Section 5

Draft Statement of Commitments

PREAMBLE

The draft Statement of Commitments presented in this section has been prepared in accordance with the requirements of Part 3A of the Environmental Planning and Assessment Act 1979, and presents a compilation of the actions and the initiatives the Proponent commits to implement if the proposed Yarraboldy Extension is approved. These commitments are designed to effectively manage, mitigate, guide and monitor the Yarraboldy Extension Project through its various phases.

The Environmental Assessment of the Yarraboldy Extension Project has identified a range of environmental, social and management outcomes and measures, all required to avoid or reduce the environmental and social impacts of the project. The draft Statement of Commitments reflects these desired outcomes, action and timing of commitments that would be undertaken to achieve the outcomes.

All parties involved in the design, establishment and operational phases of the project will be required to undertake their components of work in accordance with the commitments.

This page has intentionally been left blank

Table 5.1
Draft Statement of Commitments for Site Operations and Management

Desired Outcome	Action		Timing
1. Groundwater			
Reduction in the amount of drawdown on local groundwater	1.1	Design the mine plan so that the interception of groundwater within the old Wallerawang Colliery underground workings is minimised.	Ongoing.
The need to discharge raw groundwater into the surrounding surface water environment is negated, thus avoiding the potential change in surface water quality.	1.2	Manage the small amount of groundwater intercepted on site for use in dust suppression.	As groundwater is intercepted.
Efficient dewatering of the pit.	1.3	Install a sump in a strategic location in the open cut pit.	Ongoing.
Determination if there are any impacts to groundwater associated with the Project to allow potential impacts to be identified in a timely manner to allow appropriate mitigation.	1.4	Continue the existing groundwater monitoring regime but also include monitoring of the bore that has been installed within the Yarraboldy footprint and the old ventilation shaft next to the haul road.	Ongoing.
Minimisation of groundwater contamination.	1.5	Manage chemicals and hydrocarbons appropriately.	Ongoing.
Prevention of managing water with a low pH.	1.6	Manage any potentially acid-generating material by the selective placement of cover material.	As required.
Mitigation of any groundwater impacts that are identified through monitoring in a timely manner.	1.7	Implement the following measures if impacts on groundwater users related to activities associated with the project are demonstrated to be greater than anticipated. • Assess the significance of the impacts. • Investigate measures to minimise the impacts. • Describe what measures would be implemented to reduce, minimise, mitigate or remediate these impacts to the satisfaction of the DECCW - NOW.	If an impact to a groundwater user is identified.
Timely mitigation of any impacts to groundwater.	1.8	If a non-conformance with a nominated trigger value is determined to be the result of activities associated with the Project, then the impacted landholder and DECCW - NOW will be notified and a remediation strategy will be proposed and implemented.	If a non-conformance with a nominated trigger value is determined to be the result of activities associated with the Project.

Table 5.1 (Cont'd)
Draft Statement of Commitments for Site Operations and Management

Desired Outcome	Action	Timing
2. Surface Water		
Minimisation of changes to existing drainage patterns of the Project Site	2.1 Retain selected surface water structures such as the existing dams, sediment retention points and clean water diversion banks.	During construction period.
Prevention of sediment-laden water discharge off site from the progressive disturbed areas of the Project Site.	2.2 Install temporary erosion and sediment control structures. 2.3 Construct diversion and sediment basins for the capture of sediment-laden water for treatment.	During construction, site establishment, operational and rehabilitation phases.
Minimisation of erosion and sedimentation.	2.4 Prepare and implement a general Erosion and Sediment Control Plan (in accordance with the requirements of Landcom (2004)) to manage surface water flows within the Project Site. 2.5 Maintain groundcover at 70% or better over areas disturbed and no longer required by the Project and as site conditions provide for practicability. 2.6 Progressively rehabilitate disturbed areas no longer required by the Project soon after the cessation of mining activities.	Ongoing.
Prevention of contamination of clean surface water on Project Site.	2.7 Construct diversion bunds for dirty water flow separate from clean water diversions bunds. 2.8 Divert dirty water into sediment basin and Retention Dam A. 2.9 Divert clean water along clean water diversion bunds for flow into Neubecks Creek.	Ongoing.
Prevention of contamination of water in Neubecks Creek.	2.10 Divert dirty water into sediment basins for treatment. 2.11 Pump water from sediment basin into Retention Basin A for storage and use in dust-suppression activities on Project Site.	Ongoing.
Prevention of saline groundwater discharge off site.	2.12 Pump groundwater from in-pit sump into Retention Dam A for storage and use in mining operations and dust suppression.	As required.
Minimisation of contamination of clean water on site with dirty water generated from mining operations	2.13 Install a sediment trap in the coal crushing/ stockpiling and maintenance area to remove coal fines from surface flows. 2.14 Install an oil/water separating unit to receive and treat potentially contaminated water from the maintenance and wash-down bay for further treatment in the sediment basin.	Ongoing.
Implementation of a comprehensive and ongoing surface water monitoring program.	2.15 Monitor surface water quality for pH, EC, TSS, turbidity, Oil & Grease, filterable iron and sulfate ion concentrations. 2.16 Record the volume and quality of water extracted from the in-pit sump for discharge off site.	Quarterly during surface flow events. Daily during discharge for pH, EC and turbidity. Whenever required.

Table 5.1 (Cont'd)
Draft Statement of Commitments for Site Operations and Management

Desired Outcome	Action		Timing
3. Flora			
Minimisation of short and long-term impacts on flora within the Project Site	3.1	Define and clearly mark vegetation for retention prior to the commencement of site establishment to ensure that native vegetation is confined only to those areas required for mining operations.	Prior to commencement of site establishment activities.
	3.2	Progressively rehabilitate completed areas within the Project Site to maximise cover of native vegetation in appropriate areas and minimise opportunities for erosion and weed invasion.	As areas become available for rehabilitation.
	3.3	Control noxious weeds on the Project Site.	Ongoing.
Establishment of native vegetation with ecological and conservation value.	3.4	Utilise local native plant species and shrubs for rehabilitation and landscaping.	During rehabilitation and landscaping activities.
	3.5	Undertake replacement planting of some of the same tree species and shrubs within the Project Site upon cessation of mining activities.	During rehabilitation and landscaping activities.
Establishment of original groundcover.	3.6	Retain bushrock with the topsoil and re-spread during the rehabilitation phase to return groundcover to near-original state.	During rehabilitation and landscaping activities.
4. Fauna			
Management of disturbance within the Project Site to minimise impact on fauna of conservation value.	4.1	Identify the boundaries of disturbance and progressive disturbance and avoid clearing outside these boundaries.	Site establishment phase.
	4.2	Retain all substantial habitat trees wherever possible.	Site establishment phase.
	4.3	Undertake any tree-felling in accordance with a prepared Tree Felling Protocol.	
	4.4	Provide habitat for important target species such as the Purple copper butterfly.	Rehabilitation phase.
Maintenance and improvement of the biodiversity value of the Project Site and surrounding areas.	4.5	Develop a Flora and Fauna and Rehabilitation Management Plan.	Prior to vegetation clearing.
	4.6	Progressively increase forest and woodland communities within the already disturbed areas, the coaly residue areas and the rehabilitated land, to provide foraging and sheltering habitat.	Ongoing and rehabilitation phase.
	4.7	Use nesting boxes and salvage hollows to assist in maintaining the short and long term habitat value for hollow dependent species.	Rehabilitation phase.
	4.8	Implement a biodiversity offset in consultation with DoP and DECCW.	Within 18 months of the date of Project Approval.

Table 5.1 (Cont'd)
Draft Statement of Commitments for Site Operations and Management

Desired Outcome	Action		Timing
5. Heritage			
Site activities are undertaken without impacting upon any Aboriginal and European heritage items.	5.1	Stop works at and in the vicinity of any Aboriginal and European heritage sites or relics, if found.	During site establishment, construction and operational phases of Project.
	5.2	Contact DECCW if any Aboriginal and European heritage sites or relics are found.	
	5.3	Receive authorisation from DECCW prior to proceeding with any works in the vicinity of any identified Aboriginal and European heritage sites or relics are found.	
6. Transport Aspects			
Achieve safe and efficient transport operations	6.1	Install "Truck Turning" signs in accordance with RTA requirements.	Prior to despatch of coal from Yarraboldy.
	6.2	Install guide posts at all site entrances	As required.
	6.3	Improve the sight distances at all entrances through removal of vegetation in RTA verges with RTA approval.	As required.
7. Noise			
All activities are undertaken in such a manner as to reduce the noise level generated and minimise impacts on surrounding landholders and/or residents.	7.1	Regularly service all equipment used on-site to ensure the sound power levels remain at or below the levels used in the modelling to assess generated noise levels and compliance with the criteria.	Ongoing.
	7.2	Attend to local community concerns over construction, operational or transport noise.	Ongoing.
Noise generated by operational activities does not exceed DECCW nominated criteria nor significantly impacts on neighbouring landowners and/or residents.	7.3	Construct the amenity bund on the southern side of the mine area	During the first 6 months of operation.
	7.4	Position the drilling rig, if required, behind an earth mound to reduce noise levels.	If dictated by noise monitoring.
	7.5	Operate the pump behind a noise barrier.	Ongoing.
	7.6	Orientate the crusher with the open side facing northwards.	Ongoing.
	7.7	Operate the existing crushing plant only when new plant is not operating.	Until existing plant is decommissioned.

