Part F

Evaluation and Justification of the Project

Preamble

This part of the Environmental Assessment concludes the document with an evaluation of the Glennies Creek Open Cut Coal Mine Project. Alternative development options are considered and the residual environmental risks assessed. This Part also includes an assessment of the Project against the principles of Ecologically Sustainable Development, and concludes with a justification of the Project.

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F1 DEVELOPMENT ALTERNATIVES

F1.1 Introduction

The Director-General's requirements issued on 25 January 2007 required that the *Environmental Assessment* include a detailed description of the development alternatives considered.

The considerations of feasible alternatives to the proposed activities are discussed in this Part and relate principally to:

- alternative open cut pit sizes;
- alternative mining methods;
- alternative mining sequences;
- alternative waste rock emplacement designs;
- alternative waste rock emplacement locations; and
- alternative dirty water containment design.

The alternative of not developing the proposed open cut is considered in Part F3.

F1.2 Alternative Open Cut Pit Sizes

The Project as proposed would recover an estimated 7.7Mt of coal from the area of the proposed open cut shown in **Figure B3**. Extension of the proposed open cut to the south and east is constrained by the sub-cropping of the mineable coal seams, as well as current and former mining activities. Extension of the proposed open cut northwards was considered during the planning phase of the Project but ultimately rejected due to the factors listed below.

- Extension to the northeast would require the relocation of Stony Creek Road for comparatively low yields.
- Extension to the north would encounter prohibitive stripping ratios, rendering such an extension uneconomic under current market conditions.
- As discussed in detail in Part B1.3.1, there is the potential to extract a further 1.3Mt of coal from an area to the northwest of the proposed open cut (**Figure B2).** This, however, would encroach upon Possum Skin Dam and impact on the integrated site water management system by reducing the on-site water storage and evaporation capacity. The Proponent is unwilling at present to reduce this capacity. As a result, extraction of this coal does not form a part of this application. However, should the Proponent elect to exploit the remaining coal reserve beneath Possum Skin Dam in the future, a subsequent modification application and related environmental assessment would be submitted to the Department of Planning.
- Extension of the proposed open cut to the west would encounter high stripping ratios, require relocation of the Glennies Creek Colliery surface facilities and, possibly, Middle Falbrook Road.

F1.3 Alternative Mining Methods

Underground longwall mining methods were considered but as the coal seams within the proposed pit shell are relatively close to the surface, open cut mining is more economically viable than underground mining. In addition, the coal to be mined consists of multiple seams with only limited thicknesses of intervening interburden which would preclude a multi seam underground mining operation.

F1.4 Alternative Mining Sequences

The option of mining the proposed open cut from west to east rather than east to west was considered. This alternative would have allowed for the enhancement of the biodiversity offset areas over a longer timeframe prior to disturbance of areas of native vegetation with high biodiversity value in the eastern section of the open cut. However, this option was rejected for the following reasons.

- It would prevent the future recovery of the 1.3Mt coal resource beneath the southern part of Possum Skin Dam (see Part B1.3.1).
- It would result in the final void being located in the northeast of the proposed open cut which would prevent access to any potential underground coal resource to the north and west of the proposed open cut from the Glennies Creek final void.
- Commencement of open cut mining in the west would initially result in a longer haul distance for waste rock during the early stages of the proposed mining sequence, significantly impacting on the viability of the Project.

F1.5 Alternative Waste Rock Emplacement Designs

A number of alternative final landforms for the waste rock emplacements were considered during the environmental assessment process. The alternatives, together with their advantages and disadvantages are provided in **Table F1**.

Table F1
Alternative Waste Rock Emplacement Designs

Design	Advantages	Disadvantages
Higher emplacement with smaller disturbance footprint.	• Smaller footprint hence less area of vegetation cleared.	• Increased visual impact from a more imposing landform and less aesthetic blending with the existing Camberwell waste rock emplacement.
Lower emplacement with steeper slopes.	• Less visually intrusive.	• Steeper slopes would result in less successful or unsuccessful rehabilitation, and a higher potential for erosion.
Lower emplacement with larger disturbance footprint.	• Less visually intrusive.	• Clearing of additional vegetation and habitat would be required.

The design presented in Part B7.3 was considered the best compromise between potential visual impacts, impacts on native vegetation and fauna, and providing a stable final landform.

F1.6 Alternative Waste Rock Emplacement Locations

A number of alternative out-of-pit waste rock emplacement locations were considered. The two feasible alternative locations and their advantages and disadvantages are presented in **Table F2**. It is further noted that footprint of the selected out-of-pit waste rock emplacement was refined/adjusted to minimise impacts upon known Brush-tailed Phascogale habitat.

Table F2
Alternative Waste Rock Emplacement Locations

Alternative Emplacement Location	Advantages	Disadvantages
North of the proposed open cut.	• Minimise the area of disturbance of native vegetation.	• Emplacement closer to surrounding residences with resulting increased air quality, noise and visual amenity impacts. • Increased haul distances and costs.
Infilling of the Camberwell North Pit.	• No or reduced out-of-pit waste rock emplacement.	• Block access to the Glennies Creek Underground Coal Mine.

The footprint of the proposed waste rock emplacement is considered to be the best location because impacts on residents would be minimised and continued access to the Glennies Creek Underground Coal Mine operations would not be compromised.

F1.7 Dirty Water Containment Design

The Proponent considered using a single, larger Dirty Water Containment Dam in the same location as the Northern Dirty Water Containment Dam. However, the footprint of the single Dirty Water Containment Dam would have impinged upon the area of the Bull Oak Forest Community to the east of the out-of-pit waste rock emplacement and would have resulted in a greater loss of habitat suitable for the threatened Brush-tailed Phascogale than the proposed Dirty Water Containment Dam design. As a result, the construction of a single Dirty Water Containment Dam was rejected in favour of a small dam and a supplementary Southern Dirty Water Containment Dam.

