Appendix B3

EDS - Summary of evidence - Geochemistry – Jenny Webster-Brown

Outstanding issue	Summary of EDS evidence	Reference
Existence of two pit lakes in perpetuity (one of them very large) in the catchment, containing contaminated water. Possible release of hydrogen sulphide gas.	• Water quality of pit lakes requires more credible prediction • More comprehensive assessment of implications for future value / rehabilitation of water bodies required • Convern re potential impacts on communities and businesses Comment on MGL response: • proposal for barriers to prevent human use or contact; defer prediction of water quality and hydrogen sulphide gas generation, apply adaptive management (chemical dosing) of lakes • Community and businesses still have to contend with large bodies of contaminated water and their risk/stigma which will last longer than barriers and fences. • Remaining concern re management of lake after mine has closed	Paragraphs [23]-[33]
Mine contaminated seepage from ELFs, TSF and waste rock stacks evading capture by underdrainage (where present) and contaminating shallow groundwater and downsteam environments.	• Percolation rates optimistic • Adaptive management cannot reverse seepage into the shallow groundwater; monitoring to detect this process would need to be very comprehensive to be effective. • No liners proposed. Comment on MGL response: • Liners not proposed because may degrade with time and effective capture systems in place. • Optimistic predictions of percolation rates and seepage capture efficiency – not realistic. • Measures to prevent seepage escape out-of-step with modern mining practices. • Overflow of seepage and runoff collection ponds into surface water system during high rainfall events remains a mechanism of contaminant release from the mine site that will go undetected in compliance monitorng.	Paragraphs [35]-[45], [47]-[48].
Underestimation of degree of arsenic contamination in water quality predictions.	• Risk of significant arsenic emission from mining operation in to wider environment via surface water, shallow groundwater and wind. Comment on MGL response: • MGL say arsenic concentrations in seepage and mine impacted waters based directly on expeeriments and analagous environments at Macraes mine.	Paragraphs [52]-[57]

	• Several examples in modelling predictions where experimental and Macraes-based arsenic concentrations adjusted downwards, assuming it will bind strongly to solid iron oxide - not a realistic assumption in many of the environments being modelled.	
The difficulty of passive treatment for mine waste water, and lack of clarity on what is envisaged and who will be responsible.	• Concern about reliance on passive treatment system – potential for long term significant environmental risk post closure. Comment on MGL response: • Examples provided by MGL for coal (not gold) mines, acidic (not neutral pH) discharges, pilot scale and/or of short duration. • Applicant suggests passive treatment system can be adapted to achieve better contaminant removal if needed and adjustments could be made later. • However, no design or concept for a possible passive treatment system has been provided. • Further information required to provide confidence, given issues experience elsewhere, eg Golden Cross.	Paragraphs [64] – [68]
The compliance monitoring proposed will not detect all of the contaminant loss from the mine site, and so not prevent contamination of downstream environments.	• Concern re incomplete set of limits for compliance monitoring (some contaminants not covered), how metals bound to suspended sediments will be detected, how often monitoring will be undertaken, how sediment contamination and bioaccumulative effects will be assessed (etc). Comment on MGL response: • Contaminant bound to suspended sediment not targeted by compliance monitoring (determines dissolved component only for most contaminants). • Proposed overflow from seepage collection ponds during high rainfall events would contain abundant suspended sediment and contaminants bound to this. This would not be detected by compliance monitoring. • Monitoring of WTP discharge now proposed to include both dissolved and "total" contaminants concentrations (i.e., including contaminants bound to suspended sediment) (new consent conditions in D.02 – ORC consent conditions). • Sediment contamination monitoring now proposed (new consent conditions proposed in D.04 – Schedule Two – ORC consents)	Paragraphs [75], [79-87]