Table 5.1 (Cont'd)
Draft Statement of Commitments for Site Operations and Management

Desired Outcome	Action		Timing
8. Blasting			
Achieve compliance with all ANZECC Blasting Guidelines.	8.1	Utilise deck charges and/or other suitable techniques to minimise ground vibration.	For relevant blasts to achieve compliance.
	8.2	Utilise electronic detonators to minimise ground vibration.	For relevant blasts to achieve compliance.
	8.3	Optimise use of stemming materials and/or other suitable techniques to control airblast overpressure.	All blasts.
	8.4	Optimise initiation sequence to minimise airblast overpressure and ground vibration.	All blasts.
9. Air Quality			
Site activities are undertaken without exceeding DECCW air quality criteria or adversely impacting upon surrounding receivers.	9.1	Continue monitoring of PM_{10} at the existing monitoring site, this being representative PM_{10} level at the potentially worst affected receptor.	Ongoing.
	9.2	Increase frequency of PM_{10} sampling from once per six days to once per three days in the event that elevated PM_{10} levels are recorded.	In the event that elevated PM_{10} levels is recorded.
	9.3	Continue with implementation of dust mitigation practices associated with Pine Dale Coal Mine, including watering of disturbed areas and haul roads, and covering of product truck loads.	Ongoing.
	9.4	Implement extra mitigation measures such as more watering, and modification of site activities.	If increased dust levels are recorded during windy conditions.
Implementation of an appropriate air quality monitoring program for continued compliance with DECCW guideline levels.	9.5	Monitor deposited dust levels at six existing deposition gauges (D1-D6).	Ongoing.
	9.6	Review and submit dust monitoring results to DECCW.	Annually.
Minimisation of greenhouse gas, other gases, and odour emissions through reductions in diesel consumption.	9.7	Optimise and schedule vehicle operations to minimise vehicle movements.	Ongoing.
	9.8	Maintain engines according to manufacturers' guidelines and keep tyres at optimum pressure.	Ongoing.
	9.9	Minimise vehicle idling time.	Ongoing
10. Visibility			
Limit the visibility of Operational areas from nearby residences and Castlereagh Highway.	10.1	Construct the amenity bund on the southern side of the mine area.	During the first 6 months of operation.
	10.2	Progressively rehabilitate all areas where mining is completed.	Ongoing.
	10.3	Orientate flood lighting to minimise off-site light emissions.	Ongoing.

Table 5.1 (Cont'd)
Draft Statement of Commitments for Site Operations and Management

Desired Outcome	Action	Timing
11. Soils, Land Capability and Agricultural Suitability		
Maintenance of soil value for rehabilitation and minimisation of soil loss through erosion.	11.1 Retain soils stripped from undisturbed areas of the Project Site for rehabilitation works. 11.2 Develop appropriate soil management procedures for handling and stockpiling soils of the types found at the Project Site. 11.3 Develop appropriate soil and erosion management procedures to minimise soil erosion from stockpiles and stripped areas.	During site establishment, operational and rehabilitation phases.
Remediation of contaminated soils.	11.4 Excavate and remove soils contaminated with hydrocarbons. 11.5 Remove contaminated soil (if the contamination is limited in area) to a designated location at the site (away from natural drainage) for the bio-remediation of the contaminated material. 11.6 Remove contaminated soil (if the contamination is widespread) and transport to a facility licensed to accept the specific type of contaminated material.	As soon as possible and within one month of contamination occurring.

Section 6

Evaluation & Justification of the Project

PREAMBLE

This section concludes the assessment of the proposed Pine Dale Coal Mine – Yarraboldy Extension. The key assessment requirements (identified in the Director-General's Requirements) and other issues identified as having higher unmitigated risk rankings (see Section 3.3) are re-assessed based on the implementation of the proposed safeguards, controls and mitigation measures and a residual risk level determined. The Project is then evaluated based on the residual risk posed and in consideration of ecologically sustainable development (ESD) principles.

A justification for the Project is then provided based on the residual impacts of the Project, the likely economic and social benefits that would be generated and the consequences locally, regionally and nationally of the Project not proceeding.

This page has intentionally been left blank

6.1 INTRODUCTION

As a conclusion to the *Environmental Assessment*, the development and operation of the Pine Dale Coal Mine – Yarraboldy Extension is evaluated and justified through consideration of its potential impacts on the environment and potential benefits to the local and wider community.

An evaluation of the Project has been undertaken by firstly re-assessing the risks posed to the local environment by the Project's activities and then considering the implementation of the commitments for controls, safeguards or mitigation measures as summarised in Section 5. The Project has also been evaluated against the principles of Ecologically Sustainable Development (ESD) in order to provide further guidance as to its acceptability.

Section 6.3, which presents the justification of the Yarraboldy Extension, re-visits the predicted residual impacts on the biophysical environment, considers the socio-economic benefits which would be provided and assesses the consequences of not proceeding with the Project.

6.2 EVALUATION OF THE PROJECT

6.2.1 Residual Environmental Risk and Impacts

Following consideration of the proposed operational safeguards, controls and mitigation that would be implemented by the Proponent as part of the Project design, **Table 6.1** re-assesses the risk associated with each of the potential environmental impacts identified in Section 3.3. It is noted that in some cases no residual risk rating has been allocated as the assessment recorded in Section 4B has determined that the impact would not occur.

Table 6.1
Analysis of Mitigated Risk

Page 1 of 5

Potential Environmental Impacts (see Table 3.2)	Level / Scale of Impact (if applicable)	Consequence of Occurrence if Mitigated	Likelihood of Occurrence if Mitigated	Mitigated Risk Rating*
Groundwater				
Reduced groundwater availability for existing uses	Impacts restricted to groundwater bores on Proponent owned land	**3**	**D**	**M**
	Reduction in availability of <15% of non-project related bores			
	Reduction in availability of >15% of non-project related bores			
Degradation of groundwater dependent ecosystems	Impacts restricted to groundwater bores on Proponent owned land			
	Impacts to local groundwater dependent ecosystems			
	Impacts to regional groundwater dependent ecosystems			

Consequence of Occurrence: 1 = Insignificant; 2 = Minor; 3 = Moderate; 4 = Major; 5 = Catastrophic
Likelihood of Occurrence: A = Almost Certain; B = Likely; C = Possible; D = Unlikely; E = Rare
Risk Rating: E = Extreme; H = High; M = Moderate; L = Low

Note *: Represents the lowest risk rating that can be assigned as the lowest possible consequence or likelihood has been assigned.

Table 6.1 (Cont'd)
Analysis of Mitigated Risk

Potential Environmental Impacts (see Table 3.2)	Level / Scale of Impact (if applicable)	Consequence of Occurrence if Mitigated	Likelihood of Occurrence if Mitigated	Mitigated Risk Rating*
Change in the hydrology/ geomorphology of the surrounding creek systems	Minor changes to hydrology/ geomorphology of the local creek systems	1	D	L
	Moderate changes to hydrology/ geomorphology of the local creek systems			
	Large scale changes to hydrology/ geomorphology of the local creek systems			
Impacts on groundwater quality		2	D	L
Reduced availability of water to local landowners		2	D	L
Surface Water				
Degradation of aquatic communities	Impacts restricted to aquatic communities on Proponent owned land	1	E	L
	Impacts to local aquatic communities	2	E	L
	Impacts to regional aquatic communities	3	E	M
Reduced downstream surface water quality	Impacts restricted to surface water on Proponent owned land	2	C	M
	Localised impacts to surface water	2	D	L
	Regional impacts to surface water	3	E	M
Reduced flows to downstream vegetation due to a reduction of environmental flows through the mine site				
Reduced flows in surrounding creek systems due to a reduction of environmental flows through the mine site				
Changes to the coverage and frequency of flooding due to altered flood regimes		2	C	M
Increased flows and/or flooding in natural drainage lines for a short period due to dam failure.		3	D	M
Uncontrolled discharge of dirty, saline, contaminated water outside licence conditions		2	C	M
Erosion and Sedimentation				
Loss of soil resources		2	D	L
Increased sedimentation within downstream creeks		2	C	M
Mobilisation of heavy metals		2	D	L
Threatened Flora and Fauna				
Loss of threatened fauna habitat		3	D	M
Threatened vegetation stress/death				
Reduction in species diversity		2	C	M
Loss of threatened vegetation species communities				

Consequence of Occurrence: 1 = Insignificant; 2 = Minor; 3 = Moderate; 4 = Major; 5 = Catastrophic
Likelihood of Occurrence: A = Almost Certain; B = Likely; C = Possible; D = Unlikely; E = Rare
Risk Rating: E = Extreme; H = High; M = Moderate; L = Low

Note *: Represents the lowest risk rating that can be assigned as the lowest possible consequence or likelihood has been assigned.

Table 6.1 (Cont'd)
Analysis of Mitigated Risk

Potential Environmental Impacts (see Table 3.2)	Level / Scale of Impact (if applicable)	Consequence of Occurrence if Mitigated	Likelihood of Occurrence if Mitigated	Mitigated Risk Rating*
Reduction in threatened aquatic vegetation numbers	Increased stress to threatened aquatic fauna			
	Reduction in localised numbers of aquatic threatened fauna			
	Reduction in regional numbers of aquatic threatened fauna			
Aboriginal Heritage				
Disturbance to or destruction of Aboriginal sites or artefacts	Destruction of a minor Aboriginal site or artefact			
	Destruction of a significant Aboriginal site or artefact			
Noise				
Health related issues to noise impacts		**2**	**C**	**M**
Sleep deprivation from noise impacts		**2**	**D**	**L**
Noise impacts on livestock				
Nuisance/ amenity impacts on the surrounding landowners/ residents		**2**	**C**	**M**
Structural damage to buildings or structures from airblast overpressure	Minor damage to buildings or structures	**2**	**D**	**L**
	Significant damage to buildings or structures	**3**	**E**	**M**
Vibration				
Damage to buildings and structures	Minor damage to buildings or structures	**2**	**E**	**L**
	Significant damage to buildings or structures	**3**	**E**	**M**
Nuisance/ amenity impacts to surrounding landowners		**2**	**D**	**L**
Sleep deprivation due to low level vibration from the crushing facility				
Air Pollution				
Increased deposited dust levels and suspended particulate matter concentration		**2**	**C**	**M**
The release of sulphur dioxide and its associated odour relating to a spontaneous combustion outbreak				
Reduced local amenity due to the production of nitrogen oxide from blasting operations				
Greenhouse and other gas emissions		**2**	**A**	**H**
Minor health impacts associated with emissions of sulphur dioxide and nitrogen oxide				

Consequence of Occurrence: 1 = Insignificant; 2 = Minor; 3 = Moderate; 4 = Major; 5 = Catastrophic
Likelihood of Occurrence: A = Almost Certain; B = Likely; C = Possible; D = Unlikely; E = Rare
Risk Rating: E = Extreme; H = High; M = Moderate; L = Low

Note *: Represents the lowest risk rating that can be assigned as the lowest possible consequence or likelihood has been assigned.

