

## Advice to decision maker on coal mining project

### Proposed action: Byerwen Coal Project (EPBC 2010/577, MF205) – New Development

<b>Requesting agency</b>	Department of Sustainability, Environment, Water, Population and Communities and Office of the Coordinator-General, Queensland Department of State Development, Infrastructure and Planning
<b>Date of request</b>	24 July 2013
<b>Date request accepted</b>	24 July 2013
<b>Advice stage</b>	Environment Impact Assessment (draft)
<b>Summary of request from the regulators</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) and the Office of the Coordinator-General (the Office), Queensland Department of State Development, Infrastructure and Planning, is currently assessing the proposed project under Part 4 of the <i>State Development and Public Works Organisation Act 1971</i> (SDPWO Act).</p> <p>The Department and the Office, in accordance with the bilateral agreement triggered on 4 March 2011, advise the Committee of an opportunity to comment on the Environmental Impact Statement recently placed on public exhibition. Specifically, the Department and the Office seek the advice of the Committee on the following matters:</p> <ol style="list-style-type: none"> <li>1. Review the information on groundwater (RfA Section 3.1.2, 3.2.2, 4.1 and EIS Chapter 17 and Appendix 18) and provide advice on whether the hydrogeological and ecological conceptualisation are adequate, relevant data has been used and the information and analysis are sufficiently robust to understand the potential for impacts on groundwater and the users of that groundwater, including all types of groundwater dependent ecosystems (terrestrial vegetation, surface water bodies, subterranean ecosystems and surface habitat for threatened species and communities).</li> <li>2. Provide advice on whether conclusions regarding impacts are robust and all significant impacts have been identified. Provide advice on the adequacy of proposed mitigation, monitoring and management measures and any additional measures that the State and Commonwealth regulators might consider to mitigate risks from the proposal.</li> <li>3. Review the information on surface water (RfA Section 3.1.3, 3.2.2, 4.2 and EIS Chapter 15 and 16, Appendix 16 and 17) and mine water management system (RfA Section 3.2.7, 4.2.3 and EIS Chapter 8 and Appendix 11). Provide advice on the adequacy of the hydrological and hydraulic modelling. Provide advice on whether all significant impacts have been identified. Provide advice on the adequacy of proposed mitigation and management measures. The state has a specific interest in the proposed</li> </ol>

---

mine water management system, the five creek diversion proposals, flooding and ongoing management of water quality. The Commonwealth has a specific interest impacts of the proposed mine on surface water resources, in particular, changes to surface water dynamics and resources that may support surface habitat for threatened species and communities?

4. Does the mine water management system provide enough detail to understand the water balance of the site and the ongoing management of water quality? Does the Committee find the water balance and conclusions relating to water management to be reasonable?

5. Review the water related risk assessment (RfA Section 5) and advise if the assessment of risk has been done properly. If the assessment is considered insufficient, what advice regarding areas of inadequacy can the Committee provide?

6. There are a number of other mines either existing or proposed in the surrounding area (including Newlands Coal project, Suttor Creek project and Sonoma Coal project). The existence and operating management of these mines within this area raises the possibility of cumulative impacts. Review the Cumulative Impacts (RfA Section 6). Does it provide enough detail to understand and assess potential cumulative surface water and groundwater impacts? Does the Committee identify any particular concerns relating to cumulative impacts?

7. Review Section 3, 6, 7 and 10 of the Environmental Management Plan (EIS Volume 2 Appendix 9). Will the proposed mitigation and control strategies mitigate potential impacts of the project to water resources?

Advice is sought within two months of receiving the request to allow the Coordinator-General to ask the proponent, Byerwen Pty Ltd, for supplementary information should it be required.

---

## Advice

The Committee was requested to provide advice on the Byerwen Coal Project in Queensland to the Commonwealth and State regulators at the Environmental Impact Assessment (draft) stage.

This advice draws upon aspects of information in the Environmental Impact Statement, together with the expert deliberations of the Committee. The project assessment documentation and information accessed by the Committee are listed in the source documentation at the end of this advice.

