



Ivanhoe Coal Pty Ltd

ENVIRONMENTAL ASSESSMENT



Proposed Ivanhoe North Rehabilitation Project



Prepared by: **R.W. CORKERY & CO.**
GEOLOGICAL & ENVIRONMENTAL CONSULTANTS



Ivanhoe Coal Pty Ltd

ENVIRONMENTAL ASSESSMENT

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Declaration Form

for the submission of an Environmental Assessment prepared in accordance with the
Environmental Planning and Assessment Act 1979 (Part 3A – Section 75).

(a) EA prepared by:

name: Robert William Corkery
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(b) Planning Approval application by:

applicant name: Ivanhoe Coal Pty Limited
applicant address: Level 18, BT Tower
1 Market Street
SYDNEY NSW 2000

(c) Address/land details

properties to be developed/ land description: Part of Ben Bullen State Forest (No Title) adjacent to the Castlereagh Highway approximately 3km south of the village of Cullen Bullen

(d) Project Outline:

Ivanhoe North Rehabilitation Project

The rehabilitation of the abandoned Cullen Main West open cut and concurrent recovery, crushing and despatch of the remnant coal resource retained between the high wall of the abandoned open cut and Ivanhoe No. 2 underground workings.

(e) Assessment of

Environmental Impact:

The assessment of environmental impacts of this project includes the matters referred to in Director-General's Requirements provided to the Proponent on 6 January 2006 under Section 75F of the *Environmental Planning and Assessment Act 1979*.

(f) Declaration:

I, Robert William Corkery, hereby declare that I have overseen the preparation of the contents of this assessment and to the best of my knowledge:

- it has addressed the Director-General's Requirements as provided by the Department of Planning on 6 January 2006;
- the assessment contains all available information that is relevant to the environmental assessment of the project; and
- the information contained in the document is neither false nor misleading.

Signature: _____

Name: Robert W Corkery

Date: _____



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Executive Summary

INTRODUCTION

This Environmental Assessment has been prepared by R.W. Corkery & Co. Pty. Limited to accompany an application for planning approval by Ivanhoe Coal Pty Limited ("the Proponent") to develop and operate the Ivanhoe North Rehabilitation Project ("the project"). A project that would rehabilitate the abandoned Cullen Main West open cut and recover approximately 550 000 t of coal.

The area which is the subject of the project (the "Project Site") is located within Ben Bullen State Forest, off the Castlereagh Highway, approximately 2km south of the village of Cullen Bullen (see **Figure A**). The Project Site includes the abandoned Cullen Main West open cut, a sufficiently large area above the former open cut to allow for the progressive removal of the high wall and a buffer zone between the proposed area of disturbance and surrounding land.

PROJECT DESCRIPTION

The project, if approved, would involve the following activities:

- Construction of a site entrance on the Castlereagh Highway and the upgrading of an existing access road to the area of the proposed activities.
- Progressive shaping and rehabilitation of the former open cut area through the programmed removal and placement of overburden materials. The overburden would be obtained from between the high wall of the former open cut and the recently abandoned underground workings of Ivanhoe No.2 Colliery.
- Development of a small coal recovery operation to remove the coal exposed by the progressive removal and reshaping of overburden. The coal recovery area

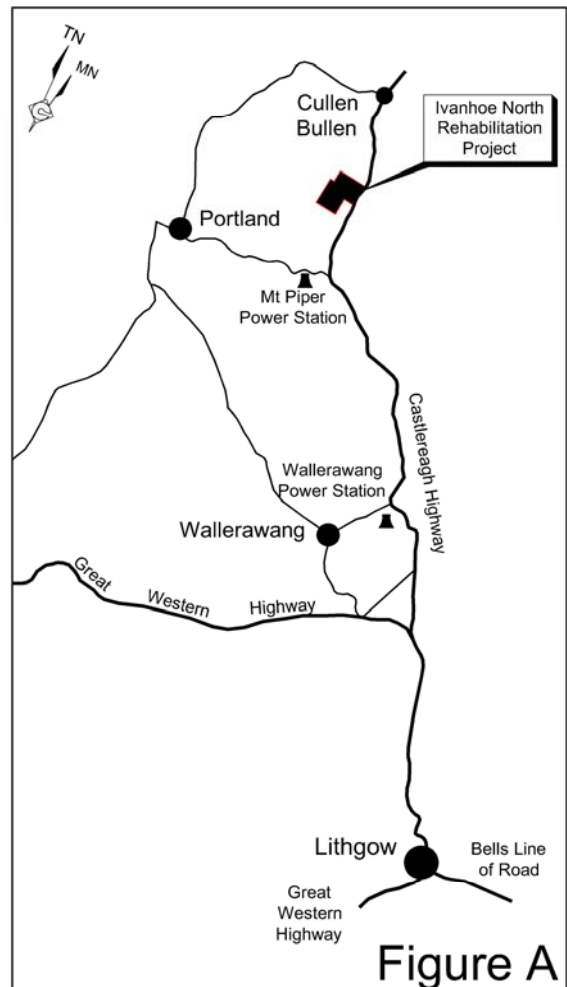


Figure A

has been defined by a review of economic, geological and environmental considerations and would recover an estimated 550 000t of coal.

