

BEFORE THE EXPERT PANEL

FTAA-2507-1089

**UNDER
IN THE MATTER**

Fast-track Approvals Act 2024
of the Bendigo-Ophir Gold Project

**STATEMENT OF EVIDENCE OF DR ALEXANDER MCALPINE ON BEHALF OF
SUSTAINABLE TARRAS INC**

Date 4 October 2026

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TO THE EXPERT PANEL

1. My name is Dr Alexander McAlpine. My qualifications and general industry experience are summarised in my initial Evidence, dated 04 April 2026¹. Whilst not a recognised expert in groundwater modelling I do have considerable management and industrial-research experience in fractured rock characterisation and flow-simulation studies, including low-permeability igneous and meta-sedimentary rocks in both New Zealand and overseas.
2. This statement addresses the new material provided by the Applicant in response to RFI 13, being the Rev-3 Update to the Geotechnical Factual Report² (GFR), together with accompanying Figures, Tables and Appendices (A to J). I have reviewed all the above material, though without sufficient time to thoroughly assess it all.

Code of Conduct

3. In my initial Statement of Evidence I stated that I have read and complied with the Environment Court Code of Conduct for Expert Witnesses in Part 9 of the Environment Court Practice Note. I re-confirm compliance with the Code of Conduct in preparing this statement.

Summary

4. My key finding is that the Applicant's Geotechnical Factual Report of 23 September provides field-data and interpretations that are inconsistent or inadequate to support the conclusions in the "Memorandum RFI 12: Water - TSF and Shepherds ELF Seepage, dated 23 September 2026³, and in particular the statements that:

"The dominant receiving environment for unrecovered seepage is the shallow groundwater and surface water systems in the Shepherds Creek catchment. Therefore, the vast majority of unrecovered seepage is detectable by the proposed monitoring network.";

"The potential for unrecovered seepage to the deep schist system is extremely low"; and

"The modelling was highly conservative and undertaken to identify low probability, high impact scenarios." "This gives confidence that the predictions provided here are at the upper end of the modelled values."

5. I consider the magnitude and uncertainty of groundwater seepage into the schist bedrock, and its speed and direction of migration within the schist are grossly underestimated.

¹

https://www.fasttrack.govt.nz/_data/assets/pdf_file/0019/23527/7dd35426d7a7abad200e3d8117ea4396a37ad9ca.pdf

² https://www.fasttrack.govt.nz/_data/assets/pdf_file/0033/36888/BOGP-Site-Geotechnical-Factual-Report_Rev3_Sept2026.pdf

³ https://www.fasttrack.govt.nz/_data/assets/pdf_file/0017/36440/RFI-12-Response-TSF-and-Shepherds-ELF-Seepage-FINAL.pdf

Fracture Networks

6. As set out in my original brief of evidence the key geological parameters that will determine the potential unrecovered seepage to the deep schist are the water conductivity of the schist matrix and the presence of any natural (or induced) fracture networks. As noted by the Applicant, both have a marked directionality.
7. Of particular significance for deep groundwater modelling are the core logs and photographs of the 2024/2025 “Investigation Boreholes” (MDD327, MDD333, MDD362, MDD365, MDD394, MDD396, MDD399) and the newly acquired 2026 “TSF Deep Boreholes” (MDD502, MDD506, MDD507, MDD507R) set out in the GFR. Numerous fractures and joints are logged where these boreholes penetrate unweathered or slightly-weathered schist, though it is unclear from the logs and core photographs alone which might be natural (pre-existing), and which might be drilling-induced.
8. The orientation of fractures, joints and schistosity are illustrated in Appendix A and summarised in Section 5 of the GFR. These complement more detailed field characterisation of structural features reported elsewhere⁴.
9. However, the implications of these features for groundwater seepage in the schist are not considered. The latest Groundwater Modelling⁵ also does not incorporate any model runs to accommodate the scenario of directionally-enhanced permeability. In this respect I find it inadequate to address the concerns raised in the Panel’s RFI 11 regarding potential uncaptured seepage within the schist bedrock. To the contrary, it appears all groundwater modelling scenarios have been continued to run with an arbitrary 1 to 100-fold reduction in vertical water-conductivity in the unweathered schist (which is stated as having been imposed to reflect a flat-lying schistosity texture).
10. Furthermore, no models have been run with enhanced vertical and horizontal water-conductivity in the schist - to reflect the steeply-dipping conjugate fractures sets identified during field-mapping and indicated from well logs and cores. Consequently, all model runs are constrained to permit only negligible vertical seepage into the schist (where capture will be difficult) and/or laterally downslope into the Ardour and Bendigo aquifers.
11. From personal experience, and by rough approximation, I consider these modelling choices have resulted in the current modelling to have underpredicted the potential seepage into the schists, possibly by one or two of orders of magnitude.
12. Other data provided under RFI 13 also indicate potentially conductive natural fractures within the schist, including:
 - Occasionally observed pressure interference between adjacent wells;
 - Variable well-inflow rates between different wells and/or test intervals; and
 - Different hydraulic-pressure zones seen on piezometers within single wells.

