

Advice to decision maker on coal mining project

Proposed action: Meteor Downs South Coal Mine (EPBC 2013/6799 – New Development)

Requesting agency	Department of the Environment
Date of request	8 November 2013
Date request accepted	11 November 2013
Advice stage	Draft Preliminary Documentation

Advice

The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (the Committee) was requested to provide advice on the Meteor Downs South Coal Mine in Queensland which is being assessed at the draft Preliminary Documentation stage by the Department of the Environment in accordance with the provisions of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This advice draws upon aspects of information in the draft Preliminary Documentation together with the expert deliberations of the Committee. The project documentation and information accessed by the Committee are listed in the source documentation at the end of this advice.

The proposed project is a new coal mine development in the Bowen Basin in Central Queensland. The proposal would be situated approximately 25 kilometres (km) west of the township of Rolleston and 45 km south east of the township of Springsure and would extract approximately 14.4 million tonnes of coal over an eight year period at a rate of 1.5 million tonnes per annum, with the potential to extract an additional 3.6 million tonnes of coal situated close to the proposal's lease boundary. The coal would be crushed and transported by rail to Gladstone.

It is noted that the proposed project is of a small scale when compared to the adjacent Rolleston Coal Mine and other coal mines in the Bowen Basin, and therefore, the potential impacts of this proposal on water resources should be considered in this context.

The Committee, in line with its Information Guidelines¹, has considered whether the proposed project assessment has used the following:

Relevant data and information: key conclusions

Several critical investigations are currently under review or are yet to be completed, including the: hydrogeological conceptualisation; numerical groundwater model; site water balance, including discharge scenarios; design and arrangement of mine water management infrastructure; baseline

characterisation of water resources and water-dependent ecosystems; assessment of cumulative impacts on groundwater resources; surveys to determine the presence or absence of threatened species listed under the *Environment Protection and Biodiversity Conservation Act 1999*; and, characterisation and quantification of acid forming materials.

An expanded flood study would predict flood impacts on the proposal's landforms and mine water management system. Baseline characterisation of potentially affected creeks, aquifers and water-dependent ecosystems beyond the proposed project's lease boundary is necessary to enable impacts from groundwater drawdown and/or discharges of mine-affected water to be fully assessed.

A regional water balance and an assessment of cumulative impacts on surface water resources and water-dependent species and ecosystems would place the proposal's impacts within a regional context.

Application of appropriate methodologies: key conclusions

A number of conclusions and assumptions in the assessment documentation need to be validated or amended, as appropriate, using the results of the investigations proposed by the proponent and recommended in this advice.

Alluvial aquifers associated with Spring Creek and Bootes Creek have been excluded from the numerical groundwater model; however, their incorporation in the model would inform the assessment of impacts on creek hydrology and water-dependent ecosystems arising from groundwater drawdown.

Reasonable values and parameters in calculation: key conclusions

Clarification or justification for the adoption of the following approaches, parameters and/or assumptions is needed: the use of a constant head boundary for the "down gradient" boundary between the proposal and the Rolleston Coal Mine; adopted hydraulic conductivity values for the basalt aquifer; calculations used to provide revised estimates of groundwater seepage to the mine pit; exclusion of in-pit placement of waste rock from the proposed final void water balance; assumptions regarding the quality of mine-affected water; the design of the mine water management system; and, use of flow in Meteor Creek as a mine-affected water discharge trigger.

The proponent's conclusion that surface water-groundwater connectivity is not likely to occur in the vicinity of the proposal is not supported by the results of the baseline groundwater characterisation program.

The Committee's advice, in response to the Department's specific questions, is provided below.

Question 1: Does the Committee agree with the proponent that the further works proposed, together with the works undertaken and provided to date, are likely to provide sufficient information on the water resources and its management to assess likely significant impacts from the proposed action? If the information is considered insufficient for that purpose, what advice regarding areas of inadequacy can the Committee provide?

1. The existing and further work proposed, and the additional information outlined below, would improve the assessment of impacts on water resources.
2. In addition to the investigations proposed in Appendix A of the assessment documentation to update the hydrogeological conceptualisation and numerical groundwater model, it is recommended that:
 - a. The scope of work be expanded to predict groundwater drawdown impacts on the alluvium and other aquifers associated with Spring Creek and Bootes Creek and their tributaries, as well as springs within the model domain. This information would inform the assessment of

