations 2022 require a dam safety assurance programme be in place for all high PIC dams. A dam safety assurance programme requires operational maintenance and surveillance activities to be documented, and annual and 5-yearly reviews of the dam performance and safety to be undertaken.

(8) Factor of safety for land outside the site boundary

64. AM considers that in terms of geotechnical risks/impacts of mining induced seismicity, or the possible effects from mining induced seismicity, have not been considered in light of the general wider effects that have been recorded in similar mines elsewhere, where significant magnitude effects have been recognised up to 30km from the mine location.

65. PO considers that the potential for far field disturbance (for example, subsidence or general slope instability outside the open pit) can be better qualified and potentially quantified once the existing stress regime is established more reliably with reference to seismic evidence and measurement, to be used as input into a 3D numerical assessment of sequential mining and backfill. The key to making this exercise meaningful hinges on the quality of the definition of the stress field. This information is used for the confirmation of the design of the pit walls and has

important benefits for other assessments such as identifying mining induced changes to the stress field. AM and SE agree.

66. ET notes that proposed condition NEW12, Schedule 2 D.04 requires where project works may alter geotechnical stability, a minimum Factor of Safety of 1.5 must be maintained under static loading for all ground outside the project site as shown on Plan 2 of Common Conditions. ET recommends that a clarifying comment is added to proposed condition NEW12, Schedule 2 D.04 making clear that this relates to pit stability only. CM agrees.

SIGNATURES OF EXPERTS

Peter O'Bryan

Eric Torvelainen

Dr Trevor Matuschka

Dr Paul Weber

Alex McAlpine

Steven Emerman

Mark Pizey

Colin MacDiarmid

APPENDIX 1 – BL written statement

BEFORE THE FAST-TRACK EXPERT PANEL

IN THE MATTER of the Fast-track Approvals Act 2024 ("FTAA")

AND

IN THE MATTER of Bendigo-Ophir Gold Project (FTAA-2507-1089)

Written Statement

GEOLOGY / GEOTECH / ENGINEERING

Prof. Dr. Bernd Lottermoser

10.06.2026

Topic A – Slope design

Question A2: Adoption of design criteria

Can the experts agree to a set of appropriate project slope design criteria, that if adopted, would give parties confidence in the design being proposed achieving successful closure - acknowledging slope stability design criteria for a project is subjective balancing:

- **Available data**
- **Level of conservativism or optimism in assumed ground and groundwater models**
- **Modelling methodologies and approach to analysis and how model variability and uncertainty is managed both in design and during operation as new data comes available.**
- **Consequence of exposure to slope instability for:**
  - **Open pit slopes**
  - **Natural and made (cut/ fill) slopes above or below critical infrastructure and amenities**
  - **Surface water management**
  - **Publicly assessable land – during active mining and post closure**
- **Published guidance where relevant (e.g. Worksafe, NZDSG, NZ Building Act)?**

The Risk of Landslides

Shepherds Creek valley is a deeply incised alpine catchment with mapped landslides (Otago Natural Hazards Database Portal). The Otago Natural Hazards Database Portal classifies parts of the Bendigo-Ophir project site and the Shepherd TSF location as an existing landslide, however, with no further information available. In particular, the Shepherd TSF structure is planned to be placed within known landslide areas, and tailings are to be positioned next to, below and on-top of Holocene (11,700 years to present) and undifferentiated Quaternary (2,6 million years to present) landslide deposits (actual document page 6-7, FIG 21, FIG 22, FIG 23; Matakanui Gold 2025a). Geological origin and age of landslides are, however, irrelevant to possible risks, because prehistoric landslide masses are susceptible to reactivation regardless of origin and age, for example during and after construction activities (cf. Hamel et al. 2022).

Matakanui Gold (2025a, actual document page 24) states that "*Landslide potential into the impoundment exists. The landslide movement can be managed through tailings and landslide underdrainage in combination with tailings beaching against landslides, which together provide a buttressing effect (FM 7). The mitigation of landslides into the reservoir will form part of the Detailed Design stage*".