The proposed project as described in the Environmental Impact Statement is a new open-cut coal mine, located approximately 20 km west of Glenden and approximately 140 km west of Mackay, in the northern Bowen Basin. The total proposed project footprint is approximately 7,000 ha and would extract up to 15 million tonnes per annum of run of mine coal over the 50 year project life. The proposed project will consist of eight pits, the construction of two coal handling and preparation plants, two coal loading facilities and two water management systems. The project is located within the Rosella Creek and Upper Suttor River sub-catchments of the Bowen River and Suttor River catchments respectively. These catchments constitute part of the headwaters of the Burdekin Basin.

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

Relevant data and information has not been provided on water inputs, stores and outputs at a regional scale to enable the assessment of cumulative impacts. Data from existing and proposed coal seam gas and coal mining operations in the northern Bowen Basin is needed to inform a regional water balance and cumulative

---

impact assessment.

For the proposed project area, relevant data and information has not been provided in relation to:

- Groundwater monitoring data to establish a baseline prior to mining operations;
- The characterisation of groundwater systems across the proposed project area, including the likely sources of recharge and discharge, groundwater flow directions, hydraulic conductivity ranges and potentiometric head contours of hydrostratigraphic units;
- The extent of hydrological interactions between water sources, including the role of fractures in transmitting groundwater flow; and
- Results from the second ecological survey.

Application of appropriate methodologies: key conclusions

A regional water balance is needed to fully assess the impacts of the proposed project in a cumulative sense, but this has not been provided. The proponent has undertaken a cumulative impact assessment; however without the relevant regional data and information, this assessment is simplistic and does not allow for the consideration of integrated or synergistic impacts with a suitable level of confidence.

Appropriate methodologies and assessments have been provided at the proposed project scale; however, some have not been applied correctly, or do not include sufficient detail to enable a full impact assessment. The project assessment documentation should include:

- A site water balance which incorporates all water inputs, stores and outputs of the mine water management system, with results showing the response to seasonal and long term climate variation, extreme weather events and water requirements over various stages of mine development;
- A detailed conceptual groundwater model including representative cross-sections of hydrostratigraphic units, with clearly defined hydrogeological properties for each of the units across the proposed project area;
- A fit-for-purpose numerical groundwater model; and
- A quantitative risk assessment of the potential impacts of the proposed project on surface water and groundwater dependent ecosystems.

Reasonable values and parameters in calculations: key conclusions

The Committee has concerns with a number of assumptions used in groundwater calculations, particularly the representation of a complex heterogeneous system as a single homogeneous unit in modelling, which has not been demonstrated to be fit for purpose. The hydraulic conductivity estimate for this unit, representing all hydrostratigraphic units intersected by the mining pits (up to 350 m deep), was derived by calculating a mean of data taken from selected bores to a maximum depth of 120 m.

The values used to determine local water quality objectives for the Suttor River (for example, salinity) may not be representative, as they are based on a monitoring point on Suttor Creek, which joins the Suttor River downstream of the release point.

*Question 1: Review the information on groundwater (RfA Section 3.1.2, 3.2.2, 4.1 and EIS Chapter 17 and Appendix 18) and provide advice on whether the hydrogeological and ecological conceptualisation are adequate, relevant data has been used and the information and analysis are sufficiently robust to understand the potential for impacts on groundwater and the users of that groundwater, including all types of groundwater dependent ecosystems (terrestrial vegetation, surface water bodies, subterranean ecosystems and surface habitat for threatened species and communities).*