Table 6.1 (Cont'd)
Analysis of Mitigated Risk

Potential Environmental Impacts (see Table 3.2)	Level / Scale of Impact (if applicable)	Consequence of Occurrence if Mitigated	Likelihood of Occurrence if Mitigated	Mitigated Risk Rating*
Visual Amenity				
Decreased visual amenity during the life of the mine		1	D	L
Altered visual outlook following mine closure		2	C	M
Nuisance/ amenity impacts from mine lighting		1	D	L
Sleep deprivation from mine lighting				
Impacts on State Forests				
Loss of timber resource (short to medium term only).		3	D	M
Reduction in native fauna populations and species diversity.		2	D	L
Loss or damage to property.		3	D	M
Soil and Land Capability				
Erosion of stripped, stockpiled and replaced soils		2	D	L
Insufficient soil quantities/ qualities for rehabilitation		2	D	L
Reduced productivity of the final landform		3	D	M
Contaminated soil and land due to hydrocarbon/ chemical spills		2	D	L
Rehabilitation, and Final Landform				
Reduced amenity of the final landform		2	C	M
Reduced productivity of the rehabilitated land	<10% reduction in expected productivity	1	C	L
	10 – 50% reduction in expected productivity	2	C	M
	>50% reduction in expected productivity	3	D	M
Reduction in native fauna species diversity	<10% reduction in fauna species diversity	1	C	L
	10 – 50% reduction in fauna species diversity	2	C	M
	>50% reduction in fauna species diversity	3	D	M
Waste Management				
Contamination of downstream surface waters				
Contamination of groundwater				
Contamination of downstream lands				
Reduced visual amenity				

Consequence of Occurrence: 1 = Insignificant; 2 = Minor; 3 = Moderate; 4 = Major; 5 = Catastrophic
Likelihood of Occurrence: A = Almost Certain; B = Likely; C = Possible; D = Unlikely; E = Rare
Risk Rating: E = Extreme; H = High; M = Moderate; L = Low

Note *: Represents the lowest risk rating that can be assigned as the lowest possible consequence or likelihood has been assigned.

Table 6.1 (Cont'd)
Analysis of Mitigated Risk

Page 5 of 5

Potential Environmental Impacts (see Table 3.2)	Level / Scale of Impact (if applicable)	Consequence of Occurrence if Mitigated	Likelihood of Occurrence if Mitigated	Mitigated Risk Rating*
Land Contamination				
Surface water and land contamination	Minor surface water and land contamination	**2**	**C**	**M**
	Moderate surface water and land contamination	**2**	**D**	**L**
	Significant surface water and land contamination	**3**	**E**	**M**
Reduced availability of soils	<10% loss of soil resource	**1**	**D**	**L**
	10 – 50% loss of soil resource	**2**	**D**	**L**
	>50% loss of soil resource	**2**	**D**	**L**
Spontaneous Combustion				
Uncontrolled fire event				
Odour and subsequent emission of sulphur dioxide				
Socio-Economic Impacts				
Changed economic activity and related social impacts		**N/A**	**N/A**	
Change in the socio economic structure of the local community	Minor change in the local community			
	Moderate change in the local community			
	Significant change in the local community			

Consequence of Occurrence: 1 = Insignificant; 2 = Minor; 3 = Moderate; 4 = Major; 5 = Catastrophic
Likelihood of Occurrence: A = Almost Certain; B = Likely; C = Possible; D = Unlikely; E = Rare
Risk Rating: E = Extreme; H = High; M = Moderate; L = Low

Note *: Represents the lowest risk rating that can be assigned as the lowest possible consequence or likelihood has been assigned.

Through the implementation of the proposed controls, safeguards and mitigation measures identified in Section 4B and summarised in the Statement of Commitments in Section 5, the risk rating for the majority of potential environmental impacts has been reduced.

In some cases, a rating is no longer provided as the relevant assessment recorded in Section 4B determined the likelihood to be so low, or consequence so insignificant, as to be virtually non-existent. This approach was taken generally when the risk rating could not be considered any lower than "high" due to a likelihood classification as "almost certain" or consequence classification as "catastrophic" so as not to suggest a significance that does not exist.

It is noted that the mitigated risk rating for greenhouse gases and other emissions has remained high. Although the Project would contribute minimal greenhouse gas compared to State wide and national emissions, by the nature of coal mining it is certain that greenhouse emissions would be released.

It is also noted that the mitigated risk rating relating to both the productivity of the final landform and the loss of timber resources for Forests NSW has been reduced from high to moderate. A brief commentary is provided below relating to these potential impacts.

- Reduced productivity of the final landform

  Reduced productivity of the final landform could occur in those sections of the Yarraboldy Extension area where natural woodland currently exists. Conversely, the productivity of the 10ha former Yarraboldy Open Cut Mine would increase significantly following the reconstruction of a suitable landform. It has been the increased productivity relating to the 10ha that has reduced the risk rating to moderate.

- Loss of timber resources for Forests NSW

  The Project will include the clearing of some mature timber which could have been used for forestry purposes although in reality, Forests NSW intends to recover as much millable timber as possible prior to the Proponent's clearing program. Although it is planned to rehabilitate the Project Site with native vegetation for nature conservation and forestry purposes, the period of time to achieve the desired success of this strategy is uncertain. In reality, timber resources within the rehabilitated area would not be available for an extended period of time until the timber matures. However, the fact that the timber resources would eventually be achieved has reduced the risk rating to moderate.

6.2.2 Ecologically Sustainable Development

6.2.2.1 Introduction

Sustainable practices by industry, all levels of government and the community are recognised to be important for the future prosperity and well-being of the world. The principles of Ecologically Sustainable Development (ESD) that have been recognised for over a decade were based upon meeting the needs of the current generation while conserving our ecosystems for the benefit of future generations. In order to achieve sustainable development, recognition needs to be placed upon the integration of both short-term and long-term environmental, economic, social and equitable objectives.

Throughout the design of the Project, the Proponent has endeavoured to address each of the sustainable development principles. The following sub-sections draw together the features of the Project that reflect the four principles of sustainable development, namely:

- the precautionary principle;
- the principle of social equity;
- the principle of the conservation of biodiversity and ecological integrity; and
- the principle for the improved valuation and pricing of environmental resources.

6.2.2.2 The Precautionary Principle

In order to satisfy this principle of ESD, emphasis must be placed on anticipation and prevention of environmental damage, rather than reacting to it. During the planning phase for the Project and throughout the preparation of the *Environmental Assessment*, the Proponent

engaged specialist consultants to examine the existing environment, predict possible impacts and recommend controls, safeguards and/or mitigation measures in order to ensure that the level of impact satisfies statutory requirements or reasonable community expectations. Throughout the development of the Project, the Proponent and its consultants have adopted an anticipatory approach to impacts by undertaking an analysis of the risks posed by activities of the Yarraboldy Extension, an appropriate level of research and baseline investigations and environmental evaluation. The controls, safeguards and/or mitigation measures have therefore been planned with a comprehensive knowledge of the existing environment and the potential risk of environmental degradation posed by Project activities.

The implementation of the environmental safeguards, controls and mitigation measures has been formalised by the Proponent as the draft Statement of Commitments presented as Section 5.

Examples of matters relating to the precautionary principle that were considered during the various stages of the Project are listed below.

Identification of Project Objectives

The proposed Yarraboldy Extension has been designed with the principal objective of the continuation of the supply of coal for the Pine Dale Coal Mine in a safe and environmentally responsible manner which meets the requirements of local and State government agencies, accepted industry standards and wherever possible, reasonable community expectations. The Proponent recognises that only through comprehensive environmental assessment, consideration of feasible mitigation measures and an environmentally responsible approach to the design and operation of the Project can the risk of harm to the environment be minimised.

Design of Project Components

Several design aspects of the proposed Yarraboldy Extension required the consideration of potential impacts on the local environment to ensure the requirements of local and State government agencies, accepted industry standards and wherever possible, reasonable community expectations were met. These included the following.

- The footprint of the Project Site has been designed to avoid all known archaeological sites, therefore preventing the need to disturb any known archaeological sites. The Proponent also is aware of their obligations under the National Parks and Wildlife Act regarding the discovery of artefacts and the steps that are required to be taken if an artefact is discovered within the Project Site. All personnel who work on the site are also trained and aware of these obligations.
- The Project footprint has been designed so that known habitat (*Bursaria spinosa*) of the threatened Purple copper butterfly has been avoided.
- The Project has been designed to include a strategy to salvage hollows during the clearing process, where practicable and installation on trees in adjacent forest together with additional nesting boxes.
- The Project would include the establishment of a biodiversity offset to maintain biodiversity values.

