

Advice to decision maker on coal mining project

IESC 2015-073: New Acland Coal Mine Stage 3 (EPBC 2007/3423) – Expansion

Requesting agency	The Australian Government Department of the Environment
Date of request	27 October 2015
Date request accepted	27 October 2015
Advice stage	Assessment

Context

The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (the IESC) was requested by the Australian Government Department of the Environment to provide advice on the New Acland Coal Mine Stage 3 project (the proposed project) in Queensland.

The IESC has previously provided advice to the Commonwealth Department of the Environment and the Queensland Office of the Coordinator-General on the draft Environmental Impact Statement (EIS) for the proposed New Acland Coal Mine Stage 3 project, EPBC 2007/3423 (IESC 2014-045 dated 10 April 2014).

This advice draws upon aspects of information in the proponent's Additional information to the Environmental Impact Statement (AEIS), together with the expert deliberations of the IESC. The project documentation and information accessed by the IESC are listed in the source documentation at the end of this advice.

The proposed project is to expand and extend by up to 12 years, the New Acland Coal Mine, located approximately 35 km northwest of Toowoomba in the Lagoon Creek Catchment and the Clarence-Moreton Basin of Queensland. The proposed project involves creation of three open cut pits to increase production of coal from the Walloon Coal Measures from 4.8 Mtpa to 7.5 Mtpa of thermal product coal. Ancillary infrastructure developments would include upgrading the existing coal handling and preparation plant (CHPP) and associated stockpile areas as well as construction of an 8-km rail-spur and balloon loop, and a train load-out facility.

The proposed project is located in the catchment of Lagoon Creek. Lagoon Creek is an ephemeral creek that flows into Oakey Creek, which is part of the larger Condamine River Catchment of the Murray-Darling Basin.

Key potential impacts

The IESC's advice of April 2014 identified significant uncertainty in the proponent's groundwater model predictions. While the proponent's groundwater model has been improved, uncertainties remain in the hydrogeological conceptualisation and subsequent revised groundwater impact predictions including the magnitude of drawdown and the lateral extent of potential impacts. Based on the revised assessment documentation, key potential impacts resulting from the proposed project are to groundwater resources, groundwater and surface water users and groundwater dependent ecosystems (GDEs), including the EPBC Act-listed endangered ecological community Brigalow (*Acacia harpophylla* dominant and co-dominant).

Assessment against information guidelines

The IESC, in line with its Information Guidelines (IESC, 2015), and consistent with matters raised in its April 2014 advice on the proposed project, has considered whether the proposed project assessment has used the following:

Relevant data and information: key conclusions

Evidence of faulting to the south and east of the proposed open cut pits has not been provided. Hydrogeological monitoring data to validate the stated groundwater flow "barrier" effect of faults (including justification of existence and extent of faulting) has not been provided. The proponent has not included groundwater abstraction data from surrounding groundwater users in the groundwater model. Surface water quality objectives remain undetermined.

Application of appropriate methods and interpretation of model outputs: key conclusions

Calibration hydrographs indicate the groundwater model has bias which results in frequent over-prediction of groundwater head in the alluvium and Walloon Coal Measures, when compared to observed data in monitoring bores. Updated modelling also predicts water levels within final voids will exceed the existing groundwater level, contributing to continued low confidence in the model conceptualisation and predictions.

Identification of GDEs, including EPBC Act-listed endangered ecological communities, has not occurred within the predicted lateral extent of groundwater drawdown, including outside of the proposed project area. Mapping of depth to groundwater and consideration of seasonal groundwater requirements of GDEs have not been provided.

Advice

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

Question 1: The proponent has revised the groundwater modelling in response to the IESC advice of 10 April 2014, including a sensitivity and uncertainty analysis of the parameters and assumptions used within the original model. The revised modelling has been peer-reviewed and assessed by Queensland Government groundwater experts.

Does the IESC consider that the matters raised in its advice of 10 April 2014 are adequately addressed in the updated information provided in the proponent's EIS?

