

## Advice to decision maker on coal mining project

### Proposed action: Continuation of Bengalla Mine (EPBC 2012/6378) – Expansion

<b>Requesting agency</b>	Department of Sustainability, Environment, Water, Population and Communities
<b>Date of request</b>	17 April 2013
<b>Date request accepted</b>	17 April 2013
<b>Advice stage</b>	Environment Impact Assessment (draft)
<b>Summary of request from the regulator</b>	<p>The Department of Sustainability, Environment, Water, Population and Communities (the Department) is currently assessing the proposed project in accordance with the provisions of the <i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act).</p> <p>The Department notifies the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (the Committee) of an opportunity to comment on the draft Environmental Impact Statement. Specifically, the Department seeks the advice of the Committee on:</p> <ol style="list-style-type: none"> <li>1. Does the Committee consider that the proponent has provided sufficient information on the water resources and its management to assess likely significant impacts from its proposed action? If the information is considered insufficient for that purpose, what advice regarding areas of inadequacy can the Committee provide?</li> <li>2. What are the likely impacts of the proposed mine on surface and ground water resources, in particular, changes to surface and/or groundwater dynamics and resources that may support surface habitat for threatened species and communities?</li> <li>3. Does the Committee find the water balance and conclusions relating to water management provided by the proponent and attached to this brief to be reasonable?</li> </ol>

### Advice

The Committee was requested to provide advice to the Commonwealth regulator on the continuation of Bengalla Coal Mine Project in New South Wales, at the draft Environmental Assessment stage. This advice draws upon aspects of information in the draft Environmental Impact Statement together with the expert deliberations of the Committee. The draft Environmental Impact Statement and information accessed by the Committee are listed in the source documentation at the end of this advice.

The Bengalla Coal Mine is located in the upper Hunter River catchment, approximately 4 km west of the township of Muswellbrook. The mine is currently licensed to produce up to 10.7 million tonnes per annum of

run-of-mine coal. The proposed extension would produce an additional 316 million tonnes of coal over a 24 year period, at a rate of up to 15 million tonnes per annum. As part of the proposed project, up to 70 million tonnes of coal rejects would be generated and encapsulated within an expanded overburden emplacement area. The disturbance boundary for the proposed project covers an area of approximately 796 hectares.

The Committee, in line with its Information Guidelines<sup>1</sup>, has considered whether the proposed project assessment has used the following:

Relevant data and information: key conclusions

There is insufficient data and quantitative information for the Committee to assess the impacts of the proposed project. In particular, there is an unexplained lack of information and data about the presence, extent and condition of water-dependent species and ecosystems in the Hunter River; flood extent; the management and potential exposure of potential acid forming materials and leachate; seasonal variation in discharge scenarios and water extraction; water quality in Dry Creek; stability of the overburden emplacement area; and existing and proposed management measures and monitoring plans.

Appropriate methodologies which have been applied correctly: key conclusions

A regional water balance was not provided. While a site water balance was prepared, the validation process has produced uncertainty about its ability to accurately predict external water demand and the frequency and volume of discharges.

Groundwater drawdown from the Bengalla extension and Mt Arthur Coal Mine is predicted to partially intersect beneath the Hunter River Alluvium. However, the use of a constant head boundary condition for the Hunter River was not appropriate for determining the groundwater/surface water impacts of the mine and may have led to under-estimation of the cumulative impact of drawdown in the Hunter River Alluvium.

The project-specific and cumulative impacts of surface water extraction and discharges on the water quality and aquatic ecology of the Hunter River have not been adequately assessed; in particular, the impacts of increased water extraction, groundwater drawdown and water discharges on water quality and aquatic ecology. Further, the impact assessment has not considered the cumulative effect of surface water extraction and groundwater drawdown during low flow and drought periods.

The proponent's risk assessment does not provide a description of the consequence classes, nor does it provide sufficient information on proposed mitigation measures to justify the resulting residual risk ranking. Other than for groundwater, an assessment of cumulative risks is not evident in the documentation presented.

Reasonable values and parameters in calculations: key conclusions

The site water balance report provided limited and inconsistent information, making it difficult for the Committee to assess the adequacy of the water balance and to fully assess the potential impacts and proposed mitigation measures for the proposed project.

The assumptions and data used in the salt water balance may have led to underestimation of salt loading to the Hunter River as a result of the proposed project.

The proponent has elected to use a simulated rainfall dataset that provides a lower mean annual rainfall than that measured by nearby meteorological stations. Justification for the use of this data rather than measured data has not been provided. Adoption of this dataset may have implications for discharge scenarios, water demand from the Hunter River, and the sizing and operation of water management infrastructure.