⁴ https://www.fasttrack.govt.nz/_data/assets/pdf_file/0018/24282/Part-3-02-PSM5131-003R-DRAFT.pdf

⁵ https://www.fasttrack.govt.nz/_data/assets/pdf_file/0029/32987/RFI-11-Question-2b-and-2c-Water-Updated-Groundwater-Modelling-for-Bendigo-Ophir-Gold-Deposit.pdf

13. Open natural fractures are a general feature of the Otago Schist which in parts of Otago have sufficient water-conductivity to form designated aquifers and be utilised as water supplies, albeit low-yielding^{6 7}.

Conclusions

14. In conclusion, I consider the newly available data provided for RFI 13, together with the updated Groundwater Modelling provided in the Applicant's response to RFI 11, are currently inadequately integrated. Consequently, as I have stated above, the magnitude and uncertainty of groundwater seepage into the schist bedrock, and its speed and direction of migration within the schist are grossly underestimated.
15. The 23 September 2026 Memorandum RFI 12: Water - TSF and Shepherds ELF Seepage⁸ states that:

"Groundwater modelling reported in RFI 11⁸, described further in this response, indicates that unrecovered seepage from the TSF and Shepherds ELF (seepage potentially bypassing subsurface drainage at these facilities) is expected to be low (less than 0.5% from the TSF and less than 5% respectively from the ELF). The modelling indicates that the majority of this unrecovered seepage primarily reports to the shallow groundwater and surface water systems within the Shepherds Creek catchment, where it can be effectively monitored, intercepted, collected, managed and/or treated."

and

"In summary, the modelling confirms the seepage pathways are as expected and the proposed engineering controls will cut off and collect the majority of seepage generated in the Shepherds Valley";

16. The above two statements are not supported by the information presented in the GFR.

⁶ Otago Regional Council, Groundwater Exploration in the Ida Valley, 2012

https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=CAESfAHrOzAVi04a0sE9HCyPE6KeeOSLs0JQR5j9u1YqFyxY99BFnnQNTEm7vIKRtsSeMcjEVNX1TP446j93Aa4L8idQrxuAbObX25KQTajyt6qMMIP55YzsrTvLQ53DEPa4hB8-kTu0qG-7IEFSWoL_V7GXxmOoKVZ4fSR6Us&ved=2ahUKEwiixY-3k5qXAxWF68BHTddCq4QFnoECDUQAQ&uoh=2&usg=AOvVaw3m4Pws7-Egn3O5TZVhvY50

⁷ Yeo, S., 2023, Otago Regional Council Memorandum A1758401

https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=CAESoQEB6zswFUoVUX6slWMtsgQr8v-NZ7IfW3629EFWPkqTjuKb8IPuEm7NaZosorwo733sIC6LgSwmMbxctNm9cWWO6g5A7gywextE3WSQC3z8JvEUNFr5Z_qbY6i_eC9JGpqu0nQ3B3qjYUzVyzcnNnUi_gWs-tWqZ5IMk5ltTBVobID6P8hls1LuPGGqnWqWe5-gzRrY_LjtxsBWMsDFjP0Pw&ved=2ahUKEwi1ioOvlpqXAxVPr1YBHRiVDwEQFnoECBsQAQ&uoh=2&usg=AOvVaw2KzFq0t22343vsj1OJ8lzQ

⁸ https://www.fasttrack.govt.nz/_data/assets/pdf_file/0017/36440/RFI-12-Response-TSF-and-Shepherds-ELF-Seepage-FINAL.pdf

17. Lastly I also consider the limitations listed in Section 10 of the Updated Groundwater Modelling Report are pertinent, particularly the statement that:

"The model is a simplified representation of the groundwater system, in particular the model cannot replicate the explicit effects of fine scale heterogeneity and/or fracturing within the schist."

Signed:

A handwritten signature in blue ink, appearing to read "Alex McAlpin", followed by a horizontal line.

Date:

4 October 2026