- 
1. Adequate baseline groundwater quality and quantity data has not been provided. The project assessment documentation should include the following groundwater data and information:
    - a. Results of an on-ground bore survey to confirm the groundwater bore data from the Department of Natural Resources and Mines database, as well as the presence of any unregistered bores within or surrounding the proposed project area.
    - b. Hydraulic properties of all coal seams and hydrostratigraphic units within the proposed project boundary, to the full depth of proposed mining pits and across all mining areas. Data presented to date from exploration is focussed on the southern mining area and is not necessarily representative of the hydrogeology across the proposed project area.
    - c. Information about shallow hydrostratigraphic units including:
      - i. The presence of alluvium adjacent to the Suttor River, its properties and extent;
      - ii. The presence, diversity and identity of stygofauna; and
      - iii. The role of groundwater in wetland hydrology.
    - d. Groundwater quality and quantity data from monitoring bores, which should reflect seasonal conditions over a sustained period.
    - e. Assessment of the presence of groundwater dependent ecosystems beyond the proposed project boundary that have the potential to be impacted by drawdown in groundwater pressures as a result of the proposed project and/or surrounding operations through cumulative impacts.
  2. Regarding the groundwater conceptualisation and analysis, the Committee considers that:
    - a. The proponent's hydrogeological conceptualisation of localised sandstone aquifers, with limited interconnectivity, is not supported by sufficient evidence. Little information has been provided to verify the proponent's claims of the lack of connectivity between surface and groundwater and between groundwater units. Recommendations on further information required to support the hydrogeological conceptualisation has been provided in paragraph 1.
    - b. The analysis of pit inflows and groundwater drawdown over the proposed project life is not sufficiently robust and does not allow for impacts to groundwater and groundwater users, including groundwater dependent ecosystems, to be fully understood. Analytical equations that assume uniform radial flow from a single homogeneous layer have been used, with little sensitivity analysis. The simplification of a complex heterogeneous system has not been proven to be fit for purpose and is inconsistent with the groundwater conceptualisation. Whilst the estimation of a maximum drawdown extent may be conservative, the Committee does not have confidence that it is an accurate representation of the system in a spatial or temporal sense.
    - c. To fully understand the potential impacts to groundwater and groundwater users, the project assessment documentation should include:
      - i. A detailed groundwater conceptual model, based on observed data, including representative cross-sections of hydrostratigraphic units, with clearly defined hydrogeological properties for each of the units across the proposed project area; and
      - ii. A numerical groundwater model to represent the behaviour of each of the units within the conceptualisation. Sensitivity analysis, uncertainty analysis and peer review are needed to ensure that the groundwater modelling is robust.

*Question 2: Provide advice on whether conclusions regarding impacts are robust and all significant impacts have been identified. Provide advice on the adequacy of proposed mitigation, monitoring and management measures and any additional measures that the State and Commonwealth regulators might consider to*

---

---

*mitigate risks from the proposal.*

3. As to the potential impacts to groundwater surface water, the water balance and cumulative impacts, the Committee makes the following observations:
  - a. There is insufficient information and analysis to fully assess all potential impacts to groundwater. Recommendations have been made in paragraphs 1 and 2.
  - b. The proposed project has the potential to impact on surface water quality and quantity, including impacts to a palustrine wetland and water dependent species. Recommendations for further mitigation and management measures are included in paragraph 6.
  - c. The information provided on the operation of the mine water management system is not robust. Recommendations relating to the site and regional water balance are shown in paragraph 7.
  - d. The cumulative impact assessment does not provide sufficient detail to understand and assess the range of potential cumulative surface water and groundwater impacts as described in paragraphs 10 to 14.
4. Further, potential impacts may result from the four final voids that will be created covering a total area of 1,342 ha with depths up to 350 m. The Committee considers that:
  - a. Voids are a long-term environmental legacy and that backfilling of voids and pit lakes represents best environmental practice.
  - b. The inadequacies with the site water balance (see paragraph 7a) and groundwater modelling (see paragraph 2) lead to uncertainty regarding the final water level in the voids and a wide range of predicted salinity values. Based on the information presented, the Committee has a low level of confidence in the final void modelling results.
  - c. Further assessment should be undertaken to identify and quantify the potential impacts of void water discharge to groundwater and surface water systems, particularly with respect to salinity. Relevant mitigation and management measures should be identified to address these impacts.
  - d. Groundwater and surface water monitoring should extend well beyond the project life to the point of hydrologic and hydrochemical equilibrium to ensure that any impacts from the potential discharge of void water are detected and mitigation measures applied.
5. Additional monitoring and mitigation strategies need to be developed to address potential impacts to water resources, which are outlined in paragraphs 3 and 4. These impacts should be highlighted in a stand-alone environmental risk assessment recommended in paragraph 9.

