

APPENDIX J STYGOFAUNA

PEER REVIEW RESPONSE

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Our ref: 20458

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Dear Nathan,

Review of Boggabri Coal Mine (BCM) MOD 8 Project and response to comments regarding

Attached is a brief report to assist Boggabri Coal Operations Pty Ltd in responding to comments on the stygofauna assessment and potential impacts from the MOD 8 project.

The Project Modification Report for MOD 8 was exhibited publicly from 12 August to 9 September 2021 and received 50 submissions. Among the submissions is some advice from the Independent Expert Scientific Committee (IESC) on Coal and Coal Seam Gas. This provides recommendations/requirements for additional information on impacts to stygofauna.

In the brief report below, I review the current stygofauna assessment and provide information in response to the IESC comments, provide an unbiased expert opinion regarding the adequacy of the assessment, and provide other comments and recommendations regarding the potential impact to stygofauna from the project.

Regards,



Dr Peter Hancock

Senior Groundwater Ecologist

Review of stygofauna assessment for Boggabri MOD 8 Coal Project

IESC Comments

In their advice to the decision maker, the IESC recommend that more field sampling be done to improve knowledge of the distribution and abundance of stygofauna. One stygofauna taxon was collected from the alluvium of Nagero Creek, but for a more robust assessment, additional sampling is recommended in the alluvium of Nagero, Bollol and Goonbri Creeks, and this sampling should not be constrained to bores with EC < 1,500 $\mu\text{S}/\text{cm}$. The IESC suggests that using environmental DNA may be useful in assessing whether stygofauna occur in the aquifers.

Summary of stygofauna assessment for Boggabri MOD 8 Project

The stygofauna assessment was prepared by WSP and is reported in Appendix Q- Groundwater Dependent Ecosystem Assessment of the MOD 8 Modification Report (WSP 2021). Sampling for this assessment was focussed on the area of additional drawdown modelled to result from the MOD 8 development, and was not intended to address cumulative drawdown from approved mining operations at the BCM, Maules Creek Coal Mine to the north and Tarrawonga Coal Mine to the south of BCM.

A pilot survey of 8 bores occurred in 2018 and 2019, with only one bore containing stygofauna. A single species, *Notobathynella* sp., was collected from MW6 in the alluvium of Nagero Creek south-west of the mine. At the time of sampling (late 2018), groundwater level was <5 m bgl. Between 2007 and 2018, water level in this bore increased steadily from approximately 258 mAHD to almost 263 mAHD (AGE 2021).

Under their conditions of approval, BCM are required to implement a Water Management Plan that includes baseline data on stygofauna distribution, obtained from detailed surveys of areas that could be affected by the project. The plan also requires a program to monitor for and assess potential impacts on stygofauna.

A stygofauna monitoring program is in place that includes seven bores sampled initially in 2018. These are shown in Figure 6.1 of Appendix Q (WSP 2021) and include 3 bores north of BCM, three along Nagero Creek alluvium (MW6, Belleview MB, Cooboobindi MB), and one approximately 2 km south of Nagero Creel (Vic Park MB). An additional bore, GW020432 in the Nagero Creek alluvium, was recommended for inclusion in future monitoring programs.

WSP (2021) acknowledge that the single species collected from MW6 is indicative of a more diverse stygofauna taxa, given the high diversity in the broader Namoi alluvium. During the risk assessment, the alluvial aquifer of Nagero Creek, which is the main aquifer likely to be impacted by MOD8, was considered of high ecological value, partly because stygofauna were present.

Potential impacts from the MOD 8 Project

The GDE risk assessment suggests that there will not be significant drawdown on the alluvial aquifers from MOD 8, and that only a small tongue of alluvium south-west of BCM will be affected (WSP 2021). The extent of this drawdown is expected to be 0.8 m (AGE 2021). Cumulative drawdown from approved mining at Boggabri, Tarrawonga, and Maules Creek, as well as MOD 8 project would increase drawdown

in this location by about 5 m. Cumulative drawdown will also affect an area south-east of Tarrawonga and adjacent to Goonbri Creek. Here, drawdown is modelled to be about 5-6 m (AGE 2021).

Unbiased expert opinion regarding the adequacy of the assessment

Given that the Namoi River alluvium is known to have a high stygofauna diversity (Korbel et al. 2013), a full sampling assessment would have been more suitable to establish baseline distribution, diversity, and abundance in the area, than a pilot study. While NSW have guidelines for assessing impacts to groundwater dependent ecosystems, they do not specify the intensity or method for sampling (Serov et al 2012). For this, the Western Australia Environmental Protection Authority's Guidance Statements 54 and 54a (WA EPA 2003, 2007) are often adopted. Under these guidelines, at least two rounds of sampling from 20 bores per survey are required for areas where stygofauna are considered likely. However, the number of suitable bores available for sampling often limits the number of samples that can be collected. If there were bores with EC >1,500 $\mu\text{S}/\text{cm}$, then they could have been included in the survey program. Stygofauna diversity can be higher in areas with EC >1,500 $\mu\text{S}/\text{cm}$, but moderate diversity can still occur in bores with up to 5,000 $\mu\text{S}/\text{cm}$, and some species tolerate EC exceeding 10,000 $\mu\text{S}/\text{cm}$ (Hancock and Boulton 2008).

Regardless of the number of samples collected, the alluvial aquifer was considered as a 'high ecological value' GDE partially because it had stygofauna in it. Knowing aquifer diversity and the distributions of different taxa would be useful in future impact assessment, particularly if stygofauna were confirmed from the small section of aquifer modelled to experience drawdown. However, for the purpose of assessing impact, it is adequate to adopt the precautionary approach of assuming stygofauna are present throughout the aquifer.

Modelling indicates only minor drawdown resulting from the MOD 8 project. However, drawdown of up to 5 m around Nagero Creek, and 5-6 m near Goonbri Creek, has been modelled for the cumulative impacts. Water level in these aquifers is typically 7 to 10 m deep, and aquifer thickness is between 25 and 75 m (WSP 2021), so a reduction in water level of 5 m could dry out some sediments along the margin, but the thicker parts of the aquifer will remain saturated. As stygofauna are assumed to occur in this alluvium, there may be some minor impact due to the reduction in living space. However, it is my opinion that there will still be a sufficient volume of saturated aquifer for them to survive.

Conclusion and recommendations

I have reviewed relevant sections of the Boggabri MOD 8 Groundwater Dependent Ecosystem Assessment and consider that it is adequate in its assessing impacts to stygofauna. This is because the assumption was made that stygofauna occur throughout the alluvial aquifer, despite only one taxon being collected. My opinion is also based on the assumption that groundwater modelling resulting from MOD8 is 0.8 m.

However, not having baseline survey data for stygofauna communities in the locations modelled for drawdown will make it impossible for any monitoring program to assess whether the proposed activities are having an impact, should one be established. A more detailed survey of stygofauna in the alluvium of Goonbri, Bollol and Nagero Creek would provide a baseline data against which to compare any future

monitoring data. The survey should include areas modelled to be impacted by drawdown, namely the new monitoring bores to be installed in the alluvium along Nagero Creek, south-west of the mine, and the thin band of Goonbri Creek alluvium extending north of the Bollol Creek confluence. One more round of stygofauna sampling is recommended, with additional follow-up monitoring to occur if there is a significant decline in water level or water quality in the alluvial aquifer.

References

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Korbel, K.L., Lim, R.P., and G.C. Hose (2013) An inter-catchment comparison of groundwater biota in the cotton-growing region of north-western New South Wales. *Crop and Pasture Science*. 64, 1195-1208.