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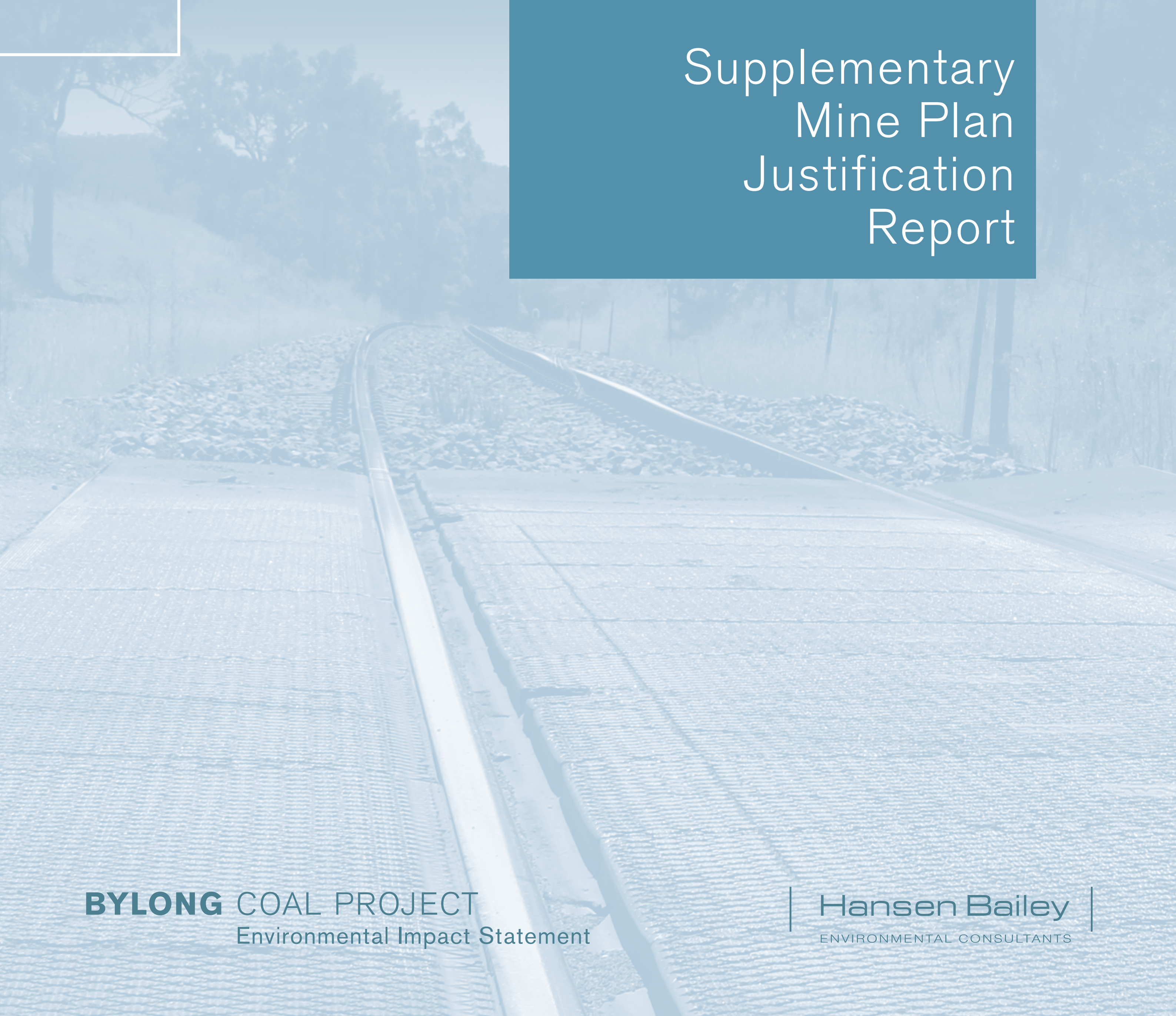
Supplementary Mine Plan Justification Report



BYLONG COAL PROJECT
Environmental Impact Statement

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WORLEY PARSONS SERVICES PTY LTD ON BEHALF OF KEPCO BYLONG AUSTRALIA PTY LTD

Bylong Coal Project
Environmental Impact Statement
Response to Submissions – Supplementary Mine Plan Justification Report

March 2016

REPORT: WORLEY01/02

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REPORT TO :	Andrew Burleigh Senior Project Manager Australia East Worley Parsons Resources & Energy
REPORT ON :	Bylong Coal Project Environmental Impact Statement Response to Submission – Supplementary Mine Plan Justification Report
REPORT NO :	WORLEY01/02
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1.0 INTRODUCTION

The Bylong Coal Project (the Project) Environmental Impact Statement (EIS) was lodged with the Department of Planning and Environment (DP&E) and was placed on public exhibition between 23 September 2015 and 6 November 2015. DP&E received a number of submissions from regulators, organisations and members of the community on the EIS and has requested the proponent to provide a response to the submissions received.

A number of submissions questioned the need for open cut mining areas as part of the Project. The following report will set out to 1.) Summarise relevant points of the existing Mine Plan Justification Report as set out within Appendix E of the Project EIS (Mine Advice 2015), and 2.) Provide further open cut justification information from a mine planning perspective, irrespective of the associated EIS modelling results and suggested invalidity of those results as argued by some submissions.

2.0 EXISTING MINE JUSTIFICATION BACKGROUND INFORMATION SUMMARY

2.1 General Information

Mining is accepted by the public at large because of the role it plays in society as a provider of minerals and metals for the public's needs and general wellbeing (Boutilier and Thompson 2011). A resource company's overarching objective is to optimise extraction of the available resource, thereby delivering the greatest economic advantage to satisfy the initial investment decision. This is undertaken within the allowable boundaries governed by environmental and social inputs. Therefore it is important to evaluate the role that environmental and social considerations play in decisions about mineral development, that is, that these considerations should be evaluated alongside more traditional business and economic considerations (Eggert 2006).

These general objectives are echoed by the Department of Industry, Resources & Energy (DI-R&E), through which a proposed mining development must be preliminarily approved in-principle via way of a Conceptual Project Development Plan (CPDP) that demonstrates that the proposal is (DI-R&E 2015a):

- Practical (i.e. uses reputable, tried and tested mining methods),
- Feasible (i.e. is considered reasonably economic in the prevailing economic climate),
- Optimises resource utilisation (i.e. extracts all of the available coal resource, avoiding sterilisation or waste, using tried and tested mining methods), and
- Can be achieved within known environmental and mining/production constraints.

It is important to note that DI-R&E places specific emphasis on maximising the resource extraction for each mining related Development Consent application thus ensuring maximum socio-economic benefit to the State of New South Wales. Through this process all technical mining aspects are required to be considered. Herewith, the imperative is set to extract the most resource from each relevant coal authorisation in the first instance and then subsequently constrain extraction through a responsible and prudent evolutionary planning process implementing limitations to mining with each subsequent layer of understanding gained over time, i.e. from a resource, social, environmental, and economic perspective.

2.2 Common Australian Coal Mining Methods and Selection of Project Open Cut Mining

Coal mining methods within Australia are generally defined as either open cut or conversely underground mining methods. Open cut methods generally and more likely target shallow seam environments, i.e. resulting from low stripping ratios, and are usually regarded as more cost effective[1], albeit only to a point. In addition, open cut mining is generally considered a safer and simpler mining method when compared to underground methods. From a coal mining perspective, selecting between open cut and underground mining methods can be undertaken during the initial mine planning stages (i.e. Greenfield projects) when deciding how best to utilise an available resource or during operations (i.e. Brownfield projects) as open cut operating costs rise and a decision is made (and relevant approvals are sought) to transition to underground methods. However in the end, the selection of open

1 *"Costs usually drive the decision to take a surface mine underground. As a surface mine gets deeper and the stripping costs keep rising, there comes a time when underground mining costs less than surface mining. The commercial decision to choose between extending a surface mine or going underground will be based on detailed analysis of all operating and capital costs involved"* (Luxford 1997).

cut methods is also influenced by additional fundamentals such as technology, economies of scale, market conditions, community expectations, land access and external environmental considerations.

To this end, the laterally extensive and shallow depth Project coal resources lend themselves to traditional safer, open mining cut methods. These shallow coal resources extend laterally across the large majority of the Bylong Valley within Authorisations (A) A287 and A342 and if unconstrained, open cut mining could extend across the valley in its entirety. In view of the abovementioned fundamentals that influence the decision to undertake open cut mining, layers of mining constraints have then been implemented over several years of mine planning to deliver the proposed mine plan (Mine Advice 2015). This challenge has been exacerbated by evolving legislation and policy along with changing public sentiment towards mining over the life of the Project.

