



Memorandum

To: Bendigo-Ophir Gold Project Expert Panel

From: Santana Minerals, Engineering Geology Ltd, Hydro Geochem Group, Komanawa Ltd

Date: 23 September 2026

Re: RFI 12: Water - TSF and Shepherds ELF Seepage

Matakanui Gold Limited (MGL), Eric Torvelainen - Engineering Geology Ltd (EGL), Ryan Burgess - Hydro Geochem Group (HGG), Matt Dumont - Komanawa Ltd (Komanawa) respond to the water/seepage matters raised in RFI 12.

Summary

The proposed and conditioned design measures already provide effective controls for keeping unrecovered seepage extremely low and will maintain water quality below the proposed compliance limits. These measures include:

- A primary seepage collection system for the Tailings Storage Facility (TSF), which includes underdrains that extend the full length of the TSF, an upstream cutoff drain and embankment chimney drain (D.04 Condition 24);
- Low permeability seepage cutoffs, Zone A (design value of $1 \times 10^{-7} \text{m/s}$) and grout curtains at the TSF Embankment (D.04 Condition 24);
- Subsurface drainage beneath the toe of Shepherds Engineered Landform (ELF) (100m minimum) (D.04 Condition 95);
- Low permeability seepage cutoffs, Zone A (design value of $1 \times 10^{-7} \text{m/s}$)¹, at the toe of the Shepherds ELF/Seepage Collection Sump (D.04 Condition 73);
- Secondary seepage interception measures, which includes a grout curtain and seepage interception wells at the toe of the Shepherds ELF/Seepage Collection Sump (D.04 Condition 25);
- Subsurface drainage beneath the toe of Shepherds Valley Infill (D.04 Conditions 64-65); and
- A network of groundwater performance and compliance monitoring bores (D.04 Conditions 30-34), with Trigger Action Response Plans to guide monitoring, response, and escalation if seepage is detected (D.04 Condition 21).

¹ Note, the low permeability seepage cutoff at the toe of the ELF is currently designed to $1 \times 10^{-7} \text{m/s}$, which exceeds the consent requirements of 10^{-6}m/s .



In RFI 12, the Panel requested that additional design measures be considered, to further control seepage. As a result, MGL proposes the following new, additional design measures, which will also be included in the final proposed consent conditions², to provide further certainty and assurance that unrecovered seepage is reduced to as close to zero as feasibly possible:

- Extension of the subsurface drainage beneath Shepherds ELF to extend in the valley floor over the full length of Shepherds Creek.
- Low permeability seepage cutoffs, Zone A (design value of 1×10^{-7} m/s), at the Shepherds Valley Infill toe at its maximum downstream extent. It is proposed the consent condition will align with D.04 Condition 73, that conductivity at the toe is no more than 10^{-6} m/s.
- Grout curtains, interception wells and seepage collection measures at the toe of the Shepherds Valley Infill.

These additional measures are discussed further below.

Groundwater modelling reported in RFI 11³, 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.

The modelling indicates that a very small proportion of seepage (less than 0.1% for the TSF and 1.70% for the ELF) is not captured and could reach the Ardour Aquifer via the deep groundwater system (further information provided in the response below). The groundwater modelling is conservative and more than half of the modelled parameter sets show less than 0.01% of seepage is lost to the deep groundwater system (i.e., does not discharge upstream of SC01 to the shallow groundwater where it can be managed).

Design and the corresponding consent conditions have evolved since the groundwater modelling was developed. Therefore, the model does not include some of the existing, and new, proposed additional seepage collection design measures outlined above (i.e., the TSF grout curtain, Shepherds ELF and Shepherds Valley Infill grout curtains and interception wells, and increased underdrainage in the ELF or TSF). These additional design elements will act to increase total recovered seepage and lower the unrecovered

² These new conditions will be included in the final condition set provided with the final legal submissions on 28 September 2026.

³ RFI 11 - Question 2 b and c - 17 August 2026



seepage proportions beyond what the current groundwater modelling suggests. The groundwater model will be updated and revised as per best practice and in accordance with D.04 Condition 23 to inform detailed design.

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. This will protect water quality in downstream receptors (e.g., Ardour Aquifer and Lindis River). Performance and compliance monitoring (as conditioned) will be implemented to provide confidence and assurance that downstream receptors remain protected from water quality impacts related to seepage.