F2 PROJECT EVALUATION

F2.1 Introduction

In order to evaluate the environmental impact of the Project, the residual impacts of the Project, ie. those predicted following the adoption of the proposed design and operational safeguards and management measures, were examined through the completion of a further environmental risk analysis for the Project (Part F2.2). The residual environmental impacts are then evaluated in the context of ecologically sustainable development, to further consider their acceptability (Part F2.3).

Part F2.4 presents an overall summary of the Project evaluation. This forms the basis for the Project justification presented in Part F3.

F2.2 Residual Environmental Risks

An assessment of the unmitigated environmental risks associated with the Project has previously been presented in **Table C2**. Taking into account the design and operational safeguards and management measures described in Part D, together with the commitments provided in Part E, an assessment of the mitigated risks associated with the Project was completed for each potential environmental impact based on the likelihood of occurrence and potential environmental consequence. **Tables C2**, **C3** and **C4** which outline the basis for determining the risk posed (without mitigation) are reproduced as **Tables F3**, **F4** and **F5**. **Table F6** reproduces the results of the analysis of, (unmitigated) risk together with the residual (mitigated) risks associated with the Project.

Table F3
Qualitative Consequence Rating

Level	Descriptor	Description
5	Catastrophic	• Massive and permanent detrimental impacts on the environment. • Very large area of impact. • Massive remediation costs. • Reportable to government agencies. • Large fines and prosecution resulting in potential closure of the operation.
4	Major	• Extensive and/or permanent detrimental impacts on the environment. • Large area of impact. • Very large remediation costs. • Reportable to government agencies. • Possible prosecution and fine.
3	Moderate	• Substantial temporary or minor long term detrimental impact to the environment. • Moderately large area of impact. • Moderate remediation costs. • Reportable to government agencies. • Further action may be requested by government agency.
2	Minor	• Minor detrimental impact on the environment. • Affects a small area. • Minimal remediation costs. • Reportable to internal management only. • No operational constraints posed.
1	Insignificant	• Negligible and temporary detrimental impact on the environment. • Affects an isolated area. • No remediation costs. • Reportable to internal management only. • No operational constraints posed.
Source: Modified after Standards Australia - *Environmental Risk Management – Principles and Process* - Table 4(B)		

Table F4
Qualitative Likelihood Rating

Level	Descriptor	Description
A	Almost Certain	Is expected to occur in most circumstances.
B	Likely	Will probably occur in most circumstances.
C	Possible	Could occur.
D	Unlikely	Could occur but not expected.
E	Rare	Occurs only in exceptional circumstances.
Source: Standards Australia - *Environmental Risk Management – Principles and Process* - Table 4(A)		

Table F5
Risk Matrix

Likelihood	Consequences				
	Insignificant 1	Minor 2	Moderate 3	Major 4	Catastrophic 5
A (Almost Certain)	H	H	E	E	E
B (Likely)	M	H	H	E	E
C (Possible)	L	M	H	E	E
D (Unlikely)	L	L	M	H	E
E (Rare)	L	L	M	H	H

Note: Rating after Standards Australia - *Environmental Risk Management – Principles and Process* - Table 4(C)

Table F6
Mitigated Risks Associated with the Project

Environmental Issue	Risk Source/Potential Impact(s)	Potential Environmental Impacts	Unmitigated Risk	Mitigated Consequence	Mitigated Likelihood	Mitigated Risk
Water	• Discharge of dirty, saline or contaminated water to surface drainages or aquifers.	• Reduced water quality and impacts on downstream ecosystems, agriculture and groundwater quality.	M	3	E	M
	• Reduction in environmental flows through on-site capture of water.	• Reduced natural surface water flows and impacts on downstream ecosystems, agriculture and groundwater quality.	M	1	C	L
	• Pollution of groundwater by hydrocarbons, salinity and chemicals.	• Reduced groundwater quality and impacts on ecosystems and agriculture at and downstream from discharge point.	L	3	E	L
	• Reduction of groundwater levels due to mine in-flows.	• Reduction of groundwater levels and impacts on ecosystems and agriculture at and downstream from discharge point.	M	2	E	L
	• Altered flood regimes.	• Indirect impacts on native vegetation communities and ecosystems.	L	2	E	L
Air Quality	• Dust emissions from mine operations and vehicle movements.	• Nuisance / amenity impacts from dust deposited on window sills, cars, surfaces etc. Adverse health impacts if PM_{10} levels are excessive.	H	3	D	L
	• Greenhouse gas emissions from mining and transportation operations.	• Contribution to global greenhouse gas emissions.	L	1	B	M
	• Greenhouse gas emissions from burning product coal.	• Contribution to global greenhouse gas emissions.	M	1	B	M
	• Emission of odours, noxious gases (ie. NO, SO_2).	• Nuisance/health impacts on residents.	L	2	E	L
Flora and Fauna	• Removal of native vegetation due to land clearing activities.	• Loss of, or alteration to, existing vegetation communities and habitats, as well as adverse impacts on fauna. Reduced biodiversity.	H	2	C	M
	• Disturbance to habitat as a result of project operations, ie. noise, dust, contaminated water etc.	• Direct adverse impact(s) on threatened species, populations or communities. Reduced biodiversity.	H	2	E	L

Notes
1 – Potential consequence of destruction of Aboriginal objects can only be assessed by the local Aboriginal community. For the purpose of this risk analysis consequence is assumed to be Moderate.
2 – Other potential socio-economic impacts such as noise and dust have been analysed under those specific issues