The resultant proposed open cut mining operation is a pragmatic[2], balanced outcome tabled to satisfy the relevant socio-economic parameters of the Project and subsequently the Project owner, who is responsible for investment should the mine proceed. The proposed level of open cut mining has been revised, modified and limited to a point that is considered to provide the minimum size of open cut mining worth undertaking from an operational and business case perspective whilst at the same time limiting the potential environmental and social impacts that are inherent in open cut coal mining[3]. This is highlighted by direct comparison of the proposed Project open cut coal reserves to be extracted versus the actual available Project open cut coal resource. The most recent independent Joint Ore Reserves Committee (JORC) coal resources report identifies a total of 391.6 million tonnes (Mt) of *in-situ* open cut coal resource within the two authorisations held for the Project (RPM 2014). Therefore, the proposed Project open cut run-of-mine (ROM) extraction of 33 Mt (Hansen Bailey 2015) equates to a mere 8% of total available Project open cut *in-situ* coal resource. The aforementioned clearly demonstrates the concessionary processes implemented through the mine planning and environmental study process. It is important to note that any form of open cut mining will deliver some level of environmental impact and in this case the Project proposal is considered to be of moderate size (DI-R&E 2015b) and will only operate for a relatively short time period thus ensuring a lower level of associated residual environmental impacts. Again, this highlights the pro-active attempt to reduce those impacts directly attributed to open cut mining to within acceptable levels and it is self-evident from a trade-off perspective that a responsibly sized and appropriately located open cut mining operation has been put forward.

2.3 Rejects Disposal and Minimising Environmental Legacies

Aside from the basic mine planning instruments utilised in the selection of open cut mining methods, another critical aspect of the Project is the question of the environmentally responsible disposal of coal reject materials. The coal resource specific to the Project requires the coal to be processed (i.e. washed) so as to yield coal qualities acceptable for the export coal market. As such, the resultant processing waste product (coarse and fine reject material) necessitates some form of reject storage facility to be developed within the vicinity of the Project.

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[2] Includes systematic consultation with the DP&E, DI-R&E and immediately affected community at relevant stages throughout the Pre-Feasibility Study, Feasibility Study and Gateway Application stages of project development (Hansen Bailey 2015) resulting in relevant mine plan modifications, including a reduction of open cut mining extent and number of open cuts across the valley, reduction in mining intensity and omission and positioning of open cut mining to limit intrusive environmental, visual and vista impacts.

[3] *"Large areas of low strip ratio open cut resources have been excluded from mine planning predominantly to avoid areas of Biophysical Strategic Agricultural Land. Other constraints to open cut mine design include the Bylong Village, infrastructure and rivers, creeks and associated alluvials"* (DI-R&E 2015b).

Reject materials generated during the processing of extracted coal typically comprise both coarse and fine materials and as such have their own unique issues with regards to disposal. Currently in NSW, Australia and internationally there is negative sentiment towards the disposal of rejects on the surface, specifically high moisture content fine rejects within dam structures (i.e. tailings dams). Best practice reject disposal is achieved by implementing “fundamentally stable” storage facilities. Such an outcome can be achieved through the following:

- Co-disposal of reject materials within open cut overburden emplacement areas (OEA) that have undergone geotechnical design and appraisal, e.g. final slope angles stipulated at less than 10°(DI-R&E 2013) thus satisfying stability concerns post mine closure.

- Disposal of rejects in voids created during the mining operations below natural ground level, i.e. open cut voids or underground mine workings. This aspect is more specific to reject materials with high moisture contents whereby the action of gravity on such materials is nullified through disposal below natural ground level.

In the longer term, abandoned underground mine workings can theoretically provide a suitable opportunity for some rejects disposal. However, important and often limiting considerations include:

- Disposal underground is constrained in the early years of mine development in that available void space is limited while the mine plan develops and does not necessarily match the volume of rejects produced until some later point in time. Therefore storage of both coarse and fine rejects on the surface is required for some period of time until adequate void space is made available underground. As a result some level of environmental risk is introduced for a portion of the mine life and in addition there will generally be some level of requirement to dispose rejects in an appropriately designed and rehabilitated surface emplacement area post mine closure. Examples of the most recent underground only mine project applications include the Spur Hill Underground Coking Coal Project and the Caroona Coal Project which indicate a strategy of co-disposal emplacement areas of coarse and fine rejects required on surface, i.e. in the order of 25 million bank cubic meters (SHUCCP 2013). Underground only options do not necessarily eliminate emplacement requirements of material on the surface.

- The infrastructure and equipment required to co-dispose both coarse and fine rejects underground comes at considerable added capital expense. In addition, operating costs of the mining operation will inevitably increase, notably the cost of underground reject disposal can be three to four times higher than typical surface emplacements (GHD 2014). Reliability of the process is an important consideration and any downtime in the reject emplacement process can deliver knock on operational impacts. Shielding against the latter usually requires a level of redundancy with some amount of storage and disposal capacity on the surface, therefore reducing the likelihood of attaining all reject disposal underground. To date use of this process is generally limited to pilot plants evaluating feasibility for use on a full operational scale.

- The current state of underground longwall mine rejects disposal generally presents with constrained capacity for disposal, technical challenges and complexities whereby current technologies are being implemented on a trial basis with mixed results. Longwall mines have the ability to generate large volumes of reject materials in comparison to the remnant underground void space left behind. This is due to the inherent nature of the mining method, resultant ground collapse and consolidation within this void space resulting in the adverse material quantity imbalance. Successful rejects disposal in an underground only mine is limited to operations with well-established and extensive networks of abandoned mine roadways that remain open with limited potential in specific planned longwall mining areas (Gilroy *et el* 2012). It is self-evident that the aforementioned practice would suit mature bord and pillar underground operations with virtually no ability identified for the Project as the majority of all roadways, excluding gateroads required for longwall extraction, are necessary for life of mine operation. Implementation of such a practice would be futile during Project operations due to reject quantities being produced and the available underground void space imbalance[4]. Additionally, operational and safety risks would be introduced such as fluid in-rush hazards.

From the above, it is evident that some open cut mining is imperative in advance of the longwall mine if large tailings dams and course reject areas on the surface are to be avoided and in fact limited. The beneficial use of initial short term open cut mining provides a major positive aspect when weighing up the cumulative impacts of the Project.

2.4 General EIS Submissions and Further Technical Justification Summary

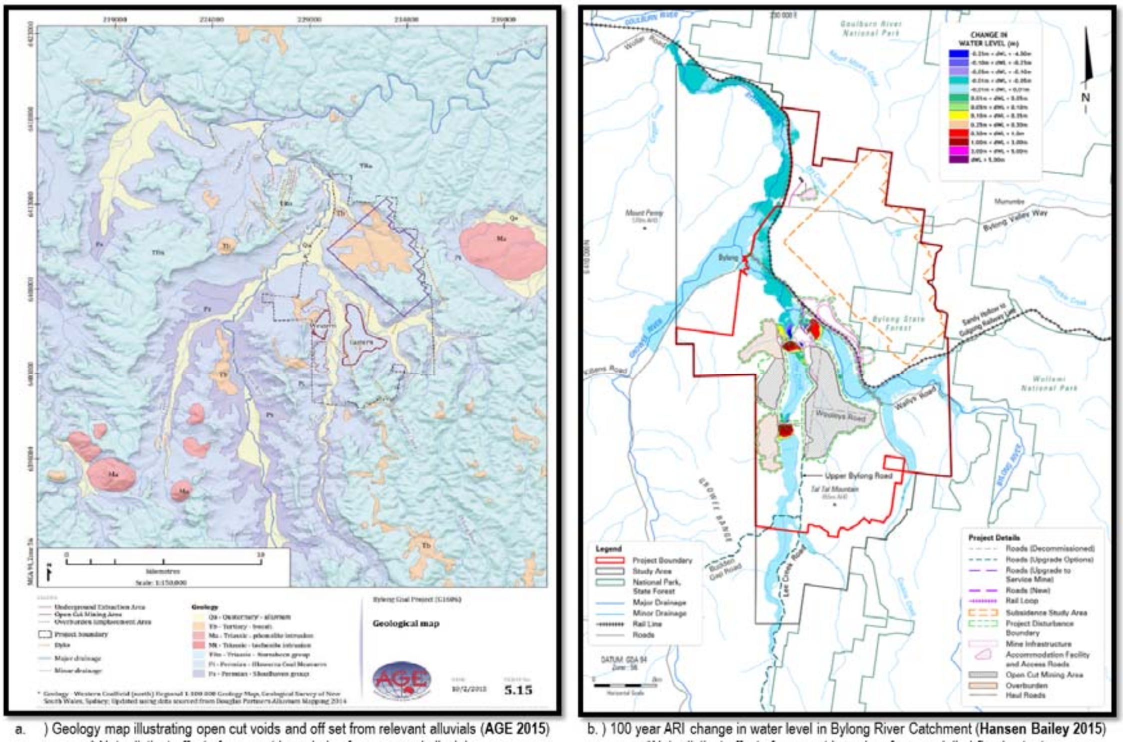
The submissions received during the public exhibition period have generally provided the following general sentiment towards the Project (and inherently toward open cut mining). The main concerns relate to perceived impacts on agricultural land and site specific Natural Sequence Farming (NSF), alluvial systems, surface water and groundwater, noise and dust, cultural heritage, ecology and visual aspects.