Tailings Storage, ELF and Shepherds Valley Infill Design – EGL

The groundwater modelling described below indicates the primary seepage loss potential is via the shallow groundwater system in Shepherds Creek and any deep losses are low and primarily report to the shallow groundwater system downstream. With seepage losses primarily reporting to the shallow groundwater system, EGL recommend that the potential unrecovered seepage can be cutoff and collected with the measures already proposed in the consent conditions, with some minor improvements as discussed below. The current measures include:

- A primary seepage collection system for the Tailings Storage Facility (TSF), which includes underdrains that extend the full length of the TSF, an upstream cutoff drain and embankment chimney drain (D.04 Condition 24);
- Low permeability seepage cutoffs, Zone A (design value of $1 \times 10^{-7} \text{m/s}$) and grout curtains at the TSF Embankment. (D.04 Condition 24);
- Subsurface drainage beneath the toe of Shepherds Engineered Landform (ELF) (100m minimum) (D.04 Condition 95);
- Low permeability seepage cutoffs, Zone A (design value of $1 \times 10^{-7} \text{m/s}$)⁴, at the toe of the Shepherds ELF/Seepage Collection Sump (D.04 Condition 73);
- Secondary seepage interception measures, which includes a grout curtain and seepage collection wells at the toe of the Shepherds ELF/Seepage Collection Sump (D.04 Condition 25);
- Subsurface drainage beneath the toe of Shepherds Valley Infill (D.04 Conditions 64-65).
- A network of groundwater performance and compliance monitoring bores (D.04 Conditions 30-34), with Trigger Action Response Plans to guide monitoring, response, and escalation if seepage is detected (D.04 Condition 21).

⁴ Note, the low permeability seepage cutoff at the toe of the ELF is currently designed to $1 \times 10^{-7} \text{m/s}$, which exceeds the consent requirements of 10^{-6}m/s .



In RFI 12 the Panel requested that the applicant consider additional design measures acceptable to ensure unrecovered seepage from TSF and the Shepherds ELF is reduced to as close to zero as feasibly possible. A series of alternatives were proposed as listed below:

- a. Use of a synthetic liner (such as HDPE geomembrane or comparative alternative) at the base of each structure
- b. Placement of structurally engineered low permeability materials with a conductivity of 1×10^{-7} m/s or less at the base of each structure
- c. Removal of high permeability weathered schist material at the base of each structure
- d. Underdrainage layers that intercept the full extent of overlying waste material at the base of each structure

EGL recommends not lining the base of the TSF and ELFs, with either a synthetic liner or with placement of structurally engineered low permeability materials. The modelling has confirmed that the seepage losses primarily report to the shallow groundwater system and the design measures already proposed allow for capture of these losses. Losses to the deep schist groundwater system, that may not be able to be collected, are modelled by Komanawa Groundwater Modelling report prepared for RFI 11 (17 August 2026) to be low for the TSF and ELF, less than 0.1% and 1.7% respectively.

Lining the TSF impoundment or ELFs with structurally engineered low permeability materials (1×10^{-7} m/s) will not improve on the low permeability of the schist at depth ($< 4 \times 10^{-8}$ m/s) beneath the weathering. Lining with HDPE can achieve a lower permeability. However, it has disadvantages including geotechnical instability risks through the introduction of a weak plane beneath ELFs or TSF embankments, and for the TSF construction there are issues associated with water ingress beneath the liner, wind uplift, and safety of workers installing the liner above tailings and decant pond water.

EGL agrees that there are benefits in the removal of high permeability weathered schist material or use of grout curtains at key locations. This is currently proposed at the TSF embankment and toe of Shepherds ELF / Seepage Collection Sump. As a practical approach to provide additional measures to give confidence seepage losses will be collected in the shallow groundwater system, EGL and MGL propose that a grout curtain and interception wells are also installed beneath the downstream extent of the Shepherds Valley Infill. Additionally, a low permeability seepage cutoff, with a conductivity of no more than 10^{-6} m/s, will be installed at the toe of Shepherds Valley



Infill⁵. These measures will be included in the updated consent conditions provided on 28 September 2026 .

Underdrainage is proposed to be installed in the following locations:

- Over the full length of the TSF, which was included in the 14 September 2026 conditions (D.04 Condition 24), following the recommendation in the Komanawa Groundwater Modelling report prepared for RFI 11 (17 August 2026).
- The full length of the Shepherds Valley Infill , which was included in the 14 September 2026 conditions (D.04 Condition 64-65) to provide effective collection of seepage in the floor of the valley prior to it surfacing.
- The toe of Shepherds ELF (for 100m) (D.04 Condition 95).

Following groundwater modelling results, EGL agrees with the Panel that there is benefit in installing underdrainage along the full length of Shepherds Creek alignment beneath Shepherds ELF , which will be included in updated consent conditions provided on 28 September 2026.

Note, EGL recommends that it is not necessary to extend the drainage up Jean Creek based on the groundwater modelling outcomes from Komanawa, which shows Jean Creek is not a major discharge point of the natural system. The Panel proposed the option of a drainage blanket beneath the full extent of the ELF or TSF. EGL does not consider this necessary and a subsurface drain in the floor of Shepherds Valley will be sufficient.