- potential impacts on the hydrological regime of springs and/or creeks, and water-dependent species and ecosystems;
- b. The approach to calibrate the updated steady state groundwater model in the event that groundwater levels are impacted by mining at the Rolleston Coal Mine, be clarified;
 - c. Model boundary conditions be reviewed during the re-conceptualisation of the hydrological regime and groundwater model. In particular, the review should consider whether a general head boundary would be more appropriate than a constant head boundary between the proposal and the Rolleston Coal Mine. If a constant head boundary is considered appropriate, the proponent should provide clear justification for this approach;
 - d. The order of magnitude of the hydraulic conductivity values of the basalt aquifer provided in the assessment documentation be clarified. Field data and rising head tests indicate that the mean hydraulic conductivity of the basalt on site was in the range of 10^2 m/d; however, the final estimated value is given as 6.6×10^{-2} m/d;
 - e. Assessment of final void water levels incorporates the in-pit placement of waste rock. Modelling of final pit void water levels without inclusion of this material will not provide for a realistic assessment outcome, which may have implications for assessment of post-mining groundwater level recovery and the potential for the final void to flood or export contaminants;
 - f. The final void water balance confirms whether the final void will act as a groundwater sink and identifies any situations in which the final void may discharge contaminants to the surrounding aquifers;
 - g. Clarification of the estimated seepage rates from the Permian aquifer is needed; specifically, how seepage from this aquifer has been calculated, and whether (and how) vertical hydraulic conductivity has been accounted;
 - h. In the absence of field data, the method for calculation of seepage rates should ensure that those rates are not underestimated; and
 - i. Water quality modelling be used to assess options for in-pit disposal of potentially acid forming materials before placement of these materials commences.
3. The following information and investigations would increase confidence in the conclusions of the assessment documentation and/or provide a more comprehensive and accurate assessment of potential impacts:
 - a. Development of a regional water balance;
 - b. Expansion of the flood study to incorporate: Aldebaran Creek; Naroo Dam and upstream tributaries; the planned relocation of the Spring Creek dam; and the proposed expansion of the Rolleston Coal Mine. The results of the updated study should be used to predict the potential for: impacts on in-stream and riparian vegetation and/or channel morphology; erosion or destabilisation of the waste rock dump; flooding of the mine pit; and impacts on the proposal's infrastructure and adjacent properties, including proposed levees and the Rolleston Coal Mine;
 - c. Baseline surface water quality data from an expanded monitoring network, which includes sites:
 - i. At the outlet or immediately downstream of Naroo Dam to measure the quality of water that is discharged downstream;
 - ii. In Aldebaran Creek, downstream of all proposed discharge and road crossing locations within the mining lease, to provide baseline data against which the potential impacts of coal transport can be monitored; and
 - iii. Downstream of the proposed basalt quarry;

- d. Baseline sediment quality characterisation in and downstream of Naroo Dam to enable detection of any impacts arising from discharge of mine-affected water;
- e. Identification of groundwater dependent ecosystems that may be affected by groundwater drawdown; in particular, alluvium and any gaining waterholes along Spring Creek, and groundwater dependent terrestrial vegetation that may provide nesting, roosting or foraging habitat for threatened species. This investigation should be extended to Bootes Creek if groundwater drawdown is predicted to extend beneath this watercourse; and
- f. Surveys to characterise baseline wet season aquatic ecology in Naroo Dam and Spring Creek and its tributaries within the mine lease. To fully assess potential impacts from groundwater drawdown and/or discharges of sediment-laden or mine-affected water, it is also recommended that baseline aquatic ecosystem surveys are undertaken in:
 - i. Spring Creek upstream of its confluence with Bootes Creek and downstream of Naroo Dam; and
 - ii. Aldebaran Creek upstream and downstream of the mine lease.

Question 2: What are the likely impacts of the proposed mine on surface and ground water resources, in particular, changes to surface and/or ground water dynamics and resources that may support surface habitat for threatened species and communities?

- 4. The proposal in its current form is likely to adversely impact on the hydrology and water quality of Naroo Dam, which is currently or potentially used as foraging or nesting habitat by a number of species listed under the *Environment Protection and Biodiversity Conservation Act 1999*. These species include: *Rostratula australis* (Australian Painted Snipe); *Haliaeetus leucogaster* (White-bellied Sea Eagle); and *Ardea modesta* (Eastern Great Egret), *Ardea ibis* (Cattle Egret); *Gallinago hardwickii* (Latham's Snipe); and *Erythrotriorchis radiates* (Red Goshawk).
- 5. Mine-affected water dams are proposed to inundate areas of the threatened ecological community *Dichanthium sericeum grassland on Cainozoic igneous rocks*. Capture of Spring Creek tributary flows within these dams is not best practice water management and makes capacity of the dams larger than required for management of mine-affected water. Adoption of the 'clean' and 'dirty' water separation principle would reduce impacts on this threatened ecological community by minimising the area of inundation.
- 6. Tree species within the mine lease have been assessed as providing suitable habitat for a number of threatened species including: *Phascolarctos cinereus* (Koala); *Nyctophilus corbeni* (South Eastern Long-eared Bat); *Erythrotriorchis radiates* (Red Goshawk); *Monarcha melanopsis* (Black-faced Monarch); and *Geophaps scripta scripta* (Squatter Pigeon). If terrestrial vegetation is found to be groundwater dependent and adversely impacted by mining-induced groundwater drawdown, the extent of habitat loss for threatened species resulting from development and operation of the proposal is likely to have been under estimated.
- 7. Ecological surveys, recommended in the response to Question 1, are needed to confirm the presence or absence of threatened species beyond the mine lease boundary that may be affected by groundwater drawdown and/or discharge of mine-affected water. If present, an assessment of direct and/or indirect impacts resulting from development of the proposal should be conducted.

