THE Bloomfield GROUP

Bloomfield Colliery

Completion of Mining and Rehabilitation

Part 3A Environmental Assessment Project Application 07_0087

Volume One

November 2008

Prepared by

business environment

STATEMENT OF VALIDITY

Environment Assessment prepared under Part 3A of the *Environmental Planning and Assessment Act 1979* and Regulations (NSW).	
This report has been prepared by:	Nicole Croker B. App Sc (EAM) (Hons) Director Business Environment Pty Ltd Suite 4, 80 Mann Street, Gosford NSW 2250
This report relates to:	Bloomfield Colliery Completion of Mining and Rehabilitation.
Applicant's Name:	Bloomfield Collieries Pty Limited
Property Description:	North of John Renshaw Drive, Buttai & east of Buchanan Road, Buchanan, 20 km north-west of Newcastle. Refer Appendix B for Lot and DP descriptions.
Declaration:	This Statement has been prepared in accordance with: • Part 3A of the Environmental Planning and Assessment Act 1979 and Regulations (NSW); and • the Director General's requirements dated 8 October 2007 in relation to this environmental assessment. This Statement contains all available information that is relevant to the environmental assessment of the development to which the Statement relates. To the best of my knowledge, the information contained in this report/documentation is not false or misleading.
Signed:	
Name:	Nicole Croker
Date:	12 November 2008

EXECUTIVE SUMMARY

1. INTRODUCTION

Bloomfield Colliery ('Colliery') is an existing open cut mining operation located to the north of John Renshaw Drive, Buttai and east of Buchanan Road, Buchanan, approximately 20 km north-west of Newcastle (refer **Figure A**). Mining has occurred on the Colliery site for approximately 170 years.

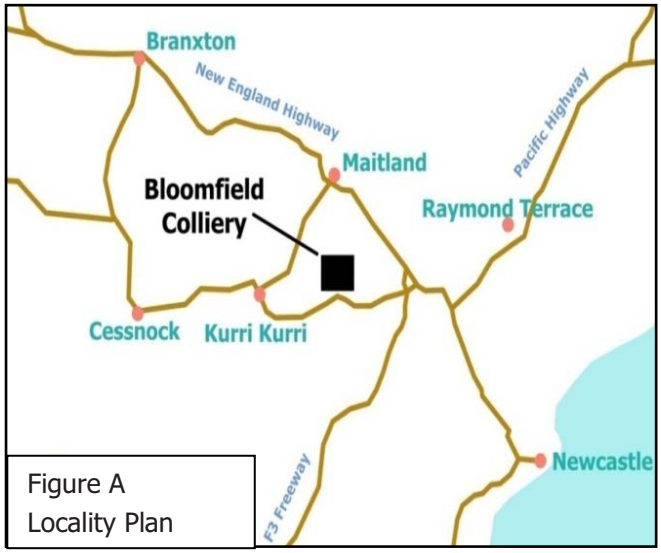

Figure A
Locality Plan

This Environmental Assessment ('EA') has been prepared to accompany a Project Application to enable the completion of mining and rehabilitation at Bloomfield Colliery ('the Project').

The EA has been prepared in accordance with Part 3A of the *Environmental Planning and Assessment Act 1979* and the *Environmental Planning and Assessment Regulation 2000*. The EA contains those items required to be addressed by the relevant legislation and the EA requirements issued by the Director-General of the NSW Department of Planning ('DoP') for the Project.

2. THE APPLICANT

The applicant for the Project is Bloomfield Collieries Pty Limited ('Bloomfield'), part of The Bloomfield Group of companies. Bloomfield is an Australian owned family company.

3. THE PROJECT AREA

The Project covers an area of approximately 317 hectares of which 299 hectares (95%) is presently disturbed by mining-related activities. All land within the Project Area is owned by Ashtonfields Pty Limited.

The site is located within the Cessnock Local Government Area, and zoned 1(a) Rural 'A' under the *Cessnock Local Environmental Plan 1989*.

4. PROJECT OVERVIEW

This Project Application and EA seeks approval for the continued operation of the following mine infrastructure and related activities to enable Bloomfield to complete its mining and rehabilitation schedule at the Colliery:

- the current and proposed open cut mine areas;
- the workshop;
- the road between the open cut pit areas and the ROM coal stockpile at the washery; and
- the road that links the workshop, open cut pits and washery.

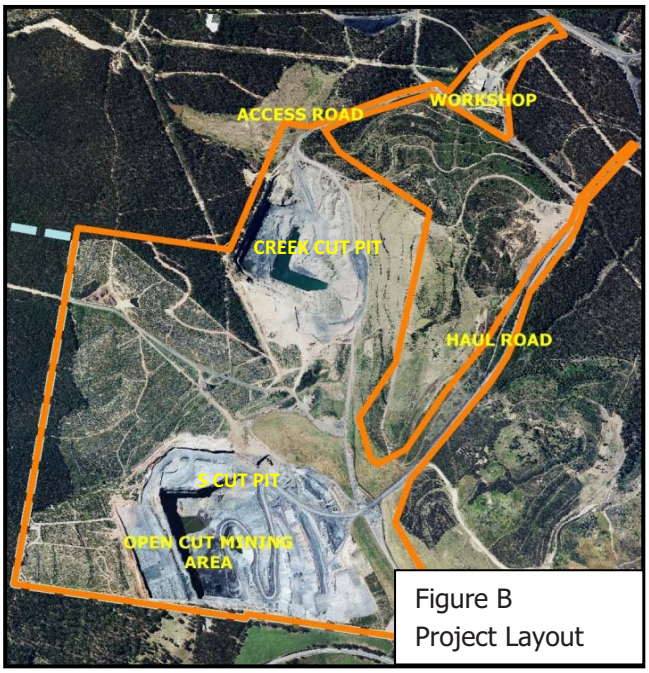

Figure B
Project Layout

The location of these elements of the Project is shown in **Figure B**.

Other mining infrastructure and activities at the Colliery have previously been approved under Project Approval 05_0139 for the Abel Underground Mine ('Abel Project Approval') granted by the Minister for Planning to Donaldson Coal Pty Limited on 7 June 2007. These infrastructure items and activities include the continued use of the washery and rail loading facility, management of water associated with the washery, coarse reject and tailings disposal and coal handling.

It is proposed to complete open cut mining over a 10 to 12 year period, which has been divided into 5 stages.

The first stage, representing current operations (the current 2007-2008 period), is for the mining of a maximum of 0.88 million tonnes per annum ('mtpa') run-of-mine ('ROM') coal. Stages 2, 3 and 4 (Years 1-5, 5-7 and 7-10 respectively) propose to mine up to a maximum of 1.3 mtpa ROM coal. Stage 5 (approximately Years 10-12) is for the completion of site rehabilitation. Current assessments of economically recoverable reserves have determined that there are approximately 14 million tonnes of ROM coal remaining in the Project Area.

The maximum annual mining rate provided for assessment purposes provides for flexibility in production rates over each year, enabling Bloomfield to respond to coal market fluctuations while enabling impact assessment studies to be based on maximum production scenarios.

The mine plan aims to extract the remaining economically recoverable reserves by extending the existing S Cut and Creek Cut mine pits. These pits, shown on **Figure B**, mine a range of coal seams within the Tomago Coal Measures.

A final void will remain at the end of mining which will be used as a reject emplacement area for the washery. The Abel Project Approval enables washery operations, including the emplacement of reject material, to continue after the completion of the Bloomfield Project.

5. THE MINING OPERATION

Mining is currently undertaken at the Colliery as a multi-seam truck and excavator or face shovel operation, conducted in sequential mining blocks. It is proposed to continue this existing method using the same or similar equipment. The majority of the Project Area has been previously cleared and additional clearing required for open cut mining is minimal.

ROM coal is trucked to the ROM coal stockpile at the Bloomfield washery for processing, which occurs under the Abel Project Approval.

Bloomfield Colliery operates 7 days per week, 24 hours per day operation. Approval is sought to continue the current hours of operation. Studies undertaken for this EA are based on these hours.

Bloomfield currently employs 66 personnel. This includes open cut mining and washery staff. It is proposed to continue operations with similar staffing levels.

6. INFRASTRUCTURE AND SUPPORTING FACILITIES

No new infrastructure is proposed to be constructed or brought onto the Project Area. Existing infrastructure (refer **Figure B**) that forms part of this Project includes:

- Open cut workshop, fuel storage area, offices and bathhouse;
- Temporary haul and access roads;
- Permanent roads linking major infrastructure components such as the open cuts, the workshop, and the ROM coal stockpile pad; and
- Water management system including 'clean' and mine water management structures.

The Project will not generate any additional vehicle movements. All product coal, once processed at the washery, is transported to Newcastle Port by rail from the Bloomfield rail loading facility.

7. INTEGRATION WITH OTHER MINING OPERATIONS

Integration of this Project with adjacent operations and any associated cumulative impact has been a key consideration in mine planning and in all impact assessment studies. Mining operations that are either in the vicinity of the Project or integrated with part of the Bloomfield Project include:

- Donaldson Open Cut Mine;
- Abel Underground Mine;
- Bloomfield washery and associated facilities (approved under the Abel Project Approval); and
- Tasman Underground Mine.

Key aspects of the Project that are integrated with the operations listed above include:

- Delivery of coal from the various mines to the ROM coal stockpile areas adjacent to the washery, which will continue after completion of the Project;
- Water management system components utilized by multiple operations, such as Bloomfield, Donaldson, Abel and the Bloomfield washery, with the open cut water management forming part of the overall integrated water balance;
- Provision of a final void that will be used for future management of washery reject and tailings;
- Integrated rehabilitation planning, considering the final land use proposed for multiple sites; and
- The Integrated Environmental Monitoring Program developed for these integrated operations under the Abel Project Approval.

The post-mining rehabilitation strategy also incorporates the requirements of the Abel Underground Mine and the washery, which will continue to operate after completion of the Project.

8. REHABILITATION & POST-MINING LAND USE

A key component of this Project is the completion of mining on the site and associated rehabilitation and development of post-mining land use.

Bloomfield will undertake progressive rehabilitation as per the Bloomfield Colliery Rehabilitation Plan in stages of landform reshaping, preparation of the ground surface, species planting and site monitoring and maintenance. Rehabilitation will follow the objectives and procedures provided by the Bloomfield Rehabilitation Management System.

Post-mining landform and land use requirements and design are influenced by the requirements of the land owner, various stakeholders including government agencies and the objectives of the Lower Hunter Regional Strategy (DoP, 2006), which provides concept plans for the site as part of 'future employment lands'. All infrastructure not required for ongoing washery operations or required by landowner will be removed at the end of the Project and the landform rehabilitated to a mix of grazing and habitat areas suitable to its rural zoning.

A final void will be retained on the site after completion of rehabilitation as part of an active disposal site for reject material from the washery.

9. IDENTIFICATION OF KEY ISSUES AND ENVIRONMENTAL ASSESSMENT

In order to undertake a comprehensive environmental assessment of the Project, Bloomfield has undertaken a consultation process and a comprehensive environmental risk assessment study. The consultation process involved discussions with various government agencies and active engagement with a community focus group that met during the project planning phase to discuss the various Project issues. A newsletter providing key information and mine contact details for feedback and questions was also provided to the local community as part of a comprehensive community 'door knock' programme undertaken by mine management.

The risk assessment assisted in identifying and prioritising potential environmental impacts associated with the Project so that key issues could be addressed and subjected to detailed assessment. Key issues were also provided by the DoP Director-General's requirements for the EA.

Detailed assessment has been undertaken for the following key issues:

- Flora, fauna & threatened species;
- Aboriginal & European heritage;
- Surface and ground water;
- Integrated management;
- Rehabilitation, post mining landform and final void management;
- Noise, blasting and vibration;
- Air quality;

- Greenhouse gases;
- Social and economic; and
- Visual.

The following sections provide a summary of the main findings arising from each of these assessment studies. Integrated management and rehabilitation, post mining landform and final void management are described in the previous sections.

10. FLORA, FAUNA & THREATENED SPECIES

A large part of the Project Area is cleared of vegetation and disturbed by mining. The survey therefore focussed investigations on two vegetated areas of approximately 9 hectares near the western boundary. Approximately 1.7 hectares of this vegetated area will be cleared for the Project. A total of 123 native plant species were recorded. Three vegetation communities were identified within the survey area, of which the *Lower Hunter Spotted Gum-Ironbark Forest* community is listed as an Endangered Ecological Community ('EEC') in the *Threatened Species Conservation Act 1995* ('TSC Act'). There is 0.8 hectares of this EEC in the Project Area.

73 native fauna species were recorded, of which 6 are listed as Vulnerable in the Schedules of the TSC Act. A further 5 species listed under the Schedules as being observed or recorded within 5 km of the Project Area were included in the assessment.

The study concluded that due to the nature of the existing environment and the implementation of the safeguards described below, there would be minimal impact on flora, fauna, threatened species and the *Lower Hunter Spotted Gum-Ironbark Forest* EEC.

Mitigation measures include the continuation of erosion and sediment control measures and pre-clearance protocols for protecting hollow dwelling fauna. A contribution by Bloomfield to research into the conservation of the *Lower Hunter Spotted Gum-Ironbark Forest* EEC in the Hunter Region may be appropriate if this 0.8 ha EEC area is to be cleared for mining.

11. ABORIGINAL & EUROPEAN HERITAGE

The Aboriginal Heritage Study was conducted in accordance with the DECC's *Interim Community Consultation Requirements for Applicants*.

The Project Area was divided according to land use history. In the "unmodified" area (the area proposed to be mined), 6 stone artefact sites were identified and assessed as being of low scientific significance. The remainder of the Project Area which has been previously mined was classed as "modified" and was considered to have negligible potential for heritage evidence.

The assessment concluded that, with the implementation of an Aboriginal Heritage Management Plan and continued consultation with registered Aboriginal stakeholders, potential impacts on Aboriginal heritage will be very low.

Searches of relevant databases and plans did not identify any recorded European heritage sites on or in close proximity to the Project Area.

12. NOISE, VIBRATION & BLASTING

The Noise, Vibration & Blasting assessment identified the potential impacts of noise, vibration and blasting of the Project, including the cumulative impact from nearby mining activities. Construction noise was not assessed as there will not be any construction associated with the Project.

Background noise levels were calculated for representative locations and project specific noise assessment criteria for each location were established in accordance with the Industrial Noise Policy. Prediction of noise sources using modelling was carried out for representative operational 'worst-case' scenarios of Year 1 (end Stage 1), Year 5 (end Stage 2), and Year 10 (end Stage 4) applying the following noise mitigation and management procedures:

- The excavator and dump site would be situated in a shielded location during night-time operation in Years 1, 5 and 10;
- No dozer operation at the drill location would occur during night and morning shoulder periods (i.e. between 10.00 pm and 7.00 am) in Years 1, 5 and 10; and
- The front end loader would replace the dozer at the dump site during the night-time period unless 4 dBA of noise suppression is achieved in Year 1 and 5.

Further noise assessment in consultation with the relevant government agencies will be undertaken during the project to determine whether these mitigation procedures require modification in the future.

The assessment study concluded that project specific noise criteria is likely to be met in all years with the exception of:

- Location G (Buchanan Rd) where an exceedance of 1 dBA is predicted during a prevailing south east wind during the evening period in Years 1, 5 and 10 and during the night-time period in Years 1 and 10; and
- Location M (John Renshaw Drive) where an exceedance of 1 dBA is predicted during a prevailing north west wind during the night-time period in Year 1.

These minor exceedances of up to 1 dBA are unlikely to be noticeable.

The Project will meet the sleep disturbance criteria at all locations surrounding the development during calm and prevailing weather conditions with the exception of Location G where a 1 dBA exceedance during the morning shoulder period is predicted during a south east wind in Year 10. This 1 dBA exceedance is unlikely to cause sleep disturbance at this location.

The predicted airblast and ground vibration levels will meet DECC guidelines at all residences surrounding the Project during all operational stages of the Project. Blasting will only be undertaken during the hours of 9.00 am to 5.00 pm Monday to Saturday. Blasting will not occur on Sundays or Public Holidays.

The cumulative noise, vibration and blasting impact is predicted to comply with the INP. With implementation of the proposed controls and management procedures, environmental risk associated with noise and vibration is considered to be low.

13. AIR QUALITY & GREENHOUSE GASES

The air quality assessment focused on the potential impacts of particulate matter emissions. Modelling indicated that no residences were likely to experience either dust deposition or particulate matter concentrations above DECC's assessment criteria. Bloomfield will prepare and implement an Air Quality Monitoring Program. Bloomfield will also undertake the following ongoing actions to minimise dust generation:

- All vehicles will be operated in accordance with the existing Mine Transport Management Plan;
- Disturbed areas will be minimised where possible;
- Regular dust suppression water spraying will be undertaken;
- All mobile equipment will be maintained in good working order;
- Adequate stemming will be used in blast holes; and
- Meteorological conditions will be considered in blast timing.

The Project will liberate Scope 1 & 2 greenhouse gases as a result of the combustion of diesel and petrol to power mining and other equipment, the use of explosives and the use of electrical energy. The most significant Scope 1 & 2 greenhouse gases for the Project are CO_2 and N_2O.

Depending on ROM coal production, the Project is estimated to liberate between 19.5 million tonnes ('Mt') and 30.4 Mt of CO_2 equivalent greenhouse gases (including Scope 3 emissions) over the life of the mine. The estimated annual emission of CO_2 equivalent greenhouse gases for Australia in 2005 using the Kyoto accounting procedures was 559 Mt. This did not

include Scope 3 greenhouse gases liberated by the burning of the coal by the end user as they would be accounted for in the country in which the end user is located.

14. SURFACE HYDROLOGY AND WATER MANAGEMENT

The Project is located within the Four Mile Creek and Buttai Creek catchments. The surface water management system for the Project forms an integral part of the water management system for the Abel Underground Project.

The existing water management structures, facilities and systems are considered adequate to cater for the continued Bloomfield operation with minimal new works. The impacts of potential surface water issues associated with the Project are considered to be low. Safeguards include the implementation of an Erosion and Sediment Control Plan and ongoing water quality and quantity monitoring of as part of the Integrated Environmental Monitoring Program ('IEMP').

15. GROUNDWATER

Groundwater levels in the Project Area show the accumulated effects of long-term mining. Due to the long period of time mining has occurred on the site, there is no evidence to suggest what pre-mining groundwater levels might have been. However, the influence of mining on water levels is apparent by the marked differences in groundwater levels between shallow and deeper coal measures.

Groundwater in the vicinity of the Project Area is saline and of negligible value for beneficial users. No adverse impacts on groundwater supply, quality or any groundwater dependent ecosystems are expected as a result of the Project.

Dewatering associated with the Project is likely to lead to groundwater recovery levels occurring above present levels before the completion of the Project and then stabilizing within 20-30 years.

Small impacts on stream base flows are predicted for Wallis and Buttai Creeks with rapid recovery post-mining.

16. SOCIO-ECONOMIC IMPACTS

The mining industry is the largest employer within the Cessnock Local Government Area. The Project is predicted to have the following beneficial social and economic impacts:

- Continued employment of 66 employees;
- The continuation of direct and flow-on economic benefits;
- No additional need for additional accommodation and community services;

- Additional royalty and tax payments to State and Commonwealth governments; and
- Site rehabilitation enabling the land to be developed for other purposes.

Ongoing community consultation by Bloomfield will ensure that community concerns are addressed in a timely manner.

17. VISUAL AND LIGHTING

Residences near the Project Area are generally rural in nature and have existing rural and bushland views, with some viewing sections of existing mine disturbance. While the Project will be visible from some southern residences in its early stages, intervening vegetation and topography generally screens operations and the visual impact associated with the completion of mining is considered to be low.

Bloomfield will undertake the following measures to mitigate the visual impact of the Project:

- Priority will be given to rehabilitation along the southern boundary of the Project Area;
- Progressive rehabilitation will occur;
- Mobile lighting will be directed away from potential external viewpoints; and
- Mine contact details will be provided to the community to enable prompt action if issues with mobile lighting need to be addressed.

Progressive rehabilitation of the Project Area will improve the visual amenity of the site and will enable visual improvement of an area historically disturbed by mining.

18. ECOLOGICALLY SUSTAINABLE DEVELOPMENT ('ESD')

The design of the Project has addressed each of the ESD principles and it is concluded that the Project is consistent with the principles of ESD and achieves a sustainable outcome for the local and wider environment.

19. CUMULATIVE IMPACT

Due to the interaction of the Project with nearby operations such as the Bloomfield washery and rail loading facility, Donaldson Open Cut Mine and the Abel Underground Mine, cumulative impact has formed an integral part of each assessment study undertaken for this EA.

Bloomfield Colliery forms part of the Integrated Environmental Monitoring Program ('IEMP') that integrates monitoring stations and data between the Bloomfield, Donaldson and Abel Mines and to some degree Tasman Underground Mine to the south. The IEMP forms part of

the Abel Project Approval and will be modified as necessary to take into account any additional requirements for the Bloomfield Project.

Each assessment study has concluded that potential impacts remain low when cumulative impacts are taken into account.

20. JUSTIFICATION FOR THE PROJECT

This Environmental Assessment for the Completion of Mining and Rehabilitation of Bloomfield Colliery has considered in detail potential impacts on the environment and potential benefits to the local and wider community.

An evaluation of the Project was undertaken by assessing the risks posed to the environment by Project activities currently and then with the implementation of controls to determine the residual risk. The Project was also evaluated according to the principles of ESD.

This evaluation found that many aspects of the Project would have a low to medium environmental risk, even when no environmental controls or mitigation measures were put in place. The application of additional mitigation measures by Bloomfield ensures a low environmental risk in all key assessment areas.

Bloomfield has provided a draft Statement of Commitments as part of this EA which commits it to a range of mitigation and monitoring measures that will further mitigate, manage and/or monitor any potential impact.

21. CONCLUSION

Approval of this Project will enable Bloomfield to extract the remaining economic reserves from the Project Area in a safe, efficient and controlled manner which minimises environmental impacts, while providing continued employment for their employees and numerous associated suppliers and contractors in the local and broader area. Approval will also enable Bloomfield to rehabilitate and enhance the site in accordance with the requirements of the various relevant stakeholders and policies in place for the Lower Hunter Region.

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1. INTRODUCTION

1.1 PROJECT OVERVIEW

Bloomfield Colliery ('Colliery') is an existing open cut mining operation located to the north of John Renshaw Drive, Buttai and east of Buchanan Road, Buchanan, approximately 20 km north-west of Newcastle (refer **Figure 1**).

The Colliery is operated by Bloomfield Collieries Pty Limited ('Bloomfield'), part of The Bloomfield Group of companies ('TBG'). TBG has interests in coal mining; heavy engineering; contract coal washing; diesel engine maintenance, repair and sales; motel operations and land development.

Coal has been mined on the site by both underground and open cut means for approximately 170 years. The current owners purchased the operation in 1937, with underground mining ceasing on the site in 1992. The current operation consists of open cut mining, an on-site Coal Handling and Preparation Plant (washery), a rail loading facility that loads processed coal for transporting to the Port of Newcastle, and various ancillary items such as an administration building, workshop and internal haul roads.

Bloomfield Colliery is located within Consolidated Coal Lease 761 ('CCL761'), granted under the *Mining Act 1992,* and mining operations are carried out in accordance with Environmental Protection Licence 396 ('EPL 396') issued under the *Protection of the Environment Operations Act 1997*, and a Mining Operations Plan ('Bloomfield MOP') lodged with the NSW Department of Primary Industries ('DPI') in 2004. The area covered by CCL761 is shown on **Figure 2**.

Bloomfield is working in accordance with its planned open cut mining program and is actively rehabilitating former mining areas on the site. Current assessment of economically recoverable reserves has determined that there is approximately 14 million tonnes of run-of-mine ('ROM') coal remaining on the site. ROM coal is a term used for 'raw' coal that has not been processed at the washery.

In recent years, the Colliery has produced coal at a rate of approximately 0.8 to 1.3 million tonnes per annum ('mtpa') ROM coal. It is proposed to continue mining at similar production rates and to complete mining over a 10 to 12 year period, which has been divided into 5 stages. In Stage 1, representing current operations (the current 2007-2008 period), mining is proposed to operate at a maximum of 0.88 mtpa ROM coal. In Stages 2, 3 and 4 (Years 1-5, 5-7 and 7-10 respectively), a maximum of 1.3 mtpa ROM coal is proposed. Stage 5 (approximately Years 10-12) is for the completion of site rehabilitation.

Mining operations at the Colliery have previously been carried out pursuant to existing use rights. The introduction of Part 3A of the *Environmental Planning and Assessment Act 1979* ('EP&A Act') and the *State Environmental Planning Policy (Major Projects) 2005* ('Major Projects SEPP') requires Bloomfield to obtain project approval under Part 3A in order to complete its proposed mining schedule and to rehabilitate mine areas.

Various mining items and activities at the Colliery have been approved as part of the Abel Project Approval (MP 05_0136), granted to Donaldson Coal Pty Limited. The Abel Underground Mine is located to the south-east of Bloomfield and was approved by the NSW Minister for Planning on 7 June 2007. Operation of the Abel Underground Mine requires use of some Bloomfield infrastructure and to enable this use, the Abel Project Approval includes the continued:

- operation of the coal washery and rail loading facility owned by Bloomfield;
- management of water associated with the washery;
- coarse reject and tailings disposal; and
- coal handling.

As the ongoing operation of these infrastructure items and activities is already approved, they do not form part of this Application. The Abel Project Approval area is shown on **Figure 26** (refer **Section 15.3**).

This application for project approval ('Application') and Environmental Assessment ('EA') relates to those infrastructure items and activities at the Colliery which are not included in the Abel Project Approval and which therefore require approval under Part 3A of the EP&A Act. These include:

- the current and proposed open cut mine areas;
- the unshaped and shaped overburden dump areas;
- the workshop;
- the road between the open cut pit areas and the ROM coal stockpile at the washery; and
- the road that links the workshop, open cut pits and washery.

The above areas that are the subject of this Application are referred to throughout this document as the 'Project Area'.

The Project Area is shown on **Figure 2**. The completion of open cut mining activities at Bloomfield Colliery has been designed to cater for the ongoing operation of the washery and the reject management system as outlined in detail in the Abel Project Approval.

1.2 PROJECT OBJECTIVES

The objectives of this Project are to:

- Complete the program of open cut mining within Bloomfield Colliery, including operation of the associated workshop, haul road and access road that links the workshop, open cut pits and coal washery;
- Undertake rehabilitation of the site in accordance with commitments to the landowner, relevant regulatory requirements and planning considerations, including the Lower Hunter Regional Strategy (Department of Planning, 2006); and
- Liaise with local landholders to ensure community concerns are identified and addressed in the design and operation of the mining activities.

The purpose of this EA is to provide the documentation and information necessary to address and satisfy the requirements issued for the Project by the Director-General, in accordance with Part 3A of the EP&A Act.

1.3 THE APPLICANT

The applicant for this Project is Bloomfield Collieries Pty Limited ('Bloomfield'). Bloomfield is an Australian owned family company incorporated in 1952. Bloomfield is part of The Bloomfield Group of companies ('TBG'). TBG has exposure to a number of business activities through limited liability companies, ultimately controlled by Big Ben Holdings Pty. Coal mining operations are the primary source of revenue, with additional interests in mainly vertically integrated mining product and service providers.

Coal mining operations are carried out across two sites, Bloomfield Collieries (Four Mile Creek, Ashtonfield) and Rix's Creek (Singleton), with all mining tenements held by Bloomfield. Other mining prospects include Curlewis, Plashett and Bickham. TBG also undertakes toll washing for Donaldson Coal. TBG employs 425 people across all interests.

LEGEND

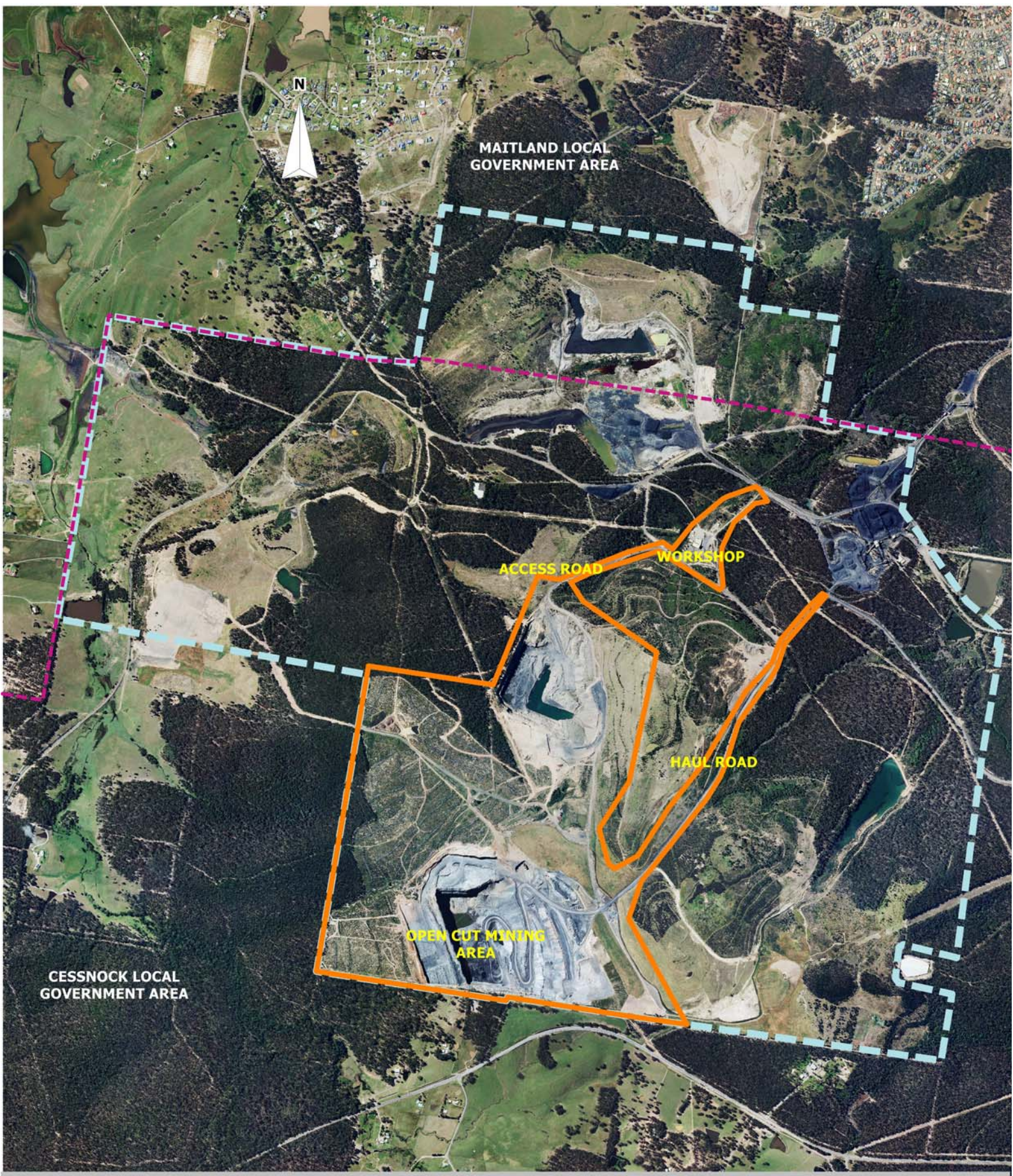
- BLOOMFIELD COLLIERY
- TOWN
- ROAD

FIGURE 1

LOCALITY PLAN

BLOOMFIELD COLLIERY
COMPLETION OF MINING AND REHABILITATION

SEPTEMBER 2008



0 1 km

LEGEND

- PROJECT APPLICATION AREA
- BLOOMFIELD MINING LEASE
- LGA BOUNDARY

FIGURE 2

AERIAL VIEW OF PROJECT AREA

BLOOMFIELD COLLIERY
COMPLETION OF MINING AND REHABILITATION

SEPTEMBER 2008

1.4 PART 3A APPLICATION PROCESS

Mining operations at Bloomfield Colliery have previously been carried out pursuant to existing use rights. The introduction of Part 3A of the EP&A Act in 2005 effectively required Bloomfield to obtain ministerial approval to continue mining and undertake site rehabilitation.

As the Project is related primarily to the completion of mining and rehabilitation at Bloomfield Colliery, the Project is for the purpose of coal mining and is therefore classified as a Major Project under the Major Projects SEPP to which Part 3A of the EP&A Act applies. The approval of the Minister for Planning is therefore required.

The Part 3A process requires a Preliminary Assessment Report (PA Report) to accompany project approval applications made to the Minister for Planning via the NSW Department of Planning ('DoP'). A PA Report for this application was lodged with DoP in August 2007. The PA Report included a Preliminary Risk Assessment, which identified the key issues associated with the proposed development. On 8 October 2007, the Director-General of DoP released his Environmental Assessment Requirements for the Project Environmental Assessment ('EA'). These Requirements are provided in **Appendix A**, which also provides a table of where each requirement has been addressed in the EA.

This EA addresses all of the Director-General's Requirements for the EA. It also contains:

- a revised Risk Assessment incorporating changes in risk identified as a result of detailed technical studies undertaken for the EA;
- a detailed description of the proposed operation of the mine, rehabilitation procedures, and measures to mitigate, reduce, control or manage any predicted environmental impacts from the operation; and
- a draft Statement of Commitments, which are the commitments made by Bloomfield to ensure the operation is in accordance with the management and mitigation measures documented in this EA.

Once DoP has established the adequacy of this EA, the EA will be publicly exhibited for at least thirty (30) days, in accordance with EP&A Act requirements. During the exhibition period, the public will be invited to make submissions in relation to the Project. Following the exhibition period, DoP will review all documentation and submissions, and produce an assessment report relating to the Application for the consideration of the Minister for Planning.

Minor modifications have been made to the Project as described in the PA Report. Mine plans and scheduling have been modified in response to more detailed mine modelling and

findings of studies undertaken for this EA. Changes made are generally minor. The modified description of the Project is provided in **Section 2** of this EA.

1.5 PROJECT TEAM

This EA has been prepared by Business Environment Pty Ltd on behalf of Bloomfield. Consultants listed in **Table 1** formed part of the Project Team, undertaking the various impact assessment studies required for the EA.

Table 1 Project Team

Area of Specialty	**Consultant**
Community Facilitation	Margaret McDonald-Hill
Risk Assessment	GSS Environmental
Flora, Fauna & Threatened Species Assessment	EcoBiological
Aboriginal Archaeology Assessment	SouthEast Archaeology
European Heritage Assessment	Business Environment
Noise, Vibration and Blasting Assessment	Heggies Pty Limited
Air Quality & Greenhouse Gas Assessment	Holmes Air Sciences
Surface Water Assessment & Water Balance	Evans & Peck
Groundwater Assessment	Aquaterra
Socio Economic Assessment	Hunter Valley Research Foundation
Visual Assessment	Business Environment

2. DESCRIPTION OF THE PROPOSED DEVELOPMENT

2.1 LOCATION AND SETTING

Bloomfield Colliery is an open cut mining operation located approximately 20 kilometres north-west of Newcastle. The site has been used for coal mining for approximately 170 years. Mining operations in the vicinity of the Project include:

- Donaldson Open Cut Mine, on the eastern boundary of Bloomfield Colliery;
- Abel Underground Mine to the south-east;
- Bloomfield washery and associated facilities (rail loading facility and tailings disposal areas) approved as part of the Abel Project Approval; and
- Tasman Underground Mine, located approximately 6.5 km south of Bloomfield Colliery but with product being brought to the Bloomfield washery and rail loading facility.

CCL761, granted 20 November 1991, forms the boundary of the current Bloomfield Colliery site, which includes the active open cut mining areas, rehabilitation areas, workshop, haul road, washery, water management structures and other ancillary items. These main elements are shown on **Figure 2**, an aerial plan of CCL761.

The Project Area (shown on **Figure 2**) is located within CCL761 and includes the following:

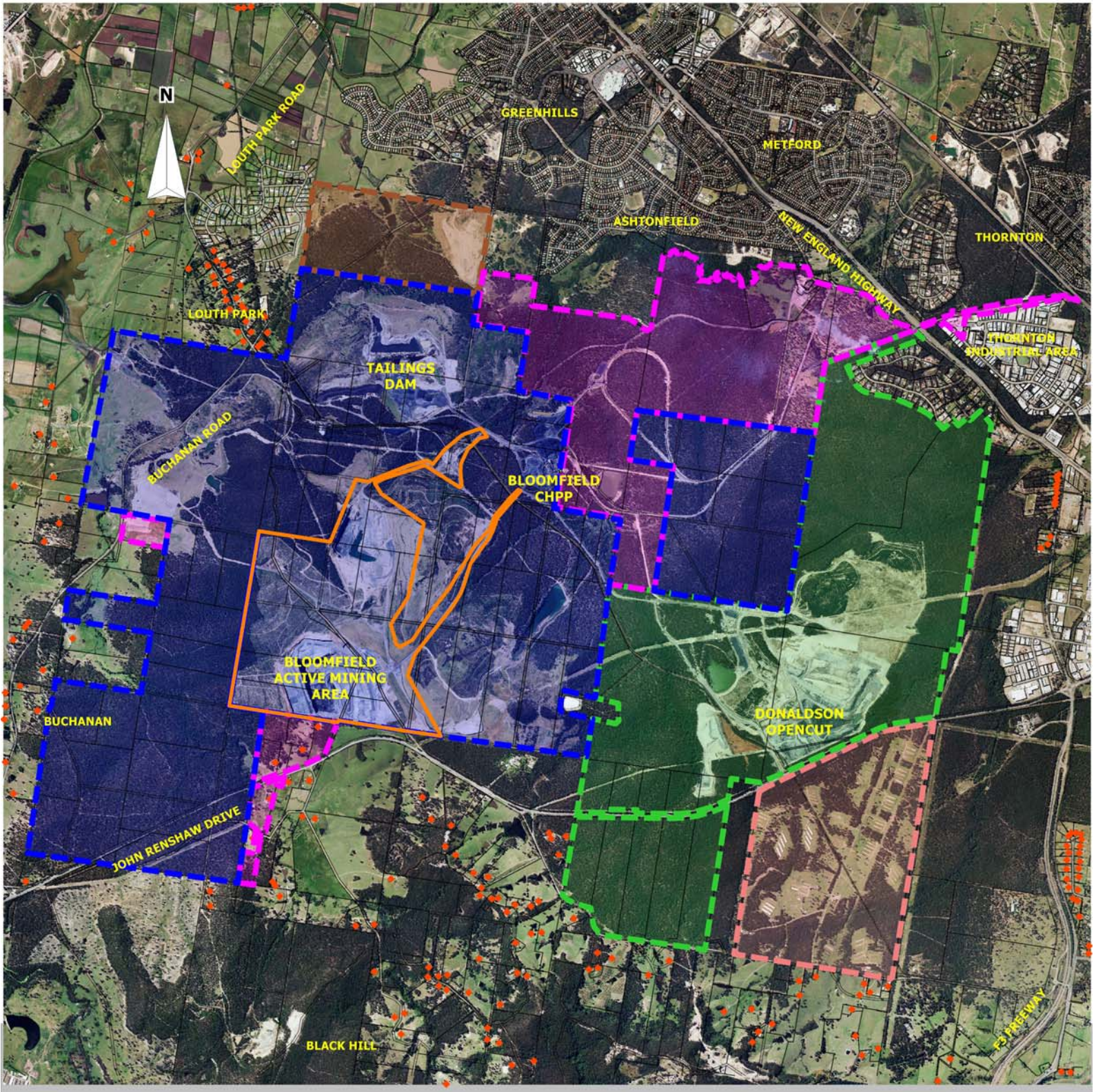
- The current and proposed active open cut coal mining areas;
- The unshaped and shaped overburden dump areas;
- Workshop and surrounding area used for maintenance and fuel storage;
- Road linking the current and proposed coal mining areas with the ROM coal stockpiles adjacent to the coal washery; and
- Road linking the current and proposed coal mining areas to the workshop.

Bloomfield washery (also referred to as the Coal Handling and Preparation Plant, or 'CHPP') and rail loading facility ('RLF') operations, including associated water management and process waste management, does not form part of this Project. These operations were approved by the Minister for Planning on 7 June 2007 as part of the Abel Project Approval.

Following approval of this Project application, it is proposed that a new surface mining lease will be sought for the Project Area. Where possible, cadastral boundaries have been followed in the formation of the Project Area, to assist in the development of the new mine lease.

All land within the Project Area is owned by Ashtonfields Pty Limited ('Ashtonfields'), an independent third party with a long standing relationship with Bloomfield, and is held by Bloomfield under a commercial lease. Land use within the Project Area is exclusively associated with the extraction, stockpiling and transport of coal. The land consists of active mining areas and associated infrastructure (i.e. hardstands, laydown areas, roadways, overburden stockpiles, dams, drains, etc), rehabilitated mined areas, and undisturbed vegetated areas. **Figure 3** is an aerial photograph showing the Project Area and its surrounds.

The land along the western boundary of the Project Area is mainly open forest. To the north and east, the Project Area is generally bounded by rehabilitated mined land. Land adjoining the south of the Project Area, near John Renshaw Drive, has been cleared for grazing. John Renshaw Drive is the nearest public road to the Project Area. A number of residences are located to the south of the Project Area. These are mainly rural residential properties adjacent to John Renshaw Drive and extending southwards along Lings Road and Browns Road. Residential properties are also located to the west adjacent to Buchanan Road and to the north-west at Louth Park. The nearest urban residential area is Ashtonfield, approximately 2.25 kilometres north-east of the workshop area. The nearest residence to the Project Area not owned by Bloomfield is located approximately 600 metres south of the southern boundary of the Project Area. **Figure 3** shows residences within the vicinity of the Project Area, as well as local land uses.



0 1 km

LEGEND

- PROJECT APPLICATION AREA
- BLOOMFIELD
- DONALDSON
- ASHTONFIELD
- ROMAN CATHOLIC CHURCH
- MAITLAND COUNCIL
- RESIDENCE

FIGURE 3
LAND USE, OWNERSHIP AND RESIDENCES

BLOOMFIELD COLLIERY
COMPLETION OF MINING AND REHABILITATION

SEPTEMBER 2008

2.2 COAL RESOURCE AND RESERVES

Bloomfield's open cut mine has been operating since 1962. An exploration drilling program was undertaken in October 2005 and the results were included in the Colliery geological model. Interpretation of the output from the model indicates that there is a measured coal resource of 28 million tonnes within the Project Area. Current economic assessment of the resource determined that approximately 14 million tonnes of recoverable coal reserves can be mined economically.

The coal bearing stratum occurring in the Project Area are the Tomago Coal Measures. These coal measures lie beneath the Newcastle Coal Measures and above the Maitland Group.

The coal seams worked by Bloomfield Colliery, in descending order, are as follows:

- Buttai Seams (E and F Seams);
- A, B, and C Seams;
- Whites Creek Seam;
- Elwells Creek Seam;
- Donaldson Seam;
- Big Ben Seam; and
- Rathluba Seam.

Seams present as either complete seams, a number of splits of the seam, or a collection of dispersed coal bands. Coal reserves in the Project Area are shown on **Figure 4**, with **Figure 5** showing cross sections of the seam sequence. The Rathluba Seam is not proposed to be mined in the current mine plans and has not been included in the estimated recoverable reserves.

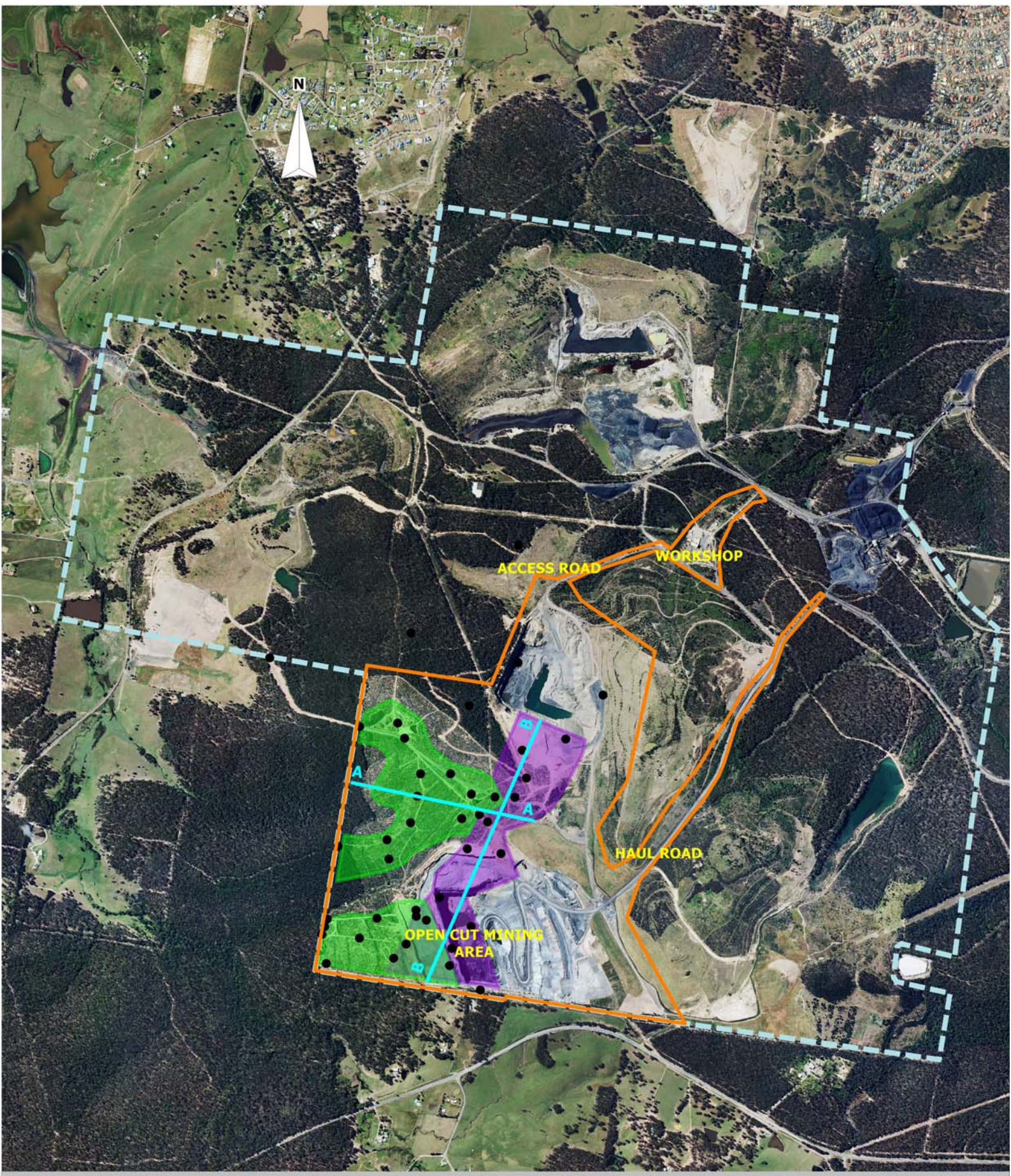
Site geology is typified by moderately dipping strata from the eastern and western sides of the lease, forming a syncline running axially from the north-east to the south-west of the lease. There is a well-defined dyke and fault structure running from the north-north-west to south-south-east through areas where mining has been completed through both open cut and underground methods. The remaining coal reserves have no known major geological impediments.

2.3 PAST AND PRESENT OPERATIONS

Mining of coal seams within the Tomago Coal Measures has been carried out in the Bloomfield area for over 170 years. The current owners commenced mining on the site in 1937. At various times the Donaldson, Big Ben and Rathluba Seams have been mined by underground methods. The extent and cross section of these seams is shown on **Figure 4** and **Figure 5.** All underground mining on the site ceased in 1992.

In 1962, a small open cut operation was commenced using bulldozers and tractor scrapers. The open cut has continued to expand and develop with the introduction of new machinery and technology as follows:

- 1978: P&H 2800 Electric Face Shovel with a fleet of 85 & 180 tonne rear dump trucks commissioned;
- 1981: P&H 5700 Electric Face Shovel commissioned;
- 1985: 2800 Electric Face Shovel decommissioned;
- 1986: P&H 2355 Dragline commissioned;
- 1991: Marion 305-M Dragline commissioned;
- 1998: Draglines decommissioned; and
- 2007: Hitachi EX5500 Excavator commissioned.