Detailed justification of mine planning in relation to the abovementioned concerns are outlined in Mine Advice 2015 and Hansen Bailey 2015. Table 1 simplistically summarises the advantages and relevant supporting justification for the selection of open cut mining methods for the Project and the perceived environmental implications expressed within the relevant submissions.

[4] At an order of magnitude assessment level, the Project Main Heading roadways total approximately 40 km which equates to approximately 770,000 m^3 (i.e. 40,000 m x 5.5 m roadway width x 3.5 m roadway height) of potential storage volume. In addition, Project Gateroad Heading roadways total approximately 131 km resulting in 2,500,000 m^3 of potential storage volume. Anticipated underground only rejects volumes are approximately 0.8 Mlcm per annum (as per Hansen Bailey 2015, Table 9. Indicative underground production schedule). In reality, Main Headings and Gateroad Headings roadways would only store approximately 4 years of rejects generated for an underground only scenario. Accepting that significant volumes of rejects cannot be emplaced in longwall goaf areas, then it is clear that the Project in its current form could not warrant an underground only component and satisfy full reject storage underground.

TABLE 1. Open Cut Advantages and Perceived Environmental Disadvantages Summary.

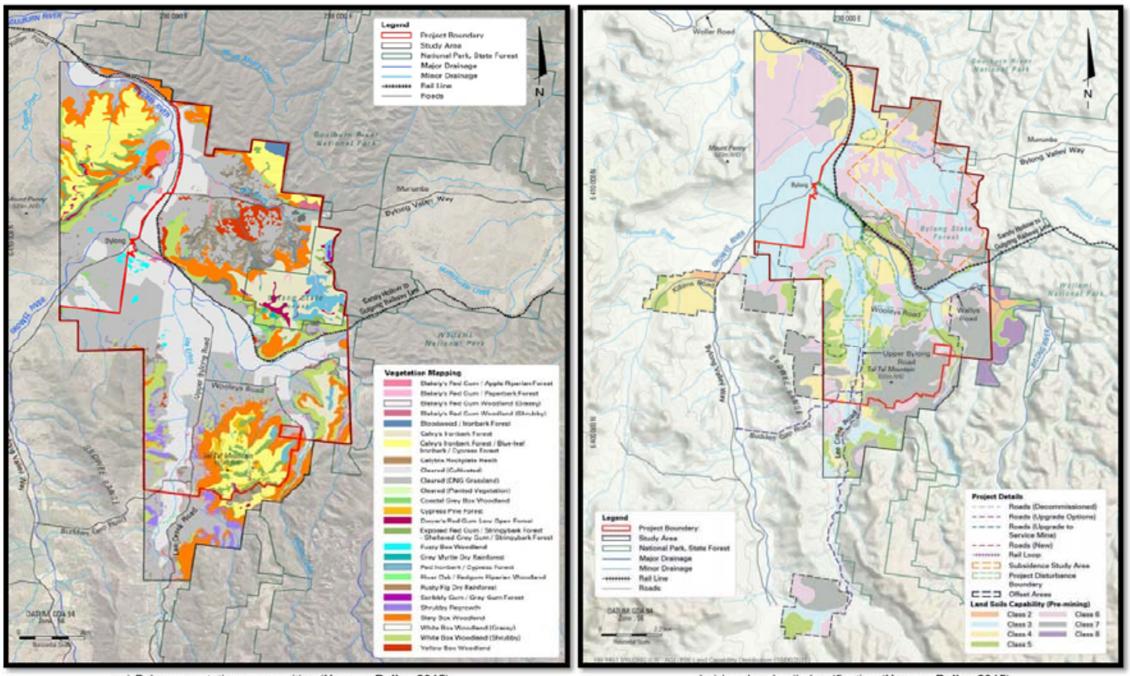
Open cut advantages & relevant justification	Perceived overall Project environmental disadvantages
Resource utilisation In general, coal resources are finite and as such from a sustainability perspective the resource utilisation should be maximised as far as possible. "*Minerals are essential to meeting the needs of the present while contributing to a sustainable future*" (Hustrulid and Kutcha 2006). Through optimal use of a resource by way of an approved mine reduces the necessity and delay of any future mine requirements. General DI-R&E requires maximising resource recovery (DI-R&E 2015). Increases benefits (i.e. royalties, jobs etc) to the State by way of a prolonged mine life. Basis of any resource company is to maximise resource recovery to satisfy initial investment decision. Reject emplacement Open cut voids and OEAs provide a complementary, logical and advantageous solution for coal processing reject disposal. The open cut mining areas have been designed and planned to ensure no open cut voids remain within the landscape post mining. Project economics and lower business case risk Inclusion of open cut mining can reduce project capital requirements, i.e. through the use of contractors, and has been highlighted as having potential lower operating costs when compared to shallow underground mining operations. As such, inclusion of open cut mining methods assists in improving project economics and in turn lowers project risk from a financial perspective. Practicality Open cut mining is generally a simplistic, safe and practical mining method utilised as the starting point for many resource deposits. The selected method of truck and excavator provides for a more flexible method suited to the deposit/environmental constraints as opposed to alternative large scale strip mines undertaken by dragline equipment. Open cut operations can be regarded as very quick to start up and generate positive cash flow as compared to underground longwall operations, especially utilising contractors, negating the long lead times and capital expense required for commencement of an underground operation without a highwall entry. This aspect provides advantages in providing relatively shorter start up time frames to operations, especially in light of unknown approval time frames etc.	Alluvial Impacts Open cut voids have been offset from relevant river systems (and associated alluvials) as per recommended NSW guidelines (DIPNR 2005), i.e. "*open cut operations should provide a barrier of 150 m between an agreed point on the highwall and a Schedule 2 stream system*". As such, significant impacts to alluvial material have been avoided through mine design (see Figure 1a). Water Impacts (Surface & Groundwater) Along with other mine planning inputs, proposed open cut voids have been sited external to significant flood extents (see Figure 1b) therefore minimising surface water impacts. Groundwater aquifers relative to open cut voids include alluvials, weathered Permian bedrock and coal seams (AGE 2015). The latter aquifer is inevitably unavoidable through any mining of the coal resource. As outlined above, primary alluvial aquifers have been offset through the mine planning process and remain *insitu* therefore limiting direct impacts on alluvials (see Figure 1a). Agricultural Land Impacts (including NSF) From the onset of the Feasibility Studies and EIS the Project has attempted to avoid disturbance of relevant agricultural land through offsetting open cut operations from these areas (process complicated through changing legislation and guideline interpretations). As a starting basis, open cut operations have been offset from Class II land & soil capability government mapping (Emery 1986). As a result of changing guidelines & legislation, coupled with site verification, proportionately small incidental quantities of highly capable land will be disturbed (SBA 2015). These relatively minor impacts are to be reduced further through the planned removal and re-emplacement of relevant soils with full rehabilitation of mining areas. Open cut mining is not proposed within the footprint of alluvials and affiliated NSF (Hansen Bailey 2015) and mining areas have purposely been offset to limit implications and allow for possible continuation of this farming method. Ecological Impacts Open cut mine planning included targeting the "cleared" (i.e. grazing lands or grasslands) valley areas therefore minimising impacts on native vegetation and threatened flora and fauna species (see Figure 2 and Figure 3). Heritage Impacts Heritage items are generally sporadic in their occurrence, variable in their significance and as such complicate definitive open cut mine planning. Precedence and practice suggests previous mining operations have gained approval to disturb/relocate/destroy such items but, as indicated above, open cut mining has targeted cleared/worked land in an attempt to limit potential impacts on such items as previous historic agricultural practices would in effect have had some level of impact/clearing on certain items. KEPCO has committed to appropriate mitigation measures for relevant impacted items. Noise & Dust Implications Through systematic discussions with relevant stakeholders, relevant modelling and strategic property acquisitions, the proposed mine plan has been adjusted to limit mining extent and mining intensity to pro-actively reduce numbers of those immediately impacted receptors. Resultant limited impacted landholders exhibit rights to voluntary acquisition or compensable mitigation works. Visual & Vista Impacts Unlike specific comparisons made to nearby open cut operations during the submission process whereby these operations are highly visual and adjacent to public roads, the Project open cut operations are significantly set back from the Bylong Valley Way and generally shielded by advantageous intervening topography and vegetation. From a comparative perspective, the Project has illustrated significant resource sacrifice (DI-R&E 2015b) to satisfy these concerns.