Table F6 (Cont'd)
Mitigated Risks Associated with the Project

Environmental Issue	Risk Source/Potential Impact(s)	Potential Environmental Impacts	Unmitigated Risk	Mitigated Consequence	Mitigated Likelihood	Mitigated Risk
Noise and vibration	• Increased noise levels from mine and ancillary operations.	• Nuisance / amenity impacts, including sleep disturbance.	H	2	D	L
	• Increased levels of vibration from mine blasting.	• Structural damage to buildings and structures. Nuisance / amenity impacts on surrounding landowners / residents. Reduced agricultural production.	L	2	E	L
Rehabilitation, Final Landform	• Modified / unstable landform on completion of the Project.	• Excessive erosion, modified water flows, safety issues, permanent scaring.	H	2	D	L
	• Reduced capability of final landform or failure of rehabilitation.	• Reduced biodiversity and/or agricultural production. Erosion, dust generation, permanent scaring.	H	2	D	L
Transportation	• Increased traffic levels due to movement of workforce and contractors.	• Increased traffic congestion. Elevated risk of accident/incident on local roads. Road pavement deterioration.	M	1	D	L
	• Temporary closure or other restriction on road network.	• Delayed journeys, unpredictable arrival times.	M	2	D	L
	• Simultaneous closure of Stony Creek and Glennies Creek Roads.	• Closure of the most convenient access routes to the Glennies Creek area.	M	2	D	L
Aboriginal Heritage[1]	• Removal or destruction of Aboriginal sites and/or objects.	• Impact on Aboriginal cultural heritage.	H	3	E	M
Visual Amenity	• Changes in visual characteristics of the Project Site.	• Decreased visual amenity.	M	1	D	L
Socio-Economic Impacts[2]	• Potential changes in employment and infrastructure.	• Improved economic activity and related social impacts attributable to reduced unemployment.	NA			
	• Perceived or actual Impacts on amenity of neighbouring properties.	• Reduced quality of life (actual or perceived) and / or property values.	M	1	D	L
	• Reduced property values due to presence of mining operation.	• Reduced individual wealth.	M	1	C	L
Soil and Land Capability	• Reduction in soil quality through stripping and stockpiling.	• Erosion, reduced soil capability, biodiversity and / or agricultural productivity.	H	3	D	M
	• Increased erosion and soil loss through poor rehabilitation and / or surface water control.	• Reduced soil capability, agricultural productivity or biodiversity, permanent scaring.	H	2	D	L

Notes
1 – Potential cultural consequence of destruction of Aboriginal objects can only be assessed by the local Aboriginal community. For the purpose of this risk analysis consequence is assumed to be Moderate. (TABLE AMENDED TO REFLECT THIS NOTE)
2 – Other potential socio-economic impacts such as noise and dust have been analysed under those specific issues

As can be seen from **Table F6,** the proposed design and operational safeguards, together with the proposed management measures, are anticipated to reduce the likelihood of an environmental incident occurring as a result of the Proponent's activities. In a number of instances, the measures are also expected to result in a reduction in the consequence of a potential impact or risk. As a result, the proposed safeguards and management measures are anticipated to reduce the risk of unwanted environmental impact or incidents to low to moderate.

It is acknowledged, however, that this analysis of environmental risk is based on a community wide assessment. Individuals within the community may be impacted to greater or lesser extent and have different perceptions of environmental values. The degree of impact upon a particular resident would be dependent on the distance and direction of their residence from the Project Site, the topographic position of the residence in relation to the Project Site and the sensitivity of each resident to the particular class of impact.

F2.3 Ecologically Sustainable Development

F2.3.1 Introduction

Ecologically sustainable development (ESD) is defined in Section 6(2) of the *Protection of the Environment Administration Act 1991* as follows.

> *Ecologically sustainable development requires the effective integration of economic and environmental considerations in decision-making processes. Ecologically sustainable development can be achieved through the implementation of the following principles and programs:*
>
> *(a) the precautionary principle—namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:*
>
> *(i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and*
>
> *(ii) an assessment of the risk-weighted consequences of various options,*
>
> *(b) inter-generational equity—namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations,*
>
> *(c) conservation of biological diversity and ecological integrity—namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,*
>
> *(d) improved valuation, pricing and incentive mechanisms—namely, that environmental factors should be included in the valuation of assets and services, such as:*
>
> *(i) polluter pays—that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,*

> *(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,*
>
> *(iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.*

as "*development which meets the needs of the present without compromising the ability of future generations to meet their own needs*" (The World Commission for the Environment and Development, 1988, p.43). The principle aims to allow the needs of the present generation to be met, while conserving the long-term viability of ecosystems for future generations. The 1992 *Inter-governmental Agreement on the Environment* identified four key guiding principles for ESD. These are:

- the precautionary principle;
- social equity through intra- and inter-generational equity;
- the conservation of biodiversity and ecological integrity; and
- the promotion of improved valuation and pricing of environmental resources.

During the design and planning phase, the Proponent endeavoured to address each of the principles outlined above, namely:

- the precautionary principle;
- social equity through intra- and inter-generational equity;
- the conservation of biodiversity and ecological integrity; and
- the promotion of improved valuation and pricing of environmental resources.

In addition, the Proponent modified the proposed Project design and/or operational aspects of the Project where impacts inconsistent with the above principles were highlighted during the environmental assessment.

Each of the above principles are discussed below in light of the Project objectives and the proposed design and management safeguards.

F2.3.2 Precautionary Principle

The precautionary principle holds that where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental impacts. In the application of this principle, decisions should be guided by careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and an assessment of the risk-weighted consequences of various options should be made. Emphasis must be placed on anticipation and prevention of environmental damage, rather than remediation after the damage has occurred.

For the proposed Glennies Creek Open Cut Coal Mine, the Proponent has engaged eight specialist consultancies to conduct detailed assessments of a number of areas identified during the consultation and risk assessment phase outlined in Part C. These assessments ensure that there is a sufficient scientific understanding of the Project and the surrounding environment to enable the Minister to make a decision consistent with this principle.

