

## Advice to decision maker on coal mining project

### IESC 2022-138: Moorlands Open Cut Coal Mine Project (EPBC 2015/7451) – New Development

<b>Requesting agency</b>	The Australian Government Department of Climate Change, Energy, the Environment and Water
<b>Date of request</b>	4 November 2022
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<b>Advice stage</b>	Assessment

The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (the IESC) provides independent, expert, scientific advice to the Australian and state government regulators on the potential impacts of coal seam gas and large coal mining proposals on water resources. The advice is designed to ensure that decisions by regulators on coal seam gas or large coal mining developments are informed by the best available science.

The IESC was requested by the Australian Government Department of Climate Change, Energy, the Environment and Water to provide advice on the Huaxin Energy (Aust) Pty Ltd's Moorlands Open Cut Coal Mine Project in Queensland. This document provides the IESC's advice in response to the requesting agency's questions. These questions are directed at matters specific to the project to be considered during the requesting agency's assessment process. This advice draws upon the available assessment documentation, data and methodologies, together with the expert deliberations of the IESC, and is assessed against the IESC Information Guidelines (IESC, 2018).

### Summary

The Moorlands Open Cut Coal Mine Project ('the project') is a proposed new thermal-coal mine located in the Moorlands Basin approximately 25 km northwest of Clermont in Central Queensland. The project will extract approximately 1.9 million tonnes of run-of-mine coal annually for 30 years (AARC Environmental Solutions 2022a, p. 6). Mining will progress simultaneously from the northern and southern extents of the pit, leaving a void lake in the central area (AARC Environmental Solutions 2022a, p. 16).

The project is located mainly within the headwaters of the Belyando-Suttor Catchment and proposes to harvest water by constructing two weirs on Miclere and Western creeks (AARC Environmental Solutions

2022a, p. 27). Tributaries of Brigalow Creek will be diverted around the mine (AACR Environmental Solutions 2022a, p. 27).

The project will require construction of mine infrastructure, including a coal handling and preparation plant (CHPP), a co-disposal dam for fine and coarse rejects from the CHPP, a water management system, the water harvesting system, waste dumps and road corridors. The project may also require construction of train-loading facilities (AACR Environmental Solutions 2022a, p. 31).

The IESC considers that the data provided on groundwater, surface water, sediments, groundwater-dependent ecosystems (GDEs) and other aquatic ecosystems are wholly inadequate. Most field data were collected in 2013 and are insufficient to provide a robust baseline against which to judge potential impacts.

Key potential impacts from this project are:

- groundwater drawdown from mining operations which may impact GDEs;
- loss of approximately 5 km of ephemeral-stream channels due to the proposed diversion which will affect riparian connectivity and instream ecological processes;
- changes to surface water flow regimes from the proposed diversion of Brigalow Creek and from two weirs built for water harvesting. These changes may impact aquatic biota and ecological processes, riparian vegetation and associated wildlife, and alluvial aquifers;
- changes to surface water quality and possibly alluvial groundwater quality from discharges of untreated mine-affected water (MAW); and
- legacy effects of a permanent saline void lake.

Due to the very limited baseline data (mostly collected in 2013), the IESC identified substantial additional work to provide sufficient context, to inform modelling, and to address the key potential impacts.

- Additional, up-to-date baseline data must be collected. This includes at least two years' sampling of groundwater, surface water, sediments, aquatic and riparian biota, and GDEs (including stygofauna).
- Once these baseline data have been collected, the proponent will need to use them to:
  - update the description of the project area and redevelop conceptualisation of ground and surface water systems, including interpretation of field tests and time-series data;
  - update the groundwater modelling and uncertainty analyses;
  - develop an ecohydrological conceptual model to guide identification of potential impact pathways and quantify the likely local and regional extents of the project's impacts on water resources and water-dependent assets; and
  - update the void modelling using the results of post-mining groundwater modelling and surface water modelling, and consider climate-change impacts during the post-mining period.
- The proponent will then need to develop the Receiving Environment Management Plan, surface water and groundwater management plans, a GDE management plan, and a rehabilitation and void management plan using the baseline data and modelling updates outlined above. These plans should incorporate Trigger Action Response Plans that provide clear linkages between

monitoring, mitigation and management actions allowing timely responses and actions to prevent or rectify impacts.