- The Project has been designed around mining through and subsequently rehabilitating the un-rehabilitated former Yarraboldy Open Cut Mine, which would ultimately produce a more sustainable land use in the future than is currently available.
- Aspects of the Project such as the proposed tonnages, the hours of operation, types of equipment used, how the coal is processed etc would remain almost identical as what has already been approved for the existing Pine Dale Coal Mine. These aspects were designed into the Project to ensure the changes in impacts as a result of the Yarraboldy Extension would be limited and may even decrease in some aspects, as mining operations would be moving further away from the town of Blackmans Flat.
- The Project has been designed to include the construction of an amenity bund during the initial phases to mitigate any potential noise impacts from the Project on residents in Blackmans Flat.
- The crusher would be relocated further to the north into the Yarraboldy Extension. This would increase the distance between the crushing area and the nearest residential receptors and therefore should reduce impacts associated with the crusher such as noise and dust at these nearest residential receptors.
- The Project has been designed to be a net water user. As a net water user, the requirement to discharge excess water would be limited. This would reduce potential Project-related impacts to surface water and groundwater relating to discharge.
- The Private Coal Haul Road would be utilised to transport the majority of product coal to customers, rather than it being transported on the public road network. This would reduce noise impacts from the transport of product as the Private Coal Haul Road is located further away from residential receptors. Transporting the majority of coal on the Private Coal Haul Road would also decrease the impacts and thus maintenance costs from transporting coal on the public road network.

Integration of Safeguards and Procedures

The framework for ongoing environmental management, operational performance and rehabilitation of the Project Site would be provided through the Project approval and be managed in accordance with approved management plans, which would involve the input from relevant State and local government agencies. The Mining Operations Plan, which would contain a range of site specific environmental procedures to achieve consistency with specified outcomes and to control identified risks, would be updated periodically, while 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:

- all on-site procedures would be regularly reviewed, particularly in light of monitoring results;

- surface water, groundwater, noise, deposited dust and PM_{10} levels would be monitored at locations potentially most affected by the Project in order to ensure the continued compliance with the goals outlined in this document;
- wherever possible, areas not required for mining-related activities or not already disturbed by previous mining activities would remain vegetated to assist in minimising erosion and reducing the suspended sediment load in surface water flowing through the Project Site;
- topsoil and subsoil would be stripped, stockpiled and re-spread on the basis of the quality of the soil (as indicated by the soil mapping unit) and planned final land use of different areas of the final landform; and
- clearing of vegetation would be undertaken where possible outside of primary breeding season for native animals (September to December). A pre-clearing inspection would also be undertaken for breeding nesting fauna and relocation of species, if required.

Rehabilitation and Subsequent Land Use

Long term adverse impacts on the local environment would be avoided through the design and rehabilitation of disturbed areas to a landform and vegetation structure equivalent to that of the pre-mining environment (vegetation conservation and for use by I&I NSW – Forests).

Conclusion

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

6.2.2.3 Social Equity

Social equity embraces value concepts of justice and fairness so that the basic needs of all sectors of society are met and there is a fair distribution of costs and benefits to the community. Social equity includes for both inter-generational (between generations) and intra-generational (within generations) equity considerations.

Equity within generations requires that the economic and social benefits of the development be distributed appropriately among all members of the community. Equity between generations requires that the non-material well-being or "quality of life" of existing and future residents of the local community would be maintained throughout and beyond the life of the Project.

Both elements of social equity are addressed through the design of the Project itself, 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 proposed development are listed below.

Identification of Project Objectives

The proposed Yarraboldy Extension has been designed with an objective of maintaining current employment numbers at the Pine Dale Coal Mine. If the Project does not proceed, all employment and flow-on effects associated with the Pine Dale Coal Mine would cease once the coal resource which is currently approved for extraction is exhausted. This would ultimately lead to a loss of income and economic benefit to the local community and loss of an opportunity to exploit a valuable low-cost energy source close to existing power generation facilities for domestic power generation. Finally, there would be a loss of royalties to the State Government.

The Project has also been designed with an objective to ensure the continued viability of surrounding land uses throughout and beyond the life of the Yarraboldy Extension.

Design of Project Components

The Project has been designed to maintain inter-generational equity, i.e. in recognition that mining is a relatively short-term land use and to ensure components of the existing biological, social and economic environment available to existing generations would also be available to future generations.

- The location and design of the Project footprint, has been designed to minimise disturbance upon native vegetation and sensitive fauna habitats.
- The location and design of the Project footprint has been designed to ensure that disturbance to known Aboriginal heritage sites would be avoided.
- The Project has been designed to include a strategy to salvage hollows during the clearing process, where practicable and installation on trees in adjacent forest together with additional nesting boxes.
- The Project would include a biodiversity offset to maintain biodiversity values.
- The rehabilitation of the Project Site has been designed to re-establish native vegetation for nature conservation and forestry purposes. The un-rehabilitated former Yarraboldy Open Cut Mine would also be rehabilitated with an aim to re-establish native vegetation for nature conservation and forestry purposes.

Integration of Safeguards and Procedures

The Proponent recognises that all members of the local surrounding communities should benefit appropriately from the Project either directly or indirectly. In order to ensure a realistic distribution of benefits, the Proponent would continue to consult with the local community and maintain a pro-active approach to issues of interest. This dialogue would also include a system to record, manage and respond to any complaints relating to the operation.

Rehabilitation and Subsequent Land Use

The final landform would be constructed and rehabilitated in a manner that would generally retain land for nature conservation and forestry purposes. This should assist in maintaining the existing State Forest for use not only for conservation and forestry, but also for recreational purposes by the local community.

Conclusion

The principle of social equity has been addressed throughout the design of the Yarraboldy Extension. The Project would maintain the economic activity of the surrounding local communities through maintaining employment and demand for local goods and services and flow-on effects. As such, the benefits of the Project would be distributed throughout the local community. The Yarraboldy Extension was also designed such that elements of the existing environment available to this generation, including local biodiversity and forestry would continue to be available to future generations. The Proponent would continue to adopt a pro-active approach in identifying and addressing any concerns identified by the local community.

6.2.2.4 Conservation of Biological Diversity and Ecological Integrity

The protection of biodiversity and maintenance of ecological processes and systems are central goals of sustainability. 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 proposal has been designed to achieve compliance with these principles are set out below.

Identification of Project Objectives

It is the objective of the Proponent to undertake the development and operation of the proposal in a safe and environmentally responsible manner.

The Proponent also proposes to construct a final landform and rehabilitate the Project Site with species that are suitable for nature conservation and forestry purposes. The area to be rehabilitated back to nature conservation and forestry purposes would be greater that what is currently available for nature conservation and forestry purposes within the Project Site, as the currently un-rehabilitated former Yarraboldy Open Cut Mine would also be rehabilitated for nature conservation and forestry purposes as part of the Project.

Design of Project Components

The Project has been designed to ensure that the Project would not threaten the integrity of an ecological system as a whole or the conservation of a threatened species in the short or long term. The key design components relating to the conservation of biological diversity and ecological integrity are as follows.

- The Project would include a biodiversity offset to maintain biodiversity values.
- The Project has been designed to rehabilitate the area to use for forestry purposes and conservation use. The currently un-rehabilitated former Yarraboldy Open Cut Mine would also be rehabilitated to the same standards. The rehabilitation of the overall Project Site would therefore in the long term be either equal to or better than what is currently established within the Project Site increasing the overall biodiversity values.
- The Project has been designed to include a strategy to salvage tree hollows during the clearing process, where practicable and installation on trees in adjacent forest together with additional nesting boxes.

- Clearing of vegetation would be undertaken where possible outside of primary breeding season for native animals (September to December). A pre-clearing inspection would also be undertaken for breeding nesting fauna and relocation of species if required.
- The Project footprint has been designed so that known habitat (*Bursaria spinosa*) of the threatened Purple copper butterfly has been avoided.
- The Project Site has been designed to limit the clearing of vegetation by centring the proposed mining area over the previously disturbed former Yarraboldy Open Cut Mine.

Integration of Safeguards and Procedures

The following safeguards and procedures would be integrated into the Project with the objective of maintaining biological diversity and ecological integrity.

- During the clearing process, any hollow-bearing trees would be salvaged where practicable and installed on trees in adjacent forest together with additional nesting boxes.
- Clearing of vegetation would be undertaken where possible outside of primary breeding season for native animals (September to December). A pre-clearing inspection would also be undertaken for breeding nesting fauna and relocation of species, if required.

Progressive Rehabilitation and Subsequent Land Use

As noted above, the final landform and rehabilitation design for the Project Site would ensure that the area would be suitable for nature conservation and forestry purposes. The area to be rehabilitated would also include the currently un-rehabilitated former Yarraboldy Open Cut Mine. Rehabilitation of the Project Site would therefore increase the area that is currently available for nature conservation and forestry purposes.

Conclusion

The proposed project would address the principles of Conservation of Biological Diversity and Ecological Integrity through the following.

- Establishment of a biodiversity offset.
- Minimisation of disturbance to areas of native vegetation and re-establishment of comparable areas native vegetation disturbed.
- Increasing the area currently available for nature conservation and forestry purposes.
- Avoiding known habitat of threatened species in the area.
- Providing temporary habitat in forested areas adjacent to the Project Site until rehabilitation could sustain an equally suitable habitat.
- Should threatened species be identified within those areas of the Project Site to be disturbed, these would be relocated or managed appropriately.

In addition, the Proponent would identify an offset for the native vegetation to be removed to maintain the biodiversity values both in the short term and long term.

6.2.2.5 Improved Valuation and Pricing of Environmental Resources

The issues that form the basis of this principle relate to the acceptance that the polluter pays, all resources are appropriately valued, cost-effective environmental stewardship is adopted and the adoption of user pays prices based upon the full life cycle of the costs. A reflection of these issues on the proposed Yarraboldy Extension is set out below.