In general, tailings have low geotechnical strength and are themselves highly susceptible to liquefaction/undrained failure and sliding. The practice of placing wet mine tailings near, below or on top of landslide material presents a geotechnical and environmental risk. Such a practice may trigger risks to TSF integrity because of possible landslide movement above, below and into the TSF and associated weakening of TSF foundations, slope instability and mobilisation of tailings beyond the impoundment. In fact, storage of tailings in catchment areas of narrow river valleys and on, below and on-top of landslide-prone materials (like the proposed Shepherd TSF) is known to lead to the transformation of local landslide risks into severe environmental hazards of possible regional impact and contamination with international attention and engagement (cf. Torgoev et al. 2014). Thus, Matakanui Gold's (2025a) intended construction and engineering approach, (a) placing wet tailings below, next to and on-top of landslide materials and (b) using and relying on wet tailings to manage and mitigate any landslide / mass movements in the Shepherds Creek valley, is associated with containment risks and may destabilise the landscape.

A further statement is given by Matakanui Gold (2026a, actual document page 8): "*Landslides are a potential hazard if they are large enough to displace the contents stored by a dam. The site would have experienced multiple large magnitude earthquakes over the millions of years that the site has existed in its current form. There is no evidence that this has resulted in landslides on the sides of the valley that could displace tailings from the TSF and so this hazard is considered very low risk.*" No further information on landslide potential is provided. Thus, Matakanui Gold (2025a, 2026a) perceives that landslide risks in the Shepherds Creek valley will solely be due to seismic events. Other possible causes for landslides to occur in future, such as heavy rainfalls and construction activities, have not been considered. In this context, it is well known that construction activities can destabilise landscapes (cf. Hamel et al. 2022). For example, foundation excavation for construction of mine tailings dams can remove toe support from prehistoric landslide masses with subsequent reactivation of the landslide masses (e.g. Ok Ma Tailings Dam, Papua New Guinea, Griffiths et al. 2004). Also, with global climate change, the Central Otago district is likely to experience a greater likelihood of more extreme rainfall events (Cameron et al. 2017). Higher intensity extreme rainfall events may lead to increased likelihood of landslides (Cameron et al. 2017).

<u>Assessment of Environment Effects – Landslides</u>
Matakanui Gold seeks to develop property in an area prone to natural hazards (in this case, landslides). An adequate Assessment of Environment Effects should include a risk analysis of a detail appropriate to the activity, consider risk management measures, assess the proposal against the relevant natural hazard provisions, and determine the residual risk with appropriate risk reduction (cf. de Vilder et al. 2024). Such a required assessment of land at-risk of landslides for the Bendigo-Ophir Project, and especially the Shepherd TSF area, is missing from the application. Consequently, project slope design criteria are of conceptual nature rather than at the feasibility stage of mine development.

<u>Topic D – Shepherds seepage sump</u>

<u>Question D2:</u>
Can the experts agree there is sufficient capacity and engineering design in the surface water management about the site to ensure the surface flows do not enter the sump. If not what additional measures may be required.

<u>Local Climate</u>
New Zealand generally has a temperate maritime climate, with frequent rain events that occur throughout the year. By contrast, Central Otago is the driest region of New Zealand, receiving less than 400 mm of rainfall annually, with the Bengio-Ophir Project area featuring a cold semi-arid continental climate (i.e. a region where annual evaporation exceeds annual rain/snow precipitation) (cf. Macara 2015). In addition, Central Otago has very hot summers and the area is commonly buffeted by dry winds. This combination of high temperatures, low rainfall, and wind-driven evaporation has resulted in an inland salt lake (Sutton Salt Lake Scenic Reserve) as well as localised accumulations of evaporative salts (e.g. jarosite, gypsum, ferricopiapite, halite, bloedite) in soils and on rock surfaces (Druzbicka et al. 2015). While dry spells of more

than two weeks occur relatively frequently in Central Otago, significant rainfall events associated with episodic flash floods, high flow events and major floods also occur.

With global climate change, the area is experiencing a trend towards a warmer, drier and more extreme climate (Cameron et al. 2017). In future, the region faces significantly higher average temperatures, an increase in hot days, a greater likelihood of more extreme rainfall events, and growing threats from longer and more severe droughts, water scarcity, and out-of-season wildfires.