*Question 3: Review the information on surface water (RfA Section 3.1.3, 3.2.2, 4.2 and EIS Chapter 15 and 16, Appendix 16 and 17) and mine water management system (RfA Section 3.2.7, 4.2.3 and EIS Chapter 8 and Appendix 11). Provide advice on the adequacy of the hydrological and hydraulic modelling. Provide advice on whether all significant impacts have been identified. Provide advice on the adequacy of proposed mitigation and management measures. The state has a specific interest in the proposed mine water management system, the five creek diversion proposals, flooding and ongoing management of water quality. The Commonwealth has a specific interest impacts of the proposed mine on surface water resources, in particular, changes to surface water dynamics and resources that may support surface habitat for threatened species and communities?*

6. The proposed project has the potential to alter the hydrology of surface water systems due to stream diversions, loss of catchment area and landform modifications. Information regarding the mine water management system does not allow for considered assessment of impacts, as addressed in paragraph 7. Further information is required to determine the potential impacts to surface water, as outlined below:
  - a. The potential for flood events to impact on the water quality of the Suttor River system, by dispersing

---

and scouring of material associated with the waste rock dumps, should be further investigated. A modelled 1,000 year average recurrence interval flood event scenario has been predicted to reach waste rock dumps associated with South Pit 1 and South Pit 2, indicating depths of up to 2 m and velocities in the order of 1 m/s adjacent to the waste rock. It is recommended that:

- i. Design and risk assessments of the proposed waste rock dumps be undertaken to mitigate any potential impacts from flood events; and
  - ii. The proponent relocate waste rock dumps beyond the extent of the 1 in 1,000 average recurrence interval flood event if appropriate measures cannot be put in place to adequately reduce risks.
- b. Flood modelling in the Kangaroo Creek catchment is needed to increase confidence in the design for water related infrastructure. The modelling provided by the proponent does not include the Rosella Creek sub-catchment within the Kangaroo Creek catchment, which incorporates the North Pit and its proposed diversion.
- c. Whilst impacts on a regional scale due to the proposed stream diversions are likely to be minimal, the five channels have the potential to result in a change to catchment hydrology, geomorphology and ecological integrity at a local scale. The Committee considers that:
- i. Based on the assessment provided to date and the proponent's commitment that management plans be developed in the future, the management measures related to stream diversions should adequately address potential impacts; and
  - ii. Emphasis should be placed on monitoring of the diversion network throughout the life of the proposed project, due to the high potential for dispersion caused by sodic soils within the proposed project area.
- d. The Committee has concerns regarding the determination of local Water Quality Objectives, specifically the selection of sampling sites for the compliance and discharge points on the Upper Suttor River. The selected sampling site FSS07 on Suttor Creek, supplemented by site BYSW6 located on a tributary within the southern area of the proposed project boundary, may not accurately represent the environmental condition of the Upper Suttor River catchment. Further assessments and sampling are needed to strengthen baseline data for the Upper Suttor River Water Quality Objectives.
- e. A palustrine wetland on the Suttor River floodplain, partially within the proposed project area has been classified as an area of high ecological significance under the State Planning Policy 4/11 – *Protecting Wetlands of High Ecological Significance in Great Barrier Reef Catchments*. The proposed project has the potential to reduce the catchment area of the wetland by approximately 43 per cent. It is likely that within the proposed 16 year timeframe of impact, a significant change to the wetland will occur, potentially resulting in reduced ecological diversity. The proponent has not sufficiently addressed all associated risks to the palustrine wetland. Due to its high ecological significance, an appropriate management strategy is needed to protect and conserve the wetland.
- f. The proponent has indicated that it intends to remove permanent water sources with a combined size of 5.8 ha. These areas have been identified as artificial wetlands that support a large array of wildlife. The removal of the dams within the proposed project area has the potential to reduce diversity within the region, as they are currently the only sources of permanent water within the southern part of the project area and are a resource for wetland birds and EPBC Act listed migratory birds.

*Question 4: Does the mine water management system provide enough detail to understand the water balance of the site and the ongoing management of water quality? Does the Committee find the water balance and conclusions relating to water management to be reasonable?*

7. A water balance is the most appropriate basis for assessing potential changes in water resources and impacts on vulnerable water-related assets. As outlined below, information provided on the mine water

---

management system lacks adequate detail to understand the regional and site water balance accounts and the management of water quality. Therefore, the Committee is unable to accurately assess the potential impacts to water resources.