## Context

The Moorlands Open Cut Coal Mine Project will disturb an estimated 1,471 ha of land (AARC Environmental Solutions 2022a, p. 12) directly through vegetation clearing and open-cut mining. This area includes 125 ha of *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)-listed Brigalow (*Acacia harpophylla* dominant and co-dominant) threatened ecological community (TEC), and potential habitat for EPBC Act-listed species including Koala (*Phascolarctos cinereus*), Ornamental snake (*Denisonia maculata*), Retro slider (*Lerista allanae*) and Squatter pigeon (*Geophaps scripta scripta*).

The project is located adjacent and partly within the Blair Athol State Forest. Land use in the region includes forestry, recreational activities, small-scale mining/fossicking and grazing (AARC Environmental Solutions 2022a, p. 102). The Blair Athol Coal Mine (13 km southeast) and the Clermont Coal Mine (20 km southeast) are nearby (AGE 2022, p. 3). Potential cumulative impacts with these mines have not been explored in detail by the proponent. However, it is likely that they would be limited given that these mines are located within different surface water catchments (AARC Environmental Solutions 2022a, p. 143) and groundwater systems, and target different coal resources in a different geological setting (AARC Environmental Solutions 2022a, p. 175). Areas of current (Bowen Basin) and future (Galilee Basin) mining activity are over 50 km from the project (AARC Environmental Solutions 2022a, p. 143) although the latter are also within the Belyando-Suttor Catchment.

The project was initially proposed in 2013. The project received an Environmental Authority (EA EPML02498414 – Queensland Government 2020) from the Queensland Government in 2016. The EA required significant additional site-specific data and information to be provided by 25 February 2022 to enable finalisation of triggers, limits and monitoring locations. From the information provided in the project documentation, it is clear that the necessary data have not been collected, and thus that the EA has not been updated.

## Response to questions

The IESC's advice in response to the requesting agency's specific questions is provided below.

Question 1: Can the Committee provide comment on whether the information in the PD, particularly the baseline and modelled data, and the conclusions drawn by the proponent, are sufficient to assess the project's impacts to surface and ground water resources, GDEs and cumulative impacts with other proposed and existing projects?

1. The information presented in the preliminary documentation (PD) is wholly insufficient to assess the project's potential impacts to surface and groundwater resources and GDEs. Fundamental geological, hydrogeological and ecological site-specific data are missing.
2. The information, conceptualisations and modelling in the PD are based on very limited site-specific data, typically obtained through desktop analyses with limited and dated field verification. For example, groundwater and surface water sampling of water quality only occurred on one or two occasions in 2013 for a small number of sites. Sufficient and more recent baseline data must be collected for this project to describe and conceptualise the project area and to inform impact and risk assessment.
3. The proponent's conclusions on the nature, extent and magnitude of potential impacts are speculative, due to a lack of evidence. Further data and information are needed for this assessment, as outlined in the response to Question 2.

Question 2: Can the Committee identify and discuss what additional information could be provided to assist in the assessment of impacts on surface and ground water resources?

4. Substantial additional data, information and analysis are required for the assessment and management of potential impacts of this project on water resources. The information provided does not satisfy the requirements as outlined in the IESC Information Guidelines (2018). The paragraphs below detail the additional information and analyses that must be provided to appropriately assess the potential impacts on surface and groundwater resources.
5. Other than flood impacts, climate change is generally not explicitly considered in the modelling provided. Climate change impacts corresponding to medium (SSP2 or RCP4.5) and high (SSP5 or RCP8.5) emissions scenarios should be considered.