a.) Geology map illustrating open cut voids and off set from relevant alluvials (**AGE 2015**)
** Note distinct offset of open cut boundaries from mapped alluvials.*

b.) 100 year ARI change in water level in Bylong River Catchment (**Hansen Bailey 2015**)
**Note distinct offset of open cut boundary from modelled flood extents.*

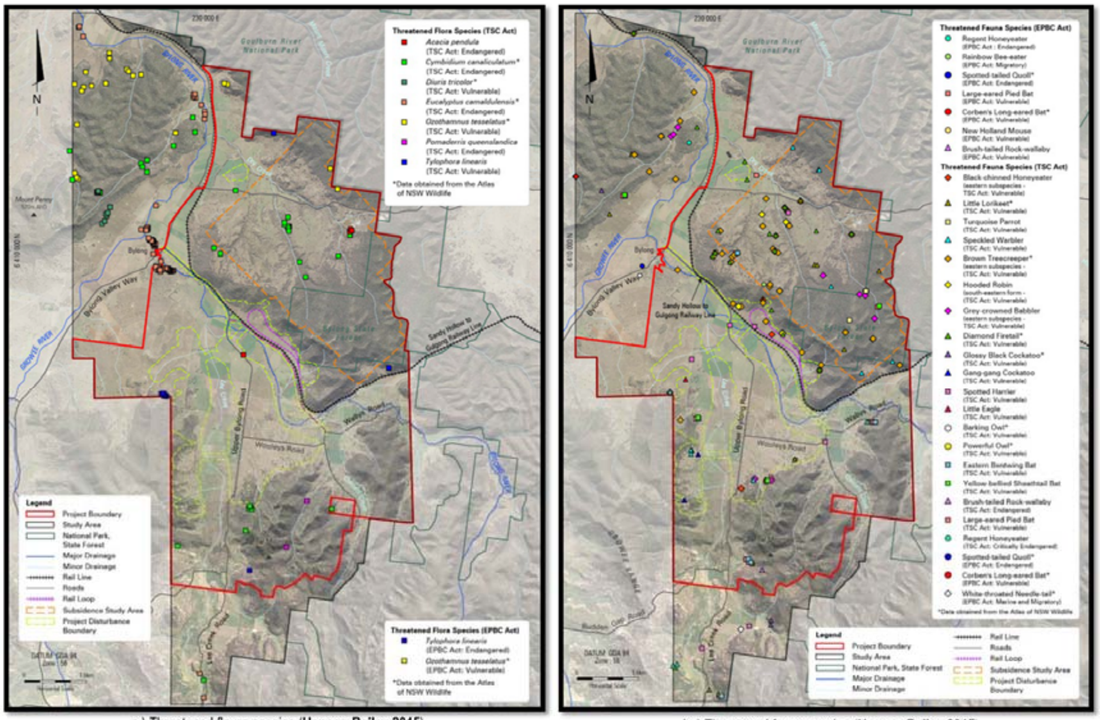
FIGURE 1. Diagrams Relevant to Alluvials and Surface Water.



a.) Bylong vegetation communities (**Hansen Bailey 2015**)

b.) Land and soil classification (**Hansen Bailey 2015**)

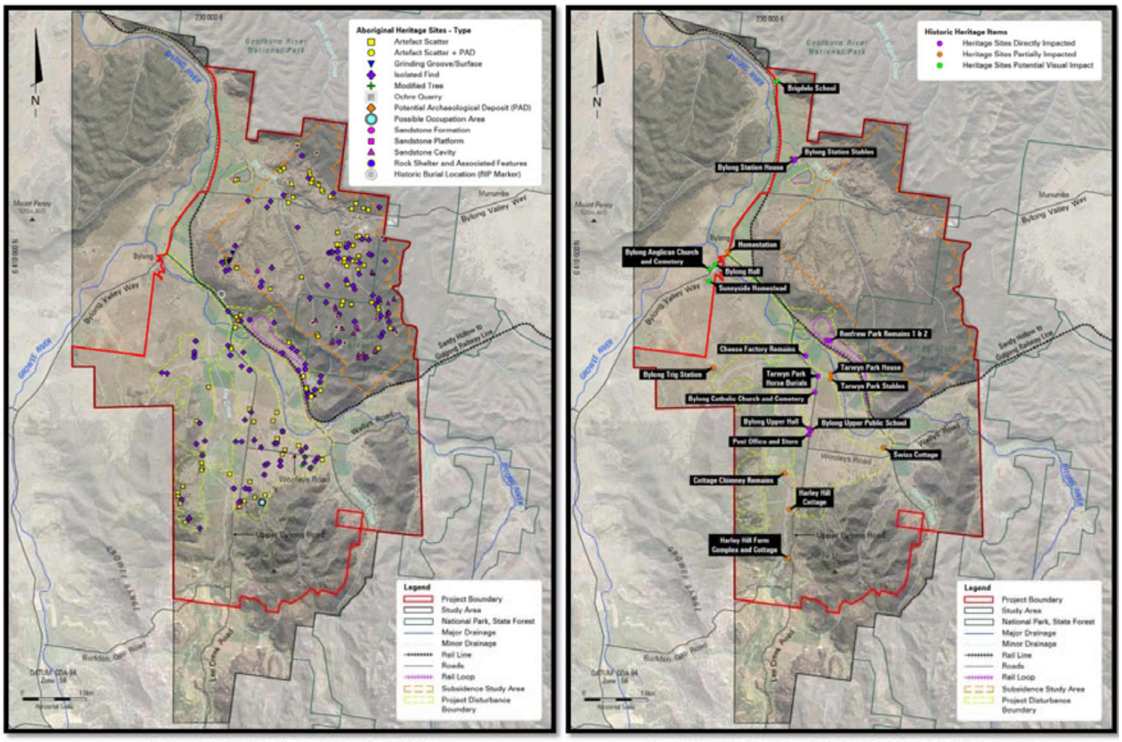
FIGURE 2. Diagrams Relevant to Vegetation, Land and Soil Classification.



a.) Threatened flaura species (**Hansen Bailey 2015**)
**Note position of open cut footprint relative to spread of threatened species indicating separation in the large majority of instances & preferred location of open cuts in this regards.*

b.) Threatened fauna species (**Hansen Bailey 2015**)
**Note general centralised location of open cut mining limiting direct interaction with spread of threatened fauna species.*