Response

1. No. A number of key matters raised in the IESC's advice of April 2014 remain unresolved, including evidence for the existence and justification of hydraulic properties of faults; representation of model domain boundaries, final voids and groundwater users in the groundwater model; identification of surface water quality objectives; and appropriate identification of GDEs. The unresolved matters, particularly regarding the chosen hydrogeological

conceptualisation (specifically the representation of faults) and model calibration approach, which may be contributing to bias and over-prediction of groundwater heads, result in continued uncertainty in the proponent's groundwater model and hence impact assessment.

Explanation

Groundwater modelling

2. Evidence, characterisation and validation of the role of faulting with regards to lateral extent and magnitude of impacts to groundwater resources is needed, with particular emphasis on faults to the south and east of the proposed open cut pits. Assessment data and monitoring bores are required to validate the assumptions made regarding faults. Monitoring bores need to be strategically positioned so that the influence of faults on groundwater head and flow can be determined.
3. The presented calibration hydrographs indicate that the updated groundwater modelling consistently over-predicts groundwater heads, by tens of metres in some cases, particularly in the alluvium and Walloon Coal Measures (e.g. monitoring bores 116P, 40Pc, CSMH1 east of proposed project area). This results in a lack of confidence in the hydrogeological conceptualisation, model calibration and predictions across the model domain. Future modelling and monitoring should consider specific environmental objectives (for example, estimating volumetric take from Oakey Creek Alluvium) using relevant calibration targets to improve groundwater impact predictions.
4. In the updated modelling, the proponent has used a relationship between topography and head level to determine constant head boundary conditions, except for alluvium for which a set value of 13.5 metres below ground level was used. These estimates need to be validated with measured groundwater level data in the vicinity of the model boundary, especially the closer eastern and western boundaries which are likely to have greater influence over model predictions.
5. The IESC considers there is a high degree of uncertainty regarding the scale of potential impacts associated with the proposed voids. This uncertainty is due to the predicted temporally variable source/sink status of the final voids, the associated potential seepage to the groundwater system, and the revised prediction that water levels will now recover to greater than pre-mining levels in Willeroo Pit (and Manning Vale East Pit in the 84th percentile prediction).
6. The proponent has not included surrounding groundwater user abstraction data in the groundwater model. All groundwater fluxes should be represented in the model, and differentiation of mine- and landholder-induced impacts on groundwater levels is needed for assessment of impacts on specific areas or bores.

Surface water quality

7. Some physicochemical and nutrient monitoring data has been collected over a representative period. However, surface water quality monitoring for dissolved oxygen and contaminant metals from more than one sampling episode has not been undertaken. Representative surface water quality data (including dissolved oxygen and contaminant metals) is needed to determine the existing surface water quality within the project area because water quality of ephemeral rivers such as Lagoon Creek is typically highly variable with time. This data will then need to be used to determine downstream surface water quality objectives (see paragraph 16).
8. As noted in the IESC's April 2014 advice, the proponent agreed with the need for a study into the cause of elevated levels of copper in Lagoon Creek to determine if these concentrations are naturally occurring, mining-related or caused by an anomalous reading. The study has not been undertaken. Once complete, the study should be used to provide a better understanding of the

existing water quality during periods of flow in Lagoon Creek, especially “first pulse” flows, and inform the assessment of impacts to ecosystems and water users downstream of the proposed project.

Groundwater dependent ecosystems

9. Consistent with the IESC’s April 2014 advice, GDEs need to be clearly identified within the zone of predicted groundwater impact. While the proponent utilised the *Wetlandinfo* tool, a systematic approach to identifying vegetation GDEs is still needed and should include:
 - a. using the hydrogeological conceptualisation to identify areas of shallow groundwater,
 - b. maps that show depth to groundwater (ideally seasonal) contours in the basalt and alluvial aquifers, overlaid with vegetation and wetland mapping to aid identification of potential GDEs,
 - c. application of this approach to the full extent of predicted drawdown impacts associated with the proposed project including outside of the project area, and
 - d. application of techniques from, for example, the Australian GDE Toolbox (Richardson et al., 2011) and Eamus et al. (2015), to confirm groundwater use by vegetation and groundwater discharge to surface water bodies.
10. Identification of remnant patches of the EPBC Act-listed endangered ecological community Brigalow (*Acacia harpophylla* dominant and co-dominant), a known vegetation GDE, is needed. Identification of, and assessment of potential impacts to, this endangered ecological community needs to occur within the predicted zone of groundwater drawdown, including outside the project area.