#### Groundwater

6. The geological information presented is based primarily on regional studies. The PD requires fundamental site-specific context such as geological units and extent, and structures such as a graben and faults, to support conceptualisation, modelling and impact prediction.
7. The hydrogeological conceptualisation of the project area requires redevelopment once additional sites have been drilled, tested and adequate time-series data collected. The influence of faults on groundwater should be explained with field observations and evidence. Further information, commensurate with risks, including hydrogeological, geological and geophysical data is recommended to support the conceptualisation (see Murray and Power, 2021). The revised conceptualisation of whether the fault is a barrier to flow should be translated to the numerical groundwater model, as it directly affects predictions of groundwater drawdown and impacts.
8. Additional information and characterisation are needed about the alluvium offsite which may be impacted by groundwater drawdown, MAW releases or the water-harvesting scheme to assess potential impacts on GDEs and alluvial aquifers along Western, Brigalow and Miclere creeks.
9. Monthly monitoring of groundwater levels and quality are needed for at least two years shortly before mining activities commence to establish a robust baseline. Monitoring should occur at the existing five monitoring bores plus an expanded network that includes additional bores surrounding the project to track the propagation of groundwater drawdown during the project, monitoring bores in the alluvium offsite, reference (unimpacted) monitoring bores, and replacement bores for any lost through mine progression. Monitoring should include physicochemical parameters, major ions, metals and nutrients. Site-specific water quality objectives (WQOs) should be derived from the baseline data as outlined in ANZG (2018) and Huynh and Hobbs (2019).
10. The groundwater model is not fit for purpose, is poorly documented, and will require complete redevelopment. The new model will need additional data for parameterisation and history-matching to increase confidence in the predicted extent and magnitude of impacts. Groundwater modelling must also be undertaken for the post-mining phase, and must include appropriate predictive uncertainty analysis (see Middlemis and Peeters 2018). The new model should be developed, reported and peer-reviewed following the Australian Groundwater Modelling Guidelines (Barnett et al. 2012).

#### Surface water

11. Additional work on flood modelling is required.
  - a. Validation of the flood model should include flood metrics obtained from multiple nearby (open and closed) gauging stations, as well as estimates available from the Regional Flood Frequency Estimation model (<https://rffe.arr-software.org/>).

- b. Flood modelling used a scenario titled '1%AEP + climate change.' It is assumed that climate change is represented by a 5% increase in rainfall intensities for each degree of global warming, but the nature of this assumption needs to be clarified.
  - c. Flood modelling of Miclere Creek should be updated to incorporate the proposed development, including access roads and other infrastructure.
  - d. Additional discussion of the flood modelling results for Brigalow Creek should be provided as it appears that the process water pond and mine infrastructure may be exposed to flooding from Brigalow Creek.
12. The diversion of two tributaries of Brigalow Creek and the presence of the open-cut mine will reduce the Brigalow Creek Catchment and change flows at multiple points along the drainage channels. The proposed diversion almost doubles the length of the pre-existing stream reach and additional information is needed on the design elements (e.g., sinuosity, bed material and heterogeneity, instream habitats) required to sustain its ecological functions. Information is also needed on potential impacts on the downstream flow regime from the diversion and the catchment excision to better understand the possible extent and magnitude of impacts on aquatic and riparian biota.
13. Baseline water and sediment quality data are limited to the results of one field survey in April 2013 (frc environmental 2014a, p. i). Further baseline monitoring at monthly intervals for at least two years will be needed at all proposed impact sites and at suitable upstream (reference) monitoring sites on Western, Brigalow and Miclere creeks.
14. The proponent suggests that a single monitoring point (CP1 – see AARC Environmental Solutions 2022a, Figure 18, p. 107) located downstream of the release point (RP1), a significant dilution source (a proposed weir pool) and a potentially major confluence, would serve as both the background monitoring point and the compliance monitoring point for the receiving waterway (AARC Environmental Solutions 2022a, p. 115).
- a. As this location would be impacted by the weir and MAW releases, the data are unsuitable for determining background condition.
  - b. This location is an inappropriate compliance monitoring point as it is too distant from the release point and is downstream of multiple dilution sources.
  - c. WC1, as specified in the EA (Queensland Government 2020, Figure 3, p. 52), would be required as a reference monitoring location should WC2 remain below a confluence with this waterway. A further reference site would be needed immediately upstream of RP1.
15. Additional monitoring points should also be considered on the currently unmonitored tributary of Western Creek weir pool, and upstream of the planned Brigalow Creek diversion. These points would provide background water quality data for comparison with data from monitoring points downstream of the project to allow the proponent to detect and respond to impacts from the project.
16. All surface water monitoring sites should be monitored for physicochemical parameters, major ions, metals and nutrients during baseline monitoring and throughout the life of the project.
17. Additional information is needed on the risks of untreated MAW discharges to Western Creek. In such ephemeral systems these discharges may have a legacy impact on aquatic biota if wetting and drying cycles lead to pulsed releases of contaminants.
18. Monitoring data are needed on sediment and water quality in all water storages, particularly if there will be uncontrolled releases.

