6-4. RELATIONSHIP BETWEEN ALLUVIUM AND FRACTURED ROCK AQUIFER

Concern:
Aquifers within the alluvium associated with the creeks can be highly productive, and accessed by significant ecosystems and surface water/groundwater users. There is little focus on the relationship between the alluvial aquifers near Lue Village, and the groundwater interference proposed in the fractured rock aquifer

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;
- 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;
- 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 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
- Environment Protection Authority 14/05/19: Describe how predicted impacts on surface water, groundwater and aquatic ecosystems will be monitored and assessed over time, including monitoring
- 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

The EIS assumes that the alluvium beneath Lawsons Creek near the Lue Village is 4-6 m thick (Cardno, 2020, pp. 10-96). The spatial extent of the alluvium as presented in (Jacobs (Australia), 2020, pp. 5-147) is provided in Figure 1. Within the groundwater model, the alluvium is represented in layer 1 and is confined to the defined valleys shown in Figure 1. Outside of the valleys, Layer 1 represents regolith. Layer 1 of the model is shown in the west to east geological model cross section in Figure 2 below.

The current conceptualisation simplifies the relationship between the alluvium and underlying aquifers. Given that the alluvium may support significant water dependent ecosystems and existing groundwater users, a more robust understanding of this relationship is warranted.

