

Comments to GBS Gold – Further Information Request – Princess Louise and North Point Gold Mines

Section 2 – Water Management

Section 2.1.1 – Douglas River Rainfall data table – first row is monthly (not daily) figures. Jan figure 786.6mm contradicts statement in the text of highest rainfall event being 206.4mm.

Response: Acknowledged and corrected in the document.

Section 2.1.2 – It may be reasonable in this project to design sediment basins to a 1 in 2 year event; however, given the recent and forecast rains, the 1 in 2 ARI needs to be justified. Section 5 contradicts the current design capacity by stating that designs will be to a 1 in 20 year event. If designs are to a 1 in 2 year event, the suitability of this capacity needs to be clearly demonstrated, and solid contingency management plans would need to be in place and presented against sediment dam capacity being exceeded. The Further Information Request (FIR) asked for certainty that the sediment basins would be able to capture contaminants in worst-case scenarios.

Response: 1:20 yrs event was a typo – corrected to 1:2 yrs event. Contingency management has been presented in the PER page 6-3.

Dilution of seepage from the Waste Rock Dump (WRD) by concurrent raised river flows is not considered to be an appropriate defence against contamination because seepage through a WRD would be delayed after a heavy rainfall event. The consequence of this is that seepage discharge would continue after stream height has subsided and dilution factors could be significantly reduced.

Response: The comment in the response document referred to contaminant materials (arsenic) potentially present at the surface from seepage during the dry season i.e. taking account of the time lag between rainfall and seepage at toe of the WRD. These materials would be removed at the onset of rains – during the first flush.

What period of rainfall (assuming 1:2 ARI) is proposed to be contained within the sediment dam, ie what duration?

Response: 1 hr, as stated in the PER.

Explain how the design capacity given for the sediment dam at Princess Louise based on Daly Waters rainfall values is identical to the dam based on Douglas River rainfall despite the difference in mean rainfall for the two regions. Should the rainfall intensities be the same?

Response: Data from BOM for Douglas River longitude and latitude is presented in the response document. T_c remains constant, so if the intensities for the T_{cs} given are similar, the dam sizes will likewise also be similar.

Section 2.2 – Water Quality Impacts – Non-acid and metalliferous drainage (salts, residues of oxidation, near-neutral solutes) from oxide (weathered) products have not been adequately considered.

Response: They have – please refer to page 4-5 of the PER. Oxide weathering products are not considered as they have been subjected to rinsing for 1000's of years, and the likelihood of the emergence of toxic materials from oxide rock is low. Residues of oxidation, such as sulphate salts cannot be reasonably predicted, given that all PAF material will be contained.

Figure 2 – North Point Water Balance diagram – indicates that seepage/runoff from WRD does not report to the sedimentation dam. The sediment dam should receive surface water runoff from the operational area and WRD as well as toe seepage from the WRD. As WRD inputs don't match outputs, this figure is probably supposed to be 5000m³.

Response: Acknowledged. The diagram was corrected to show matched outputs.

What is baseflow referring to? This normally refers to creek flow due to groundwater, without stormwater inputs. Does it possibly refer to water flowing from the base of the WRD? If this is the case, should it not report to the sedimentation dam? Runoff from the WRD should also report to the sedimentation dam.

Response: Baseflow refers to sub-surface flow below the base of the WRD. Baseflow is NOT a surface flow, and while it may daylight (at which point it is referred to as surface flow), majority of this flow eventually ends up in perched aquifers in the vadose zone and from there this water migrates to the primary aquifer.

North Point has only twice the annual rainfall volume from its operational catchment as Princess Louise despite having four times the operational catchment size. Why are the runoff coefficients different?

Response: Run-off coefficients are based on landform. Princess Louis is located in steeper terrain than North Point hence different run-off coefficients.

Figure 2 (North Point) indicates 180 000m³ going to dust suppression, of which 141 000m³ is shown to report to Yam Creek. Is this supposed to read “Yam Creek mine pit”? Otherwise there will be erosion, ARD issues, potential metalliferous drainage, creek water quality issues and waste discharge licence considerations. How would the water be transported to Yam Creek Mine Pit from pit dewatering activities – open channels?

Response: Yes, the box in the water balance diagram should read Yam Creek Open Pit (YCOP). Water will be piped to the YCOP. The average dimensions of YCOP, taken from Google Earth measurements, are 134m x 255m which gives an effective area of 34,170m². At a depth of 5 m during the dry, the available volume is 34,170 x 5 = 170,850m³.

Where are the calculations to show the basis for prediction of seepage (for figures 1 and 2)?

Please clarify that clean stormwater will be diverted around the operational catchment area.

Response: Seepage is estimated using the Darcy formula. Exact figures cannot be provided at this time. Clean water will be diverted around the site – see page 6-3 of the PER document.

Section 3 - Waste Rock Dumps

The text describes calculations based upon a minimum clay thickness of 2m achieving minimum hydraulic conductivity of 10^{-7} . Is this permeability able to be obtained for uncompacted clay ('loose dumped' – fig 3) on the sides of the PAF cells? Can these walls be made wide enough to be compacted with machinery? Figure 3 indicates a depth on top of the PAF cells of min. 0.5m clay. This does not match commitments in the text.

