15-34. HYDROGEOLOGY AROUND TSF

Concern:
The geology and hydrogeology around the TSF lacks detail. Further consideration of hydrogeological processes around the TSF would provide further confidence in the predicted behaviour and fate of leachate seeping from the TSF.

This concern responds to the following SEARs for SSD 5765:

- A description of the existing environment likely to be affected by the development, using sufficient baseline data;
- A description of mitigations and
    - Whether these are best practice and represent a full range of measures
    - Whether they will be effective / key performance indicators
    - Contingency plans for residual risks / monitoring and reporting on environmental performance
- An assessment of the likely impacts of all stages of the development, including any cumulative impacts, taking into consideration any relevant legislation, environmental planning instruments, guidelines, policies, plans and industry codes of practice;
- A summary of commitments
- Part 3: Any interference with an aquifer caused by the development does not exceed the respective water table, water pressure and water quality requirements specified for item 1 in columns 2, 3 and 4 of Table 1 of the *Aquifer Interference Policy 2012* for each relevant water source listed in column 1 of that Table.
- Part 3: impacts to significant water resources or threatened species are minimised to the greatest extent practicable
- Assessment of Lawsons Creek and Price Creek
- Assessment of likely impacts to aquifers; detailed site water balance, management of excess water and reliability
- DRG, Attachment 2A requires rehabilitation methods including
  e) monitoring for rehabilitation
  i) details of triggering intervention
  k) details of post-rehabilitation management
  l)i) assessment of rehabilitation techniques against objectives
  l) ii) assessment of potential acid mine drainage
  l) iii) processes to identify and management geochemical risks throughout mine life
  m) iii) groundwater assessment for final water level in any tailing storage facility void
  o) consideration of controls
- DRE/DPE requires a Water Management Strategy that considers
    - the existing surface and groundwater qualities
    - a robust baseline
    - a description of how groundwater and aquatic ecosystems will be monitored, Trigger Action Response Plan and trend identification

DISCUSSION

(Jacobs (Australia), 2020, pp. 5-171) reports up to 8 m of groundwater mounding in the aquifer around the TSF which implies hydraulic connectivity between the TSF and the aquifer. At the scale presented, mounding beneath the TSF is not evident on the southeast to northwest section line presented in Jacobs 2020 (Figure 1 below). If anything, the inferred groundwater flow gradient beneath the TSF in Figure 1 appears to slightly slope to the northwest, rather than towards the pit lake as reported. The fate of the leachate (seepage) is unclear both during and post mining.

Figure 1 shows the course level of hydrogeological interpretation around the TSF along the SE-NW transect. A corresponding SW-NE transect is recommended, as this would show the location of faults relative to site infrastructure. Faults, as well as the hydraulic conductivities and thicknesses of the layers play a part in how quickly leachate is transmitted through the aquifer to impact significant receptors. The layers are not labelled with their hydraulic conductivities, however, even at the scale of Figure 1, a change in layer thicknesses under the TSF are anticipated.

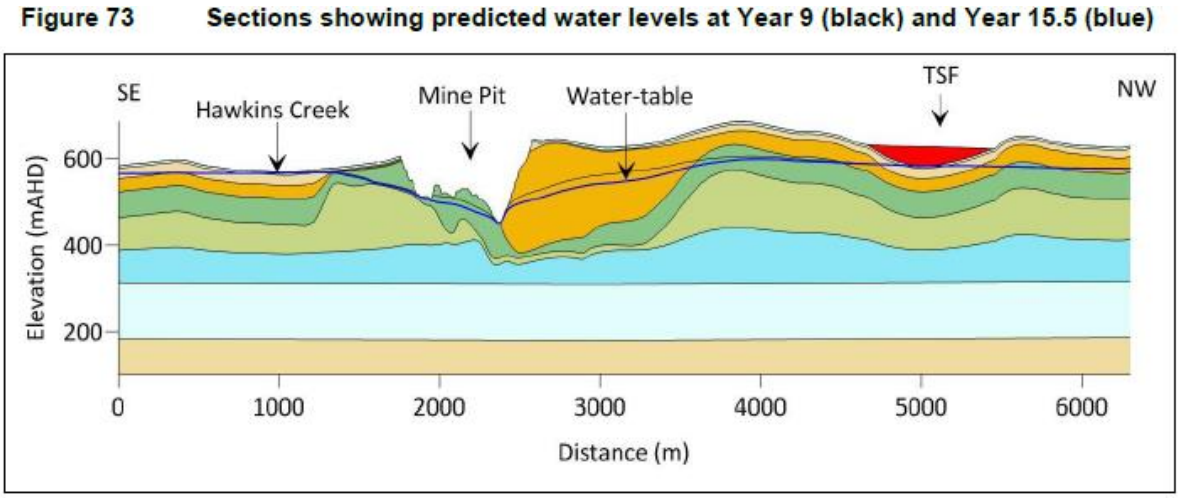

Figure 1: Groundwater levels. Source: (R. W. Corkery & Co. Pty. Limited, 2020, pp. 5-171)

The 'paired bores' drilled to investigate vertical conductivity for infiltration rates could provide some justification of the hydrogeology. BGW47/49 (some distance apart) show an upwards hydraulic gradient with some resistance to flow, while BGW50/51 and BGW60/61 (near the TSF) shows little evidence of any resistance to vertical flow.