LEGEND

- PROJECT APPLICATION AREA
- BLOOMFIELD MINING LEASE
- BORE HOLE
- BUTTAI SEAM RESERVE
- BIG BEN SEAM RESERVE
- CROSS SECTION LINE (FIG 5)

0 1 km

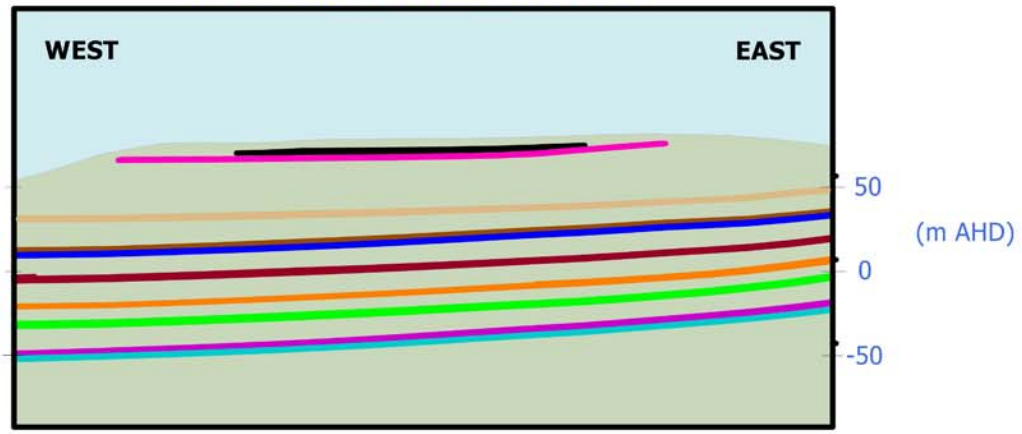
FIGURE 4

COAL RESERVES

BLOOMFIELD COLLIERY
COMPLETION OF MINING AND REHABILITATION

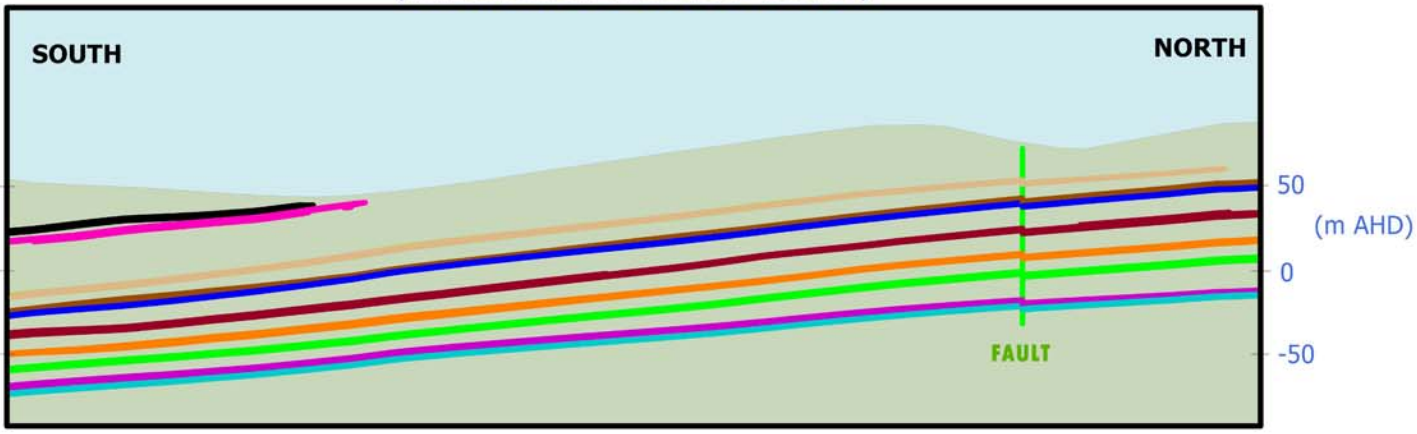
SEPTEMBER 2008

WEST TO EAST SECTION
VERTICAL EXAGGERATION : 2 TO 1
(APPROX LENGTH OF SECTION : 980 M)



SECTION A

SOUTH TO NORTH SECTION
VERTICAL EXAGGERATION : 2 TO 1
(APPROX LENGTH OF SECTION : 1500 M)



SECTION B

LEGEND

- F SEAM (BUTTAI)
- E SEAM (BUTTAI)
- C SEAM
- B SEAM
- A SEAM
- WHITES CREEK SEAM
- ELWELLS CREEK SEAM
- DONALDSON SEAM
- BIG BEN TOP SEAM
- BIG BEN BOTTOM SEAM

0 500 m

HORIZONTAL SCALE

FIGURE 5

COAL SEAMS

BLOOMFIELD COLLIERY
COMPLETION OF MINING AND REHABILITATION

SEPTEMBER 2008

Coal won from the open cut operation is predominantly thermal coal with some soft coking coal for the Asian export market. All coal is transported to the washery by internal haul roads and then by rail via the Bloomfield rail loading facility for export through the Port of Newcastle.

The Project will continue open cut mining operations on the site over five stages spanning the next 10 to 12 years, utilising methods and equipment similar to those currently used.

2.4 WORKFORCE AND HOURS OF OPERATION

Bloomfield Collieries currently employs 66 personnel. This includes open cut mining and washery staff. Nine additional staff is employed in management and administrative roles for The Bloomfield Group. It is proposed to continue operations at similar staffing levels.

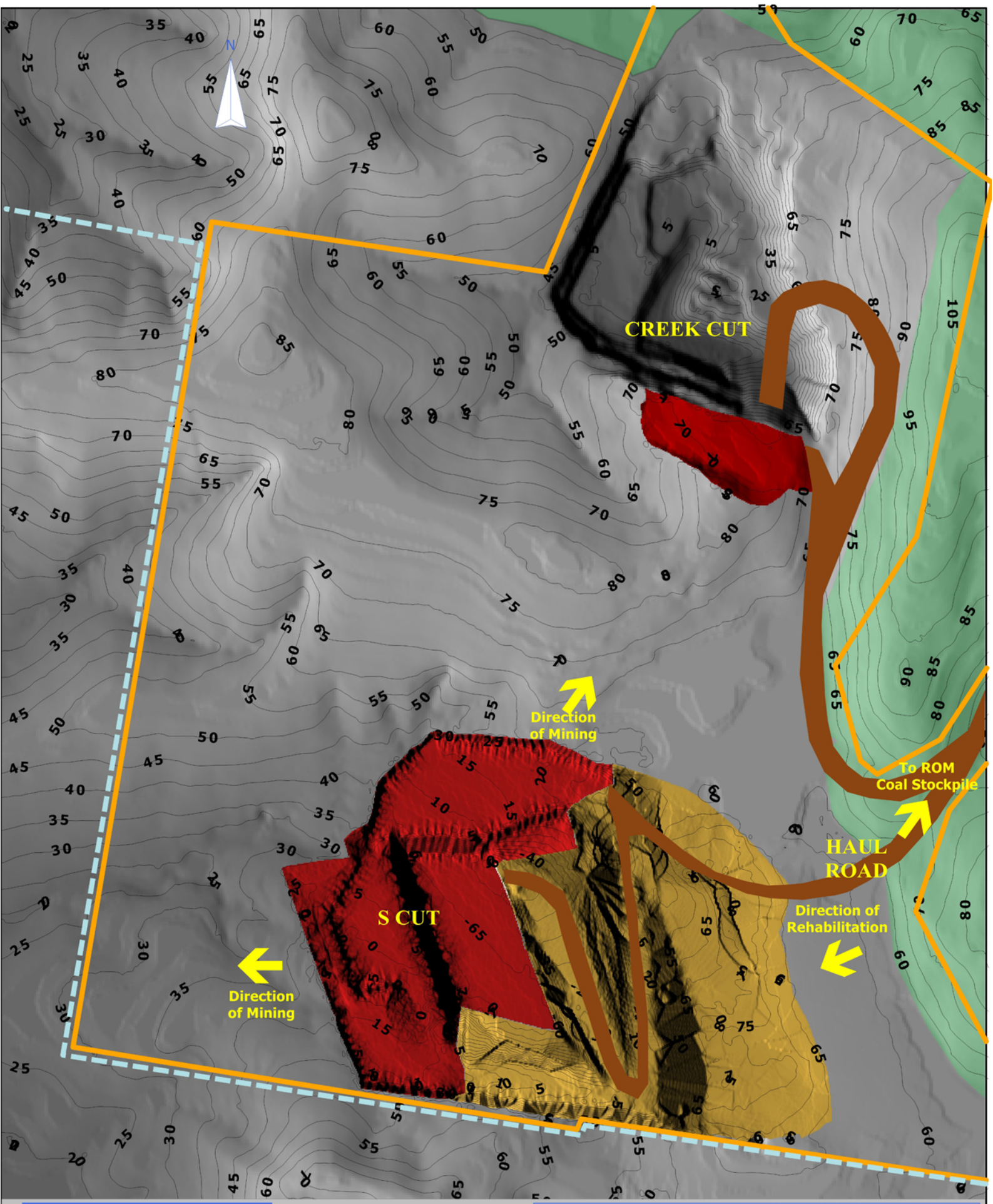
The Colliery operates 7 days per week, 24 hours per day. Approval is sought to continue the current hours of operation. The environmental assessment studies undertaken for the Project are based on these hours of operation.

2.5 PROPOSED MINE PLAN AND SCHEDULING

The proposed mine plan is based on an exploratory drilling program undertaken by Bloomfield in October 2005 and the results of the updated Colliery geological model.

The area to be mined is located in the south-western section of CCL761 and corresponds to the area contained within the current Bloomfield MOP. The proposed mining sequence and stages are described as follows and are shown in **Figures 6** to **10**.

- Stage 1 (current mining-2007-2008 period) – (**Figure 6**): Mining consists of two active open cut pits referred to as 'S Cut' and 'Creek Cut';
- Stage 2 (approximately Years 1-5) – (**Figure 7**): Mining in S Cut will advance to the west and north, while mining in Creek Cut advances in a southerly direction;
- Stage 3 (approximately Years 5 to 7) – (**Figure 8**): Mining in S Cut continues north and west, whilst mining in Creek Cut continues southwards, eventually joining to create one pit;
- Stage 4 (approximately Years 7 to 10) – (**Figure 9**): Completion of mining in Creek Cut and western extensions of S Cut; and
- Stage 5 (approximately Years 10 to 12) – (**Figure 10**): Post Mining Rehabilitation.



LEGEND

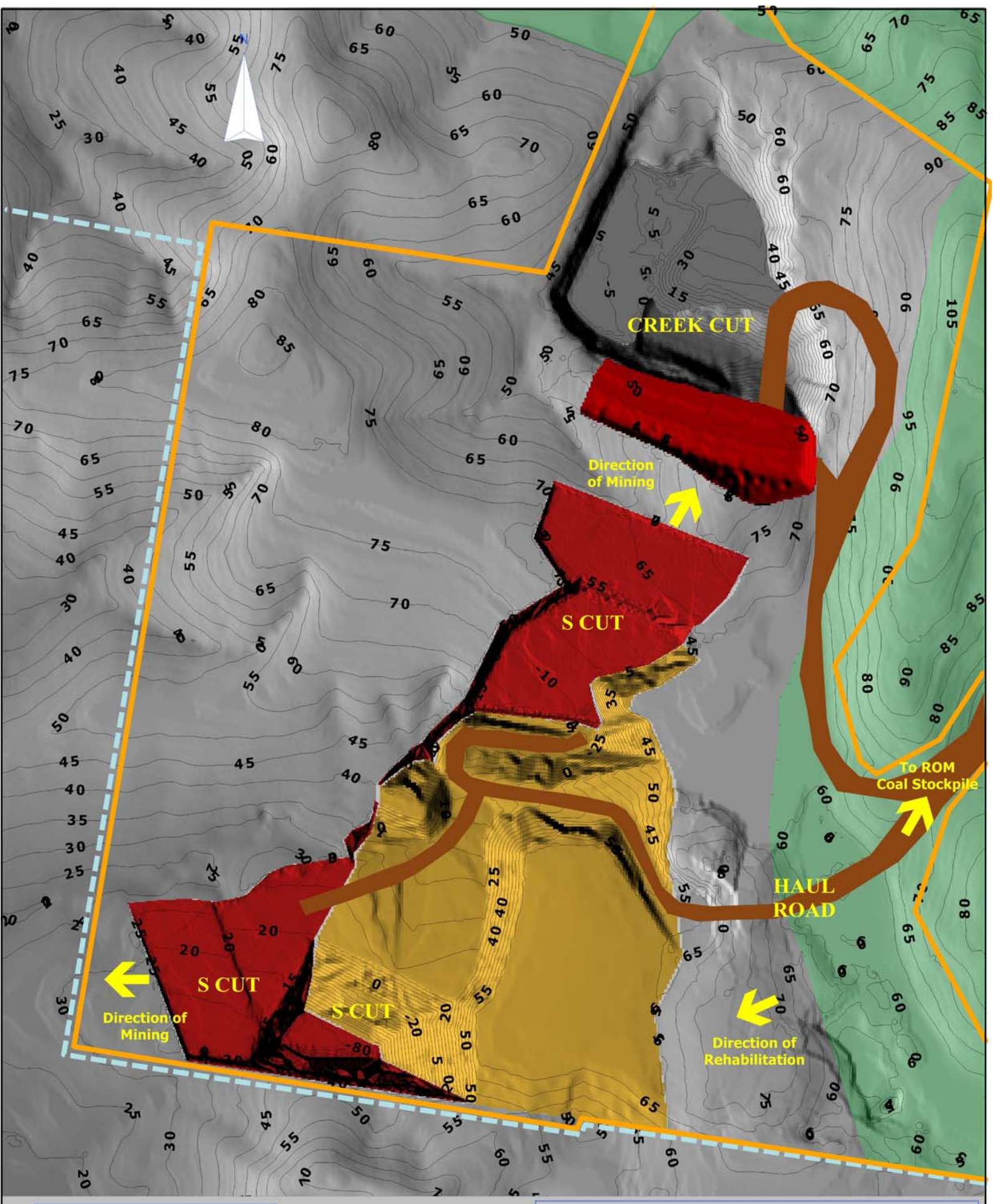
- BLOOMFIELD MINING LEASE
- PROJECT APPLICATION AREA
- REHABILITATION AREA
- ACTIVE MINING AREA
- OVERBURDEN DUMP
- TOPOGRAPHY
- HAUL ROAD

0 200 m

FIGURE 6

STAGE 1 MINE PLAN

BLOOMFIELD COLLIERY
COMPLETION OF MINING AND REHABILITATION
SEPTEMBER 2008



LEGEND

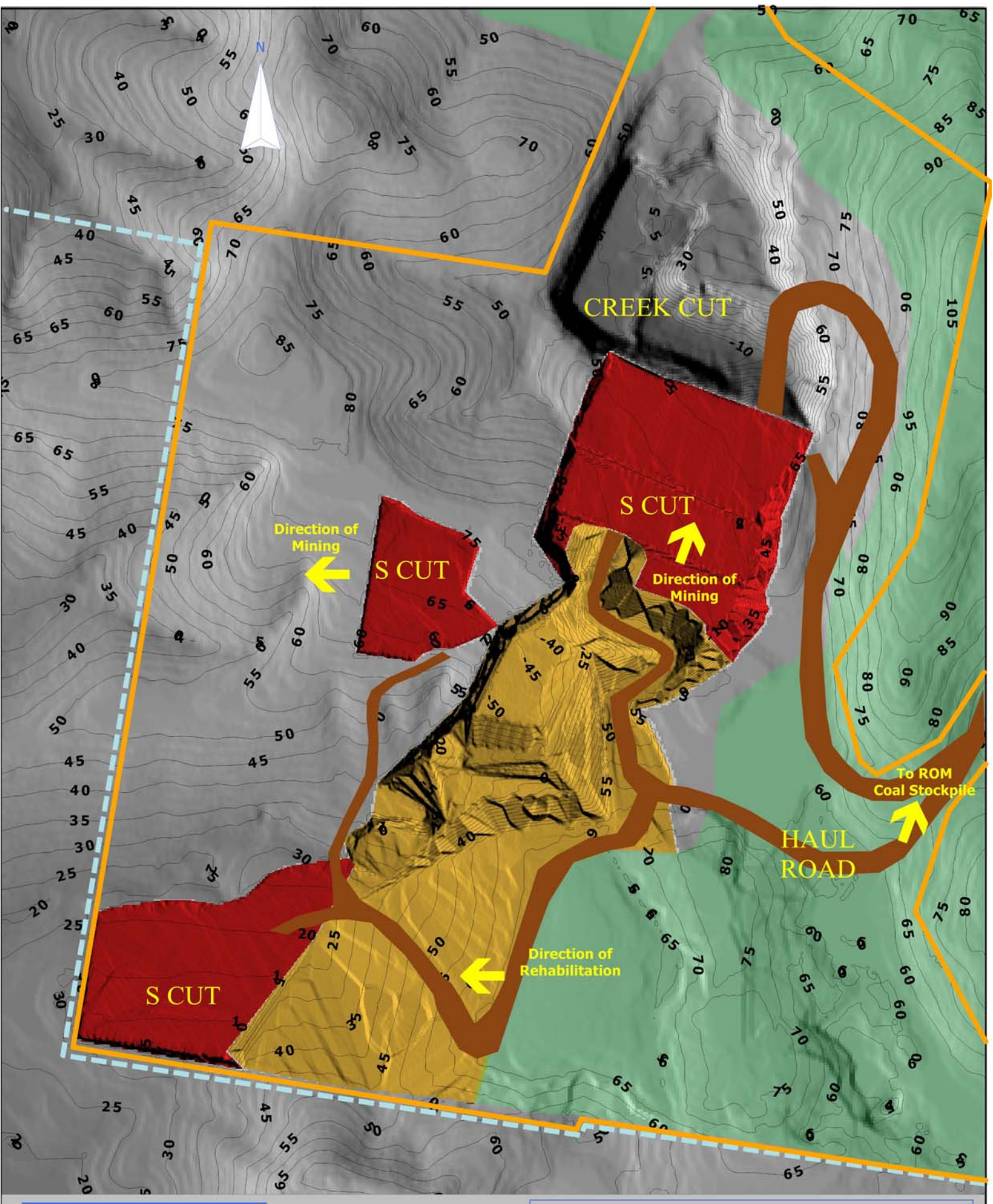
- BLOOMFIELD MINING LEASE
- PROJECT APPLICATION AREA
- REHABILITATION AREA
- ACTIVE MINING AREA
- OVERBURDEN DUMP
- TOPOGRAPHY
- HAUL ROAD

0 200 m

FIGURE 7

STAGE 2 MINE PLAN

BLOOMFIELD COLLIERY
COMPLETION OF MINING AND REHABILITATION
SEPTEMBER 2008



LEGEND

- BLOOMFIELD MINING LEASE
- PROJECT APPLICATION AREA
- REHABILITATION AREA
- ACTIVE MINING AREA
- OVERBURDEN DUMP
- TOPOGRAPHY
- HAUL ROAD

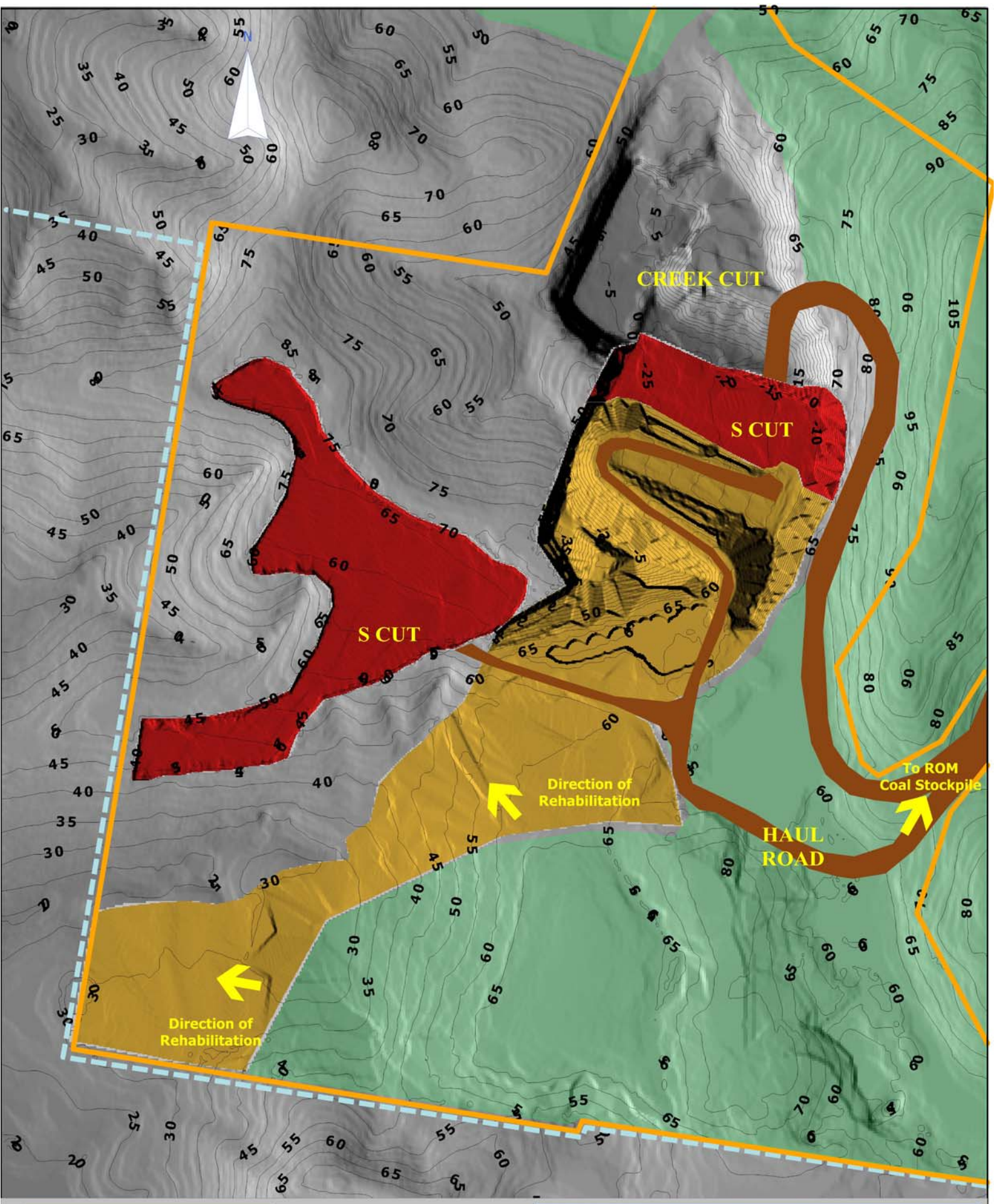
0 200 m

FIGURE 8

STAGE 3 MINE PLAN

BLOOMFIELD COLLIERY
COMPLETION OF MINING AND REHABILITATION

SEPTEMBER 2008



LEGEND

- BLOOMFIELD MINING LEASE
- PROJECT APPLICATION AREA
- REHABILITATION AREA
- ACTIVE MINING AREA
- OVERBURDEN DUMP
- TOPOGRAPHY
- HAUL ROAD

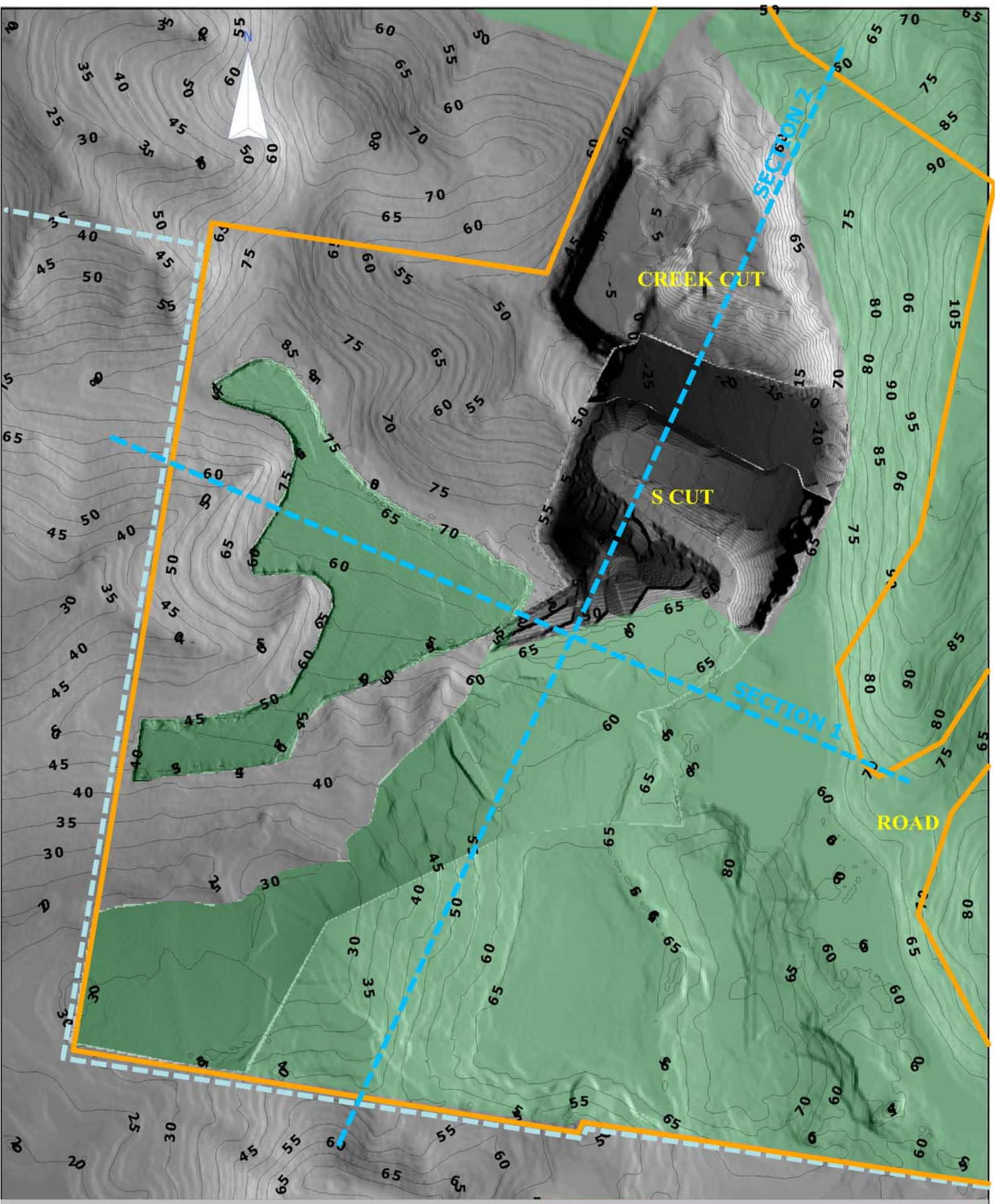
0 200 m

FIGURE 9

STAGE 4 MINE PLAN

BLOOMFIELD COLLIERY
COMPLETION OF MINING AND REHABILITATION

SEPTEMBER 2008



LEGEND

- BLOOMFIELD MINING LEASE
- PROJECT APPLICATION AREA
- REHABILITATION AREA
- TOPOGRAPHY
- SECTION LINE

0 200 m

FIGURE 10

STAGE 5 MINE PLAN

FINAL LANDFORM CONTOURS AND REHABILITATION

BLOOMFIELD COLLIERY

COMPLETION OF MINING AND REHABILITATION

SEPTEMBER 2008

A final void will remain at the end of mining. This void will be used as a reject emplacement area for the washery. The Abel Project Approval enables washery operations to continue after the completion of the Project.

Multiple seams will be extracted in each cut, as described in **Section 2.2**.

It is proposed to mine the remaining reserves at a maximum rate of 0.88 mtpa ROM coal during Stage 1 and up to 1.3 mtpa ROM coal during Stages 2 to 4. Coal reserves that are currently economically recoverable have been estimated at approximately 14 million tonnes ROM coal. The maximum annual mining rate provides for flexibility in production rates over each year to enable Bloomfield to respond to coal market fluctuations and variations in quality and yield that occur over time. A maximum annual mining rate was generally used as the basis for impact assessment studies undertaken for the EA.

2.6 MINING METHOD AND EQUIPMENT

Mining at Bloomfield is generally undertaken as a multi-seam truck and excavator/face shovel operation, conducted in sequential mining blocks. It is proposed to continue with these existing methods of extraction.

2.6.1 Mining Methodology

The existing mining process for each block includes:

- Vegetation removal;
- Topsoil/pre-strip;
- Drilling and blasting;
- Overburden removal and stockpiling;
- Coal removal (followed by interburden removal and coal removal for lower seams); and
- Overburden reshaping and rehabilitation.

The majority of the area to be mined has previously been cleared of vegetation, with grasses and low vegetation allowed to regenerate to stabilize the surface until it is required for mining. An area of approximately 1.7 hectares of remnant vegetation will be cleared at the western and north-western limit of the S Cut workings. Vegetation is pushed up into windrows with dozers for placement under advancing overburden dumps.

Depending on topsoil/subsoil depth and quality, the material is pushed up with dozers and loaded onto haul trucks with front-end loaders, or excavated and loaded directly onto haul

trucks with an excavator. It is then placed on reshaped overburden dumps in preparation for rehabilitation. Topsoil stockpiling is avoided where possible for operational and topsoil quality reasons. Lower unconsolidated (non-bedrock) horizons are free-dug as they do not require blasting prior to removal. They are then loaded onto rear dump trucks for hauling to overburden emplacements, as part of pre-strip operations.

Following topsoil/pre-strip removal, blast hole patterns are drilled into the overburden, in preparation for blasting. Blast pattern and hole depth is designed in accordance with excavator capability and safe blast design. The holes are then loaded with explosives and detonated.

After blasting, loose overburden material is removed by excavator/face shovel and placed onto rear dump haul trucks for hauling to overburden emplacements. Emplacement design will continue in a similar manner to the current operation.

The exposed coal seam is then ripped and pushed up with dozers, loaded onto coal trucks and transported to the ROM coal stockpile via internal haul roads.

The interburden/coal extraction process is repeated for each seam until the basal Big Ben seam has been removed. The resultant void is then available for backfilling with the overburden from subsequent mining blocks. Emplacements are reshaped by dozer to create the final contour shape.

A detailed description of the rehabilitation process is provided in **Section 3**. The sequence of mining showing extraction, backfilling and subsequent rehabilitation is shown in **Figure 11**.

2.6.2 Mining Equipment

Bloomfield currently uses an excavator or face shovel and a fleet of rear dump trucks for the removal of topsoil, prestrip, overburden and interburden material. Two drill rigs are used for blast hole drilling. A coaling fleet comprising a front-end loader or excavator, rear-dump trucks and a fleet of road trucks is used to transport the raw coal. It is proposed that the same, or similar, equipment will be used for the Project.

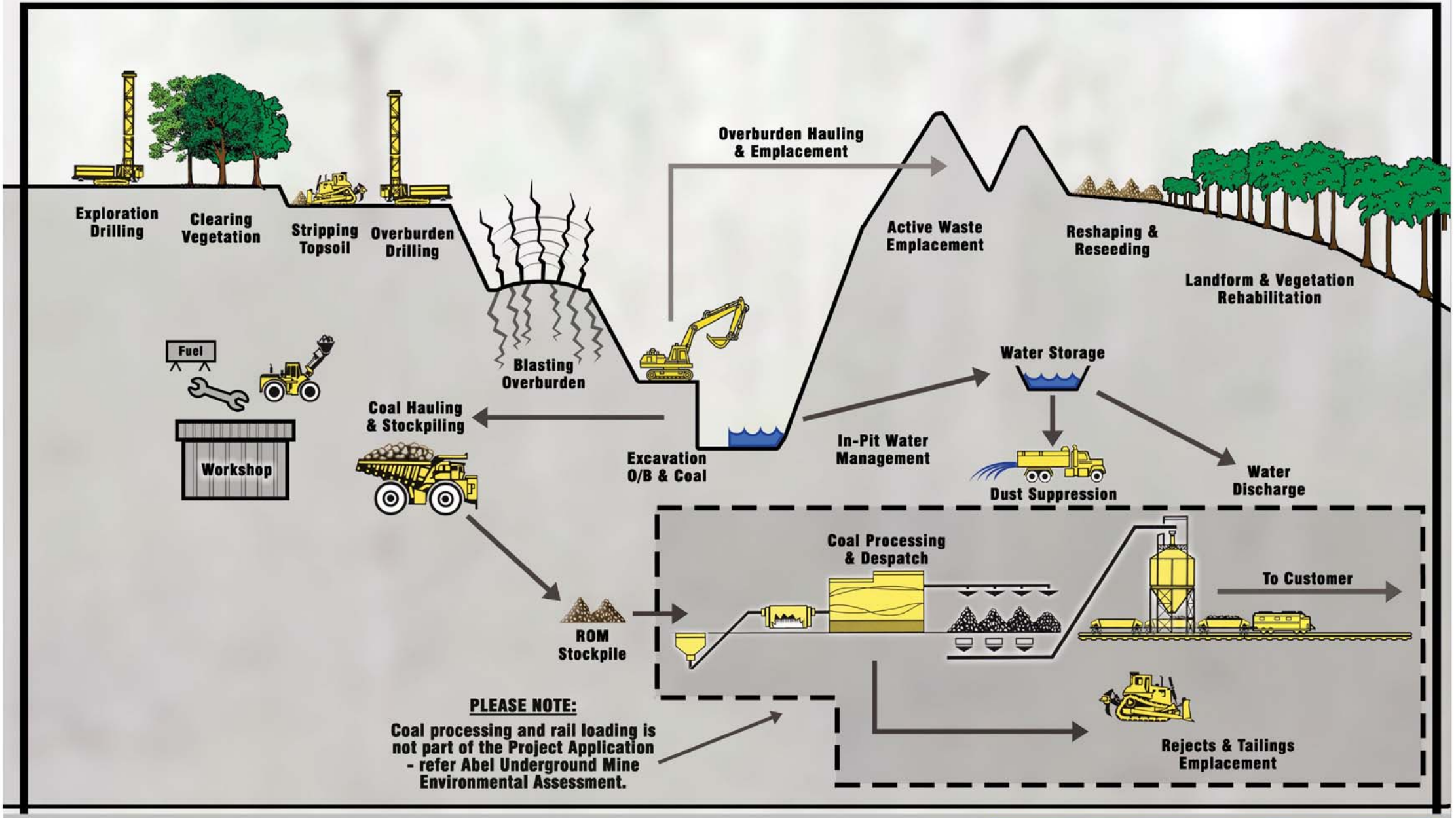


FIGURE 11

SCHEMATIC OF MINING PROCESS

BLOOMFIELD COLLIERY
COMPLETION OF MINING AND REHABILITATION
SEPTEMBER 2008

2.7 INFRASTRUCTURE AND SUPPORTING FACILITIES

Major infrastructure components in the Project Area, all of which currently exist, consist of the following:

- Open cut workshop, fuel storage area, offices and bathhouse;
- Temporary internal mine roads constructed as required to access mine areas;
- Permanent access roads linking major infrastructure components such as the workshop, and the ROM coal stockpile pad;
- Water management system including 'clean' and mine water management structures; and
- Dust suppression water tank storage.

The coal washery and associated facilities are approved under the Abel Project Approval.

Existing infrastructure is considered sufficient for the proposed remaining life of mine. No new infrastructure is proposed to be constructed or brought onto the site. Potential environmental impacts associated with the operation of this infrastructure are addressed in this EA.

2.8 ENVIRONMENTAL MANAGEMENT SYSTEM

The Bloomfield Mining Operations Environmental Management System ('EMS') has been developed generally in accordance with ISO 14001 principles. It contains an Environmental Policy as well as relevant environmental systems and procedures to guide current operations. This EMS, systems and procedures will continue to be applied to Project operations, until the completion of mining. Any additional requirements resulting from conditions of the Project Approval or Mining Lease will be incorporated into the existing EMS.

Bloomfield's Environmental Policy is as follows:

"*It is the policy of the Bloomfield Group and its subsidiary and associated companies to strive to achieve a high standard of care for the natural environment in all of the activities associated with our coal mining and engineering operations.*

We aim to conduct our operations in an ecologically sustainable manner through:

- *Minimising our impact on the environment by:*
  - *Managing the effect of our activities with regard to air, ground and water pollution;*
  - *Reducing noise associated with our activities to as low as reasonably practicable;*
  - *Controlling the waste associated with our activities and the identification of recycling opportunities;*
  - *Rehabilitating disturbed mining areas; and*
  - *Managing our energy consumption.*
- *Identifying, monitoring and, providing adequate resources to manage risks arising from our operations in accordance with the structure of our Environmental Management System, which establishes the appropriate objectives and targets related to the environmental risks relevant to the scope of our operations;*
- *Reviewing our environmental management activities and seeking to continually improve our production processes, waste management and the use of resources;*
- *Conducting our operations in compliance with all relevant environmental legislation, regulations and licences;*
- *Consulting with managers and employees about our aim and about their individual responsibilities;*
- *Informing our contractors, customers and suppliers of our aim and of their environmental responsibilities in relation to our business; and*
- *Consulting with the community and relevant government bodies with regard to our environmental performance, obligations and issues, as appropriate to their interests*."

Existing systems and procedures that have been developed to manage the impacts and operation of activities on the site include:

- Mining Operations Plan;
- Maintenance Management System;
- Rehabilitation Management System;
- Environmental Water Management System;
- Draft Waste and Contamination Procedure;
- Draft Land Disturbance Management System;
- Aboriginal Heritage Management System;
- Mine Transport Management Plan;
- Shot Firing and Explosives Management System;
- Bushfire Management Plan; and
- Fuel and Bulk Oil Delivery Procedures.

Bloomfield operations are also included in the Integrated Environmental Monitoring Program ('IEMP') (refer **Section 2.12**) relating to the adjacent Abel and Donaldson operations. Systems have been established to ensure procedures are communicated, implemented and reported. These include such mechanisms as:

- Communication, inspection and reporting procedures;
- Employee consultation systems;
- Toolbox talks and inductions;
- Scheduled environmental inspections;
- Contractor Management System;
- Incident Notification and Reporting Procedure; and
- Complaints Protocol.

2.9 WATER MANAGEMENT

This section provides an overview of the water management system for the open cut operations. A detailed surface water management and assessment study has been completed by *Evans & Peck*. Details are provided in **Section 11** and **Appendix H**.

The Bloomfield surface water management system integrates water management for the open cut and the Bloomfield washery and has been assessed and approved under the Abel Project Approval. This section therefore discusses the system as approved, emphasising those areas that are most relevant to this Project.

The water management system includes the following:

- Existing surface water storages and sediment control dams (Lake Kennerson, Lake Foster, Possums Puddle and the Stockpile Dam) and the pipelines and drains that allow water to be transferred between these storages, or discharged offsite;
- Pumps for the supply of water from Lake Foster to the washery;
- Pumps for supply of groundwater extracted from old underground workings to supplement water supply to the washery when required;
- The washery associated stockpile areas and the Stockpile Dam;
- Previously mined areas including S Cut and Creek Cut used for disposal of wastes from the washery (coarse rejects and fine tailings) and the rehabilitation of these areas following completion of waste disposal; and
- Mine water discharge regime as per the existing EPL.

Water collected in-pit and from surrounding disturbed areas will continue to be directed to Lake Kennerson via existing pipelines and open drains. The Bloomfield water management system, as it exists, forms part of the Integrated Water Management System approved on 5 May 2008 for the Bloomfield, Abel and Donaldson mines.

2.10 ENERGY AND GREENHOUSE GAS MANAGEMENT

Bloomfield Colliery currently uses energy in the form of diesel and petrol for plant and equipment, electricity and explosive charges. The amounts of energy used and estimated emissions of greenhouse gases from this use are calculated in the Air Quality Assessment undertaken by Holmes Air Sciences, described in **Section 10** and **Appendix G**.

Bloomfield is currently registered as a participant in the Federal Government Energy Efficiency Opportunities ('EEO') and Greenhouse Challenge Plus programs. An Assessment and Reporting Schedule has been prepared under the EEO program and an Energy Assessment of open cut operations will be undertaken in accordance with the commitments made in that schedule. The EEO Energy Assessment will document current and proposed initiatives for the efficient supply and management of energy usage, as well as procedures for the reporting and management of greenhouse gases resulting from Scope 1 and 2 emissions, which are those emissions that are produced directly as a result of equipment use on site (Scope 1 emissions), and the use of electricity on the site (Scope 2 emissions).

Appendix G predicts that the Project will produce 28,489 tonnes of Scope 1 emissions and 14,214 tonnes of Scope 2 emissions in Stage 1. In Stages 2-4, 23,164-35,312 tonnes of Scope 1 emissions and 11,102–16,490 tonnes of Scope 2 emissions are estimated to be produced. The *National Greenhouse and Energy Reporting Act 2007* (NGER Act) requires

corporations that control facilities emitting 25 kilotonnes (25,000 tonnes) or more of greenhouse gas (CO_2 equivalent) per year to register and report their greenhouse gas emissions. Bloomfield Colliery will therefore be required to monitor and report on its greenhouse gas emissions under the NGER Act. Such reports will be provided in the form required by the NGER Act.

Scope 3 greenhouse gas emissions are those indirect emissions that are a consequence of Bloomfield's operations, but are not from sources owned or controlled by Bloomfield, for example, the burning of Bloomfield's coal for energy by their customers.

Depending on ROM coal production, the Project is estimated to liberate between 19.5 Mt and 30.4 Mt of CO_2 equivalent greenhouse gases (including Scope 3) over the life of the mine, with an annual average of between 1.76 and 2.85 million tonnes. In 2005, Australia emitted an estimated 559 Mt of CO_2 equivalent greenhouse gases using the Kyoto accounting procedures. The Scope 3 emissions from the Project would not be included in the NSW inventory as the coal is for export and would be accounted for in the country in which the end user is located.

2.11 WASTE AND HAZARDOUS MATERIALS MANAGEMENT

Bloomfield Colliery has an existing *Draft Waste and Contamination Procedure* that specifies measures undertaken by Bloomfield to reduce waste, ensure regulatory compliance and reduce the risk of environmental impact from pollution.

Mining operations produce volumes of waste that require responsible management and disposal. As part of the mining process, potential pollutants (such as diesel, oils and chemicals) are also stored and used on-site. Bloomfield has an obligation, under the POEO Act to ensure that contaminated waste is handled responsibly and that the risk of pollution is managed in accordance with the requirements of EPL 396. Bloomfield also has a responsibility to the community to minimise pollution and reduce the total volume of general waste requiring disposal.

Bloomfield's existing policies and procedures for waste and hazardous materials management will continue to be used for this Project. The procedures include:

- Regulatory responsibilities and requirements;
- Disposal procedures for various waste streams;
- Controls for the storage, use and disposal of potential pollutants;
- Methods of reducing waste production;
- Methods of minimising risk of environmental, safety and health impacts;

- Communications and training with regard to the above requirements;
- Monitoring and reporting requirements; and
- Procedures for roles and responsibilities.

Process waste (for example, tailings and rejects) is the responsibility of the washery approved under the Abel Project Approval. Process waste therefore does not form part of this Project. The *CHPP & RLF Environmental Management Plan* provided under the Abel Project Approval describes the management and monitoring of process waste.

Bloomfield has adopted the waste management hierarchy as the principle upon which the site waste management strategy is based. In order to minimise the amount of non-recyclable waste being produced on-site, all waste management measures should reflect the waste hierarchy, which is to reduce, re-use, recycle and then responsibly dispose.

Bloomfield's *Draft Waste and Contamination Procedure* identifies waste hierarchy management responses for wastes such as:

- waste oil;
- hydrocarbon contaminated solids (eg: oily rags);
- hydrocarbon contaminated soil;
- hydrocarbon contaminated water;
- used hydraulic hoses;
- oil filters;
- batteries;
- empty drums;
- general wastes such as wood and plastics; and
- scrap steel.

Hazardous materials such as fuels, oils and chemicals are stored at the workshop area that forms part of the Project Area. These items are stored and used in accordance with existing site hazardous and dangerous materials guidelines which include the storage of all fuels within the bunded fuel farm and the collection and treatment of all potentially contaminated water within the workshop via an oily water separator with collection system. This system is discussed in the Surface Water Assessment (**Section 11.2**).

Initiating explosive products used in the mining operation are stored at a secure magazine not located within the Project Area.

2.12 INTEGRATION WITH OTHER MINING OPERATIONS

The Director General's requirements for this Project include a requirement to address integrated management. This is discussed in detail in **Section 15.2**.

Integration of this Project with adjacent operations has been a key consideration in mine planning and in all impact assessment studies. For example, open cut water management is an integral part of the overall water management system as it manages surface water from the Donaldson and Abel mines, and the Bloomfield washery. The post-mining rehabilitation strategy (refer **Section 3.7**) also incorporates the requirements of the Abel Mine and the washery, which will continue operating after the completion of this Project.

Key aspects of the Project that are integrated with the operations of adjacent projects include:

- Delivery of coal from the Project and other mines to the ROM coal stockpile areas adjacent to the washery, which will continue after completion of the Project;
- Water management system components utilised by multiple operations, such as the Bloomfield, Donaldson, and Abel mines and the Bloomfield washery, with the open cut water management forming part of the overall integrated water balance;
- Provision of a final void that will be used for future management of washery reject and tailings;
- Integrated rehabilitation planning, considering the final land use proposed for multiple sites; and
- Integrated environmental monitoring program for the adjacent sites (described as following).

Due to the proximity of other mining operations, relevant impact assessment studies (i.e. air quality and noise) have considered cumulative impact as part of their studies.

An Integrated Environmental Monitoring Program ('IEMP') developed as part of the Abel Project Approval has been approved by DoP and is currently being implemented as described in **Section 15.2**.

Impact assessment studies undertaken for this Project and recommended monitoring regimes have taken into consideration existing IEMP requirements.

3. REHABILITATION AND LANDSCAPE MANAGEMENT STRATEGY

3.1 INTRODUCTION

Rehabilitation is an integral part of the Bloomfield Project and will involve the following:

- placement and shaping of overburden material to form a suitable landform;
- preparation of the ground surface including placement of topsoil/topdressing material as required;
- planting of appropriate vegetation species; and
- monitoring and maintenance of the rehabilitated areas to ensure long-term success.

Rehabilitation is currently undertaken in accordance with a *Land Rehabilitation Management System* ('LRMS') developed by Bloomfield. The LRMS was prepared giving consideration to government requirements, industry standards and stakeholder consultation. This section describes these requirements, including the LRMS which will be adopted for rehabilitation of the Project Area. This section also provides a discussion on final land use options and a description of a preferable post mining landform and land use, as well as the treatment of the final void that will remain after mining has been completed.

Consideration of the most appropriate post mining landform and final void is integrated with the requirements of other projects or proposals (refer **Section 2.12** and **Section 15**). This includes the use of the final void for rejects disposal from the washery operations, as provided for by the Abel Project Approval. As washery operations have been approved to continue to 2028, this influences rehabilitation considerations for the final void. The Lower Hunter Regional Strategy (DoP, 2006), DPI requirements with regard to landform stability and safety, and landowner requirements are also key considerations in post mining landform selection and design These considerations are described in detail in **Section 3.6**.

3.2 REHABILITATION MANAGEMENT SYSTEM

Bloomfield Colliery currently undertakes site rehabilitation in accordance with its documented LRMS, developed in accordance with guidelines issued by the DPI.

The LRMS outlines the rehabilitation methodology implemented by Bloomfield for the preparation, management and relinquishment of rehabilitated lands at Bloomfield mining operations.

The system includes:

- Overall rehabilitation aim, objectives and criteria;
- Overview of regulatory requirements and guidelines;
- Information on roles and responsibilities for rehabilitation;
- Auditing, review and consultation; and
- A specific Rehabilitation Plan for each Bloomfield site (ie: Bloomfield Colliery, Rix's Creek, etc).

The LRMS will form the basis for continuing rehabilitation of the Bloomfield Project Area. A Rehabilitation Plan for Bloomfield Colliery is appended to the LRMS and incorporates commitments made in the current Bloomfield MOP.

A detailed Final Rehabilitation Plan and Mine Closure Plan will be prepared as part of the MOP process. The detailed content of these plans will reflect the overview of final rehabilitation and mine closure objectives, procedures, monitoring and maintenance documented in the following sections.

3.3 REHABILITATION AIM AND OBJECTIVES

The current aim of rehabilitation at Bloomfield Colliery is to provide a safe and stable landform, compatible with the surrounding landscape, which allows for a range of possible post-mining land-uses including mixed-use development.

The objectives of the current Rehabilitation Plan are as follows.

3.3.1 General Rehabilitation Objectives

- Land will be rehabilitated in accordance with relevant DPI standards applicable at the time of rehabilitation;
- Rehabilitated land will represent a minimal source of off-site environmental impacts, such as dust, water pollution, visual amenity and weeds;
- All infrastructure owned by Bloomfield Colliery must be removed under the terms of its Commercial Lease with the landowner (Ashtonfields);
- Rehabilitated land will require ongoing management inputs no greater than similar adjacent land; and
- Rehabilitation will be compatible with the proposed post-mining land-use (mixed-used development).

3.3.2 Landform Objectives

- Rehabilitated land will be safe and stable;
- Land capability will be returned to a class similar to that existing prior to the commencement of mining; and
- Mined land will be re-contoured to a landform compatible with the surrounding natural landscape.

3.3.3 Vegetation Objectives

- Rehabilitated land will be topdressed, fertilised and sown with grass seed and/or native vegetation species; and
- A sustainable vegetation cover will be established on rehabilitated land.

Each rehabilitation objective listed above is linked with specific completion criteria and progress indicators in Bloomfield's Rehabilitation Plan.

3.4 REHABILITATION PROCEDURES

Rehabilitation procedures are documented in the LRMS and are divided into the following stages:

- Landform reshaping;
- Preparation of the ground surface (eg: topdressing material application);
- Species selection; and
- Site monitoring and maintenance.

These procedures are described as follows.

3.4.1 Landform Reshaping

During open-cut mining, overburden is placed in progressive spoil dumps. These dumps are subsequently reshaped to re-establish a landscape that blends with the surrounding undisturbed topography. As a general rule, slopes are constructed at 10 degrees or less, with any exceptions pre-approved by DPI.

Figure 10 (provided in **Section 2**) provides the Mine Plan for Stage 5, which represents the post- mining phase. This figure illustrates the final post-mining landform contours and areas to be rehabilitated. Two cross-section lines (Section 1 and 2) are also shown on **Figure 10**.