- On-site crushing and temporary stockpiling of the recovered coal within a defined coal crushing area.
- Transportation of the recovered and crushed coal to local power stations, the Lidsdale Siding for rail transport to export markets and/or Western Main Colliery for coal washing.
- Installation of, and/or modification to, a range of services, structures and transportable buildings.
- Proposed hours of operation for the project would be between 7.00 am and 6.00 pm Monday to Saturday.



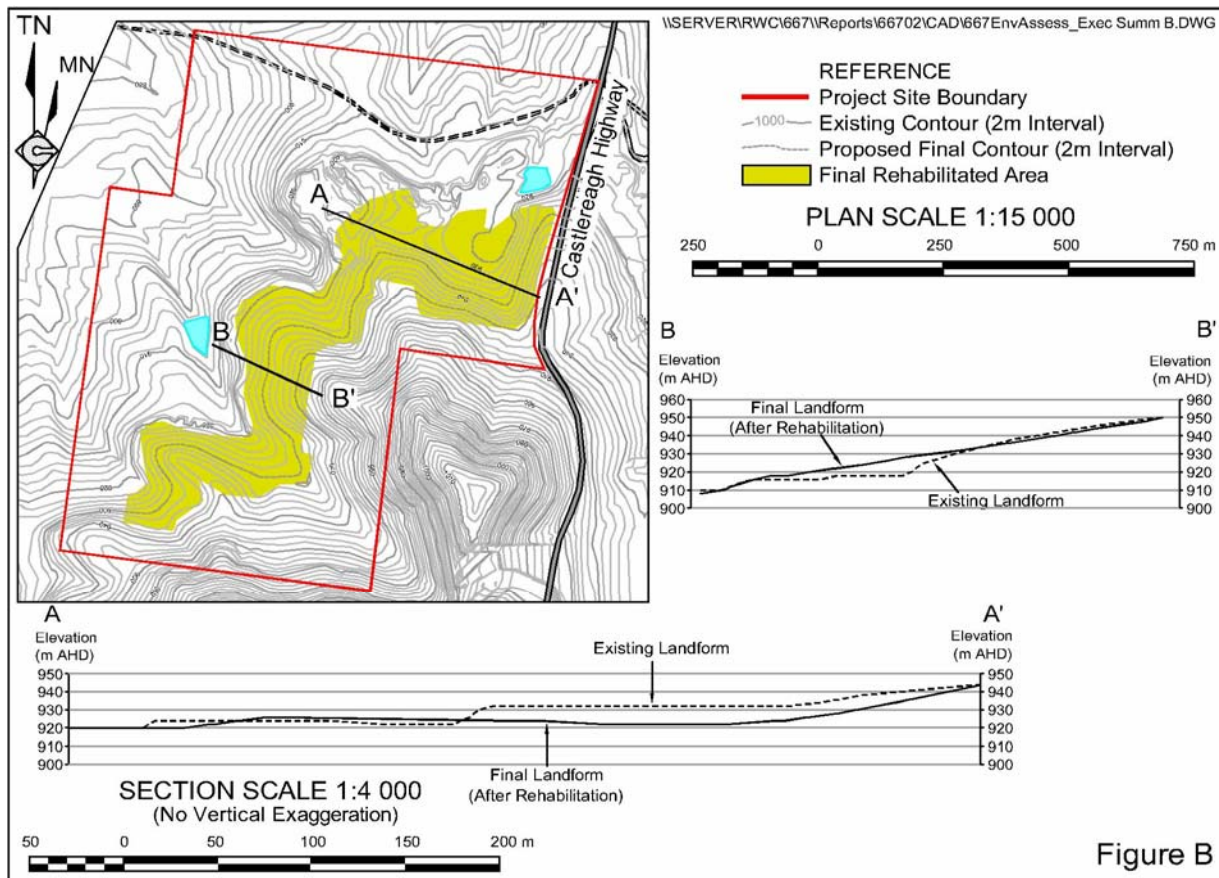


Figure B

The proposed operations, which would integrate the recovery of coal and progressive rehabilitation of the site, would commence in the southwest and progressively work northwards. It is not planned to disturb areas other than the former open cut floor and the area identified between the abandoned high wall and the limit of Ivanhoe Colliery underground workings. **Figure B** presents cross-sections of the existing and proposed rehabilitated landform.

It is anticipated that the entire project (with the exception of some minor ongoing rehabilitation maintenance activities) would be completed within approximately 2 years.

THE PROPONENT

Ivanhoe Coal Pty Limited is a wholly owned subsidiary of Centennial Coal Company Limited and currently operates the Ivanhoe Colliery, located to the immediate north of the Mt Piper Power Station.

BACKGROUND

The Cullen Main West open cut was a contour mining operation which operated shortly after World War II until the early 1950's when it was abandoned. With the approval of DPI (Mineral Resources), the Proponent has used approximately 20% (2.0ha) of the abandoned open cut (through Mining Purpose Lease (MPL) 79) for mine ventilation for the Ivanhoe Colliery and placement of coarse reject generated by the Ivanhoe and Invincible Collieries. The Proponent has rehabilitation obligations over this area. No party, however, has rehabilitation obligations over the remaining 80% (11.4ha) of the former open cut which remains largely unrehabilitated (although there has been significant tree regrowth on parts of the open cut floor and "out-of-pit" spoil dumps). A number of factors including availability of equipment and the currently buoyant coal price have combined to make the rehabilitation of the entire former open cut and concurrent recovery of the remaining coal, practically and economically feasible.