- a. The mine site water balance provided is overly simplistic, with limited model inputs and outputs, which makes any assessment of potential impacts on receiving environments highly uncertain. Volumetric water balance components should be estimated with consideration of seasonal and long term climate variation, including the potential for extreme events, and the staged project plan. The site water balance model would be improved if future iterations were to include all water inputs and outputs in the system, including:
  - i. The total water demand for the mine water operation rather than a net demand;
  - ii. The operation of clean water dams for the purpose of facilitating either diversions or release of water from the mine pits;
  - iii. Confirmation that, under all scenarios, any river discharges will be made in accordance with proposed dilution rates for low, medium and high flows to prevent water quality (particularly salinity) impacts;
  - iv. Sediment affected water from the drainage of disturbed area such as mining infrastructure areas for release or site use; and
  - v. Other internal water movements, such as the on-site re-use of water from mine pits, the coal handling and processing plant and co-disposal process.
- b. The proponent has not provided a regional water balance. The Committee recommends that a regional water balance be undertaken and should:
  - i. Extend across the regional surface and groundwater systems to defined monitoring points, beyond which there will be no measurable impacts as a result of the proposed project;
  - ii. Detail the set of water stores and the flow of water between those stores under current conditions within this region;
  - iii. Assess the change as a result of the proposed project to the quantity or quality of water within any store or flow of water between these stores;
  - iv. Assess the resultant impacts on water dependent ecosystems and assets within the region;
  - v. Take into account seasonal and long term climate variations and the proposed mine development plan; and
  - vi. Undergo a sensitivity analysis.

*Question 5: Review the water related risk assessment (RfA Section 5) and advise if the assessment of risk has been done properly. If the assessment is considered insufficient, what advice regarding areas of inadequacy can the Committee provide?*

8. The qualitative risk assessments in Section 5 of the Request for Advice and the Hazard and Risk Management Plan in the project assessment documentation relate only to risks to people and property and do not include a specific assessment of water-related risks to the environment. While water-related risks to the environment were identified throughout the project assessment documentation, there is limited evidence to assess whether a consistent quantitative methodology has been applied.
9. The project assessment documentation needs the addition of a stand-alone risk assessment considering water-related risks to the environment. This risk assessment should be informed by further studies and assessments recommended by the Committee and should:

- 
- a. Identify regional water related assets that may be vulnerable as a result of the proposed project;
  - b. Identify potential impacts on those assets, including cumulative impacts;
  - c. Quantitatively assess the likelihood and consequence of identified impacts;
  - d. Determine the overall level of risk to assets; and
  - e. Assess the residual risk following application of proposed mitigation measures.

*Question 6: There are a number of other mines either existing or proposed in the surrounding area (including Newlands Coal project, Suttor Creek project and Sonoma Coal project). The existence and operating management of these mines within this area raises the possibility of cumulative impacts. Review the Cumulative Impacts (RfA Section 6). Does it provide enough detail to understand and assess potential cumulative surface water and groundwater impacts? Does the Committee identify any particular concerns relating to cumulative impacts?*

10. The cumulative impact assessment provided in this proposal is a simple qualitative summation of estimated individual impacts and does not appear to consider interactive or synergistic impacts. The Committee expects that, as a minimum, a cumulative impact assessment would:
    - a. Cover geographic and temporal boundaries large enough to include all potentially significant impacts on the water resources;
    - b. Identify all past, present, and reasonably foreseeable actions, including development proposals, programs and policies, likely to impact on the water resources;
    - c. Identify all water resources that are likely to be cumulatively impacted by the developments and assess their condition, value and sensitivity;
    - d. Include a regional water balance (see paragraph 7b);
    - e. Consider the full extent of potential impacts including direct, indirect, upstream, downstream, and consequential;
    - f. Utilise appropriately robust/repeatable/transparent methodologies to determine the significance of impacts;
    - g. Consider relevant management approaches, legislation, policy and guidelines; and
    - h. Determine mitigation, monitoring and management measures to avoid or minimise and report on potential cumulative impacts.
  11. Fit-for-purpose groundwater modelling and a detailed site water balance would improve quantification of the contribution of the proposed project to potential cumulative impacts on surface and groundwater resources.
  12. The Committee notes that there are large numbers of existing or proposed coal mining and coal seam gas operations in the northern Bowen Basin (see Attachment A to this advice from the proponent's assessment documentation), including some operations on which the Committee has previously provided advice. The Committee considers that these operations in the region present a significant risk of cumulative impacts, in particular:
    - a. Cumulative groundwater drawdowns;
    - b. Disturbance of natural catchments and regular discharge of mine water to surface water catchments which ultimately flow to the Great Barrier Reef;
    - c. Potential for flooding and uncontrolled release from mine water management systems during extreme
-