Identification of Project Objectives

One of the objectives of the Proponent for this Project is to ensure the ongoing operation of the Pine Dale Coal Mine by undertaking all activities in an environmentally responsible manner that enables compliance with all relevant requirements. In addition, by identifying the objective of rehabilitating the Project Site, including previously mined areas, comparable to what currently exists and a future land use of nature conservation and forestry, the Proponent had indicated the value placed on both of these non-coal elements of the environment.

Design of Project Components and Integration of Safeguards and Procedures

The extent of research, planning and design of environmental safeguards and mitigation measures to prevent irreversible damage to environmental resources, other than the coal to be mined, is evidence of the value placed by the Proponent on these resources.

Progressive Rehabilitation and Subsequent Land Use

The design of the final landform to replicate as far as practical, the known pre-mining environment as well as enhance the existing environment through the rehabilitation of the former Yarraboldy Open Cut Mine exemplifies the value placed by the Proponent on the existing environment of the Project Site.

Conclusion

The value placed by the Proponent on the environmental resources, other than the coal to be mined, is evident in the identification of proposal objectives, extent of research, planning and environmental safeguards and measures to be implemented to prevent irreversible damage of these resources undertaken in association with the proposal and the design of a post-mining landform amenable to future land uses comparable or better than what is currently in place. It is planned that the price of the product sold would be sufficient to enable the Proponent to undertake all environmentally-related tasks and meet any commitments made to the local community.

6.2.2.6 Conclusion

The approach taken in planning for this Project has been multi-disciplinary, involved consultation with potentially affected local residents and various government agencies. The emphasis has been on the application of appropriate safeguards to minimise potential environmental, social and economic impacts. The design of the proposed Yarraboldy Extension has addressed each of the sustainable development principles and on balance, it is concluded that the proposal achieves a sustainable outcome for the local and wider environment.

6.3 JUSTIFICATION OF THE PROJECT

6.3.1 Introduction

In assessing whether the development and operation of the Project is justified, consideration has been given to both biophysical and socio-economic factors including the predicted residual impacts on the environment and the potential benefits of the Project. This section also considers the consequences of the Project not proceeding, the planning considerations involved in the design of the Project and the alternatives considered as part of the final Project design.

6.3.2 Biophysical Considerations

Table 6.1 presents the range of mitigated residual impacts on the biophysical environment predicted should the Project proceed based on the assessments summarised in **Section 4B**. The Project would have some impacts on the biophysical environment. The residual impacts considered being of greatest significance and the proposed management of these are summarised in the following sections.

6.3.2.1 Ecology

Based in the fauna assessment for the Project, the following residual impacts relating to ecology would result.

The Project would result in the removal of approximately 14ha of native forest, 2ha of grassland/shrubland, 1ha of artificial wetland and 10ha of un-rehabilitated open cut coal mine. This includes known habitat for three threatened fauna species and potential habitat for a number of additional threatened and migratory species.

In relation to the maintenance or improvement of biodiversity values, there would be a net increase in vegetation within the extension area. The biodiversity values of the extension area would remain relatively low for some period of time, however, this would be mitigated through the establishment of the biodiversity offset area. Therefore, the overall biodiversity values would be maintained in the short term and enhanced in the long term as the rehabilitated areas mature. The following is also noted.

- There would be a net progressive increase in forest and woodland communities with approximately 10ha of bare earth and coaly residue and additional areas of disturbed land rehabilitated. In the medium term (5 to 30 years), this would result in an increase in foraging habitat for most of the species currently utilising the forested areas. It would also increase the sheltering habitat for these and many other species and also the breeding habitat for some.
- Emphasis would be placed upon enhancing habitat for important target species, such as the Purple copper butterfly. Due to the nature of the habitat requirements for this species, it is anticipated that this could be achieved in the medium term. Although not 'like for like' replacement of biodiversity values, the enhancement of such habitat provides an important contribution to both local and regional biodiversity values.

- The use of nesting boxes and salvaging of hollows would assist in maintaining the short and medium term habitat value for hollow-dependent species. It is acknowledged that the value to this measure would begin to reduce over approximately 15 to 20 years as the nesting boxes and salvaged hollows begin to deteriorate. However, this would provide the opportunity for more mobile species to transition to other roosting habits.

In order to further reduce the potential impacts of the proposed extension, a Flora and Fauna and Rehabilitation Management Plan would be developed as part of the overall biodiversity management strategy. These plans would be developed in consultation with the DECCW prior to any clearing activities within the forest or woodland areas and provide for mitigation and management measures as outlined in Section 4B.4.4 of this *Environmental Assessment*.

The flora assessment conducted for the Project identified that there would be residual impacts on four Key Threatening Processes, namely:

- clearing of native vegetation;
- removal of dead wood and dead trees;
- loss of hollow-bearing trees; and
- bushrock removal.

In order to minimise impacts of removal of native vegetation, removal of dead wood and dead trees, loss of hollow-bearing trees and bushrock removal, two operational safeguards would be implemented. Fallen logs, tree trunks and branches would be saved during clearing operations and replaced on the rehabilitated landscape at the cessation of mining. The rehabilitated land would be re-planted with native tree and shrub species representative of those that would be cleared. Over time, these actions would compensate for the impact of the initial removal.

6.3.2.2 Noise

Based in the noise assessment for the Project, the following residual impacts relating to noise would result.

Based on noise modelling, it was determined that operational noise levels would meet the Project specific noise criteria at all locations with the exception of a possible 2dB(A) exceedance at Residence 8 and a 1dB(A) exceedance at Residence 10. These exceedances are predicted to occur during the final shaping of the final landform in Mining Area C within the existing Pine Dale Coal Mine.

The elevated noise levels at Residence 8 and Residence 10 represent a marginal noise level increase which would not be noticeable by most people. Notwithstanding this, the noise levels are predicted to be within the noise management zone. Therefore, in order to limit the impact on these residences, the following management procedures would be considered for implementation, if appropriate.

- Prompt response to any community issues of concern.
- Noise monitoring on site and within the community. If noise monitoring identifies actual exceedances of the noise criteria, either noise mitigation should be installed on the bulldozers, or one of the bulldozers should be removed from reshaping activities in Mining Area C.

- Consideration of acoustical mitigation at receivers.
- Consideration of negotiated agreements with property owners for the short duration exceedances may occur.

Product transportation within the Project Site from the product coal stockpile area to the intersection of the Castlereagh Highway during the evening period between 6:00pm and 8:00pm is predicted to comply with the Project specific noise criteria at all locations during calm and prevailing meteorological conditions with the exception of Receiver 1 where exceedances of up to 4dB(A) are predicted and Receiver 2 where a 2dB(A) exceedance is predicted under prevailing west-northwest winds.

It should be noted that, while evening noise levels from product transport are predicted to exceed the Project specific noise criteria based on the INP, noise levels are predicted to meet the road traffic noise criteria when travelling on the Castlereagh Highway. Furthermore, predicted noise levels from on-site truck movements are significantly below existing road traffic noise levels at the nearest residence and it is therefore considered unlikely that on-site truck movements would be distinguishable from existing road traffic movements.

It should also be noted, that product transport at the Pine Dale Coal Mine is currently approved to operate at the proposed rates (10 trucks (20 movements) per hour) and no complaints have been received.

Notwithstanding this, if complaints regarding noise emissions between 6.00pm and 8.00pm from the transport of product within the Project Site to the Castlereagh Highway intersection arise, the following management procedures would be considered.

- Prompt response to any complaint.
- Noise monitoring on site at the point of the complaint.
- Installation/refinement of on-site noise mitigation measures and mine operating procedures where practical.
- Consideration of acoustical mitigation at receivers.

In addition, noise levels attributable to the Project would continue to be monitored on a quarterly basis at the potentially affected receiver locations outlined in the current Pine Dale Coal Mine Noise Monitoring Program and, if elevated noise levels associated with the Project result, then appropriate mitigation measures would be investigated an adopted where appropriate to reduce noise emissions relating to the Project.

6.3.2.3 Surface Water Resources

Based in the surface water assessment for the Project, the following residual impacts relating to surface water resources would result.

- Elevated turbidity within surface water runoff.
- Entrainment of coal fines within surface water runoff.
- Potential for elevated mineral and nutrient content in surface water runoff.

- Potential for increased salinity within surface water runoff.
- Potential for elevated levels of hydrocarbons in surface water associated with the workshop.
- Changes in clean water flows reporting to surrounding watercourses.
- The potential for further alteration to the existing hydrologic regime.

In order to minimise the above residual impacts in relation to surface water, the following strategies would be implemented.

- All flows would be designed and managed in accordance with industry best practice so that water flows leaving the Project Site result in neutral to beneficial effect on water quality in the receiving waters of Neubecks Creek and Coxs River.
- All clean and dirty water flows would be segregated.
- Overland flow would be minimised across disturbed areas.
- All surface water captured within the dirty water system would be managed appropriately in order to meet the Project's water usage requirements.
- Dirty water captured would be preferentially re-used on site and only discharged in accordance with the Proponent's EPL when total site storage levels are above 90%. This would provide the capacity to contain more rainfall events and reduce potential for wet weather discharges and/or flooding of the active pit. All discharges would be monitored to ensure compliance with the EPL.
- Temporary erosion and sediment control structures would be installed during the site establishment phase of the Project to minimise the discharge of sediment-laden water from newly disturbed areas.
- The final landform would be designed to generally recreate the natural drainage catchments as closely as possible and would be predominantly free-draining although sediment retention dams would remain in place until a stable landform is achieved, after which the dams may remain as clean water dams.
- The proposed Retention Dam A would be built to meet or exceed the minimum specified design sizes.
- The mine plan and the open-cut pit would be designed to maximise potential for in-pit water storage, should it be required during high rainfall events.
- If multiple sediment dams are constructed, water would be transferred from sediment basins lower in the treatment chain to sediment basins higher in the treatment chain to ensure the lower basins have capacity to store rainfall events.