CONSULTATION AND KEY ISSUE IDENTIFICATION

The Director-General's Requirements, issued by the Department of Planning, identified eight environmental issues requiring assessment within the Environmental Assessment. One of these, "blasting" is not relevant to the project. The remaining seven issues are:

- Transport
- Noise
- Air
- Soil and Water
- Flora and Fauna
- Heritage
- Visual

In addition, consultation with local and government stakeholder identified the following additional issues.

- Property values
- Rehabilitation and final landform
- Contaminated lands
- Bushfire
- Spontaneous combustion

A risk assessment was then undertaken to identify those issues which would present the greatest risk of environmental impact. This considered both the consequence and likelihood of impact and confirmed those issues identified within the Director-General's Requirements present the greatest potential for environmental impact. An assessment of impacts was then undertaken based on the potential risk(s) associated with each issue.

ENVIRONMENTAL SAFEGUARDS AND IMPACTS

Following an assessment of the environmental setting, project design and the operational safeguards proposed by the Proponent, the following residual impacts were identified.

Traffic

- Heavy vehicles would enter and exit the Project Site from an upgraded intersection with the Castlereagh Highway, however, this is unlikely to increase the number of heavy vehicles using this section of road given the

predicted reduction in production at the nearby Cullen Valley Colliery.

- The movement of heavy vehicles along the proposed transport route would be unlikely to effect traffic flows but under a worst case scenario may slightly accelerate pavement deterioration.

Noise

- When operations are focussed in the northern operational blocks, a marginal exceedance of noise criteria (1dB(A)) is predicted at the residence of B. Muenzer to the north.
- Traffic noise would be marginally increased ($\leq 1.1\text{dB(A)}$), but within DEC nominated criteria.
- The project would not contribute to cumulative noise impacts associated with the concurrent operation of the project and the proposed recommencement of open cut mining at the Invincible Colliery.

Surface Water Resources and Erosion

- If managed in accordance with the proposed safeguards, erosion would be prevented and impacts on surface water would be limited to temporary alterations to the drainage of the Project Site as follows.
 - Four clean water dams would be constructed upstream of the operational areas to prevent flooding.
 - Two sediment dams would also be constructed downstream of the operational areas to allow for the settlement of suspended settlement prior to discharge from the Project Site.

Visual Amenity

- Over the life of the project, activities would be visible from several residences and public vantage points, especially to the west and northwest. Ultimately however, the proposed rehabilitation of the Project Site would improve the visual aesthetic through removal of the largely unvegetated high wall.



Air Quality

- The project would result in a slight incremental increase in dust and sub-10µm particulate matter. This would be within DEC nominated air quality criteria at surrounding residences.

Flora and Fauna

- The project would result in disturbance to native vegetation and fauna habitat but would not result in an increased threat to species, populations or communities of conservation significance.

Rehabilitation and Final Landform

- The project would result in temporary disturbance to the existing landform, however, the project would ultimately provide a final landform better suited to the current dual land use of the Project Site for nature conservation and forestry.

Soils

- The project would result in the temporary disturbance to Project Site soils, although if managed in accordance with the proposed safeguards, there would be no long term degradation of soil quality.

Aboriginal Heritage

- The project would not impact on any Aboriginal sites or artefacts.

Property Values

- A short term decrease in property values, or extended sale period, may occur as a consequence of the project. However, as the project life is restricted to 2 years any minor impact would be of similarly limited duration.

Spontaneous Combustion

- No occurrences of spontaneous combustion are expected.

Bushfire

- Given the project would be of short duration, with fire suppression equipment readily available and the appropriate work instructions implemented, the risk of bushfire would not be significantly increased.

Groundwater

- No impact on groundwater is expected.

Contaminated Lands

- The project would not lead to contamination of lands.

CONCLUSIONS

The proposed Ivanhoe North Rehabilitation Project provides for the rehabilitation of an area previously disturbed by open cut mining activities and the recovery of a remnant coal resource. If approved, it would release the NSW Government from its responsibility for the rehabilitation of the abandoned open cut mine.

The project would be developed and operated in compliance with a statement of commitments presented within the Environmental Assessment, itself developed from the design features, operational safeguards and management measures proposed to minimise the impact of the project on the local environment and community. The Environmental Assessment, prepared following the review of seven specialist consultant studies, has identified that the project should proceed because it would:

- (i) provide for the rehabilitation of the Cullen Main West open cut and an improved environmental and public safety outcome;
- (ii) be operated in accordance with the environmental safeguards that are detailed throughout the Environmental Assessment and have been developed with respect to the principles of ecologically sustainable development; and
- (iii) have minimal impact on most aspects of the biophysical environment whilst allowing for the recovery of a coal resource in a previously disturbed area. Where a predicted impact has been identified, all reasonable and feasible safeguards have been implemented by the Proponent in an effort to minimise the identified impact.