<u>The Risk of First Flush Events</u>

At the Bendigo-Ophir site, mine water control, management and treatment need to consider that (a) the site has a semi-arid climate, (b) local rock surfaces and soils are invariably saline, (c) some of local watercourses are ephemeral and experience dry spells and flow only in response to specific rainfall or snowmelt events, and (d) projected climate changes and associated extremes for the Central Otago region will lead to more significant droughts and extreme rainfall events.

The consequence of such extended dry periods and droughts is the fact that so-called "first flush" events will occur in the project area with increasing frequency and magnitude. In mine water management, a first flush event refers to the rapid dissolution of evaporative salts, the desorption of metals and metalloids into waters, and the initial, highly concentrated surge/spike/peak of metals, metalloids and sulfate washed out of mine workings (e.g., underground workings), waste facilities (e.g., waste rock dumps), or mining-impacted waterways (e.g. Romero-Matos et al. 2026). Gradual increases in contaminant concentrations occur during long dry spells and sudden large increases (first flush) are observed during the rising limb of the discharge following dry spells (Nordstrom 2009; Lottermoser 2010).

Climate change exacerbates first flush events by causing longer dry periods, seasonal changes or drought followed by intense downpours (Nordstrom 2009), leading to spikes that can overwhelm conventional mine water treatment facilities (e.g. SRK Consulting 2021). Therefore, designing treatment options and managing peaks is crucial to prevent environmental degradation of downstream surface waters, toxic flood surges to aquatic organisms, and regulatory violations. To minimize such risks, facilities often implement seasonal treatment of first flush waters, intercepting and storing this highly concentrated initial runoff for specialized treatment before release. With climate change, mine water treatment efforts will have to increase the capacity of engineered designs to deal with more extreme conditions, not average conditions (Nordstrom 2009).

<u>Assessment of Environment Effects – First Flush Events</u>

The presented Water Management Plan (Matakanui Gold 2025b), the BOGP Post Closure Active Water Treatment Plant (WTP) Order of Magnitude (Oom) Study (Matakanui Gold 2025c), and the Joint Response to Panel Request for Information 4 – Geology, Geotech, Engineering 3 June 2026 (Matakanui Gold 2026b) do not consider: (i) Central Otago's semi-arid climate and climate change, (ii) the known local occurrence of saline rocks/soils, (iii) the likelihood of first flush events, (iv) the likelihood of escalating frequency and severity of first flush events, (v) their consequences to mine water control, management and treatment, (vi) the need for extreme event risk modelling, and (vii) the necessity of targeted treatment of highly concentrated first flush surges of contaminants. In fact, it has been explicitly stated that the modelling of mine water treatment of Shepherds TSF as well as ELF and CIT Backfill Water was based on constant As and Fe concentrations (Matakanui Gold 2025c, p. 14-15). Consequently, mine water control, management and treatment are of conceptual nature rather than at the feasibility stage of mine development.

Question D3:

Can the experts agree if a similar leachate mix and potential for contamination source (to both surface and groundwater) exist for the CIT backfill, Western ELF and SREK Backfill (given the dominance of TZ4 waste rock in these ELF sites) and can these be managed by the central treatment leachate sump system or will they require separated treatment.

In principle, different rock types and mine site domains generate different mine water qualities. Mine water control, management and treatment should be based on the segregation of contact and non-contact water, first flush diversions and retention ponds. If similar leachate compositions will exist for all contamination sources, a central treatment system would suffice. In this context, surface, pore and seepage waters of the Shepherds Creek TSF can be expected to have significantly higher pH values (due to the addition of alkaline process chemicals) than those of the waste rock dumps.

Question D4:

Not a civil or geotechnical engineering question, but it is important that the treatment options selected are effective and enduring. Do the experts have additional information on treatment options etc. (Cross over questions for treatment rates, reliability and capacity on closure).