It is unclear whether the design of the reinstated Dry Creek incorporates proposed discharges from the adjacent Mount Pleasant operation.

*Question 1: Does the Committee consider that the proponent has provided sufficient information on the water resources and its management to assess likely significant impacts from its proposed action? If the information*

*is considered insufficient for that purpose, what advice regarding areas of inadequacy can the Committee provide?*

1. The proponent has provided insufficient data and quantitative information to comprehensively assess the potential impacts from the proposed project. Assessment of the proposed project would be improved by the proponent addressing the recommendations identified in Questions 2 and 3 below; in particular:
  - a. revision of the groundwater model to relax the constant head boundary along the Hunter River to ensure an accurate estimation of the cumulative impact of drawdown in the Hunter River Alluvium;
  - b. further refinement of the water balance and salt balance;
  - c. assessing the project-specific and cumulative impacts on the Hunter River, particularly on groundwater dependent ecosystems and threatened species (e.g. amphibians);
  - d. assessing the potential for exposure of potentially acid forming materials and subsequent risks to water quality and water-dependent ecosystems;
  - e. undertaking flood modelling up to the 1:1000 year average recurrence interval flood event and protecting mine landforms from these events; and
  - f. considering the potential impacts from the planned future westward expansion of the Bengalla Coal Mine (not part of the current proposal) as part of the cumulative impact assessment.

*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?*

2. The proposed project is likely to cause, and cumulatively contribute to, a number of changes in surface water and groundwater dynamics in the Hunter River and the Hunter River Alluvium. These changes, if realised, would affect the surface habitat for threatened species and communities. Key impacts include: groundwater drawdown; potential changes to water quality; a reduction in surface water flow resulting from water extraction; and loss of contributing catchment. In light of the numerous existing and proposed coal mining developments in the upper Hunter River region, the Committee considers that water related impacts of the Bengalla coal extension should be reviewed, as far as possible, as part of a cumulative assessment process.
3. The Committee has concerns relating to the validity of the groundwater modelling and drawdown predictions. Drawdown prediction in the Hunter River alluvium, both beneath and in the vicinity of the Hunter River, is of critical importance. This is vital for assessing surface water and groundwater connectivity, exchange fluxes, and impacts of depressurisation on river flows.
4. The Committee has major concerns about the groundwater modelling and its ability to make accurate drawdown predictions. Most notably, the use of a constant head boundary condition along the Hunter River forces constant river levels to apply at all times. The drawdown contours are therefore 'forced' to a value of zero at the location of the river to maintain constant head conditions. The model cannot be used to make predictions at and around the vicinity of the constant head boundary. An assessment of cumulative drawdown of Bengalla and Mt Arthur coal mines cannot be made using this erroneous model construction.
5. The Committee recommends that the model be revised to relax the constant head boundary along the Hunter River, so that it is an 'active' part of the model, enabling surface water/groundwater interaction to be reliably/accurately simulated so that robust estimates of cumulative drawdown can be made. Further, as a result of the inability to predict the extent and magnitude of groundwater drawdown, the Committee cannot accurately assess the impacts of groundwater drawdown on the surface habitat for threatened species and communities.