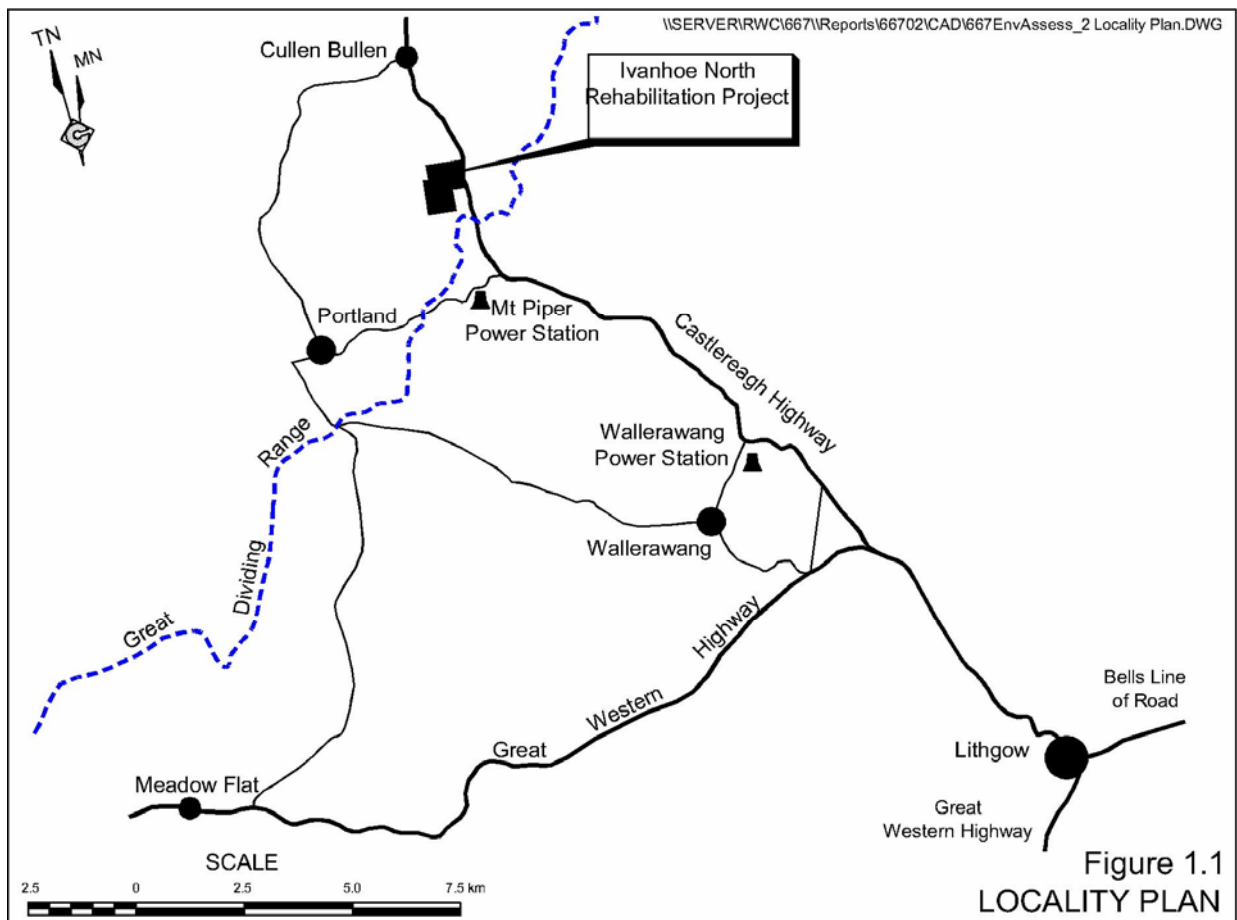
Section 1

Introduction

1.1 SCOPE

Ivanhoe Coal Pty Limited (“the Proponent”) proposes to progressively rehabilitate an abandoned open cut coal mine known as the abandoned Cullen Main West open cut and concurrently recover approximately 550 000t of the coal exposed during the rehabilitation process. This coal will be mined and crushed on site at a nominal rate of 300 000tpa and despatched via the Castlereagh Highway to Mt Piper and Wallerawang Power Stations, Western Main Colliery and the Lidsdale Siding. The Ivanhoe North Rehabilitation Project (“the project”), will take approximately two years to complete.

Figure 1.1 presents the location of the Project Site to the west of the Castlereagh Highway, approximately 22km northwest of Lithgow and 2km to the south of the village of Cullen Bullen.



The Proponent holds a surface lease over approximately 20% of the abandoned Cullen Main West open cut (Mining Purposes Lease (MPL) 79) for the Ivanhoe Colliery, and therefore has an obligation to rehabilitate that section of the abandoned Cullen Main West open cut. The remainder of the former open cut, however, is considered a derelict mine and rehabilitation obligations lie with the NSW government.

This Environmental Assessment has been prepared to support the Proponent's application for Planning Approval from the Minister for Planning for the proposed Ivanhoe North Rehabilitation Project. A copy of the application for planning approval is included as **Appendix 1**. The Environment Assessment outlines the project and provides information on mitigation measures and management controls to manage potential environmental impacts and ensure the effective rehabilitation of the site and recovery of the coal resource. The Environment Assessment has been prepared in accordance with the provisions of Part 3A of the *Environmental Planning and Assessment Act 1979*, and specifically with reference to the key assessment requirements provided by the Director-General's Requirements issued by the Department of Planning (**Appendix 2**).