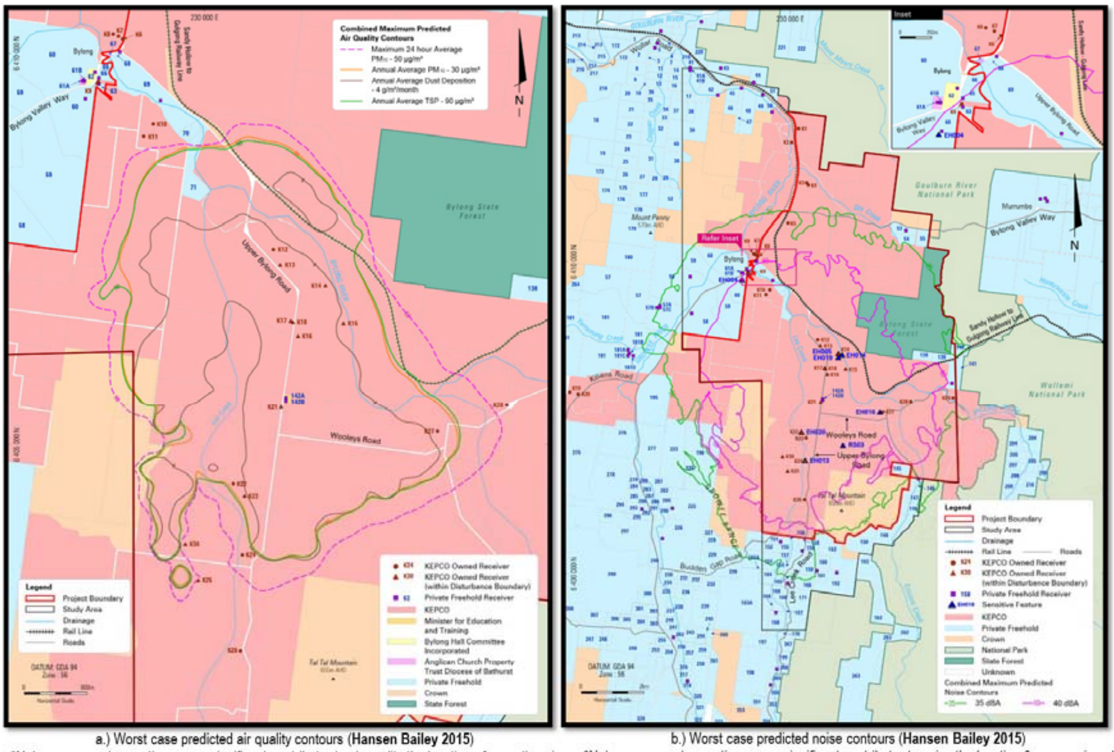
FIGURE 3. Diagrams Relevant to Threatened Flora and Fauna species.



a.) Aboriginal heritage sites (**Hansen Bailey 2015**)
**General comment - depiction may be misleading in that surveys are generally specific to the proposed Project boundary. Generally, open cut footprints are confined to previously cleared lands.*

b.) Historic heritage sites of local significance (**Hansen Bailey 2015**)
**Note that for large majority of sites the open cut footprint is generally offset.*

FIGURE 4. Diagrams Relevant to Aboriginal and Historic Heritage.



a.) Worst case predicted air quality contours (**Hansen Bailey 2015**)

**Note as open cut operations are a significant contributor to air quality the location of operations is such that the number of impacted receptors is minimal as impacts are generally confined to KEPCO land.*

b.) Worst case predicted noise contours (**Hansen Bailey 2015**)

**Note as open cut operations are a significant contributor to noise the location & sequencing of operations has limited number of external receptors as major impacts are within the confounds of KEPCO properties.*

FIGURE 5. Diagrams Relevant to Noise and Dust.

3.0 FURTHER ECONOMIC JUSTIFICATION CONSIDERATIONS AND RISK MITIGATION

On the assumption that it is accepted that open cut mining is a safer and more cost-effective mining method when compared to underground mining, then from a business case perspective the use of open cut mining, particularly at the front end of a project, delivers improved economic outcomes and naturally lowers overall Project financial risk.

Improved Project economics via way of open cut mining can be highlighted through analysis of hypothetical project earnings utilising a relevant example production profile with probable operating margins[5]. Figure 6 illustrates a hypothetical operation with Present Value (PV) earning scenarios for varied operating margins. Expected earnings can then be compared against anticipated project capital requirements thereby gaining an understanding of sensitivities and the ability of that project to service the initial capital commitment. Therefore, assuming a hypothetical 30 year mine life, which is similar to the Project, producing 5 million tonnes per annum (Mtpa) of product coal at an average margin of $20/t, then expected PV[6] earnings of approximately $1.2 billion may be achieved at a Discount Rate of 7%. From a comparative perspective (see Figure 6), the Project capital requirements are estimated at $1.3 billion (Gillespie Economics 2015) whereas the most recent comparative underground only project is that of the Wallarah 2 Coal Project with estimated capital requirements in the order of $1.5 billion (Gillespie Economics 2013). It is noted that unlike the Project, the Wallarah Project does not require a coal washery and that its capital requirements will be far less than a Bylong stand-alone underground coal mine. This hypothetical example highlights the difficulties in achieving suitable project economics from a corporate perspective (i.e. the difficulty in even paying back the original capital investment).

In the current economic climate whereby margins in thermal coal mines are falling, the project payback period extends and the ability to service the capital investment is at increased risk. Therefore preserving and improving operating margins is a priority and can be achieved through some level of open cut mining with lowered relative operating costs. In terms of the Project, should open cut mining deliver a difference of say $10/t in margin, for example, as compared to underground mining, then for the projected duration of open cut mining, i.e. 8 years, an additional $300 million in earnings before interest, tax & depreciation (EBITDA) substantially strengthens the fundamentals of the Project's business case (see Figure 6 for additional margin examples and related earnings).

From a high level economic assessment point of view, the aforementioned hypothetical analysis highlights the necessity for open cut mining to be included in the Project mine plan. Resultant improved economics via way of open cut mining assists to buffer the Project against mining cycles and related resource price fluctuations, thus lowering overall risk and ensures viability of the Project in the long run.

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[5] Utilising a hypothetical project case and margin scenario assessment eliminates any arguments relating to coal price, exchange rates, operating costs etc and provides a common platform for high level assessments from an explanatory point of view.

[6] PV = Future Worth/$(1+i)^n$, where i = Discount Rate and n = Project year.

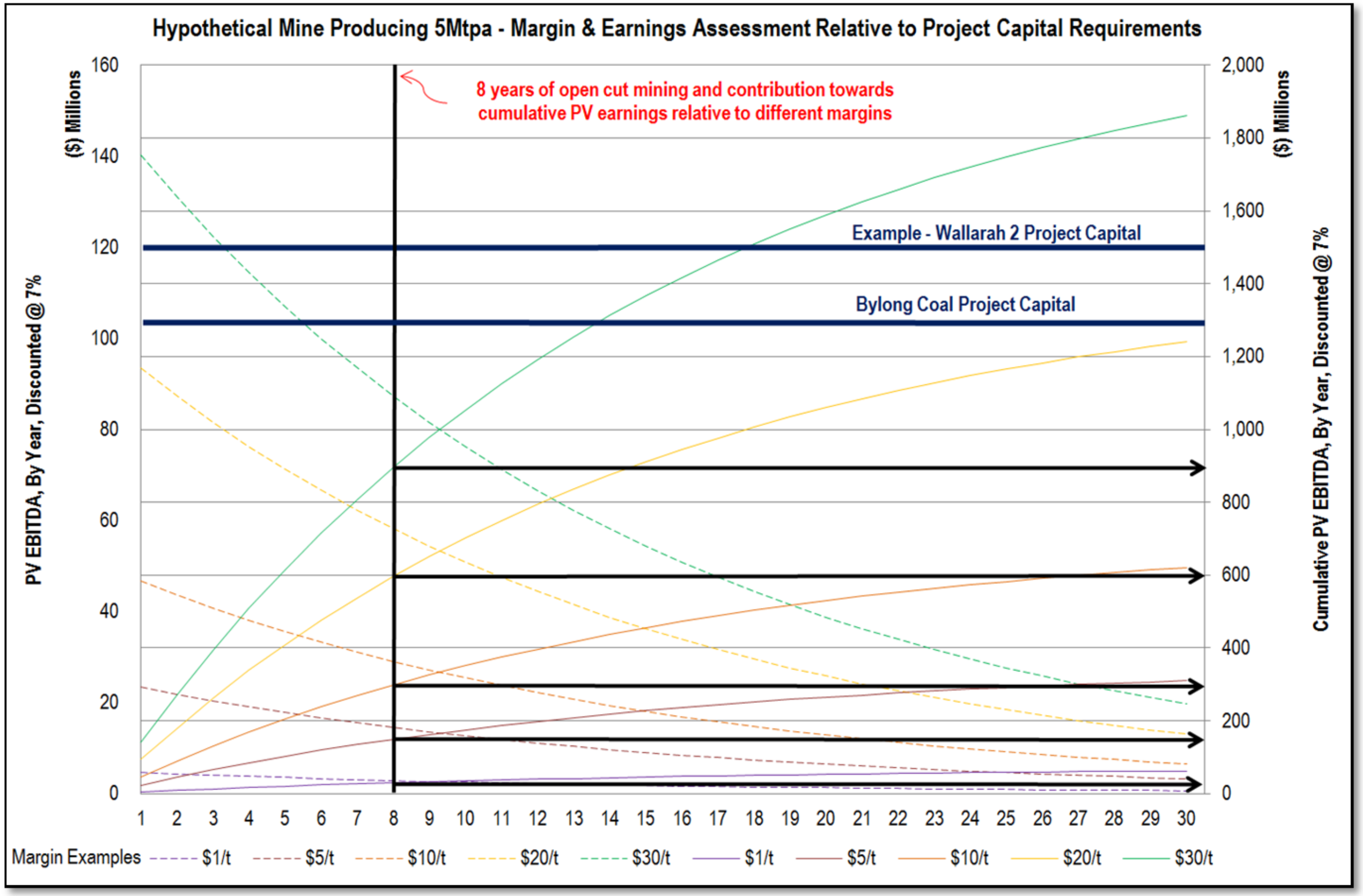

Figure 6 Hypothetical Case - Potential Earnings and Cumulative Earnings by Year.