Project Objectives

The principal objectives of the Project are the design and operation of an open cut mine in a manner that minimises surface disturbance and impact on the environment and surrounding residents, as well as ensuring compliance with environmental criteria, reasonable community expectations and all relevant statutory requirements through appropriate design, management and mitigation measures.

Design Safeguards

A number of design features were incorporated during the initial design stage in recognition of the Precautionary Principle. In addition, subsequent modifications were made in response to issues identified during the specialist consultant investigations undertaken as part of the environmental assessment phase. These design features and modifications included the following.

- The out-of-pit waste rock emplacement was designed to avoid an area of native vegetation to the east of the proposed open cut. The design was subsequently altered to also avoid an area with a number of trees with hollows that form habitat for the Brush-tailed Phascogale.
- The site access road was realigned to avoid an area of native vegetation to the west of Possum Skin Dam.
- The original design included a final void at the western end of the open cut. However, when groundwater modelling indicated that unacceptably high salinity levels would develop in the void, the proposed design was altered such that the final void would be filled eg. with breaker stone from the Glennies Creek Underground Coal Mine's pre-treatment plant or reject material from the Camberwell CHPP.
- Haul routes have been placed, as far as practicable, within the open cut and out-of-pit waste rock emplacement footprints to avoid disturbing additional areas of native vegetation.
- The slopes of the final landform would vary from approximately 1:5 (V:H) to 1:25 (V:H) to mimic the slopes of the natural landform within and adjacent to the Project Site. This would also minimise the potential for erosion and topsoil loss requiring further rehabilitation.
- The initial project design included a single dirty water containment dam. However following identification of habitat suitable for the threatened Brush-tailed Phascogale and likely impacts on the Bull Oak Forest Community, a two dam design was introduced.

Management and Operational Safeguards

The framework for ongoing environmental management, operational performance and rehabilitation of the Project Site would be provided through the project approval and would be managed in accordance with the DPI - MR Mining, Rehabilitation and Environmental Management Process, and would involve the input from relevant State and local government agencies. The Mining Operations Plan would contain a range of site specific environmental procedures to achieve consistency with planned outcomes and to control identified risks. The Annual Environmental Management Report would report on the progress of the operation and provide an opportunity to review the effectiveness of the environmental management strategies adopted. In addition, the following management and operational safeguards would be implemented.

- All on-site procedures would be regularly reviewed, particularly in light of monitoring results.
- Air quality, noise and ground vibration, would be monitored at selected locations to ensure the routine compliance with the goals outlined in those Parts.
- Regular monitoring of the status of rehabilitation, regeneration and enhancement programs within the Project Site and the biodiversity offset areas would be undertaken, with particular attention paid to threatened and vulnerable species. Remediation actions would be undertaken when identified as necessary following monitoring.
- Topsoil and subsoil would be stripped, stockpiled and re-spread in accordance with the procedures outlined in Part D8. An inventory of all stripped, stockpiled and re-spread soils would be maintained to ensure potential rehabilitation issues are identified and rectified.
- The surface and groundwater structures and management procedures outlined in Parts D10 and D11 would be implemented to prevent contaminated surface runoff leaving site, or significant erosion occurring and be monitored.

Rehabilitation and Subsequent Land Use

Long term adverse impacts on the environment would be avoided through:

- creation of a stable, free-draining final landform which blends with the surrounding landforms;
- progressive rehabilitation, including shaping of the final landform, spreading of subsoil and topsoil and reseeding or replanting with endemic, locally sourced species as described in Parts B15, D4 and D5; and
- a final land use of native conservation for the rehabilitated mine area and biodiversity offset areas which would, in the longer term, provide significant habitat with enhanced biodiversity values.

Conclusion

The precautionary principle has been considered during all stages of the design and assessment of the Project. The approach adopted, including initial design, risk analysis, consultation, specialist environmental assessment, design modification and safeguard design, provides a high degree of certainty that the Project would not result in any major unforeseen impacts.

F2.3.3 Social Equity

Social equity includes both intra- and inter-generational equity. Intra-generational equity requires that the economic and social benefits of the Project be shared equitably among all members of the community, ie. both groups and individuals. Inter-generational equity requires that the present generation pass onto the next generation an environment that does not limit the ability of future generations to attain a quality of life at least equal to that of current generation.

Both elements of social equity are addressed through the design of the Project, the implementation of operational safeguards to mitigate any short-term or long-term environmental impacts, and the proposed rehabilitation of the areas directly disturbed. Examples of matters relating to social equity that are relevant to the various stages of the Project are listed below.

Project Objectives

The objectives of the Project are to design and operate the open cut in a cost-effective manner to ensure security of employment, both within and outside the Hunter Valley. In addition, the Proponent intends to maintain an open and honest relationship with the members of the surrounding community through ongoing consultation, and address issues of concern as they arise.

The Proponent intends to ensure inter-generational equity by incorporating long-term offset strategies and preserving the disturbed areas following completion of mining for nature conservation. Furthermore, the Project would continue, and increase, the opportunities for economic activity in the local area both directly and indirectly.

Design Safeguards

The Project has been designed to maintain inter-generational equity by ensuring components of the existing biological, social and economic environment available to the present generation would also be available to future generations. Examples include the following.

- Enhancement and perpetual protection of the biodiversity offset areas and rehabilitated Project Site. This, in particular, would provide habitat and protection for the threatened Brush-tailed Phascogale and Grey-crowned Babbler.
- The location and orientation of the out-of-pit waste rock emplacement, open cut facilities area site access road and dirty water containment dams have been designed to ensure the least possible area of disturbance to native vegetation and sensitive fauna habitats.