6.3.2.4 Air Quality

Based in the air quality and greenhouse gas assessment for the Project, the following residual impacts relating to air quality were identified.

The results of the modelling indicate that the cumulative 24-hour average PM_{10} concentrations are predicted to exceed the guideline of 50µg/m³ at the nearest sensitive receptors on some days during both the site establishment phase and operational phase. It should be noted, that both the scenarios modelled for 24 hour concentrations were based on the worst case, where both crushing operations and the transport of product is occurring for the total amount of the proposed hours of operation in a day and that one blast would also occur. As it is proposed that blasting would only occur once a week and that crushing and product transport may not always be constant it can be assumed that the modelled predictions for 24 hour concentrations of PM_{10} are greater than what would actually occur in most instances for the Project.

It must be noted that historical monitoring results of PM_{10} for the existing Pine Dale Coal Mine (which has similar operations to the proposed Yarraboldy Extension) show that the 24 hour average. Notwithstanding this, the following measures would be implemented to manage any actual impacts resulting in cumulative 24-hour average PM_{10} concentrations associated with the Project.

- Ongoing monitoring of PM_{10} at the existing monitoring site, which is representative of PM_{10} levels at the potentially worst affected receptor.
- If it is determined that PM_{10} dust levels become elevated, extra mitigation measures would be implemented such as more road watering and modification of site activities during windy conditions.
- An increase in the frequency of PM_{10} sampling (from once every 6 days to once every 3 days, for example) may be conducted should elevated PM_{10} concentrations begin to be recorded.
- Ongoing implementation of dust mitigation practices associated with the existing Pine Dale Coal Mine including haul road watering and covering of product truck loads.

6.3.2.5 Blasting

Based on an independent assessment of blasting impacts on behalf of the Proponent for the Project, the following was concluded.

- The ground vibration criteria of 5mm/s could be satisfied at the closest residence approximately 400m from the closest blast. An 80kg maximum instantaneous charge would enable this criterion to be satisfied although reliance would be placed on site experience and monitoring to confirm the maximum instantaneous charge used when close to residences. As blasting progresses away from the closest residence, an increase in maximum instantaneous charge would be made.
- At a distance of 400m from a blast, the air blast level could be in the order of 115dBL based on the worst case scenario. If good control of blast parameters is maintained, lower air blast levels than 115dBL would expected at this distance. Similarly, with an increased distance, the potential for an air vibration limit exceedance would diminish and/or disappear.

- The stringent blasting protocol that was developed for the existing Pine Dale Coal Mine would be maintained for the Project, especially when blasting within a 400m to 600m range. However, as the Project develops further away (i.e. beyond the 600m distance) a less stringent protocol of blasting can be implemented.

6.3.2.6 Groundwater Resources

Based on the groundwater assessment for the Project, the following residual impacts relating to groundwater resources would result.

- Predictive analytical groundwater modelling indicated that groundwater inflow to the open cut pit of the Yarraboldy Extension would reduce from 45m^3/day after the first 6 months of operation to 15m^3/day at the end of initial 18 months of mining. After this time, mining would intercept groundwater stored in the old Wallerawang Colliery underground void and the total inflow would reach 35m^3/day by the end of the second year of mining.
- Extraction of groundwater by dewatering would lower the water levels of the Lithgow Seam aquifer within and close to the Yarraboldy Extension area, however, this drawdown would be negligible as the seam dips away to the northeast from the proposed extraction area and the water table is increasingly lower than proposed in the open cut pit. Therefore, only those bores that are either directly to the north or to the east of the Yarraboldy Extension area could be impacted by mine dewatering. All privately owned bores within a 15 km radius are beyond the extent of the mine dewatering and therefore the Project would not impact on any groundwater users in the area.

Groundwater trigger values have been developed and groundwater would be monitored on a regular basis to determine if any impacts are occurring to groundwater as a result of the Project.

The Proponent would implement the following measures if impacts on groundwater related to activities associated with the Project are demonstrated based on monitoring and trigger values.

- Assess the significance of the impacts.
- Investigate measures to minimise the impacts.
- Describe what measures would be implemented to reduce, minimise, mitigate or remediate these impacts to the satisfaction of the DECCW - NOW.

If a non-conformance with the recommended trigger criteria is determined to be the result of activities associated with the proposed Yarraboldy Extension, then the impacted landholder and DECCW - NOW would be notified and a remediation strategy would be proposed and implemented.

6.3.2.7 Heritage

Based on the heritage assessment for the Project, no known archaeological sites would be disturbed as part of the proposed Yarraboldy Extension.

6.3.2.8 Transportation Aspects

Based on the traffic and transport assessment conducted for the Project, it was assessed that there would be no impacts to traffic or road infrastructure as a result of the Project.

6.3.2.9 Visibility

Based upon the available topographic information, observations from surrounding vantage points and the proposed mitigation measures, it was considered that the operations within the Yarraboldy Extension area would generally not be visible from surrounding residences except during the construction of the amenity bund and in the very late stage of the Project**.**

Based on the minimal and short duration of potential impacts to visibility of the Project, no extra mitigation measures have been proposed.

6.3.2.10 Soils, Land Capability and Agricultural Suitability

Based on the assessment, it was determined that no further mitigation measures other than those described in the assessment would be required to manage any residual impacts to soils, land capability or agricultural suitability within the Project Site. Overall, the land capability of the site would be improved given the 10ha void created by the old Yarraboldy Open Cut Mine would be removed.

6.3.3 Socio-economic Considerations

The proposed Yarraboldy Extension, if approved would enable the Proponent to continue to obtain access to a valuable coal resource for local markets. The proposed project would also provide a continued source of employment and income for residents in the local area and the surrounding district and assist in maintaining the local economies. Income in the form of royalties would also continue to be paid to the State government as a result of the Project.

6.3.4 Planning Considerations

This subsection reviews the compliance of the proposed Yarraboldy Extension with local, regional and State planning instruments. It is noted that whilst the relevance of these instruments may change in the future, the following represents the application of these in their current form to the Project as described in Section 2.

State Environmental Planning Policy (Major Development) 2005

Being a coal mine, the proposed Project is identified under Schedule 1 of the SEPP as a Group 2 class of development and hence is a Major Development to which Part 3A of the EP&A Act 1979 applies. This *Environmental Assessment* addresses the requirements of this SEPP.

State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007

The SEPP specifies matters requiring consideration in the assessment of any mining, petroleum production and extractive industry development, as defined in NSW legislation. **Table 3.1** presents a summary of each element requiring consideration and a reference to the section in the *Environmental Assessment* where this is addressed.

State Environmental Planning Policy No. 33 – Hazardous and Offensive Development (SEPP 33)

Based on the risk screening method of DUAP (1997), neither the storage nor transport of the hazardous materials to be stored on the Project Site would result in the Project being considered a hazardous, offensive or potentially hazardous under SEPP 33 (see **Appendix 4**).

State Environmental Planning Policy No. 44 (SEPP 44) – Koala Habitat Protection

SEPP 44 has been addressed by the flora consultant for the Project (GCNRC, 2010b – see *Specialist Consultant Studies Compendium* – Part 4). The Project Site does not represent core Koala habitat (see Section 4B.3.3.3).

State Environmental Planning Policy No. 55 – Remediation of Land (SEPP 55)

As the previous mining operation is not known to have generated any contamination that requires remediation work prior to undertaking the proposed mining operation, SEPP 55 is not relevant to the consideration of the Project.

6.3.5 Consequences of not Proceeding with the Project

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

i) The coal recoverable by open cut methods would not be mined by the Proponent. Such an outcome would be contrary to the State's and the Proponent's objective to maximise resource utilisation.

ii) The un-rehabilitated former Yarraboldy Open Cut Mine would not be rehabilitated.

iii) Employment of 12 on-site full-time equivalent personnel and seven product transport drivers would cease.

iv) The disposable wages for the above workforce would be foregone, a substantial proportion of which would be spent in the Lithgow area.

v) Foregoing the additional PAYE taxes for the three year life of the mine.

vi) Foregoing additional coal royalties and payments to State Authorities.

vii) The additional minor impacts relating to the Project on the local biophysical environment would not eventuate.

It is considered that the benefits of proceeding with the proposed Yarraboldy Extension therefore far outweigh the minor impacts on the environment that would result. The nominated consequences of not proceeding with the Project also weigh heavily in favour of proceeding with the Project.

6.4 CONCLUSION

The proposed Yarraboldy Extension has, to the extent feasible, been designed to address the issues of concern to the community and all levels of government. The Project provides for maintaining production, sale and despatch of up to 350 000tpa of thermal coal products to local customers. The ongoing operation of the Pine Dale Coal Mine would ensure that current

employment opportunities associated with the operation are maintained which would continue to contribute to the to the local economy. The post-mining landform would integrate the re-establishment of native woodland for native conservation and forestry purposes. It would also include the rehabilitation of the former Yarraboldy Open Cut Mine to native woodland for nature conservation and forestry purposes, thus resulting in a net land use benefit.

This document and the range of specialist consultant studies undertaken have identified that the Project should proceed because it would:

i) continue the assist in satisfying the local demand for thermal coal;

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

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

iv) satisfy sustainable development principles; and

v) provide for continuing and future use of the Project Site for nature conservation and forestry purposes.