These cross-sections are provided as **Figure 12**. These two sections show the final void and treatment of rehabilitation areas.

3.4.2 Preparation of the Ground Surface

After landform reshaping, the surface is rock raked and exposed surface rock is removed or buried prior to the spreading of topdressing material. Soil material stripped ahead of the mining is applied to the new surface. Where appropriate, bio-solids and mulch are used in the topdressing process. These materials are brought onto site by a licenced contractor and applied in accordance with the NSW Biosolids Guidelines (EPA, 1997).

The surface is then contour cultivated to integrate the topdressing layer with the underlying material and sown with pasture or tree seed mix. If bio-solids are not used, fertiliser may be spread with the pasture seed mix. Following sowing, the surface is rolled to encourage germination.

All of these works are performed as soon as is practical after spreading the topdressing material to minimise losses and preserve biological activity.

3.4.3 Species Selection

Rehabilitated areas are generally sown with pasture species to create a stable landscape potentially suitable for light grazing. Areas of tree planting are also incorporated into the rehabilitation scheme and are situated to assist with habitat enhancement and to visually blend former overburden dump areas with the surrounding landscape.

Typical species used in rehabilitation include:

<u>Pasture Mix:</u>

- Rhodes Grass
- Rye Wimmera
- Kikuyu
- Clover Haifa
- Couch
- Shirohie Millet
- Oats Coolabah

Native species/trees:

- *Acacia implexa, A. decurrens, A. falcate, A. longifolia, A. mearnsii, A. myrtifolia, A. ulicifolia, A. irrorata, A. sauveolens*
- *Angophora costata*
- *Casuarina torulosa*
- *Corymbia maculata*
- *Eucalyptus crebra, E. saligna, E. pilularis, E. resinifera, E. umbra, E. haemastoma, E. gummifera, E. paniculata, E. acmenioides*
- *Leptospermum polygalifolium*
- *Syncarpia glomulifera*

3.4.4 Site Monitoring and Maintenance

Maintenance of rehabilitated areas is ongoing to ensure rehabilitation objectives are met. Pasture growth is encouraged by slashing low density grazing and fertilizer application.

A weed control program assists the detection and treatment of any infestation.

All rehabilitated areas are inspected annually to identify areas requiring maintenance or further treatment. Any erosion occurrences are investigated to ascertain the cause of the problem and remedial actions are implemented to prevent recurrence. These actions may be in the form of respreading of topdressing material on minor rill erosion or remedial earthworks for more major occurrences.

3.5 FINAL VOID

A final void will be retained on the site after the completion of mining. The location of this final void is shown on **Figure 10** and **Figure 12**. (Note: **Figure 10** is located with the staged Mine Plans provided in **Section 2**.)

The final void will be at the northern extension of S Cut where it will join with Creek Cut. The final void will remain as part of an active disposal site for reject material from the washery, approved under the Abel Project.

Proposed rehabilitation of the final void, once filled with reject material, is described in the Environmental Assessment for the Abel Project. It states that rehabilitation "*will be undertaken in accordance with DPI guidelines which require the Bloomfield Mine Operations Plan, required as a condition of the Bloomfield mining lease, to provide details on proposed*

outcomes to be achieved through rehabilitation and final landform." (Donaldson Coal, 2006, p. 2-19)

Bloomfield plans to rehabilitate the reject emplacement areas, once capacity has been reached, by shaping to a stable, undulating, self draining landform with mixed cover of pasture and native vegetation. These plans may in future be influenced by the needs of other projects that utilise the final void, as described in **Section 3.6** and therefore Bloomfield has selected a post-mining landform and land use option that best caters for the potential needs of these projects.

3.6 POST-MINING LANDFORM AND LAND USE

3.6.1 Factors Influencing Post-Mining Landform and Land Uses

Selection of an appropriate post-mining land use and development of a suitable post mining landform is an integral part of the Project. Factors influencing the selection of an appropriate post-mining landform and land use are:

- DPI requirements with regard to landform stability and safety;
- The Lower Hunter Regional Strategy (DoP, 2006) (LHRS) (refer **Section 4.4.3)** identifies the Project Area as part of a larger future development area incorporating a "future freight hub and employment lands providing an opportunity for the storage, transfer and distribution of containerized freight and associated employment" (location shown on **Figure 13** in **Section 4**). Therefore any decisions regarding the post-mining landform and land use will need to take this, and any additional detailed plans that may be prepared in the future, into consideration;
- The Project Area is owned by Ashtonfields and any decision regarding post mining landform and land use will take Ashtonfields' requirements into consideration;
- The Bloomfield washery, rail loading facility and associated infrastructure will continue to operate after the Project is scheduled to be completed, so active washery infrastructure and transport will *continue* in the Project Area; and
- Where relevant, other strategic planning and conservation studies may influence decisions regarding the type of land use or vegetation cover within the Project Area. Studies may include the draft Lower Hunter Regional Conservation Plan (described in **Section 4.4.4**), Hunter-Central Rivers Catchment Action Plan (refer **Section 4.4.6**), Wallis and Fishery Creek Total Catchment Management Strategy (refer **Section 4.4.7)** and Hunter and Central Coast Regional Environmental Management Strategy (refer **Section 4.4.5).**

3.6.2 Consideration of Alternative Final Landforms and Uses

A range of alternative final landforms and land uses for the Project Area have been considered by Bloomfield. Details of these alternatives, with respect to the considerations presented in **Section 3.6.1**, are provided as follows.

i. Residential Land Use

The current zoning of the Project Area is 1(a) Rural 'A', and as such no residential or rural residential development is currently permissible. There are no regional or local plans that currently identify the area as being required for residential land use. The *Lower Hunter Regional Strategy* (LHRS) does not identify the Project Area for future residential development.

However, land uses identified in the LHRS will require residential areas to support the requirements generated by the employment zone. As the LHRS is progressed, residential development may be included in those parts of the Project Area identified as reaching satisfactory safety and stability criteria associated with such development.

ii. Industrial Land Use

The LHRS identifies the Project Area as part of a 'future freight hub and employment lands'. This area extends eastward towards the New England Highway, as shown on **Figure 13**. The LHRS is a strategic land use planning document that aims to cater for the Lower Hunter Region's predicted growth over the next 25 years. The Strategy does not place a timeframe on the development of a freight hub, but it is assumed that, if approved, it would be constructed progressively as land areas became available post-mining.

Bloomfield's proposed project timing may enable southern and western sections of the Project Area to be made available for industrial purposes in ten to twelve years time (the time required to complete this Project). However, filling of the final void with reject material from the Bloomfield washery, as well as active operation of the washery, is expected to occur over the life of the adjacent Abel Mine project, which has consent to operate until 2028 (as stated by Schedule 3(5) of the Abel project approval). The final void area, which is located in the central section of the Project Area, would therefore need to be excised from any industrial development until the completion of the Abel Project.

Rehabilitation of the final void occurs after filling with reject material from the washery and forms part of the Abel Project approval. Filling of the void with material other than washery rejects, as part of an overall land rehabilitation strategy, is not possible as the void space is required as a location to dispose of reject material from the washery. If the objectives of the Abel Project altered in future or were not met, rehabilitation to appropriate final landforms

would be completed with material from within the site. This would be considered in consultation with the land owner and relevant stakeholders as described in **Section 3.6.1**.

Bloomfield's current Commercial Lease with the landowner prohibits the emplacement of foreign material, not arising from the core mining activity of the tenant, on the Project Area. This requirement therefore excludes the importation of material from off site.

As the Project Area has been identified as having potential for industrial-type uses in the future, Bloomfield consider that the Project Area should be rehabilitated in such a way that does not conflict with this future land use. Such rehabilitation would mean providing a flat to undulating topography suitable for mixed use industrial, seeded with grasses to stabilize, together with areas of trees for habitat, until such time as detailed determinations are made regarding any future industrial use of the site. Should no such future development eventuate, the site would remain as a stable, rural landscape.

iii. Open Forest/Bushland

Previously mined areas adjacent to and parts of the Project Area have been rehabilitated to grazing land with areas of native vegetation as can be seen to the east of the Project Application Area on the aerial photograph provided as **Figure 2**.

The draft Lower Hunter Regional Conservation Plan prepared in 2006 (refer **Section 4.4.4** for detail) is a partner document to the LHRS and identifies a conservation corridor from the Watagan Ranges to Port Stephens, providing a significant link between the southern sandstone ranges and the coastal heaths and wetlands of Port Stephens. The corridor is also identified on LHRS plans. The corridor is mapped south of John Renshaw Drive and east of George Booth Drive, crossing the New England Highway where wetland areas provide a direct link to Hexham Wetlands and across to the Pacific Highway and Fullerton Cove. The corridor is not on the Project Area and is separated from it by John Renshaw Drive.

Due to the proximity of the Bloomfield Project Area to this corridor, visibility of parts of the Bloomfield site from outside areas, the proximity of bushland to the west and east and the desire to provide ongoing habitat opportunities for fauna, Bloomfield consider it important to incorporate areas of bushland into its rehabilitation plans.

As the LHRS identifies the Project Area as part of a future industrial development, Bloomfield considers that areas of tree planting identified in rehabilitation plans be carefully selected, considering any future development plans. If the objectives of the LHRS altered or the current planning strategy for industrial use of the Project Area was changed during the project timeframe, Bloomfield may re-consider its selected final landform and land use strategy to include additional bushland areas. This would be considered in consultation with the land owner and relevant stakeholders as described in **Section 3.6.1**.

iv. Undulating grazing land/rural landscape

This option would rehabilitate the Project Area to undulating grazing landform consistent with its pre-mining land capability, while still providing areas of native vegetation to enhance biodiversity and aesthetic values.

This option is compatible with the LHRS, provides local habitat opportunities and linkages with adjacent remnant native vegetation. This land use type allows Bloomfield to progressively rehabilitate the Project Area to a stable landform that minimises erosion and sedimentation.

3.6.3 Preferred Post-Mining Landform and Final Landuse

After consideration of the above options, Bloomfield has determined that rehabilitated land suitable for a variety of future land uses, whilst enabling the retention of habitat areas, is the most appropriate choice.

The Project Area is therefore proposed to be rehabilitated in accordance with its pre mining land capability to create a stable, undulating landscape with a mix of pasture and tree areas suitable for grazing and general habitat.

Post mining landform contours are shown on **Figure 10**. Cross sections of the proposed post mining landform are provided as **Figure 12**. The current pre-mining drainage pattern, which drains the western section of the Project Area towards Buttai Creek and the eastern section towards Four Mile Creek, will be modified by the mining process so that, during mining, all disturbed sections of the Project Area drain towards Four Mile Creek via Lake Kennerson. Contour drains, with sediment basins if required, will be incorporated into rehabilitated areas to direct the flow of clean water towards diversion drains that bypass mine water storages and drain to Four Mile Creek (refer **Section 11** for further details).

At the completion of mining in the Project Area, all infrastructure not required for the continued washery operations will be removed pursuant to the existing Commercial Lease. The landowner has, to date, requested that the major internal roads and power lines remain at the completion of mining.

Items that would remain operational include washery reject emplacement areas and the washery and its associated stockpiles and water management system components.

The staged mine plans provided as **Figures 6 to 10**, show conceptually how rehabilitation will progress as mining is completed. These plans show post-mining contours and areas to be rehabilitated. Detailed rehabilitation plans, showing specific areas to be planted with native vegetation and those areas to be seeded with grasses, will be prepared as part of the MOP process, which provides detailed mining information as the project advances.

3.7 INTEGRATION OF REHABILITATION WITH OTHER PROJECTS

The Bloomfield Project is integrated with nearby mining operations, including the Abel Mine, Donaldson Mine and Bloomfield washery. The Bloomfield Project Area is covered by the approved Abel Project Area for the integrated water management system that manages water across the Abel, Donaldson and Bloomfield projects, and for the use of the Bloomfield final voids and previous mine areas for rejects disposal from the Bloomfield washery, which form part of the Abel Project.

Open cut mining and rehabilitation on the Bloomfield Project Area does not form part of the Abel Approval. The completion of mining and rehabilitation, and associated activities required to undertake these actions is the subject of this current Application, referred to as the Bloomfield Project. Integration of the various projects is described in detail in **Section 15**.

The following describes the rehabilitation systems and plans that are approved for use or have been prepared for the various projects, and how they interact and are compatible.

The Abel Mine approval required a **Landscape Management Plan** to be prepared. This Plan was required to include a Final Void Management Plan, Integrated Mine Closure Plan and Rehabilitation Management Plan. The Landscape Management Plan, which has been approved by DoP, incorporates the Donaldson and Abel Project Areas, as these two projects share common components such as water management and some surface facilities. The Bloomfield Project Area is addressed in this Plan as follows:

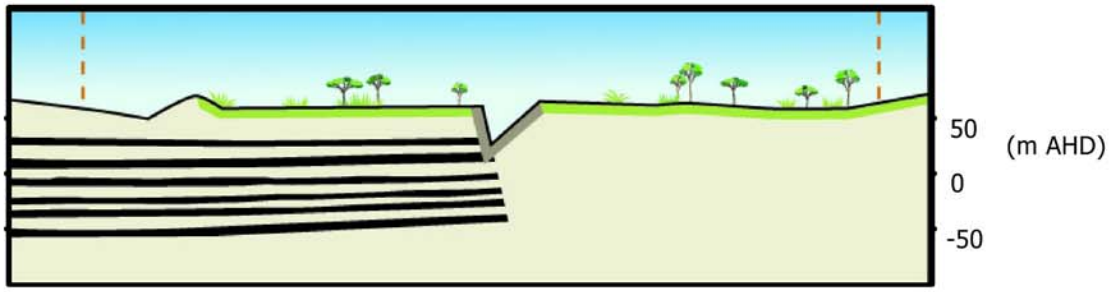
- **Final Void Management Plan** – this Plan addresses the Abel/Donaldson final void only and is not relevant to the Bloomfield Project;

- **Integrated Mine Closure Plan** – as part of the Abel Mine closure objectives, reference is made to the filling of *"former open cut areas within Bloomfield Colliery with tailings from the coal washing process…"* (GSS Environmental, 2007. p7 Section 1.5.2). The description provided is as per that quoted in **Section 3.5** of this EA. The Mine Closure Plan also refers to rehabilitation procedures for "*Domain 3: Bloomfield Colliery*" (GSS Environmental, 2007. p38, Section 8.1.3), which are the rejects disposal areas within the Bloomfield site, including the Bloomfield final void. This section states that *"While certain aspects of the Bloomfield Colliery are being utilized by Abel (ie: tailings disposal, CHPP, rail loadout, etc) the responsibility for mine closure and meeting the lease relinquishment requirements of the DPI-MR will be retained by Bloomfield."* A Closure and Rehabilitation Strategy for the relevant areas was provided by Bloomfield as part of the Integrated Mine Closure Plan.

- **Rehabilitation Management Plan –** This Plan was provided to DoP in two sections. The first was prepared by Donaldson Coal for the Abel and Donaldson project areas. The second, prepared by Bloomfield, was the **Land Rehabilitation Procedure** (which has subsequently evolved into the Land Rehabilitation Management System) for those areas of Bloomfield used for Abel Project rejects storage.

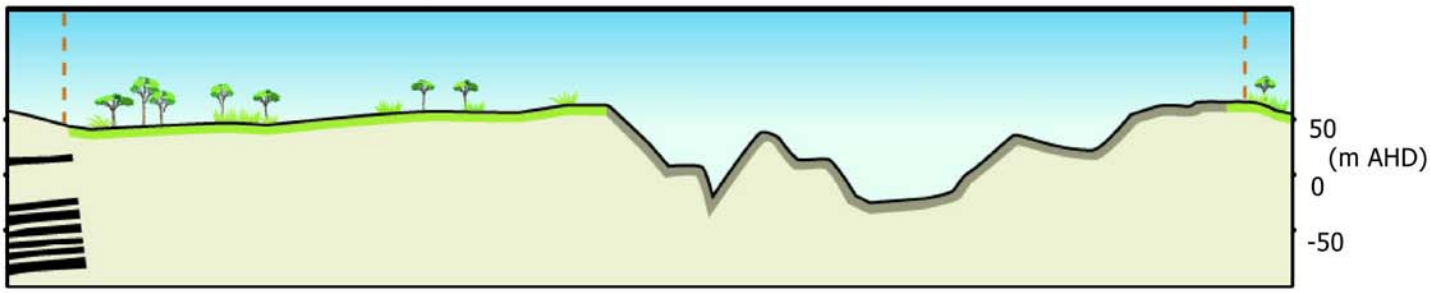
Bloomfield's LRMS provides detailed description and procedures on the current and proposed rehabilitation of the Bloomfield Colliery site. The rehabilitation aim, objectives and procedures outlined in this EA have been taken from this document, which is consistent with the rehabilitation content of Bloomfield's Mining Operations Plan.

WEST TO EAST SECTION
VERTICAL EXAGGERATION : 2 TO 1
(APPROX LENGTH OF SECTION : 1670 M)



SECTION 1

SOUTH TO NORTH SECTION
VERTICAL EXAGGERATION : 2 TO 1
(APPROX LENGTH OF SECTION : 2320 M)



SECTION 2

LEGEND

- PROJECT APPLICATION AREA
- REHABILITATION AREA
- FINAL VOID AREA
- COAL MEASURES

Refer Figure 10 for Location of Cross sections

0 500 m

HORIZONTAL SCALE

FIGURE 12

FINAL LANDFORM CROSS-SECTIONS

BLOOMFIELD COLLIERY
COMPLETION OF MINING AND REHABILITATION

SEPTEMBER 2008

4. STATUTORY PLANNING REQUIREMENTS

4.1 STATUTORY APPLICATION PROCESS

Mining operations at Bloomfield Colliery have previously been carried out pursuant to existing use rights. The introduction of Part 3A of the EP&A Act in 2005 required Bloomfield to obtain Project Approval for the Minister for Planning to continue mining and undertake site rehabilitation.

This Project, which is for the completion of mining and rehabilitation at the Colliery, is for the purpose of coal mining and is therefore classified as a Major Project under the Major Projects SEPP to which Part 3A of the EP&A Act applies. The approval of the Minister for Planning is therefore required, through DoP.

The Project Approval process under Part 3A requires a Preliminary Assessment ('PA') Report to accompany Project Applications to DoP. A PA Report for this Application was lodged with the Minister in August 2007. The PA Report included a Preliminary Risk Assessment, which identified the key issues associated with the proposed development. The Director-General of DoP subsequently issued the Environmental Assessment Requirements for the Project. These Requirements were issued on 8 October 2007 and are attached as **Appendix A**.

This EA has been prepared to comply with Part 3A of the EP&A Act, the EP&A Regulation and the Director-General's EA Requirements specific to this project.

Once the Director-General of DoP has established that the EA is adequate, the EA will be publicly exhibited for at least 30 days in accordance with EP&A Act requirements. During this time, members of the community and government agencies may provide comment on the EA. The EA and all comments submitted by the public are then reviewed. The Director-General of DoP will then prepare an Environmental Assessment Report to be submitted to the Minister for Planning. The Minister for Planning determines the Application following consideration of the Director-General's Environmental Assessment Report.

4.2 LOCAL GOVERNMENT AREA AND PERMISSIBILITY

The Project Area is located wholly within the Cessnock local government area. This area is shown on **Figure 2**. The Project Area is zoned 1(a) Rural 'A' under the *Cessnock Local Environmental Plan 1989*, which permits mining and associated surface activities with consent.

The objectives of the 1(a) Rural 'A' zone are as follows:

"(a) to enable the continuation of existing forms of agricultural land use and occupation,

(b) to ensure that potentially productive land is not withdrawn from production,

(c) to encourage new forms of agricultural land use,

(d) to enable other forms of development which are associated with rural activity and which require an isolated location, or which support tourism and recreation, and

(e) to ensure that the type and intensity of development is appropriate in relation to:

(i) the rural capability and suitability of the land,

(ii) the preservation of the agricultural, mineral and extractive production potential of the land,

(iii) the rural environment (including scenic resources), and

(iv) the costs of providing public services and amenities."

(Cessnock LEP, 1989)

The Project is compatible with these objectives, as it requires a relatively isolated location, enables agriculture on rehabilitated land and the land contains coal extractive production potential.

4.3 RELEVANT LEGISLATIVE REQUIREMENTS

4.3.1 Current Approvals

Current approvals held by Bloomfield include:

- Consolidated Coal Lease 761, ('CCL761'), issued 20 November 1991 and expiring 29 October 2010 – the Project Area is located wholly within CCL761. CCL761 also includes the washery and infrastructure that does not form part of this Project Application;
- Environment Protection Licence No. 000396 ('EPL 396') under the *Protection of the Environment Operations Act 1997* ('POEO Act')– issued for CCL761; and
- Notification of Dangerous Goods on Premises to WorkCover NSW, covering storage locations for distillate, petrol, lube and waste oils, gas cylinder stores and sodium hydroxide and MIBC reagent, ammonium nitrate, emulsion and blasting accessories.

Water licences (under Part 5 of the *Water Act 1912*) are currently under application. Open cut excavation, water extraction bores from old underground workings and monitoring bores will be covered by these applications. Application for the required water licences has been made under the *Water Act, 1912* rather than the *Water Management Act 2000* as the

relevant Regulations for licensing under the *Water Management Act 2000* have not yet been gazetted.

An application for a licence to Store Dangerous Goods was lodged with WorkCover in May 2006.

4.3.2 Required Permits and Licences

Permits, approvals or licences that will be required for the Project include:

- approval under Part 3A of the *EP&A Act*;
- a Mining Lease from Department of Primary Industries issued under the *Mining Act 1992* for the continuing mining operations;
- an Environment Protection Licence ('EPL') under the POEO; and
- licences under the *Water Act 1912* and *Water Management Act 2000* for monitoring piezometers, groundwater extraction from the open cut bore and aquifer interference/intersection associated with open cut excavation. **Table 2** provides details of required water licences.

A mining lease issued under the *Mining Act 1992* entitles the leaseholder to mine the minerals specified in the lease. A Mining Lease will be issued by the DPI after approval has been granted by DoP.

Mining legislation specifies conditions which must be met with regard to safety, environmental management, waste disposal and payment of royalties to the State. A Mining Operations Plan ('MOP') is required as a condition of any new mining lease. Bloomfield will be required to submit Annual Environmental Management Reports ('AEMR') documenting annual environmental performance in relation to the MOP commitments. DPI regularly audits compliance with the MOP.

An EPL is required from DECC under the POEO Act as the proposal is a scheduled activity under the POEO Act. A licence is currently held and requires management within set standards and ongoing monitoring of air, water, waste and noise.

The current EPL 396 is a premise-based licence that includes the operation of the washery, rail loop and other areas that do not form part of this Project. It is considered appropriate that EPL 396 would continue, with the inclusion of any new requirements for this Project and an updated schedule of documents to make reference to this EA.

Water-related licences are detailed in the following **Table 2**. All natural catchment surface water that is captured by dams, etc on the Bloomfield site forms part of the integrated water management system approved by the Abel Project and therefore does not form part of the

licensing requirements for the Bloomfield Project. Further details on water management and required licences is provided in **Section 2.9**.

Table 2 Water Management Licence Requirements

Structure/Facility	Licensing Details	Application Purpose
Groundwater monitoring piezometers located at: 1. 363804E 6370112N (Lot1/DP1045723)	All licensed under Pt 5 of the *Water Act 1912*. Licenses valid in perpetuity from 14 Oct 2008. Licence Number 20BL172024	Monitoring only
2. 365285E 6371009N (Lot1/DP982215)	Licence Number 20BL172025	
3. 366765E 6372059N (Lot1/DP995229)	Licence Number 20BL172026	
4. 367685E 6371037N (Lot4/DP11988)	Licence Number 20BL172028	
5. 366534E 6368071N (Lot44/DP755260)	Licence Number 20BL172029	
6. 365298E 6368267N (Lot36/DP755260)	Licence Number 20BL172030	
7. 364595E 6368658N (Lot35/DP722260)	Licence Number 20BL172031	
8. 363017E 6369040N (Lot18/DP755260)	Licence Number 20BL172032	
Open Cut borehole. Location: 365381E 6369267N (Lot28/DP 755260).	Under application. Licence application submitted on 12-Sep-2008.	Extraction of estimated 73ML of aquifer groundwater per annum.
Open cut excavation: initially two open cuts (S Cut and Creek Cut), merging to form a single cut in Yr 7 of project.	Under application. Licence application submitted on 12-Sep-2008.	Interception of groundwater at a rate of 1.4ML per day (averaged over life of project)

4.3.3 Commonwealth Legislation

i. Environment Protection and Biodiversity Conservation Act, 1999

The *Environment Protection and Biodiversity Conservation Act 1999* ('EPBC Act') requires the Commonwealth Minister for the Environment to approve any actions that may have a significant impact on matters of national environmental significance. These matters are:

- World Heritage properties;
- National heritage places;
- Wetlands of international importance (eg: RAMSAR wetlands);
- Threatened species and ecological communities;
- Migratory species;
- Commonwealth land and marine areas; and
- Nuclear actions (including uranium mining).

The only matter of possible relevance to the Project is threatened species and ecological communities. The Flora, Fauna and Threatened Species Assessment undertaken for this EA concluded that these matters are not of relevance in the Project Area. Therefore, approval under the EPBC Act is not required. Further detail is provided in **Appendix D**.

ii. Native Title Act 1993

The *Native Title Act 1993* is administered by the National Native Title Tribunal which is responsible for maintaining a register of native title claimants and bodies to whom native title rights have been granted. These native titleholders and claimants must be consulted prior to the granting of a mining lease over land to which the native title claim or right applies. All land within the Project Area has been assessed for possible native title claims. The land is made up of private land (owned by Ashtonfields), dedicated Crown Roads or dedicated Council Public Roads and as such is not subject to native title claim.

iii. Energy Efficiency Opportunities Act 2006

The *Energy Efficiency Opportunities Act 2006* ('EEO Act') took effect on 1 July 2006 and was amended in March 2007. It aims to improve the identification and evaluation of energy efficiency opportunities by large energy using businesses and, as a result, to encourage implementation of cost effective energy efficiency opportunities. Bloomfield registered on 31 March 2007 and has submitted an Assessment and Reporting Schedule.

In order to achieve its aim, the EEO Act requires large energy-using businesses to:

- undertake an assessment of their energy efficiency opportunities to a minimum standard to improve the way in which opportunities are identified and evaluated; and
- report publicly on the outcomes of that assessment in order to demonstrate to the community that those businesses are effectively managing their energy.

The EEO Act outlines the broad requirements for large energy using businesses, and allows for regulations to provide detailed requirements for assessment, reporting, verification and other elements of the EEO program.

The *Energy Efficiency Opportunities Regulations 2006* provide details of the EEO program's requirements. Proposed amendments in the *Energy Efficiency Opportunities Amendment Regulations 2008* aim to streamline energy use reporting with the Australian Government's National Greenhouse and Energy Reporting ('NGER') System making it easier for EEO registered companies to collect and report one set of energy use data, reducing potential duplication. Most companies will not be affected by the changes. However, for those companies that may have different sets of energy use under each scheme, the amendments will reduce the compliance burden and avoid duplicative reporting requirements. The amendments commenced on 1 July 2008, to coincide with the commencement of the NGER System.

iv. National Greenhouse and Energy Reporting Act 2007

The *National Greenhouse and Energy Reporting Act 2007* ('NGER Act') establishes a national framework for Australian corporations to report greenhouse gas emissions, reductions, removals and offsets, and energy consumption and production, from 1 July 2008. The NGER Act requires corporations that control facilities emitting 25 kilotonnes (25,000 tonnes) or more of greenhouse gas (CO_2 equivalent) per year to register and report their greenhouse gas emissions. The greenhouse gas assessment for the Project predicted that Bloomfield will exceed the threshold amount and is therefore required to register the site and report greenhouse gas emissions. This requirement is discussed further in **Section 2.9** and in the air quality assessment in **Section 10**.

4.3.4 NSW Legislation

In addition to the EP&A Act, various other items of legislation have been referred to in the assessment of potential impacts, or are required to be addressed at some stage of the Project. Where relevant to the planning process, the legislation has been addressed in the studies undertaken for each key issue.

Relevant legislation includes:

- *Threatened Species Conservation Act 1995*;
- *Threatened Species Conservation Regulation 2002*;
- *National Parks and Wildlife Act 1974*;
- *Environmentally Hazardous Chemicals Act 1985*;
- *Occupational Health and Safety Amendment (Dangerous Goods) Act 2003*;
- *Coal Mine Health and Safety Act 2002*;
- *Local Government Act 1993*;
- *Roads Act 1993*;
- *Water Management Act 2000*;
- *Water Act 1912*;
- *Native Vegetation Act 2003*;
- *Protection of the Environment Operations Act 1997*;
- *Mining Act 1992*;
- *Protection of the Environment Operations Amendment (Scheduled Activities and Waste) Regulation 2008*;
- *Occupation Health and Safety Act 2000*; and
- *Heritage Act 1977*.

4.3.5 Hunter Regional Environmental Plan 1989

Hunter Regional Environmental Plan 1989 ('HREP 1989'), which helps to guide development in the Hunter Region, has the following goals:

- '*To promote the balanced development of the region, the improvement of its urban and rural environments and the orderly and economic development and optimum use of its land and other resources, consistent with conservation of natural and man-made features and so as to meet the needs and aspirations of the community;*
- *To coordinate activities related to development in the region so there is optimum social and economic benefit to the community; and*
- *To continue to strive for a regional planning process that will serve as a framework for identifying priorities for further investigations to be carried out by the DoP and other agencies.*'

With regards to the HREP, the Project:

- occurs within the footprint of existing mining developments;
- is unlikely to increase the environmental impact of the existing operations;
- will result in continued economic benefit for the Hunter Region; and
- is consistent with the objectives of the HREP.

4.3.6 Hunter Regional Environmental Plan 1989 (Heritage)

The general aims and objectives of this plan are:

- To conserve the environmental heritage (including the historic, scientific, cultural, social, archaeological, architectural, natural and aesthetic heritage) of the Hunter Region;
- To promote the appreciation and understanding of the Hunter Region's distinctive variety of cultural heritage items and areas including significant buildings, structures, works, relics, towns, precincts and landscapes; and
- To encourage the conservation of the Region's historic townscapes which contain one or more buildings or places of heritage significance or which have a character and appearance that is desirable to conserve.

While the Plan applies to land within the Project Area, no items within the Project Area were listed as heritage items on its Schedules.

4.4 RELEVANT POLICIES AND GUIDELINES

4.4.1 Policies and Guidelines Used in Project Impact Assessment

Various policies and guidelines have been referred to in the preparation of this EA including:

- Management of Stream/Aquifer Systems in Coal Mining Developments (DIPNR, 2006);
- Guidelines for Fresh and Marine Water Quality (ANZECC);
- Managing Urban Stormwater: Soils and Construction (Landcom);
- NSW State Rivers and Estuaries Policy;
- NSW Wetlands Management Policy;
- State Groundwater Policy documents – various (DNR);
- NSW Industrial Noise Policy (EPA, 2000);

- Environmental Criteria for Road Traffic Noise (DEC);
- Environment Noise Control Manual (DEC);
- Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (DEC);
- Threatened Species Assessment Guidelines (DECC, 2007);
- NSW Groundwater Dependent Ecosystem Policy (DNR);
- Draft Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation (DEC); and
- Environmental Guidelines: Assessment and Classification and Management of Liquid and Non-Liquid Wastes (EPA, 1999).

4.4.2 State Environmental Planning Policies

State Environmental Planning Policies (SEPPs) that are relevant to the Project are:

- SEPP (Mining, Petroleum Production and Extractive Industries) 2007;
- SEPP (Major Projects) 2005;
- SEPP 33 - Hazardous and Offensive Development; and
- SEPP 44 – Koala Habitat Protection.

SEPP (Mining, Petroleum Production and Extractive Industries) 2007 is also referred to as the Minerals SEPP. It was gazetted on 16 February 2007. It repealed SEPP 37 – Continued Mines and Extractive Industries and SEPP 45 – Permissibility of Mining. The SEPP removed mining developments from Schedule 1 of SEPP 11–Traffic Generating Development. SEPP 11 has been repealed by *State Environmental Planning Policy (Infrastructure) 2007* which commenced on 1 January 2008.

The Minerals SEPP aims to:

- Provide for the proper management and development of mineral, petroleum and extractive material resources for the purpose of promoting the social and economic welfare of the State;
- Facilitate the orderly and economic use and development of land containing mineral, petroleum and extractive material resources; and
- Establish appropriate planning controls to encourage ecologically sustainable development through the Environmental Assessment, and sustainable management of the development of mineral, petroleum and extractive material resources.

With regards to mining, the Minerals SEPP outlines where various minerals activities are permissible both with and without development consent. The Minerals SEPP also defines mining developments that are prohibited, exempt or complying developments. These provisions do not affect the requirement for approval under Part 3A of the EP&A Act for the Project.

SEPP (Major Projects) 2005 identifies and provides the framework for major projects and the Part 3A process. The Project follows the Part 3A process.

SEPP 33 Hazardous and Offensive Development requires consideration of whether an industrial proposal is a potentially hazardous or a potentially offensive industry. A potentially hazardous industry is defined as a development that

> *'would pose a significant risk in relation to the locality:*
>
> *(a) to human health, life or property, or*
>
> *(b) to the biophysical environment,*
>
> *and includes a hazardous industry and a hazardous storage establishment'(Clause 3).*

A potentially offensive industry is defined as a development that:

> *'would have a significant adverse impact in the locality or on the existing or likely future development on other land, and includes an offensive industry and an offensive storage establishment' (Clause 3).*

Section 2.11 details the existing management procedures for fuels and other hazardous materials. An EPL will be obtained for the Project. DoP's Guidelines for Hazardous and Offensive Development (DoP, 1994) states that *'typically, the level of offence would not be considered significant if relevant EPA licences can be obtained'.* Therefore, it is considered that the Project is not considered to be an offensive industry.

SEPP 44 – Koala Habitat Protection applies to all LGAs listed in Schedule 1 of the SEPP, and restricts a Council from granting development consent on land identified as core koala habitat without the preparation of a plan of management. As Cessnock LGA is listed in Schedule 1 of the SEPP, the SEPP is relevant to this Project and is addressed in **Section 7**.

SEPP 44 requires that, for proposals on properties involving 1 hectare or more, the habitat should be evaluated for potential Koala Habitat and core Koala Habitat. A koala habitat assessment was completed as part of the Flora, Fauna and Threatened Species Assessment for this Project. Although it found the Koala feed tree species *Eucalyptus punctata* to be present, it did not constitute at least 15% of the tree species. Therefore, the assessment

concluded that no core koala habitat was identified within the Project Area (refer to **Section 7**) and a Koala Management Plan is not required.

4.4.3 Lower Hunter Regional Strategy

The Lower Hunter Regional Strategy, prepared by DoP (2006), is a land use planning document that outlines the provision of sufficient, appropriately placed housing and employment land to cater for the Region's predicted growth over the next 25 years. The strategy is based on population growth projections forecasting an additional 160,000 people in the Region by 2031.

The Project Area lies on land which the Lower Hunter Regional Strategy identifies as part of land a '*future freight hub and employment lands*'. This land is shown on **Figure 13**. It will provide an opportunity for the storage, transfer and distribution of containerised freight and associated employment. At a community briefing held by Newcastle Council in 2006, the freight hub was described as an '*inter-modal freight facility*'. Discussions regarding the final land use for the site are an ongoing part of the Project and are being held between Bloomfield, the land owners and the relevant government agencies during the EA process. Rehabilitation of the Project Area as described in **Section 3** will enable future development of the Project Area consistent with this Strategy.

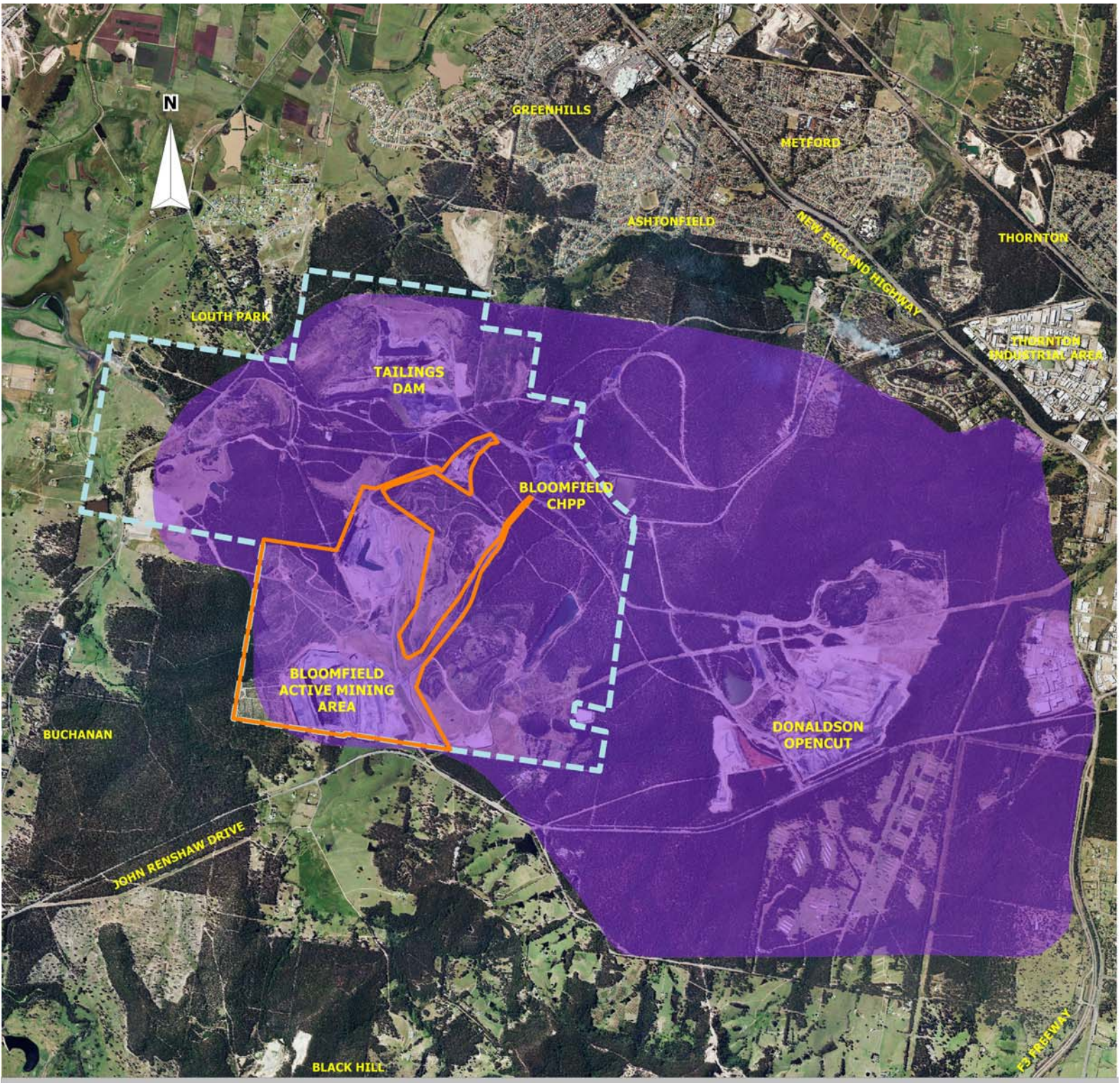
4.4.4 Draft Lower Hunter Regional Conservation Plan

This draft Plan (DEC 2006) sets out a 25-year program to direct and drive conservation efforts in the Lower Hunter Valley. It is a partner document to the Lower Hunter Regional Strategy (**Section 4.4.3**) and sets out the full range of Government planning priorities and identifies proposed areas for growth. The draft Plan includes announcements of significant Government conservation decisions and also seeks feedback on remaining key implementation and longer-term design issues.

The backbone of the major new conservation corridors identified in the Plan will be the new reserves formed by the dedication of private land considered to be of high conservation value lands. The most significant of these is the Watagan Ranges to Port Stephens proposal, which provides a highly significant link between southern sandstone ranges and the coastal heaths and wetlands of Port Stephens.

The Plan identifies private land for dedication into this corridor south of John Renshaw Drive and east of George Booth Drive. Final land use determinations for the Project Area will take this Plan into consideration. The rehabilitation strategy for this Project, to return the site to a rural character with tree and pasture areas, does not conflict with adjacent land use and vegetation type to the south. The ability and effectiveness of the proposed Green Corridor

as referred to in the draft Plan is unlikely to be adversely affected by the proposed rehabilitation strategy for the Project Area.



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LEGEND

- BLOOMFIELD MINING LEASE
- PROJECT APPLICATION AREA
- FUTURE FREIGHT HUB AND EMPLOYMENT LANDS
  Lower Hunter Regional Stratergy
  (Dept of Planning, 2006)

FIGURE 13
LOWER HUNTER REGIONAL STRATEGY EMPLOYMENT LANDS

BLOOMFIELD COLLIERY
COMPLETION OF MINING AND REHABILITATION

SEPTEMBER 2008

4.4.5 Hunter and Central Coast Regional Environmental Management Strategy

The Hunter and Central Coast Regional Environmental Management Strategy ('HCCREMS') is a regional initiative being implemented through the collaborative efforts of fourteen Councils in the Hunter, Central and Lower North Coast of NSW. It seeks to facilitate a regional approach to Ecologically Sustainable Development ('ESD') by actively encouraging greater co-operation between member Councils, State and Federal authorities, industry and community groups. HCCREMS has become widely regarded as a model approach to integrating local government planning and environmental management at the regional level. HCCREMS:

- provides a framework for coordinated action in relation to environmental management issues impacting on the region;
- addresses those environmental and natural resource issues that are best managed at a regional scale (e.g. biodiversity conservation and water quality management are key issues which require a broad management approach that transcends arbitrary institutional boundaries); and
- facilitates regional partnerships and resource sharing to address key environmental management issues in a coordinated, pro-active and efficient manner.

The Regional Biodiversity Conservation Strategy is a unique and multi-faceted project of HCCREMS. It aims to develop a strategy and implementation plan to protect the natural, biological diversity of the Lower Hunter & Central Coast in order to maintain existing ecological processes for future generations. This plan will provide a framework for enhancing the integration of biodiversity information into current and future land use planning processes, thereby providing greater certainty to land managers.

The document produced as part of HCCREMS, *Vegetation Survey, Classification and Mapping Lower Hunter and Central Coast Region* (NPWS 2000), has been incorporated in the Ecology Assessment (**Appendix D** and **Section 7**).

4.4.6 Hunter-Central Rivers Catchment Action Plan

The Hunter-Central Rivers Catchment Action Plan ('CAP') (HCRCMA, 2007) builds on the work of the Catchment Blueprints for the Central Coast, Hunter and Lower North Coast, which were endorsed by the NSW Government in February 2003. The CAP is a guide to protecting and improving the region's natural resources over the next 10 years and has been developed in consultation with local communities. It focuses on five natural resource management areas for protection and improvement namely; biodiversity, aquatic health, soils, estuarine health and marine health. Investigation of these areas for this EA demonstrates that the Project will not conflict with these priorities.

4.4.7 Wallis and Fishery Creek Total Catchment Management Strategy

The primary objective of this Total Catchment Management Strategy ('TCM Strategy') is to define issue specific strategies for the Wallis and Fishery Creek catchments to improve the health of the catchment. The TCM Strategy accommodates community attitudes and priorities, and identifies appropriate mechanisms to resolve issues confronting the future management of the catchments, including the sustainability of current land uses. The TCM Strategy Committee is responsible for implementing the TCM Strategy's recommendations. Committee members have been briefed on the Project and the objectives of the TCM Strategy have been considered in the development of mine plans, water management and rehabilitation objectives.

4.4.8 Draft Water Sharing Plan for Hunter Unregulated and Alluvial Water Sources

Water Sharing Plans are progressively being developed for rivers and groundwater systems with the introduction of the *Water Management Act 2000* ('WMA'). These plans provide a legal basis for sharing water between the environment and consumptive uses. They will provide water users with greater certainty over future access to water and increased trading opportunities.

The draft Plan for Hunter Unregulated and Alluvial Water Sources is currently being finalised. Bloomfield will conduct mining operations in accordance with the draft Plan once finalised. Once it commences, the licensing provisions of the WMA will also take effect in the Plan area. Existing *Water Act 1912* licences will be converted into access licences and water supply works and water use approvals under the WMA.

Under the WMA, extraction of water for basic domestic and stock rights from a river fronting a landholder's property or from groundwater underlying the property (known as basic landholder rights) does not require a water access licence. For groundwater extraction, DWE must still approve the bore. DWE is also developing a regulation to limit extractions under basic landholder rights to a reasonable volume. All other water extraction must be authorised under a water access licence.

Bloomfield Colliery lies within the Wallis Creek Water Source in the Hunter Extraction Management Unit of the Plan. Bloomfield currently operates eight monitoring bores and one extraction bore. Bores will be licensed as required as detailed in **Section 12**.

4.4.9 Thornton-Killingworth Sub-Regional Conservation and Development Strategy

This Strategy (Parsons Brinckerhoff, 2003) covers the interface area between the local government areas of Lake Macquarie, Newcastle, Maitland and Cessnock and includes the Project Area. The Strategy aims to *'identify important areas of conservation, map physical constraints to development, develop a summary of constraints and factors for consideration for possible new development areas and identify strategic directions for the area.'*

The Strategy notes that there is potential for open cut mining around John Renshaw Drive and George Booth Drive. The Project will not interfere with the Strategy objectives.

5. CONSULTATION

5.1 CONSULTATION OBJECTIVES

Consultation with government authorities and the local community has been undertaken throughout the planning phase for the Completion of Mining and Rehabilitation at Bloomfield. The objectives of the consultation program were to:

- Fully inform the local community about the proposal and address and include any community concerns in the Environmental Assessment;
- Provide technical information to the local community using methods that could be clearly understood and provide a forum for open questions and dialogue; and
- Involve government authorities, including Department of Primary Industries, Department of Planning, Cessnock and Maitland City Councils, in the planning process to best address their key considerations in project planning.

5.2 COMMUNITY CONSULTATION

A community consultation program was developed early in the Project to inform the surrounding community of the Project and involve them in the consideration of issues. This ongoing program includes the following elements:

- A **community focus group** was formed with representatives from the local community. This group, facilitated by an independent consultation specialist, had its first meeting on 18 April 2007 and subsequently four meetings have been held. These meetings presented the Project to the group and discussed the Project and mine matters generally. The group was also provided with presentations by specialist consultants on subjects such as risk assessment and the planning process and undertook a site inspection. The focus group included representatives from areas surrounding the mine site, including Buttai, Black Hill, Buchanan, Louth Park and Ashtonfield. Attendees were encouraged to discuss information provided at the meetings within their local communities and to suggest other members of their community who may have be interested in attending. Additional community members who expressed interest in attending were able to attend to hear presentations.
- **Mine management door knocked residences** surrounding the mine. If residents were home, the Project was discussed and any environmental impact concerns noted. Where residents were not home, a newsletter and mine contact details were left.

- A **newsletter** detailing the Project was left at each door-knocked residence with a note from the Bloomfield management encouraging them to contact the mine if they had any queries about the Project. Approximately 300 newsletters were distributed. Of these, 70 were given directly to residents with the remainder left in letter boxes.
- Occupants of unattended residences were encouraged to contact Bloomfield if they had any concerns regarding the Project. As a result, **16 meetings or telephone conversations with residents** occurred to discuss the Project and the application process. A record of these meetings is provided in **Appendix B**. Briefings and information have also been provided to individuals and organisations as requested throughout the planning phase.
- **Presentations** to the following organisations or community representatives:
  - Wallis, Fishery and Four Mile Creeks Catchment Management Forum (part of Hunter-Central Rivers Catchment Management Authority);
  - The Catholic Diocese of Newcastle-Maitland;
  - Donaldson Mine management;
  - Chris Parker – Greens candidate for Cessnock City Council; and
  - Ashtonfields Pty Limited.
- A new Bloomfield **website** was developed to provide information about the Project and its application process. The website address is www.bloomcoll.com.au.

Community feedback has generally been positive and interested in the process to complete mining and site rehabilitation. The community raised issues relating to past and existing operations, in particular blasting, air quality, visual impact and the proposed final land use options. Some residents were unaware of the mine and/or had minimal interest in its operations.

5.3 GOVERNMENT CONSULTATION

Authority consultation for the Project has included:

- Meetings with DPI in March and September 2007;
- Presentation to Cessnock City Council in April 2007;
- Presentations to Maitland City Council in April, May and June 2007;
- Discussions with NSW DoP Sydney and Newcastle throughout 2007 and 2008; and
- Meeting and site inspection with NSW Department of Water and Energy in September 2007.

6. IDENTIFICATION OF KEY ISSUES AND ENVIRONMENTAL ASSESSMENT

6.1 RISK IDENTIFICATION PROCESS

The Project Application and Preliminary Assessment lodged with the Department of Planning on 8 August 2007 identified the likely environmental issues through application of a risk analysis process. A Preliminary Risk Assessment was developed for the Project and risk values were allocated to all proposed aspects of the mine and potential impacts.