1.2 THE PROPONENT

Ivanhoe Coal Pty Limited (a wholly owned subsidiary of Centennial Coal Company Limited ("Centennial")) operates the Ivanhoe Colliery, located to the immediate north of the Mt Piper Power Station. Centennial was established in 1989 and listed on the Australian Stock Exchange in 1994. Centennial has grown through acquisition and internal development of coal mining operations centralised south of Newcastle (Northern Coalfield), around Lithgow (Western Coalfield) and west of Wollongong (Southern Coal Field) (see **Figure 1.2**). Centennial currently operates 15 coal mines in NSW.

1.3 OBJECTIVES

The Proponent's primary objectives for the development of the proposed Ivanhoe North Rehabilitation Project are to rehabilitate the abandoned Cullen Main West open cut and concurrently recover approximately 550 000 tonnes of coal exposed during this process. A number of supplementary objectives would also be achieved, namely to:

- (i) remove the existing high wall and create a final landform with slopes and vegetation corresponding to that of the surrounding environmental setting;
- (ii) improve public safety with the removal of existing unsafe high walls;
- (iii) develop and operate the project in a manner that complies with all statutory requirements;
- (iv) undertake all activities in an environmentally responsible manner, employing a level of control and safeguards that would ensure compliance with appropriate criteria/goals or reasonable community expectations at all times; and
- (v) take advantage of current buoyant export coal prices and thereby complete the project in a cost-effective manner and at no cost to the Proponent or the NSW State Government, who currently holds the responsibility to rehabilitate the bulk of the site.





1.4 DOCUMENT FORMAT

The Environment Assessment has been structured to address the key environmental assessment requirements of the Director-General of the Department of Planning (DoP), which themselves have been based on the requirements of DoP and other relevant NSW and local government agencies. The Environment Assessment has been compiled in a single volume which includes six sections of text, a reference section, a glossary, and a set of Appendices. The Environment Assessment is supported by a *Specialist Consultant Studies Compendium* incorporating the reports prepared by six specialist environmental consultancies engaged to assess specific aspects of the project.

The format of the Environment Assessment has been structured as follows.

- Section 1:** introduces the project and project objectives, the Proponent and provides a summary of the approvals required and approvals process.
- Section 2:** describes the proposed rehabilitation, coal recovery, processing, transportation and waste management activities of the project.
- Section 3:** provides the environmental setting of the Project Site including site history, ownership details, existing disturbance and land ownership and land use details.
- Section 4:** provides a summary of the identification of key issues for assessment based on the Director-General's Requirements for the project, stakeholder consultation through the project planning stages and a risk assessment undertaken to establish the specific environmental risk(s) posed by issues identified.
- Section 5:** presents the proposed management, assessment of potential impact and maintenance/monitoring requirements for the key issues identified in Section 4.
- Section 6:** provides a draft statement of commitments in relation to environmental management and monitoring for the entire project.
- Section 7:** evaluates the project in terms of biophysical, economic and social considerations, and the principles of Ecologically Sustainable Development.
- Appendices:** present the following additional information.
- (i) A copy of the Proponent's application for planning approval.
 - (ii) The Director-General's Requirements.
 - (iii) A record of consultation undertaken by the Proponent with local and government stakeholders.
 - (iv) A risk assessment of the major issues identified through stakeholder consultation.

Seven reports prepared by six consultancies have been compiled into the *Specialist Consultant Studies Compendium* which has been placed on exhibition with the EA. Reference is made throughout the Environment Assessment to these reports.



1.5 APPROVALS AND APPROVALS PROCESS

1.5.1 Approvals Required

In order for the Ivanhoe North Rehabilitation Project to proceed, the following approvals are required.

- (i) Planning Approval issued by the Minister for Planning under Part 3A of the *Environmental Planning and Assessment Act 1979*.
- (ii) A mining lease issued by the Minister for Primary Industries under Section 51 of the *Mining Act 1992*.
- (iii) An Environment Protection Licence issued by the Department of Environment and Conservation under Section 48 of the *Protection of the Environment Operations Act 1997*.
- (iv) A permit issued by the Road and Transport Authority under Section 138 of the *Roads Act 1993* for the construction of the upgraded intersection at the site entrance.

1.5.2 Approvals Process

An overview of the approvals process is provided to assist readers understand the steps from commencement to determination of the Proponent's application for planning approval.

The approvals process reflects all formal stages involved in the assessment of the Ivanhoe North Rehabilitation Project, some of which have already been completed by DoP or the Proponent. For stages completed so far, the relevant date is recorded, whereas for the remaining stages beyond the commencement of the exhibition of the Environmental Assessment, an estimate of the likely date of each subsequent step is provided.