---

weather events; and

- d. A legacy of multiple final voids with the potential for highly saline discharge to regional surface and groundwater systems post production.
13. In relation to cumulative impacts, the regional extraction of large quantities of coal and overburden will create a regional scale linear void and result in de-stressing and redistribution of crustal loading along the eastern edge of the Bowen Basin. Consequent seismicity and spatial changes in the relationships of stratigraphic units and/or topography have the potential to change aquifer interconnectivity and surface water flows. The consequence of establishing a deep linear void trending parallel to many subsurface structural lineaments, including faults, would benefit from further scientific investigation.
14. The Committee considers that the scale and rate of development of coal seam gas and coal mining operations will significantly alter the existing hydrological and hydrogeological processes in the northern Bowen Basin. Therefore, the Committee recommends that regulators establish a collaborative approach across involved industries in the northern Bowen Basin to predict, monitor and manage the potential cumulative impacts to surface and groundwater resources.

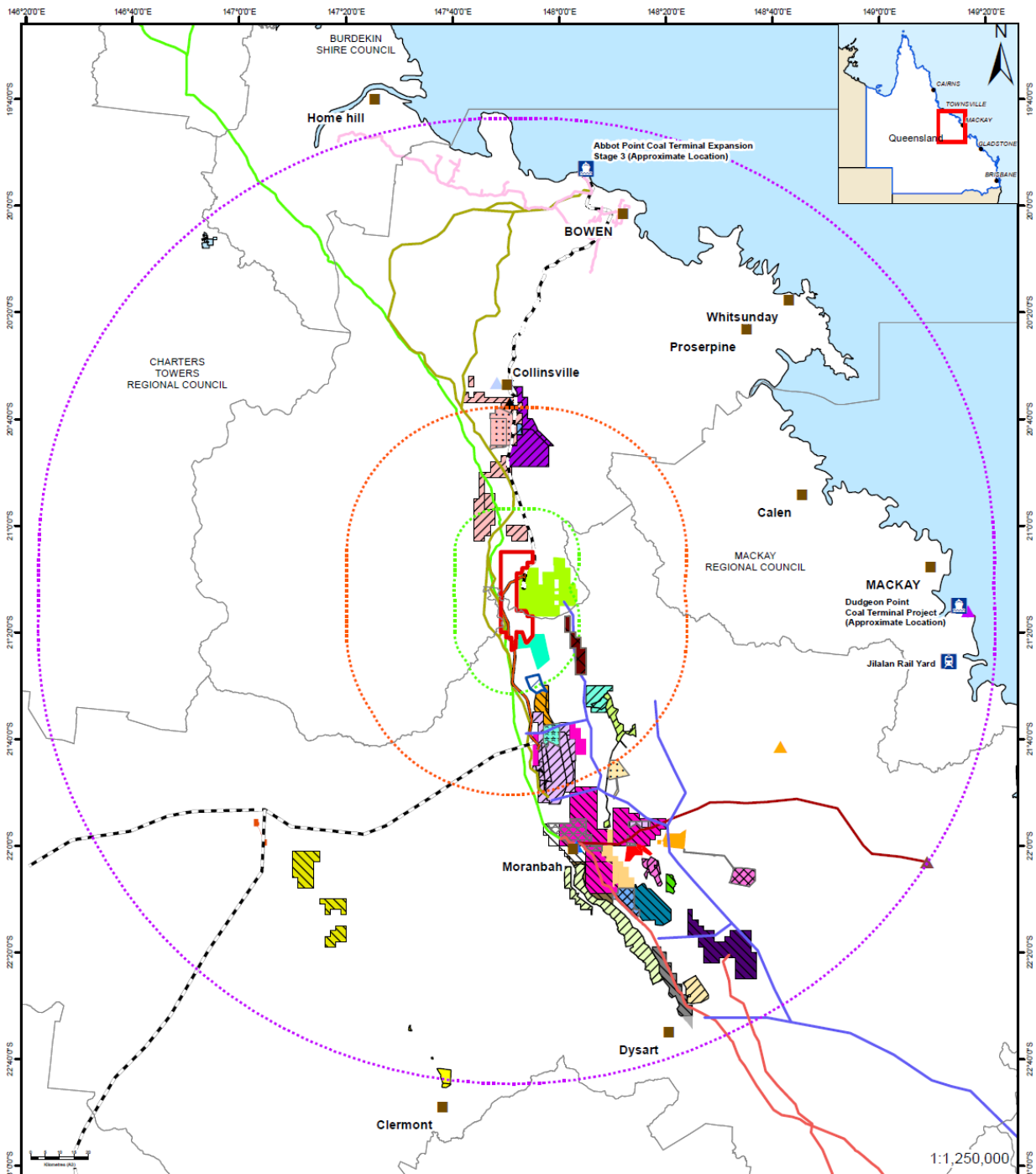
*Question 7: Review Section 3, 6, 7 and 10 of the Environmental Management Plan (EIS Volume 2 Appendix 9). Will the proposed mitigation and control strategies mitigate potential impacts of the project to water resources?*