The risk assessment (**Appendix C**) was developed using the *Risk Management Guidelines Companion to AS/NZS 4360:2004* (Standards Australia, 2004). It provides the preliminary screening of potential environmental impacts to identify those impacts that have higher levels of risk and those impacts unlikely to result in significant risks to the environment. As such the risk assessment establishes the following:

- It provides an objective, informed basis for the identification of key issues, which are further examined in detail in the Environmental Assessment ('EA').
- It provides an objective basis for the identification of issues unlikely to result in significant risks to the environment and hence issues which are not further examined in detail in the EA.
- It enables the EA to quickly focus on key issues relevant to the decision making process, rather than resulting in an EA that accords the same level of attention to key and non-key issues, with often key issues obscured.
- It enables the EA to be a briefer and more succinct document without limiting its scientific credibility.
- It provides an EA more readily understandable to and capable of being appreciated by community stakeholders.
- It ensures the EA is a decision making tool rather than a catalogue of facts regarding a project, irrespective of their relevance to decision making.
- In using the abovementioned risk assessment methodology, it establishes a transparent basis for identification of key issues.

The Preliminary Risk Assessment was considered by DoP and other relevant agencies when establishing the Director-General's Requirements for the EA. This step provides a further level of confidence that the identification of key issues following the risk assessment is robust and independent. After completion of the detailed technical studies required determining potential impact assessment of the Project, the Preliminary Risk Assessment was

re-examined and new controls included in the risk tables. The Risk Assessment Ratings were then modified as required to provide a final risk assessment rating for each activity.

The risk assessment process involved the following main steps:

- Establishment of the context for the risk assessment process;
- Identification of environmental risks;
- Analysis of risks;
- Evaluation of risks to determine significant issues;
- Consideration of significant issues and potential controls; and
- Re-evaluation of risks to determine a final risk rating for each activity.

After identifying each aspect of proposed operational works, an Environmental Risk Rating was applied to each aspect. This Risk Rating was based on Environmental Consequence Descriptions (Catastrophic, Major, Moderate, Minor, Insignificant) together with a 5 level probability rating for each aspect. This process provided an overall Risk Rating for each aspect, categorised as High, Medium or Low Risk.

For each Project aspect, three separate scenarios were then considered:

- No controls – which is a measure of 'raw' risk associated with an activity, or what may occur if no controls or mitigation measures are in place;
- Current controls – where applicable, as many aspects are already controlled as part of the environmental management of Bloomfield Mine; and
- Proposed controls – which were determined by the working group to form part of the proposed development, for example, a bund, diversion, mining method or management plan.

The Environmental Risk Register developed from the above process showed that many aspects of the proposed development, even with no controls, would be low or medium risk. Low Risk is categorised as 16 to 25 in the classification system. Controlled risk associated with Project aspects ranged from 17 to 24.

The Environmental Risk Assessment process was used to focus on key issues where the risk of environmental impact was considered higher. Although, after implementation of controls, all aspects were categorised as low level risk, focus was directed to those aspects that, without controls, presented a higher level of risk. After the completion of detailed technical studies that also included recommendations for further reduction of potential risks, the risk assessment was again reviewed and updated, and the risk rankings for key issues revised where appropriate. The outcome of this risk assessment concludes that with the mitigation

and remediation measures proposed in this EA the Project has a low risk ranking for all key issues.

6.2 IDENTIFICATION OF KEY ISSUES

Key issues identified from the Risk Assessment process for further investigation were identified as:

- Those items that remain as a medium risk after implementation of controls (Nil items);
- Those items that were identified as High risk prior to implementation of controls; and
- Those items where risk categorisation required further investigation to confirm potential impact.

The Director-General's Requirements for the EA, together with the Environmental Risk Assessment process, identified the key issues for assessment as:

- Flora and Fauna;
- Heritage (both Aboriginal and non-Aboriginal);
- Surface and Ground Water;
- Integrated Management (with neighbouring mines);
- Rehabilitation, Post mining landform and Final Void Management;
- Noise;
- Blasting and Vibration;
- Air Quality;
- Greenhouse Gases; and
- Social and Economic.

As a result of preliminary community consultation, visual aspects were also included in the list of key issues.

Each of these key issues is assessed in detail in the following Chapters. After completion of the assessment studies for key issues, the risk register and risk ratings were reviewed to determine whether the risk ratings had increased or decreased as a result of detailed investigation. The risk rating allocated to a proposed activity after consideration of detailed studies and proposed management and mitigation measures is referred to as the 'residual risk'.

6.3 ASSESSMENT OF RESIDUAL RISK

In order for an aspect of the operation to be acceptable, the minimum requirement adopted for the Project was that the residual environmental risk should be a low level risk after additional impact assessment and implementation of the recommended controls was considered. Initially where a low level risk could not be achieved, additional controls were applied. In a number of cases this was achieved by adopting the controls already in place and documented (or proposed as amendments) to the proposed/existing Environmental Management Plans for the Bloomfield Mine (refer **Section 2.8**) or Integrated Management Plans with other mines including Abel, Donaldson and Tasman Mines (refer **Section 2.12**).

Where existing controls did not address the identified environmental impact, or where it was considered a low level residual risk could not be obtained through implementation of existing controls, additional controls were proposed by the specialist studies undertaken to assess specific impacts. These additional controls are in the draft Statement of Commitments (**Section 18**). For example, environmental risk associated with blasting vibration, if no controls were proposed, was considered generally to be a high risk. When controls are introduced, risk associated with all aspects, including blasting vibration, reduces to low.

After completion of the assessment studies for key issues, the risk register and risk ratings were reviewed and updated to determine whether the risk ratings had increased or decreased as a result of the detailed investigation undertaken for the EA. The risk rating allocated to a proposed activity after consideration of detailed studies and proposed management and mitigation measures is referred to as the 'residual risk' (a measure of the remaining environmental risk once appropriate controls and mitigation strategies have been applied).

All aspects of the proposal following assessment and implementation of appropriate controls as identified in the draft Statement of Commitments are categorised as having a 'low environmental risk' and considered acceptable. The draft Statement of Commitments provides a system whereby the key issues for the Project will be subject to various plans of management. Such plans provide for appropriate monitoring of these issues and various trigger levels which will require further action if the monitoring demonstrates impacts greater than those outlined in this EA.

6.4 INTRODUCTION TO DETAILED ASSESSMENT STUDIES

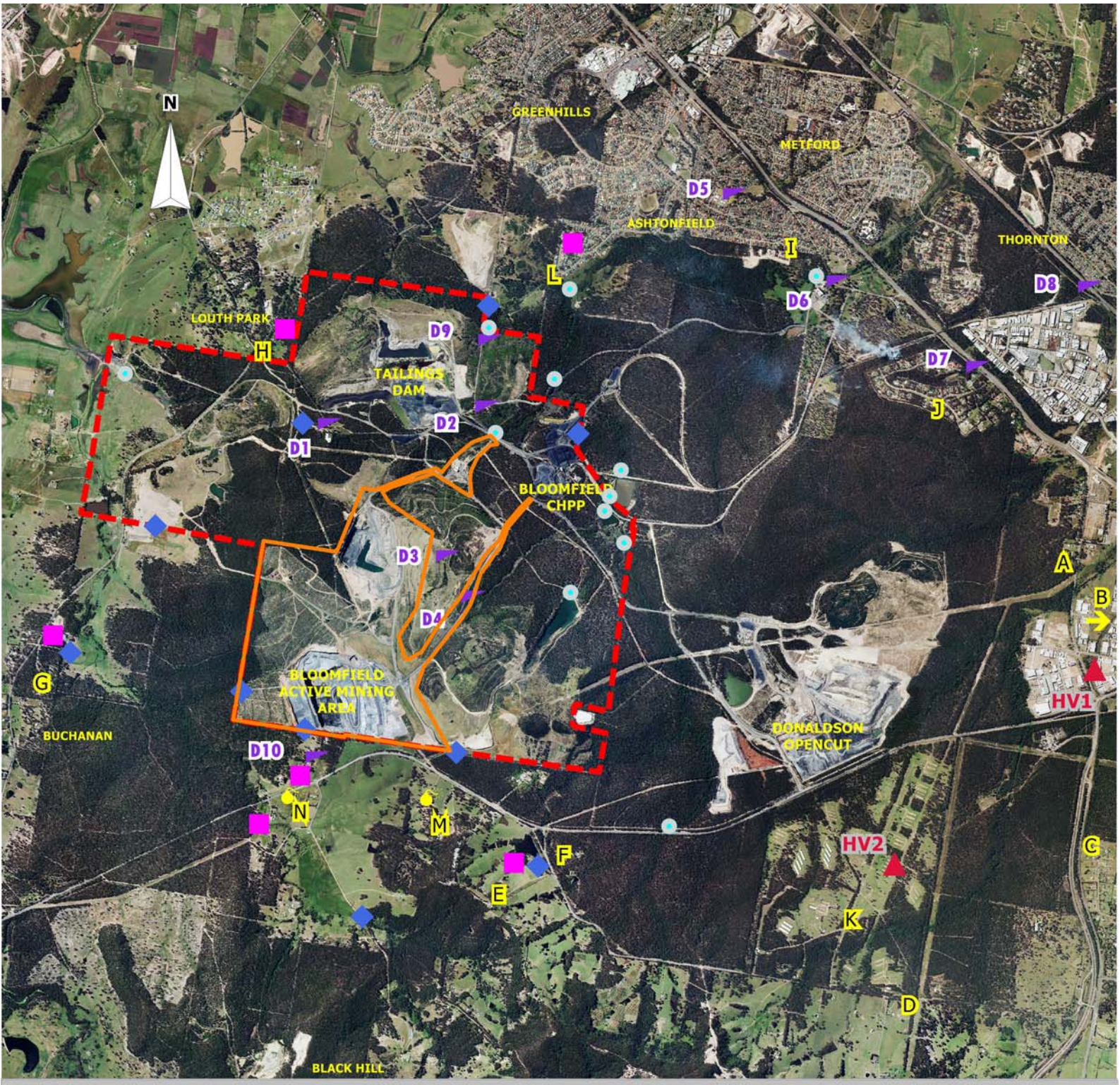
All items identified as key issues were investigated in detail by specialist consultants with expertise in the assessment and management of these particular issues. Their detailed assessment studies are provided as Appendices to this EA. The following chapters provide a summary of each of the studies, with reference to the relevant Appendix where required for

more detail. Some of the studies required monitoring to be undertaken to collect baseline data that could be used in the assessment of potential impact. The locations selected for monitoring or assessment purposes around the Project Area are shown on **Figure 14**. Visual impact assessment locations are provided on **Figure 20**.

The proposed description of the mining operation, together with mine equipment, methods and other relevant information was provided to the consultants. Minor changes to the mine plans were developed over the assessment timeframe and these were provided to the specialist consultants who then amended their studies as required. The final risk assessment was undertaken after receipt of all technical studies, to determine the final residual risk of the Project.

The various technical studies have used terminology and staging in their studies that may vary according to the needs of the assessment being undertaken, which in some cases included computer modelling of representative stages. While some studies have used representative years in their modelling, these representative years have been termed either 'years' or 'stages'. To assist understanding of the various studies, the following describes which mine stages correspond with years provided by the studies:

- **Stage 1** represents the current situation of mining at Bloomfield, ie: Year 1;
- **Stage 2** represents approximately Years 1 to 5 of mining;
- **Stage 3** represents approximately Years 5 to 7 of mining;
- **Stage 4** represents approximately Years 7 to 10 of mining, with some specialist studies including rehabilitation in this stage. The air quality study refers to this stage as Year +10; and
- **Stage 5** is the post-mining rehabilitation stage, after mining has been completed. This represents approximately Years 10 to 12. Some specialist studies include this stage in their Stage 4, or refer to it simply as 'post-mining' or 'rehabilitation stage'.



LEGEND

- BLOOMFIELD MINING LEASE
- PROJECT APPLICATION AREA
- NOISE MONITORING
- PIEZOMETERS
- WATER MONITORING
- D1 DUST MONITORING
- BLAST MONITORING
- A REPRESENTATIVE RESIDENCES
- HV1 HIGH VOLUME AIR SAMPLING

0 1 km

FIGURE 14
MONITORING AND ASSESSMENT LOCATIONS

BLOOMFIELD COLLIERY
COMPLETION OF MINING AND REHABILITATION

SEPTEMBER 2008

7. ECOLOGY

7.1 INTRODUCTION

The Flora, Fauna and Threatened Species Assessment undertaken by *EcoBiological* is provided as **Appendix D**. The following provides a summary of the report identifying and describing existing flora and fauna species and communities on and surrounding the Project Area, including the conservation significance of species, communities and habitats on site. SEPP 44–Koala Habitat Protection and the requirements of Section 5(a) of the EP&A Act with regard to threatened species, populations, and ecological communities, and their habitats, are also addressed.

The investigation focused on two areas of vegetation, each approximately 9 hectares, of which approximately 1.7 hectares of vegetation will be cleared for the Project. The Assessment concludes that there would be minimal impact on flora, fauna, threatened species or Endangered Ecological Communities.

The requirements of the following legislation were considered in the preparation of this assessment:

- *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* ('EPBC Act');
- NSW *Threatened Species Conservation Act 1995* ('TSC Act');
- NSW *Threatened Species Conservation Regulation 2002*;
- NSW *National Parks and Wildlife Act 1974* ('NP&W Act');
- NSW *Environmental Planning and Assessment Act 1979* ('EP&A Act'); and
- NSW SEPP 44 Koala Habitat Protection.

The assessment methods used are consistent with the *Draft Guidelines for Threatened Species Assessment* (DEC and DPI 2005) and *Threatened Species Survey and Assessment: Guidelines for Developments and Activities* (working draft DEC 2004). Under the EA provisions of the EPBC Act, actions that are likely to have a significant impact on a matter of national environmental significance are subject to an assessment and approval process. Action includes any project, development, activity, or series of activities. The Act identifies seven matters of national environmental significance as:

- World Heritage properties;
- National heritage places;

- Wetlands of international importance (Ramsar wetlands);
- Threatened species and ecological communities;
- Migratory species;
- Commonwealth marine areas; and
- Nuclear actions (including uranium mining).

7.2 SURVEY METHODS

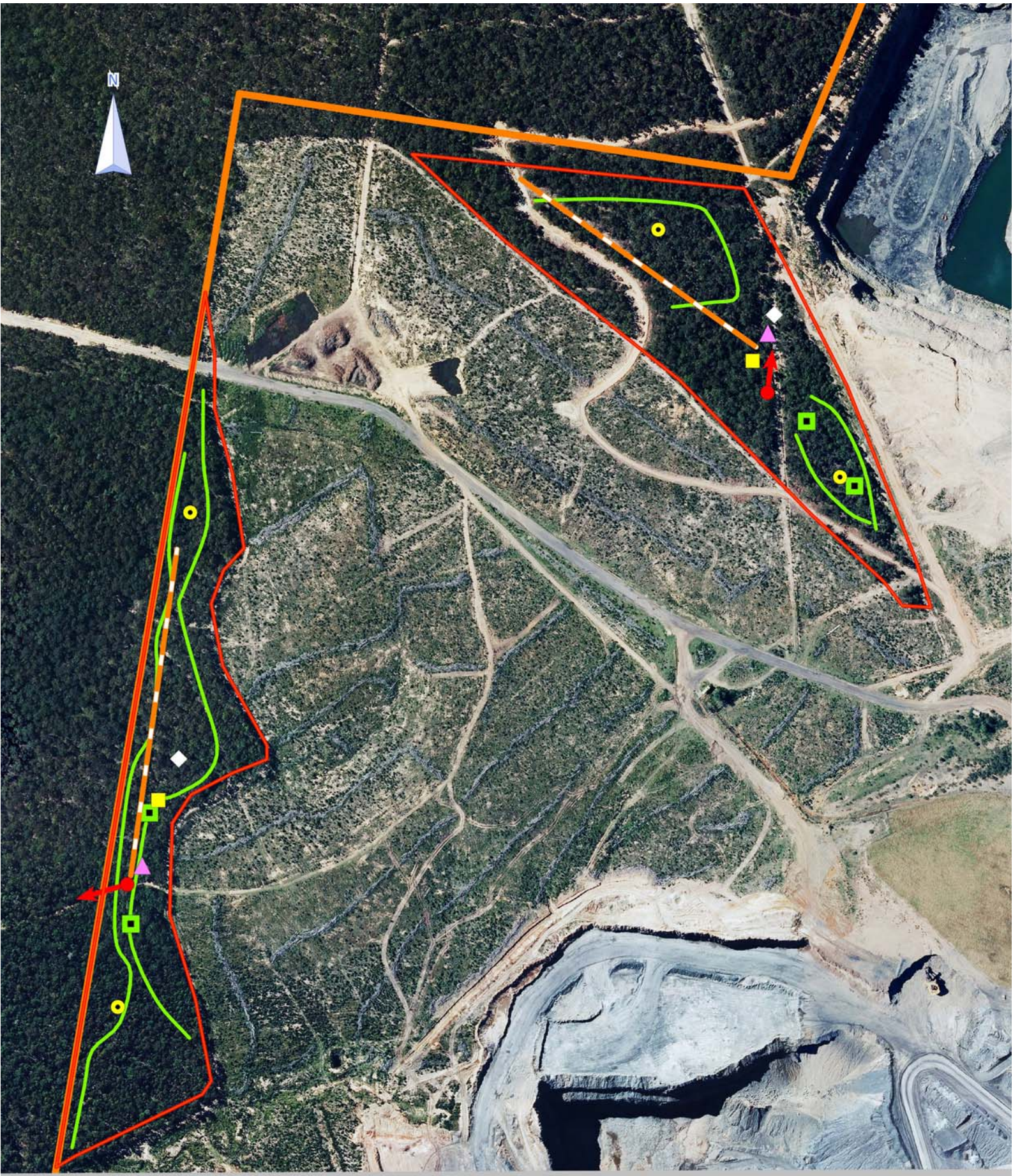
7.2.1 General

Table 3 lists the survey methodology for each survey target. These methods are detailed in **Appendix D**. Flora and flora survey locations are shown on **Figure 15.**

Table 3 Survey Methodology

Target	Survey Methods
Arboreal Mammals	• Spotlighting from dusk for 3 hours; • Trapping over four day and night period; and • Diurnal inspection of tree hollows.
Terrestrial Mammals	• Spotlighting from dusk for 3 hours; • Trapping over four day and night period; and • Diurnal searches for the presence of fauna activity such as diggings, scats or scratch marks.
Bats	• Bat surveys (using Anabat).
Birds	• Diurnal survey using visual and call identification; • Opportunistic diurnal sightings; and • Nocturnal aural survey and search for owl pellets.
Amphibians	• Diurnal dip netting and visual searches; • Aural survey; and • Nocturnal spotlighting.
Reptiles	• Funnel traps; and • Diurnal suitable habitat inspection for occupancy, scats or other detectable traces.
Habitat Hollows	• Diurnal hollow survey to assess the number and size of

Target	Survey Methods
	hollows present; and • If hollows present, visual survey at dusk to determine use.
Flora	• Systematic transect searches (improved likelihood of finding rare or threatened species); and • Standard 0.04 ha floristic plots placed in a representative part of each community.
Vegetation Community Type Determination	• Ground-truthing of previous mapping; and • Using GPS to determine community boundaries.



LEGEND

- Project Application Area
- Investigation area boundaries
- Floristic transect
- Mammal trapping transects
- Floristic plot
- Harp trap
- Reptile trap locations
- Owl call-playback location
- Anabat recording and direction
- Bird survey locations

0 200 m

FIGURE 15

ECOLOGY SURVEY LOCATIONS

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7.2.2 Threatened Species, Endangered Ecological Communities and Key Threatening Processes

Table 4 lists the results of a search of the NPWS Atlas of NSW Wildlife for threatened species and endangered ecological communities recorded within 5 km of the Project Area. Based on the habitat requirements of these species, the likelihood of any of the reported threatened species occurring on the site or using the habitat of the site as an essential part of a foraging range was determined. A field survey was then conducted using the list as a guide to species likely to occur on the site. The survey was expanded to include any species listed on Schedules 1 and 2 of the TSC Act considered likely to occur in the type of vegetative habitat present on the site. This information was used to narrow the initial list to determine for which species an impact assessment was required. The likelihood of any 'key threatening processes' occurring on the subject site was also assessed.

Table 4 The Likelihood of Threatened Flora and Fauna Species Recorded Within 5 km Occurring on the Subject Site.

Scientific Name	Common Name	Likelihood of being found on the subject site	Impact assessment required?
Acacia bynoeana	Bynoe's Wattle	Not likely-unsuitable habitat	No
Eucalyptus parramattensis decadens	Drooping Redgum	Not likely-unsuitable habitat	No
Grevillea parviflora	Small-flower Grevillea	Not likely-unsuitable habitat	No
Tetratheca juncea	Black-eyed Susan	Not likely-unsuitable habitat	No
Phascolarctus cinereus	**Koala**	**Likely –suitable habitat**	**Yes**
Petaurus australis	Yellow-bellied Glider	Not likely-unsuitable habitat	No
Petaurus norfolcensis	**Squirrel Glider**	**Likely –suitable habitat**	**Yes**
Pteropus poliocephalus	**Grey-headed Flying-fox**	**Likely –suitable habitat**	**Yes**
Saccolaimus flaviventris	**Yellow-bellied Sheathtail Bat**	**Present on subject site**	**Yes**
Mormopterus norfolkensis	**Eastern Freetail-bat**	**Present on subject site**	**Yes**
Miniopterus australis	**Little Bent-wing Bat**	**Present on subject site**	**Yes**
Miniopterus schreibersii oceanensis	**Eastern Bent-wing Bat**	**Present on subject site**	**Yes**
Scoteanax rueppellii	**Greater Broad-nosed Bat**	**Present on subject site**	**Yes**
Rostratula benghalensis australis	Painted Snipe	Not likely-unsuitable habitat	No
Ephippiorhynchus asiaticus	Black-necked Stork	Not likely-unsuitable habitat	No
Irediparra gallinacea	Comb-crested Jacana	Not likely-unsuitable habitat	No
Callocephalon fimbriatum	**Gang Gang Cockatoo**	**Possible-suitable foraging habitat**	**Yes**

Scientific Name	Common Name	Likelihood of being found on the subject site	Impact assessment required?
Neophema pulchella	**Turquoise Parrot**	**Likely –suitable habitat**	**Yes**
Pomatostomus temporalis temporalis	Grey-crowned Babbler	Not likely-unsuitable habitat	No
Ninox connivens	Barking Owl	Not likely-unsuitable habitat	No
Tyto tenebricosa	Sooty Owl	Not likely-unsuitable habitat	No
Ninox strenua	**Powerful Owl**	**Present on subject site**	**Yes**

7.3 SEPP 44 KOALA HABITAT PROTECTION

SEPP 44 requires that, for proposals involving 1 hectare or more, the habitat should be evaluated for potential Koala Habitat and core Koala Habitat. Potential Koala Habitat is defined as areas of native vegetation where the trees listed in Schedule 2 (of SEPP 44) '*constitute at least 15% of the total number of trees in the upper and lower strata of the tree component*'. Should potential Koala Habitat be found, further investigation for the existence of core Koala Habitat should be undertaken. If this habitat is found to be present, then a detailed Plan of Management should be prepared for the Koala colony in the area. Schedule 2 feed tree species are listed in **Appendix D**.

7.4 FIELD SURVEY RESULTS

7.4.1 Flora

A floristic list (refer **Appendix D**) was compiled for each vegetation community from the transect searches and from the standard 0.04 hectare floristic plot placed in a representative part of each community in each vegetation area. The plots were marked out using a 20 by 20 metre quadrat. Within each plot, all vascular plant species were recorded and assigned a cover abundance score using a six point Braun-Blanquet scale (Poore 1955). A total of 123 native plant species were recorded in the areas, comprising flowering plants (including trees, shrubs, climbers, herbs and grasses), ferns, and cycads. **Table 5** lists the total number of flora species recorded in each vegetation community.

Plants listed under the Rare or Threatened Australian Plants ('ROTAP') Scheme (Briggs and Leigh 1996) were considered along with species and vegetation deemed to be of local conservation significance. The ROTAP list and associated coding system was developed and has been maintained by CSIRO since 1979, and lists species that are Presumed Extinct, Endangered, Vulnerable, Rare or Poorly Known at the national level. No threatened flora species were found in the areas.

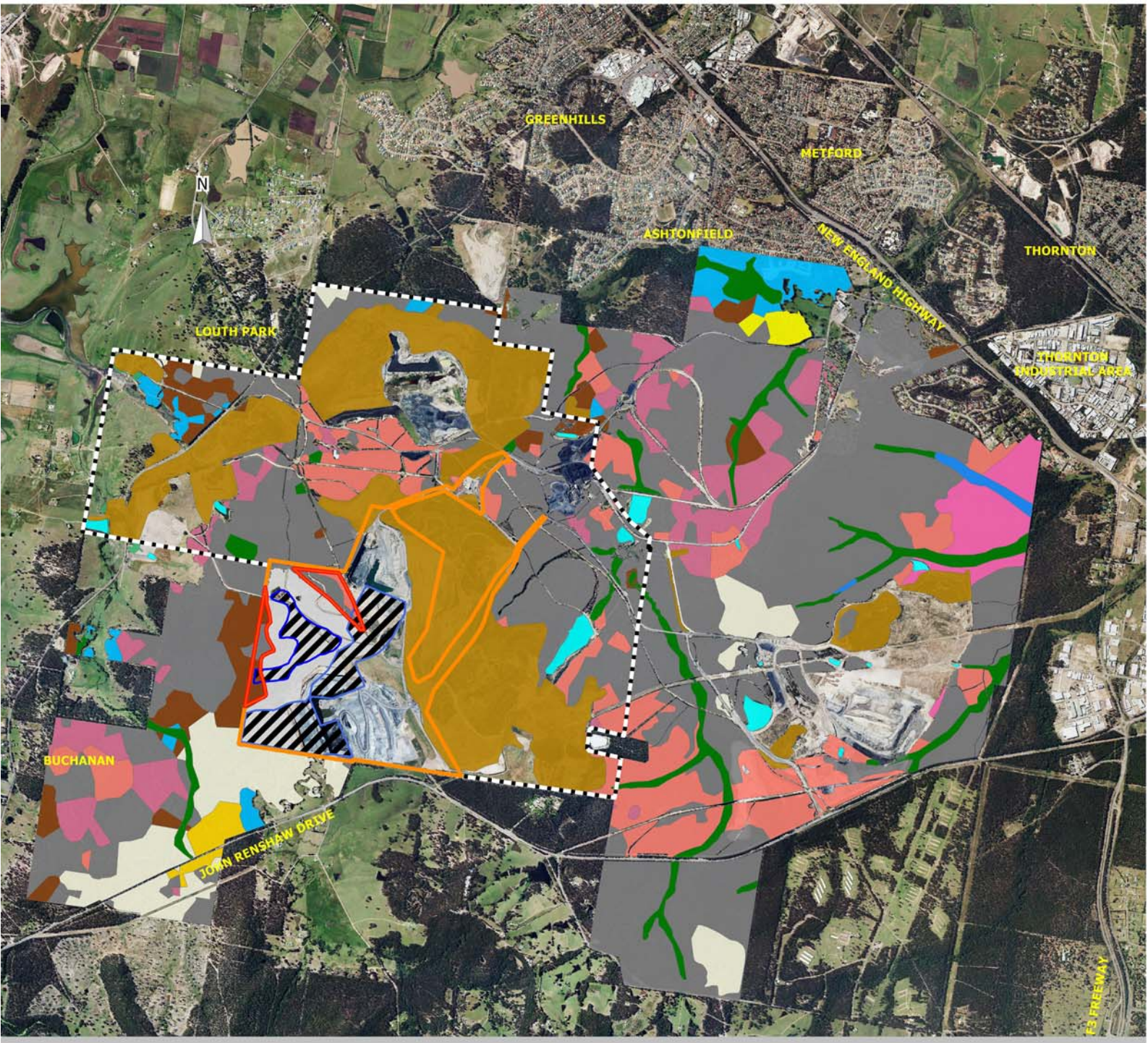
7.4.2 Vegetation Communities

Previous remnant vegetation mapping of the Project Area by Driscoll and Bell (2006) provided the basis for the determination of the vegetation communities present. Vegetation communities were classified according to the LHCCREMS model (refer **Section 4.4.5**).

Three vegetation communities were determined to be present and **Figure 16** shows these communities in the context of the surrounding vegetation. One of the communities, *Lower Hunter Spotted Gum - Ironbark Forest*, is listed as an Endangered Ecological Community ('EEC') in the TSC Act. The Project will clear 0.8 hectares of this community. **Table 5** provides data on species diversity, area and condition for each vegetation community. Detailed descriptions of each vegetation community are provided in **Appendix D**.

Table 5 Vegetation Types Recorded in the Bloomfield Study Area

Community	Total species recorded	Condition	Area (ha)
Eastern Block			
MU17 Lower Hunter Spotted Gum - Ironbark Forest	55	undisturbed disturbed	6.38 0.79
MU30 Coastal Plains Smooth - barked Apple Woodland	68	undisturbed disturbed	2.42 0.50
Western Block			
MU17 Lower Hunter Spotted Gum - Ironbark Forest	58	undisturbed	3.21
MU15 Coastal Foothills Spotted Gum – Ironbark Forest	68	undisturbed disturbed	5.33 0.40



LEGEND

- Bloomfield lease boundary
- Ecology investigation area boundary
- Application area boundary
- Proposed pit areas
- Dam
- MU undefined alluvial Cabbage Gum community
- MU15 Coastal Foothills Spotted Gum - Ironbark Forest
- MU17 Lower Hunter Spotted Gum - Ironbark Forest EEC
- MU18 Central Hunter Spotted Gum - Ironbark Forest
- MU19 Hunter Lowlands Redgum Forest EEC
- MU30 Coastal Plains Smooth-barked Apple Woodland
- MU30 Coastal Plains Smooth-barked Apple Woodland with dominant Angophora bakeri
- MU30 Coastal Plains Smooth-barked Apple Woodland with dominant Eucalyptus pilularis
- MU31 Coastal Plains Scribbly Gum Woodland
- MU35 Kurri Sands Swamp Woodland EEC
- MU41 Swamp Oak - Sedge Forest
- MU5 Alluvial Tall Moist Forest
- Rehab/regrowth
- Regrowth from clearing

0 1 km

FIGURE 16

VEGETATION COMMUNITIES

BLOOMFIELD COLLIERY
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7.4.3 Fauna

A list of fauna species and the habitat(s) in which they were recorded was compiled during the field surveys with a total of 73 native vertebrate fauna species recorded, comprising 45 birds, 1 arboreal mammal, 3 terrestrial mammals, 14 bats, 7 reptile and 2 frog species. Of these, 6 are listed as Vulnerable under the TSC Act as shown in **Table 6**. One introduced mammal, the rabbit, was also recorded in the study area.

Table 6 Threatened Fauna Recorded on the Subject Site

Scientific Name	Common Name
Ninox strenua	Powerful Owl
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat
Mormopterus norfolkensis	East Coast Freetail Bat
Miniopterus australis	Little Bent-wing Bat
Miniopterus schreibersii	Common Bent-wing Bat
Scoteanax rueppellii	Greater Broad-nose Bat

7.4.4 Habitat Hollows

A total of 55 trees with potential hollows were mapped with 135 hollows recorded. The location of trees having potential habitat hollows is shown on Figure 6 in **Appendix D**.

7.4.5 SEPP 44 Koala Habitat Protection

The only listed feed tree species present was *Eucalyptus punctata* which did not constitute at least 15% of the total number of trees. Potential Koala habitat was therefore not present and no further investigation required.

7.4.6 Groundwater Dependent Ecosystems

No groundwater dependent ecosystems were found in either area during field surveys. Both areas were on elevated ground and while there were shallow drainage lines, there was little change between vegetation at these locations and the surrounding vegetation.

7.5 THREATENED SPECIES, COMMUNITIES, AND THREATENING PROCESSES IMPACT ASSESSMENT

7.5.1 Threatened Species Conservation Act 1995

In NSW, threatened species are defined as those listed on Schedules 1 (Endangered) and 2 (Vulnerable) of the TSC. Threatened species include those which are considered of

conservation concern because of restricted distributions or habitat requirements, significant population or distributional range declines, and where threats to species' survival still prevail.

An impact assessment was conducted according to the *Draft Guidelines for Threatened Species Assessment* (DEC & DPI 2005). **Appendix D** provides the full assessment process. **Table 6** lists the threatened fauna species recorded during fieldwork. Adding species considered likely to be found onsite due to suitable habitat (species **bolded** on **Table 4**), a total of 11 threatened species required assessment. The assessment of these species and the EEC show that there would be no significant impact on any threatened species or the EEC resulting from the works associated with the Project.

7.5.2 Commonwealth EPBC Act 1999

Consideration of the matters of national significance protected under the EPBC as outlined in **Section 7.1** concluded that none of these matters would be involved in the Project. In particular, there were no wetlands, no migratory species, and none of the listed threatened species or ecological communities present.

7.6 MITIGATION

The assessment concluded that due to the destructive nature of open cut mining, mitigation measures should be directed towards preventing any impacts in the surrounding habitat as well as providing compensation for lost habitat. The amount of vegetation loss would be small, approximately 1.3 ha in the eastern block and 0.4 ha in the western block as shown on **Figure 16**. The following measures should be implemented to minimise any impact associated with this loss:

- Provide effective erosion and sediment control measures in order to protect all flow-off areas. These measures would particularly apply to the western portion; the disturbance/forest edge of the eastern portion is below its surroundings;
- Prepare and implement a pre-clearance protocol; and
- Provide commensurate support of a relevant DECC approved research program in response to the loss of any of the 0.8 ha of Lower Hunter Spotted Gum – Ironbark Forest EEC. Initial discussion with DECC has indicated that a suitable strategy could be the contribution by Bloomfield to research appropriate to the conservation of this EEC community in the Hunter Region.

7.7 CONCLUSION

The Flora, Fauna and Threatened Species Assessment concluded that there would be minimal impact on flora, fauna, threatened species and the *Lower Hunter Spotted Gum - Ironbark Forest EEC*.

Mitigation measures including erosion and sediment control measures, pre-clearance protocols for protecting hollow dwelling fauna and a contribution strategy for the EEC will be provided.

Clearing will follow existing strategies as outlined in **Section 2.8** to minimise environmental harm.

8. HERITAGE

8.1 EUROPEAN HERITAGE

Searches of the following did not find any recorded heritage sites on or in close proximity to the Project Area:

- Register of the National Estate;
- State Heritage Register and Inventory;
- Register of the National Trust (NSW);
- Hunter Regional Environmental Plan ('REP') 1989; and
- Cessnock Local Environmental Plan ('LEP') 1989.

The NSW *Heritage Act 1977* defines a relic as *"any deposit, object or material evidence:*

(a) which relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement, and

(b) which is 50 or more years old."

Mining has occurred in various locations and using both underground and open cut methods on the Bloomfield site for approximately 170 years. Therefore, various relics are likely to be on the site in the form of buried disused equipment or other infrastructure. Under the *Heritage Act 1977* an excavation permit may be required if relics are to be disturbed, excavated, exposed, moved, damaged or destroyed. However, under the provisions of Section 75U of the EP&A Act, the requirement to obtain an excavation permit does not apply to Major Projects assessed under Part 3A of the Act.

8.2 ABORIGINAL HERITAGE

8.2.1 Introduction

An Aboriginal Heritage Impact Assessment was undertaken by *South East Archaeology* in accordance with the relevant DECC policies and DoP requirements and in association with the local Aboriginal community. It is presented as **Appendix E**.

8.2.2 Study Objectives and Scope

The objectives of the assessment were to:

- Identify and record any Aboriginal heritage evidence, areas of potential evidence and cultural values within the study area in consultation with the Aboriginal community;
- Assess the potential impacts of the Project upon any identified or potential Aboriginal heritage evidence or cultural values;
- Assess the significance of any Aboriginal heritage evidence or cultural values identified;
- Provide details of any Aboriginal heritage evidence in accordance with DECC requirements;
- Consult with the local Aboriginal community as per the DECC policy entitled Interim Community Consultation Requirements for Applicants;
- Present recommendations for the management of any identified Aboriginal heritage evidence, potential heritage resources or cultural values; and
- Prepare a formal archaeological report to meet the requirements of DECC and DoP.

The assessment involved:

- Research into the environmental and archaeological background of the Project Area;
- Searches of the DECC Aboriginal Heritage Information Management System ('AHIMS'), Register of the National Estate, National Heritage List or Commonwealth Heritage List, NSW State Heritage Inventory, the Hunter REP 1989 (Heritage), Cessnock LEP 1989, the Aboriginal and Torres Strait Islander Heritage Protection Act 1984 and the EPBC Act;
- Development of a predictive model of Aboriginal site location for the heritage investigation areas;
- Field survey of the Project Area after division into "modified" and "unmodified" areas (refer **Section 8.3**);
- Consultation with the local Aboriginal community; and
- Preparation of a report outlining the results of the investigation and a description of measures that would be implemented to avoid, minimise, mitigate, offset, manage and/or monitor any impacts of the Project (**Appendix E**).

8.3 PREDICTIVE MODEL OF SITE LOCATION

A model was constructed to identify areas of high archaeological potential. The Project Area was divided into two categories: "modified" and "unmodified" based on past and existing land use.

"Modified" applies to land that has been extensively impacted by past mining activities, earthmoving works or building, such that there is negligible potential for any Aboriginal heritage to survive. *South East Archaeology* found no potential for heritage evidence to exist in these areas using this model.

"Unmodified" applies to land yet to be mined in which there remains some potential for heritage evidence. However high levels of ground disturbance due to the removal of vegetation has reduced the levels of archaeological visibility and effective survey coverage. The removal of vegetation has also substantially lowered the potential for most other forms of heritage evidence (eg. carved trees, scar trees and stone arrangements).

The predictive model indicates within the "unmodified" area, there is generally a high potential for stone artefacts to occur. **Table 7** details the prediction of Artefacts in the "unmodified" area.

Table 7 Comparison of Predictive Model for Site Location of Artefacts in "Unmodified" Area and Survey Results

Artefact	Prediction	Survey results
Artefact Scatters	high	high
Bora/ceremonial sites	very low	very low or negligible
Burials	very low	very low
Carved Trees	very low	very low or negligible
Grinding Grooves	low to moderate in drainage depressions and very low elsewhere	very low or negligible
Lithic Quarries	low to moderate	very low or negligible
Mythological/Traditional Sites	low	cannot be discounted
Scarred Trees	very low	very low or negligible
Stone Arrangements	very low	very low or negligible

8.4 RESULTS

A total of six Aboriginal heritage sites, B2, B16, B18, B19, B20 and B22, comprising nineteen loci of identified evidence were recorded within the "unmodified" area. These were all stone artefact occurrences, containing 53 lithic items in a very low density distribution. These sites

were assessed as being of low scientific significance within a local context, due to their common nature, low representative value, low integrity and limited potential for deposits that may be in situ and/or of research value. **Table 7** gives a comparison of results from the predictive model and field survey. Details of each site are provided in **Appendix E** with their locations shown on **Figure 17**.

8.5 REASSESSMENT OF PREDICTIVE MODEL OF SITE LOCATION

In view of the survey results, the predictive model of site location was re-assessed (refer to **Section 8.3**). **Table 8** compares the initial Predictive Model with the re-assessed Predictive Model.

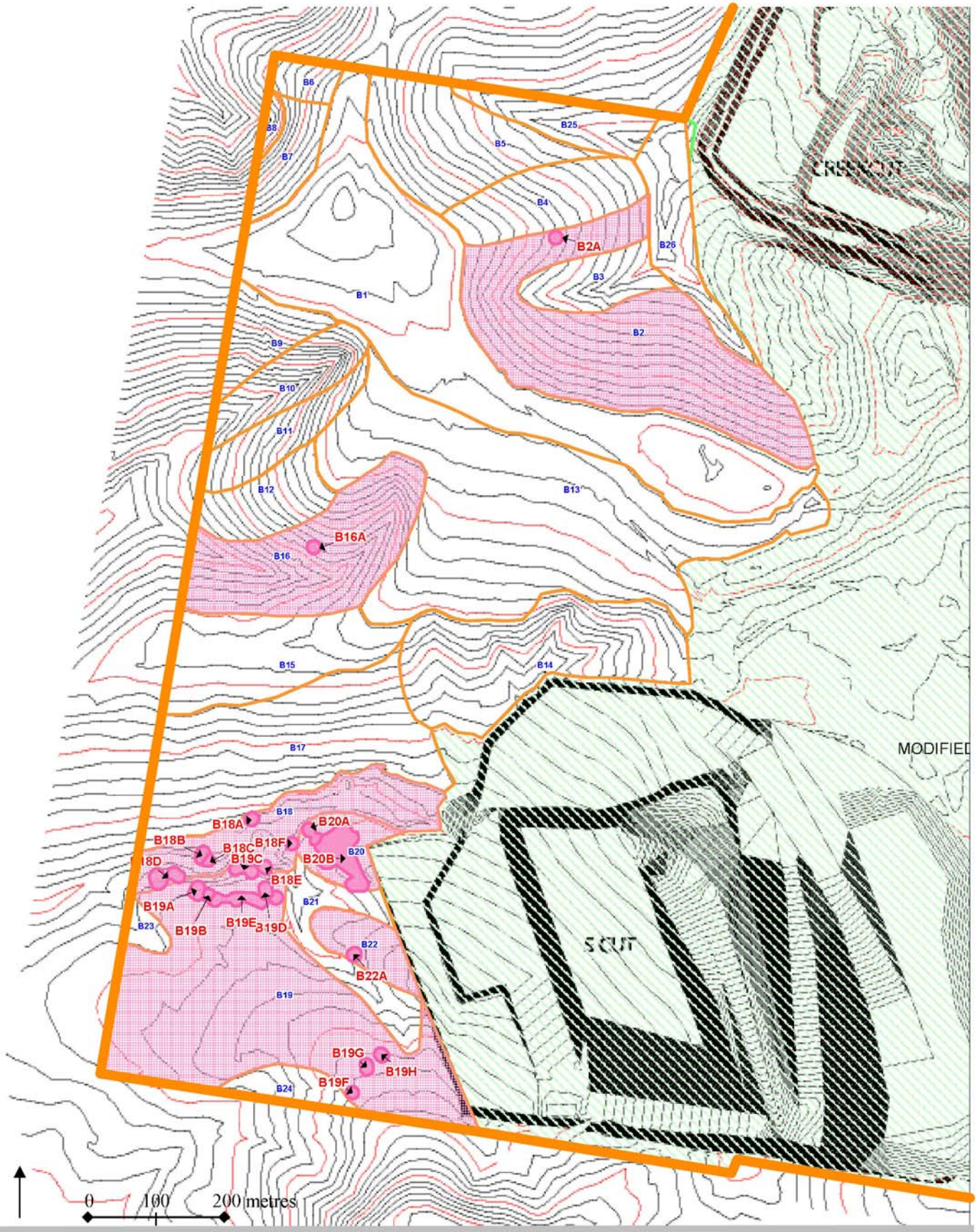
Table 8 Comparison of Predictive Model for Site Location of Artefacts with the Reassessed Predictive Model

Artefact	Initial Prediction	Re-assessed Prediction
Artefact Scatters	high	high
Bora/ceremonial sites	very low	very low or negligible
Burials	very low	very low
Carved Trees	very low	very low or negligible
Grinding Grooves	low to moderate in drainage depressions and very low elsewhere	very low or negligible
Lithic Quarries	low to moderate	very low or negligible
Mythological/Traditional Sites	low	cannot be discounted
Scarred Trees	very low	very low or negligible
Stone Arrangements	very low	very low or negligible

Further artefacts are expected to occur across the "unmodified" area in a distribution and density consistent with these results, particularly in areas that were obscured by vegetation or not directly sampled during the survey (apart from areas totally impacted by recent land use, in which potential for evidence is negligible). However the potential for sub-surface deposits that may be in situ and/or of research value is considered to be low to very low.

8.6 CONSULTATION

The Project Area lies within the boundaries of the Mindaribba Local Aboriginal Land Council ('LALC') and within an area of potential interest to other indigenous persons and organisations. These include the Awabakal, Worimi and Wonnarua groups.



LEGEND

- PROJECT APPLICATION BOUNDARY
- SURVEY AREAS
- BROAD SITE AREAS
- SITE LOCI

FIGURE 17

LOCATION OF ARCHAEOLOGICAL SURVEY AREAS AND ABORIGINAL HERITAGE EVIDENCE

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Aboriginal cultural values may be associated with the Project Area, relating to both traditional and contemporary use. Consultation with the relevant Aboriginal community is the primary means of identifying cultural values and a consultation process in accordance with the DECC *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (2005).

Consultation and involvement of the Aboriginal community was undertaken as per the requirements of *Interim Community Consultation Requirements for Applicants* (DECC, 2004). Field inspection was undertaken with representatives of the Mindaribba LALC present. All registered stakeholders were forwarded a detailed statement of the Project methodology for comment and invited to attend an inspection of the Project Area. Copies of the draft report were forwarded to Aboriginal stakeholders and their comments sought and addressed.

The NP&W Act provides the primary basis for the legal protection and management of Aboriginal heritage sites within NSW by providing various controls for the protection, management and destruction of Aboriginal objects. Under the Part 3A Major Project amendments to the EP&A Act, subsequent to approval being granted, Section 90 Consent under the NP&W Act may not be required to impact Aboriginal objects. The draft Statement of Commitments (**Section 18**) outlines the proposed heritage management and mitigation measures to ensure there will not be significant impact on Aboriginal heritage sites and that appropriate consultation occurs in relation to these sites.

8.7 SIGNIFICANCE ASSESSMENT

8.7.1 Criteria

The significance of Aboriginal heritage evidence was assessed along the widely used criteria for Aboriginal heritage management derived from the relevant aspects of the *ICOMOS Burra Charter* (ICOMOS, 2000) and *State Heritage Inventory Evaluation Criteria and Management Guidelines*. It includes scientific (archaeological) value, importance to Aboriginal people (cultural value), educational value, historic value, and aesthetic value. These criteria are fully described in **Appendix E**.

8.7.2 Significance of Heritage Evidence

South East Archaeology concluded that the Aboriginal heritage sites shown on **Figure 17** do not surpass the threshold for significance in terms of educational, historic or aesthetic value. Mindaribba LALC expressed their interest in the identified evidence and its cultural value. They were assessed as being of low scientific significance within the local and regional context as the:

- Sites are of low representative value within a regional context. Similar evidence exists elsewhere throughout the Hunter Valley and the identified artefacts do not represent rare or unusual types;
- Sites generally exhibit a limited range of artefact and stone material types and the artefacts occur at very low densities;
- Sites have been substantially affected by post-depositional processes, particularly the extensive vegetation clearance works and earthmoving works, and are consequently of low integrity; and
- As a result of extensive levels of ground disturbance, there is limited potential for further heritage evidence to occur in the form of artefact deposits that are in situ and/or of research value.

8.8 MANAGEMENT AND MITIGATION MEASURES

The Aboriginal Heritage Assessment has concluded that potential impacts of the Project on Aboriginal heritage will be low. The proposed management and mitigation measures are:

- An Aboriginal Heritage Management Plan ('AHMP') will be formulated in consultation with the relevant Aboriginal stakeholders (Mindaribba LALC, Lower Hunter Wonnarua Council and Awabakal Traditional Owners Aboriginal Corporation) prior to any Project impacts occurring, to specify the policies and actions required to mitigate and manage the potential impacts of the proposal on Aboriginal heritage. The plan will include procedures for ongoing Aboriginal consultation, mitigation measures for the identified and potential Aboriginal evidence, and management procedures for any previously unrecorded evidence or skeletal remains. The Plan will comprise a detailed Statement of Commitments that will guide management of the Aboriginal heritage resource in lieu of a Section 90 Consent. The primary elements of the Plan are outlined in Section 10 in **Appendix E**; and
- Bloomfield will continue to consult with and involve the registered Aboriginal stakeholders, particularly the LALC's, in the ongoing management of the heritage resources within the Project Area as per the AHMP.

8.9 CONCLUSION

Impacts of the Project on Aboriginal heritage may occur directly through mining operations, maintenance or use of surface facilities. Most impacts will be confined to the "unmodified" Project Area and existing areas of ground disturbance in which the potential for heritage evidence is negligible. However, where impacts do occur to ground in which there are

9. NOISE, VIBRATION AND BLASTING

9.1 INTRODUCTION

An assessment of noise and blasting issues associated with the proposed Bloomfield Completion of Mining and Rehabilitation Project was undertaken by *Heggies Pty Ltd*. The complete study is provided as **Appendix F**. The assessment aimed to identify the potential impacts of noise, vibration and blasting from the Project, including consideration of cumulative impact from nearby mining activities including Donaldson, Abel and the Bloomfield washery and rail loading facility. Construction noise has not been assessed as construction activities will not occur as part of the Project.

The noise assessment has been prepared with reference to AS1055:1997 *Description and Measurement of Environmental Noise Parts 1, 2 and 3* and in accordance with DECC's *NSW Industrial Noise Policy* ('INP') (DECC, 2000). Where issues relating to noise are not addressed in the INP, such as sleep disturbance, reference is made to the NSW *Environmental Noise Control Manual* ('ENCM') (DECC, 1994).

The noise assessment is based on modelling of three representative operational stages of mining. The representative stages described by the noise assessment are Year 1, Year 5 and Year 10. **Section 2.5** of this report describes five mine stages. The representative years provided by the noise assessment correlate with the end of Stage 1 (Year 1), end of Stage 2 (Year 5) and end of Stage 4 (Year 10). For the purpose of this summary the representative years used in the Noise Assessment in **Appendix F** have been used.