Section 7

References

ANZECC/ARMCANZ (2000). *National Water Quality Management Strategy: Australian Guidelines for Water Quality Monitoring and Reporting.*

Aquaterra (2010). *Pine Dale Coal Mine Yarraboldy Extension Groundwater Assessment. Part 1 of the Specialist Consultant Studies Compendium.*

AS&R (2010). *Pine Dale Coal Mine Yarraboldy Extension Aboriginal Heritage Assessment. Part 9 of the Specialist Consultant Studies Compendium.*

Barnson (2010). *Pine Dale Coal Mine Yarraboldy Extension Traffic and Transport Assessment. Part 8 of the Specialist Consultant Studies Compendium.*

Bembrick CS. (1983). *Stratigraphy and Sedimentation of the Late Permian Illawarra Coal Measure in the Western Coal Field, Sydney Basin NSW*, Royal Society of NSW Journal and Proceedings 116 No.'s 3-4pp 105-118

Benson & Keith (1990). *A Description of Vegetation of the Wallerawang 1:100 000 Map Sheet.*

Bish S (1999), *Hydrogeological Assessment for Coxs River Catchment,* Department of Land and Water Conservation.

Countrywide Ecological Services (2004). *Fauna Assessment for the Pine Dale Coal Mine.*

DEC (2005). *Draft Guidelines of Aboriginal Heritage Assessment and Community Consultation.*

DEC (2005). *Guidelines for Threatened Species Assessment.*

DEC (2006). *Study of the Vegetation of the Western Blue Mountains.*

DECC (2007). *Guidelines for the Assessment and Management of Groundwater Contamination.*

DECC (2008). *Soils and Construction: Managing Urban Stormwater.*

DECCW (2009). *Waste Classification Guidelines.*

Department of Planning (2008). *Applying SEPP 33 Consultation Draft.*

Ecotone Ecological Consultants (1996). *Flora and Fauna Survey and Assessment Mt Piper Power Station Perimeter Lands and Thompsons Creek Dam.*

Ecotone Ecological Consultants (2009). *Draft Terrestrial Fauna Impact Assessment for the Proposed Pine Dale Coal Mine Stage 1 and 2.*

Ecotone Ecological Consultants (2010). *Pine Dale Coal Mine Yarraboldy Extension Fauna Assessment. Part 5 of the Specialist Consultant Studies Compendium.*

Elliot and Veness (1981). *Selection of Topdressing Material for Rehabilitation of Disturbed Areas in the Hunter Valley*. J. Soil Cons. NSW 37: 37-40.

EPA (1999). *NSW Environmental Criteria for Noise (ECRTN).*

EPA (2000). *Industrial Noise Policy.*

GCNRC (2004). *Pine Dale Coal Mine Environmental Impact Statement Flora Study.*

GCNRC (2010a). *Pine Dale Coal Mine Yarraboldy Extension Soil Assessment. Part 3 of the Specialist Consultant Studies Compendium.*

GCNRC (2010b). *Pine Dale Coal Mine Yarraboldy Extension Flora Assessment. Part 4 of the Specialist Consultant Studies Compendium.*

GHD (2005). *Enhance Place Pty Limited – Wallerawang Pit Top (Pine Dale Mine Site) Rehabilitation – Enhance Place Mine Rehabilitation – Licence Variations Supporting Information Report.*

GSSE (2010). *Pine Dale Coal Mine Yarraboldy Extension Surface Water Assessment. Volume 1, Part 7 of the Specialist Consultant Studies Compendium.*

Heggies Pty Ltd (2010a). *Pine Dale Coal Mine Yarraboldy Extension Air Quality Assessment. Part 6 of the Specialist Consultant Studies Compendium.*

Heggies Pty Ltd (2010b). *Pine Dale Coal Mine Yarraboldy Extension Noise and Vibration Assessment. Part 7 of the Specialist Consultant Studies Compendium.*

Hazelton and Murphy (2007). *Interpreting Soil Test Results. What Do All the Numbers Mean*? A Guide for the Interpretation of Soil Test Results. CSIRO Publishing , Collingwood.

HNCMA (2007). *Regional Biodiversity Corridors and Priority Fauna Habitats.*

King (1993). Soil Landscapes of the Cullen Bullen 1: 250 000 Sheet. Report Department of Land and Water Conservation, Sydney.

Lithgow City Council (1994). *Local Environment Plan.*

Lithgow Tourism (2010). *Coal Mining in Lithgow.*

Rosewell (1993). *SOILOSS, A Program to Assist in the Selection of Management Practices to Reduce Erosion*. Second Edition. Department of Conservation and Land Management, Sydney.

Rosewell and Edwards (1988). *SOILOSS. A Program to Assist in the Selection of Management Practices to Reduce Erosion*. Technical Handbook No. 11. Soil Conservation Service of NSW, Sydney.

RW Corkery & Co Pty Limited (2004). *Environmental Impact Statement for the Pine Dale Coal Mine Proposal.*

RW Corkery & Co Pty Limited (2010). *Preliminary Environmental Assessment for the Pine Dale Coal Mine Extension Stage 1 and 2.*

SCA (2007). *Drinking Water Catchments Regional Environmental Plan No.1.*

Ward and Morris (1981). *Final Report on the Geological Assessment of the Clarence Colliery Lease Area (Authorisation No. 127),* prepared for Coalex Pty Ltd, 85pp (unpublished).

Yoo (2001). *A compilation of the Geology of the Western Coalfield, Notes to Accompany the 1: 100,000 Western Coalfield Geological Maps*, Geological Survey Report No GS 2001/204

This page has intentionally been left blank

Section 8

Glossary of Technical Terms, Acronyms, Symbols & Units

ACRONYMS AND ABBREVIATIONS

AADT Annual Average Daily Traffic

ABS Australian Bureau of Statistics

ADO Automotive Diesel Oil

AEMR Annual Environmental Management Report

AHD Australian Height Datum; generally equivalent to mean sea level

AMD Acid Mine Drainage

ANZECC Australia and New Zealand Environment and Conservation Council

AS Australian Standard

CCL Consolidated Coal Lease

CD Collection District (Australian Bureau of Statistics)

Council Lithgow City Council

DECC Department of Environment and Conservation

DECCW Department of Environment, Climate Change & Water

DIPNR Department of Infrastructure, Planning and Natural Resources

I&I NSW Industry & Investment NSW

DP Deposited Plan

EC Electrical Conductivity

EPBC Act *Environment Protection and Biodiversity Conservation Act 1999*

EP&A Act *Environmental Planning and Assessment Act 1979*

EPL Environment Protection Licence

ESD Ecologically Sustainable Development

INP Industrial Noise Policy

LALC Local Aboriginal Land Council

LEP Local Environmental Plan

LGA Local Government Area

MOP Mining Operations Plan

NEPC National Environment Protection Council

NEPM National Environment Protection Measure

NHMRC National Health and Medical Research Council

NSESD National Strategy for Ecologically Sustainable Development

NPWS National Parks and Wildlife Service

PFM Planning Focus Meeting

$PM_{2.5}$ particulate matter <2.5μm in diameter

PM_{10} particulate matter <10μm in diameter

PVS Peak Vector Sum

RBL Rating Background Level

REP Regional Environmental Plan

RH Relative Humidity

RTA Roads and Traffic Authority

SCSC Specialist Consultant Studies Compendium

SEPP State Environmental Planning Policy

TAPM The Air Pollution Model

TSC Act *Threatened Species Conservation Act 1995*

TSP Total Suspended Particulates

SYMBOLS

% percentage.

'000 t multiples of one thousand tonnes.

< less than.

> greater than.

Av average.

^{o}C degrees Celsius.

cm centimetre (unit of length).

dB decibel, unit used to express sound intensity.

dB(A) the unit of measurement of sound pressure level typically heard by the human ear, expressed in "A" scale.

ha hectare (10 0000m^2).

hr hour.

g/m^2/month grams per metre squared per month.

km kilometre (= 1 000 metres).

km^2 square kilometres.

km/hr kilometres per hour.

kV thousand volts (unit of electrical potential).

L litre (=1 000 mL).

L_{A1} sound level exceeded 1 per cent of the sampling time.

L_{A10} sound level exceeded 10 per cent of the sampling time.

L_{A90} sound level exceeded 90 per cent of the sampling time.

L_{Aeq} the L_{Aeq} is the "equal energy" average noise levels, and is used in some instances for the assessment of traffic noise effects or the risk of hearing impairment due to noise exposures.

$L_{Aeq\ 1\ hour}$ the "equal energy" average noise level over 60 minutes – used for assessing impacts of motor vehicles.

m metre.

mAHD metres of elevation relative to the Australian Height Datum.

m^2 square metre.

m^3 cubic metre.

ML megalitres.

mm millimetres (= 0.001 metres).

Mm/s millimetre per second.

m/s metres per second.

Mtpa million tonnes per annum.

pH a measure of the degree of acidity or alkalinity of a solution; expressed numerically (logarithmically) on a scale of 1 to 14, on which 1 is most acidic, 7 is neutral acid, and 14 is most basic (alkaline).

t tonnes.

tpa tonnes per annum.

tph tonnes per hour.

tsp total suspended particulate.

µg/m^3 micrograms per cubic metre.

µm micron, one millionth of a metre (one thousandth of a millimetre).

vkt vehicle kilometres travelled.

vph vehicles per hour.