Response: This hydraulic conductivity does not need to be achieved on the sides of the PAF cells. It is only required where vertical infiltration is predominant. The differential in permeabilities between the sides of the PAF cells and WRD material will ensure that water will run off the sides without significant infiltration. Fig 3 been corrected to reflect commitments in the text.

The base of PAF cells is not indicated to be clay lined. Groundwater mounding and capillary rise within the WRD is not discussed. Groundwater mounding (and capillary rise) could potentially enter the PAF cell from beneath, far more so if the base of the PAF cell is not lined with compacted clay.

Response: The water mounding in a WRD is only minor due to the high porosity and permeability of the dump. Also, the PAF cells will be located at least 5 m above any potential phreatic surface in the WRD – this information has now been included in the document.

A water-limiting PAF cell liner merely slows oxidation processes inside the PAF cell, rather than prevents it altogether. A second line of defence within the PAF cell could be the inclusion within the clay shell of a base layer of lime or other acid neutralising material, the quantity calculated to be sufficient to neutralise the 7220 / 36050 tonnes of PAF material (or whatever eventuates in practise).

Response: No base layer of lime in the PAF cells is proposed.

Lessons from Rum Jungle point to the importance of on-site quality control and material selection in obtaining low permeabilities and adequate thicknesses of capping layers to optimise cover performance. There has been no demonstration that quality control will be achieved, monitored or remedied by GBS.

Response: Quality control will be instituted by GBS and a commitment is made to that effect. Quality control will be achieved, monitored and remedied by GBS.

No indication is provided of actual testing of clayey soils from the site to establish the likely permeabilities of the clayey material when compressed as well as when loose dumped. This does not provide the required:

“Certainty that Acid Rock Drainage issues will be minimised through the availability of sufficient amounts of clay material with the correct properties” (FIR pg 2).

Response: The soils at the site have not been tested, however inspection of the soils has indicated that these are high clay content soils – see PER table 4.1. A lower than expected hydraulic conductivity parameter value has been used in the calculations (10^{-7} rather than the achievable 10^{-8} or even 10^{-9}) to compensate for this.

There is no information on Yam Creek mine pit. The existing quantity and quality of water in this pit was requested in the FIR.

Response: This information is not available.

Please clarify the final paragraph in Section 3. There appears to be some contradiction, particularly with the claim that arsenic is inert and cannot migrate from the waste rock dump.

Response: Once arsenic has been contained in the PAF cells in its mineral form of arsenopyrite which is inert and insoluble it cannot migrate further i.e. out of the WRD.

Section 4 – Pit Voids

There is no consideration of the existing quantity and quality of Yam Creek Mine Pit water and whether this pit has the capacity to accept the quantities of water from the dewatering of North Point pit.

FIR pg 3 - *Consideration is required of the effects of using water high in arsenic and other metals to suppress dust on the site, in terms of its potential to accumulate in the environment though evaporation, before mobilisation with stormwater runoff:*

14) Indicate existing soil concentrations of Arsenic and other potentially mobile contaminants.

This has not been addressed. A summary of the geochemical data in this context would be appreciated, or else the raw data if available.

Response: Dust suppression will only occur on operational areas which drain to the sedimentation basins. No information on geochemistry is currently available.

Section 5 - Sedimentation Basins

FIR pt. 15 – *Present design standards for the sedimentation basins – ie what size particles, and to what level of treatment.*

This has not been addressed. The response to the FIR (pg 8) indicates that the appropriate location for the sedimentation dam design details is in the PER. This has not been presented.

Response: The locations was indicated in the PER page 2-5 and page 2-6.

Section 6 – Closure

For the statement below, please provide the basis for this judgement, showing modelling or first principle calculations:

During a high intensity storm the exit flow rates within the catchments for North Point and Princess Louise are expected to be in the order of 520 and 720m³/hr respectively. The load of stored contaminants available for dissolution to the run-off at the toe of the WRD and basal seepage – arsenic is used for this example as it is of greatest concern by the regulatory authorities – is judged as being in the region of 0.2kgs in its pure and soluble form..

What about other identified metallic toxicants in the ore/surrounding geology?

*From this, based on a 24 hr first flush scenario, the water leaving the site would contain: $2 * 1,000,000 / [24 * (520 + 720) * 1000] = \text{approx } 0.006 \text{ mg/l as arsenic}$. This amount of arsenic is within the allowable concentration for arsenic in drinking water quality guidelines of 0.007 mg/l as As (DWQG 2004). It should be noted that this concentration of arsenic would be further diluted by flows from nearby creeks and rivers and the concentrations would become non-detectable a short distance from the mine sites.*

Response: Both above statements are removed from the response to FIR. In their place recently obtained data from nearby mines (Woolwonga and Fountain Head) and local stream monitoring is presented.

The following comments and query apply to the above statement in the FIR response. Drinking water guidelines offer insufficient protection to the aquatic ecosystem. Over what distance are the toxic effects of this discharge predicted to take place? Catchment flow modelling should be used to predict water quality for all identified toxicants at the site below the discharge points.

Response: The request for protection of aquatic ecosystem as opposed to using drinking water guidelines is not understood. In this instance, drinking water guidelines are 3 times as stringent as fresh water quality guidelines.