9.2 DEVELOPMENT OF NOISE MANAGEMENT STRATEGY

Selecting an appropriate noise management strategy for the Project involved the following steps:

- Determining the noise reduction required to achieve Project-specific noise levels;
- Identifying the specific characteristics of the industry and the site that would indicate a preference for specified measures;
- Examining the mitigation strategies chosen by similar industries on similar sites with similar requirements for noise reduction; and considering that strategy's appropriateness for the subject development;
- Considering the range of noise-control measures available; and
- Considering community preferences for particular strategies.

The preference ranking (from most preferred to least preferred) for noise mitigation strategies is listed in Section 2 of **Appendix F**.

9.3 IMPACT ASSESSMENT PROCEDURES

The various assessment procedures used in accordance with the INP are as follows:

9.3.1 Assessing Intrusiveness

The background noise level must be measured. The equivalent continuous noise level ('L_{Aeq}') of the source should not be more than five decibels above the measured background level ('L_{A90}').

9.3.2 Amenity Assessment

This is based on noise criteria specific to land use and associated activities. The criteria relate only to industrial-type noise and do not include road, rail or community noise. The existing noise level from industry is measured. If it approaches the criterion value, then noise levels from new industries need to be designed so that the cumulative effect does not produce noise levels that would significantly exceed the criterion.

Amenity criteria for receivers such as residences, schools, etc are provided in **Appendix F**. For residential receivers, different criteria are provided for day-time, evening and night-time. The INP definition of day-time, evening and night-time is as follows:

- Daytime: 7.00 am to 6.00 pm (8.00 am to 6.00 pm Sundays and Public Holidays);
- Evening: 6.00 pm to 10.00 pm (same for Sundays and Public Holidays); and
- Night-time: 10.00 pm to 7.00 am (10.00 pm to 8.00 am Sundays and Public Holidays).

9.3.3 Sleep Disturbance

DECC has acknowledged that the relationship between maximum noise levels and sleep disturbance is not currently well defined. Criteria for assessing sleep disturbance has not been identified under the INP and hence, sleep arousal has been assessed using the guidelines set out in the ENCM. To avoid the likelihood of sleep disturbance, the ENCM recommends that the $L_{A1(1\ minute)}$ noise level of the source under consideration should not exceed the background noise level ('L_{A90}') by more than 15 dBA when measured outside the bedroom window of the receiver during the nighttime hours.

9.4 EXISTING ACOUSTICAL AND METEOROLOGICAL ENVIRONMENT

9.4.1 Ambient Background Noise Monitoring

Ambient noise surveys were conducted to characterise and quantify the acoustical environment in the area surrounding the Project Area as well as the Abel and Donaldson Mines. Monitoring and assessment locations are shown on **Figure 14**.

The ambient noise survey was used to define a morning shoulder period between 6.00 am and 7.00 am for the area surrounding the mine. During this period the rating background noise levels ('RBL's') were typically higher than those during the day due to the significant influence of peak traffic flows on surrounding roads including John Renshaw Drive, Weakleys Drive, the F3 Freeway and, New England Highway. The morning shoulder period RBL's have been calculated using actual measurements undertaken during the morning shoulder period.

9.4.2 Effects of Meteorology on Noise Levels

i. Wind

Wind has the potential to increase noise at a receiver when it is light and stable and blows from the direction of the noise source. As the wind strength increases the noise produced by the wind will obscure noise from most industrial and transport sources. Where wind blows from the source to the receiver at speeds up to 3 m/s for more than 30% of the time in any season, then wind is considered to be a feature of the area and noise level predictions must be made under these conditions.

Weather data was obtained, for a period of 12 months, from a DECC weather station located near Beresfield. This data was used in favour of that collected at the Donaldson mine site as the Donaldson station is shielded by trees resulting in lower than normal wind speeds being recorded. The Beresfield data was analysed to determine the frequency of occurrence of winds up to speeds of 3 m/s for daytime, evening and night in each season. It found that certain winds, typically from the southern sector in the evening and night and north western sector at night, are a feature of the area.

ii. Temperature Inversion

Temperature inversions occur predominantly at night during the winter months and have the ability to increase noise levels by focusing sound waves. For a temperature inversion to be a significant characteristic of the area it needs to occur for approximately 30% of the total night-time during winter, or about two nights per week.

Analysis of Meteorological data from Beresfield found that temperature inversions are not a feature of the area as the occurrence of inversion does not exceed the 30% threshold. Therefore, the occurrence of temperature inversion during the night-time period has not been considered as part of this noise assessment.

9.5 NOISE CONTROLS

The following noise mitigation and management procedures have been incorporated into the noise model with the aim of achieving Project specific noise criteria. These noise controls, developed for three representative years of the Project, are:

Year 1 (end Stage 1)

- The excavator and dump site would be situated in a shielded location during night-time operation;
- No dozer operation at the drill location would occur during night and morning shoulder periods (i.e. between 10.00 pm and 7.00 am); and
- The front end loader would replace the dozer at the dump site during the night-time period unless 4 dBA of noise suppression is achieved.

Year 5 (end Stage 2)

- The excavator and dump site would be situated in a shielded location during night-time operation;
- No dozer operation at the drill location would occur during night and morning shoulder periods (i.e. between 10.00 pm and 7.00 am); and
- The front end loader would replace the dozer at the dump site during the night-time period unless 4 dBA of noise suppression is achieved.

Year 10 (end Stage 4)

- The excavator and dump site would be situated in a shielded location during night-time operation; and
- No dozer operation at the drill location would occur during night and morning shoulder periods (i.e. between 10.00 pm and 7.00 am).

9.6 PROJECT SPECIFIC NOISE CRITERIA

9.6.1 Operational Noise Design Criteria

The acoustical environment typifies that of urban, suburban and commercial environments. Residences in the general area have been assessed under the relevant receiver type i.e. urban, suburban or commercial. The intrusive and amenity noise assessment criteria based on the INP for the assessment localities are presented in **Appendix F** and provided in **Table 9, Table 10** and **Table 11**.

The intrusive criterion for the morning shoulder period (6.00-7.00 am) is based on measured results during the survey period. The INP states that these criteria have been selected to protect at least 90% of the population, living in the vicinity of industrial noise sources, from the adverse effects of noise for at least 90% of the time. Provided the criteria in the INP are achieved, it is unlikely that most people would consider the resultant noise levels excessive.

9.6.2 Sleep Disturbance Noise Goals

To minimise the potential for sleep disturbance in the morning shoulder period (6.00 and 7.00 am) night-time RBL's have been used to set criteria instead of those recorded during the morning shoulder period. Sleep disturbance criteria used for the assessment is provided in **Appendix F** and **Table 12, Table 13** and **Table 14**.

9.7 OPERATIONAL NOISE MODELLING AND RESULTS

9.7.1 Operational Noise Modelling Parameters

A computer model was used to predict noise emissions from the operation of the Project. A three-dimensional digital terrain map giving all relevant topographic information was used in the modelling process. The model used this map, together with noise source data, ground cover, shielding by barriers and/or adjacent buildings and atmospheric information to predict noise levels at the nearest potentially affected receivers.

Topographic contours and operational mine plans were supplied by Bloomfield for the purpose of modelling noise from the Project. Prediction of noise sources were carried out, under calm and prevailing atmospheric conditions (prevailing winds), for three representative operational scenarios namely;

- Year 1 (end Stage 1);
- Year 5 (end Stage 2); and
- Year 10 (end Stage 4).

Atmospheric parameters under which noise predictions were made include temperature, humidity, wind speed, wind direction and temperature gradient. Full data is provided in **Appendix F**. Other assumptions made relating to the mine operation in the modelling process include:

- All acoustically significant plant and equipment operates simultaneously.
- Mobile noise sources, such as haul trucks, were modelled at typical locations and assumed to operate in repetitive cycles.
- All noise control measures described in **Section 9.5** are implemented.

9.7.2 Operational Scenario - Noise Model Summary

The operational scenario modelled during each period is likely to represent an acoustically worst-case scenario. The model incorporated the type and number of pieces of equipment in operation during the relevant period, and the sound power levels of relevant equipment.

9.7.3 Operational Noise Modelling Results and Discussion

Noise emission levels were predicted from the proposed operation for the typical operational scenario including the noise controls described in **Section 9.5**. Noise from all sources that contribute to the total noise from the site have been examined to identify characteristics that may cause greater annoyance (for example tonality, impulsiveness etc). The appropriate modifying factors, as outlined in the INP, have been applied where these characteristics are considered to be present. A summary of the predicted operational noise levels from representative years for worst case receiver locations are within **Table 9**, **Table 10** and **Table 11**.

Table 9 Predicted Bloomfield Project Noise Levels Year 1 (end of Stage 1)

Location	Period	Predicted Noise Level LAeq(15minute) (dBA)			Project Specific Noise Criteria (LAeq)
		Calm	NW Wind	SE Wind	
E Browns Road Black Hill	Day	<30	N/A	N/A	41 dBA
	Evening	<30	N/A	<30	40 dBA
	Night	<30	<30	<30	36 dBA
	Morning Shoulder	<30	40	<30	44 dBA
F Black Hill Road Black Hill	Day	<30	N/A	N/A	41 dBA
	Evening	<30	N/A	<30	40 dBA
	Night	<30	<30	<30	36 dBA
	Morning Shoulder	<30	41	<30	47 dBA
G Buchanan Road Buchanan	Day	37	N/A	N/A	43 dBA
	Evening	37	N/A	**42**	41 dBA
	Night	<30	<30	**37**	36 dBA
	Morning Shoulder	37	30	40	45 dBA
H Mt Vincent Rd Louth Park	Day	<30	N/A	N/A	43 dBA
	Evening	<30	N/A	32	41 dBA
	Night	<30	<30	<30	36 dBA
	Morning Shoulder	<30	<30	32	42 dBA
I Lord Howe Dr. Ashtonfield	Day	<30	N/A	N/A	44 dBA
	Evening	<30	N/A	<30	45 dBA
	Night	<30	<30	<30	38 dBA
	Morning Shoulder	<30	<30	<30	47 dBA
J Kilarney Street Avalon Estate (Thornton)	Day	<30	N/A	N/A	49 dBA
	Evening	<30	N/A	<30	47 dBA
	Night	<30	<30	<30	40 dBA
	Morning Shoulder	<30	<30	<30	53 dBA
K Catholic Diocese (Former Bartter) K1,K2,K3	Day	<30	N/A	N/A	41 dBA
	Evening	<30	N/A	<30	40 dBA
	Night	<30	<30	<30	36 dBA
	Morning Shoulder	<30	32	<30	47 dBA
L Kilshanny Avenue Ashtonfield	Day	<30	N/A	N/A	46 dBA
	Evening	<30	N/A	34	46 dBA
	Night	<30	<30	<30	40 dBA
	Morning Shoulder	<30	<30	34	48 dBA

Location	Period	Predicted Noise Level LAeq(15minute) (dBA)			Project Specific Noise Criteria (LAeq)
		Calm	NW Wind	SE Wind	
M John Renshaw Drive Buttai	Daytime	39	N/A	N/A	45 dBA
	Evening	39	N/A	36	43 dBA
	Night	<30	**37**	<30	36 dBA
	Morning Shoulder	39	47	36	48 dBA
N Lings Road Buttai	Daytime	42	N/A	N/A	45 dBA
	Evening	42	N/A	42	43 dBA
	Night	34	34	33	36 dBA
	Morning Shoulder	42	42	43	48 dBA

Table 10 Predicted Bloomfield Project Noise Levels Year 5 (end of Stage 2)

Location	Period	Predicted Noise Level LAeq(15minute) (dBA)			Project Specific Noise Criteria (LAeq)
		Calm	NW Wind	SE Wind	
E Browns Road Black Hill	Day	<30	N/A	N/A	41 dBA
	Evening	<30	N/A	<30	40 dBA
	Night	<30	<30	<30	36 dBA
	Morning Shoulder	<30	39	<30	44 dBA
F Black Hill Road Black Hill	Day	<30	N/A	N/A	41 dBA
	Evening	<30	N/A	<30	40 dBA
	Night	<30	<30	<30	36 dBA
	Morning Shoulder	<30	41	<30	47 dBA
G Buchanan Road Buchanan	Day	37	N/A	N/A	43 dBA
	Evening	31	N/A	**42**	41 dBA
	Night	<30	<30	36	36 dBA
	Morning Shoulder	38	33	43	45 dBA
H Mt Vincent Rd Louth Park	Day	<30	N/A	N/A	43 dBA
	Evening	<30	N/A	32	41 dBA
	Night	<30	<30	<30	36 dBA
	Morning Shoulder	<30	<30	33	42 dBA

Location	Period	Predicted Noise Level LAeq(15minute) (dBA)			Project Specific Noise Criteria (LAeq)
		Calm	NW Wind	SE Wind	
I Lord Howe Dr. Ashtonfield	Day	<30	N/A	N/A	44 dBA
	Evening	<30	N/A	<30	45 dBA
	Night	<30	<30	<30	38 dBA
	Morning Shoulder	<30	<30	<30	47 dBA
J Kilarney Street Avalon Estate (Thornton)	Day	<30	N/A	N/A	49 dBA
	Evening	<30	N/A	<30	47 dBA
	Night	<30	<30	<30	40 dBA
	Morning Shoulder	<30	<30	<30	53 dBA
K Catholic Diocese (Former Bartter) K1,K2,K3	Day	<30	N/A	N/A	41 dBA
	Evening	<30	N/A	<30	40 dBA
	Night	<30	<30	<30	36 dBA
	Morning Shoulder	<30	31	<30	47 dBA
L Kilshanny Avenue Ashtonfield	Day	<30	N/A	N/A	46 dBA
	Evening	<30	N/A	33	46 dBA
	Night	<30	<30	<30	40 dBA
	Morning Shoulder	<30	<30	34	48 dBA
M John Renshaw Drive Buttai	Daytime	38	N/A	N/A	45 dBA
	Evening	38	N/A	35	43 dBA
	Night	<30	36	<30	36 dBA
	Morning Shoulder	38	48	36	48 dBA
N Lings Road Buttai	Daytime	34	N/A	N/A	45 dBA
	Evening	31	N/A	34	43 dBA
	Night	<30	32	<30	36 dBA
	Morning Shoulder	35	42	36	48 dBA

Table 11 Predicted Bloomfield Project Noise Levels Year 10 (end of Stage 4)

Location	Period	Predicted Noise Level LAeq(15minute) (dBA)			Project Specific Noise Criteria (LAeq)
		Calm	NW Wind	SE Wind	
E Browns Road Black Hill	Day	32	N/A	N/A	41 dBA
	Evening	31	N/A	<30	40 dBA
	Night	<30	<30	<30	36 dBA
	Morning Shoulder	31	40	<30	44 dBA
F Black Hill Road Black Hill	Day	30	N/A	N/A	41 dBA
	Evening	<30	N/A	<30	40 dBA
	Night	<30	32	<30	36 dBA
	Morning Shoulder	<30	42	<30	47 dBA
G Buchanan Road Buchanan	Day	39	N/A	N/A	43 dBA
	Evening	34	N/A	**42**	41 dBA
	Night	<30	<30	**37**	36 dBA
	Morning Shoulder	34	33	43	45 dBA
H Mt Vincent Rd Louth Park	Day	<30	N/A	N/A	43 dBA
	Evening	<30	N/A	34	41 dBA
	Night	<30	<30	<30	36 dBA
	Morning Shoulder	<30	<30	33	42 dBA
I Lord Howe Dr. Ashtonfield	Day	<30	N/A	N/A	44 dBA
	Evening	<30	N/A	<30	45 dBA
	Night	<30	<30	<30	38 dBA
	Morning Shoulder	<30	<30	<30	47 dBA
J Kilarney Street Avalon Estate (Thornton)	Day	<30	N/A	N/A	49 dBA
	Evening	<30	N/A	<30	47 dBA
	Night	<30	<30	<30	40 dBA
	Morning Shoulder	<30	<30	<30	53 dBA
K Catholic Diocese (Former Bartter) K1,K2,K3	Day	<30	N/A	N/A	41 dBA
	Evening	<30	N/A	<30	40 dBA
	Night	<30	<30	<30	36 dBA
	Morning Shoulder	<30	32	<30	47 dBA
L Kilshanny Avenue Ashtonfield	Day	<30	N/A	N/A	46 dBA
	Evening	<30	N/A	35	46 dBA
	Night	<30	<30	<30	40 dBA
	Morning Shoulder	<30	<30	35	48 dBA

Location	Period	Predicted Noise Level LAeq(15minute) (dBA)			Project Specific Noise Criteria (LAeq)
		Calm	NW Wind	SE Wind	
M John Renshaw Drive Buttai	Daytime	39	N/A	N/A	45 dBA
	Evening	39	N/A	36	43 dBA
	Night	<30	36	<30	36 dBA
	Morning Shoulder	39	46	35	48 dBA
N Lings Road Buttai	Daytime	31	N/A	N/A	45 dBA
	Evening	<30	N/A	<30	43 dBA
	Night	<30	33	<30	36 dBA
	Morning Shoulder	<30	37	<30	48 dBA

Modelling shows that operational noise levels from the Project are predicted to meet the Project specific noise criteria at all receiver locations under calm and prevailing weather conditions with the exception of:

- **Location G** (Buchanan Road) where an exceedance of 1 dBA is predicted during a prevailing south east wind during the evening period in Years 1, 5 and 10 and during the night-time period in Years 1 and 10; and
- **Location M** (John Renshaw Drive, Buttai) where an exceedance of 1 dBA is predicted during a prevailing northwest wind during the night-time period in Year 1.

These minor exceedances of up to 1 dBA are unlikely to be noticeable by most people. Since the operational scenario modelled is likely to represent an acoustically worst-case scenario, actual operational noise levels from the proposed Bloomfield Project are likely to be less than those predicted.

9.7.4 Sleep Disturbance Analysis

In assessing sleep disturbance, typical L_{Amax} noise levels of plant and equipment to be used at the subject site during the night was used as input to the ENCM acoustic model and predictions were made at the nearest residential areas under adverse weather conditions at night. The use of the L_{Amax} noise level provides a worst-case prediction since the L_{A1} noise level of a noise event is likely to be less than the L_{Amax}. A summary of the predicted maximum noise levels at the most affected locations are contained within **Table 12, Table 13** and **Table 14**.

Table 12 Predicted Maximum Noise Levels at Night during Adverse Weather Year 1 (end of Stage 1)

Location	Period	Predicted Noise Level LAmax (dBA)		Sleep Disturbance Criteria (LAeq)
		NW Wind	SE Wind	
E Browns Road Black Hill	Night	34	<30	46 dBA
	Morning Shoulder	34	<30	46 dBA
F Black Hill Road Black Hill	Night	38	32	46 dBA
	Morning Shoulder	39	32	46 dBA
G Buchanan Road Buchanan	Night	<30	39	46 dBA
	Morning Shoulder	<30	39	46 dBA
H Mt Vincent Rd Louth Park	Night	<30	31	46 dBA
	Morning Shoulder	<30	31	46 dBA
I Lord Howe Dr. Ashtonfield	Night	<30	<30	48 dBA
	Morning Shoulder	<30	<30	48 dBA
J Kilarney Street Avalon Estate (Thornton)	Night	<30	<30	50 dBA
	Morning Shoulder	<30	<30	50 dBA
K Catholic Diocese (Former Bartter) K1,K2,K3	Night	42	<30	46 dBA
	Morning Shoulder	42	<30	46 dBA
L Kilshanny Avenue Ashtonfield	Night	<30	<30	53 dBA
	Morning Shoulder	<30	<30	53 dBA
M John Renshaw Drive Buttai	Night	41	31	46 dBA
	Morning Shoulder	46	31	46 dBA
N Lings Road Buttai	Night	41	36	46 dBA
	Morning Shoulder	41	36	46 dBA

Table 13 Predicted Maximum Noise Levels at Night during Adverse Weather Year 5 (End of Stage 2)

Location	Period	Predicted Noise Level LAmax (dBA)		Sleep Disturbance Criteria (LAeq)
		NW Wind	SE Wind	
E Browns Road Black Hill	Night	<30	<30	46 dBA
	Morning Shoulder	32	<30	46 dBA
F Black Hill Road Black Hill	Night	36	<30	46 dBA
	Morning Shoulder	36	<30	46 dBA
G Buchanan Road Buchanan	Night	31	43	46 dBA
	Morning Shoulder	32	43	46 dBA
H Mt Vincent Rd Louth Park	Night	<30	<30	46 dBA
	Morning Shoulder	<30	33	46 dBA
I Lord Howe Dr. Ashtonfield	Night	<30	<30	48 dBA
	Morning Shoulder	<30	<30	48 dBA
J Kilarney Street Avalon Estate (Thornton)	Night	<30	<30	50 dBA
	Morning Shoulder	<30	<30	50 dBA
K Catholic Diocese (Former Bartter) K1,K2,K3	Night	<30	<30	46 dBA
	Morning Shoulder	<30	<30	46 dBA
L Kilshanny Avenue Ashtonfield	Night	<30	<30	53 dBA
	Morning Shoulder	<30	34	53 dBA
M John Renshaw Drive Buttai	Night	45	<30	46 dBA
	Morning Shoulder	45	36	46 dBA
N Lings Road Buttai	Night	38	30	46 dBA
	Morning Shoulder	38	36	46 dBA

Table 14 Predicted Maximum Noise Levels at Night during Adverse Weather Year 10 (end of Stage 4)

Location	Period	Predicted Noise Level LAmax (dBA)		Sleep Disturbance Criteria (LAeq)
		NW Wind	SE Wind	
E Browns Road Black Hill	Night	36	<30	46 dBA
	Morning Shoulder	40	<30	46 dBA
F Black Hill Road Black Hill	Night	42	<30	46 dBA
	Morning Shoulder	42	<30	46 dBA
G Buchanan Road Buchanan	Night	35	45	46 dBA
	Morning Shoulder	40	**47**	46 dBA
H Mt Vincent Rd Louth Park	Night	<30	32	46 dBA
	Morning Shoulder	<30	31	46 dBA
I Lord Howe Dr. Ashtonfield	Night	<30	<30	48 dBA
	Morning Shoulder	<30	<30	48 dBA
J Kilarney Street Avalon Estate (Thornton)	Night	<30	<30	50 dBA
	Morning Shoulder	<30	<30	50 dBA
K Catholic Diocese (Former Bartter) K1,K2,K3	Night	<30	<30	46 dBA
	Morning Shoulder	32	<30	46 dBA
L Kilshanny Avenue Ashtonfield	Night	<30	<30	53 dBA
	Morning Shoulder	<30	<30	53 dBA
M John Renshaw Drive Buttai	Night	46	30	46 dBA
	Morning Shoulder	46	32	46 dBA
N Lings Road Buttai	Night	40	30	46 dBA
	Morning Shoulder	43	31	46 dBA

Modelling shows that L_{Amax} noise levels at night are predicted to meet the sleep disturbance criteria at all receiver locations under calm and prevailing weather conditions with the exception of Location G (Buchanan Road) where an exceedance of 1 dBA is predicted during a prevailing south east wind during the morning shoulder period in Year 10. This 1 dBA exceedence is considered unlikely to cause sleep disturbance at this location.

9.7.5 Cumulative Noise Assessment

Existing and proposed mining in the vicinity of the Project includes the existing Bloomfield washery and rail loading facility, Donaldson Mine, Abel Mine and Tasman Mine. Due to its

remote location, the noise impact of the Tasman Mine will be negligible and therefore has not been considered as part of this assessment.

The potential for the simultaneous operation of the Project, Abel and Donaldson Mines to exceed the acceptable and maximum noise amenity criteria can be assessed on a worst case scenario basis by adding the predicted noise levels from the existing and proposed operations together. The cumulative intrusive level is then adjusted (by -3 dBA) to the equivalent amenity level for comparison with the relevant amenity criteria for each location.

The results of the cumulative noise assessment, during calm and adverse weather conditions, shows that the cumulative impact of mining in the area surrounding the Bloomfield Project will comply with the relevant amenity criteria set in accordance with the INP. The results are provided in **Appendix F**.

9.8 USE OF EXPLOSIVES

Existing blast designs at Bloomfield Mine vary depending on the location of the blast in relation to sensitive residences.

DECC has set down guidelines for blasting based on human comfort levels. These have been adapted from the ANZECC Guidelines (1990) *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration* and are as follows:

- Airblast
  - "*The recommended maximum level for airblast is 115 dB Linear Peak.*
  - *The level of 115 dB may be exceeded on up to 5% of the total number of blasts over a period of 12 months. However, the level should not exceed 120 dB Linear Peak at any time*."
- Ground Vibration
  - "*The recommended maximum level for ground vibration is 5 mm/s (peak particle velocity [ppv]). It is recommended that a level of 2 mm/s be considered as a long term regulatory goal.*
  - *The ppv level of 5 mm/s may be exceeded on up to 5% of the total number of blasts over a period of 12 months. The level should not exceed 10 mm/s at any time*."

- Times and Frequency of Blasting
  - "*Blasting should only generally be permitted during the hours of 9.00 am to 5.00 pm Monday to Saturday. Blasting should not take place on Sundays or Public Holidays.*
  - *Blasting should generally take place no more than once per day.*"

9.8.1 Assessment of Blasting Impacts

In order to predict the levels of blast emissions (ground vibration and airblast) at the surrounding receivers from the Project, the measured ground vibration and airblast levels from recent blasting operations conducted in 2006 and 2007 were used to develop blast emissions site laws for each of the three stages of mine development considered, assuming current blasting practice. The maximum instantaneous charge ('MIC') will vary, and be limited, depending on the location of the area being mined and its relation to the nearest affected receiver. Site laws are currently used to design the MIC for each individual blast based on the limit at the nearest affected receiver. This will continue to be the practice for future mine development. Currently, MIC levels near the southern boundary of the development vary up to 200 kg depending on the orientation and depth of face being fired.

A summary of the results for the closest affected receivers is provided in **Appendix F**. The results reflect the levels that would be experienced when blasting at the nearest point to residential receivers during each stage of development. The blast prediction results demonstrate that predicted airblast and ground vibration levels will meet the DECC guidelines for blasting at all residences surrounding the development during all operational stages of the Project.

9.9 CONCLUSION

9.9.1 Operational Noise Predictions

Operational noise levels are predicted to meet the Project specific noise criteria at all receiver locations under calm and prevailing weather conditions with the exception of:

- **Location G** where an exceedance of 1 dBA is predicted during a prevailing south east wind during the evening period in Years 1, 5 and Year 10 and during the night-time period in Years 1 and 10; and
- **Location M** where an exceedance of 1 dBA is predicted during a prevailing north west wind during the night-time period in Year 1.

These minor exceedances of up to 1 dBA are unlikely to be noticeable by most people. Since the operational scenario modelled is likely to represent an acoustically worst-case scenario, actual operational noise levels from the Project are likely to be less than those predicted.

9.9.2 Sleep Disturbance Assessment

The predicted LAmax noise levels from the Project will meet the sleep disturbance criteria at all locations surrounding the development during calm and prevailing weather conditions with the exception of:

- **Location G** where a 1 dBA exceedance during the morning shoulder period is predicted during a south east wind in Year 10.

This 1 dBA exceedance is unlikely to cause sleep disturbance at this location.

9.9.3 Blasting Assessment

The blast prediction results presented in **Section 9.8.1** demonstrate that predicted airblast and ground vibration levels will meet the DECC guidelines for blasting at all residences surrounding the development during all operational stages of the Project.

9.9.4 Cumulative Impact Assessment

The cumulative impact of mining in the area surrounding the Bloomfield Project including the existing Donaldson Mine, Abel Mine and existing Tasman Mine is predicted to comply with the relevant amenity criteria set in accordance with the INP.

With implementation of the stated controls and management procedures, environmental risk associated with noise and vibration is considered to be low.

10. AIR QUALITY

10.1 INTRODUCTION

An assessment of potential air quality issues was undertaken by Holmes Air Sciences. The assessment follows the "*Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*" (DECC, 2005) using a Level 2 assessment. It uses the ISCMOD dispersion model with estimated emissions (taking account of control measures) and local meteorological data to predict dust concentration and deposition levels arising from the Project. After making appropriate allowances for existing levels of dust, the predicted values were then compared with the assessment criteria published by the DECC.

10.2 IDENTIFICATION OF ISSUES

The continuation of existing mining operations will result in the liberation of a number of classes of particulate matter ('PM'), consisting of total suspended particulate matter ('TSP'), particulate matter with equivalent aerodynamic diameters of 10 μm or less ('PM_{10}') and particles with equivalent aerodynamic diameters of 2.5 μm and less ('$PM_{2.5}$'). These emissions would occur primarily as fugitive dust from open cut mining operations.

There will also be exhaust emissions from diesel-powered haul trucks and other mining equipment. These emissions will include carbon monoxide ('CO'), minor quantities of sulphur dioxide ('SO_2'), nitrogen dioxide ('NO_2') and PM_{10}. Greenhouse gases (including CO_2) are addressed in **Section 10.9**. In practice, the gaseous emissions will be minor and the sources too widely dispersed across the mine site to cause ambient concentrations that could give arise to environmental impacts. Emissions of particulate matter from the exhausts of diesel-powered mining equipment are automatically taken into account in the assessment of dust emissions. This is because they are included in the estimates of emissions when the emission-factor equations used for estimating fugitive emissions are applied.

Because of the low concentrations of gaseous emissions compared with the assessment criteria, the focus of the assessment will be on the potential impacts due to emissions of particulate matter.

The proposal deals with the continuation of mining and rehabilitation in the Project Area over five stages, as described in **Section 2.5**. The four mining stages (Stages 1-4) have been assessed to determine the change in air quality effects with time as mining and waste emplacement areas progress.

Although some rehabilitation will occur in Stage 4, it has been assessed that the emissions from this will be less than that from active mining. Model simulations for Stage 1 have been made to allow the model predictions to be compared with historical monitoring data, assisting in establishing background levels for particulate matter.

The assessment assumes a ROM coal production maximum of 0.88 mtpa for Stage 1 after which a maximum of 1.3 mtpa will be mined. Overburden ratios will vary over the mine stages. Emissions from the nearby Donaldson and Abel mines and from the ROM coal processed at the Bloomfield washery have been included in the cumulative modelling.

Figures 3 and 4 in **Appendix G** show the source locations used in the modelling. These figures can be used to precisely identify the locations of the mining areas and the haul routes assumed for each of the model runs. Each numbered point shows the location of a dust emission source used in the model.

10.3 AIR QUALITY ASSESSMENT CRITERIA

10.3.1 Particulate Matter ('PM')

PM_{10} criteria are used to relate predicted concentrations to potential health effects. These criteria relate to the total PM burden in the air. Thus it is necessary to consider the effects of PM emissions from other mining operations and sources of PM, as well as Bloomfield emissions. The criteria used to assess the significance of predicted deposition and concentration levels are:

- Annual mean TSP of 90 $\mu g/m^3$;
- 24 hour maximum PM_{10} of 50 $\mu g/m^3$;
- Annual mean PM_{10} of 30 $\mu g/m^3$; and
- 24 hour average PM_{10} of 50 $\mu g/m^3$ with 5 exceedences permitted per year.

10.3.2 Dust Deposition

In addition to health impacts, airborne dust also has the potential to cause nuisance impacts by depositing on surfaces, for example, washing, motor cars, verandas, outdoor furniture and on vegetation/crops. The DECC (2005) criteria for dust (insoluble solids) fallout is:

- Annual average maximum increase in deposited dust of 2 g/m^2/month; and
- Annual average maximum total deposited dust level of 4 g/m^2/month.

10.4 EXISTING AIR QUALITY

10.4.1 Dust (insoluble solids) Deposition

Bloomfield's existing network of dust deposition gauges is shown on **Figure 14**. All dust gauges, except for D4, have recorded annual average dust deposition levels lower than DECC's criteria of 4 g/m^2/month. D4 is situated within the existing mine and is well removed from residential areas. Monitoring data from gauges is provided in **Appendix G**. PM exists in the local area due to existing operations at Bloomfield and Donaldson as well as from traffic and emissions from industrial and domestic activities in Newcastle and surrounding urban and industrial areas.

10.4.2 Dust Concentration Data

Continuous data on PM_{10} concentrations was provided by DECC's Beresfield monitoring station. TSP and PM_{10} concentrations (one-day-in-six-basis) were also provided by Donaldson's monitors at Blackhill. Data from December 1999 to October 2007 shows 31 occasions when the 24-hour average PM_{10} concentration at Beresfield exceeded the DECC's criteria of 50 $\mu g/m^3$ with only one such occasion in the past 12 months (October 2007). Similarly, since December 1999, there have been nine occasions when 24-hour average PM_{10} concentration (one-day-in-six-basis) has exceeded 50 $\mu g/m^3$ at the Blackhill monitor. None of these occurred in the last 12 months. These observations include the effects of existing mining operations and any other sources.

Although the annual average PM_{10} concentration at Beresfield exceeded DECC's 30 $\mu g/m^3$ criterion from late 2002 to the end of 2003, it has been below the criterion since that time. The annual average PM_{10} concentration at Blackhill has not exceeded the criterion since monitoring commenced in December 1999. The annual average TSP concentration at Blackhill has also been lower than the DECC 90$\mu g/m^3$ criterion since monitoring commenced.

Although emissions from mining at Donaldson and Bloomfield will theoretically contribute to concentrations of PM_{10} and TSP at the Beresfield and Blackhill sites, emissions modelling presented in the Donaldson EIS indicates that these contributions are likely to be small and unlikely to have caused, or contributed significantly to the measured exceedances. The higher concentrations at both sites occurred on the same days. Therefore the highest concentrations measured are most likely to be due to regional air pollution from bushfires or other, non-mining, events that cause elevated levels over wide areas.

10.5 METEOROLOGICAL CONDITIONS

10.5.1 Wind Speed and Wind Direction

Modelling used data from the Beresfield meteorological station as the Donaldson Station, built for the Donaldson Mine, does not comply with AS2923-1987 due to its shielding by trees. The wind roses show that over the year the most common winds are from the west, west-northwest, east-southeast and southeast. Westerlies are most common in winter and the south-easterlies in summer. Autumn and spring show an intermediate pattern between that which applies in summer and winter. Since the closest residences are to the south of the Project Area, the use of the Beresfield data is considered to be conservative.

10.5.2 Temperature and Rainfall

Bureau of Meteorology data from the East Maitland Bowling Club provides the longest record of temperature, humidity and rainfall data. January is the warmest month with a mean daily maximum temperature of 30.7^{o}C and July is the coolest with a mean daily minimum temperature of 5.8^{o}C. The Bureau of Meteorology's data is provided in **Appendix G**.

Rainfall data, in particular the number of rain days that can be expected per year, is of particular importance in estimating dust emissions from wind erosion. Over 82 years of records, there have been approximately 84.7 rain days per year.

10.6 ASSESSMENT APPROACH

The assessment followed the DECC's *Approved Methods of the Modelling and Assessment of Air Pollutants in New South Wales* (DECC, 2005). It specifies how assessments based on the use of air dispersion models should be undertaken and include guidelines for the preparation of meteorological data to be used in dispersion models and the relevant air quality criteria for assessing the significance of predicted concentration and deposition rates from the proposal. The only deviation relates to the use of the ISCMOD model instead of the AUSPLUME, CALPUFF and TAPM models which are named models in the approved methods. ISCMOD has been specially developed from the US EPA's ISCST3 model to give improved performance in the prediction of short-term PM_{10} concentrations. DECC has accepted it for a number of recently completed mining and quarry assessments, where the modifications are particularly relevant. Further detail on modelling methods is provided in **Appendix G.**

10.7 ESTIMATING EMISSIONS

A discussion of the emissions for each stage of the Project is provided in **Appendix G**. **Table 15** provides a summary of emissions for each stage and activity while

Table 16 provides summary of emissions for nearby mines.

Table 15 Summary of Emissions for Bloomfield (kg)

(OB refers to activities involving overburden handling; CL refers to activities involving coal handling; and WE refers to activities involving wind erosion)

Activity	Stage 1	Stage 2	Stage 3	Stage 4
OB - Stripping topsoil - Creek cut	235	291	454	-
OB - Stripping topsoil - S cut	325	269	106	560
OB - Drilling - Creek cut	4,769	10,386	16,179	19,974
OB - Drilling - S cut	6,586	9,588	3,795	-
OB - Blasting - Creek cut	3,614	7,872	12,262	15,138
OB - Blasting - S cut	4,991	7,266	2,876	-
OB - Sh/Ex/FELs loading - Creek cut	20,275	44,157	68,783	-
OB - Sh/Ex/FELs loading - S cut	27,999	40,760	16,134	84,918
OB - Hauling to emplacement - from Creek cut	49,009	106,737	166,263	-
OB - Hauling to emplacement - from S cut	67,680	98,526	39,000	205,263
OB - Emplacing at dumps - Creek cut	20,275	44,157	68,783	-
OB - Emplacing at dumps - S cut	27,999	40,760	16,134	84,918
OB - Dozers on O/B - Creek cut	-	63,512	107,176	-
OB - Dozers on O/B - S cut	132,316	68,805	25,140	132,316
OB - Dozers on Rehabilitation - Creek cut	-	31,252	52,737	65,107
OB - Dozers on Rehabilitation - S cut	65,107	37,762	12,370	-
CL - Dozers ripping - Creek cut	29,163	36,106	56,242	69,435
CL - Dozers ripping - S cut	40,272	33,329	13,193	-
CL - Loading ROM to trucks -Creek cut	31,074	56,834	99,460	109,297
CL - Loading ROM to trucks - South Pit	42,912	52,462	20,766	-
CL - Hauling ROM coal to dump hopper - Creek cut	54,516	119,990	189,540	269,750
CL - Hauling ROM coal to dump hopper - S cut	91,872	118,560	47,548	-
CL - unloading ROM coal at stockpile/hopper Creek cut	Emissions from approved activities at CHPP are taken into account in the cumulative assessment			
CL - unloading ROM coal at stockpile/hopper S cut				
CL - Rehandle ROM coal at stockpile/hopper				
CL - Handling coal at CHPP				
CL - Dozers at CHPP				
CL - Loading rejects (too wet)				
CL - Loading product coal stockpile				
CL - Loading coal to trains				
WE - OB spoil area - Creek cut	-	16,983	-	-
WE - OB spoil area - S cut	123,835	161,586	212,288	187,521
WE - Open pit - Creek cut	14,153	38,212	63,686	91,991
WE - Open pit - S cut	88,453	95,176	63,686	-
WE - ROM stockpiles	Emissions from approved activities at CHPP are taken into account in the cumulative assessment			
WE - Product stockpiles				
Grading roads	13,516	13,516	13,516	13,516
Total (kg)	**960,946**	**1,354,854**	**1,388,118**	**1,349,703**
ROM coal production (t)	**880,000**	**1,300,000**	**1,300,000**	**1,300,000**
TSP emission per tonne of ROM coal produced (kg/t)	**1.09**	**1.04**	**1.07**	**1.04**

Table 16 Summary of Emissions for Nearby Mines (kg)

Surrounding mines contribution	1,123,655	84,444	84,444	84,444
Donaldson (only in 2007), Abel and Bloomfield emissions from Bloomfield CHPP	531,364	282,390	282,390	282,390

10.8 ASSESSMENT OF RESULTS

The modified version of the ISC model ('ISCMOD') was used together with estimated emissions for Stages 1, 2, 3 and 4 and meteorological data for 2005 to model the dispersion and deposition of emissions for the Project.

Results provided estimated:

- maximum 24-hour PM_{10} concentrations;
- annual average PM_{10} concentrations;
- annual average TSP concentrations; and
- annual average dust (insoluble solids) deposition rates.

A summary of the modelling results is provided as **Table 17**. It shows that no residences are predicted to experience either dust deposition or PM concentrations above the DECC's assessment criteria. Resident ID referred to in **Table 17** is the location of residences as shown on **Figure 14**.

Table 17 Summary of Model Predictions

Summary of predicted particulate matter levels at residential locations for the Project in isolation and cumulatively									
Stage	**Resident ID (refer Figure 14)**	**Project in isolation**				**Project combined with other sources and background**			
		24hr PM_{10}	**Annual Average PM_{10}**	**Annual Average TSP**	**Annual Average Dust Deposition**	**24hr PM_{10}**	**Annual Average PM_{10}**	**Annual Average TSP**	**Annual Average Dust Deposition**
		µg/m³	**µg/m³**	**µg/m³**	**g/m²/month**	**µg/m³**	**µg/m³**	**µg/m³**	**g/m²/month**
DECC goal		**50**	**30**	**90**	**4**	**-**	**30**	**90**	**4**
Current	E	22.4	2.7	3.3	0.5	NA	15.3	31.3	1.0
	F	16.4	3.2	4.1	0.8	NA	20.3	37.6	1.3
	G	8.5	1.2	1.4	0.1	NA	11.5	26.7	0.6
	H	14.5	2.2	2.3	0.1	NA	13.6	28.9	0.6
	I	5.8	0.3	0.4	0.0	NA	11.9	27.0	0.5
	K	5.7	1.0	1.1	1.1	NA	18.9	36.5	1.6
	L	9.7	1.0	1.1	0.1	NA	14.9	30.2	0.6
	M	45.5	6.4	8.4	1.2	NA	19.2	36.7	1.7
	N	28.2	2.9	3.8	0.2	NA	13.8	29.7	0.7
+5 years	E	20.4	2.8	3.4	0.4	NA	12.9	28.5	0.9
	F	20.0	3.4	4.2	0.5	NA	14.1	30.1	1.0
	G	9.7	1.5	1.8	0.1	NA	11.3	26.4	0.6
	H	23.1	4.1	4.5	0.1	NA	14.2	29.6	0.7
	I	9.5	0.5	0.6	0.0	NA	10.7	25.6	0.5
	K	7.3	1.3	1.5	0.1	NA	12.4	27.9	0.8
	L	16.9	1.5	1.6	0.0	NA	12.3	27.4	0.6
	M	32.7	5.6	7.3	0.9	NA	15.7	32.3	1.4
	N	28.5	3.5	4.4	0.3	NA	13.3	29.2	0.8

Summary of predicted particulate matter levels at residential locations for the Project in isolation and cumulatively									
Stage	**Resident ID (refer Figure 14)**	**Project in isolation**				**Project combined with other sources and background**			
		24hr PM_{10}	**Annual Average PM_{10}**	**Annual Average TSP**	**Annual Average Dust Deposition**	**24hr PM_{10}**	**Annual Average PM_{10}**	**Annual Average TSP**	**Annual Average Dust Deposition**
		µg/m³	**µg/m³**	**µg/m³**	**g/m²/month**	**µg/m³**	**µg/m³**	**µg/m³**	**g/m²/month**
DECC goal		**50**	**30**	**90**	**4**	**-**	**30**	**90**	**4**
+7 years	E	22.6	2.9	3.5	0.4	NA	13.6	29.3	0.9
	F	20.3	3.5	4.3	0.5	NA	16.2	32.8	1.2
	G	13.4	1.7	2.0	0.1	NA	11.6	26.7	0.6
	H	21.4	3.4	3.7	0.1	NA	13.7	29.0	0.6
	I	9.4	0.5	0.5	0.0	NA	10.8	25.8	0.5
	K	8.2	1.3	1.6	0.1	NA	13.6	29.5	0.9
	L	14.8	1.4	1.5	0.0	NA	12.7	27.9	0.6
	M	35.6	5.7	7.3	0.9	NA	16.3	33.0	1.4
	N	28.7	3.8	4.9	0.4	NA	13.9	29.9	0.9
+10 years	E	18.2	2.6	3.2	0.3	NA	12.7	28.2	0.7
	F	25.1	3.5	4.3	0.4	NA	14.3	30.3	0.9
	G	12.1	1.5	1.8	0.1	NA	11.3	26.5	0.6
	H	19.2	3.5	3.9	0.1	NA	13.6	28.9	0.6
	I	9.0	0.5	0.6	0.0	NA	10.7	25.6	0.5
	K	9.5	1.4	1.7	0.1	NA	12.6	28.1	0.7
	L	14.4	1.6	1.7	0.0	NA	12.6	27.7	0.6
	M	33.0	4.6	5.8	0.6	NA	14.7	30.9	1.0
	N	22.1	2.8	3.6	0.3	NA	12.6	28.4	0.8

10.9 GREENHOUSE GAS EMISSIONS

Greenhouse gas inventories are calculated by a number of different methods. The procedures specified under the Kyoto Protocol to the United Nations Framework Convention on Climate Change are the most common. The protocol identifies greenhouse gases as carbon dioxide ('CO_2'), methane ('CH_4'), nitrous oxide ('N_2O'), hydrofluorocarbons ('HFCs'), perfluorocarbons ('PFCs') and sulphur hexafluoride ('SF_6'). CO_2 and N_2O are formed and released during the combustion of gaseous, liquid and solid fuels.

The Project will liberate greenhouse gases as a result of the combustion of diesel and petrol to power mining and other equipment, the use of explosives and the use of electrical energy. The most significant gases for the Project are CO_2 and N_2O. Different gases have different greenhouse warming effects (potentials) and emission factors take into account the global warming potentials of the gases created during combustion. Inventories of greenhouse gas emissions can be calculated using published emission factors.

When the global warming potentials are applied to the estimated emissions then the resulting estimate is referred to in terms of CO_2 equivalent emissions. The emission factors published by the Australian Greenhouse Office ('AGO') (2006) have been used to convert fuel usage and electricity consumption into CO_2 equivalent emissions. These are provided in **Appendix G** as is the methodology used to estimate emissions for the Project in terms of Scope 1, 2 and 3 emissions.

Scope 1 emissions are produced directly as a result of fuel burning equipment use on site, Scope 2 from the use of electricity on the site, and Scope 3 from the use of equipment and facilities that have generated greenhouse gases in their production prior to purchase. Scope 3 emissions also include the use of the coal mined on the site by other parties, ie: the customer.

The estimation of greenhouse gas emissions was undertaken for ROM coal production of 800,000 tpa and 1.3 mtpa. It is considered more appropriate to model greenhouse gas emissions on the average ROM coal production over the life of the mine, which is expected to be closer to 800,000 tpa than 1.3 mtpa.

The Project is estimated to liberate 28,489 tonnes of Scope 1 emissions and 14,214 tonnes of Scope 2 emissions in Stage 1. In Stages 2-4, 23,164-35,312 tonnes of Scope 1 emissions and 11,102–16,490 tonnes of Scope 2 emissions are estimated to be liberated.

The *National Greenhouse and Energy Reporting Act 2007* ('NGER Act') requires corporations that control facilities emitting 25,000 tonnes or more (CO_2 equivalent) per year to register and report their Scope 1 and 2 greenhouse gas emissions. Bloomfield Colliery will be

required to monitor and report on its greenhouse gas emissions, and report in the form required by the Act.

Bloomfield is currently registered as a participant in the Federal Government Energy Efficiency Opportunities ('EEO') and Greenhouse Challenge Plus programs. An Assessment and Reporting Schedule has been prepared under the EEO program and an Energy Assessment of open cut operations will be undertaken in accordance with the commitments made in that schedule. The EEO Energy Assessment will document current and proposed initiatives for the efficient supply and management of energy usage, as well as procedures for the reporting and management of greenhouse gases resulting from Scope 1 and 2 emissions.

Depending on ROM coal production, the Project is estimated to liberate between 19.5 Mt and 30.4 Mt of CO_2 equivalent (including Scope 3) over the life of the mine, or average between 1.76 and 2.85 mtpa. This is small when compared with the estimated annual emission of 559 Mt of CO_2 equivalent for Australia in 2005 using the Kyoto accounting procedures. The Scope 3 emissions from the Project would not be included in the NSW inventory as the coal is for export and would be accounted for in the country in which the end user is located.

10.10 SUMMARY AND CONCLUSIONS

Holmes Air Sciences assessed the air quality impacts associated with the operation of the Project. Modelling simulations of the dispersion of dust emissions for the four mining stages have been undertaken. Model predictions show the effects of the mine in isolation and when the mine is considered with other sources of dust (cumulative impact). No exceedences of any long-term assessment criteria are predicted.

The assessment also provides estimates of the greenhouse gas emissions from the operation. The Project is estimated to liberate between 19.6 Mt and 30.4 Mt, or an average of between 1.76 and 2.85 mtpa CO2-equivalent gases over its life.

11. SURFACE HYDROLOGY AND WATER MANAGEMENT

11.1 INTRODUCTION

An assessment of the surface water issues was undertaken by *Evans & Peck* in consultation with the Groundwater assessment by *Aquaterra*. It is provided as **Appendix H**.

The surface water management system for the Project forms an integral part of the water management system approved by the Abel Project Approval. This is shown schematically on **Figure 18.** It involves the management of all surface runoff and groundwater sources associated with the Abel, Bloomfield and Donaldson mines, ensuring continuous supply to the Bloomfield washery whilst minimising discharge to Four Mile Creek from the operating areas. The lettering on each of the catchment areas identified on **Figure 18** represents the designation used for water balance analysis detailed in **Appendix H**.