3.1 Underground Only Option High Level Assessment

A similar type of high level comparative analysis may be undertaken to illustrate the viability of an underground only Project option. Considering the equivalent Project underground mine production profile along with relevant capital and operating costs, then a simple Discounted Cash Flow[7] (DCF) can be undertaken delivering an order of magnitude Net Present Value (NPV). Relevant sensitivity analyses conducted on the DCF can then be used to illustrate the economic inputs critical to the financial viability of the option as well as the financial viability of the option itself.

The Project underground only mine in its current form is anticipated to have a total life-of-mine (LOM) in the order of twenty years producing approximately 64 million ROM tonnes. The indicative production profile is illustrated in Table 2.

Table 2 Underground Only Option Indicative Production Profile.

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ROM (Mt)	0.1	0.5	0.4	3.7	3.6	5.7	6.0	5.9	5.0	5.6	5.6	4.6	6.3	5.4	5.5	5.3	5.6	5.9	4.7	6.0
PROD (Mt)	0.0	0.4	0.3	2.1	2.5	4.1	4.5	4.4	4.1	4.9	4.9	3.8	3.6	3.3	3.3	3.2	3.6	4.0	3.0	4.1

**NOTE – rounding to one decimal place.*

The main inputs to a representative DCF include relevant economic parameters such as coal price, exchange rate, discount rate and tax rate along with typical annual operating costs of the operation. The indicative initial capital investment and subsequent sustaining capital are also required. From a high level assessment perspective these inputs are detailed and justified as follows:

- Economic parameters:
  - Coal price – much deliberation is made of relevant thermal coal price to be utilised in economic modelling. "*It should be noted that it is not the current or historic coal prices that are relevant to the analysis but forecast prices during the years of operation*" (Gillespie Economics 2015). Therefore, for consistency, the forecast coal prices utilised in the Bylong EIS Economic Impact Assessment will be utilised in this basic assessment and any variation or opinion on the validity of such pricing will be further quantified via way of sensitivity analysis. On average, an anticipated twenty year coal price in the order of US$100/t will be utilised in this assessment. In comparison the latest available Resources and Energy Quarterly Report issued by the Office of the Chief Economist – Department of Industry, Innovation and Science suggests a benchmark thermal coal price in the order of US$60/t[8] (OCE 2015), at least in the short term. From a sensitivity analysis perspective, this represents a 40 % lower coal price from that used in this analysis. In essence, the underground only option is significantly compromised at these lower coal prices. Comparison and impacts to the NPV of this 40 % change in coal price can be made later in this section of the report detailing specific sensitivity variations.

7 The precise inputs to this DCF model are commercially in confidence.

8 Note that the thermal coal price is that of Newcastle Benchmark thermal coal pricing. The Project quality, suited to the South Korean market, is discounted against this price culminating in further stress on NPV of an underground only option.

- Exchange rate – as with coal price, much deliberation is made as to what exchange rate is to be utilised in economic modelling. For consistency the exchange rate utilised in the Bylong EIS Economic Impact Assessment of 0.84 US$/AUS$ has been utilised within this high level study. In comparison the latest Statement on Monetary Policy issued by the Reserve Bank of Australia suggests a U.S. dollar to Australian dollar exchange rate of 0.78 utilised in preparing domestic forecasts for the current period (RBA 2016). From a sensitivity analysis perspective, current exchange rates are approximately 7 % lower from those used in this assessment. In essence, the underground only economics are improved via way of lowering exchange rates. Comparison and impacts to the NPV of this 7 % change in exchange rate can be made later in this section of the report detailing specific sensitivity variations.
- Discount rate – 7% will be utilised consistent with the Project EIS Economic Impact Assessment (Gillespie Economics 2015).
- Tax rate – current Australian corporate tax rate is 30% (Gillespie Economics 2015).

- Typical underground only mine Free on Board (FOB) costs:

  In general, underground coal mine FOB costs are broken down into the following broad categories (along with indicative percentage break-down):

  - Mining costs (~44%)
  - Coal handling and preparation costs (~14%)
  - Product transport and port costs (~19%)
  - Overheads and indirect costs (~9%)
  - Royalty and levy costs (~14%)

Irrespective of individual FOB categories, the actual total FOB costs ultimately determine the NPV of an underground only option. In the case of the underground only option analysis an average FOB cost of approximately AUS$67/t during longwall production (US$53/t using an exchange rate of 0.78 or US$56/t using an exchange rate of 0.84) has been derived as an appropriate cost input with respect to the current EIS Economic Impact Assessment, a possible Project underground only mine plan and expected overarching mining conditions. Irrespective of the selected value, when benchmarked against typical seaborne thermal cost curves, the selected FOB costs are relatively optimistic and fall within the lower quartiles of the Australian producers, as shown in Figure 7. Any higher value of FOB cost used would further erode value of an underground only mine option.

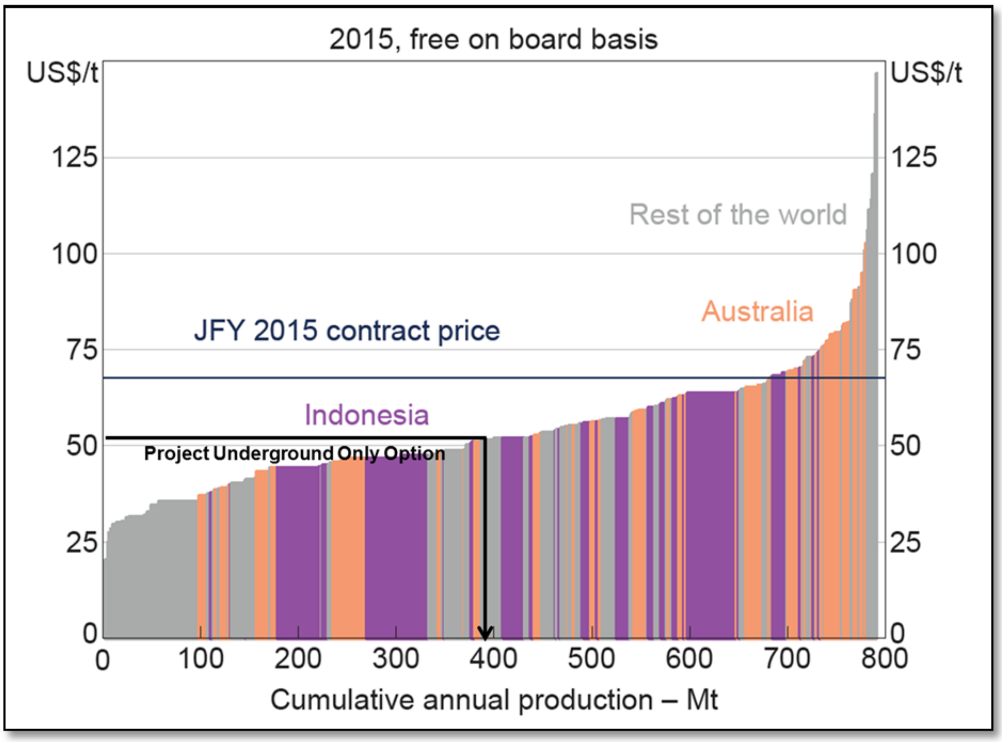

Figure 7 Seaborne Thermal Coal Production Costs (RBA 2015).

- Typical underground only mine capital costs:

Gillespie Economics 2015 provides the indicative capital requirements specific to the underground mining component of the Project:

- Underground mining equipment and infrastructure – AUS$419M.
- Coal Handling and preparation plant (including sustaining capital) – AUS$231M.
- Surface infrastructure for both open cut and underground (including sustaining capital) – AUS$470M.

  Note – from an underground only option perspective a certain proportion of this capital will not be required and as such an estimate is to be made. To be conservative, a surface infrastructure capital value of AUS$235M will be utilised, approximately 50% of the original Project surface infrastructure capital requirements. This is exclusive of any capital requirements associated with reject disposal requirements and as such inclusion of additional capital in this regard would result in reduction of anticipated NPV.
- Owners Costs – AUS$75M.