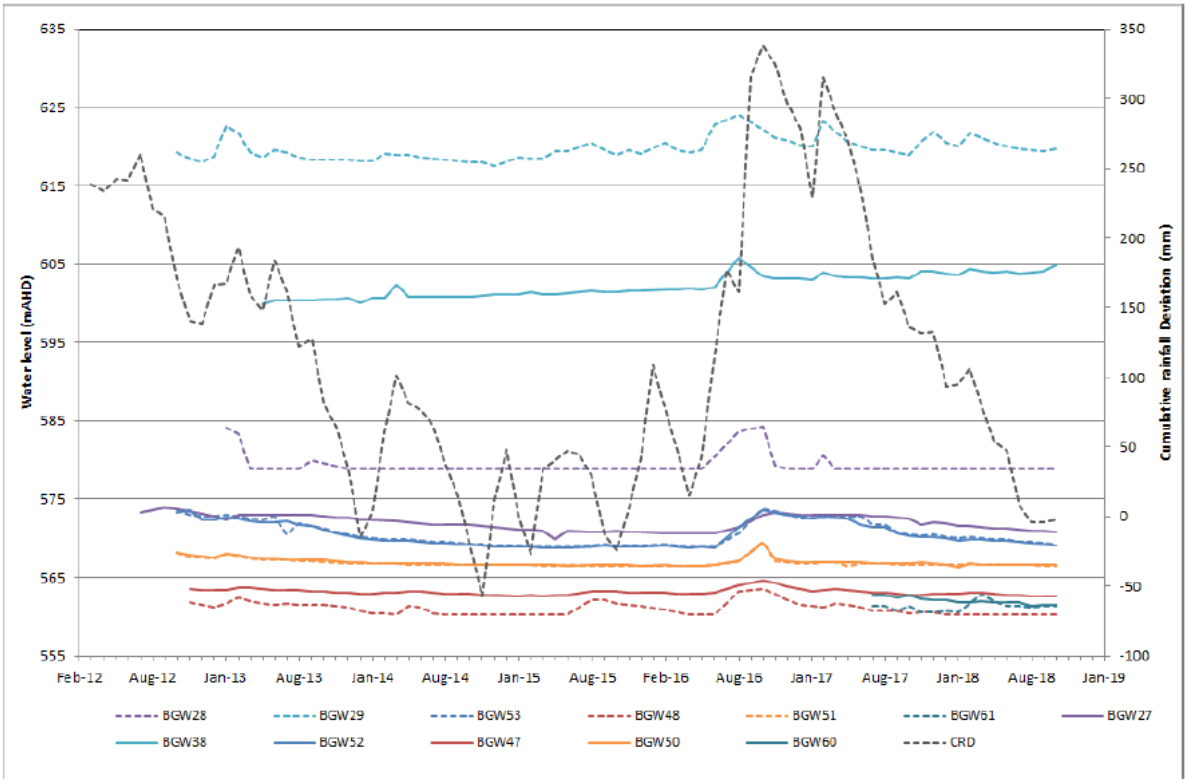

Figure 2: Paired well hydrographs – Figure 27 in (Jacobs (Australia), 2020, pp. 5-94)

From July 2017 to January 2018, BGW60/61 (near the proposed TSF) showed evidence of some barrier to vertical flow. This resistance or barrier is not evident after January 2018. Exploration drill holes approved under mining legislation have less stringent backfilling requirements than bores but may create new conduits for vertical groundwater flows. Powers under Section 324 of the WMA 2000 can be used to manage local impacts on existing groundwater works.

Table 1: Paired bore near TSF

Location	Bore	Depth (m)	Screened Depth	Geology
TSF	BGW61	5	1-5	Alluvium
	BGW60	33	21-33	Rylstone Volcanics

REFERENCES

Jacobs (Australia), 2020. *Part 5 - Groundwater Assessment,* Sydney: Silver Mines Pty. Limited.

R. W. Corkery & Co. Pty. Limited, 2020. *EIS Bowdens Silver Project,* Sydney: Bowdens Silver Pty Limited.