Relevant elements of the Integrated Water Management System cannot be considered in isolation and are therefore referred to in this Project. Water management facilities included in the Abel Project Approval and operated by Bloomfield are:

- Existing surface water storages and sediment control dams (Lake Kennerson, Lake Foster, Possums Puddle and the Stockpile Dam) and the pipelines and drains that allow water to be transferred between these storages, or discharged offsite;
- Pumps for the supply of water from Lake Foster to the washery;
- Pumps for supply of groundwater extracted from old underground workings to supplement water supply to the washery when required;
- The washery associated stockpile areas and the Stockpile Dam;
- Previously mined areas including S Cut and Creek Cut used for disposal of wastes from the washery (coarse rejects and fine tailings) and the rehabilitation of these areas following completion of waste disposal; and
- Mine water discharge regime as per the existing EPL. (Refer **Section 2.9**)

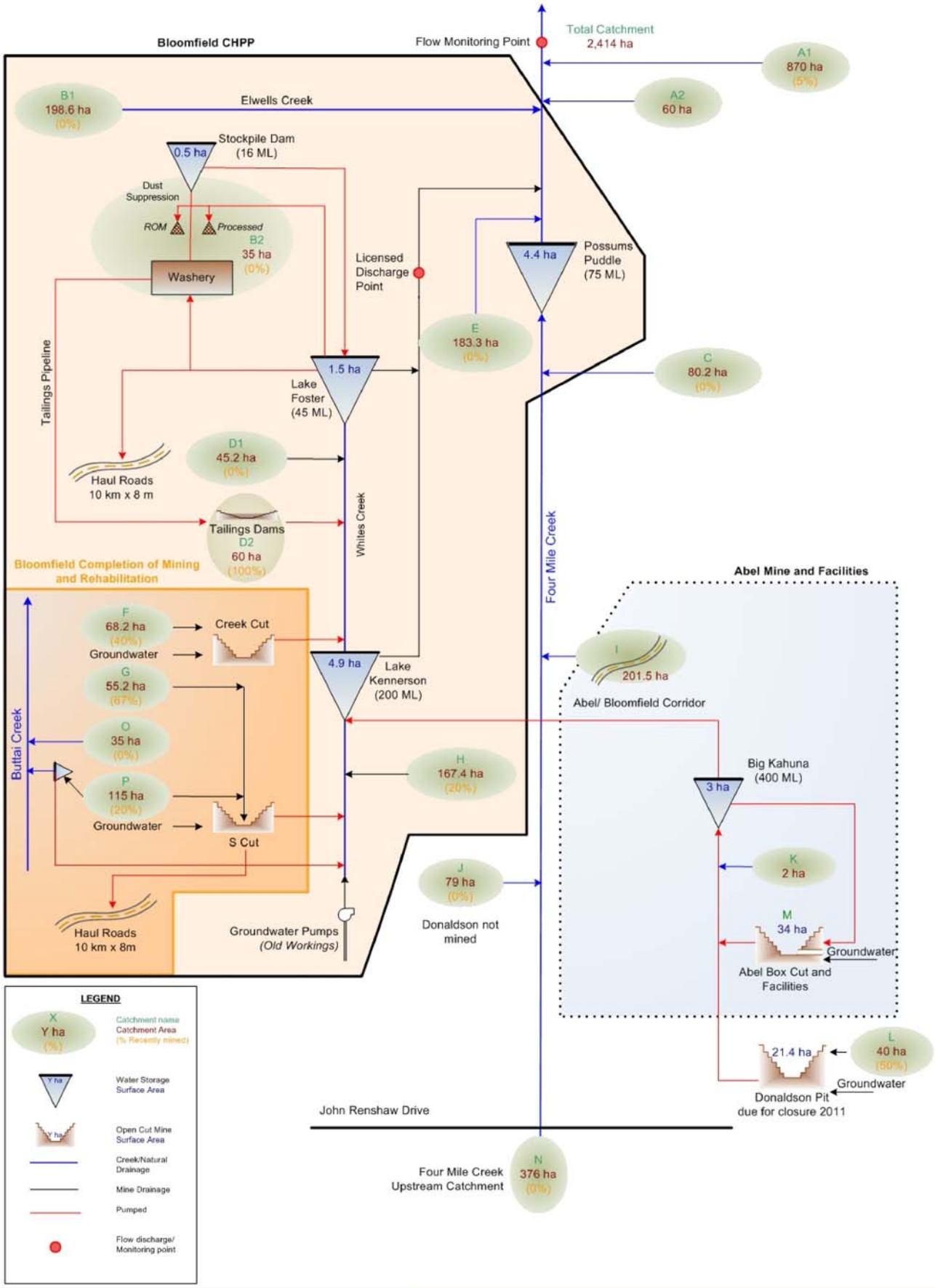

FIGURE 18

INTEGRATED WATER MANAGEMENT SYSTEM SCHEMATIC OF BLOOMFIELD, ABEL AND DONALDSON MINES

BLOOMFIELD COLLIERY
COMPLETION OF MINING AND REHABILITATION

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11.2 EXISTING OPERATIONS AND WATER MANAGEMENT

The existing water management system for the Bloomfield Mine is detailed in **Appendix H**. The following provides a summary of the existing water management system as shown on **Figure 18**.

Mining currently occurs in the S Cut and Creek Cut pits. All surface runoff and groundwater that drains to S Cut is transferred to Lake Kennerson. From Lake Kennerson it is either transferred to Lake Foster for use in the washery or, in the event of there being excess water held in Lake Kennerson, discharged to Four Mile Creek in accordance with an existing EPL. Water from Creek Cut is directly transferred to Lake Foster.

All drainage from active overburden dumps currently drains either to the active pits (S Cut and Creek Cut) or to Lake Kennerson. Surface runoff draining to the pits, as well as groundwater inflow to the pits, is pumped to Lake Kennerson which serves as a sediment control dam as well as a key part of the Bloomfield water management system. Routine monitoring of water quality since 1996 shows an average total suspended solids ('TSS') concentration of 9.5 mg/L and a 90th percentile concentration of 19 mg/L indicating Lake Kennerson achieves a high level of sediment capture.

Existing haul roads connect the active pits to the workshop area and the ROM coal stockpile area. Runoff from the haul roads drains into the existing water management systems located within the Bloomfield Mine lease area.

The layout of the existing workshop area and the boundary of the catchment that drains to the workshop sediment dam are shown on **Figure 19.** The main access road between Creek Cut and the ROM coal stockpile forms the southern boundary of the workshop area. This road is drained, via a table drain, to a low (vegetated) detention basin on the southern side of road. This detention basin acts as a sediment control pond. Once the basin is sufficiently full, water overflows through a culvert under the access road and discharges into the drainage line that flows along the western side of the workshop area. This drainage line eventually becomes Elwells Creek.

The facilities and the stormwater drainage arrangements for the workshop area comprise:

- A covered workshop in which all machinery maintenance and repair is undertaken. Roof runoff from the workshop is directed to the ground adjacent to the building.
- Roads and machinery parking area to the immediate south and southeast of the workshop building drain via a slightly depressed drainage path around the eastern side of the workshop building towards the main sediment dam. A small localised catchment drains to a small sediment control basin (marked as "Collection Area" on

Figure 19). If filled to capacity, this collection area overflows into the drain that diverts water around the eastern side of the workshop.

- Surface runoff from the roads and car park areas to the north and east of the workshop drain to a culvert under the sealed access road, before draining into a sediment dam. This sediment dam overflows into the Elwells Creek drainage line.
- The entrance to the workshop is ramped up, to divert surface runoff around the workshop entrance. All internal drainage from within the covered workshop drains through an internal grease trap and sediment control sump, then through an external triple baffle oily water separator. Retained oily water is diverted to a storage tank and emptied periodically by a licenced contractor. The storage tank has a flashing beacon to indicate when near capacity and requiring evacuation. A licensed contractor pumps out the tank.
- A tank farm, located immediately west of the workshop, has a series of fuel tanks that store bulk diesel and oil (total capacity of 128,000 L). The tank farm is contained within a bunded area designed in accordance with AS1940. The bunded area has a locked valve overflow line. Surface runoff from the bunded area drains to a sump. The sump pump operates automatically pumping to a triple chamber oil/water separator. Separated oily water flows to a holding tank (with flashing warning beacon). A licensed contractor pumps out the tank.
- Decanting of fuel is carried out in a dished pad. Underflow from the dished pad flows to an automatically draining holding tank and into the triple chamber oil/water separator. Separated oily water flows to the holding tank (with flashing warning beacon). A licensed contractor pumps out the tank.
- Minor volumes of oils and greases are stored on a raised storage platform located at the northeastern corner of the workshop building. A catch tray that drains to the triple baffle oily water separator surrounds the storage platform.
- The prill bin and pad is surrounded by 150 mm concrete guttering, which directs surface runoff via a sediment retention sump into a below-ground concrete holding tank. The tank is equipped with a float switch that triggers a red flashing beacon when requiring pumping out. A licensed contractor pumps out the tank.

The local catchment surrounding the prill bin drains, via a small sediment pond, into Elwells Creek. This sediment pond is inspected and cleaned out periodically. The local catchment is largely undisturbed bushland and overflow of surface runoff from the prill pad would only occur in very high rainfall events, when the pad would not be operating.

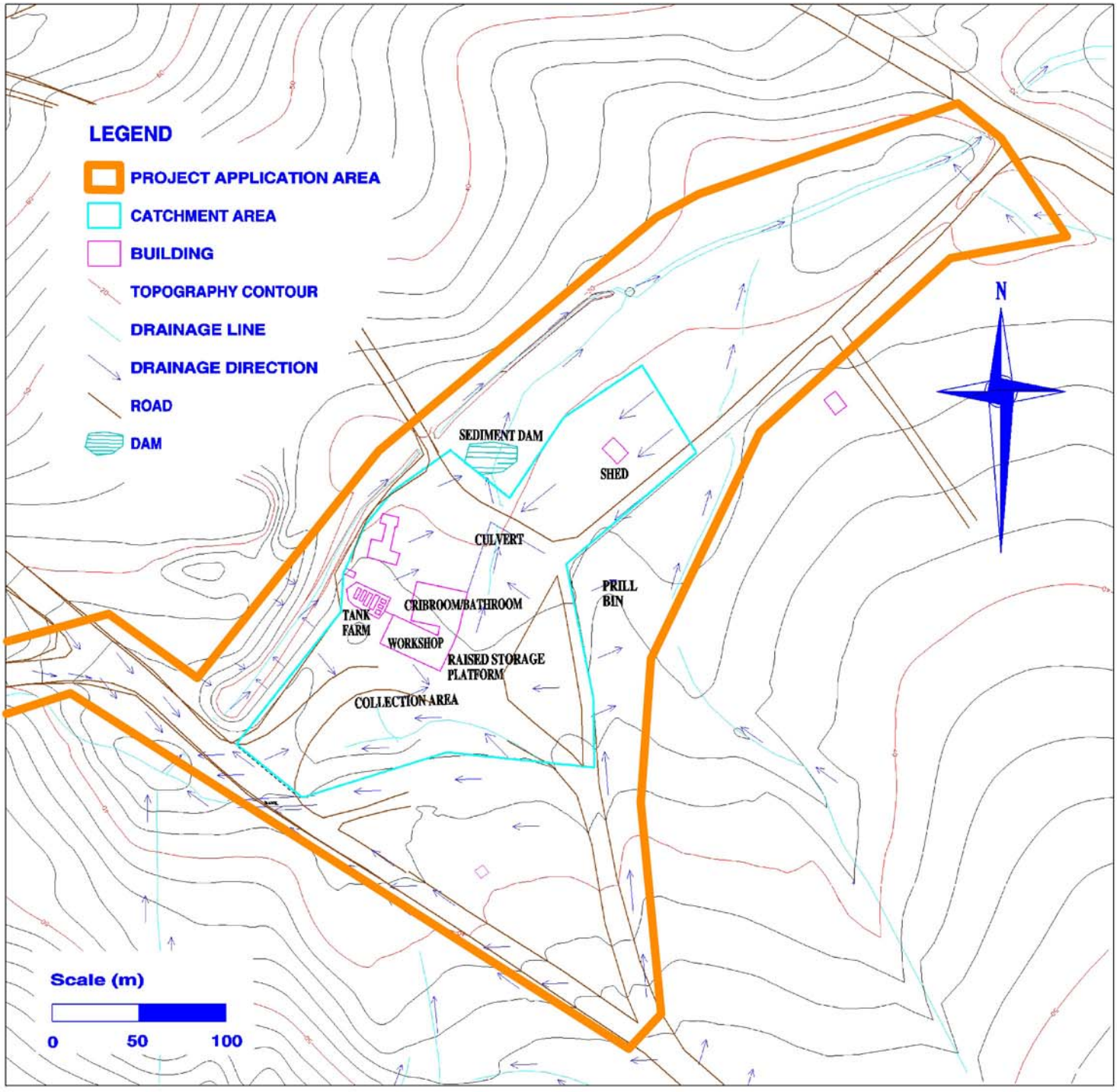

FIGURE 19

WORKSHOP SURFACE WATER PLAN

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Management actions to ensure appropriate operation of the pollution control systems in the vicinity of the workshop area include:

- All water storage tanks are emptied by a licenced contractor on a routine basis. The contractor is on call to undertake additional pump-out if a flashing warning light indicates that pump-out is required.
- All hydrocarbon management infrastructure is subject to quarterly documented maintenance inspections.
- The sediment dam is inspected quarterly and cleaned out as necessary to maintain sediment capture capacity.
- A water quality monitoring point is located on Elwells Creek about 350 m downstream of the sediment dam to which the workshop area drains. This monitoring point also receives runoff that drains via sediment traps from the haul road located immediately adjacent to the monitoring point.

11.3 ALTERATIONS TO EXISTING OPERATION

The Project will involve only minor alterations to the existing operation of the water management system.

11.3.1 Mining Areas

The Project covers an area to the west and north of S Cut extending as far north as the Creek Cut. Proposed mining will occur concurrently westward from the existing S Cut and northward to link with the existing Creek Cut.

The existing S Cut encroaches approximately 48 hectares into the headwaters of Buttai Creek. As mining progresses approximately 118 hectares of the Buttai Creek Catchment will be affected by mining and measures will be put in place to protect Buttai Creek. These measures include directing all runoff from the area affected by mining into the mine water management system away from Buttai Creek until rehabilitation is complete. At the completion of mining, all areas draining to Buttai Creek will be rehabilitated and runoff directed back to Buttai Creek.

Overburden placement and rehabilitation will follow the mining sequence. Until Stage 3 of the Project, runoff from all active overburden dumps and rehabilitated areas will drain to active pit areas from where it will be pumped to Lake Kennerson. After this stage, a series of diversion drains and a sediment dam (as shown on **Figure 18**) will be constructed on the overburden dumps. Diversion drain design calculations are presented in **Appendix H**.

An Erosion and Sediment Control Plan ('ESCP') will be implemented to ensure that no undue pollution of receiving waters occurs during the Project. The ESCP will be prepared in accordance with guidelines in *Managing Urban Stormwater: Soils and Construction* (Landcom 2004) and *Managing Urban Stormwater Soils and Construction - Volume 2E: Mines and Quarries* (draft DECC and Sydney Metropolitan CMA 2007).

Areas to the west of mining disturbance will be protected from runoff from the overburden areas until rehabilitation is complete. Once rehabilitation is completed on each area, the relevant diversion drain will be filled-in and rehabilitated with the exception of the drain along the north-western edge of S Cut. This is shown on Figure 4.1 in **Appendix H**. It will be retained to direct runoff into the sediment dam retained as a water storage dam with all water captured pumped to Lake Kennerson. Until rehabilitation is completed, all runoff from the overburden dumps that is directed to mine pits or to the sediment dam will be pumped to Lake Kennerson as for current operations. Each diversion drain will have an operating life of about 5 years. Design calculations for diversion drains, sediment dam and spillway in accordance with *Managing Urban Stormwater: Soils & Construction* are provided in **Appendix H**.

11.3.2 Workshop

Stormwater pollution control arrangements and management regime in the vicinity of the workshop and prill bin have been reviewed and are considered to be in line with current standards. No modifications are proposed.

11.4 SURFACE WATER ASSESSMENT AND IMPACTS

11.4.1 Water Balance Analysis

A detailed water balance analysis has been undertaken that takes account of all surface and groundwater sources that would enter the water management systems on the Bloomfield, Donaldson and Abel Mine sites.

The water balance model results indicate that by adopting the proposed target operating water levels, the existing water management facilities within the Bloomfield and Donaldson mine areas can be operated to achieve the following objectives:

- Maintain water supply for the CHPP and dust suppression at all times;
- Minimise discharge from the Stockpile Dam (washery); and
- Minimise discharge from Lake Kennerson.

The water balance model has been used to develop a feasible set of operating rules that demonstrate the adequacy of the water management facilities to achieve these objectives. It is anticipated that the operating rules will be regularly reviewed and refined in the light of operating experience.

The water balance estimates show the following features:

- Water supply for all mine purposes can be provided by the water management system without extracting water from old Bloomfield underground workings at a greater rate than has been extracted historically.
- The demand for water supply from the Bloomfield underground workings will gradually reduce as additional water becomes available from the Abel underground workings.
- Some discharge from Lake Kennerson is likely to continue under most climate conditions. However the discharge volume for Lake Kennerson is estimated to be significantly less than historical rates.
- The Stockpile Dam would not overflow in any of the three representative climate years. (Refer **Appendix H**).

11.4.2 Impacts on Flow Regime

Given all the other influences of mine activities, the increase in the catchment area draining into Four Mile Creek catchment as a result of encroachment into Buttai Creek catchment (maximum of 118 ha out of a total of 2,467 ha) is not expected to lead to any perceptible increase in flow in Four Mile Creek.

The location of the existing high wall of the S Cut approximately coincides with the catchment divide between Four Mile Creek to the east and Buttai Creek to the west. As the S Cut progressively extends to the west it will encroach into two small tributary catchments (36 ha and 114 ha respectively) of the Buttai Creek catchment.

The area draining into the pits will alter as mining progresses. The maximum area affected will be about 118 ha by Stage 3. Approximately 32 ha will not be affected by mining. The anticipated impact on flow into Buttai Creek catchment at Buchanan Road would be a reduction in the average annual flow by 3% in Stage 1, rising to 7% by Stage 3 and remaining at that level until rehabilitation is complete (Stage 5). Once rehabilitation is completed, the area excluded from Buttai Creek catchment will be restored to the catchment.

The catchment area that will be temporarily excised from the Buttai Creek catchment comprises the steeper upper reaches of the catchment from which the main runoff process is

surface runoff immediately following rainfall. Accordingly, based on previous modelling of the flow regime in Four Mile creek and other local creeks, the majority of the estimated reduction in annual runoff volume will occur as a result of flows in the flow range up to the 20th percentile. This portion of the catchment can therefore be expected to have minimal effect on base flow in Buttai Creek.

The tributary creeks that drain from the mine lease area join Buttai Creek upstream of Buchanan Road. About 2 km downstream of the road Buttai Creek drains into a large ephemeral wetland area which drains into Wallis Creek. From the 1:25,000 topographic map, the wetland appears to have a maximum area of about 35 ha. However, inspection of aerial photographs and observations by Bloomfield Colliery staff over a number of years indicate that the actual water area varies significantly in response to rainfall and runoff.

From a hydrologic perspective, the wetland acts as a large shallow water storage area which only spills into Wallis Creek after heavy rainfall such as that which occurred in June 2007. The predicted maximum 7% reduction in annual flow as a result of the mine is not expected to have any significant impact on the wetland, because the wetland only requires about 150 ML/year offsetting the loss by evaporation. It follows that, even if the Bloomfield expansion reduces the average annual flow in Buttai Creek from about 1,550 ML/year to 1,445 ML/year, there will still be sufficient water to maintain the wetland.

Because the wetland only spills into Wallis Creek in high flows, the encroachment of mining into the Buttai Creek catchment is not expected to have any noticeable effect on the flow regime in Wallis Creek which has a catchment area of about 15,000 ha upstream of the Buttai Creek junction.

11.4.3 Impacts on Surface Water Quality

- The Project is expected to have the following impacts on water quality:
- Reduced salt load discharged to Four Mile Creek on account of the anticipated deduction on discharge volume from Lake Kennerson;
- Continuation of the existing low level of discharge of sediment to Four Mile Creek as all sediment laden water from recently rehabilitated areas will be collected in the pits or sediment dam and transferred to Lake Kennerson which has demonstrated capacity to provide low levels of TSS in any discharge (average 12 mg/L); and
- No discharge of sediment to Buttai Creek as all runoff collected in the pits and the sediment dam will be transferred to Lake Kennerson.

11.4.4 Impacts on Existing Surface Water Users

The reduction in flow associated with mining is temporary and is not expected to effect any downstream water users.

11.5 DRAFT SURFACE WATER MANAGEMENT PLAN

With the exception of a small sediment dam on the headwaters of Buttai Creek, the water management systems that support the existing and proposed mining at Bloomfield are part of the Integrated Water Management System ('IWMS') provided for the Bloomfield, Abel and Donaldson mines as part of the Abel Project Approval. This draft Surface Water Management Plan is consistent with the IWMS.

New pits and sediment dams proposed as part of the Project will be operated in the same way as the S Cut pit is currently operated and will not require any new facilities other than a small sediment dam constructed near the western boundary of the Project Area for Stage 3. The objectives for the IWMS are to set out in **Section 11.2**.

11.6 WATER MANAGEMENT FACILITIES AND OPERATIONS

Based on the water balance modelling, existing water management facilities will not require any modification in terms of size or operating regime to cater for the proposed completion of mining at Bloomfield. Target operating levels of various storages are provided in **Appendix H.** Management actions to ensure appropriate operation of the pollution control systems in the vicinity of the workshop area are described in **Section 11.2**.

11.6.1 Proposed Surface Water Monitoring

The surface water monitoring program as per the Abel Project Approval includes the following sites relevant to the Project:

- Four Mile Creek at John Renshaw Drive;
- Four Mile Creek upstream of the Bloomfield lease area ('CCL761');
- Four Mile Creek at the New England Highway; and
- Buttai Creek at Lings Road.

It is proposed to add a monitoring site on Buttai Creek immediately upstream of Buchanan Road. The existing and proposed monitoring locations are shown on **Figure 14.**

The following monitoring regime is proposed:

- Monthly field testing for Temperature, pH, EC, DO and Turbidity;
- Monthly grab samples for laboratory analysis of TSS, TDS, pH and EC;
- Quarterly grab samples for laboratory analysis of Chlorides, Sulfates, Alkalinity, Calcium, Magnesium, Sodium and Potassium;
- Daily water grab samples from the discharge point when there is controlled discharge from Lake Kennerson. A grab sample will also be collected at the flow gauging station behind the Four Mile Workshops. These samples will be analysed for EC, pH, TSS and Filterable iron in accordance with the EPA licence; and
- Daily water grab samples of any overflow from the Stockpile Dam. These samples will be analysed for TSS, TDS, pH and EC.

11.6.2 Proposed Surface Water Response Plan

The procedure to be followed in the event of unforeseen surface or groundwater impacts being detected during the Project is as follows:

1. The nature of the suspected impact and all relevant monitoring data will be immediately referred to an independent qualified hydrologist or hydro-geologist as appropriate for assessment.
2. An assessment will be made of the potential magnitude of the impact and the level of risk.
3. Alternative response and mitigation measures will be detailed for discussion with DWE, DECC and/or DPI-Minerals as appropriate.
4. A response/mitigation plan will be implemented to the satisfaction of DWE, DECC and/or DPI-Minerals.

11.7 CONCLUSION

The surface water assessment notes that the proposed operations form an integral part of the IWMS. Minimal alterations to this system are required to cater for the Project. A detailed water balance analysis has been undertaken which indicates that existing water management facilities and systems can cater for the continued Bloomfield operation with minimal new works. The impacts of potential surface water issues associated with the Proposal are therefore considered to be low.

12. GROUNDWATER

12.1 INTRODUCTION

A groundwater impact assessment was undertaken by *Aquaterra Consulting Pty Ltd* and is provided as **Appendix I**. The study was in consultation with the Surface Water assessment by Evans & Peck. The objectives of the assessment were to:

- Assess and describe the existing groundwater environment of the Project and its vicinity;
- Identify key potential risks to the environment from the Project;
- Evaluate the potential impacts of the Project on the regional and local groundwater resources, incorporating any necessary management and mitigation strategies; and
- Assess the residual post-Project impacts and any ongoing management requirements.

The study was undertaken with reference to the following relevant policies:

- NSW State Rivers and Estuaries Policy;
- NSW Wetlands Management Policy;
- NSW Groundwater Policy Framework Document – General;
- NSW Groundwater Quantity Management Policy;
- NSW Groundwater Quality Protection Policy;
- NSW Groundwater Dependent Ecosystem Policy;

and the following relevant best practice guidelines:

- Groundwater Flow Modelling Guideline (MDBC, 2001);
- Independent Inquiry into the Hunter River System (Healthy Rivers Commission, 2002);
- Guidelines for Management of Stream/Aquifer Systems in Coal Mining Developments – Hunter Region (DNR, 2005); and
- Groundwater Monitoring Guidelines for Mine Sites within the Hunter Region (DIPNR, 2003).

The *Draft Water Sharing Plan for Hunter Unregulated and Alluvial Aquifer Sources*, released in March 2008 (refer **Section 4.4.8**) has been considered. Although unlikely to be adopted

prior to lodgment of this EA, Bloomfield proposes to conduct mining operations in accordance with the draft Plan.

12.2 GROUNDWATER INVESTIGATIONS

A search of the Department of Water and Energy ('DWE') groundwater bore database identified thirteen existing registered bores within approximately 5 km of the Project. Summary details of these bores are in **Appendix I**. Following analysis of hydrographs for all bores, the groundwater levels in the Bloomfield mining area show the accumulated effects of long-term mining activity in the area. Although there is no evidence to suggest what pre-mining groundwater levels might have been, the influence of mining on water levels is apparent by the marked differences in groundwater levels between shallow and deeper coal measures.

Twenty-four piezometers were installed at eight sites around the Bloomfield mine area to enable separate sampling, testing and monitoring of the main coal seams involved in past or proposed mining, as well as the shallow alluvium and/or regolith zone. A limited amount of historical information was also available from several old piezometers on the site however, in most cases the construction details were uncertain. Regional information was obtained where possible from piezometers on adjacent mining projects.

A hydraulic testing program was carried out on the standpipe piezometers to determine aquifer permeabilities. Water samples were collected for detailed chemical and physico-chemical analysis. Follow-up water quality sampling was carried out six months after the initial testing, as part of the ongoing baseline monitoring program. The baseline program also involves monthly measurement of water levels in all Bloomfield piezometers.

Water samples were collected in May and December 2007 from the Bloomfield standpipe piezometers, and submitted for detailed chemical analysis. Electrical conductivity ('EC') and pH were measured in the field at the time of sampling.

The existing hydrogeological environment covering climate, geology, hydrogeology, recharge and discharge, groundwater quality and usage and the groundwater-surface water interaction is described in **Appendix I** along with detailed information on the study methodology, investigations and analysis results.

12.3 ASSESSMENT OF POTENTIAL IMPACTS

The Creek Cut and S Cut voids have been assumed to remain as permanent open voids in the groundwater modelling, so that the impact of the Project can be assessed (as far as possible) separately from the impacts of neighbouring mining projects. One of these

projects, the Abel Mine, is approved to continue for several years after completion of mining at Bloomfield. However, with ongoing processing of coal at the washery, the final voids will be progressively backfilled by deposition of washery rejects.

A numerical groundwater flow model based on the MODFLOW package, used in conjunction with the SURFACT module, was used to assess the potential impacts of the Project. The model area was approximately 200 km^2. A full account of the model set-up, the assumed hydraulic parameters, modelling methods, model calibration, and sensitivity analysis are provided in **Appendix I**.

12.3.1 Predictive Modelling

The potential impacts of the Project were assessed by running the calibrated model in transient mode. The model was configured with annual changes in the area and base level(s) of mining, by altering the hydraulic parameter values of model cells within mined and/or backfilled areas, and with drain cells activated in all active open cut areas. To accommodate parameter changes using MODFLOW, the modelling was conducted as a series of sequential model runs, with parameter changes between successive runs in accordance with the mining schedule.

Because of the proximity of nearby Donaldson and Abel projects, these operations were also simulated in the model. The Donaldson Project has been in operation since 2001 and is due for completion in another 3-4 years, and the Abel Project is currently under development and projected to continue for 10 years after completion of mining at Bloomfield.

The predicted mine dewatering rate from the prediction modelling ranged between 0.4 and 2.1 ML/d, with the maximum occurring in Year 6 (during Stage 3) and minimum in Year 11 (Stage 4). Predicted average rate over the 11 years modelled was 1.4 ML/d. These rates are of similar magnitude to current and recent dewatering rates. A detailed account of the predictive modelling results is presented in **Appendix I**.

12.3.2 Recovery Modelling-Post-Mining Impacts

The post-mining recovery of groundwater levels was modelled for 100 years after completion of mining. Aquifer parameter values for the mined out and backfilled open cut areas were modified to values appropriate for either waste backfill or voids. The pit voids will continue to be backfilled by deposition of rejects from the washery, with this ongoing activity forming part of the Abel Project Approval. Therefore, for the post-mining recovery, it was assumed that the final voids would remain intact through the 100 year recovery period.

The recovery model run showed that groundwater levels in all model layers are predicted to recover to higher than current (2007-2008) levels. This result is due to the fact that after

completion of mining at Abel (some years after completion of Bloomfield) the groundwater levels will recover not just from the impacts of mining during the period modelled in this study, but also from the significant effects of past mining as well.

The recovery modelling shows that virtual full recovery of groundwater levels over the entire model area will occur within 60 years of completion of mining at Bloomfield and on the Bloomfield lease area itself, recovery will be substantially completed within 20-30 years, and to groundwater levels higher than at present. Post-mining groundwater levels are predicted to stabilise at around 18-35 metres AHD within the Bloomfield mine area, compared with maximum 2006 levels around 25 metres AHD predicted by the steady-state calibration model.

12.3.3 Potential Impacts on Surficial Groundwater

Plots of drawdown at the completion of the Project show a decline in groundwater levels after completion of mining, relative to the model-predicted levels at 2006.

The plot for the surficial aquifer Layer 1 (alluvium and regolith layer) shows a very limited area of drawdown at the location of the final S Cut pit void, and a more extensive area of groundwater recovery or draw-up (compared with 2006 levels) near the south western corner of the Bloomfield lease, and extending beyond the lease boundary for a maximum distance of approximately 500m. Groundwater levels were already depressed in the vicinity of the S Cut pit in 2007, due to many years of dewatering pumping from the S Cut sump area (shown on Figure 3). A much larger area of drawdown impact is predicted for the Abel project area to the south-east of Bloomfield.

Drawdowns from the Bloomfield mining were predicted to reach a maximum at Year 7, at which time mining from the southern end of S Cut is scheduled to cease, and groundwater levels would start to recover. Drawdown contours for Layer 1 at the end of Year 7 are shown on Figure 21 in **Appendix I**. It is seen that drawdown of 1m or more is predicted to extend approximately 1km to the west to the edge of alluvium associated with Buttai Creek. The potential for impacts on groundwater storage in the alluvium will be monitored at shallow piezometers at Sites 1 and 8 (Figure 21 in **Appendix I**).

Predicted drawdowns in Layer 1 further south from Site 8 (Figure 21 in **Appendix I**) are influenced more by the Abel project than Bloomfield.

Hydrographs for Bloomfield monitoring bores show that within a year or two of completion of mining, groundwater levels in the surficial aquifer will recover to above the model-predicted 2006 levels. The recovery model run shows that ultimately groundwater levels will stabilise at levels well above the 2006 levels.

The predicted drawdown impacts on the surficial aquifer are not expected to have any adverse impact on groundwater dependent ecosystems, because the groundwater levels are already well below ground surface, the groundwater in the surficial aquifer is saline and none were found on the Project Area during the Flora, Fauna and Threatened Species Assessment (refer **Section 7.4.6**).

12.3.4 Potential Impacts on Wallis Creek and Buttai Creek

The combined effects of Bloomfield, Donaldson and Abel are predicted to mutually interact and have small impacts on stream baseflows. It is therefore not possible to totally isolate the effects of Bloomfield from the combined impact. However, due to proximity, the Wallis and Buttai Creek baseflows will be more sensitive to Bloomfield than to Donaldson or Abel.

The model shows that there will be only minimal reduction in baseflows to Wallis Creek and Buttai Creek as a result of completion of mining. The maximum baseflow reduction in Wallis Creek is predicted to be 19 kL/d (0.2 L/s), which equates to 2% of the current modelled baseflow. A much smaller baseflow reduction is predicted for Buttai Creek, reaching a maximum of just 5.1 kL/d (0.06 L/s) in Year 8, or 35% of the current model-predicted baseflow. Nil baseflow impact is predicted for all the smaller tributary streams.

Monitoring of baseflow impacts at Buttai Creek is considered impractical due to the buffering effect of the wetlands on flow measurement and because a reduction of 5 kL/d would be too small to detect. It is recommended that baseflow impacts in Buttai and Wallis Creeks are assessed by reference to the groundwater model predictions, in conjunction with groundwater level monitoring at Sites 1 and 8 (as shown on Figure 21 in **Appendix I**). Drawdown impacts significantly greater than those predicted by groundwater modelling should trigger an investigation by an approved hydrogeologist, and if necessary, a re-run of the groundwater model to determine possible baseflow impact.

Like groundwater levels, the recovery modelling also predicted that baseflows in Wallis Creek and Buttai Creek would recover to higher than current levels. Rapid recovery is predicted to occur in both streams in the first 20 years post-mining, and baseflows would be fully stabilised at above 2006 levels within 60 years after completion of mining at Bloomfield.

12.3.5 Potential Impacts on Groundwater Quality

The groundwater in the Project vicinity is saline and of negligible beneficial use value. No adverse impacts on groundwater quality are expected as a result of the Project.

Longer-term, it is possible that some local improvement in groundwater quality may occur due to increased rates of recharge into former pit areas that have been backfilled with waste. If evaporation from any water bodies that form in the residual pit voids exceeds

recharge from direct rainfall, the voids could become groundwater sinks. The balance between recharge and evaporation will depend on the relative sizes of the water surfaces (evaporation) and the void catchment areas (recharge). This balance will be dependent on the rate of ongoing deposition of washery rejects after completion of the Project, which is discussed in the Abel Project EA.

12.3.6 Potential Impacts of Tailings and Coarse Rejects Disposal

It is proposed that washery tailings and coarse rejects will continue to be deposited into abandoned open cuts on the Project Area. This will in time include the final pit voids remaining at the completion of the Project.

Water draining from the tailings deposited into the open cuts is currently making its way through old voids and directly through the coal seams into the former underground workings in the Big Ben Seam, from where it is recovered by pumping from the "Big Ben Borehole" and transferred into the water supply circuit for re-use in the washery. The tailings disposal has caused the development of a slight mound near the northern part of the Bloomfield lease and recovery from the Big Ben Bore has, in conjunction with pit dewatering, led to the formation of a pronounced cone of depression near the central southern part of the lease. This pattern is expected to continue until completion of mining.

After completion of mining at Bloomfield, the washery will continue to operate, and tailings/rejects disposal to the former open cuts will continue, and water will continue to be recycled from the tailings by recovery from the Big Ben Bore or by other means. Therefore, the current pattern of a small groundwater mound or mounds (in disposal areas) and small depression (around water recovery areas) is expected to continue. The depth of the cone of depression is expected to diminish over time, due to the cessation of dewatering pumping from the open cuts, other than for recycling of washery tailings water.

The rate of operation of the washery, and therefore the rate of backfilling of final voids, tailings and rejects disposal and water recovery, is discussed in the Abel Project EA. However, the pattern of behaviour described above is considered likely to apply.

12.4 MONITORING AND MANAGEMENT

The monitoring program currently operating at the Bloomfield mine will be continued and will be integrated with the surface water monitoring program. As required, monitoring bores will be licenced under the *Water Act 1912* and/or the *Water Management Act 2000*. Monitoring will include:

- Three monthly measurement of water levels in all piezometers;

- Six-monthly sampling of all standpipe piezometers for EC, TDS and pH;
- Annual sampling from all standpipe piezometers for physical properties (EC, TDS and pH), major cations and anions, nutrients, and dissolved metals;
- Monthly measurement of the volume of mine water pumped from the open cuts and from the former underground workings. Separate inflow rates will be monitored if two or more separate mining areas are active at any time; and
- Monthly measurement of EC and pH of mine water pumped from the open cuts.

The following response plan will be implemented in the event of significant unforeseen variances from the predicted inflow rates and/or groundwater level impacts:

- Additional sampling and/or water level measurements to confirm the variance from expected behaviour.
- Immediate referral to a qualified hydrogeologist for assessment of the significance of the variance. The review hydrogeologist would be requested to recommend an appropriate remedial action plan or amendment to the mining or water management approach. If appropriate, this recommended action plan would be discussed with DWE and other agencies for endorsement.

12.5 CONCLUSIONS

The groundwater investigations led to the following principal conclusions:

- Groundwater quality is variable, with salinity ranging from less than 1000 mg/L to more than 13000 mg/L TDS. pH is generally close to neutral.
- Groundwater is present in most lithologies in the area, but significant permeability is generally only present in association with cleat fracturing in the principal coal seams in the Permian coal measures. Groundwater levels generally fall to the east and west from a central ridge coinciding approximately with the axis of the Four Mile Creek Anticline. Water levels range from around 35 metres AHD near the central northern end of the Project Area to around 10-15 metres AHD along the eastern boundary, and around 15-20 metres AHD at the north-western corner. The groundwater levels in the Permian coal measures are unrelated to the local topography, and are frequently artesian (i.e. above ground level) in low-lying areas.
- Surficial groundwater levels in the alluvium/colluvium, probably including the thin upper highly weathered zone of the Permian coal measures, are strongly controlled by the local topography, and appear to be unrelated to the groundwater in the underlying less weathered Permian coal measures. Thus the surficial groundwater

water levels are above the Permian groundwater levels in elevated locations and below the Permian levels in low-lying areas.

- The dewatering operations at Bloomfield and Donaldson have caused noticeable cones of drawdown in groundwater levels along the southern margin of the Bloomfield Open Cut. This appears to have had negligible impact on groundwater levels in the alluvium/colluvium, or in the Permian coal measures lithologies that are stratigraphically above the zones that have been directly intersected by the open cut.
- Dewatering will continue to be required as part of the Project. The total groundwater inflow rate is predicted to average 1.4 ML/d (500 ML/yr), peaking at 2.1 ML/d (770 ML/yr) in Year 6 (during Stage 3). These inflow rates are similar to those currently occurring. Sensitivity modelling suggests that the maximum inflow rates could be between about 2.0 and 2.3 ML/d.
- Dewatering associated with the Project is predicted to impact groundwater levels in the strata above the Big Ben. Maximum drawdowns of approximately 40m are predicted in the coal measures near the southern end of the lease, but as the pit retreats to the north in later years, groundwater levels are predicted to recover to above the present (2007-8) levels even before completion of mining at Bloomfield.
- Recovery of groundwater levels after completion of mining have been assessed by 100 years of post mining simulations. Recovery modelling has predicted that groundwater levels will recover to well above current levels, and recovery will stabilise over the Bloomfield lease area within 20-30 years after completion of mining.
- Small impacts on stream baseflows are predicted to occur in Wallis Creek and Buttai Creek baseflows. No other surface streams are predicted to be impacted by the Bloomfield proposal. Modelling predicts rapid recovery post-mining.
- No adverse impacts on surface water quality are expected.
- No existing groundwater supplies are expected to be impacted.
- No adverse impacts are expected on any groundwater dependent ecosystems.

13. SOCIO-ECONOMIC ASPECTS

13.1 THE COAL MINING INDUSTRY

The minerals industry is one of the largest industry sectors in NSW, estimated by the NSW Minerals Council to produce approximately $12 billion of resources each year and with exports worth more than $8 billion. The industry annually contributes more than $1 billion to government in royalty payments and state and federal taxes. As the largest customer of the NSW rail network and the ports of Newcastle and Port Kembla, the industry also pays over $500 million to government towards the cost of these facilities as well as other service costs such as water and electricity. **Table 18** shows the strong growth of the mining industry and the taxes paid by the mining industry.

Table 18 Growth of the Australian Mining Industry

	1996-1997 ($M)	2006-2007 ($M)
Value of mining exports Australia (1)	17,937.2	62,741.0
Total tax Expense by mineral companies (2)	1,783	8,035

(1) Source: ABS 5368.0 International Trade in Goods and Services.
(2) Includes direct and indirect taxes. Source: Mineral Council of Australia-Minerals Industry Survey Report.

13.2 REGIONAL PROFILE

The Project lies wholly within the Cessnock LGA. According to the 2006 Census, the population of Cessnock LGA is 48,265. Approximately 7.7% of the population are employed in mining. This is larger than the 3.5% of the population of the Hunter Statistical Division. **Table 19** provides a comparative distribution of employment in various industry sectors in Cessnock LGA, with the state of NSW, and Australia wide. It shows that the mining, manufacturing, retail and accommodation sectors in the Cessnock economy are of greater relative importance than they are to the NSW economy in general. In addition, the local importance of coal mining is shown in the comparison of the regional economy and the national economy.

Table 19 Comparative Employment Distributions from 2006 Census

2006 Census Sector	Cessnock LGA	Australia	2006 Census Sector	Cessnock LGA	NSW
	% of population (calculated average)			% of population (calculated average)	
Coal mining	6.6	0.3	Agriculture, Forestry and Fisheries	2.3	2.7
Hospitals	3.0	3.3	Mining	7.7	0.7
Accommodation	3.3	1.3	Manufacturing	14.1	9.6
School Education	3.1	4.5	Retail	13	1.2
Cafes, Restaurants and Takeaway Services	3.9	3.6	Accommodation and Food Services	9.5	6.5

(Source: Australian Bureau Statistics www.abs.gov.au)

13.3 ECONOMIC AND SOCIAL IMPACT ASSESSMENT

The key benefits of the Project include the continuation of economic benefits to the local region and NSW associated with ongoing employment, operational expenditure and employee expenditure. The flow-on effects contribute to a range of sectors including wholesale and retail trade, accommodation, cafes, restaurants, rail and road transport, agriculture and mining machinery sector, electricity supply, and community services.

A quantification of the economic impact of Bloomfield coal mining operations on the economy of the Hunter Region was undertaken by the Hunter Valley Research Foundation (HVRF, 2008). The detailed report is provided in **Appendix J**. Bloomfield draws on the services provided by another company in the Bloomfield Group, known as Four Mile P/L. It provides engineering support services to two mines in the Bloomfield Group, Bloomfield Collieries and Rix's Creek near Singleton.

13.4 DATA AND METHODOLOGY

Data was provided from Bloomfield Colliery and Four Mile Pty Limited as a proportion of the operations of the Four Mile Pty Limited subsidiary have been included in this analysis. Any reference to Four Mile Pty Limited only refers to the proportion of activity which is attributable to the operation of Bloomfield Collieries. The information was provided based on operational expectations for 2008 which was also assumed to be typical of the future activities of Bloomfield Collieries and Four Mile Pty Limited. Although the assessment

focused on one year, the results outlined represent the annual initial and flow-on benefits that will accrue to the Hunter Region economy for each year of operation.

The analysis was based on the HVRF 2001 input output ('I-O') model of the Hunter Region economy. The I-O model was developed for the Hunter Region economy and uses multipliers to assess the impacts on the regional economy that would result from the operation of Bloomfield Collieries and Four Mile Pty Limited. The model makes assumptions that may act to reduce the extent of any impacts. These are provided in **Appendix J**.

13.5 RESULTS

Data supplied by Bloomfield Colliery shows that almost all mine employees live in the Lower Hunter, and 95% of Bloomfield Colliery suppliers are located in the Hunter Region. This direct support of the local community results in flow-on impacts as shown in **Table 20**.

Table 20 Flow-on Output Impacts of Bloomfield Collieries for 2008

Type of impact (base year = 2008)	**$M**
Multiplier impacts	
Production (Combined repairs and mining)	33.0
Consumption (Combined repairs and mining)	16.5
Total flow-on (multiplier impact)	**49.5**

As a result of the operation of Bloomfield Collieries (together with Four Mile Pty Limited) flow-on employment benefits will be generated in the regional economy from the production and consumption induced impacts. **Table 21** summarises these benefits. It should be noted that in **Section 2.4**, the number of employees of Bloomfield is given as 66, and that administration, management and washery staff, which were not include in **Section 2.4,** have been included in **Table 21.**

Table 21 Flow-on Employment Impacts of Bloomfield Collieries for 2008

Type of impact	Number of jobs
Initial – repairs (Four Mile Pty Limited)	30
Initial – mining (Bloomfield Collieries)	75
Multiplier impacts	
Production (Combined repairs and mining)	110
Consumption (Combined repairs and mining)	94
Total flow-on (multiplier impact)	204
Total output impact	**309**

(Job=one year and full-time)Total flow-on (multiplier impact)

13.6 ROYALTIES

In exchange for the right to extract minerals in NSW, royalties are paid to the Crown by the leaseholder of the mining operation. NSW legislation identifies the rate and point at which royalties are charged. Leaseholders determine the royalties owed and submit regular assessments and payments to the NSW DPI. These assessments are regularly audited by the Department.

The assessment excluded the value of royalties generated from Bloomfield Collieries as the payment of these royalties goes into Government revenue. Unlike expenditures paid to other industries, in return for the direct production of goods or delivery of a specific service, there is no clear product or service that is produced because of royalties. However, these royalties are documented as an additional benefit from the Project. The expenditure of this money by the Government will generate economic activity, but is beyond the scope of the report by HVRF to analyse the activity such revenue could generate. However, based on existing rates, HVRF predicts royalties to be approximately $3 million in each year Bloomfield Collieries operates. This rate was calculated on the coal price at the time of preparation of the EA. As royalty payments are linked to coal prices, which vary greatly over time, royalty payments from the Bloomfield Project could be lower or higher.

13.7 COMPLETION OF MINING AND REHABILITATION IMPACTS

As this Project is for the completion of mining and rehabilitation of the site, it is unlikely to result in any staff increases. This will not place additional stress on the local community for provision of additional housing/accommodation, health, education or social services.

The growth of mining sector in the region and state will ensure staff can be absorbed into other projects. The diversity of skills amongst staff will ensure they are not competing for similar jobs and will enhance reemployment opportunities. Some staff may choose to retire from the industry.

The ability of Bloomfield to complete mining operations and rehabilitate the site will provide an improvement in the visual quality of the area and reduce risks associated with erosion and sedimentation, and dust from unvegetated land. The ability to then develop the land for other purposes, including those outlined by the Lower Hunter Regional Strategy (refer to **Section 4.4.3**) will enable further economic growth for the region.

13.8 COMMUNITY ISSUES AND INVOLVEMENT

The impacts identified by community consultation related to dust, noise and lighting from the mine, and their visual amenity. The environmental issues raised by the community as part of the consultation program have been subject to specialist assessment as part of this EA. Management and mitigation activities to address each of these concerns are discussed in the relevant sections, Noise and Vibration-**Section 9**, Air Quality-**Section 10** and Visual Amenity-**Section 14**.

A range of mitigation and ongoing monitoring measures have been identified to address the predicted social impacts and issues raised by the community. Positive feedback was received regarding Bloomfield's existing community consultation process as discussed in **Section 5**. As part of the Bloomfield's ongoing community relations program, regular contact is undertaken with close neighbours and information provided in response to questions or issues raised. There is also scope for ongoing consultation with the community through the Bloomfield Colliery Community Focus Group and the distribution of the community newsletters. It is intended to prepare a newsletter for distribution on lodgement of the EA. The EA will also be placed on the Bloomfield website for public access.

13.9 CONCLUSION

The Project will continue to provide direct and indirect benefits to the local, regional and state economy. Proactive community consultation by Bloomfield Colliery will ensure minimised impact on the community from the Project. Rehabilitation of the site will enable it to be developed for other purposes including those outlined in the Lower Hunter Regional Strategy for continued economic growth for the region.

14. VISUAL AND LIGHTING ASSESSMENT

14.1 INTRODUCTION

An assessment of the visual environment including lighting was undertaken following community consultation that identified them as areas of concern. In particular, night lighting of existing operations was identified as an issue for the local community. Visual was not identified as an issue of high risk by the preliminary risk assessment. This assessment does not address the visual impacts of the washery, which forms part of the Abel Project Approval.

Visual amenity and lighting have been considered in more detail in this EA. The objectives of the visual assessment were to:

- Determine the visual qualities of the Project Area and surrounds;
- Identify viewing points around the site with the potential to view proposed operations within the site, in particular, residences or other places of public access, such as roads or public buildings or facilities, both for day and night-time operations;
- Determine the visual impact from these viewing points, in terms of scale, distance, change to landscape attributes, for both day-time and night-time operations; and
- Identify potential options to prevent, reduce or manage any identified visual impact.

The Project consists of four main visual elements:

1. The proposed open cut mining area, consisting of the active mine pits, emplacement areas, haul ramps and areas of active rehabilitation;
2. Haul road for the transportation of ROM coal from the open cut mining area to the ROM coal stockpile at the washery;
3. Access road from the open cut mining area to the workshop; and
4. The workshop area consisting of the workshop/maintenance shed, fuel farm and hard stand area for equipment storage.

14.2 ASSESSMENT METHODOLOGY

14.2.1 Visual Impact Factors

The assessment of overall visual impact took into account Visual Sensitivity and Visual Effect. Visual Sensitivity is a measure of how a change to the existing landscape is viewed by people

from difference land use areas in the vicinity of the Project. Residences generally have a higher visual sensitivity than other land uses including industrial, agriculture or transport corridors. However, the sensitivity of individual residences may range from high to low depending on:

- The screening effects of any intervening topography, buildings or vegetation. Residences with well screened views of the Project have a lower sensitivity than those with open views;
- The viewing distance from the residence to visible areas of the Project. The longer the viewing distance, the lower the sensitivity; and
- The use of the view. Residences with active visual orientation towards the Project (living rooms, verandahs etc) have a higher sensitivity than those not orientated towards it and do not make use of the views towards it.