- | | |
|----------------------------|---|
| 1. 30 June 2005 | ⇒ The Proponent formally wrote to the then DIPNR seeking Director-General's Requirements supported by Form A. |
| 2. 20 July 2005 | ⇒ A Planning Focus Meeting was convened for all relevant government agencies to attend a briefing about the project (based upon a Background Paper distributed) and a site inspection. |
| 3. 1 August 2005 | ⇒ Part 3A of the <i>Environmental Planning and Assessment Act 1979</i> accented to by the NSW Parliament and gazetted in Government Gazette. Note: DIPNR was dissolved in August 2005 and the functions relating to the administration of the <i>Environmental Planning and Assessment Act 1979</i> were transferred to the Department of Planning. |
| 4. 18 November 2005 | ⇒ The Proponent formally lodged with the Department of Planning its Application for Planning Approval (see Appendix 1). |
| 5. 7 January 2006 | ⇒ Advertisement placed in the Lithgow Mercury notifying of the application for project approval by the Proponent. |



- | | |
|---|--|
| 6. 9 January 2006 | ⇒ Requirements issued by the Director-General of the Department of Planning (see Appendix 2). |
| 7. 24 March 2006 | ⇒ Draft Environmental Assessment lodged with Department of Planning to assess adequacy for exhibition. |
| 8. 4 May 2006 | ⇒ Final Environmental Assessment submitted to DoP for exhibition and assessment. Following receipt of the document (hard copies and CDs), the Department of Planning will place all documents on public exhibition and notify neighbours and other stakeholders about the project and the exhibition period. Details of the project and the Executive Summary will be placed on the DoP website. |
| 9. 4 May 2006 to 31 May 2006 | ⇒ Review of Environmental Assessment during exhibition period by the community and government agencies. |
| 10. 1 June 2006 | ⇒ The Department of Planning would seek from the Proponent, a response / clarification of issues raised in the submissions from the community and government agencies. |
| 11. 8 June 2006 | ⇒ The Proponent would provide responses to the issues raised – and if necessary, submit a revised Statement of Commitments. |
| 12. 8 June 2006 to 8 August 2006 | ⇒ The Department of Planning would prepare its assessment report based on all documentation submitted by the Proponent, community and government agencies – within a maximum period of 60 days as nominated in the Director-General's Requirements. During this period, the Minister can appoint a Panel of Experts or Panel of Officers to assess one or more of the specific issues relating to the project. |
| 13. 11 August 2006 | ⇒ Determination by the Minister. |

In the event the project is granted planning approval by the Minister, the Proponent would then approach the relevant Government agencies to advance the respective applications for the other three approvals discussed in Section 1.5.1.



Section 2 Project Description

2.1 PROJECT SITE LAYOUT

Figure 2.1 presents the proposed Project Site layout and identifies the following components.

- (i) The existing area of disturbance including 4.2ha of open areas with limited regrowth, eg. open cut high wall and floor, and 5.2ha of vegetation regrowth on the out-of-pit spoil dumps.
- (ii) The area of proposed disturbance including 12.3ha of vegetated land above the existing open cut high wall.
- (iii) A coal crushing area and facilities area.
- (iv) An upgraded Project Site entrance, access road and internal haul road.

The coal crushing area, facilities area and internal haul road would be located within the area of existing disturbance.

The Project Site also contains areas where drainage and surface water management features would be installed and areas which would remain undisturbed and act as a buffer to the project activities.