Question 2: The Queensland Coordinator-General has imposed, stated and recommended conditions to mitigate and manage impacts to surface and groundwater, at Appendices 1, 2 and 4 respectively of the *New Acland Coal Mine Stage 3 project: Coordinator-General’s evaluation report on the environmental impact statement (December 2014)* and these are reflected in the draft *Environmental Authority – New Acland Coal Mine (August 2015)*.

Does the IESC consider that the outstanding matters raised in its advice of 10 April 2014 in managing impacts to surface and groundwater are adequately addressed through the Queensland Coordinator-General’s conditions of approval (December 2014)? If not, what outstanding matters are still required to be addressed?

Response

11. The Queensland conditions proposed under the draft Environmental Authority and imposed, stated and recommended by the Coordinator-General address a number of issues raised in the IESC’s advice of 10 April 2014 that were not resolved by the proponent’s AEIS. Residual matters raised in response to Question 1 (and the IESC’s April 2014 advice) are outlined below.

Groundwater

12. The IESC has remaining concerns regarding the high degree of uncertainty over the role of faulting and its influence on propagation of drawdown impacts to areas surrounding the proposed project site. Specifically:
 - a. The groundwater impact assessment is lacking a geological map to show locations of faults. Without a detailed hydrogeological investigation it is difficult to determine the hydraulic nature of a fault, particularly whether it is a barrier or conduit to groundwater flow (as also noted by the peer review of the proponent’s revised groundwater modelling (AGE 2014)). Geological maps and hydrogeological field investigations (such as groundwater head measurements on

either side of modelled faults) should be provided to validate the proponent's conceptualisation of the nature of faults, including verification of their existence, vertical and lateral extent, hydraulic properties and how they are parameterised in the groundwater model.

- b. Further monitoring bores (in addition to those stated in the Coordinator General's report and the draft Environmental Authority) are needed to validate the predicted lateral extent of drawdown propagation, which is controlled in the Walloon Coal Measures by the faulting.
 - c. Future reviews of modelling should require validation of the existence and nature of faulting in terms of their effect on groundwater and a sensitivity analysis of their impact on predictions.
 - d. Monitoring requirements should be targeted towards reducing the uncertainty of the predicted lateral drawdown extent. This will be particularly important when determining the proponent's offsets requirements for the Commonwealth Government's Murray-Darling Basin Plan aquifers (the Oakey Creek Alluvial aquifer and the Main Range Volcanics aquifer) and make-good requirements. Additional investigations and modelling are required to reduce uncertainties in predictions of scale of impact to these aquifer systems.
13. In addition to the Coordinator-General's Schedule 3, Condition 2 regarding requirements for Oakey Creek Alluvial aquifer, inclusion of other water users' take within the groundwater model is needed. Accurate representation of landholder water use within the model, appropriate model outputs and presentation would be required to facilitate differentiation of mine-induced impacts from landholder impacts for specific wells or areas of importance to local landholders.
14. Further to the investigation into residual voids (draft Environmental Authority - Condition E20), inclusion of updated groundwater modelling and subsequent analysis of potential impacts associated with the final voids is needed. Such modelling and analysis would result in improved predictions of final water levels, changes in water quality with time, ongoing estimates of take via evaporation (and estimates of associated volumetric take from regulated alluvial and volcanic aquifers), and the scale and impact of seepage to surrounding aquifers. This would inform subsequent adaptive management measures that may need to be implemented during the proposed project.