15. As addressed in paragraph 9, the proponent has not provided a comprehensive assessment of all risks to water resources. The Committee considers that the Environmental Management Plan needs to be revised to include mitigation and control strategies to address all potential impacts identified through the risk assessment.
16. In addition to the Environmental Management Plan, the proponent commits to the development of various additional management plans, including Surface Water and Groundwater Management Plans, prior to commencement of any works. As the Committee does not have access to these management plans, it is unable to comment on their adequacy.

---

<b>Date of advice</b>	26 August 2013
<b>Source documentation available to the Committee in the formulation of this advice</b>	Byerwen Coal Pty Ltd. May 2013. Byerwen Coal Project Environmental Impact Statement.
<b>References cited within the Committee's advice</b>	<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>
<b>Attachments</b>	A: Figure 34-1: Cumulative Impacts - Whole Region as provided in the Byerwen Coal Project Environmental Impact Statement.

---



<p><b>Legend</b></p> <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: yellow; border: 1px solid black;"></span> Clermont Coal Mine</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightblue; border: 1px solid black;"></span> Sarsfield Expansion Project</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightgreen; border: 1px solid black;"></span> Drake Coal Project</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightyellow; border: 1px solid black;"></span> Ellensfield Coal Mine Project</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightcyan; border: 1px solid black;"></span> Carborough Downs Mine Expansion Project</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightpink; border: 1px solid black;"></span> Cordilla Coal Mine Project</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightpurple; border: 1px solid black;"></span> Eagle Downs Coal Project</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightblue; border: 1px solid black;"></span> Eagle Field Expansion Project</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightgreen; border: 1px solid black;"></span> Grosvenor Coal Project</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightyellow; border: 1px solid black;"></span> Integrated Isaac Plains Project</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightcyan; border: 1px solid black;"></span> Millermum Expansion Project</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightpink; border: 1px solid black;"></span> Moonvale Coal Project</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightpurple; border: 1px solid black;"></span> Sutor Creek Project</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightblue; border: 1px solid black;"></span> Newlands &amp; Newlands Extension Projects</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightgreen; border: 1px solid black;"></span> Talwood Project</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightyellow; border: 1px solid black;"></span> Dysart East</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightcyan; border: 1px solid black;"></span> Twin Hills</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightpink; border: 1px solid black;"></span> Sonoma Coal Project</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightpurple; border: 1px solid black;"></span> Vermont Coal Project</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightblue; border: 1px solid black;"></span> Caval Ridge Mine Project - Change 5</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightgreen; border: 1px solid black;"></span> Bowen Basin Coal Growth - Caval Ridge</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightyellow; border: 1px solid black;"></span> Bowen Basin Coal Growth - Daunia Mine</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightcyan; border: 1px solid black;"></span> Goonyella Riverside Mine</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightpink; border: 1px solid black;"></span> Jax Project</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightpurple; border: 1px solid black;"></span> Sarum Project</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightblue; border: 1px solid black;"></span> New Lenton Project</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightgreen; border: 1px solid black;"></span> Burton Project</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightyellow; border: 1px solid black;"></span> Wards Well