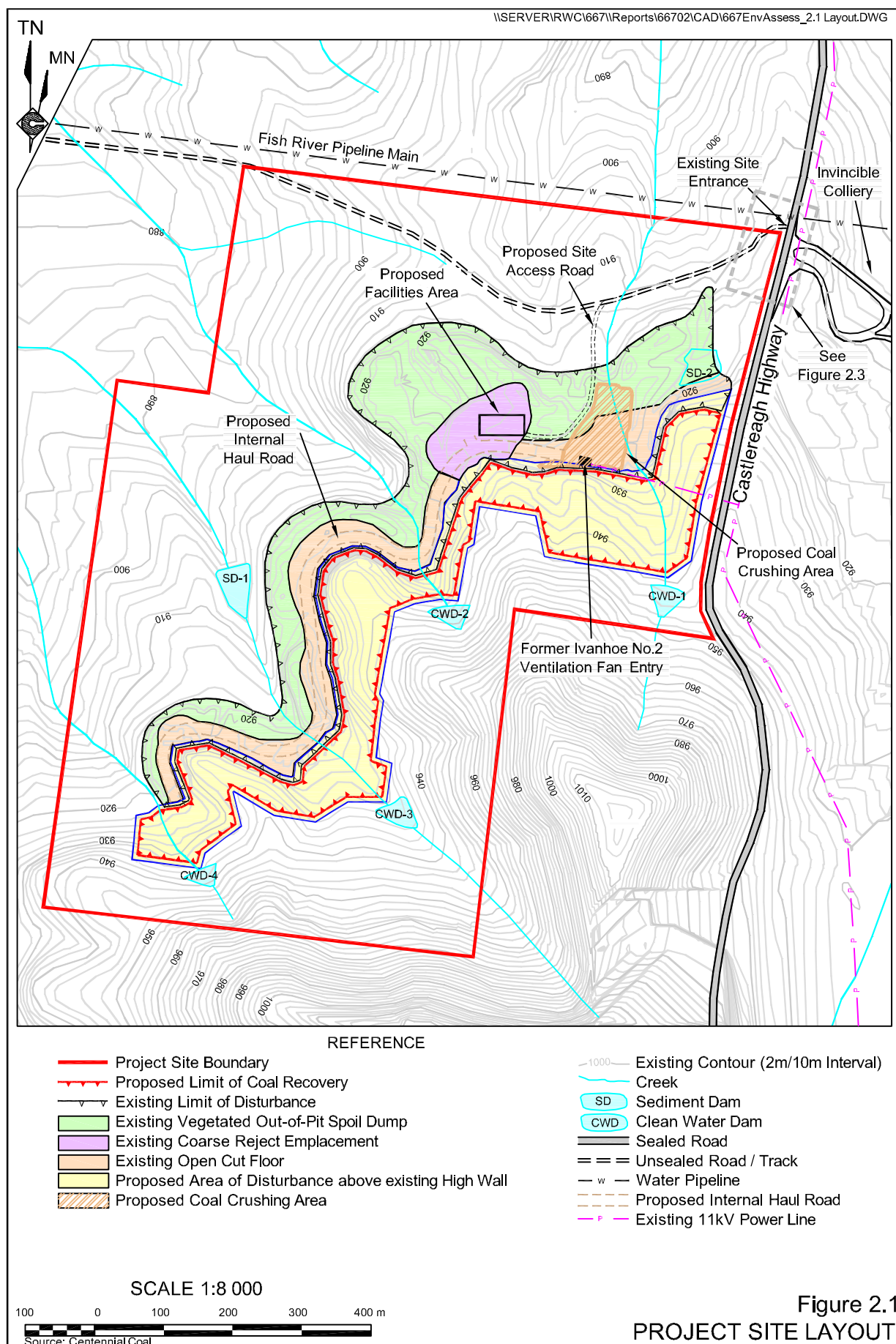
2.2 RESOURCE ASSESSMENT

Four coal seams, namely Middle Irondale, Lidsdale, Lower Irondale and Lithgow, containing recoverable coal, are present at increasing depth within the Project Site.

Other coal seams are present in the Lithgow/Wallerawang Area above the Middle Irondale Seam but do not occur within the proposed area of disturbance. **Figure 2.2** presents a representative cross-section through the Project Site showing the typical seam and interburden thickness.

The Proponent has established that approximately 550 000t of coal could be recovered within the four coal seams. **Table 2.1** presents a summary of the coal resource quantity and quality.





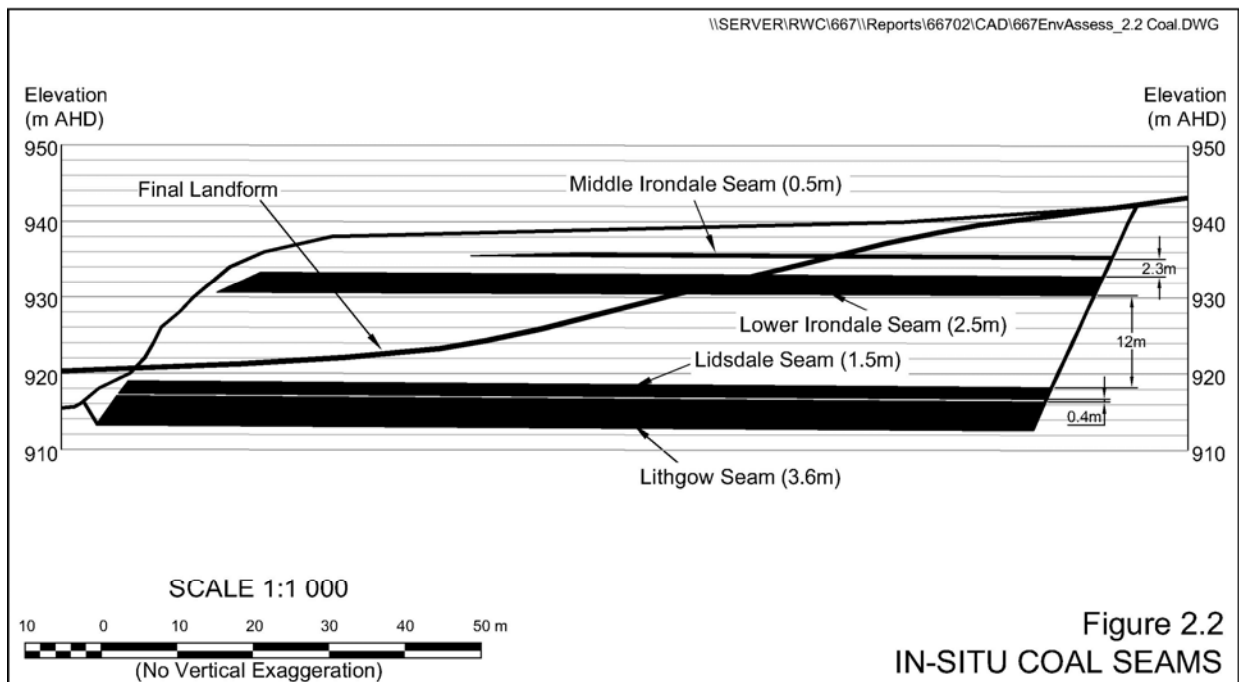


Table 2.1
Recoverable Coal Resource

Coal Seam	Average Thickness (m)	Recoverable Coal (t)	Ash Content
Middle Irondale	0.5	5 000	18% - 30%
Lower Irondale	Upper ply 0.6	20 000	8% - 16%
	Lower ply (banded) 1.9	100 000	42% [#]
Lidsdale	1.5	100 000	30% [*]
Lithgow	Upper plies 2.0	185 000	25%
	Lower plies 1.6	140 000	12% - 13%
Total		550 000	
[#] Selective blending would result in coal of ash content of 30% or lower			
[*] Ash content obtained through selective recovery and blending of four plies within the seam			
Source: Centennial Coal			