For high level evaluation of an underground only option a total initial capital of AUS$960M is used along with an additional AUS$19M per annum in sustaining capital. From a benchmark perspective these capital inputs are comparable, if not optimistic, to recent similar underground only projects, such as the previously mentioned Wallarah 2 Coal Project initial capital requirements of AUS$1.5 billion (Gillespie Economics 2013). Notably the abovementioned project does not require reject disposal facilities nor coal washing facilities indicating that typical capital requirements would be much higher should such facilities be required.

The resultant DCF analysis of the abovementioned underground only production profile with associated costs delivers a negative NPV in the order of AUS$89M. This clearly demonstrates that in the Project's current configuration an underground only mine is not a viable alternative to the Project in its current form which relies upon a combination of both open cut and underground mining.

The sensitivity analyses of the underground only option include assessment of the resultant NPV via way of varying critical inputs of the DCF. Critical inputs are changed by a factor within reasonable bounds with each scenario delivering a specific NPV relative to that input and the corresponding change. The results are depicted graphically via way of Tornado and Spider diagrams (see Figures 8 and Figure 9). Sensitivity analysis of the DCF for the underground only mine option suggests, as with the majority of coal mining projects, the inputs that influence the NPV outcome the greatest are as follows (in descending order of influence):

1.) Coal price and exchange rate – these are generally outside the control of the Project.

2.) Production - has been fixed in this analysis so as to reflect the Project underground production profile.

3.) Operating and capital costs – based on the overarching economic climate, the Project has some capability in optimising these costs. The sensitivity analysis highlights the relatively large changes required in input parameters for the underground only option to in fact deliver a positive NPV.

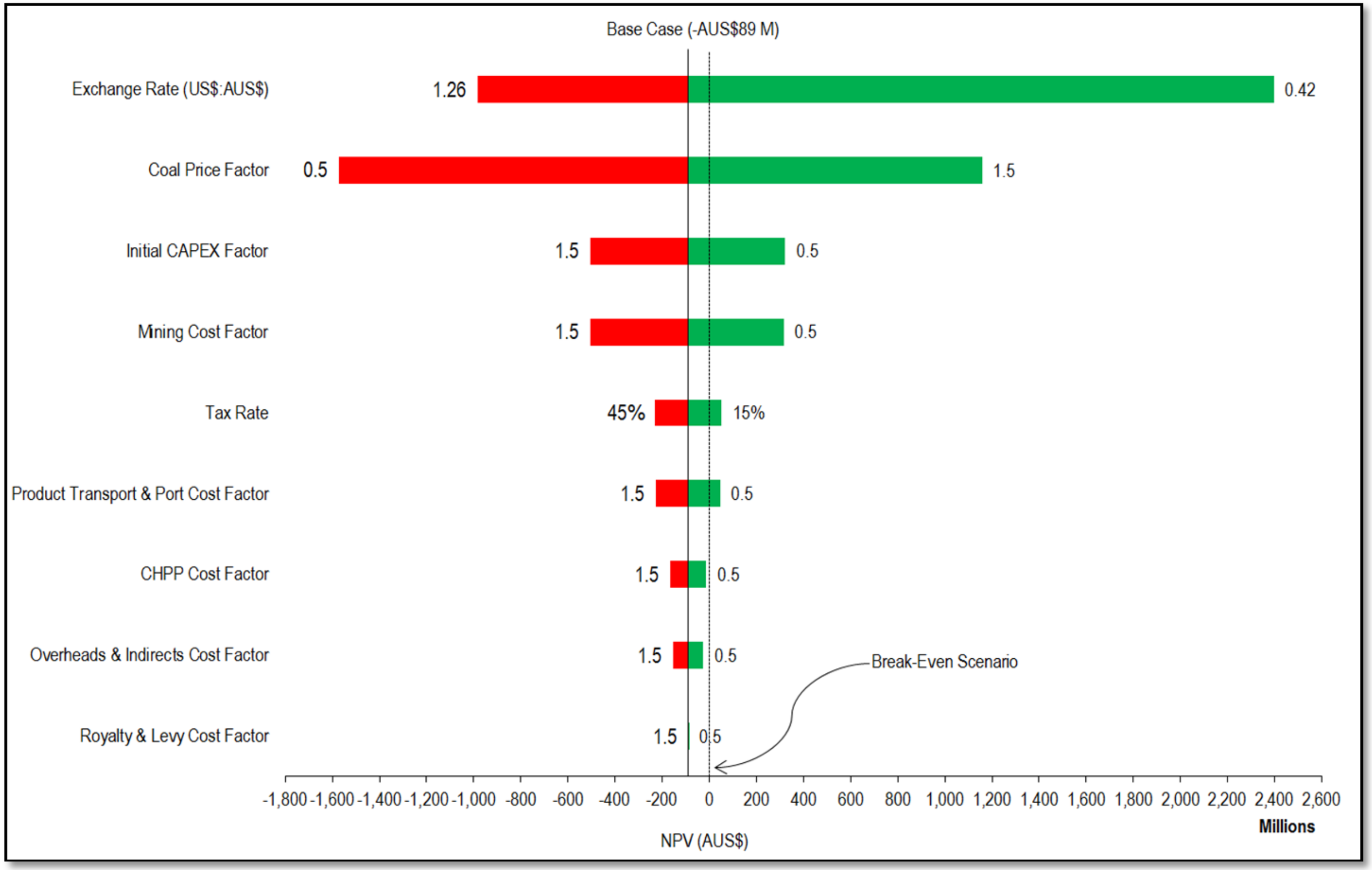

Figure 8 Underground Only Option NPV Sensitivity Analysis (Tornado Diagram).

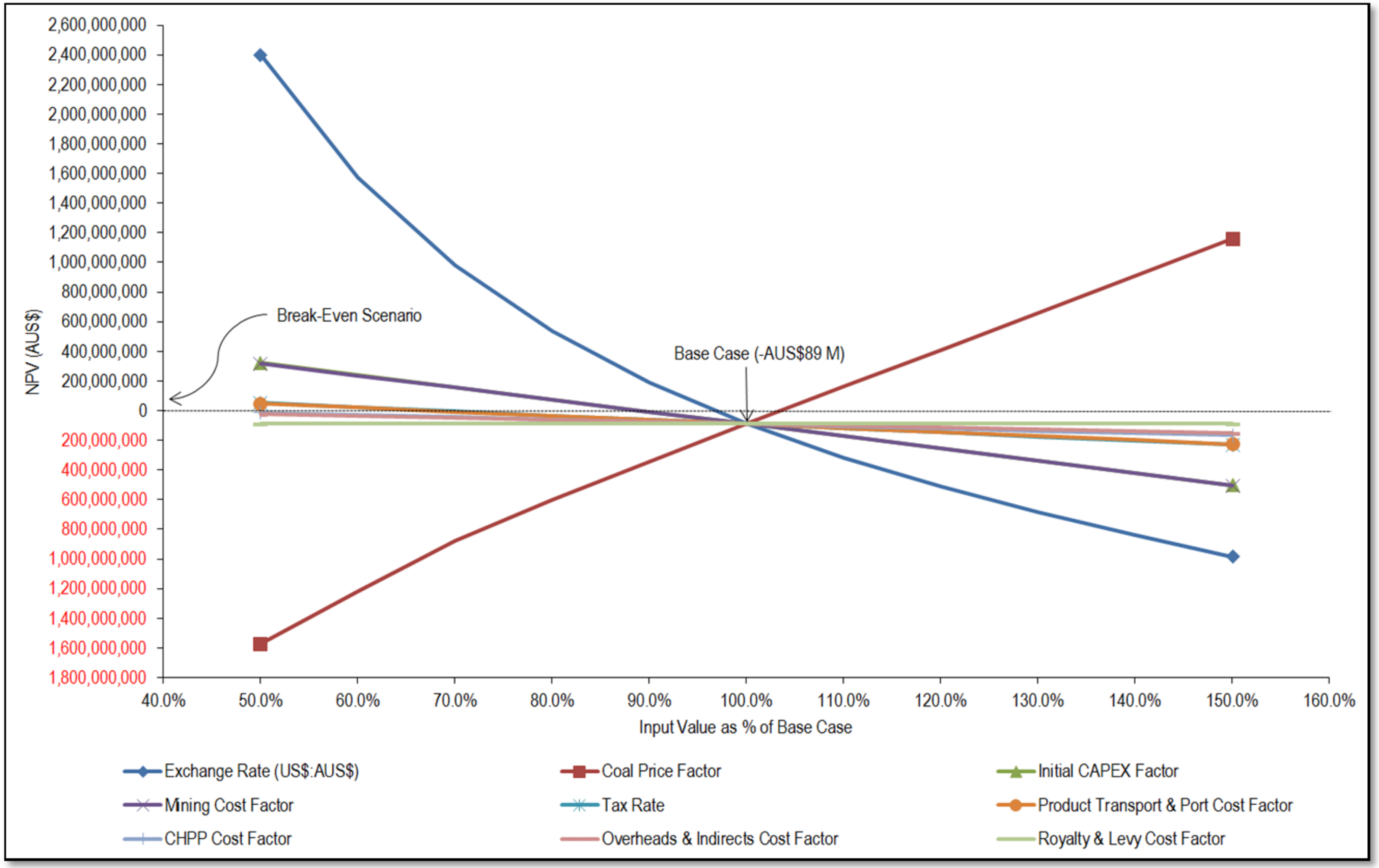

Figure 9 Underground Only Option NPV Sensitivity Analysis (Spider Diagram).