- The waste rock emplacement has been designed to blend into the existing topography, reducing the visual impact of the final landform.
- The final void would be filled to the present surface. This would prevent excessively saline water accumulating within the final void.

Management and Operational Safeguards

The Proponent has, and would continue to ensure inter- and intra-generational equity through the following management and operational safeguards.

- Consultation with local community stakeholders to ensure the Project does not have a significant negative impact on the facilities, services and amenity of the area surrounding the Project Site.
- The Proponent recognises the importance of ensuring the preservation of the Aboriginal sites identified during the Aboriginal heritage assessment. Accordingly, the Proponent would develop an appropriate management protocol as outlined in Part D7.5 to salvage and store any Aboriginal artefacts that would otherwise be disturbed by the Proponent's activities in an appropriate manner. This would ensure that these artefacts are available for future generations.

Rehabilitation and Subsequent Land Use

The final landform would be constructed and rehabilitated in a manner that would blend with the existing landscape. Specifically, the slopes of the rehabilitated landform would be similar to the surrounding natural and man-made landforms, and the upper surface would be gently undulating. The planned nature conservation land use would be consistent with the *Synoptic Plan: Integrated Landscapes for Coal Mine Rehabilitation in the Hunter Valley* and the *Glennies Creek Catchment – Total Catchment Management Study – Management Strategy* and would preserve and enhance the biodiversity values in the vicinity of the Project Site for future generations.

Conclusion

The principle of social equity has been addressed throughout the design of the Project. It would contribute to the economic activity of the Singleton Local Government Area and the Hunter Valley as a whole by stimulating demand for local goods and services. As such, the benefits of the Project would be distributed throughout the local community. The Proponent would adopt a pro-active approach to identifying and addressing any concerns identified by the local community or its members.

The Project was also designed such that elements of the existing environment available to this generation, including land for nature conservation purposes, would be enhanced and would continue to be available to future generations.

F2.3.4 Conservation of Biodiversity and Ecological Integrity

The protection of biodiversity and maintenance of ecological integrity are central goals of sustainability. Biodiversity is usually considered at three levels: genetic diversity, species diversity and ecosystem diversity. It is important that developments do not threaten the integrity of the ecological system as a whole or the conservation of threatened species in the short- or long-term. Details of how the Project has been designed to achieve compliance with these principles are set out below.

Project Objectives

The Proponent is committed to undertake all activities in an environmentally responsible manner, and recognises the need to ensure that changes to natural components of the environment do not adversely affect biological diversity or ecological integrity. As such, the Project has been designed with an objective of minimising impacts on the flora and fauna within and in the vicinity of the Project Site, whilst allowing the extraction of an economically viable resource.

Design Safeguards

The following design features were incorporated into the Project to ensure that the impact of the Proponent's activities on the biodiversity and ecological integrity of the Project Site and surrounding areas are minimised.

- The biodiversity offset areas have been selected:
  - to be as close as possible to the Project Site;
  - to incorporate as much existing native vegetation as possible;
  - to be consistent with the *Synoptic Plan: Integrated Landscapes for Coal Mine Rehabilitation in the Hunter Valley* and the *Glennies Creek Catchment – Total Catchment Management Study – Management Strategy;* and
  - to incorporate the greatest variety of habitat as possible, including riparian, river flat, and hill slope areas.
- Design of the out-of-pit waste rock emplacement and dirty water containment dams to avoid as much native vegetation as possible, including refining the footprints in light of the identification of habitat for the threatened Brush-tailed Phascogale along a road reserve to the east of the proposed open cut.
- Nesting boxes suitable for Brush-tailed Phascogale would be erected within the Northern Biodiversity Offset Area to compensate for clearing of native vegetation within the Project Site.

Management and Operational Safeguards

The following management and operational safeguards would be incorporated by the Proponent to ensure that the impact of its activities on the biodiversity and ecological integrity of the Project Site and surrounding areas is minimised.

- Clearing of native vegetation would preferentially occur in late Spring and early Autumn to avoid nesting or roosting fauna. In addition, trees with hollows would be inspected prior to any clearing commencing, and any threatened nesting or roosting animals would be relocated appropriately.
- Enhancement of the biodiversity offset areas and areas of the Project Site that would not be disturbed would commence as soon as possible. This would include planting or spreading seed of endemic flora species, and installing nesting boxes and roosting tubes in trees within the biodiversity offset areas.
- Suitable cleared vegetation would be retained and used during rehabilitation of disturbed areas or relocated to the biodiversity offset areas.
- Weed eradication programs would be implemented, as required.

Biodiversity Offset Strategy

The Biodiversity Offset Strategy would enhance and protect in perpetuity approximately 254ha of Project-related land, namely the Northern, Southern and Western Biodiversity Offset Areas. In addition, the Biodiversity Offset Strategy would enhance and protect a further 33ha of non-Project-related land, namely the Supplementary Biodiversity Offset Area.

The areas of each vegetation community and fauna habitat area that would be preserved within the biodiversity offset areas and the areas that would be disturbed by the Project are presented in **Tables F7** and **F8** respectively.