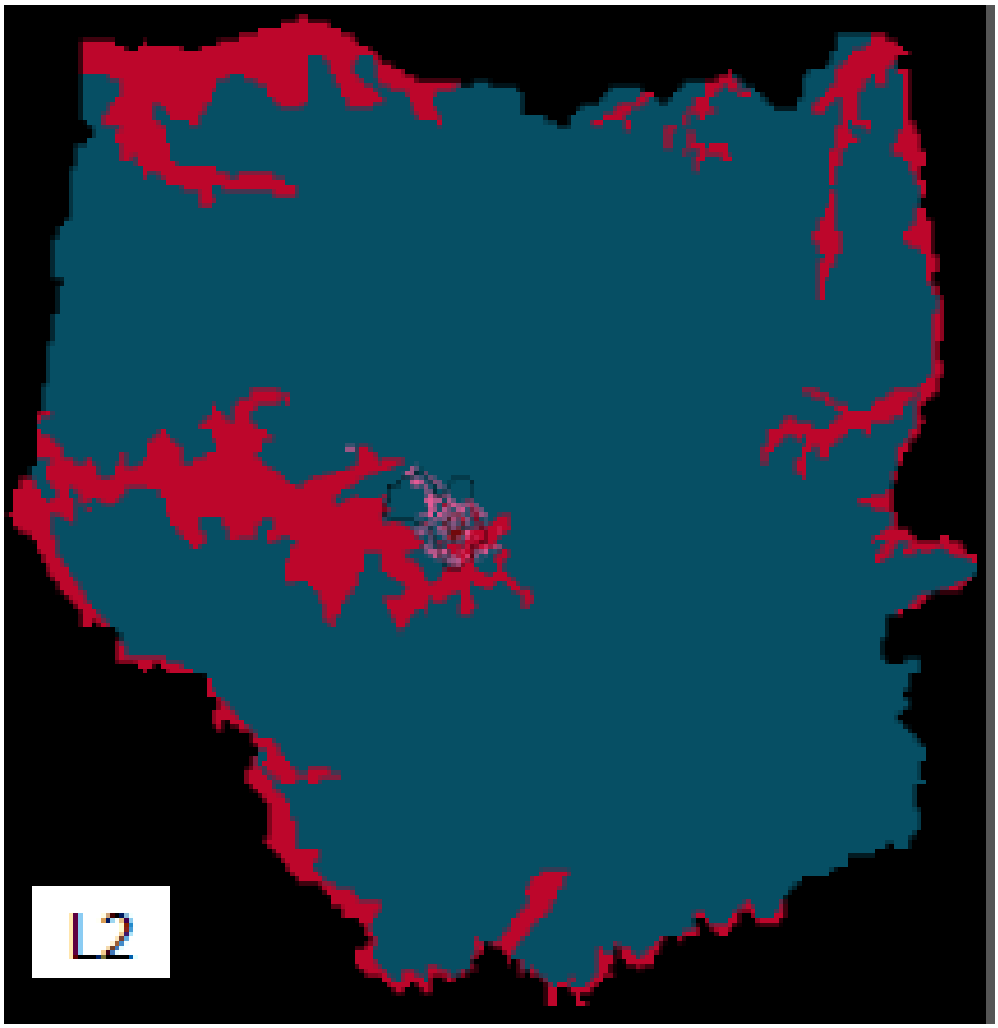

Figure 1: Distribution of alluvium near proposed mine shown in red. Source - (Jacobs (Australia), 2020, pp. 5-147)

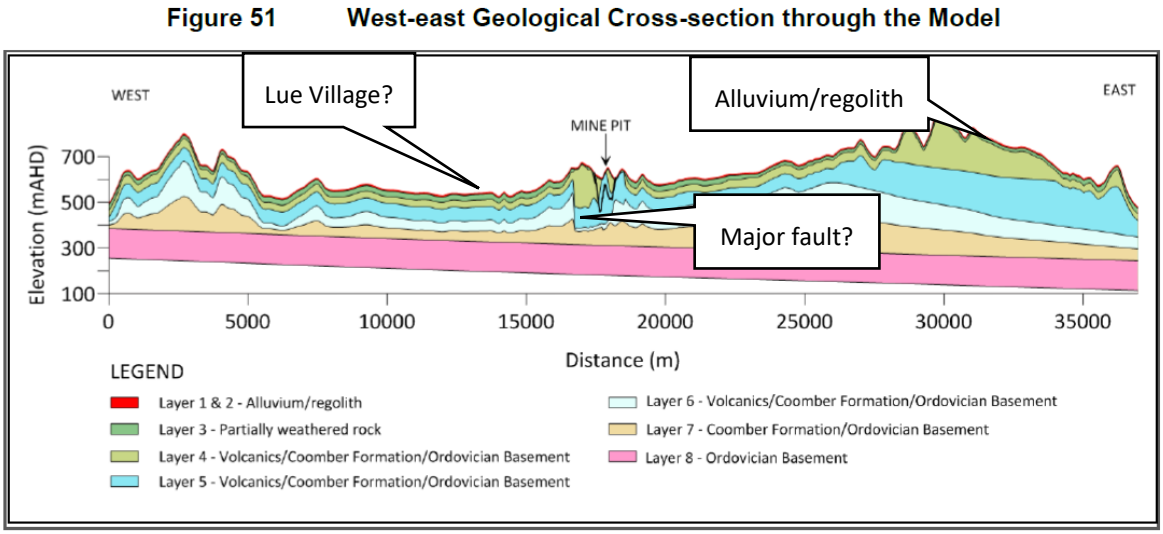

Figure 2: West-east modelled cross section. Source: Adapted from Figure 51 from (Jacobs (Australia), 2020, pp. 5-143)

Jacobs (2020) allowed two metres below Drain boundary condition in the MODFLOW model cells before recharge from minor watercourses was reduced to zero (Jacobs (Australia), 2020, pp. 5-135). This condition

contributed to the predicted drawdown (Figure 3) which expands to a maximum of 1 m beneath Lawsons Creek after mining (Jacobs (Australia), 2020) under the regional modelling conducted. The availability of surface or groundwater flows beneath Lawsons Creek have not been verified in the EIS but are assumed to provide recharge until the alluvial aquifer water table drops to less than two metres below ground level. Hydraulic properties are derived from Hawkins Creek to the northwest. Figure 20 of (Jacobs (Australia), 2020) indicates that hydraulic conductivity (K) in the alluvium in that area is greater at shallower depths (5-10 m/d), however, numerical simulation modelling of the alluvium includes an upper layer with a K of 2.5 m/d overlying a layer with a K of 5 m/d to (model layer 1 zone 11 and model layer 2 zone 21).