Passive Treatment of Mine Waters Using Wetlands

In semi-arid environments (like the Bendigo-Ophir Project area), passive treatment of mine waters using wetlands may fail because high evaporation rates concentrate salts, precipitate metals and metalloids, and dry out the organic microbial substrates necessary for the functioning of wetlands. When such wetlands dry and re-wet, the sudden inflow and flushing of contaminants (sulfate, metals, metalloids) can completely overwhelm the designed water management and treatment capacities (cf. Russell et al. 2025). Thus in semi-arid climates, wetlands can fail to mitigate mine water contamination in the long term due to severe seasonal droughts and flash floods (Lottermoser 2010, p. 196-198).

At the Bendigo-Ophir Project site, wetlands are to be used for passive water management and treatment (Matakanui Gold 2025a, b, c, 2026b). The choice of installing wetlands is questionable as a long-term solution to water management and treatment. Any installed wetland is likely to fail at some point in this semi-arid environment. In fact, current remediation efforts of mine waters emanating from historic mine sites in semi-arid terrains (like southern Spain) are shifting from strictly passive wetland systems to hybrid passive and subsurface flow treatment systems, active water treatment, or adaptive management that can survive any climatic extremes.

Passive Treatment of Mine Waters Using Permeable Reactive Barriers

At the Bendigo-Ophir Project site, the development of permeable reactive barrier technologies for site-specific subsurface seepage will be pursued (Matakanui Gold 2025b, p. 74). The technology lifespan/operational life and failure timeline of permeable reactive barrier technologies depend heavily on the reactive media chosen and the specific groundwater chemistry (Torres and Gomez 2020). Permeable reactive barriers typically last between 10 to 30 years before requiring maintenance, media replenishment, or replacement.

Topic E – Silt Dam, and Process Plant Platform

Question E1:

The current proposal is for design of surface water design elements to be based on the duration of work activity - with higher return flow events used for works that have longer duration, on the assumption that the consequences of design failure are broadly similar. Do the experts agree that the level of design proposed is appropriate in all cases, and if not, can they recommend a more risk based design criteria to ensure failure of key drainage elements does not have major consequence other design elements across the site.

The Need for a Climate Risk and Resilience Assessment

The Commonwealth Model Mining Feasibility Study Guidelines list the information that companies should provide to allow informed decision-making by governments about the feasibility of mining projects (Commonwealth Secretariat 2026). Several technical analyses and information required by governments are directly relevant to surface water design and water treatment at the Bendigo-Ophir Project, including the need to present a *climate risk and resilience assessment.* This assessment should present a site-specific climate risk view, show how findings change engineering standards and operating assumptions, and include costed, scheduled resilience measures with governance and monitoring so that commitments are trackable and bankable; for example:

- State the scenario basis and sources (for example, national climate projections, regional models) and declare assumptions and data quality.
- Provide a concise hazard matrix covering acute (extreme precipitation, flood, storm, wildfire, heat/cold snaps, lightning) and chronic (temperature rise, drought, changing snowfall/rainfall, sea-level rise, permafrost/thaw) hazards.
- Show how climate risk may alter design criteria.
- Provide wet and dry stress tests for the site-wide water balance (storage, make-up, recycling, discharge) and identify drought/overflow contingencies and permits affected.
- Summarise tailings/water facility performance under extreme events (overtop risk, storm routing, beach and freeboard assumptions, power loss scenarios).
- Evaluate grid reliability under climate stress.
- Carry out climate risk assessments such as impacts of drought, floods, extreme weather events.
- Present resilience measures, including a prioritised, costed set of adaptations (engineering, operational and nature-based) with in-service dates, dependencies and owners. Measures could include spillway upgrades, berms, fire breaks, cooling/ventilation upgrades, backup power, additional storage, road raising.

Matakanui Gold (2025a, b, 2026a) does not provide a *climate risk and resilience assessment* and much of the above-listed technical analyses and information are missing. Therefore, Matakanui Gold has not aligned its tailings disposal and water management to a climate risk and resilience assessment as stated by the Commonwealth Model Mining Feasibility Study Guidelines (Commonwealth Secretariat 2026). Hence, the presented technical information appears to be of conceptual nature rather than at the feasibility stage of mine development.