Question 3: Does the Committee find the water balance, the proposed measures to update the model, and the conclusions relating to water management provided by the proponent and attached to this brief to be reasonable?

8. Fundamental elements of the water balance are currently under review, including prediction of the volume and rates of groundwater seepage into the mine pit and the design of the mine water management system. Changes to either of these elements may alter the quality and volume of water to be managed on site and/or discharged to downstream water bodies.
9. The scope of works currently proposed for update of the water balance does not appear to adequately consider potential changes to the hydrology and water quality of Naroo Dam or Spring Creek that may result from the proposed capture of upstream tributaries within the mine management system and discharges of mine-affected water. The long-term loss of more than 70% of the contributing catchment to Naroo Dam is likely to reduce the dam's extent and depth, potentially degrading its water quality. In addition, preliminary results from the groundwater monitoring program indicate that water pumped from the pit will contain elevated concentrations of some metals, including zinc and chromium. Discharge of this water into Naroo Dam, a standing water body, could lead to accumulation of these contaminants in the dam's sediments.
10. In addition to the measures proposed by the proponent, confidence in the accuracy of the water balance and the ability to comprehensively and conclusively evaluate and mitigate potential impacts arising from discharge of mine-affected water would be improved by:
 - a. Basing the water balance on the finalised design of the mine water management system and measured flow data from Spring Creek;
 - b. Quantifying the long-term effect of the significant loss of contributing catchment to Naroo Dam on the dam's depth, extent, seasonality of inundation and water quality;
 - c. Evaluating changes to the discharge regime of Naroo Dam resulting from loss of contributing catchment, discharge of mine-affected water, seepage to the mine pit, if any, and assessing the impacts of this on the hydrology, water quality and aquatic ecology of Spring Creek downstream of Naroo Dam;
 - d. Linking discharges of mine-affected water to discharges from Naroo Dam or natural flow in Spring Creek, upstream of its confluence with Bootes Creek, rather than flow in Meteor Creek. As a higher order stream with a much larger contributing catchment, the flow regime in Meteor Creek may differ substantially from that of Spring Creek. Additionally, flow at the location proposed in the assessment documentation may be affected by discharges from the Rolleston Coal Mine and therefore, may not be representative of the natural flow regime;
 - e. Modelling water quality within the mine water management system and Naroo Dam to:
 - i. Provide a basis for the assumptions and conclusions underpinning the proponent's discharge strategy;
 - ii. Assess the need for treatment of mine-affected water prior to discharges; and
 - iii. Inform the assessment of impacts on Naroo Dam, Spring Creek and any threatened species that they support;
 - f. Updating the water quality model with the site-specific water quality data collected during the proposed baseline water quality monitoring program as it becomes available; and
 - g. Undertaking sediment quality surveys within and downstream of Naroo Dam and assessing the potential for:
 - i. Accumulation and bioavailability of metal toxicants within Naroo Dam and the effect that this may have on threatened species that may use this dam as foraging habitat; and

- ii. Metal speciation changes resulting from proposed changes to the hydrological regime of dam; in particular, the release of metals from the sediments into the water column in dissolved form, and the effect that this may have on current uses of dam water (stock watering and irrigation) and aquatic ecosystem health within and downstream of Naroo Dam.
11. Two levees are proposed to prevent flooding of the mine pit. As design details have not been provided, it is difficult to evaluate the effectiveness and risks associated with these mitigation measures; particularly in relation to their structural integrity during periods of peak flow in Spring Creek or high standing water levels in Naroo Dam. Design details, including proposed construction materials and methods, together with the results of long-term structural integrity investigations are needed to assess the risks and effectiveness of the levees during the proposal's operational and post-mining phases. It is recommended that:
- a. The placement and design of the levees is reviewed following update of the flood study suggested in the response to Question 1;
 - b. Levees are designed to prevent flood water entering the pit during a 1:1,000 year ARI rainfall event;
 - c. Details of post-mining maintenance requirements are sought; and
 - d. Noting the sodicity of some of the waste rock materials, the levees are constructed from non-sodic material to minimise the risk of failure.
12. As it is likely that the discharge scenarios reported in the assessment documentation will differ from those finally adopted for the proposal, it is recommended that potential impacts associated with the operation of the mine water management system, including discharges of mine-affected water, are reassessed after the review of the mine water management system is finalised and the water balance has been updated.