Therefore as illustrated in Figure 8 and Figure 9, in order to fundamentally influence the economic viability of an underground only option and at least achieve a break-even scenario, significant increases in coal price, lowering of exchange rate as well as significant reduction of capital and mine operating costs are required. In essence, the sensitivity analysis further demonstrates that the underground only option specific to the Project is currently unviable when evaluated within a range of realistic input assumptions.

4.0 CONCLUSIONS

In addition to the Mine Justification Report as provided within Appendix E of the Bylong Coal Project EIS (Mine Advice 2015) this report provides further justification over the imperative for the open cut component of the mine plan.

Open cut mining projects will inevitably incur some level of environmental impact – this is not in dispute. The key outcome in the mine planning process is the development of a mine plan that limits these impacts to an acceptable level. The abovementioned rationalisation highlights the planning, engineering and concessions already embraced to achieve such an outcome when considering open cut mining as part of the Project mine plan in its current form. The justification provided is further underpinned through specific Government departmental submissions whereby reviews by suitably qualified specialists have concluded the following:

- "*Office of Environment (OEH) recognises KEPCO has significantly altered the proposed mine plan to avoid or mitigate impacts on Biophysical Strategic Agricultural Land, alluvial land, Critical Industry Cluster areas and the environment*" (OEH 2015).
- "*The Division supports the Bylong Coal Project (the Project) as a responsible utilisation of the State's coal resources*", "*large areas of low strip ratio open cut resources have been excluded from mine planning predominantly to avoid defined Biophysical Strategic Agricultural Land. Other constraints to open cut mine design include the Bylong Village, infrastructure and rivers, creeks and associated alluvials*" and "*given the constraints outlined in the proponent's EIS, the Division considers the Project mine plan for both open cut and underground operations to adequately recover coal resources*" (DI-R&E 2015).
- "*Council supports, in principle the project without the temporary workers accommodation facility" (MWRC 2015)*

In concluding, the inclusion of open cut mining has been demonstrated to not only aid the effective utilisation of the State's resources in line with overarching site specific environmental constraints, but is also an economic imperative to improve Project viability.

Open cut mining also provides other practical and eloquent advantages such as supporting the process of disposing coal processing rejects. Not only does open cut mining provide a suitable process to facilitate underground reject disposal in the long term but underground mining in turn provides a synergetic advantage whereby these rejects are utilised in filling open cut voids. The latter resulting in no prominent final void attributed to open cut mining. The proposed use of open cut mining provides a lower operating and capital cost base from a rejects disposal point of view and reduces latent risk and legacies associated with surface disposal techniques applicable to an underground only option.

Therefore in the Project's current form, the use of open cut mining as part of the mine plan is considered an imperative.

5.0 REFERENCES

Australasian Groundwater and Environmental Consultants (AGE) (2015). Bylong Coal Project Groundwater Impact Assessment. Consulting report prepared for Hansen Bailey Pty Ltd as part of the EIS process.

Boutilier, R.G., Thompson, I. (2011). Social License to Operate. Chapter 17.2. SME Mining Engineering Handbook. Third Edition. Volume Two. Society for Mining, Metallurgy and Exploration.

Department of Industry, Resources and Energy (DI-R&E) (2013). ESG3: Mining Operations Plan (MOP) Guidelines. Web address:

http://www.resourcesandenergy.nsw.gov.au/__data/assets/pdf_file/0007/527911/ESG3-Mining-Operations-Plan-MOP-Guidelines-September-2013.pdf

Department of Industry, Resources and Energy (DI-R&E) (2015a). Policy on Conceptual Project Development Plans for Mining Projects. Web address:

http://www.resourcesandenergy.nsw.gov.au/miners-and-explorers/applications-and-approvals/mining-and-exploration-in-nsw/project-approvals/development_plans. Date accessed 28/01/2016.

Department of Industry, Resources and Energy (DI-R&E) (2015b). Bylong Coal Project – Review of Environmental Impact Statement. Submission (No. 130987) provided to the Department of Planning & Environment as part of the Bylong Project Public Exhibition process.

Department of Infrastructure, Planning and Natural Resources (DIPNR) (2005). Management of Stream/Aquifer System in Coal Mining Developments – Stream/Aquifer Guidelines, Hunter Region.

Eggert, R. (2006). Mining, Sustainability and Sustainable Development. Australian Mineral Economics, Monograph 24. The Australian Institute of Mining and Metallurgy.

Emery, K.A. (1986) Rural Land Capability Mapping. Soil Conservation Service of NSW. Sydney, NSW.

GHD (2014). Airly Mine Reject Management Options Feasibility Analysis.

Gillespie Economics (2013). Wallarah 2 Coal Project Economic Impact Assessment. Consulting report prepared for Hansen Bailey Pty Ltd as part of the EIS process.

Gillespie Economics (2015). Bylong Coal Project Economic Impact Assessment. Consulting report prepared for Hansen Bailey Pty Ltd as part of the EIS process.

Gilroy, T., Nielsen, D., Sich, G., Nielsen, D. (2012). Metropolitan Mine underground emplacement of coal rejects – A Case Study. Coal Operator's Conference 2012.

Hansen Bailey (2015). Bylong Coal Project Environmental Impact Statement. Consulting report prepared for the Department of Planning & Environment.

Hustrulid, W., Kutcha, M. (2006). Open Pit Mine Planning and Design - Fundamentals. Taylor & Francis plc., London, UK.

Luxford, J. (1997). Surface to Underground – Making the Decision. Conference Proceedings MINDEV97: The Third International Conference on Mine Project Development. The Australian Institute of Mining and Metallurgy.

Mid-Western Regional Council (MWRC)(2015). Submission - SSD 14_6367 Bylong Coal Project EIS. Submission (No. 130842) provided to the Department of Planning & Environment as part of the Bylong Project Public Exhibition process.

Mine Advice (2015). Bylong Coal Project Environmental Impact Statement, Appendix E, Mine Plan Justification Report. Consulting report prepared by Mine Advice Pty Ltd, for Worley Parsons Services Pty Ltd on behalf KEPCO Bylong Australia, dated May 2015.

Office of Environment and Heritage (OEH) (2015). Bylong Coal Project Response to EIS. Submission (No.130935) provided to the Department of Planning & Environment as part of the Bylong Project Public Exhibition process.

Office of the Chief Economist (OCE) (2015). Resources and Energy Quarterly, December Quarter 2015. Department of Industry, Innovation and Science.

Reserve Bank of Australia (RBA) (2015). Developments in Thermal Coal Markets – Bulletin, June Quarter 2015.

Reserve Bank of Australia (RBA) (2016). Statement on Monetary Policy – Economic Outlook, February 2016.

Runge Pincock Minarco (RPM) (2014). 2014 JORC Coal Resources Report KEPCO Bylong Project. Consulting report for Cockatoo Coal Ltd on behalf if KEPCO Australia Pty Ltd.

Scott Barnett & Associates (SBA) (2015). Bylong Coal Project Agricultural Impact Statement. Consulting report prepared for Hansen Bailey Pty Ltd as part of the EIS process.

Spur Hill Underground Coking Coal Project (SHUCCP) (2013). Application for a Gateway Certificate Technical Review. Report submitted to the Mining & Petroleum Gateway Panel.

WRM (2015). Bylong Coal Project – Surface Water and Flooding Impact Assessment. Consulting report prepared for Hansen Bailey Pty Ltd as part of the EIS process.