Table F7
Vegetation Community Areas

	Area to be Disturbed [1]	Area within the Biodiversity Offset Areas [1]
Tussock Grassland Community	6.1	44.4
Regenerating Native Woodland / Shrubland	0.7	74.0
Narrow-leaf Ironbark – Spotted Gum – Forest Red Gum Community	68.3	113.1
Bull Oak Community	-	20.9
Swamp Oak Community	-	33.4
River Oak Community	-	1.5
Note 1: Areas in ha and approximately only		

Table F8
Fauna Habitat Areas

	Area to be Disturbed [1]	Area within the Biodiversity Offset Areas [1]
Open Pastures	3.8	135.6
Open Woodland	34.3	60.9
Woodland	42.4	47.0
Riparian Oaks	-	41.5
Wetland / Dams	8.7	1.1
Note 1: Areas in ha and approximately only		

For each vegetation community and fauna habitat, the proposed Biodiversity Offset Strategy would, with one exception, preserve an area within the biodiversity offset areas that is greater than the area to be disturbed. The exception is the Wetland / Dams Fauna habitat. Approximately 8.7ha of this habitat type comprising a section of Possum Skin Dam, would be disturbed. This dam was constructed and is used as an evaporation pond for the surface water management system for the Glennies Creek Colliery and the Camberwell Coal Mine. In addition, the proposed Biodiversity Offset Strategy would preserve areas of three vegetation communities and one fauna habitat that would not be disturbed by Project-related activities. As a result, the proposed Biodiversity Offset Strategy would result in protection of a greater range and area of vegetation communities and habitat areas than would be disturbed by the proposed activities and, as a result, the Project would preserve or enhance ecosystem diversity in the vicinity of the Project Site and would not threaten the integrity of the ecological systems in the short or long-term.

Rehabilitation and Subsequent Land Use

Post-mining rehabilitation of the final landform would include the reseeding or planting of native vegetation, including the threatened Western Golden Wattle (*Acacia decora)*. The final landform would be used for nature conservation, which would, in the medium- to long-term, increase the area and value of available habitat.

Conclusion

It is anticipated that the Project would have little impact on local or regional biodiversity. Notwithstanding, disturbance to areas of native vegetation would be minimised wherever possible. Enhancement of the biodiversity offset areas through placement of hollow logs and erection of nesting boxes would increase the habitat available in the short-term for the Brush-tailed Phascogale in particular. The post-mining use of the final landform for nature conservation purposes would increase the biodiversity value of the Project Site and surrounds in the medium- to long-term.

F2.3.5 Promotion of Improved Valuation and Pricing of Environmental Resources

This principle is premised on the assumption that all resources are appropriately valued and priced based upon the full life cycle of those resources, with appropriate and cost-effective environmental stewardship encouraged. A reflection on these issues with regards to the Project is set out below.

Project Objectives

The principal objectives of the Project are to operate the proposed open cut in a safe, environmentally responsible and cost-effective manner. This places environmental considerations at the forefront of the Proponent's decision-making process and demonstrates that an appropriate value has been placed on elements of the existing environment.

Design, Management and Operational Safeguards

The extent of research, planning and design of environmental safeguards and mitigation measures, as well as the Proponent's willingness to ensure the biodiversity offset areas and Project Site are used for nature conservation following the completion of mining activities, is evidence of the value placed by the Proponent on the ecological resources within and in the vicinity of the Project Site.

Rehabilitation and Subsequent Land Use

The extent and anticipated cost of the proposed rehabilitation, enhancement and weed control programs the Proponent intends to implement illustrates the value placed by the Proponent on the ecological resources within the Project Site and biodiversity offset areas.

Conclusion

The value placed by the Proponent on ecological resources is evident from the extent of site-specific investigations, planning and environmental safeguards and measures that have been undertaken and which would be implemented to prevent irreversible damage to the environment within, and in the vicinity of, the Project Site and biodiversity offset areas. It is anticipated that the income received from the sale of the coal would be sufficient to enable the Proponent to achieve an acceptable profit level whilst completing all environment-related tasks, commitments and conditions attached to all consents, leases, licences and approvals.

F2.3.6 Compatibility with the Principles of ESD

The approach taken in planning the Project has been multi-disciplinary, involving consultation with stakeholders and various government agencies, with emphasis placed on the application of design and operational management and mitigation measures to minimise potential environmental, social and economic impacts. The design of the Project has addressed each of the ESD principles and, on balance, it is concluded that the Project achieves a sustainable outcome for the local and wider environment.

F3 PROJECT JUSTIFICATION

F3.1 Introduction

This part justifies the proposed Glennies Creek Open Cut Coal Mine by drawing together and reviewing the full range of positive and negative predicted residual impacts, including cumulative impacts previously discussed in Part D of this document. The residual impacts are those that remain after the proposed design and operational management, mitigation and offset measures have been taken considered. This part also presents and reviews the design and operational management, mitigation and offset measures proposed by the Proponent.

F3.2 Biophysical Considerations

Parts D2 to D14 discuss the range of anticipated residual impacts on the biophysical and socio-economic environment attributable to the Project, including cumulative impacts. Those impacts considered to be of greatest significance, and the proposed management of these, are summarised below.

F3.2.1 Air Quality

Suspended and deposited dust levels attributable to the Project alone and cumulatively are predicted to be at or below the assessment criteria for deposited dust, total suspended particulate matter (TSP) and PM_{10} at all private residences, with the exception of those listed below.

- Residence 32 is expected to receive dust impacts in excess of the 24-hour and annual PM_{10} impact and deposited dust assessment criteria during Year 1 when Haul Routes B and D and C and E are in use, ie. Scenarios 1 and 2.
- Residence 33 is predicted to experience dust impacts in excess of the 24-hour and annual PM_{10} impact assessment criteria during Years 1 when Haul Routes C and E are in use, ie. Scenario 2, and during Year 3 when Haul Routes B and D and C and E are in use, ie. Scenarios 3 and 4. However, the annual average PM_{10} concentration for the Project alone when Haul Routes C and E are in use is predicted to be $8\mu g/m^3$, indicating that elevated Project-related PM_{10} concentrations are likely to be a relatively uncommon occurrence.
- Residence 36 is predicted to receive dust impacts in excess of the deposited dust impact assessment criteria during Year 1 when Haul Routes A and D are in use, ie. Scenario 1.
- Residence 42 is predicted to experience marginal exceedance of the 24-hour PM_{10} impact assessment criteria in Year 1 when Haul Routes C and E are in use, ie. Scenario 2. However, the predicted annual average PM_{10} concentration from the Project alone would be $5\mu g/m^3$, indicating that elevated PM_{10} concentrations are likely to be a relatively uncommon occurrence.