Question 4: Does the Committee consider the draft EA conditions (Attachment D) sufficient to ensure impacts to MNES are acceptable? Are there additional measures and commitments required to monitor, mitigate and manage impacts resulting from changes to surface or groundwater resources?

13. While the Environmental Authority provides a comprehensive framework for the management and monitoring of potential impacts, the following measures would increase confidence in the transparency, identification and mitigation of impacts on water resources:
- a. If the additional investigations proposed by the proponent, or the Department and/or in this advice, have not been undertaken at the time of project determination, a requirement to complete these investigations should be incorporated;
 - b. Ensuring that the monitoring program includes:
 - i. Sediment quality within and downstream of Naroo Dam;
 - ii. Water quality monitoring at the sites described in Question 1;
 - iii. The extent and health of groundwater dependent ecosystems as described in Question 1;
 - iv. Aquatic ecosystem health as described in Question 1;
 - v. Spring Creek and Bootes Creek alluvium and underlying aquifers;
 - vi. Groundwater quality and the extent and magnitude of groundwater drawdown within alluvial, basalt and Permian aquifers beyond the mine lease boundary to enable early identification of impacts on groundwater dependent ecosystems and other groundwater users. The monitoring network should be designed to confirm that groundwater drawdown does not extend beyond the predicted area; and

- vii. Monitoring of groundwater levels and surface water-groundwater connectivity at Naroo Dam;
- c. Commitments for surface and groundwater monitoring should be presented as part of a water monitoring plan and should be consistent with the National Water Quality Management Strategy;
- d. Given the elevated concentrations of dissolved and total chromium in groundwater monitoring results to date, it is suggested that this contaminant is also monitored in onsite water storages and that a contaminant limit is developed based on ANZECC and ARMCANZ (2000)² guidelines;
- e. Development and review of the groundwater monitoring program should incorporate consideration of groundwater drawdown and groundwater quality impacts on groundwater dependent ecosystems and any threatened species that they support;
- f. Completion of baseline (i.e. pre-works) groundwater, surface water, and ecosystem/species surveys in accordance with published methods, such as ANZECC and ARMCANZ (2000)²;
- g. Development and approval of groundwater contaminant investigation trigger levels prior to any project-related activities that may affect groundwater quality;
- h. Monitoring locations should be selected with consideration of accessibility during periods of creek flow. Where access may be impeded, the proponent should consider installation of automated water quality monitoring equipment;
- i. If the quality of mine-affected water does not comply with water release limits or investigation trigger levels, the water should be retained on site and treated prior to discharge;
- j. Base the trigger for discharge of mine-affected water on flow over the Naroo Dam spillway or flow in Spring Creek rather than flow in Meteor Creek; and
- k. Limit the use of mine-affected water for dust suppression to locations that drain back to the mine-affected water management system.

Question 5: There are a number of other mines either existing or proposed in the surrounding area, in particular the adjoining Rolleston Coal Mine. The existence and operating management of these mines within this area raises the possibility of cumulative impacts. Does the Committee identify any particular concerns relating to cumulative impacts?

- 14. It is recommended that the cumulative groundwater assessment considers the expansion proposal for the Rolleston Coal Mine as well as any other relevant development that may cumulatively interact with the proposal. The results of these investigations should be used to assess cumulative impacts on groundwater dependent ecosystems potentially affected by groundwater drawdown or changes in groundwater quality.
- 15. To understand the proposal's impacts on surface water resources and dependent ecosystems in a regional context, it is recommended that an assessment of cumulative impacts on the hydrology, water quality and aquatic ecosystems of Spring Creek, Bootes Creek and Meteor Creek is undertaken. This assessment should be informed by a regional water balance.

Date of advice 12 December 2013

Source documentation available to the Flinders Group (2013) Meteor Downs South Coal Mine, EPBC Ref 2013/6799, Preliminary Documentation, prepared for Endocoal Limited

**Committee in
the formulation
of this advice**

**References
cited within the
Committee's
advice**

¹ Information Guidelines for Proposals Relating to the Development of Coal Seam Gas and Large Coal Mines where there is a Significant Impact on Water Resources available at: <http://www.environment.gov.au/coal-seam-gas-mining/project-advice/pubs/iesc-information-guidelines.pdf>

² ANZECC AND ARMCANZ (2000) Australian Guidelines for Water Quality Monitoring and Reporting. National Water Quality Management Strategy (NWQMS). Volume 7. Australian and New Zealand Environment and Conservation Council & Agriculture and Resource Management Council for Australia and New Zealand, Canberra.