Updated Groundwater Modelling– Komanawa

The updated groundwater modelling⁶ used an ensemble method, creating many possible parameter sets (realisations) to assess the uncertainty of unrecovered seepage predictions. Where percentiles are referenced, they refer to the percentile of model realisations. Therefore, for the 95th percentile seepage reported many realisations show significantly less seepage.

Additionally, the modelling highlights the redundancy of the seepage interception design with multiple downstream features to capture seepage that could bypass the primary controls. For example, seepage that bypasses the primary seepage collection system at the TSF can be caught by the secondary interception measures at the Shepherds ELF, the Shepherds Silt Pond, and/or the Shepherds Valley Infill

⁵ Noting, low permeability, Zone A, seepage cutoffs elsewhere in the project currently have a design value of 1×10^{-7} m/s which exceeds their respective proposed the consent conditions.

⁶ RFI 11 - Question 2 b and c - 17 August 2026 and Response to Submissions on RFI 11, Memorandum from M. Dumont - 14 September 2026



underdrainage and new collection system proposed at the infill toe. Noting that while the silt pond discharges to the environment, it provides a managed and monitorable water body which is ideal for adaptive management responses. Similarly, the underground workings provide another discharge point for seepage that enters the deep schist groundwater system.

The memorandum from 14 September 2026 presented revised results⁷, which show a reduction in unrecovered seepage from the TSF and Shepherds ELF because in the results presented in response to RFI 11 on 17 August 2026 the assessment used a component-wise approach. This evaluated each mine domain separately instead of treating them as a connected system. This approach was taken due to the time pressure to build and run the model. However, this meant that the reduced hydraulic conductivity in the weathered schist under the Shepherds Seepage Collection Sump was not applied to the TSF or Shepherds Valley Infill components of the system. This resulted in modelled predictions that were from an inconsistent set of parameters. As discussed in the memorandum, dated 14 September 2026, this simplification has been rectified and has resulted in the key findings presented below:

- 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.
- The TSF has an unrecovered seepage fraction of less than 0.5%. The majority of the unrecovered seepage resurfaces to Shepherds Creek upstream of SC01 or shallow groundwater under SC01. There is less than 0.1% (95th percentile) lost to the deep groundwater system.
- Shepherds ELF has an unrecovered seepage fraction of less than 5%. The majority of the unrecovered seepage resurfaces to Shepherds Creek upstream of SC01, shallow groundwater under SC01, or the Shepherds Silt Pond. Less than 1.7% (95th percentile) is lost to the deep system.
- Unrecovered seepage for the Shepherds Valley Infill increased to 15.9% (up from 10%). Less than 4.5% (95th percentile) is lost to the deep system. Due to the infill's much smaller volume (1 Mbcm vs. 88 Mbcm), smaller footprint (0.11 km² vs. 1.11 km²), and a lower peak sulfate concentration (300 mg/L vs. 1,100 mg/L) from low-sulfide TZ3 schist placed in compacted layers, when compared to the Shepherds ELF. The overall impact of higher infill seepage combined with

⁷ Figure 8.1, Response to Submissions on RFI 11, Memorandum from M. Dumont – 14 September 2026.





reduced TSF and Shepherds ELF seepage likely yields a net reduction in total contaminant loading.

- Accounting for the relative water balance of the entire system, less than 2.5%⁸ (95th percentile) of the total seepage may be lost to the deep groundwater system. This value accounts for the differing recharge volumes for each mine domain and their corresponding modelled unrecovered seepage, but conservatively assumes that the Shepherds Valley Fill produced the same mass flux per cubic meter of fill as the TSF and Shepherds ELF. The rest of the seepage would be either captured in primary and secondary collection measures or detectable at SC01 and underlying groundwater through the water monitoring network.
- The modelling was highly conservative and undertaken to identify low probability, high impact scenarios. The 95th percentile of seepage lost to the deep system is highly affected by these outliers. If the 90th percentile is used less than 0.6% of the total mass is predicted to be lost to the deep systems. The 75th percentile and median predict less than 0.1% and less than 0.01%, respectively. This gives confidence that the predictions provided here are at the upper end of the modelled values.

The modelling presented here does not include the newly proposed engineering controls (which will also be the subject of consent conditions provided on 28 September 2026). Specifically, it does not include the proposed grout curtain at the downstream edge of the Shepherds Valley Infill, the inclusion of underdrainage for the full length of the Shepherd ELF and TSF, the secondary seepage interception downstream of the Shepherds Seepage Collection Sump and does not assess the impacts of the proposed interception wells at the Shepherds Valley Infill. These features will provide additional control on lost seepage. The modelling will be updated in line with best practice as the project continues and as per D.04 Condition 23 to inform detailed design.