Visual Effect is the measure of the level of visual contrast and integration of the Project with the existing visual environment. The magnitude of the visual effect is determined by:

- Screening by topography and vegetation at, or adjacent to, the proposed visually affected area;
- The level of contrast and integration between the Project and the current landscape; and
- The proportion of the view occupied by the visible area of the Project.

Generally, a high visual effect will result if a visible area of the Project has a high visual contrast to the surrounding landscape and occupies a large proportion of the field of view. A low or very low visual effect will occur is there is minimal contrast between the visible areas of the Project and the existing landscape setting.

The visual impact of the Project is determined by considering both its visual effect and the visual sensitivity of viewers in surrounding area. Using this methodology, locations A-F in **Table 22** have been assigned a Visual Impact Level.

14.2.2 Map and Field Analysis

A review of topographic maps and aerial photography was completed to illustrate the visual screening effects of topography. Vegetation is also a key factor associated with visual screening with the dominant height of the vegetation in the area between 6-10 metres. Tree cover heightens the screening effect of the topography where it occurs. All topographic considerations were field checked to ensure accuracy of location and viewing points.

14.2.3 Visibility from the East and the West

The Project Area cannot be viewed from the east due to intervening ridgelines and vegetation. A vegetated ridgeline to the west prevents close views from this direction, although some distant views from Kurri Kurri may be had to the site. These are at such a distance that it is difficult to determine the site location in the overall view. An area of Buchanan Road to the west has views of current rehabilitation occurring to the north west of the Project Area.

14.2.4 Visibility from the North

Some Louth Park, East Maitland and Ashtonfield residences to the north and north-east have views to the disturbed grassland areas that form part of the Tailings Management System that does not form part of the Project. Most views are limited by an east-west running ridgeline to RL85 (shown on **Figure 25**) which is to be retained. Some existing general site disturbance can also be viewed.

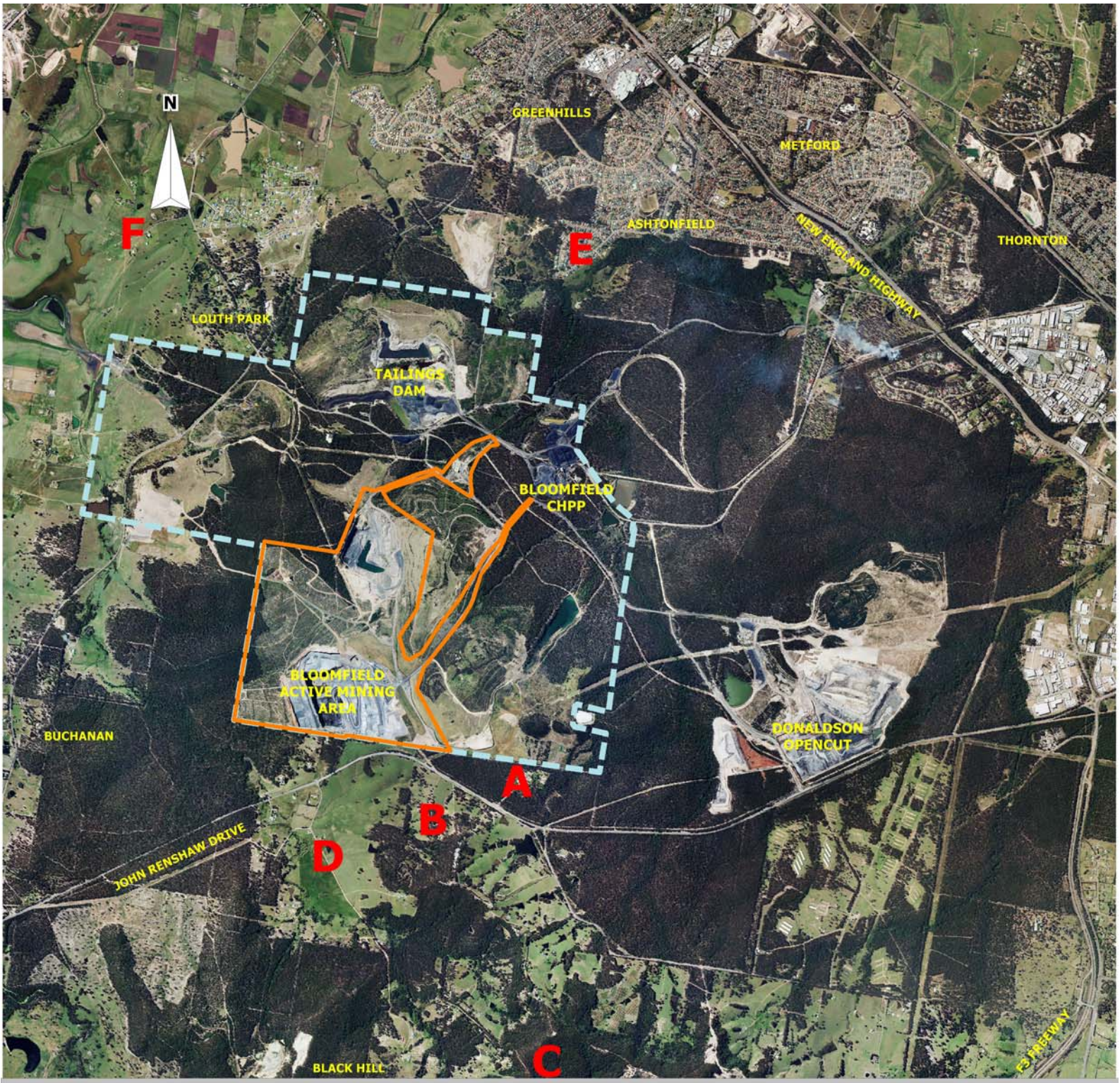
14.2.5 Visibility from the South

To the south of the existing mine boundary, rural residences are located along John Renshaw Drive, Lings Road, Black Hill Road and Browns Road. Browns Road rises to an elevation of 120 metres AHD and some residences along this road have extensive views to the north and north-east, some towards Port Stephens. They are able to view Donaldson operations. Bloomfield operations are generally screened by native vegetation and an intervening ridgeline south of John Renshaw Drive which includes Elliotts Hill. As the rehabilitation progresses, the mine operations will be increasingly screened by landform and revegetation.

Residences along Lings Road have views towards the proposed operations blocked by the vegetated Elliotts Hill which is located between the current mine and John Renshaw Drive, at an elevation of 70 metres AHD. Elliotts Hill will screen the majority of future operations from these residences, as this hill lies between the residences and the western extension of open cut operations. Residents may have minor views of some pre-stripping operations where elevation reaches 80 metres AHD. These operations will be of short duration and would not be viewed once the first level of extraction enables equipment to operate from a lower elevation within the pit.

14.2.6 Application of Study Method

For this assessment, a number of sites from the areas noted above were selected as representative viewing locations with reference to field assessment, aerial photography, topographic plans and community input. These sites are shown on **Figure 20**.



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LEGEND

- BLOOMFIELD MINING LEASE
- PROJECT APPLICATION AREA
- A VISUAL ASSESSMENT LOCATION

FIGURE 20

VISUAL ASSESSMENT SITE LOCATIONS

BLOOMFIELD COLLIERY

COMPLETION OF MINING AND REHABILITATION

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While there will be some variation in the impacts on specific viewing locations, an overall assessment of the visual impact on selected locations is considered to be representative for the majority of views.

Figure 21 to Figure 25 show photographs taken at selected locations during field inspections. These photographs were used to show current visual impact and predict impact as the Project progresses to completion.

14.3 VISUAL ISSUES

14.3.1 Landscape Setting

The landscape and visual setting of the Project Area and its surrounds is defined by undulating rural hills. Three major visual features of this landscape are the existing Bloomfield Colliery including washery and tailings dam, Donaldson Open Cut Mine and the natural feature of Elliotts Hill. There are extensive small rural landholdings surrounding the mine to the north, south and west. Residential areas of Ashtonfield are visible to the north.

14.3.2 Residential Areas (Ashtonfield)

These areas include both older and recent subdivisions in the suburb of Ashtonfield. These are generally located at the edges of urban development and viewers are likely to expect views of natural areas and bushland beyond the urban limits to be retained.

A ridgeline between the existing and proposed mining areas blocks views of potential disturbance from higher elevated residences at Ashtonfield (South Seas Drive, Tipperary Drive and Kilshanny Avenue). Residences that can view the washery and former mining areas around U Cut to the north of the Project Area will not view proposed operations due to this vegetated ridgeline, which is located within the Bloomfield Lease Area.

14.3.3 Rural Residential Areas (Black Hill Ridge)

The Black Hill Ridge area includes rural residential properties and small rural businesses which are concentrated in small groups along Black Hill Road and its side roads, such as Browns Road. Views are minimised by existing native vegetation and most residences are oriented to the north-east, whereas Bloomfield is to the north-west. Despite the prominent positions of many of the Black Hill Ridge residences in the landscape, those that may view parts of the Project would view it as part of a distant vista of established mining disturbance in the area. Views would improve as rehabilitation was completed.

14.3.4 Buttai Valley

The Buttai Valley lies south of the existing mine lease and Project Area. It is dominated by rural residential properties along John Renshaw Drive, Lings Road, and Old Buttai Road. Although views of the southern boundary of the existing mine area are minimised by existing topography and vegetation remnants, residents currently see some lights, trucks, and the active rehabilitation of the mine along the southern boundary. Similar to Ashtonfield and Black Hill, mining is an established land use in the area and, to a degree, the Buttai Valley residents would be used to seeing evidence of mining in their view. The visual impact is restricted to works along the southern boundary and will be reduced by the viewing distance and intervening topography as the existing mine moves northwards and rehabilitation occurs in the southern section of S Cut.

14.3.5 Viewers along John Renshaw Drive

Viewers along John Renshaw Drive will generally be limited to motorists. John Renshaw Drive is a State Road and provides a regional link between Cessnock and Kurri Kurri to the F3 Freeway near Beresfield, carrying significant amounts of traffic. The perceptibility of motorists is an important factor. Travelling at high speed, motorists are unable to perceive a great level of detail, particularly small elements and details. They are more likely to be sensitive to changes that affect long, horizontal elements which are more important in shaping the visual character of a road, as they can be more easily perceived as the motorist drives along the road corridor. Such elements include the stands of native vegetation along the road which take on an almost horizontal nature when seen by the motorist.

The road functions primarily as a link road and a large proportion of motorists along John Renshaw Drive would use the road to commute to work (including accessing other industrial and/or commercial facilities in the region) or to transport goods. This suggests that they would be less sensitive to changes in the visual environment than, for example, recreational users or tourists, especially to the Hunter Valley Vineyards. Views towards the mine site are restricted to works along the southern boundary which, when rehabilitated early in the Project, will block views of active mining operations as they progress northwards.

Figure 21: View North West from John Renshaw Drive Towards South Eastern Boundary of Mine Lease.

Figure 22: View of Southern Boundary of Mine Lease from Lings Road.

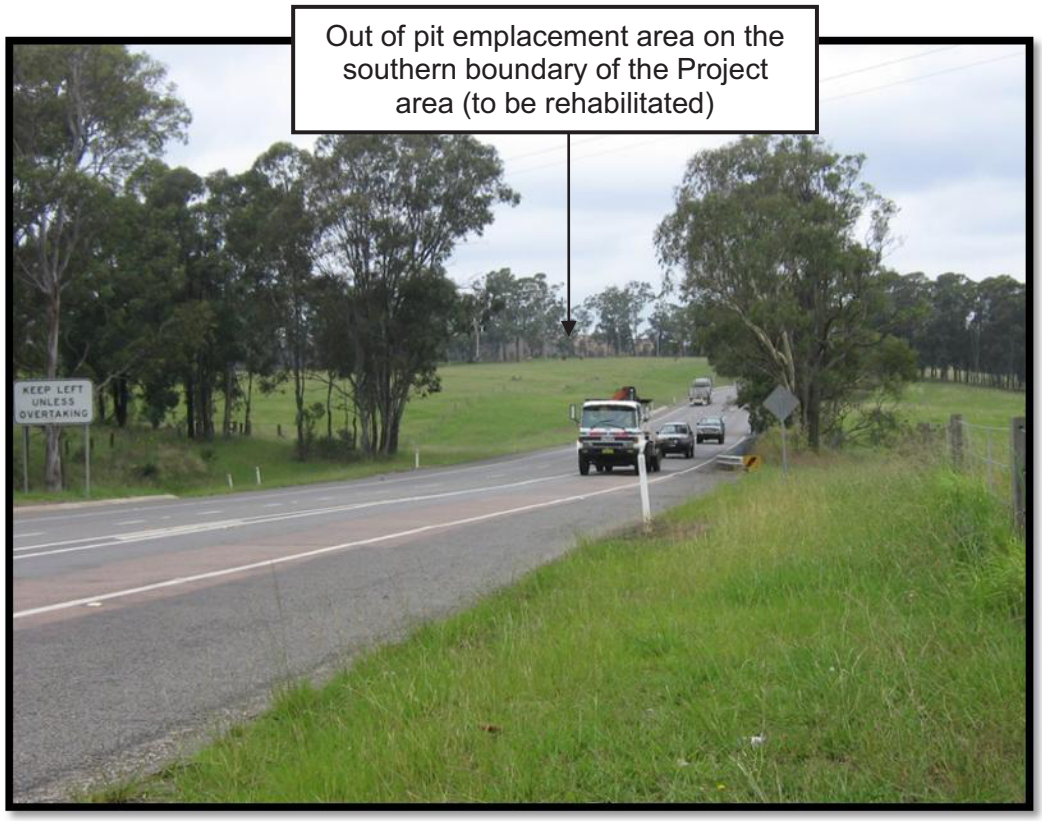


Figure 23: View North East Along John Renshaw Drive Towards Southern Boundary of Mine Lease.

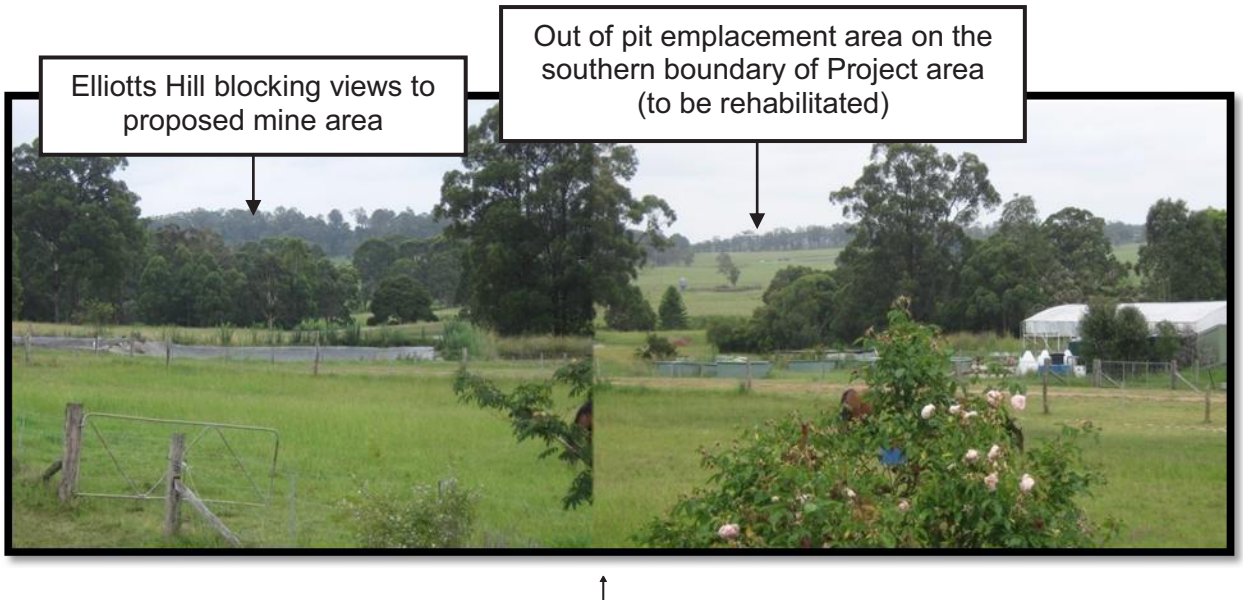


Figure 24: View North East from Property in Buttai Valley Showing Stockpiles Along Southern Boundary of Mine Lease.

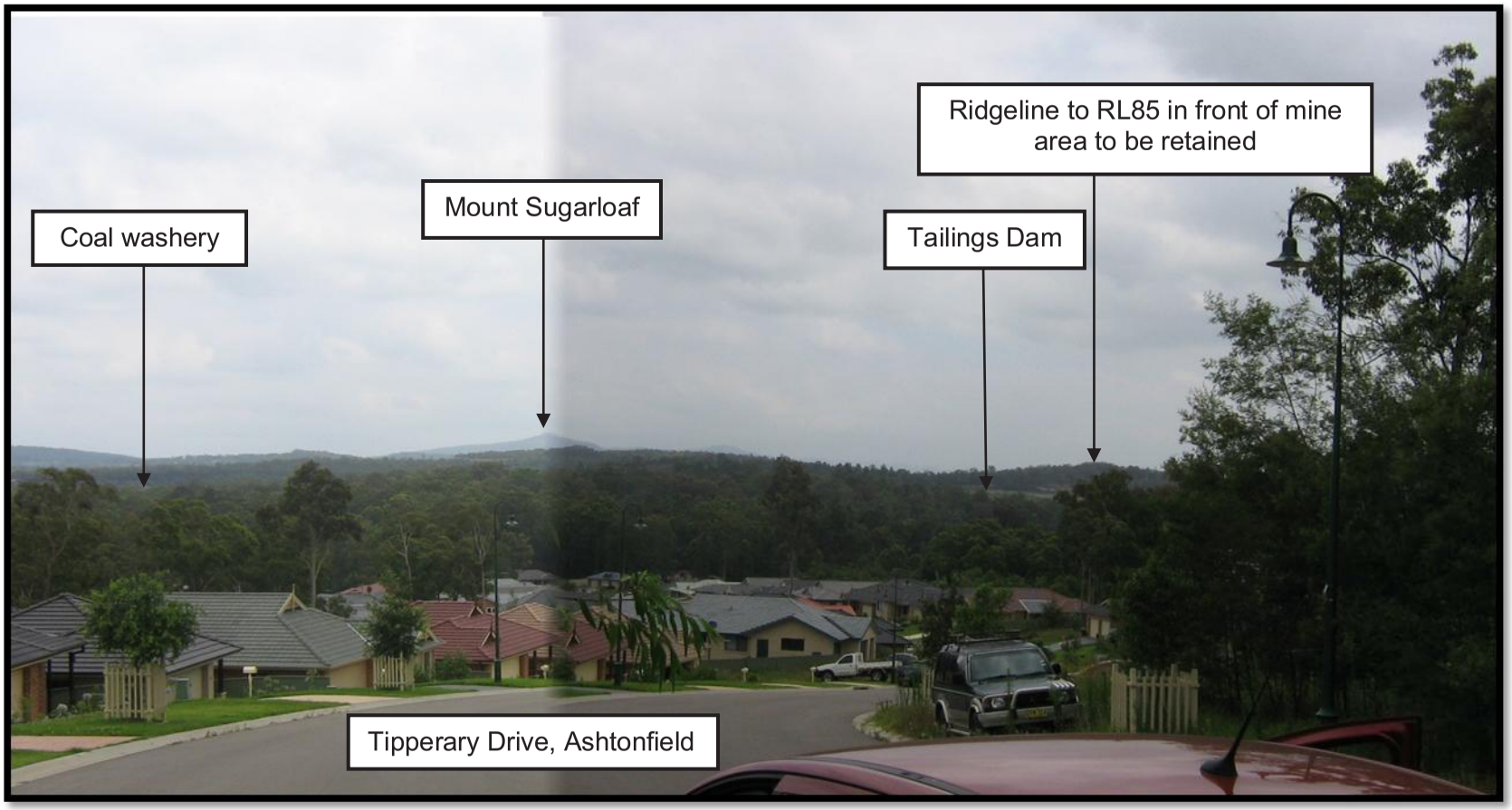


Figure 25: View South-South West from the Junction of Tipperary Drive and Kilshanny Ave, Ashtonfield.

14.4 LIGHTING IMPACTS

14.4.1 Introduction

The visual impact of lighting will be influenced by the location of operations on-site, the relative level at which the viewing location is situated and the presence of any off-site barriers such as topographic features and/or vegetation. There are two types of lighting effects.

- The first effect where the light source is directly visible and if there is a direct line of sight between a viewing location and the light source.
- The second effect relates to the general night-glow (diffuse light) that results from light of sufficient strength being reflected into the atmosphere. This type of effect will create a strong local focal point and the effect will vary with distance and atmospheric conditions such as fog, low cloud and/or dust particles which all reflect light.

14.4.2 Direct Light Effects

Locations that would have direct line of sight to night lighting for the Project Area are Buttai Valley and, at a further distance, Black Hill to the south. This will occur during the early stages of mining close to the southern boundary. Close consultation with residents and attention to the direction of fixed site lighting will reduce the impact on residents.

The visual effect of lighting associated with the Project would be at a similar level to that currently experienced. During focus group discussions, residents on the southern side of Old Buttai Road raised the issue of lighting from night-time operations shining towards their residences. This issue was immediately resolved by re-directing lighting.

14.4.3 Diffuse Light Effects

Most operational areas and machinery night lighting will not be directly visible from most locations due to the screening effect of topography and vegetation. Rather, a diffuse effect of light and its interaction with atmospheric conditions may from time to time create a glow around the Project Area. Due to the existing mining on and around the Project Area, the visual impact of the diffuse light associated with the Project will be reduced.

The diffuse night lighting effect of the Project will be similar to that which is currently experienced with the Bloomfield Colliery and would include illumination created by other nearby industrial developments.

14.5 VISUAL IMPACT ASSESSMENT

The results of the visual impact assessment of the area surrounding the Project Area are shown in **Table 22**. The Visual Impact Level is referred to as Low, or Moderate to Low.

Table 22 Visual Assessment of the Area Surrounding Bloomfield Mine

Locations (as shown on Figure 20)	Visual Impact Stages		
	Current	**During Operations**	**At Completion of Project**
A North of John Renshaw Drive	Most views prevented by trees to W-NW. Residence is approx 725m from East and South corner of Project Area, and approx 1.36km from nearest area of disturbance (overburden dump (OD)) to the NW.	Most views prevented by trees to W-NW. View of OD will diminish as OD migrates west and is progressively rehabilitated. Lights from trucks will be negligible due to height of reshaped areas.	Most views prevented by trees to W-NW. When rehabilitation is complete, visual effects will be low and become very low when informal tree and shrub planting is completed.
Visual Impact Level	Low	Low	Low
B South of John Renshaw Drive	Views prevented by trees to N-NW and topography to west. Residences are 700-800m from southern boundary of Project Area, and 800-1200m from nearest area of disturbance (OD) to the NW-NNW.	Visual impact will diminish over time as rehabilitation progresses west out of their line of sight behind Elliotts Hill. May see lights from trucks and pit.	When rehabilitation is complete, visual effects will be low and become very low when revegetation is completed.
Visual Impact Level	Low	Low	Low
C Black Hill (Browns Road)	Views prevented by trees and topography to N-NW. Residences are approx 2.8km from southern boundary of Project Area, and approx 3.1km from nearest area of disturbance (OD) to the NW.	Visual impact increases as area of OD increases.	When rehabilitation is complete, visual affects will be low and become very low when revegetation is completed.
Visual Impact Level	Low	Low	Low
D Buttai Valley (south of John Renshaw Drive)	Residences lie 580m to 1.45km from southern boundary of Project Area, and from nearest area of disturbance (OD) to the N. Can see southern extremity of OD through a thin band of mature Eucalypts along the southern boundary of Project Area. Some residences have more trees in valley between them and mine to block views.	Visual impact will diminish over time as OD and rehabilitation progresses west out of their line of sight behind Elliotts Hill. OD will be top dressed in short term and all workings will be screened by this.	When rehabilitation is complete, visual effects will be low and become very low when re-vegetation is completed.
Visual Impact Level	Moderate	Moderate-Low	Low

Locations (as shown on Figure 20)	Visual Impact Stages		
	Current	**During Operations**	**At Completion of Project**
E Ashtonfield	These residences are approx 3km from the northern boundary of the Project Area and from the nearest area of disturbance (existing washery) to the SW. Existing ridgeline intervenes.	View unlikely to change significantly as work areas screened by topography and existing vegetation.	View unlikely to change significantly as work areas screened by topography and existing vegetation.
Visual Impact Level	Low	Low	Low
F North west of Louth Park	These residences are approx 3km from the northern boundary of the Project Area and 4.5km from the nearest area of disturbance (OD) to the SE.	View unlikely to change significantly as work areas screened by topography and existing vegetation.	View unlikely to change significantly as work areas screened by topography and existing vegetation.
Visual Impact Level	Low	Low	Low

14.6 MANAGEMENT AND MITIGATION OF VISUAL IMPACT

14.6.1 Visual Impact

Ongoing rehabilitation by Bloomfield Colliery will improve the visual quality for residences with a view of the current mining operations, especially to the south of the Project Area. Residences who currently view current mining areas within the Project Area will see an improvement in visual quality as rehabilitation progress.

Priority will be given to the completion of rehabilitation along the southern boundary of the Project Area. This would reduce any potential visual impact, especially for residents in the Buttai Valley and users of John Renshaw Drive.

14.6.2 Lighting Impacts

Lighting impacts should be kept to the minimum necessary for operational and safety needs. Where possible, lights should be utilised at the lowest effective level and directed away from incoming views, in particular, Buttai Valley, John Renshaw Drive and Ashtonfield. All lighting should be directed to the ground and to within the work area and avoid being cast skyward or over long distances.

Procedures are in place to ensure lighting does not shine directly toward residences in any direction, particularly to the south. Staff and management should continue to be trained in the management of night lighting, as is currently practised. All potentially affected residences have been provided with mine contact details so that they may contact the mine and resolve any lighting issues as soon as possible.

14.7 CONCLUSION

The visual impact of the Project is considered to be low due to the limited visibility, low sensitivity of all but a few viewing locations and the short timeframe with which any visual effect can be reduced from moderate to low and eventually to very low impacts.

The proposal will greatly improve visual quality of the mine lease area as rehabilitation will re-shape and revegetate areas disturbed by previous mining operations.

15. PROJECT INTEGRATION & CUMULATIVE IMPACT ASSESSMENT

15.1 INTRODUCTION

The Bloomfield Project is integrated with components of nearby mining operations, including the Abel Mine, Donaldson Mine and Bloomfield washery. Cumulative impact, or the change in degree of impact that may occur when nearby projects are taken into consideration, has therefore formed an integral part of each assessment study undertaken for this EA.

The detailed assessment studies provided as Appendices in **Volumes 2** and **3** should be referred to for detailed information on potential cumulative impact. This section provides an overview of the results of these studies with regard to cumulative impact. Each study has concluded that, when cumulative impacts are taken into account, potential impacts remain low.

This section also discusses the management relationships between the various projects, in terms of who is responsible for the various integrated components. As shown on **Figure 26**, the Bloomfield Project Area lies within the approved Abel Project Area. This section explains this overlap and how the various components will be managed.

15.2 BLOOMFIELD AND ABEL PROJECT BOUNDARIES

Figure 26 shows that the approved Abel Project Area included land that is also within the Bloomfield Project Area. The integrated water management system that manages water across the Abel, Donaldson and Bloomfield projects formed part of the Abel Project approval and is located across all three sites. The use of the Bloomfield final voids and previous mine areas for rejects disposal from the Bloomfield washery also formed part of the Abel Project approval.

Open cut mining and rehabilitation within the Bloomfield Project Area does not form part of the Abel Approval. The completion of mining and rehabilitation, and associated activities required to undertake these actions is the subject of this current Application, referred to as the Bloomfield Project.

15.3 BLOOMFIELD PROJECT INTEGRATION

Key aspects of the Bloomfield Project that are integrated with the operations of adjacent projects include:

- Delivery of coal from the Project to the washery which also processes coal from other operations and which will continue after completion of the Project;
- Water management system components utilised by multiple operations, such as the Bloomfield, Donaldson, and Abel mines and the Bloomfield washery, with the open cut water management forming part of the overall integrated water balance;
- Provision for a final void that will be used for future management of washery reject and tailings;
- Integrated rehabilitation planning, considering the final land use proposed for multiple sites; and
- Integrated environmental monitoring program for the adjacent sites.

These aspects are described as follows, with **Table 23** providing a summary of planning approval responsibilities for the various components. In **Table 23**, the tick (√) allocates planning approval responsibility (including the satisfying of the various consent conditions) to each of the aspects described in Column 1. Responsibility is allocated either to Bloomfield as part of this Project Application, or to the Abel Project, approved by DoP in 2007 (MP 05_0139).

It is important to note that while an approval may be provided under the Bloomfield or Abel Project, commercial agreements may be made between the different entities allocating responsibilities for the actions required under those Project consents.

Table 23: Summary of Responsibilities – Relationship Between This Application and the Abel Project Approval

Project/Operational Aspect	Responsibility of this Bloomfield Application	Responsibility of Abel Project Approval (MP 05_0139)
Completion of mining at Bloomfield Colliery	√	
Bloomfield open cut coal delivery to the washery (ROM coal stockpile pad)	√	
Operation of the washery		√ (operated by Bloomfield)
Rehabilitation of Bloomfield Project mining areas	√	
Filling of Bloomfield final voids with washery reject material		√
Rehabilitation of final voids		√
Integrated Environmental Monitoring Plan		√ (some actions undertaken by Bloomfield)

15.3.1 Coal Delivery and Washery Operation

This Application includes the transport of coal to the ROM coal stockpile pad at the washery via internal haul roads. The operation of the washery (to process the coal) and management of the ROM coal stockpile pads was approved by the 2007 Abel Project Approval. The rail loading facility used to load coal for transport by rail to the Port of Newcastle also operates under the Abel Project Approval. The washery and rail loading facility are used by the various nearby mines, including the Abel, Donaldson and Tasman Mines, as well as the Bloomfield Mine.

Bloomfield currently operates the washery and rail loading facility, under the Abel Project Approval.

15.3.2 Water Management

With the exception of a sediment dam on the headwaters of Buttai Creek, introduced specifically to assist the management of water for the Bloomfield Project, the water management system that supports the existing and proposed mining at Bloomfield forms part of the Integrated Water Management System (IWMS) provided for the Bloomfield, Abel and Donaldson mines. This IWMS was approved under the Abel Project and is shown schematically on Error! Reference source not found..

The IWMS involves the management of all surface runoff and groundwater sources associated with the Abel, Bloomfield and Donaldson mines, ensuring continuous supply to

the Bloomfield washery whilst minimising discharge to Four Mile Creek from the operating areas.

Water management structures included in the Abel Project Approval and managed by Bloomfield are detailed in **Section 11.6**.

15.3.3 Final Void Management

A final void will remain on the site after completion of Bloomfield mining. Its location is shown on **Figure 10** and **Figure 12.** The final void will be used as an active disposal site for reject material from the washery, as approved by the Abel Project. The rate of backfilling of the final void, tailings and rejects disposal and water recovery, is described in the Environmental Assessment for the Abel Project. It states that rehabilitation of rejects emplacements "*will be undertaken in accordance with DPI guidelines which require the Bloomfield Mine Operations Plan, required as a condition of the Bloomfield mining lease, to provide details on proposed outcomes to be achieved through rehabilitation and final landform.*" (Donaldson Coal, 2006, p. 2-19)

Bloomfield plans to rehabilitate reject emplacement areas, once capacity has been reached, by shaping to a stable, undulating, self draining landform with mixed cover of pasture and native vegetation. These plans may in future be influenced by the needs of other projects that utilise the final void, as described in **Section 3.7**. Final void rehabilitation objectives and land use options are described in detail in **Section** Error! Reference source not found..

15.3.4 Rehabilitation

Rehabilitation of the Project Area will occur progressively throughout the life of the Bloomfield Project. Bloomfield is responsible for land rehabilitation within all parts of the Project Area, with the exception of the final void, which forms part of the Abel Project approval. An agreement between Bloomfield and Abel management will determine who undertakes final void rehabilitation. This agreement will depend on timeframes and any future plans for the site.

A detailed description of timing and schedules for the various projects and how this affects rehabilitation options is provided in **Section** Error! Reference source not found..

15.3.5 Integrated Environmental Management Program (IEMP)

An Integrated Environmental Monitoring Program (IEMP) developed as part of the Abel Project Approval has been approved by DoP and is currently being implemented as described in **Section 15.4**. Impact assessment studies undertaken for this Project and recommended monitoring regimes have considered the existing IEMP requirements.

15.4 INTEGRATED MONITORING

Bloomfield Colliery operations are included in an Integrated Environmental Monitoring Program (IEMP) that integrates monitoring stations and data between the Bloomfield, Donaldson and Abel Mines and to some degree the Tasman Underground Mine to the south. The IEMP was developed as part of the Abel Project Approval. The IEMP will be modified as necessary to take into account any additional requirements for the Bloomfield Project. The post-mining rehabilitation strategy also incorporates Abel Mine and washery requirements, as these will continue operating after the completion of the Bloomfield Project.

The aims of the IEMP are to:

- assist in the development of a sub-regional model of environmental data collection from a wider area;
- reduce duplication of monitoring on individual sites; and
- identify sensitive areas that may be between mine sites that require monitoring to enable more effective sub-regional data sets.

Data sharing across the operations provides a more accurate indication of the condition of the environment and is considered important in creating further management and mitigation measures. The increased data set is also important in determining cumulative impacts from the operations on the sub–regional environment.

The integrated monitoring equipment is operated, maintained and installed by a joint arrangement between Donaldson Coal Pty Limited and Bloomfield Collieries Pty Limited. All data from the IEMP will be made available to both parties.

The various monitoring programs that make up the IEMP have been prepared in consultation with key government departments and agencies including Department of Water and Energy (DWE), Department of Environment and Climate Change (DECC) and Maitland and Cessnock Councils.

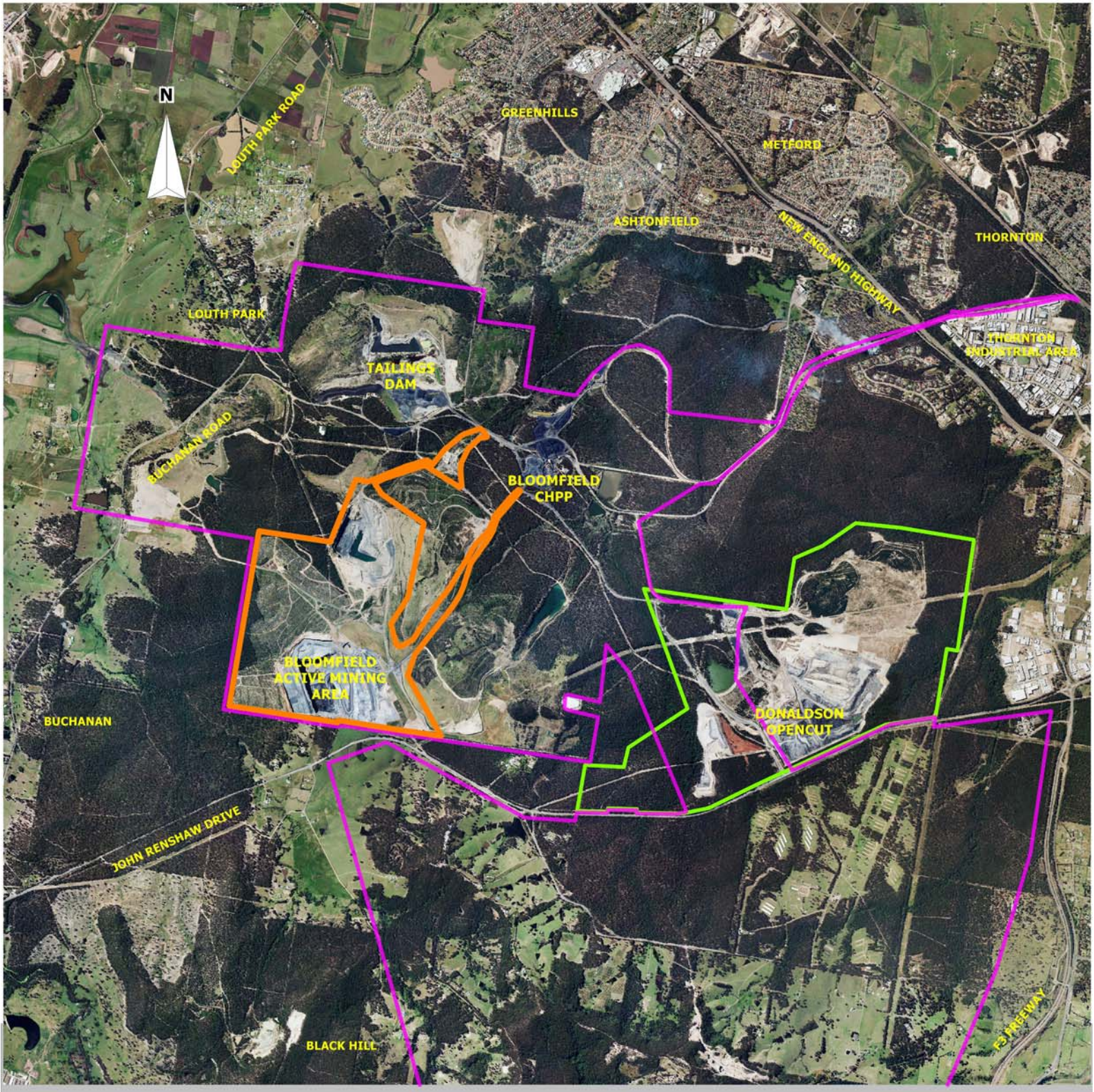
The primary objectives of the IEMP are to ensure that:

- monitoring locations provide adequate coverage when considered collectively, and are not unnecessarily duplicated;
- monitoring parameters are consistent across the sites;
- monitoring techniques are consistent across the sites; and
- monitoring frequencies are consistent across the sites, with the timing of monitoring synchronised where suitable.

Monitoring in the IEMP includes:

- Noise;
- Blasting;
- Air Quality;
- Surface Water and Groundwater;
- Meteorological;
- Flora and Fauna; and
- Aboriginal and Cultural Heritage.

Impact assessment studies and recommended monitoring regimes provided for this Project have taken into consideration existing IEMP requirements and reviewed their suitability for the Bloomfield Project, as well as any additional items that may be required.



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LEGEND

- PROJECT APPLICATION AREA
- ABEL MINE PROJECT AREA
- DONALDSON MINE PROJECT AREA

FIGURE 26

THE BLOOMFIELD PROJECT AND ADJACENT MINE PROJECTS

BLOOMFIELD COLLIERY
COMPLETION OF MINING AND REHABILITATION

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15.5 CUMULATIVE IMPACT ASSESSMENT

The following provides a summary of cumulative impact considerations for each of the impact assessment studies undertaken for the project. Details are provided in the various studies (**Volumes 2 and 3**).

The Flora, Fauna and Threatened Species Assessment took into consideration habitat requirements and ecological communities across the broader area of the Bloomfield, Donaldson and Abel Mine sites as well as adjacent landholdings. The study concluded that the Bloomfield Project would not fragment habitat as vegetation to be cleared in the eastern block is already surrounded by cleared land and the clearing in the western block would be a small portion taken out from the cleared edge. There is over 2000 ha of relatively unbroken vegetation in the vicinity of the proposed cleared area.

Although, the Project may result in the loss of 0.8 ha of the *Lower Hunter Spotted Gum – Ironbark Forest* Endangered Ecological Community (EEC), there is approximately 145 ha of this community in the immediate vicinity of the potential disturbance area and the loss of 0.8 ha would not have a significant impact on the remaining community.

The Heritage assessment concluded that, given the high levels of existing impacts within the study area and the low to very low potential for any sub-surface deposits that may be in situ or of research value, the cumulative effect of the Project on the identified and potential Aboriginal heritage resources of the region is low.

The Noise, Blasting and Vibration study included an assessment of cumulative impact from mining-related operations in the area surrounding the Bloomfield Project. This included the nearby Donaldson and Abel Mines and the Bloomfield washery and rail loading facility. The assessment of cumulative impact concluded that the Project would comply with the relevant amenity criteria set in accordance with the INP.

Air Quality modelling also addressed the presence of nearby operations and included these sources in modelling. The air quality study predicted that when the Project is combined with mining and non-mining sources, no residences would experience either dust deposition or particulate matter concentrations above the DECC's assessment criteria.

The water management systems that support the existing and proposed mining at Bloomfield are part of the Integrated Water Management System (IWMS) for the Bloomfield, Abel and Donaldson mines approved under the Abel Project Approval. The relationship between the mines is shown on **Figure 18**. The draft Surface Water Management Plan which forms part of this EA is consistent with the IWMS and is detailed in **Section 11.5**.

Analysis of potential impact of the Bloomfield Project on the IWMS and water balance indicates that the available water storage and conveyance items within the approved system are adequate to deal with any anticipated changes to water inflows to the Bloomfield pits, while maintaining supply to the washery and minimising discharge to Four Mile Creek. Accordingly, the proposed Project activities can be undertaken without the need to alter the existing approved water management facilities or water management regime.

The predictive groundwater modelling addressed cumulative impacts from the Project by considering the nearby Donaldson and Abel Mines in the overall groundwater model. Predicted impacts were generated by the model for the period up to the completion of mining, and then for a post-mining period of 100 years. It was concluded that:

- The combined effects of Bloomfield, Donaldson and Abel are predicted to have small impacts on stream baseflows in Wallis and Buttai Creeks;
- No adverse impacts on groundwater quality are expected;
- It is possible for some local improvement in groundwater quality in the longer term;
- The recovery model run shows that ultimately groundwater levels will stabilise at levels well above the 2006 levels;
- The predicted drawdown impacts on the surficial aquifer are not expected to have any adverse impact on groundwater dependent ecosystems;
- Post-mining, groundwater levels in all model layers are predicted to recover to levels higher than current (2007-2008) levels as after completion of mining at Abel (some years after completion of Bloomfield), the groundwater levels will recover not just from the impacts of mining during the period modelled in this study (2007 to 2017), but also from the significant effects of past mining as well.

The cumulative visual impact of the Project on the surrounding area was considered. It was concluded that potential visual impact remained low when considered with nearby operations, as the Bloomfield Project is part of an existing mine adjacent to other mining operations and is shielded by vegetation or landform from many locations. Completion of the Project will greatly improve visual quality of the mine lease area as rehabilitation will re-shape and revegetate areas disturbed by previous mining operations.

The design of the Project has addressed each of the Ecologically Sustainable Development (ESD) principles, and it is concluded that the Project will achieve a sustainable outcome for the local and regional environment.

16. PROJECT ALTERNATIVES

16.1 INTRODUCTION

The Project description provided in this EA was developed after consideration of various alternatives. A description of these alternatives, together with reasons for their rejection or adoption is provided in this Section.

Bloomfield Colliery has been operating for a long period of time and therefore its options for alternative mine layouts, methods and transport are limited by its existing infrastructure (**Section 2.7** and **Figure 2**) and the remaining coal resource (**Section 2.2.** and **Figure 4**).

Use of existing infrastructure (such as the workshop) is a key part of the Project. Using existing infrastructure is more economical and reduces impacts that may be associated with additional clearing and construction.

16.2 ALTERNATIVE MINE METHODS, LAYOUTS AND SCHEDULING

This Project is for the continuation of mining on the Bloomfield site and as such no new mining methods are proposed to be used. Current or similar equipment (**Section 2.6**) will be used as it is available on site, is capable of providing the necessary mining service and existing staff (**Section 2.4**) are trained in its maintenance.

As **Figure 4** illustrates, the main coal reserves remaining within CCL761 are within and to the west of the existing pit operations. The area to the west was previously planned for future mining and has generally been cleared of vegetation. Areas to the east have previously been mined and rehabilitated. Areas to the north, around the tailings area, have previously been mined and will be rehabilitated after tailings and reject emplacement is complete. **Figure 2** shows that CCL761 includes an area to the west of Buchanan Road. Sections of this area have previously been mined by underground operations and remaining economically recoverable coal reserves are limited.

The Project Area has been selected after discussions with DPI and includes the remaining coal reserves on CCL761 that are recoverable under current economic conditions.

It is proposed to mine a number of coal seams from the surface to and including the Big Ben Seam. These seams can be most economically mined by open cut methods, and the mining method to be used will be that currently used on the site. The Rathluba Seam lies beneath the Big Ben Seam as shown on **Figure 5**. The ratio of interburden to coal between the base of the Big Ben and the Rathluba is such that open cut methods are not currently feasible.

Bloomfield has previously mined the Rathluba Seam by underground mining methods and these proved not to be economically viable. There are no current plans to mine the Rathluba Seam by either mining method.

The proposed mine plan, which extends S Cut operations to the west and north, eventually joining up with Creek Cut, was selected as it is the most efficient method of mining the last remaining economically viable coal seams on the site. The selected mine plan also provides for one final void at Creek Cut, instead of two final voids. Mining in the western extension of S Cut is to the uppermost Buttai Seams. All seams are present in this area however, the Big Ben Seam has previously been worked by underground mining and pillar extraction has been undertaken.

This Project aims to extract up to a maximum of 1.3 mtpa ROM coal over a period of approximately ten years. This rate is the same or similar to historical operations. More rapid extraction could be undertaken to remove more material per year, thereby completing mining on the site over a shorter timeframe. Bloomfield, however, blends coal from both the Bloomfield operations and Rix's Creek Mine (located near Singleton) to meet market specifications. Rix's Creek and Bloomfield are both multi seam, open cut mining operations with varying coal qualities and yields.

The scheduling of coals to be mined from the various locations in the Bloomfield mine plan is designed to provide flexibility to meet changes in coal quality from Rix's Creek and/or changes in market requirements. As minor variations to the sequencing and scheduling of mining blocks may be required over the life of the Project to meet individual shipments and fulfill Bloomfield and Rix's Creek market volume and quality obligations, a maximum annual ROM coal tonnage has been provided for the purposes of impact assessment.

16.3 ALTERNATIVE TRANSPORT METHODS

Overburden is currently removed from the pit via dump truck and placed on emplacement areas which are then shaped and rehabilitated. Coal is removed from the pits by the coaling fleet and transported via an internal haul road to the ROM coal stockpile at the Bloomfield washery. It is proposed to continue using this method and the existing haul road, with some extensions to enable pit access in the northern areas. This haul road provides direct access to the ROM coal stockpile and its impact in terms of noise and dust has been modelled and considered to have minimal impact outside the Project Area (**Sections 9.9** and **10.8** respectively).

An alternative to this current transport method would be to provide an in-pit crushing system feeding a conveyor that transports coal to the ROM coal Stockpile pad at the washery. This would require Bloomfield to maintain a central extraction point, which is not possible as

Bloomfield requires flexibility in extraction areas due to the multi-seam environment and varying coal quality requirements.

16.4 REHABILITATION AND FINAL LAND USE CONSIDERATIONS

Rehabilitation methods have been developed in accordance with standard industry practice and policy. Consideration of final land use is influenced by the needs of the various government stakeholders, objectives of the Lower Hunter Regional Strategy, which identifies future potential land uses for the site and its surrounding area, and also the requirements of the landowner via the Commercial Lease. These factors are discussed in **Section 3.6.1**.

A range of alternative final landforms and land uses for the Project Area have been considered by Bloomfield, with several being investigated in detail in the past either by Bloomfield or the landowner. Consideration of these alternatives in view of the various stakeholder requirements or recommendations is provided in **Section 3.6.1.** Consideration of the options for final land use of residential, industrial, open forest/bushland or undulating grazing land/rural landscape are detailed in **Section 3.6.2**.

After consideration of the options for a final post-mining landform and land use, the preferred plan is one that rehabilitates the site in a way that it will be suitable for a variety of future land uses whilst enabling the most likely long-term retention of habitat areas. This is detailed in **Section 3.6.3**.

The various rehabilitation plans and procedures prepared for the Abel, Donaldson and Bloomfield projects need to consider the plans and procedures of each project so that they are compatible. The integration of rehabilitation systems and plans that are approved for use or have been prepared for the various projects, and how they interact and are compatible are described in **Section 3.7**.

As detailed plans for the site in relation to the Strategy have not yet been released, the site will be rehabilitated to a standard acceptable to DPI and the landowner. Alternative land uses were therefore not considered for this EA, but may be in future in response to the requirements of detailed Strategy Plans or changed requirements by the land owner.

17. ECOLOGICALLY SUSTAINABLE DEVELOPMENT

17.1 INTRODUCTION

Australia's National Strategy for Ecologically Sustainable Development ('NSESD'), endorsed by all Australian jurisdictions in 1992, defines Ecologically Sustainable Development ('ESD') as:

"using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased." (Australian Government, 1992)

The core objectives of NSESD are:

- To enhance individual and community well-being and welfare by following a path of economic development that safeguards the welfare of future generations;
- To provide for equity within and between generations; and
- To protect biological diversity and maintain essential ecological processes and life-support systems.

For a Project to achieve ESD outcomes consistent with the objectives stated above requires the integration of short and long-term economic, social and environmental effects in all decision-making relating to the Project. Thus, to be consistent with ESD principles, "*resources not only need to be used sustainably, but how they are used, who benefits and when, along with the impacts of their use, all need to be evaluated*" (Fletcher, 2002).

NSESD's widely accepted principles underpinning the consideration of economic, social and environmental effects are:

- The precautionary principle - if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;
- Social 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;
- Conservation of biological diversity and ecological integrity – a full and diverse range of plant and animal species should be maintained; and
- Improved valuation, pricing and incentive mechanisms – these mechanisms would enable environmental factors to be included in the valuation of assets and services.

