

## Appendix B2

### EDS - Summary of evidence - Groundwater Hydrology (Evidence of Dr Leanne Morgan)

Outstanding issue	Summary of EDS evidence	Reference
<p>Limited groundwater/hydrogeological data collection</p>	<ul style="list-style-type: none"> <li>• Groundwater and hydrogeological data collection insufficient to support robust assessment.</li> <li>• Field investigations typically used to estimate key parameters (hydraulic conductivity, storativity, porosity) not undertaken. Only hydraulic conductivity has been estimated, and only at two locations within the RAS pit.</li> <li>• Groundwater level monitoring limited; no potentiometric surface map developed, which is standard first step in hydrogeological assessment.</li> <li>• No hydrogeological conceptual model presented.</li> <li>• These data gaps significantly reduce confidence in the assessment of effects.</li> <li>• It also means that groundwater flow baseline conditions in receiving environments are not defined.</li> </ul>	<p>Paragraphs [19] – [37]</p>
<p>Estimates of flow to pits, drawdown and stream depletion are not conservative</p>	<ul style="list-style-type: none"> <li>• Predictions of pit inflows, drawdown, and stream depletion are based on limited data.</li> <li>• The groundwater model aligns with a low-confidence (Class 1) model under the Australian Groundwater Modelling Guidelines, which is not appropriate for assessing high-risk effects.</li> <li>• The model likely underestimates impacts; a conservative approach has not been applied.</li> <li>• Post-closure groundwater conditions have not been modelled.</li> <li>• Estimates of tunnel dewatering are highly uncertain, and this uncertainty is not adequately acknowledged.</li> </ul> <p>Comment on MGL response:</p> <ul style="list-style-type: none"> <li>• MGL response notes Dr Morgan has used an incorrect conceptual model from Hope Downs. This conceptual model has been used to illustrate what a conceptual model looks like, and has not been used as a conceptual model in Dr Morgan’s assessment.</li> </ul>	<p>Paragraphs [38] – [80]</p>
<p>Loss of wetlands from water table drawdown</p>	<ul style="list-style-type: none"> <li>• Technical assessments indicate that drawdown from mine dewatering is likely to have significant adverse effects on wetlands.</li> <li>• Proposed mitigation relies on augmenting flows in Rise and Shine Creek using bore water; however, there is substantial uncertainty regarding the effectiveness of this approach.</li> <li>• No mitigation proposed for other wetlands affected by drawdown.</li> <li>• Real risk that impacts will be irreversible, resulting in permanent wetland loss. This is considered the most likely outcome.</li> </ul>	<p>Paragraphs [81] – [93]</p>

<p>Loss of hydrodynamic containment in Shepherds Creek valley</p>	<ul style="list-style-type: none"> <li>• The assessment assumes hydrodynamic containment within Shepherds Creek valley, based on current groundwater and surface water flow toward the valley base.</li> <li>• Mine dewatering is likely to significantly alter groundwater levels and flow directions, including along the valley ridge (due to the RAS pit).</li> <li>• These changes create a high risk of losing hydrodynamic containment.</li> <li>• Loss of containment could result in contaminant plumes migrating beyond planned seepage collection systems.</li> <li>• A more rigorous and conservative assessment is required to confirm whether containment can be maintained under mining conditions.</li> <li>• If containment cannot be demonstrated, the proposed seepage collection strategy lacks credibility.</li> </ul>	<p>Paragraphs [94] – [96], [98] – [106]</p>
<p>Contaminant seepage into shallow groundwater</p>	<ul style="list-style-type: none"> <li>• The scale and surface area of mine waste storage create a high risk of contaminant seepage to shallow groundwater.</li> <li>• Quantitative assessment of seepage is limited, and the lack of supporting field data reduces confidence in predictions.</li> <li>• Long-term monitoring and management of unrecovered seepage, particularly in the decades following mine closure, are not clearly defined.</li> <li>• Potential seepage from pit lakes and tunnel tailings paste has not been adequately assessed.</li> </ul> <p>Comment on MGL response:</p> <ul style="list-style-type: none"> <li>• MGL response is that seepage capture rates of ~90% are estimated, and that impacts are manageable with monitoring and contingencies. Estimated seepage capture rates of ~90% still imply significant losses, given the large volumes of mine-impacted water.</li> </ul>	<p>Paragraphs [97], [107] – [115]</p>
<p>Contamination of aquifers and rivers</p>	<ul style="list-style-type: none"> <li>• Modelling indicates that if contaminants enter Shepherds Creek and subsequently the Ardgour Aquifer, effects will be significant due to limited dilution capacity.</li> <li>• Contamination is predicted to persist for decades, even if the source is removed.</li> <li>• Aquifer contamination is effectively irreversible in many cases, with remediation being extremely difficult or unfeasible.</li> <li>• Groundwater users, the Lindis River, and possibly the Clutha Mata-Au River will be affected.</li> <li>• The risk of contaminant migration to the Bendigo Aquifer has not been adequately assessed.</li> </ul>	<p>Paragraphs [116] – [128]</p>
<p>Impact of the proposed groundwater take on existing groundwater users</p>	<ul style="list-style-type: none"> <li>• Consent is sought for a substantial groundwater take (110 L/s) from the Bendigo Aquifer.</li> <li>• The constant rate pump test used to assess effects does not meet minimum standards set by the Otago Regional Council.</li> <li>• Drawdown estimates for neighbouring bores do not account for cumulative effects.</li> </ul>	<p>Paragraphs [129] – [140]</p>

	<ul style="list-style-type: none"> <li>As a result, the assessment of impacts on existing groundwater users is incomplete and unreliable.</li> </ul>	
Water management planning, monitoring and mitigation plans are inadequate	<ul style="list-style-type: none"> <li>Additional monitoring is required to detect unrecovered seepage, assess water quality, and better understand surface water-groundwater interactions.</li> <li>Confidence in the water balance model is low; the predicted water deficit at year 8 appears optimistic.</li> <li>Clearer trigger thresholds, response actions, and independent verification of monitoring data are needed, along with assurance of public access to data.</li> <li>No remediation strategy is provided in the event that aquifers become contaminated.</li> </ul>	Paragraphs [141] – [143]
Suitability of adaptive management	<ul style="list-style-type: none"> <li>Adaptive management is not appropriate for managing risks to aquifers, where impacts may take years or decades to become apparent and are difficult or impossible to remediate.</li> <li>Significant uncertainties remain regarding effects on receiving environments and wetlands.</li> <li>These uncertainties must be resolved before reliable conclusions can be drawn about the scale and significance of effects.</li> <li>Available evidence indicates a high potential for groundwater contamination and wetland loss.</li> </ul>	Paragraphs [144] – [147]