Water Load Balance Model – 14 August 2026 – Mine Waste Management/Hydro Geochem

The Operational and Closure Water and Load Balance Models (WLBMs) estimate surface water quality at proposed surface water compliance monitoring sites SC01 and RS03. The models include the major mine domain contaminant load sources including open pits, underground workings, ELFs, Shepherds Valley Infill, and the TSF.

⁸ Section 11 and 12 - Response to Submission on RFI 11, Memorandum from M. Dumont – 14 September 2026



Operational WLB

The Operational WLB does not represent any water treatment but does represent unrecovered seepage reporting to SC01 and RS03. An unrecovered seepage proportion of 5% was adopted for the ELFs, TSF, and Shepherds Valley Infill (timing of parallel groundwater modelling workstreams did not allow incorporation of final outputs from that work into the WLB). Based on empirical observations from the Macraes Mine⁹, attenuation factors were applied to known reactive constituents - arsenic, iron, copper, and molybdenum (noting they require validation under site specific conditions at the BOGP).

WLB results suggested that at RS03 water quality would remain below proposed compliance limits throughout mine life. The model results suggested that at SC01 the proposed compliance limits may be exceeded in Year 10 of mine life for antimony and Year 11 for nitrate. However, the updated groundwater modelling and proposed additional seepage collection measures (grout curtain, interception wells and additional underdrainage) mean the unrecovered seepage proportion adopted in the WLB is conservative for the Shepherds Creek catchment.

The Operational WLB adopted an unrecovered seepage assumption of 5% for all facilities. Updated groundwater modelling suggests unrecovered seepage from the TSF and Shepherds ELF, the largest potential contaminant sources, is likely lower than this assumption. In addition, the modelling does not include the additional seepage collection measures proposed in both the 14 September condition set or through this response, including (i) additional underdrainage beneath the TSF or Shepherds ELF, nor (ii) installation grout curtains and interception wells. Accordingly, the WLB should be regarded as a conservative assessment of potential water quality effects.

Furthermore, performance monitoring (D.04 Condition 27 and 30), development of Trigger Action Response Plans (TARPs) (D.04 Condition 21) and seepage recovery enhancement with contingency measures (e.g., additional downstream seepage interception at the Bedrock Gap) as per D.04 Condition 26 provide confidence and assurance that downstream receptors remain protected from water quality impacts related to seepage.

Closure WLB

The Closure WLB represents passive treatment and assumes negligible unrecovered seepage reports to surface water compliance locations from the ELFs, TSF, and

⁹ Macraes Mine was used as analogue site given the similar geological setting based on work by Craw and Pope (2017) and Craw and Nelson (2000).



Shepherds Valley Infill. ELF contaminant loads were simulated to decay with time. Models results suggested that active water treatment may be required for 50 years post-closure before passive treatment can achieve the proposed water quality compliance conditions at surface water compliance locations. Periodic updates to the WLBM(s) over the life of mine operation (as per (D.04 Condition 36) will enhance confidence in longer term projections for the post-closure period.

WLBM Summary

Overall, whilst the Operational WLBM suggests potential exceedance of proposed compliance limits at SC01 from 10 years or more into mine life, additional engineering controls not represented in the model (but that will be included in proposed consent conditions) provide a strong basis to mitigate this risk and provide confidence and assurance that water quality will remain below proposed compliance limits:

- Based on the updated groundwater modelling, the unrecovered seepage proportion will likely be lower the 5% value currently adopted for the two largest contaminant load sources at the BOGP (the Shepherds ELF and TSF).
- Additional seepage collection measures, both included in the 14 September 2026 consent condition package (D.04 Condition 24 and 25) and offered within this memorandum, will further lower the unrecovered seepage proportion predicted in the current groundwater modelling.
- Performance monitoring (D.04 Condition 27 and 30), development of TARPs and deployment of contingency seepage interception systems (D.04 Condition 21 and 26) can effectively manage and action enhanced seepage recovery if required.

Over the operational life of the BOGP, the WLBM(s) will be regularly updated (as per D.04 Condition 36) to incorporate performance monitoring data and enhanced system understanding, thereby enhancing confidence in longer term projections, particularly for the post-closure period.

Eric Torvelainen, BE (Hons)
Civil, MEngNZ
Director / Principal
Geotechnical Engineer
Engineering Geology Limited

Ryan Burgess, MSc.,
MIAH, MAusIMM
Principal Consultant
Hydro Geochem Group

Matt Hanson Dumont Ba
MSc
Lead Computational
Hydrogeologist
Komanawa Limited