Greenhouse gas emissions from activities related to the extraction, transportation, processing and shipping of the coal have been estimated to be 2 163 341t of carbon dioxide equivalent per year during Years 1 to 5. These emissions are estimated to contribute to 0.00001°C of global warming. This is not considered to be significant.

CO, SO_2 and NO_2 emissions would have no more than a negligible impact on the area surrounding the Project Site due to the wide spacing of mining equipment and resulting exhaust emissions onsite.

The existing monitoring program would be continued around the Project Site to validate the predicted dust levels. Operating/management measures would be modified on the basis of this monitoring, where appropriate.

F3.2.2 Noise

The Project has been designed with the aim of minimising noise impacts on surrounding residences. The Proponent would limit the noise impacts through the use of noise mitigated mining equipment, as well as limiting the hours of operation to between 7.00am and 10.00pm. The noise modelling suggests two residences, Residences 32 and 36, would experience noise impacts in excess of 5dB(A) above the Project-specific noise assessment criteria during the life of the Project. A further seven residences, Residences 4, 5, 6, 7, 8, 9 and 11, would experience noise impacts of between 1 and 5dB(A) above the Project-specific noise assessment criteria during the night under adverse weather conditions, ie. temperature inversions.

The Proponent has made contact with the owners of Residences 32 and 36 with a view to negotiating an appropriate arrangement. These negotiations are currently on hold at the request of the residents pending completion of the *Environmental Assessment*.

The predicted noise impacts expected to be experienced at Residences 4, 5, 6, 7, 8, 9 and 11 during night-time under adverse weather conditions are a consequence of concurrent CHPP and train loader operation and would be the same as impacts experienced at present. As there have been no complaints from the owners of these residences with regard the existing noise impacts, the Proponent does not consider that the residual noise-related impacts are significant.

The noise modelling also suggests that seven parcels of vacant land to the northeast of the proposed open cut in Year 1 and one parcel of land to the southeast of the Project Site during the life of the Project would receive noise levels in excess of the assessment criteria. As this land is not occupied at present, and the impact would only occur during mining of the north-eastern portion of the open cut, the Proponent does not consider these impacts to be significant.

No exceedances of the cumulative noise assessment criteria are expected.

Noise monitoring would be undertaken to validate the predicted noise levels around the Project Site and management and mitigation measures would be modified, where appropriate, in light of the outcomes from this monitoring.

F3.2.3 Blasting

All blasts would be designed to ensure that blasting-related impacts at all non-project-related residences would be within the ANZECC guidelines specified in **Table D18**. In addition, the proponent would develop blast management procedures to ensure that impacts related to the closure of Stony Creek Road are minimised. As a result blasting-related impacts are not considered to be significant.

Blast monitoring would be undertaken to measure the impacts of blasts around the Project Site, and, on the basis of these results, blast designs and procedures would be modified, if required.

F3.2.4 Fauna

The fauna survey identified five threatened fauna species within, and in the vicinity of, the Fauna Survey Area and biodiversity offset areas. These species are:

- the Grey-crowned Babbler;
- the Eastern Bentwing-bat;
- the Eastern Freetail-bat;
- the Grey-headed Flying-fox; and
- the Brush-tailed Phascogale.

The assessment concluded that the Project was unlikely to impact on the three species of bats because the Fauna Survey Area represents only a portion of the foraging area for these species, and none would appear to roost within or in the vicinity of the Project Site or biodiversity offset areas. The Grey-crowned Babbler and the Brush-tailed Phascogale may, in the absence of mitigating measures, be expected to be impacted by the Project.

The Proponent intends to undertake the following mitigation measures to ameliorate the impact of its activities on these species.

- Continued management of the proposed biodiversity offset areas and undisturbed sections of the Project Site for native vegetation conservation.
- Early commencement of rehabilitation and enhancement activities within the Project Site and biodiversity offset areas.
- Erection of nesting boxes along Glennies Creek as soon as possible after project approval is granted.

Considering the proposed mitigation measures, CES (2007) considers that the impact of the Project on the Grey-crowned Babbler and the Brush-tailed Phascogale, as well as the cumulative impact of the Project, would not be significant.

F3.2.5 Flora

The flora survey identified six flora communities and two disturbed communities within the Flora Survey Area. None of these communities is classified as an endangered ecological community. One threatened shrub species, Western Golden Wattle (*Acacia decora*) was, however, identified within the Project Site. This species would be included in the species mix to be spread or replanted during rehabilitation and vegetation enhancement programs.

In addition, the Proponent would establish approximately 10ha of native vegetation adjacent to Glennies Creek within the Northern and Supplementary Biodiversity Offset Areas as described in Part B15.10.2.

F3.2.6 Aboriginal Heritage

The Aboriginal heritage assessment concluded that, with the exception of 19 sites with known Aboriginal objects, the Project Site has a low archaeological sensitivity. The observed Aboriginal objects consisted mostly of broken flakes and occasional cores. The Proponent intends to develop an appropriate Aboriginal Heritage Management Protocol to preserve these objects. This protocol would include salvage and relocation of the known objects, in consultation with the relevant representative Aboriginal groups.

As a result of the planned mitigation measures, the residual impacts of the Project on Aboriginal heritage issues are not considered to be significant

F3.2.7 Soils, Land Capability and Agricultural Suitability

Impacts on the soils of the Project Site would be temporary and manageable given the proposed stripping, stockpiling and re-spreading procedures. As a result, the residual impacts on the soils of the Project Site are considered to be temporary and not significant.