References

Cameron C, Kremser S, Lewis J, Bodeker G, Conway J (2017) The past, present and future climate of Central Otago: Implications for the District. Bodeker Scientific, 40pp.

Commonwealth Secretariat (2026) Commonwealth Model Mining Feasibility Study Guidelines. https://thecommonwealth.org/publications/model-mining-feasibility-study-guidelines

de Vilder SJ, Kelly SD, Buxton RB, Allan S, Glassey PJ (2024) Landslide planning guidance: reducing landslide risk through land-use planning. Lower Hutt, NZ: GNS Science. GNS Science miscellaneous series 144. 84 pp.; doi: 10.21420/R2X8-FJ49

Druzbicka J, Rufaut C, Craw D (2015) Evaporative mine water controls on natural revegetation of placer gold mines, southern New Zealand. Mine Water and the Environment 34, 375-387

Geological Survey of Finland (2026) Passive treatment technologies. https://mineclosure.gtk.fi/passive-treatment-technologies/

Griffiths JS, Hutchinson JN, Brunsden D, Petley DJ, Fookes PG (2004) The reactivation of a landslide during the construction of the Ok Ma tailings dam, Papua New Guinea. Quarterly Journal of Engineering Geology and Hydrogeology 37, 173-186

Hamel JV, Knott DL, Flentje P, Fityus S (2022) Prehistoric landslides: significance, recognition, examples. International Slope Stability 2022 Symposium, Tucson, Arizona USA, 17-21 October 2022

Lottermoser BG (2010) Mine Wastes: Characterization, Treatment and Environmental Impacts. 3rd edition. Springer-Verlag, Berlin Heidelberg, 400 pp.

Macara GR (2015) The climate and weather of Otago. 2nd edition, NIWA Science and Technology Series Number 67, 44p.

Matakanui Gold Ltd (2025a) B.21 Engineering Geology Limited Shepherds Tailings Storage Facility Technical Report, PDF, 322pp.

Matakanui Gold Ltd (2025b) G.01 Water Management Plan, PDF, 85pp.

Matakanui Gold Ltd (2025c) B.41 BOGP Post Closure Active Water Treatment Plant (WTP) Order of Magnitude (Oom) Study, PDF, 34pp.

Matakanui Gold Ltd (2026a) Statement of Evidence of Dr Trevor Matuschka on behalf of Matakanui Gold Limited in response to Section 53 Feedback Tailings Storage, Dated: 17 April 2026, Part 2 27 SOE Dr Trevor Matuschka, 17pp.

Matakanui Gold Ltd (2026b) Joint Response to Panel Request for Information 4 – Geology, Geotech, Engineering, Dated: 3 June 2026, 54pp.

Nordstrom DK (2009) Acid rock drainage and climate change. Journal of Geochemical Exploration 100, 97-104

Romero-Matos J, Sánchez-López L, León R, Macías F, Cánovas CR, Olías M, Nieto JM (2026) Rainfall-driven, high-resolution assessment of water acidification in a planned reservoir within an unreclaimed historical mining basin. Environmental Pollution 128517 https://doi.org/10.1016/j.envpol.2026.128517

Russell M, Gunn J, Prabhakar G, Rickwood CJ (2025) Drought and liming impacts of mine-impacted wetland sediments. Ecotoxicology and Environmental Safety 303 (2025) 118964

SRK Consulting (2021) Implications of climate change on mine water quality. https://www.srk.com/en/publications/implications-of-climate-change-on-mine-water-quality

Torgoev IA, Aleshin YG, Ashirov GE (2014) Environmental effects of possible landslides in the areas of radioactive waste storage in Kyrgyzstan. International Conference on Remediation of Land Contaminated by Radioactive Material Residues, Astana (Kazakhstan), 18-22 May 2009, International Atomic Energy Agency, pp. 320-323

Torres E, Gomez P (2020) Chapter 7: Permeable reactive barriers (PRBs) for environmental site remediation. In: The Handbook of Environmental Remediation: Classic and Modern Techniques, Royal Society of Chemistry, https://doi.org/10.1039/9781788016261-00191