6. The proponent's literature review, and survey method and effort, were not sufficient to determine the presence of threatened species or their habitat; most notably for EPBC-listed threatened amphibian and fish species in the Hunter River. Further, the Committee notes that the Hunter River in the Muswellbrook local government area is designated as key fish habitat under the *Fisheries Management Act 1994*.
  - a. Key limitations of the proponent's approach include:
    - i. limited inclusion of literature review and database search results in the proponent's assessment. For example, while the proponent has assessed potential habitat for *Litoria booroolongensis* (the Booroolong Frog), the potential presence of *Litoria aurea* (the Green and Golden Bell Frog) has not been discussed, despite the recorded presence of this species less than 15 km from the proposed project<sup>2</sup>. Similarly, a 2004 fish survey in the upper Hunter River is cited<sup>3</sup> in support of a claim that suitable habitat for threatened fish species is not present in the Hunter River; however, the proponent does not mention that this study specifically notes the potential presence of *Prototroctes maraena* (the Australian Grayling) and recommends targeted searches for this species;
    - ii. habitat assessment for *Litoria booroolongensis* which does not consider potential habitat in the Hunter River;
    - iii. the exclusion of Dry Creek, which is to be diverted, and the Hunter River from targeted amphibian searches; and
    - iv. the exclusion of riparian and in-stream habitat assessment in the Hunter River from ecological surveys.
  - b. A more comprehensive assessment of the presence of water-dependent threatened species, their habitat and their reliance on surface water and groundwater is needed to enable an adequate assessment of the proposed project's impacts. In addition to addressing the limitations noted above, the scope of the assessment would benefit from consideration of the life-cycle habitat requirements of threatened species, the predicted extent of groundwater drawdown, the quantity of water expected to be extracted during seasonal low flow and drought conditions, and the mixing zone for water discharged from site.
7. The proposal does not provide sufficient information to fully assess the proposed project's impact on water quality in the Hunter River. In particular, detailed information about the existing and proposed management of potentially acid forming and sodic materials, flood impacts, and the frequency and quality of excess water discharges is lacking or inadequate. The uncertainties about water quality related impacts to threatened species and their habitat could be reduced by:
  - a. providing a conceptual design for the overburden emplacement area, which clearly identifies:
    - i. the proposed location and placement strategy for potentially acid forming and sodic materials,
    - ii. leachate seepage paths and containment mechanisms, and
    - iii. the proximity of the reinstated Dry Creek to potentially acid forming and sodic materials;
  - b. undertaking flood modelling for rainfall events up to and including the 1:1000 year average recurrence interval flood event and using this information to develop mitigation measures that reduce the risk of exposure of potentially acid forming and sodic materials during flood events;
  - c. using a factor of safety analysis and erosion modelling to demonstrate the stability of the overburden emplacement area, particularly in relation to the proposed placement of the reinstated Dry Creek within the overburden emplacement area footprint;

- d. incorporating an assessment of the proposal's contribution to heavy metal loading in the Hunter River;
  - e. confirming the capacity of the Hunter River Salinity Trading Scheme (HRSTS) to cope with additional saline discharges within the catchment;
  - f. providing sufficient information to enable a technical review of the salt balance and expanding its scope to:
    - i. quantify loading to the Hunter River under a range of discharge scenarios, including the 'worst case' scenario,
    - ii. more accurately ascertain and model the contribution of rehabilitated spoil to salt loading,
    - iii. quantify and predict salt loading from the operation of the CW1 dam and the reinstated Dry Creek channel,
    - iv. incorporate rehabilitation activities in Year 24 and beyond, and
    - v. demonstrate that the results of the revised water balance will comply with the aims of the HRSTS (i.e. limiting electrical conductivity in the Hunter River to 600  $\mu\text{s}/\text{cm}$ ).
8. The proponent's assessment of impacts on the aquatic ecology of Hunter River has not considered the proposed increase in water extraction, nor the site-specific cumulative interaction of this with groundwater drawdown. An assessment of the cumulative effect of groundwater drawdown, water extraction and any changes in water quality is needed to understand the potential risks to aquatic and riparian ecosystems generally, and threatened species and their habitats in particular.

*Question 3: Does the Committee find the water balance and conclusions relating to water management provided by the proponent and attached to this brief to be reasonable?*

9. Review of the site water balance has raised uncertainty about the ability to accurately predict the frequency and magnitude of discharges and the volume of water to be sourced from the Hunter River. The proponent should review and address the following matters to improve confidence in the water balance's predictions and enable a more thorough assessment of the level of risk posed to water resources and aquatic ecosystems by the proposed project:
- a. under-estimation and over-estimation against recorded site inventory data during the water balance validation process;
  - b. justification for the use of a simulated rainfall dataset rather than measured data from nearby meteorological stations has not been provided. The simulated dataset provides a lower mean annual rainfall than the measured meteorological station data, which may lead to underestimation of the amount of water to be retained or managed on site. The sensitivity of water management infrastructure to use of this dataset is not discussed by the proponent;
  - c. provision of limited and inconsistent input and output data in the water balance report. In particular, the report: does not provide information on the seasonal variation of discharges and water demand; does not provide a detailed output for the 99th percentile rainfall scenario; inconsistently provides results as a mix of 'median' or 'average' outputs; and does not clearly identify total site water demand and the amount of this demand that can be sourced internally; and
  - d. lack of a comprehensive regional water balance, limiting the Committee's ability to assess the impacts of the proposed project in a regional context.
10. In addition to the concerns with the groundwater model outlined in Question 2, the following areas of uncertainty remain and should be addressed:

- a. recovery times for affected aquifers have not been assessed; and
  - b. there appears to be a decrease in flow to the Hunter River alluvium after mining has ceased, however no explanation is provided for this.
11. The proponent has not undertaken detailed flood modelling for the proposed project. To protect downstream water resources and ecosystems from flood related impacts, it is recommended that flood modelling is undertaken for flood events up to and including the 1:1000 year average recurrence interval flood event and that measures are incorporated into the project design to protect mine landforms during these events. This assessment should also identify discharge scenarios for the CW1 dam and the receiving location of decant water from this dam.
12. It is unclear whether the design for the reinstatement of Dry Creek has provided for discharges from the Mount Pleasant Mine. Clarification of this issue should be sought, and if necessary, the design should be amended to incorporate the maximum anticipated discharge volumes from the Mount Pleasant Mine.
13. While the Committee considers that there is a minimal risk of decant from the final void, it is noted that water quality in the final void, other than salinity, has not been assessed. As noted consistently in the Committee's previous advice, the backfilling of voids and the minimisation of pit lakes represent best environmental practice for post-mining management. If this cannot be accomplished, it is recommended that the proponent undertakes a comprehensive assessment of final void water quality, which includes an assessment of the risks to fauna which may attempt to use the void as a water source.
14. In addition to the measures outlined elsewhere in this Advice, adoption of the following strategies would increase the level of protection for water-dependent biota:
- a. committing the proponent to meeting the ANZECC guidelines (2000) for protection of aquatic ecosystems (95 % protection levels) for discharges from the sediment and clean water dams. Where monitored upstream concentrations exceed these values, discharges should not exceed the 80th percentile of background (upstream) concentrations;
  - b. amending the water management plan to ensure that water in sediment dams, particularly those receiving runoff from coal rejects or Archerfield Sandstone in the overburden emplacement area, can be contained on site if the quality of this water is not suitable for release; and
  - c. making sure that mechanisms are in place to confirm that discharges from the proposed project comply with the electrical conductivity limits under the HRSTS. While it is assumed that the current project has such mechanisms in place, these have not been discussed in the environmental impact statement. Therefore, the Committee is unable to comment on the appropriateness of these arrangements under the amended proposal.
15. It is noted that the proponent has developed a water management plan for their current operation but has not yet updated this plan for the proposed project. The Committee considers that the updated plan would benefit from incorporation of the following measures and strategies:
- a. adopting the groundwater monitoring program criteria provided in the 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<sup>1</sup>;
  - b. adopting a collaborative approach to groundwater monitoring with other mines in the region and regularly revising the groundwater model as additional monitoring information is received. Provision of this information for inclusion in a regional, cumulative groundwater model would be beneficial;
  - c. structuring the baseline Dry Creek monitoring program to include water quantity (hydrograph) and the water quality parameters currently collected for the Hunter River, and to capture seasonal and inter-annual variation before further disturbance in this catchment;

- d. revising the surface water quality monitoring program to facilitate a better understanding of the contribution of sediment dams to the recorded increase in salinity downstream of the Bengalla Coal Mine. This may include undertaking volumetric and water quality monitoring of discharges from sediment dams. The results should be discussed in the context of compliance with the aims of the HRSTS;
- e. undertaking rehabilitation and monitoring to assess channel integrity, stability, and rehabilitation success in the reinstated Dry Creek as described in Appendix X of Hansen Bailey (2012). The monitoring program should be continued until results demonstrate that the channel is effectively stabilised and rehabilitation / water quality objectives are being met;
- f. identifying and monitoring suitable indicators of aquatic ecological health in the Hunter River; and
- g. making monitoring results publicly available to assist in determination of cumulative impacts on threatened species and communities in the Hunter River catchment.

16. The Northern Sydney Basin has been identified as a Bioregional Assessment priority region. Data and relevant information from the proposed project should be made accessible for this Bioregional Assessment to assist the knowledge base for regional scale assessments.

<b>Date of advice</b>	24 May 2013
<b>Source documentation available to the Committee in the formulation of this advice</b>	Hansen Bailey, 2012. Continuation of Bengalla Mine Environmental Impact Statement, prepared for the Bengalla Mining Company.
<b>References cited within the Committee's advice</b>	<p><sup>1</sup>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: <a href="http://www.environment.gov.au/coal-seam-gas-mining/project-advice/pubs/iesc-information-guidelines.pdf">http://www.environment.gov.au/coal-seam-gas-mining/project-advice/pubs/iesc-information-guidelines.pdf</a></p> <p><sup>2</sup>Department of Environment and Climate Change (NSW), 2007. Management Plan for the Green and Golden Bell Frog Key Population in the Upper Hunter, Department of Environment and Climate Change (NSW), Sydney</p> <p><sup>3</sup>Howell, T.D., and Creese, R.G., 2010. Freshwater Fish Communities of the Hunter, Manning, Karuah and Macquarie-Tuggerah Catchments: a 2004 Status Report. Industry and Investment NSW, Sydney</p>