### GDEs and other aquatic ecosystems

19. Assessment of potential GDEs is needed, especially in the northern project area and riparian zones of Western, Brigalow and Miclere creeks where groundwater drawdown and water harvesting may affect aquatic biota and riparian vegetation. Likely groundwater-dependence by obligate and facultative GDEs should be field-validated (methods in Doody et al. 2019). If GDEs are found, baseline data on the ecological condition of GDEs within the predicted zone of drawdown must be collected to detect impacts from the project.
20. Information is required on the current ecological condition of the identified wetland management areas, and the project's potential impacts on these areas.
21. When the additional groundwater monitoring bores (Paragraph 9) are installed, these bores, especially those in the alluvium, should be sampled for stygofauna using methods described in Doody et al. (2019). The Queensland Guideline for the Environmental Assessment of Subterranean Aquatic Fauna (DSITIA 2015) recommends a pilot study of ten representative bores that are at least six months old.
22. The proposed water harvesting scheme will likely impact aquatic ecosystems and riparian vegetation downstream of the proposed weirs. There will be increases in the number of low-flow days and the length of no-flow periods between flow events, a reduction in the frequency of high-flow events, and impacts will vary between the two weir sites (frc environmental 2014b, Table 9.1, pp. 66-67). These changes should be assessed in the context of natural variability to identify potential impacts to aquatic and riparian ecosystems and processes downstream of each weir.
23. Aquatic biota (e.g., attached algae, aquatic plants, stream invertebrates, fish, amphibians) and riparian vegetation along creeks within and downstream of the project area should be surveyed for at least two wet and dry seasons before mining commences to provide up-to-date baseline data, especially on potential responses to altered flow regimes upstream and downstream of the planned weirs or in the case of their failure. This sampling period should encompass periods of flow in the ephemeral streams and include collection of biota from remnant pools along the channel that may serve as aquatic refugia. Sampling sites along Brigalow Creek should be above and below the diverted inflow to assess the ecological impacts of the diversion channel and monitor the ecological response to establishment of riparian vegetation along the constructed channel.
24. Using the additional baseline data and field verification outlined above, the proponent should develop an ecohydrological conceptual model. This model will assist in identifying potential impact pathways and suitable mitigation, monitoring and management actions that can be incorporated into a management plan for GDEs and other aquatic ecosystems that may be impacted by the project.

### Void

25. Following updating of the groundwater and surface water impact assessments, the void impact assessment will also require updating. It should:
  - a. include an assessment of uncertainties of inflow of groundwater through undisturbed bedrock and seepage through backfilled material;
  - b. evaluate the risks that seepage from the void may travel via the northeast-southwest trending fault and/or the former Brigalow Creek alluvium (noting that the creek will have been diverted); and
  - c. describe the ecological implications of a saline void in the landscape and potential impacts on mobile fauna (e.g., waterbirds, bats, aerial aquatic insects) that may attempt to use the pit-lake.

## Ecology

26. The project will clear up to 1,267 ha (AARC Environmental Solutions 2022a, p. 58, 69, 75, 84 and AARC Environmental Solutions 2022b, p. 12) of vegetation including Brigalow TEC (125 ha) and potential habitat for EPBC Act-listed species including Koala, Ornamental snake, Retro slider and Squatter pigeon. This includes over 5 river-km of riparian corridors that provide refuge and ecological connectivity between patches of remnant vegetation and the Blair Athol State Forest. Loss of these areas are likely to increase stress on wildlife Matters of National Environmental Significance within the region due to clearing activities already occurring or which have occurred around the project area. As most of the wildlife survey data were collected in 2013 and given recent climatic events, the IESC recommends further field surveys to provide more robust baseline data for assessing potential impacts on EPBC Act-listed species and other wildlife associated with vegetation to be cleared or fragmented by the project's activities.

Question 3: Can the Committee provide comment on the adequacy of the proposed mitigation, management and monitoring measures? Does the Committee consider that any additional measures are needed to remain within the projected levels of impact or reduce the risks to surface and groundwater resources, GDEs and cumulative impacts with other proposed and existing projects?

27. The proponent's limited baseline data and scant information (see responses to Questions 1 and 2) are insufficient to reliably assess the project's potential impacts and guide future monitoring and mitigation. Therefore, it is premature for the IESC to comment on the adequacy of the proposed mitigation, management and monitoring measures. When the shortcomings identified above have been addressed, the proposed mitigation, management and monitoring measures should be fully revised.

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**Date of advice** 16 December 2022

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**Source documentation provided to the IESC for the formulation of this advice** AARC Environmental Solutions 2022a. *The Moorlands Project. Preliminary documentation*. Prepared for Huaxin Energy (Aust) Pty Ltd. September 2022.

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