Underground</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightcyan; border: 1px solid black;"></span> Anthony Project</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightpink; border: 1px solid black;"></span> Saraji East</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightpurple; border: 1px solid black;"></span> P/L 224</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightblue; border: 1px solid black;"></span> Moranbah CSG Operation</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightgreen; border: 1px solid black;"></span> Moranbah South</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightyellow; border: 1px solid black;"></span> Olive Downs North</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightcyan; border: 1px solid black;"></span> Windhester South</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightpink; border: 1px solid black;"></span> Willunga Project</li> </ul>		<ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightblue; border: 1px solid black;"></span> Arrow Bowen Pipeline Project (Approximate Location)</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightgreen; border: 1px solid black;"></span> Bow Energy Gas Pipeline (Approximate Location)</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightyellow; border: 1px solid black;"></span> Water for Bowen Project (Approximate Location)</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightcyan; border: 1px solid black;"></span> Northern Missing Link</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightpink; border: 1px solid black;"></span> Central Queensland Integrated Rail Project (Approximate Location)</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightpurple; border: 1px solid black;"></span> Central Queensland Gas Pipeline</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightblue; border: 1px solid black;"></span> Goonyella to Abbot Point Rail Project</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightgreen; border: 1px solid black;"></span> Connors River Pipeline (Approximate Location)</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightyellow; border: 1px solid black;"></span> North Queensland Gas Pipeline</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightcyan; border: 1px solid black;"></span> Moranbah Airport, Power &amp; Ammonium Nitrate Projects (Approximate Locations)</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightpink; border: 1px solid black;"></span> Nebo Power Station</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightpurple; border: 1px solid black;"></span> Connors River Dam (Approximate Location)</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightblue; border: 1px solid black;"></span> Collinsville Project (Approximate Location)</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightgreen; border: 1px solid black;"></span> Cows Coal Project (Approximate Location)</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightyellow; border: 1px solid black;"></span> Dalrymple Bay Coal Terminal Expansion</li> </ul>	<ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightblue; border: 1px solid black;"></span> Byerwen Project Area</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightgreen; border: 1px solid black;"></span> Local Government Boundaries</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightyellow; border: 1px solid black;"></span> 15 km extent</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightcyan; border: 1px solid black;"></span> 50 km extent</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightpink; border: 1px solid black;"></span> 150 km extent</li> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: lightpurple; border: 1px solid black;"></span> Main Towns</li> </ul>
<p><b>Cumulative Impacts - Whole Region</b></p> <p><b>Figure 34-1 Byerwen Coal Project</b></p> <p>Date: 31/01/2013</p> <p>Author: [unreadable]</p> <p>Map Scale: 1:1,250,000</p> <p>Coordinate System: GCS GDA 1984</p>		<p><b>QCOAL GROUP</b></p> <p>Environmental and Consulting Professionals Pty Ltd</p> <p><b>ep</b></p>	

© State of Queensland (Department of Environment and Resource Management (DERM), Department of Natural Resources and Mines (DNRM)). DERM has produced this map for the purpose of providing a summary of the relevant spatial information based on its controlling data provided by the State of Queensland (DERM, DNRM) and other sources at the time the map was prepared. In consideration of the Data-providing user (DERM) and DERM give no warranty or condition to the data including accuracy, reliability, completeness or suitability and accept no liability.