The land capability of the final landform would be Class VII or land best protected by green timber. The Agricultural Suitability Classification of the final landform would be Class 5, or not suitable for agriculture. Neither the land capability nor the Agricultural Suitability Classification of the undisturbed areas would be changed as a result of the Project.

F3.2.8 Visibility

The Project Site is topographically shielded from a significant proportion of the land surrounding the Project Site. However, some areas, notably to the northwest of the Project Site, have elevated, frontal views of the Project Site. The Proponent intends to undertake a number of design and management measures to mitigate the impact of its activities on the visual amenity of the surrounding residences and road users. These include construction of an amenity bund along Stony Creek Road and progressive reshaping and rehabilitation of the waste rock emplacement. In addition, the Proponent would consider any reasonable request from a landowner for assistance in creating a visual screen on private land.

As a result, the residual impact on the visual amenity of the surrounding residents is not considered to be significant. However, the Proponent recognises that individuals may be impacted by its activity to a greater or lesser extent depending on the location of their property and their sensitivity to changes in the visual landscape.

F3.2.9 Water Resources

The Proponent intends to contain surface water contaminated by excessive levels of sediment or salt and use that water for processing of coal and other mining-related activities. In addition, the Proponent has formal agreements with other local coal mining companies to supply excess dirty water for mining-related purposes, thereby reducing their demands on clean water sources such as the Hunter River. An assessment of the integrated Glennies Creek/Camberwell site water balance indicates that a balance can be readily maintained between water inputs from direct rainfall, percolation through the waste rock emplacements and groundwater inflows and outputs, with the agreements with Ashton and Newpac providing an opportunity to export substantial additional volumes of water if available.

Modelling of the quality of water in the final void indicated unacceptably high levels of salinity would develop if the void were to remain open. As a result the Proponent intends to backfill the final void following completion of mining operations.

Modelling of the drawdown of the Permian-aged aquifers indicates that the Project would generate a cone of depression that would extend approximately 1km from the Project Site, but that the impacts of the existing coal mining operations would be significantly greater than that from the Project (**Figure D34)**. In addition, the water quality of the affected aquifers is such that the water is unsuitable for agricultural or other purposes.

No impact to Glennies Creek or the associated shallow, fresh water, alluvial aquifers is predicted.

As a result, the residual impact on the water resources of the area around the Project Site is not considered to be significant.

F3.2.10 Traffic and Transportation

The traffic and transportation assessment estimated that the Project would:

- generate on average, an additional approximately 84 vehicle movements per day on Stony Creek and Middle Falbrook Roads;
- require construction of an intersection between the site access road and Middle Falbrook Road; and
- require the closure of Stony Creek Road when blasting occurs within 500m of the road.

Considering the proposed mitigation measures, the residual impacts are considered to be short term and not significant.

F3.2.11 European Heritage

The impact of the Proponent's activities on the Middle Falbrook Road Bridge over Glennies Creek was assessed as being minimal or non-existent.

F3.2.12 Conclusions

On the basis of the above, the residual impacts attributable to the Project, after the proposed design and operational management and mitigation measures have been taken into account, are not considered to be significant.

F3.3 Socio-economic Considerations

The socio-economic impacts of the Project within the Hunter Valley were assessed as being largely positive and include:

- net revenue generation of approximately $58 million;
- an additional $253.9 million in household expenditure; and
- an additional 110 full time equivalent (FTE) positions.

The quantifiable environmental costs included the following.

- Mining-related greenhouse gas emissions – negative approximately $1.2 million.
- Reduced surface water flows – negative approximately $0.2 million.

All other impacts were assessed as being not significant or not able to be quantified.

As a result, the quantifiable net socio-economic benefit of the Project within the Hunter Valley is $252.5 million. In addition, the Project would have significant economic benefits for the remainder of NSW and Australia through the payments of coal royalties, taxes, expanded export markets for coal and increased economic activity.

F3.4 Consequences of not Proceeding with the Project

The consequences of not proceeding with the Project include the following.

- The recoverable coal would not be mined by the Proponent. Such an outcome would be contrary to the objective of the Department of Primary Industries - Mineral Resources and the Proponent's obligations under the terms of its leases to maximise resource utilisation.
- The opportunity to create up to 110 full-time employment positions within the Hunter Valley would be forgone.
- The disposable wages associated with the above positions would be forgone, a substantial portion of which would be spent within the Singleton and Muswellbrook areas.

- The training opportunities that would be provided by the Proponent would be forgone.
- The benefits flowing to the NSW and Commonwealth Governments through coal royalties, taxes and increased exports would be forgone.
- The opportunity to permanently preserve and protect the native vegetation within the biodiversity offset areas and Project Site may be forgone. This vegetation represents significant habitat for at least two threatened fauna species, the Grey-crowned Babbler and the Brush-tailed Phascogale.
- A number of relatively minor impacts on the biophysical environment would not eventuate.

It is considered therefore that the public interest of proceeding with the Project exceed the residual negative impacts associated with it.

F4 CONCLUSION

The proposed Glennies Creek Open Cut Coal Mine has, to the extent feasible, been designed to address the issues of concern to the community and all levels of government. This document, together with the range of specialist consultant studies undertaken, has identified that the Project should proceed because it would:

(i) produce significant employment and economic benefits for the Hunter Valley and NSW;

(ii) satisfy sustainable development principles;

(iii) result in long-term protection of areas of native habitat within biodiversity offset areas and maintain or improve biodiversity values in the vicinity of the Project Site;

(iv) have a minimal and manageable impact on the biophysical environment;

(v) address impacts on the surrounding residents;

(vi) reduce risk levels associated with possible incidents and impacts on the environment to an acceptable level; and

(vii) contribute towards satisfying the international demand for high quality coal.

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