Surface water

15. A large proportion of the water quality objectives for contaminants in surface waters and mine release waters has not yet been determined in conditions. Given the previously identified exceedances of pH, electrical conductivity as well as sulphate levels that are higher downstream of the existing mining operations in Lagoon Creek when compared to upstream, water quality objectives are needed to determine existing conditions and to allow identification of surface water quality impacts during the proposed project.
16. Water quality objectives should be informed by monitoring data gathered from the existing mine. While preference would be to use local data or monitoring information, the use of ANZECC/ARMCANZ (2000) guideline values would be appropriate while baseline data is being gathered. The Queensland Monitoring and Sampling Manual 2009 (DEHP, 2013) presents details on the design and implementation of baseline sampling techniques, especially in ephemeral rivers such as Lagoon Creek.
17. A range of surface water quality variables, including dissolved oxygen and contaminant metals, should be included in conditions that detail the monitoring requirements for surface and discharged waters. The IESC's April 2014 advice identified contaminants that were naturally elevated (i.e. copper, manganese and aluminium) and would be mobilised into surface water during flow events.

18. Further to the currently proposed state conditions, and as identified in the IESC's April 2014 advice, existing surface water quality and flow monitors along Lagoon Creek should be upgraded to facilitate continuous monitoring during discharges and natural flow events.
19. Schedule C of the draft Environment Authority sets out the monitoring requirements for environmental dams. Further to these conditions, consideration should be given to setting regular water quality monitoring requirements including frequency of monitoring and specific parameters to be monitored (e.g. physicochemical, nutrients and contaminants) within hazardous waste and environmental dams. This information should be used to inform options for improving water quality prior to release.

Groundwater dependent ecosystems

20. Vegetation mapping and identification has largely only occurred within the project area. Identification of impacts to vegetation GDEs (including EPBC Act-listed endangered ecological communities containing Brigalow) caused by groundwater drawdown within the full extent of the proposed project's resultant impact (including outside of the mining lease area) is needed to support the existing proposed offset and monitoring conditions.

Date of advice	10 December 2015
Source documentation available to the IESC in the formulation of this advice	<p>Australian Groundwater and Environmental Consultants (AGE), 2014. <i>Groundwater Model Peer Review New Acland Mine – Stage 3</i>. Report prepared for New Acland Coal Pty Ltd. June 2014. (Appendix C of Appendix N, AEIS)</p> <p>New Acland Coal, 2014a. New Acland Coal Stage 3 Project Environmental Assessment documents, EIS. January 2014.</p> <p>New Acland Coal, 2014b. New Acland Coal Stage 3 Project Environmental Assessment documents, Additional information to the EIS. August 2014.</p> <p>Department of Environment and Heritage Protection, 2015. <i>Draft Environmental Authority – New Acland Coal Mine</i>. State of Queensland. 14 July 2015.</p> <p>Department of State Development, Infrastructure and Planning, 2014. <i>New Acland Coal Mine Stage 3 project. Coordinator-General's evaluation report on the environmental impact statement</i>. State of Queensland. December 2014.</p>
References cited within the IESC's advice	<p>ANZECC/ARMCANZ, 2000. Australian Guidelines for Water Quality Monitoring and Reporting. <i>National Water Quality Management Strategy (NWQMS)</i>. Canberra: Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand.</p> <p>DEHP, 2013. <i>Monitoring and Sampling Manual 2009 (Version 2)</i> [Online]. Brisbane: State of Queensland. Available: https://www.ehp.qld.gov.au/water/pdf/monitoring-man-2009-v2.pdf.</p> <p>Eamus, D., Zolfaghar, S., Villalobos-Vega, R., Cleverly, J. & Huete, A., 2015. Groundwater-dependent ecosystems: recent insights from satellite and field-based studies. <i>Hydrology and Earth System Sciences</i>, 19, 4229-4256.</p> <p>IESC, 2015. <i>Information Guidelines for the Independent Expert Scientific Committee advice on coal seam gas and large coal mining development proposals</i> [Online]. Available: http://www.iesc.environment.gov.au/system/files/resources/012fa918-ee79-4131-9c8d-02c9b2de65cf/files/iesc-information-guidelines-oct-2015.pdf.</p> <p>Richardson, S., Irvine, E. C., Friend, R. H., Boon, P., Barber, S. & Bonneville, B., 2011. Australian groundwater dependent ecosystem toolbox Part 1: assessment framework. Canberra: Waterlines report, National Water Commission.</p>