Using this available hydrogeological data, a prediction of drawdown beneath Lawsons Creek near Lue is provided and referenced throughout the EIS. The regional approach may not be applicable to changes in the alluvium, as aquifers within alluvium can be highly transmissive, supporting ecosystems and bore users.

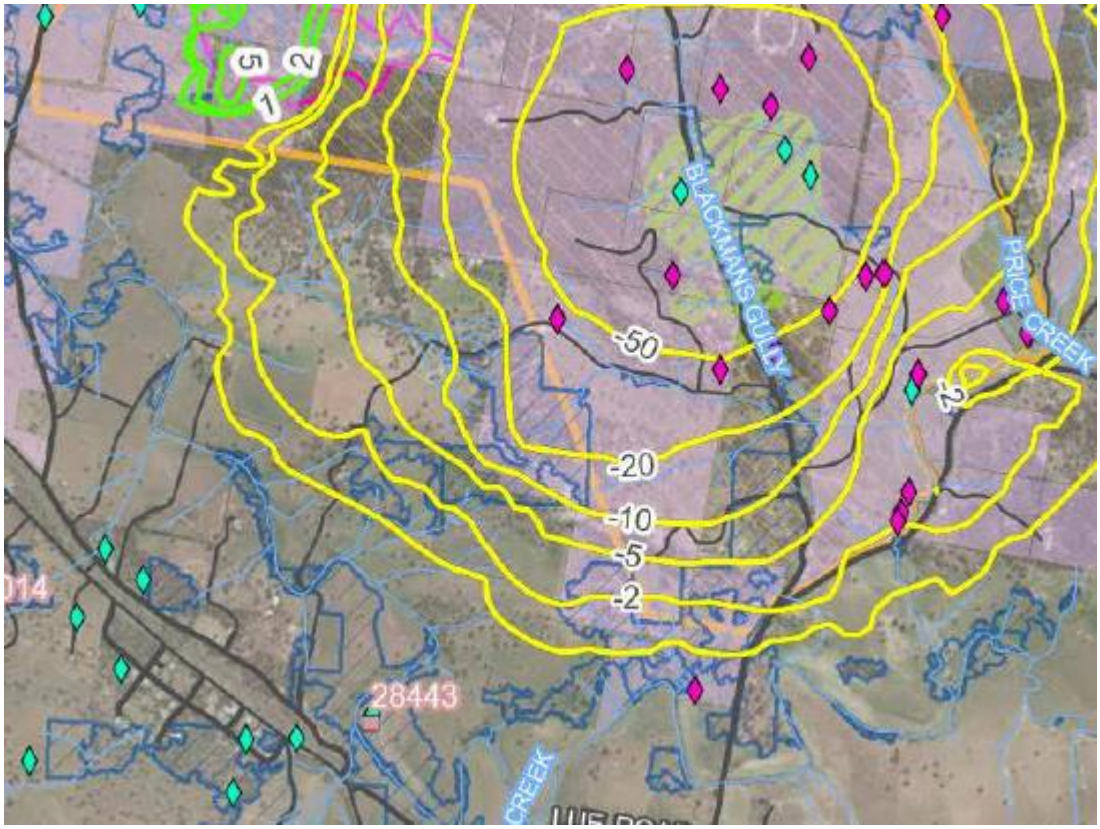

Figure 3: Predicted drawdown at the end of mining (year 15.5) Source: Figure 72 from (Jacobs (Australia), 2020)

According to SEARs, sufficient baseline data is required to characterise and describe the existing environment. A firm understanding of the existing environment enables predictions of the likely hydrogeological impacts caused by a development to be used for decision making. If the existing hydrogeology is not well understood, there is a large chance that groundwater models and predictions will be unsuitable for decision making.

REFERENCES

Cardno, 2020. *Aquatic Ecology Assessment,* Sydney: Bowdens Silver Mine.

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