GLOSSARY OF TECHNICAL TERMS

PROJECT SPECIFIC

Pine Dale Coal Mine - the currently approved coal mining operation encompassing an area of approximately 83ha north of the Castlereagh Highway (see **Figure 1.3**)

Private Coal Haul Road – privately owned coal haul road from Angus Place Colliery to the Mount Piper Power Station

Proponent – Enhance Place Pty Limited

Project Site – Proposed Pine Dale Coal Mine and the Yarraboldy Extension Area (see **Figure 1.3**)

Yarraboldy Extension area - the proposed mining area to the north of the existing Pine Dale Coal Mine which encompasses an area of approximately 27ha (see **Figure 1.3**). This area encompasses the former Yarraboldy Open Cut Coal Mine

Yarraboldy Open Cut Mine - an unrehabilitated former open cut coal mine to the north of the existing Pine Dale Coal Mine which is situated within the Yarraboldy Extension area

GENERAL

adverse weather conditions (with respect of dust) – conditions, such as high wind, that assist the movement of dust from the Project Site towards receptors

adverse weather conditions (with respect of noise) – conditions, such as temperature inversions or gentle winds (<3m/s) from the Project Site towards receptors

air contaminant – a substance in ambient atmosphere, resulting from the activity of man or from natural processes, causing adverse effects to man and the environment (also called "air pollution")

alkaline – having a pH greater than 7.0

alkalinity – in water analysis a measure of the carbonates, bicarbonates, hydroxides and occasionally the borates, silicates and phosphates in the water

alluvial – pertaining to material, such as sand or silt, deposited by running water (e.g. a creek or river)

aquifer - a layer of water-bearing material which is permeable and can transmit significant quantities of water

aquitard - a layer of water-bearing material which is relatively impermeable and cannot transmit significant quantities of water

amenity – the desirability of an area

ambient – relating to conditions outside the active Project Site.

arboreal – pertaining to tree habitats

archaeology – the scientific study of human history, particularly the relics and cultural remains of the distant past

attenuation – reduction in sound pressure levels between two locations

average annual rainfall – the average amount of rain to fall at a specific location over the period of 1 year (measured in millimetres)

background dust level – dust level in the absence of Project-related activities

background noise level – the level of the ambient sound indicated on a sound level meter in the absence of the sound under investigation (eg sound from a particular noise source; or sound generated for test purposes)

batter – an engineered slope of soil or rock fill on either side upslope or downslope of a road or embankment

biodiversity – the full range of living things and the ecosystem in which they live

biophysical – relating to the biological and physical attributes of the environment

buffer – a physical barrier / structure or width of land that encloses, partially encloses, or defines a particular environment. A buffer serves to minimise the impacts of non-desirable external influences on the adjoining environment

bulldozer – an item of tracked mobile earth moving equipment fitted with a front blade and with rear rippers used for pushing and ripping soil, rock and coal

catch drain – drain used to intercept and redirect runoff

catchment area – the area determined by topographic features within which rainfall will contribute to runoff at a particular point

clay – a size term denoting particles, regardless of mineral composition, with diameter less than 0.004 mm

concentration – the amount of a substance, expressed as mass or volume, in a unit volume of air

conductivity – the measurement of the ability of a substance (either a measure of solid, liquid or gas) to transmit electricity; a measure of the salt content

conservation – the management of resources in a way that will benefit both present and future generations

contour bank – an earth bank constructed across a slope parallel to contours

contractor – specialist brought in to perform a specific task, such as the construction of site infrastructure

ecology – the relationship between living things and their environment

deceleration lane – a lane used for decreasing speed before leaving a through road

decibel – unit expressing difference in power between acoustic signals

deposition – laying down of particulate material (e.g. sediment in a lake)

dispersibility – a characteristic of soils relating to their structural breakdown in water into individual particles

diversion bank – an earth bank constructed to divert water away from disturbed areas

drainage line – a passage along which water concentrates and flows towards a stream, drainage plain or swamp intermittently during or following rain

drawdown – the difference between the water level observed during pumping and the non-pumping water level (static water level or static head)

dust – particles of mostly mineral origin generated by erosion of surfaces and the mining and handling of materials

Ecologically Sustainable Development (ESD) – using, conserving and enhancing the community's resources so that the ecological processes on which life depends, are maintained, and the total quality of life now and in the future, can be increased (Commonwealth of Australia 1992)

ecosystem – a functional unit of energy transfer and nutrient cycling in a given place. It includes all the relationships within the biotic community and between the biotic components of the system

emission – a discharge of a substance (e.g. dust) into the environment

emission factor – an expression for the rate at which a pollutant is generated as a result of some activity, divided by the level of that activity

environment – a general term for all the conditions (physical, chemical, biological and social) in which an organism or group of organisms (including human beings) exists

Environmental Assessment (EA) – a report required to accompany a planning application for a major project – covering the project description, assessment of impacts and proposed safeguards and commitments

environmental constraint – limitation on a project by components of the existing environment

ephemeral – lasting only a short time e.g. creek flow

erosion – the wearing away of the land surface (whether natural or artificial) by the action of water, wind and ice

evaporation – the loss of water as vapour from the dam surface of a liquid

excavate – to dig into material using an excavator or other machinery

excavator – item of earth-moving equipment fitted with a bucket on an articulated boom used for digging material from a face in front of, or below the machine

exotic – introduced or foreign, not native

fauna – a general term for animals such as birds, reptiles, marsupials, fish etc

flora – a general term for plants

front-end loader – machine generally used to lift and place soil, earth, rocks, etc or to load products into trucks

grader – an item of rubber tyred earthmoving equipment, fitted with a centrally mounted blade and rippers used to shape and trim the ground surface

gradient – rate of change of a given variable (such as temperature or elevation) with distance

greenhouse – the heating of the earth's surface because outgoing long-wavelength radiation from the earth is absorbed and re-emitted by the carbon dioxide, water vapour and other greenhouse gases in the lower atmosphere and eventually returns to the surface

groundwater – water contained in voids such as fractures and cavities in rocks and inter-particle spaces in sediments e.g. sand

groundwater dependent ecosystem – those parts of the environment, the species composition and natural ecological processes of which are determined by the permanent or temporary presence or influence of ground water

habitat – the place where an organism normally lives; habitats can be described by their floristic and physical characteristics

hydrogeology – the study of groundwater

hydraulic conductivity (k) – the rate of flow of water through the soil profile or in an aquifer through a cross section of unit area under a unit hydraulic gradient, at the prevailing temperature. Usually expressed in units of metres per second or metres per day

hydraulic gradient – the direction of flow of groundwaters

igneous – a rock or mineral that solidified from molten or partly molten material

impact – the effect of human induced action on the environment (modified from Westman, 1985)

In situ – a term used to distinguish material (e.g. rocks, minerals, fossils, etc.) found in its original position of formation, deposition, or growth, as opposed to transported material

infiltration – the process of surface water soaking into the soil or ground

infrastructure – the supporting installations and services that supply the needs of a project eg. road or rail

interburden – material occurring between coal seams

inter-generational equity – the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations

intra-generational equity – the present generation should ensure that improved well-being and welfare are accessible to all sectors of society within Australia and that improved welfare within Australia does not result in decreased welfare in other nations

inversion – a weather term for a surface defining the boundary between two layers of air or different temperatures; generally used in meteorology with respect to an increase of temperature with height in contrast with the usual decrease of temperature with height in the troposphere. An inversion layer is distinguished by its large stability, which limits the turbulence and therefore the dispersion of pollutants

jointing – planes of discontinuity in rockmass which exhibit no evidence of relative movement

landform – a specific feature of a landscape (such as a hill) or the general shape of the land

major project – an activity as defined under the State Environmental Planning Policy (Major Projects) 2005

migratory – passing, usually predictably (based on aquatic species), from one region or climate to another, for purposes of feeding, breeding, or other biological purposes

mitigation measures – measures implemented to reduce (mitigate) an impact (such as the construction of a amenity bund to reduce sound emissions)

mobile equipment – wheeled or tracked self propelled equipment such as trucks and front-end loaders

monitoring – the regular measurement of components of the environment to understand a feature of the environment and/or establish that environmental standards are being met

native – said of an organism or group of organisms that is restricted to a particular region or environment. A local inhabitant of a place

particle size distribution – the relative proportions of particles (e.g. in a sediment) that fall within specific size categories

particulate matter – small solid or liquid particles suspended in or falling through the atmosphere - sometimes expressed by the term particulates

pervious – permeability

piezometer – a hole drilled specifically for the monitoring of groundwater levels and water quality

pH – a measure of the degree of acidity or alkalinity of a solution; expressed numerically (logarithmically) on a scale of 1 to 14, on which 1 is most acid, 7 is neutral acid, and 14 is most basic (alkaline)

Project Application – an application to the Department of Planning for approval of a major project (see **Appendix 1**)

precautionary principle – 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 degradation

relative humidity – the ratio of actual moisture in the air to the amount the air could hold if saturated, at a given temperature

residence time – the time that inflowing water is retained in a wetland or basin before being discharged. The RT is related to the volume of the inflow versus the total storage volume of the basin or wetland

runoff – that portion of the rainfall falling on a catchment area that flows across the land surface from the catchment past a specified point

silt – classic sediment, most of the particles of which are between 0.063mm and 0.004mm in diameter

social equity – embraces value concepts of justice and fairness so that the basic needs of all the sectors of society are met and there is a fairer distribution of costs and benefits to improve the well-being and welfare of the community, population or society

species – a taxonomic grouping of organisms that are able to interbreed with each other but not with members of other species

stockpile – a pile used to store material, such as products

stormwater – surface water runoff immediately after rainfall

stratigraphy – the succession and age of strata of rock and unconsolidated material. Also concerns the form, distribution and lithologic composition of the strata

suspended solids – analytical term applicable to water samples referring to material recoverable from the sample by filtration

sustainable development – development that meets the needs of the present without compromising the ability of future generations to meet their needs (World Commission on Environment and Development 1990)

temperature inversion – an atmospheric state where there is an increase in air temperature with height

topography – the physical relief and contour of an area

topsoil – the surface layer of a soil profile containing the main percentage of organic material and viable life forms and seeds

total suspended particulates (TSP) – the mass of all particulate matter suspended in a solution

total suspended solids – a common measure used to determine suspended solids concentrations in a waterbody and expressed in terms of mass per unit of volume (e.g. milligrams per litre)

wind rose – diagrammatic representation of wind direction, strength, and frequency of occurrence over a specified period

This page has intentionally been left blank