The Hunter and Central Coast Regional Environmental Management Strategy ('HCCREMS'- refer **Section 4.4.5**) is a regional initiative to facilitate a regional approach to ESD. The Strategy:

- provides a framework for coordinated action in relation to environmental management issues impacting on the region;
- addresses those environmental and natural resource issues that are best managed at a regional scale (e.g. biodiversity conservation and water quality management are key issues requiring a broad management approach that transcends arbitrary institutional boundaries); and
- facilitates regional partnerships and resource sharing to address key environmental management issues in a coordinated, pro-active and efficient manner.

The following sections address each of the NSESD's principles as they relate to the Bloomfield Project.

17.2 THE PRECAUTIONARY PRINCIPLE

17.2.1 Introduction

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 this EA, specialist consultants examined the existing environment, predicted possible impacts and recommended controls, safeguards and/or mitigation measures to ensure that the level of impact would satisfy statutory requirements and/or reasonable community expectations. An anticipatory approach to impacts was adopted, particularly for irreversible ecological damage, by undertaking an analysis of the risks posed by the Project and providing an appropriate level of research and baseline investigation. The controls, safeguards and/or mitigation measures have therefore been planned with a comprehensive knowledge of the existing environment and any potential risk of environmental degradation posed by the Project.

The implementation of the environmental safeguards, controls and mitigation measures is presented as the draft Statement of Commitments in **Section 18**. Best practice scientific modelling has been used for all studies to predict potential impacts. Assessment studies for all key issues for the Project have included measures to prevent environmental degradation, based on 'worst case' scenarios. An Integrated Environmental Monitoring Program ('IEMP') (**Section 17.5.3**) will monitor actual impacts for comparison against predicted impacts, and the management plans and mine plans will be adjusted accordingly if it is found that actual impacts differ from predictions.

17.2.2 Objectives of the Project

The Project has been designed to continue operations in a safe and environmentally responsible manner, and one which meets the requirements of local and State government agencies, accepted industry standards and reasonable community expectations. Bloomfield recognises that only through comprehensive environmental assessment and an environmentally responsible approach can the risk of harm to the environment be minimised.

17.2.3 Design of Project Components

Several design aspects of the Project were modified during the planning stage in order 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:

- Surface water – additional sediment control measures were included;
- Noise and vibration equipment and operational methods were selected to achieve acceptable noise and vibration outcomes;
- Out-of-pit emplacement areas have been designed to provide visual screening of the site from the residents;
- The post mining landform will be designed to provide for the re-establishment of land suitable for agriculture whilst integrating the requirements of the HCCREMS (**Section 4.4.5**) and the Lower Hunter Regional Strategy ('LHRS') (**Section 4.4.3**).

17.2.4 Integration of Safeguards and Procedures

The framework for ongoing environmental management, operational performance and rehabilitation of the Project Area will be provided through the Project approval and be managed in accordance with the DPI Mining, Rehabilitation and Environmental Management Process, both of which involve input from relevant State and local government agencies. Plans will be periodically updated and will include any required monitoring and review results. In addition:

- All on-site procedures will be regularly reviewed, in response to monitoring results, if required;
- Surface water, groundwater, noise and vibration, and air quality will be monitored to ensure continued compliance with goals outlined in this EA; and
- The principles outlined in the surface water management plan will be adopted to minimise any impact on water quality or quantity exiting the Project Area. Wherever

possible, areas not required for mining or associated activities will remain grassed to assist in minimising erosion and reducing the sediment load in surface water flows.

17.2.5 Rehabilitation and Subsequent Land Use

Long term adverse impacts on the local environment will be avoided through the design and rehabilitation of a landform suitable for the establishment/maintenance of pasture and trees with an option for future development as described by the LHRS.

17.2.6 Conclusion

The precautionary principle has been considered during all stages of the design and assessment of the Project. The approach adopted, i.e. initial assessment, consultation, specialist investigations and safeguards design, provides a high degree of certainty that the Project will not result in any major unpredicted impacts.

17.3 SOCIAL EQUITY

17.3.1 Introduction

This principle embraces concepts of justice and fairness to ensure that the basic needs of all sectors of society are met and there is a fair distribution of costs and benefits to the community. It includes both intergenerational (between generations) and intragenerational (within generations) equity considerations. Intragenerational equity requires that the economic and social benefits of the development be distributed appropriately among all members of the community. Intergenerational equity requires the present generation to ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.

Both elements are addressed through the Project's design, the implementation of operational safeguards to mitigate any short-term or long-term environmental impacts, and the rehabilitation of the Project Area.

The assessment of each key issue included consideration of protecting the existing environment to conserve it for current as well as future generations. Rehabilitation will enhance the Project Area and improve its environmental health and productivity.

17.3.2 Identification of Project Objectives

The Project has been designed with the objective to ensure the continued viability of surrounding land uses throughout and beyond the life of the mine. The Project will continue

to provide employment opportunities to residents of the Lower Hunter Region. The economic and social flow-on effects of the mine are discussed in **Section 13**.

17.3.3 Design of Project Components

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

Proposed management and mitigation strategies will ensure that any disturbance to the *Lower Hunter Spotted Gum - Ironbark Forest* EEC (**Section 7.6** and **Figure 16)** is minimised, and Aboriginal heritage items are managed in accordance with the Aboriginal Heritage Management Plan ('AHMP') (**Section 8.8**).

The availability of groundwater to surrounding landholders, although not predicted to be affected by the Project, will be monitored throughout the life of the mine. Rehabilitation has been designed to return the land to a stable landform similar to pre-mining conditions.

17.3.4 Integration of Safeguards and Procedures

Bloomfield recognises that members of the local community should benefit from the Project either directly or indirectly. In order to ensure a realistic distribution of benefits, Bloomfield will continue to consult with the local community and maintain a pro-active approach to issues of interest under its existing Complaints Protocol (**Section 2.8**).

17.3.5 Rehabilitation and Subsequent Land Use

The post mining landform will be shaped and rehabilitated following the Rehabilitation Management System (**Section 3**) to create a land capability similar to that prior to mining, with an option for future development in accordance with the LHRS (**Section 4.4.3**), or others, thereby providing the basis for continuing economic activity.

17.3.6 Conclusion

The Project will continue to contribute to the economic activity of the Lower Hunter Region and surrounding communities through the continuation of employment and continued demand for local goods and services and flow-on effects. As such, the benefits will continue to be distributed throughout the wider community. The Project will ensure that elements of the existing environment available to this generation, including agricultural land, water and local biodiversity will continue to be available to future generations. Bloomfield will continue its pro-active approach to identifying and addressing any concerns identified by the local community.

17.4 CONSERVATION OF BIOLOGICAL DIVERSITY AND ECOLOGICAL INTEGRITY

17.4.1 Introduction

It is important that developments do not threaten the integrity of the ecological system as a whole or the conservation of any threatened species or community in the short or long term. Conservation of biological diversity and ecological integrity has been considered by the flora and fauna assessment for the Project, which concludes that potential impacts on flora and fauna will be minimal with the implementation of the daft Land Disturbance Management System (**Section 2.8**) and other recommended mitigation measures.

17.4.2 Identification of Project Objectives

Bloomfield is committed to undertaking activities in an environmentally responsible manner, and recognises the need to ensure that changes to natural components of the environment do not adversely affect biological diversity or ecological integrity. As such, the Project has been designed to incorporate measures that will minimise impacts on any flora and fauna in the Project Area, whilst allowing the extraction of an economically viable resource, and ultimately result in improvements in the extent of vegetation habitat available, through progressive rehabilitation by the Rehabilitation Management System (**Section 3**).

17.4.3 Design of Project Components

Bloomfield has provided for the conservation of biological diversity and ecological integrity through the following design elements:

- Surface water management structures have been designed to ensure that any water discharged into Four Mile Creek is within DECC licence criteria;
- Minimisation of dust from roads under the Mine Transport Management Plan (**Section 2.8**);
- The placement of overburden avoid disturbance to areas of previously uncleared native vegetation;
- The use of existing internal roads will minimise disturbance to native vegetation and existing rehabilitated areas;
- Progressive rehabilitation of the Project Area following the MOP and Rehabilitation Management System (**Section 3**); and
- Precautions to prevent oil and fuel spills under Fuel and Bulk Oil Delivery Procedures (**Section 2.8**).

17.4.4 Integration of Safeguards and Procedures

Bloomfield will implement the following safeguards and procedures to maximise the conservation of biological diversity and ecological integrity on and surrounding the Project Area:

- Draft Land Disturbance Management System (**Section 2.8**);
- Post-mining rehabilitation of the Project Area as per **Section 3**;
- Monitoring will be undertaken throughout the Project in accordance with various management plans including the IEMP (**Sections 2.8** and **2.12**); and
- Weed eradication programs will be continued and, if required, expanded.

17.4.5 Rehabilitation and Subsequent Land Use

The post mining landform has been designed to provide for sustainable vegetation cover but with an emphasis upon the requirements of the owner and to allow for development in accordance with the LHRS (**Section 4.4.3**).

17.4.6 Conclusion

The Project addresses the principle of conservation of biological diversity and ecological integrity through:

- The minimisation of disturbance to areas of native vegetation including the *Lower Hunter Spotted Gum – Ironbark Forest* EEC;
- Water and air quality maintenance;
- Implementation of Bloomfield's existing Pre-clearance protocol;
- Weed eradication programs as appropriate; and
- Rehabilitation of the site post mining.

17.5 IMPROVED VALUATION AND PRICING OF ENVIRONMENTAL RESOURCES

17.5.1 Introduction

This principle requires that environmental factors be included in the valuation of assets and services, including the need for pollution generators to be responsible for the cost of containment, avoidance and abatement. It also addresses the need for full life cycle

costings for goods and services to be considered and establishing cost effective and incentive-based mechanisms to develop solutions and responses to environmental problems.

17.5.2 Identification of Project Objectives

Bloomfield's principal objective is to operate in a profitable, safe and environmentally responsible manner, which demonstrates that an appropriate value has been placed on elements of the existing environment.

17.5.3 Design of Project Components and Integration of Safeguards and Procedures

The Project includes actions to contain pollution on site. These actions and related costs involved in rehabilitation and waste management form part of the Project and will be required as part of the new Mining Lease.

Bloomfield is part of an Integrated Environmental Monitoring Program that will provide improved monitoring across the Tasman, Abel, Donaldson and Bloomfield Mines and reduce costs associated with monitoring and reporting.

Where possible, Bloomfield will utilise innovative opportunities to prevent or mitigate environmental impacts, for example, by maximising recycling, investigating fuel efficiencies of existing fleet and investigating new technologies that may come about during mining to determine whether they can provide better environmental protection or management.

17.5.4 Rehabilitation and Subsequent Land Use

The design of the post mining landform to integrate current and future uses consistent with LHRS and LHCCREMS illustrates the value placed by Bloomfield and the landowner on future agricultural, economic and ecological elements of the Project Area.

17.5.5 Conclusion

The value placed by Bloomfield on environmental resources is evident in the identification of Project objectives, extent of site-specific research, planning and environmental safeguards and measures to be implemented to prevent irreversible damage to the environment on and surrounding the Project Area.

17.6 ESD CONCLUSION

The approach taken in planning the Project has been multi-disciplinary, involving consultation with potentially affected local residents and various government agencies and

emphasis on the application of safeguards to minimise potential environmental, social and economic impacts.

The Project will continue to employ approximately 66 people and create significant royalties and taxes for the NSW Government. The selected mining process incorporates a range of measures to protect, mitigate and manage environmental impacts.

A risk assessment process has been used to identify all activities associated with the Project and their potential environmental impacts. Mitigation measures and controls have been identified and applied to these activities, and a resulting environmental risk rating applied to determine the key project issues. Studies on these key issues have been completed to determine potential impacts and develop mitigation and management strategies. All studies predict that any impacts will not be significant and that the risk of environmental impact will be low. Studies will continue to be updated through further investigation and monitoring to ensure predictions remain accurate.

The Project has key features that provide a unique Lower Hunter Region opportunity to remove high grade coal with minimal environmental impact. These are:

- The use of existing Mine infrastructure (CHPP, roads and workshop as per the Abel Project Approval) and areas of disturbance to minimise surface impacts;
- The majority of Project Area has previously been disturbed with only 1.7 ha of remnant vegetation to be cleared; and
- An Integrated Environmental Monitoring Program to monitor potential impacts over a wider area, with greater data sharing and management to assist in providing a more comprehensive regional data set for items such as air and water quality.

The mine plan was designed to include the needs of the landowner and to also be compatible with the LHRS and LHCCREMS planning strategies for future land use.

This Project offers a unique opportunity to extract coal with minimal site environmental impacts, whilst minimising new surface disturbance and maximising the efficient use of existing surface facilities so additional facilities with associated environmental impacts do not need to be constructed.

The implementation of the environmental safeguards, controls and mitigation measures is presented as the draft Statement of Commitments in **Section 18**. The design of the Project has addressed each of the ESD principles, and on balance, it is concluded that the Project achieves a sustainable outcome for the local and wider environment.

18. DRAFT STATEMENT OF COMMITMENTS

The Director-General's Requirements for the Project state that the Part 3A Environmental Assessment shall include a draft Statement of Commitments outlining the measures proposed by the Company for environmental management, mitigation and monitoring measures for the Project.

The following draft Statements provide a summary of the Project commitments made by Bloomfield throughout the EA documentation. The first column provides a draft Statement of Commitments reference number, with the third column providing a reference to which section of the EA the draft Statement is discussed in more detail.

REF.	COMMITMENT	EA SECTION No. (Refer for further detail)
1.	**General**	
1.1	Bloomfield Collieries Pty Limited ('Bloomfield') will carry out the proposed development generally in accordance with this Part 3A Environmental Assessment ('EA'). If there is any inconsistency between this draft Statement of Commitments and the EA, the draft Statement of Commitments will prevail to the extent of the inconsistency.	1.4
1.2	Bloomfield will undertake mining within the Project Area, as defined by Figure 2 of the EA. The Project Area includes the following items and their associated mining activities: • The current and proposed active open cut coal mining areas; • The unshaped and shaped overburden dump areas within the Project Area; • The workshop and surrounding area used for maintenance and fuel storage; • The road linking the current and proposed coal mining areas with the ROM coal stockpiles adjacent to the coal washery; and • The road linking the current and proposed coal mining areas to the workshop.	1.1, 2.1

REF.	COMMITMENT	EA SECTION No. (Refer for further detail)
2.	**Production**	
2.1	A maximum of 0.88 mtpa ROM coal will be mined from the Bloomfield Mine during Stage 1 with a maximum of 1.3 mtpa ROM coal mined during Stages 2 to 4.	2.5
2.2	Active mining will occur over 4 stages, which total approximately 10 to 12 years. The final (5^{th}) stage is the completion of site rehabilitation.	2.5
2.3	All Run-of-Mine ('ROM') coal will be transported by internal haul roads to the approved ROM coal stockpiles at the Bloomfield washery.	2.6.1
3.	**Hours of Operation**	
3.1	Bloomfield Mine will operate 24 hours per day, seven days per week.	2.4
4.	**Rehabilitation**	
4.1	All site rehabilitation, including monitoring and maintenance will be undertaken in accordance with procedures documented in the EA and the existing Bloomfield Rehabilitation Management System.	3.2
4.2	Any additional rehabilitation requirements and plans for this Project will be included in the existing Bloomfield Rehabilitation Management System.	3.2
4.3	Land that has been mined will be rehabilitated to a safe and stable form with a land capability similar to that existing prior to mining, and with a landform compatible with the surrounding landscape.	3.3.2
4.4	Post mining landform and land use plans will be developed in consultation with the landowner and with reference to the objectives of the Lower Hunter Regional Strategy (DoP, 2006).	3.6.1

REF.	COMMITMENT	EA SECTION No. (Refer for further detail)
5.	**Final Void**	
5.1	The final void will be retained for the deposition of washery reject material in accordance with the Abel Project Approval.	3.5
6.	**Environmental Management Systems and Plans**	
6.1	Bloomfield's existing environmental management systems, plans and procedures will be applied to this Project and will be amended where relevant to incorporate additional items required to manage, mitigate, or monitor impacts associated with this Project.	2.8, 2.11, 3.2
7.	**Environmental Monitoring and Reporting**	
7.1	Bloomfield will undertake ongoing environmental monitoring as detailed in this EA.	2.8
7.2	Bloomfield will implement and participate in the actions required for the Integrated Environmental Monitoring Program ('IEMP') that forms part of the Abel Project Approval and which includes elements of the Bloomfield Project.	2.8, 2.12, 15.2
7.3	An Annual Environmental Management Report ('AEMR') will be prepared and forwarded to relevant government departments, including DoP. The AEMR will include a summary of all monitoring undertaken during the year, including a discussion of any exceedances and responses taken to ameliorate these exceedances.	4.3.2
8.	**Consultation**	
8.1	Bloomfield will continue to consult with the local community throughout the life of the Project.	5
8.2	A specific representative of Bloomfield will be nominated and contact details provided so that members of the community may contact the mine with questions or complaints if required.	5
8.3	A record of any complaints received regarding the Project will be retained by Bloomfield for the duration of the Project.	2.8

REF.	COMMITMENT	EA SECTION No. (Refer for further detail)
9.	**Flora and Fauna**	
9.1	A Flora and Fauna Management Plan will be developed and implemented prior to any clearing occurring as part of the Project.	7.6
9.2	The existing Bloomfield pre-clearance protocol will be implemented prior to any clearing occurring as part of the Project.	7.6, 7.7
9.3	Bloomfield will commit to commensurate support of a relevant DECC approved research program in response to the loss of any *Lower Hunter Spotted Gum Ironbark Forest Endangered Ecological Community* in the Project Area.	7.6, 7.7
10.	**Aboriginal Heritage**	
10.1	An Aboriginal Heritage Management Plan ('AHMP') will be prepared in consultation with the registered Aboriginal stakeholders (Mindaribba LALC, Lower Hunter Wonnarua Council and Awabakal Traditional Owners Aboriginal Corporation) prior to any Project impacts occurring. This Plan will specify the policies and actions required to mitigate and manage the potential impacts of the Project on Aboriginal heritage. The plan will include: • Procedures for ongoing Aboriginal consultation and involvement; • Mitigation measures for the identified and potential Aboriginal evidence; • Management procedures for any previously unrecorded evidence or skeletal remains; • Cultural awareness training for relevant staff and contractors; and • Review of the plan.	8.8

REF.	COMMITMENT	EA SECTION No. (Refer for further detail)
10.2	The AHMP will include a program of salvage to be undertaken in the Project Area with representatives of the registered Aboriginal stakeholders (Mindaribba LALC, Lower Hunter Wonnarua Council and Awabakal Traditional Owners Aboriginal Corporation) collecting identified stone artefacts from sites B2, B16, B18, B19, B20 and B22 prior to any development impacts occurring.	8.8
10.3	Should any skeletal remains be detected during the Project, work in that location will cease immediately and the finds will be reported to the appropriate authorities, including the Police, DECC and Mindaribba LALC.	8.8
10.4	In the event that Aboriginal objects are located during the Project, a protocol to ascertain the value of such finds, in consultation with the Aboriginal community representatives and a qualified archaeologist will be implemented and used to inform any management decision. DECC will be informed of any finds using the appropriate site recording cards.	8.8
10.5	Further consultation with and continued involvement of the registered Aboriginal stakeholders will be continued through the Project, in relation to the contents and recommendations of Aboriginal Heritage studies.	8.8
10.6	An Aboriginal Cultural Education Program will be developed and delivered as part of the induction of personnel and contractors involved in any construction activities on the site. This program will be developed in collaboration with the Aboriginal community and incorporated into the AHMP.	8.8
11.	**Noise Management and Monitoring**	
11.1	A Noise Management Plan will be prepared and implemented for the Project. The Plan will include mitigation and monitoring requirements for the Project.	9.2
11.2	The following noise controls will be implemented to achieve noise criteria identified in this EA: During Year 1 (End of Stage 1): • The excavator and dump site will be situated in a	9.5

REF.	COMMITMENT	EA SECTION No. (Refer for further detail)
	shielded location during night-time operation; • No dozer operation at the drill location will occur during night and morning shoulder periods; and • The front end loader will replace the dozer at the dump site during the night-time period unless 4 dBA of noise suppression is achieved. During Year 5 (End of Stage 2): • The excavator and dump site will be situated in a shielded location during night-time operation; • No dozer operation at the drill location will occur during night and morning shoulder periods; and • The front end loader will replace the dozer at the dump site during the night-time period unless 4 dBA of noise suppression is achieved. During Year 10 (End of Stage 4): • The excavator and dump site will be situated in a shielded location during night-time operation; and • No dozer operation at the drill location will occur during night and morning shoulder periods.	
11.3	Bloomfield may undertake a noise monitoring and investigation program during the Project, in consultation with DECC and DoP, to determine whether relevant noise criteria can be achieved without the use of the noise controls listed in 11.2. If such a study concludes that relevant criteria can be achieved, the above controls will be modified or removed.	9.5
11.4	Noise complaints received will be dealt with in accordance with Bloomfield's existing complaints protocol.	2.8
12.	**Blasting**	
12.1	Bloomfield will continue to consult with nearby residents regarding their blasting program, consistent with current practice and the Shot Firing and Explosives Management Plan.	2.8

REF.	COMMITMENT	EA SECTION No. (Refer for further detail)
12.2	Blasting will only be undertaken during the hours of 9.00 am to 5.00 pm Monday to Saturday. Blasting will not occur on Sundays or Public Holidays.	9.8
12.3	Blasts will be designed in consideration of vibration and airblast limits, wind speed and direction.	9.8
12.4	Blast monitoring will be conducted over the life of the mine in accordance with requirements provided by the Shot Firing and Explosives Management Plan.	2.8
12.5	All relevant personnel will be trained in Bloomfield's environmental obligations in relation to blasting controls.	2.8
13.	**Air Quality**	
13.1	An Air Quality Monitoring Program will be prepared and implemented for the Project. The Air Quality Monitoring Program will include monitoring at locations as described in the EA.	2.12
13.2	Dust generation on the Project Area will be minimised by implementation of the following: • All vehicles will be operated according to Mine Transport Management Plan, which requires vehicles to remain on specified routes; • Disturbed areas will be minimised where possible; • Dust suppression water spraying will be used on all active haul roads and stockpile areas where required; • All mobile equipment will be maintained in good working order; • Adequate stemming will be used in blast holes; and • Meteorological conditions will be considered in the timing of blasts to minimise impacts of blast generated dust.	2.8

REF.	COMMITMENT	EA SECTION No. (Refer for further detail)
14.	**Greenhouse Gas Monitoring and Energy Efficiency**	
14.1	Bloomfield will assess the viability of improving energy efficiency and reducing greenhouse gas emissions from its operations, including the mining fleet, stationary equipment and mining processes.	10.9
14.2	Bloomfield will monitor greenhouse gas emissions in accordance with the requirements of the current EEO and Greenhouse Challenge Plus programs and comply with any reporting requirements under the *NGER Act 2007*.	10.9
15.	**Surface Water Management**	
15.1	Surface water management for the Project will be undertaken in accordance with Bloomfield's existing Environmental Water Management System ('EWMS'). The EMWS will be modified to address the additional requirements for this Project provided in the Draft Water Management Plan (**Appendix H**).	2.8, 11.5
15.2	An Erosion and Sediment Control Plan will be prepared that will form part of the EWMS.	2.8, 11.3, 11.5
16.	**Surface Water Monitoring Program**	
16.1	Bloomfield's existing EWMS incorporates a Surface Water Monitoring Program which will be implemented for this Project and updated to include the additional monitoring point proposed for this Project.	11.5.2
16.2	A response/mitigation procedure will be developed as part of the EWMS for unforeseen surface or groundwater impacts being detected during the Project.	11.5.3, 12.4
17.	**Groundwater Monitoring**	
17.1	Bloomfield's existing EWMS will incorporate a Groundwater Monitoring Program and will be implemented for the Project and will include those items detailed in this EA.	2.8, 12.4

REF.	COMMITMENT	EA SECTION No. (Refer for further detail)
18.	**Visual Amenity**	
18.1	Visual impacts of the Bloomfield Mine will be mitigated by the following strategies: • Rehabilitation of the southern boundary of the Project Area adjacent to John Renshaw Drive will be given priority during the early stages of mining; • Mobile directional lighting in active mine areas will be directed away from neighbouring properties and roadways; and • Complaints regarding lighting will be investigated by Bloomfield during the relevant shift.	14.6.1, 14.6.2
18.2	Tree areas will be incorporated into rehabilitation to assist the visual blending of overburden dumps with the surrounding landscape.	3.4.3
19.	**Staff Training**	
19.1	Bloomfield will ensure that all personnel receive training in their responsibilities to mitigate, manage and monitor potential environmental impacts.	2.8, 2.11, 3.2

19. CONCLUSION

Bloomfield Colliery is an open cut coal mine located approximately 20 km north-west of Newcastle. The Colliery is operated by Bloomfield Collieries Pty Limited ('Bloomfield'), part of The Bloomfield Group.

Bloomfield currently operates the Colliery under Consolidated Coal Lease 761 ('CCL761') and in accordance with a Mining Operations Plan ('MOP') and an Environmental Protection Licence issued under the *Protection of the Environment Operations Act 1997*. Operations have previously been carried out on the site pursuant to existing user rights. The introduction of Part 3A of the *Environmental Planning and Assessment Act 1979* ('EP&A Act') and *State Environmental Planning Policy (Major Projects) 2005* requires Bloomfield to obtain approval to complete its mining schedule and undertake site rehabilitation.

This document is the Environmental Assessment prepared by Bloomfield for the completion of mining and rehabilitation at Bloomfield Colliery. It has been prepared to assess any potential impacts associated with the Project, in accordance with the requirements of the EP&A Act. This Environmental Assessment will be lodged as part of a Project Application with the NSW Department of Planning.

Bloomfield proposes to complete its mining schedule over 5 stages, covering a period of 10 to 12 years. Mining methods and equipment will be similar to that used in the existing operation. Stage 1, representing 1 year of operation, has a maximum production rate of approximately 0.88 mtpa. Stages 2 to 4 have a maximum production rate of 1.3 mtpa ROM coal. Stage 5 is for the completion of site rehabilitation. Employee numbers and hours of operation will also remain similar to existing arrangements.

Key issues were identified for the Project through a process of preliminary investigation, consultation and risk assessment. These issues, which have been investigated in detail for this EA, include:

- Disturbance of threatened flora and fauna species, and potential disturbance of an Endangered Ecological Community;
- Disturbance of Aboriginal and European heritage;
- Noise and blasting impacts;
- Air quality impacts;
- Surface water and groundwater impacts;
- Socio-economic aspects; and

- Visual aspects.

Studies investigated in detail any potential key environmental impacts that may result from the Project and have concluded that any potential impacts would be minimal. They also detail management and monitoring systems that will be put in place to control, manage, mitigate or offset any potential impact. These systems are summarised in the draft Statement of Commitments provided in **Section 18**.

A key consideration of this Project is its interaction with neighbouring mines and their operations, and any cumulative impact associated with these operations as a whole. The Water Management System forms an integral part of the Abel and Donaldson Mine operations as well as the Bloomfield washery, which was approved as part of the Abel Project Approval. Due to the proximity of these mining activities to the Bloomfield Project, cumulative impact assessment and integration of monitoring activities has formed a part of each assessment study and the Project description overall. The Integrated Environmental Monitoring Program (IEMP), detailed in **Section 2.12**, will be expanded to include any additional monitoring required in this EA.

Another key component of this Project is the rehabilitation of the site after completion of mining. A rehabilitation plan for the site has been developed in consultation with the land owner, local community and relevant government authorities and considers the objectives of the *Lower Hunter Regional Strategy* and the interaction of the site with neighbouring mines, including the Abel and Donaldson Mines.

Approval of this Project will enable Bloomfield to extract the remaining economic reserves from the site in a safe, efficient and controlled manner which minimises environmental impacts, while providing continued employment for their employees and numerous associated suppliers and contractors in the local and broader area. Approval will also enable Bloomfield to rehabilitate and enhance the site in accordance with the requirements of the various relevant stakeholders and policies in place for the Lower Hunter region.

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21. LIST OF ABBREVIATIONS

ACARP	Australian Coal Association Research Program
AEMR	Annual Environmental Management Review
AHD	Australian height datum
AHIMS	Aboriginal Heritage Information Management System
ANZECC	Australian & New Zealand environment & conservation council
ARI	Average recurrence interval
AS/NZS	Australian standard/New Zealand standard
Avg	Average
CAP	Catchment Action Plan
CCL761	Consolidated Coal Lease 761
CH4	Methane
CHPP	Coal handling and preparation plant ('washery')
CL	refers to activities involving coal handling
CO	Carbon monoxide
CO2	Carbon dioxide
dB/dBA	Decibel
DECC	Department of Environment and Climate Change, NSW
DEUS	Department of Energy, Utilities and Sustainability (now DWE)
DG	Director-general
DIPNR	Department of Infrastructure Planning and Natural Resources, NSW (Now DNR and DOP)
DLWC	Department of Land and Water Conservation (now DNR)
DoP	Department of Planning, NSW
DNR	Department of Natural Resources, NSW
DPI	Department of Primary Industries, NSW
DPI-MR	Department of Primary Industries-Mineral Resources
DWE	Department of Water and Energy (formerly DEUS)
E	Endangered
EA	Environmental assessment
EC	Electrical conductivity
EEC	Endangered Ecological Community

EEO	Energy Efficiency Opportunities
EL	Exploration licence
EMS	Environmental Management System
ENCM	Environmental Noise Control Manual (NSW)
EPA	Environment Protection Authority (now DECC)
EP&A Act	Environmental Planning and Assessment Act 1979
EPBC	Environment Protection and Biodiversity Conservation Act 1999
EPL	Environmental Protection Licence
ESAP	Energy Savings Action Plan
ESCP	Erosion and Sediment Control Plan
ESD	Ecologically Sustainable Development
G	Grams
GDE	Groundwater dependent ecosystems
GIS	Geographic information system
g/m2/month	Grams per square metre per month
GPS	Global positioning system
HCCREMS	Hunter and Central Coast Regional Environmental Strategy
HFC	Hydro fluorocarbons
ICOMOS	International Council on Monuments and Sites
IEMP	Integrated Environmental Management Program
INP	Industrial Noise Policy
ISO	International Organisation for Standardisation
Kg	Kilograms
kL/d	Kilo litres per day
Km	Kilometres
KV	Kilovolt
LA1	1 minute
LA90	Measured background level
LAeq	Equivalent continuous noise level
LALC	Local Aboriginal Land Council
LAmax	Maximum continuous noise level
LGA	Local government area
LHCCREMS	Lower Hunter and Central Coast Regional Environmental Management Strategy

L/s	Litres per second
M3	Cubic metres
M	Metres
MAHD	Metres above the Australian Height Datum
Max	Maximum
mg/L	Milligrams per litre
MIC	Maximum Instantaneous Charge
ML	Megalitres ALSO Mining Lease
ML/d	Megalitres per day
Mm	Millimetres
mm/m	Millimetres per metre
m/s	Metres per second
MODFLOW	A modular three-dimensional groundwater flow model which was developed by the USGS (McDonald and Harbaugh, 1988).
MOP	Mining Operations Plan
Mt	Million tonnes
mtpa	Million tonnes per annum
NATA	National Association of Testing Authorities
NGER Act	National Greenhouse and Energy Reporting Act 2007
NO	Nitrous oxide
NO2	Nitrogen dioxide
NPWA	National Parks and Wildlife Act 1974
NPWS	NSW National Parks and Wildlife Service (now DECC)
NSW	New South Wales
OB	refers to activities involving overburden handling
PFC	Perfluorocarbons
pH	See Glossary
PM	Particulate matter
PM2.5	Particulate matter with a diameter less than 2.5 micrometres
PM10	Particulate matter with a diameter less than 10 micrometres
POEO Act	Protection of the Environment Operations Act 1997
Ppv	Peak particle velocity
RBL	Rating background noise level
REP	Regional environment plan

RLF	Rail loading facility
ROM	Run of mine (See Glossary)
ROTAP	Rare or Threatened Australian Plants
SEPP	State Environmental Planning Policy
SF6	Sulphur hexafluoride
SO2	Sulphur dioxide
T	Tonnes
TBG	The Bloomfield Group
TCM	Total Catchment Management
TDS	Total dissolved solids (See Glossary)
TSP	Total suspended particulates (See Glossary)
TSS	Total suspended solids (See Glossary)
µg/m3	Micrograms per cubic metre
Um	Micrometre
WE	refers to activities involving wind erosion

22. GLOSSARY OF TERMS

Alkalinity The extent to which a solution is alkaline. See **pH**

Alluvial aquifer A geological formation which holds water in sufficient quantity to provide a source of water that can be tapped by a bore that is made from sediment deposited by a flowing stream, e.g., clay, silt, sand, etc.

Alluvium Usually sands and gravels which have been transported by water and then deposited.

Amenity An agreeable feature, facility or service which makes for a comfortable and pleasant life.

Amphibian A cold-blooded, smooth-skinned vertebrate of the class Amphibia, such as a frog or salamander, that characteristically hatches as an aquatic larva with gills. The larva then transforms into an adult having air-breathing lungs. An animal capable of living both on land and in water.

Anabat Bat detection system

Analytes The substance in an analysis that is being identified or determined.

Anion A negatively charged ion

Aquifer system A system of porous and permeable body of rock that can yield significant quantities of groundwater.

Arboreal An animal that lives in or among trees.

Archaeology The systematic study of any culture, especially a prehistoric one, by excavation and description of its remains.

Artefacts Any object made by humans with a view to subsequent use.

Average Recurrence Interval (ARI) The statistically calculated interval likely to be exceeded once in a given period of time. A term used in hydrology, also known as return period.

Background Noise Existing noise in the absence of the sound under investigation and all other extraneous sounds.

Baseline A basic standard or level, usually regarded as a reference point for comparison: baseline data.

Batter The excavated or constructed face resulting from earthmoving operations.

Bedrock The rock on which gravel or detrital matter rests.

Biodiversity/biological diversity The variety of life forms: the different plants, animals and micro organisms, the genes they contain and the ecosystems they form.

Biosolids Nutrient rich organic materials obtained from wastewater treatment and used beneficially, as for fertilizer.

Braun-Blanquet A system for classifying Australian vegetation based on its structure. The system is based on the life form occupying the tallest vegetation layer (stratum), the height of that stratum, and the percentage cover it provides.

Buffer areas/zone Area of land set aside to provide a buffer from impacts.

Bund/bunding Earth material or concrete placed to form a barrier – for example, a noise or visual bund would be a long elevated earthen area, a fuel farm bund would be constructed to hold and contain fuels in the event of a spill.

Calibrated When an instrument has been checked for accuracy.

Call playback A loud speaker system used to play natural calls of some nocturnal animals can prompt a response to detect their presence.

Catchment The area from which a river or stream receives its water.

Cation A positively charged ion

Claystone beds A fine-grained sedimentary rock composed predominately of clay minerals and small amounts of quartz and other minerals of clay size.

Climate change A change in the long-term average condition of the weather in a given area.

Coal Lease A lease which may be granted under Section 41 of the Mining Act 1992 to allow the holder to extract coal from a certain area and to a certain depth.

Coal measures Stratigraphic geological structure that contains coal seams.

Coal Reserves Those parts of the Coal Resources for which sufficient information is available to enable detailed or conceptual mine planning and for which such planning has been undertaken.

Coal Resources All of the potentially useable coal in a defined area, based on geological data at certain points and extrapolations from these points.

Coarse rejects Rock material that is separated from the coal during the washing process.

Coking Coal Moderate to high volatility hard coal and low ash semi-soft coal used in the production process of iron and steel.

Colliery Coal mine

Colluvium Loose and incoherent deposits, usually at the foot of a slope or cliff line and brought by gravity.

Commercial Lease The Lease over designated demised premises at Ashtonfield NSW, between the Lessor (Ashtonfields Pty. Limited) and the co-lessee, Bloomfield Collieries Pty. Limited.

Cone of depression A cone like depression in the water table formed when water is pumped out of a well more rapidly than it can flow through the aquifer

Conglomerate A rock type comprising greater than 50 per cent rounded water-worn fragments (>2 mm in size) of rock or pebbles cemented together by another mineral substance.

Conservation The management of natural resources in a way that will preserve them for the benefit of both present and future generations.

Cover depth The distance between the surface of the land and the mine workings.

Decibel (dB) A unit for expressing the relative intensity of sounds on a logarithmic scale from zero (for average least perceptible sound) to about 130 (for the average pain level).

Decibel dBA A modified decibel scale which is weighted to take account of the frequency response of the normal human ear.

Dewatering The process of removing water from an underground mine by a series of pipes – generally flowing into a surface dam.

Drawdown The lowering of the water level or the potentiometric head in an aquifer due to the removal of water from a nearby bore or excavation.

Dyke A wall-like intrusive igneous rock (formed when molten rock solidifies), filling a fissure.

Ecological communities An assemblage of species occupying a particular area.

Ecologically sustainable development Using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained and quality of life for both present and future generations is increased.

Ecosystem Organisms of a community together with its non-living components through which energy and matter flow.

Electrical Conductivity The measure of electrical conduction through water or a soil-water suspension generally measured in millisiemens per centimetre or microsiemens per centimetre. An approximate measure of soil or water salinity.

Elliot trap A small elongated box made of aluminium which collapses flat for easy transport. The trap is operated by providing a lure bait and setting the treadle at one end. When a small animal enters the trap and steps on the treadle it triggers the door of the trap to close.

Endangered ecological community Community listed in the Schedules of the *Threatened Species Conservation Act 1995*.

Environment Protection and Biodiversity Conservation Act 1999 Commonwealth legislation that regulates development proposals that have an actual or potential impact on matters of national environmental significance.

Environmental impact assessment A procedure for considering the potential environmental effects of a proposed development or land use

Environmental management system Tool for managing the impacts of an organisation's activities on the environment. It provides a structured approach to planning and implementing environment protection measures.

Environmental Planning and Assessment Act 1979 NSW Government Act to provide for the orderly development of land in NSW.

Environmental Risk Register The list of site activities and potential risks associated with these activities, together with a rating of the probability of these risks occurring and their potential consequences.

Environmentally Hazardous Chemicals Act 1985 NSW legislation administered by DEC which oversees the assessment and control of the use of chemicals and their impact on the environment

Ephemeral Lasting only a day or a very short time; short-lived; transitory. Usually used in relation to stream flow.

Erosion The process by which the surface of the earth is worn away by the action of water, glaciers and winds.

Fault A fracture or fracture zone along which there has been displacement of the sides relative to one another. Displacement can be vertical and/or horizontal.

Fauna All vertebrate animal life of a given time and place.

F class (noise) An atmospheric condition in which temperature increases by 3°C, per 100m above ground.

Firing The process of setting off an explosive charge.

First flush The first amount of water that enters a channel, pipe or stream at the beginning of a rainfall event – usually containing more sediment or possible contaminants such as oils.

Flora The plants of a particular region or period, listed by species

Floristic Refers to the species composition of a plant community.

Geographical Referring to a characteristic of a certain locality, especially in reference to its location in relation to other places.

Geological The geological features of a locality

Geometry The shape of a surface or solid.

Geomorphic Of or relating to the figure of the earth, or the forms of its surface.

Geotechnical Relates to the form, arrangement and structure of geology.

Grade (Coal) a degree or step in a scale, as of quality.

Greenhouse Gas Emissions Greenhouse gas es are atmospheric gases including carbon dioxide and methane, that absorb and re-radiate the sun's warmth, and maintain the Earth's surface temperature at a level necessary to support life. Greenhouse Gas Emissions

are the release of these gasses from human activities such as burning fossil fuels (coal, oil and natural gas), agriculture and land clearing.

Grinding groove A groove found in a rock that was used for sharpening objects by Aboriginals.

Groundwater Sub-surface water which is within the saturated zone and can supply wells and springs. The upper surface of this saturated zone is called the water table.

Habitat The environment in which a plant or animal lives; often described in terms of geography and climate.

Hair tubes Tubes from 4 to 15 cm in diameter that have sticky strips applied along the inside and a bait to lure the animal at the end of the funnel generally behind a mess plate. The sticky strips collect hairs from any animal that puts its head in the funnel. The sticky strips are then sent away to be analysed to determine which animals are present in that particular area.

Harp trapping A method of catching insectivorous bats. It consists of a network of fine nylon string pulled tightly between to horizontal poles with a purpose made canvas bag at the bottom of the strings where the bats fall when fly into the network of string.

Horizons The surface separating two beds of rock.

Hydrocarbon storage area Bunded storage area for greases, oils, etc constructed in accordance with DECC Guidelines.

Hydrogeological The relation of hydrological phenomena to the surface geology.

Hydrographs A linear plot of water level versus time.

Insectivorous Feeds on insects.

Inter-modal freight facility A proposal by the State Government to site a facility on part of the rehabilitated Bloomfield Open Cut Mine in the future, consisting of a range of industries that transport goods.

I-O assessment Input-output model used for economic assessment.

Ion An atom with an electrical charge.

Kilo Volt (kV) One thousand volts.

L_{A1} Noise Level The noise level exceeded for one per cent of the time. It is used in assessment of sleep disturbance.

L_{A10} Noise Level The noise level, measured in dBA, which is exceeded for 10 per cent of the time, which is approximately the average of the maximum noise levels.

L_{A90} Noise Level The noise level, measured in dBA, exceeded for 90 per cent of the time, which is approximately the average of the minimum noise levels. The L90 level is often referred to as the "background" noise level and is commonly used to determine noise criteria for assessment purposes.

L_{Aeq} Noise Level The average noise energy, measured in dBA, during a measurement period.

L_{Amax} Noise Level The maximum noise energy, measured in dBA, during a measurement period.

Land Capability The ability of land to accept a type and intensity of use permanently, or for specific periods under specific management, without permanent damage.

Landform Any one of the various features that make up the surface of the earth.

Level A certain horizon in a deep mine. Usually referred to by the depth in metres, feet or fathoms (6') from the surface.

Lithic Relating to or consisting of stone.

Lithology The physical characteristics of rock, with reference to qualities such as colour, composition and texture.

Macro-invertebrates Large animals without a backbone, such as insects, crustaceans, molluscs, spiders and worms.

Marsupial Mammals in which the young are born in an undeveloped state and move to a pouch where they develop.

Mean The average value of a particular set of numbers.

Megachiropteran Bats Large insectivorous bats.

Megalitre (ML) One million litres.

Meteorological Phenomena of the atmosphere or weather.

Microchiropteran Bats Small insectivorous bats.

Micro-climate The meteorological conditions, or climate, in small areas such as the north or south side of a rock.

Migratory species Animals that move from one area to another to feed or breed.

Mining Act 1992 NSW legislation to regulate the prospecting and mining of minerals in the State of NSW. Department of Mineral Resources administers the legislation, which places controls on methods of exploration and mining as well as the disposal of mining wastes, land rehabilitation and environmental management.

Mining Height The height at which the seam is mined or extracted.

Mitigation To lessen in force, intensity or harshness. To moderate in severity.

MODFLOW A modular three-dimensional groundwater flow model which was developed by the USGS (McDonald and Harbaugh, 1988).

Mudstones Rock composed of clay and silt.

National Parks and Wildlife Act 1974 NSW legislation administered by DECC that aims to conserve nature including habitat, ecosystems, biodiversity, landforms and landscapes of significance. It also aims to conserve objects, places or features of cultural value.

Native Belonging to the natural flora or fauna in a region.

Open cut void The hole created by surface mining activity.

Outcrop Bedrock exposed at the ground surface.

Overburden material The soil or rock overlying a mineral deposit (eg: coal), that is removed to access the deposit.

Particulates Fine solid particles which remain individually dispersed in gases.

Percolation To filter through; permeate.

Permeability A measure of the ease with which fluid can travel through porous material.

Permian Relating to the latest Palaeozoic geological period or system.

pH Scale used to express acidity and alkalinity. Values range from 0-14 with seven representing neutrality. Numbers from seven to zero represent increasing acidity whilst seven to fourteen represent increasing alkalinity.

Piezometer A small diameter bore lined with a slotted tube used for determining the standing water level of groundwater.

Piper Trilinear diagram Allows each sample to be plotted at a unique point on the basis of the relative concentrations of the major ions in solution – the cations calcium, magnesium, sodium and potassium, and the anions carbonate/bicarbonate, sulphate and chloride. This plot allows an assessment of the recharge-discharge processes, and also allows a comparison of water samples derived from different environments within the hydrological cycle. It can also be used to assess the possible mixing of waters from different sources.

Pollution control ponds A dam or depression formed in the landscape to capture runoff that could potentially be contaminated with pollution, such as soil, fuel or other contaminants.

Prediction modelling A method of predicting certain outcomes using a mathematical calculation.

Pressure head The height of a column of fluid of specific weight.

Prill Pelletised ammonium nitrate used in mine blasting.

Project Area Areas that are the subject of this 3A application.

Protection of Environment Operations Act 1997 The NSW legislation administered by the DECC that regulates discharges to land, air and water.

Quadrats A sampling frame or an area marked out for sampling plants and animals.

Recharge To provide more water or return water to an item, for example, to recharge a dam means to return water to the dam.

Rehabilitation The process of restoring to a condition of usefulness. In regard to mining, relates to restoration of land from a degraded or mined condition to a stable and vegetated landform.

Regolith The layer of loose rock resting on bedrock, constituting the surface of most land. Also called *mantle rock*.

Rock shelter The rock-backed area under a large overhanging rock as used by Indigenous Australians for protection from sun and rain and for ritual painting.

Run of Mine (ROM) Bulk material extracted from a mine, before it is processed in any way.

Sandstone A cemented or otherwise compacted sedimentary rock composed predominantly of sand-size quartz grains.

Salinity The concentration of salts in soil or water.

Scar tree Scars are wounds from deliberate impacts to a tree that cause damage to living plant tissue on a trunk or limb. Where the tissue is damaged it stops any further growth and so the tree bears a permanent scar. Aboriginal scarred trees are trees that have been scarred by the deliberate removal of bark or wood to be used for shelter or construction of water craft.

Scope 1 Greenhouse gas emissions that are produced directly as a result of an activity on site.

Scope 2 Indirect greenhouse gas emissions from the generation of purchased electricity.

Seam An identifiably discrete coal unit.

Sedimentary rock Formed when the weathered and eroded particles of pre-existing rocks are transported by wind or water and deposited elsewhere.

Sedimentation The deposition or accumulation of sediment.

Siltstone A rock comprised of compacted silt.

Site Laws Site specific formulae developed from modelling and trial blasts to aid blast emission prediction and optimise shot design.

Species A group of similar plants of animals that are capable of interbreeding and producing fertile offspring.

Spoil Soil, rock and other waste material excavated during mining.

Spotlighting A field survey method used to detect arboreal mammals, nocturnal birds as well as birds roosting in trees. A powerful torch is used in a particular fashion to detect the presence of animals.

Stage 1 current operations undertaken at Bloomfield (Year 1)

Stage 2 Approximately Years 1 to 5 of the Bloomfield project.

Stage 3 Approximately Years 5 to 7 of the Bloomfield project.

Stage 4 Approximately Years 7 to 10 of the Bloomfield project.

Stage 5 Approximately Years 10 to 12 of the Bloomfield project.

State survey marks Markers placed at various locations around NSW that enable surveyors to accurately determine location and elevation.

Strata Plural for stratum meaning a single bed of sedimentary rock, generally consisting of one kind of matter representing continuous deposition.

Stratigraphically The distribution, deposition and age of sedimentary rocks.

Subcrop A unit of material that occurs just below the soil profile.

Sump An excavation to collect drainage water, commonly at the bottom of a shaft or at a suitable place on levels.

Surface drainage system The method used for runoff to move over the land – in channels, creeks, etc.

Survey To view in detail, especially to inspect or examine formally or officially in order to ascertain condition

Tailings Fine residual waste material separated in the coal preparation process.

Temperature Inversion Condition in which the temperature of the atmosphere increases with altitude in contrast to the normal decrease with altitude. When temperature inversion occurs, cold air underlies warmer air at higher altitudes.

Terrestrial Relating to the land and also used to mean ground dwelling.

Thermal Coal (general) Includes medium to high ash, low sulphur coals used for domestic power generation and medium to low ash high energy coals which are exported.

Threatened Species Conservation Act 1995 NSW legislation administered by DECC to protect and conserve plants and animals that may be endangered with extinction.

Tonnage-based coal royalties An amount of money paid to the government to enable a company to extract coal – the fee is based on a per tonne amount.

Tool box talks A training talk provided by a supervisor to a group of mine workers to update knowledge on particular work procedures.

Topdressing The application of sand, soil, fertiliser or other material to established or establishing vegetation to maintain the supply of nutrients and/or to provide an improved soil environment for the continued growth of desirable plants.

Topography The surface features of a geographical area.

Total Dissolved Solids (TDS) A measure of salinity expressed in milligrams per litre (mg/L).

Total Suspended Particulates (TSP) A measure of the total amount of un-dissolved matter in a volume of water or air usually expressed in milligrams per litre (mg/L) (for water) or micrograms per cubic metre (ug/m) for air.

Transect A line, or narrow strip used to conduct a census of plants or animals in a given area.

Tributaries Streams contributing its flow to a larger stream or other body of water.

U Cut A previous open cut pit to the north of Creek Cut.

Washery A place at which ore, coal, or crushed stone is freed from impurities.

Water table The upper surface of a body of ground water at the top of the zone of saturation and below the zone of aeration.