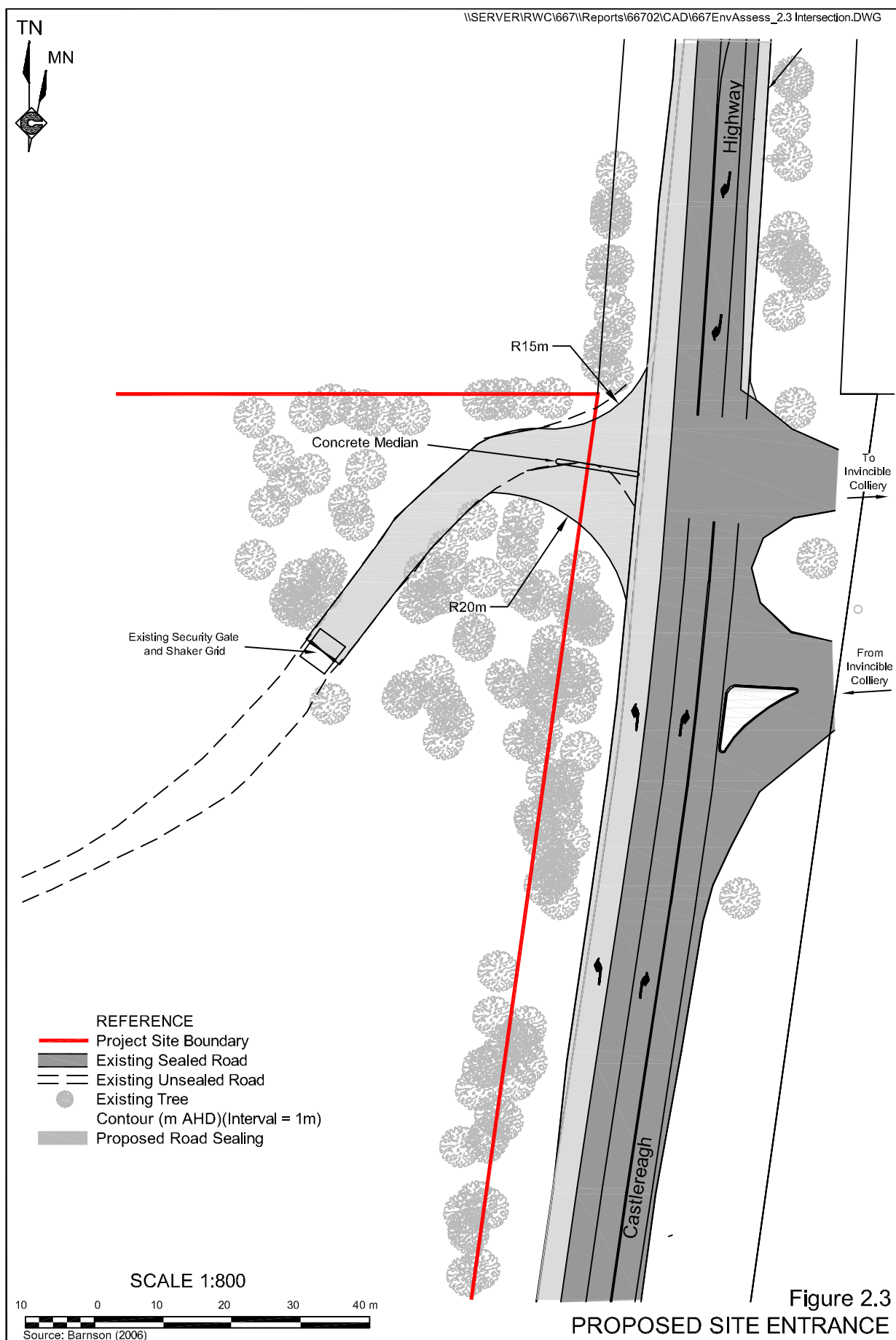
2.3 Site Establishment and Construction

2.3.1 Site Entrance and Intersection

On receipt of planning approval and the Section 138 Road Permit, the Proponent would immediately commission the construction of an upgraded intersection with the Castlereagh Highway and 0.5km long site access road between this intersection and the active coal recovery and rehabilitation areas. **Figure 2.3** presents the existing and proposed intersection with the Castlereagh Highway together with the roads providing access to and from the Invincible Colliery on the eastern side of the Castlereagh Highway.

The proposed location of the Castlereagh Highway intersection would provide sight distance in both directions of at least 200m. From this intersection, the site access road would continue along the existing alignment to where a new security gate and shaker grid would be constructed within the Project Site, approximately 50m from the Castlereagh Highway intersection. The section of the site access road between the highway and security gate would be sealed. This bitumen seal would be applied prior to the despatch of any coal from the Project Site.





2.3.2 Coal Crushing Area

The coal crushing area would cover an area of approximately 120m x 80m and would be located within the partially backfilled void around the ventilation entry of the Ivanhoe No. 2 underground workings, principally to take advantage of the already established 11kV power supply line. Overburden removed during the initial coal recovery operation, supplemented with some of the coarse reject currently stockpiled to the immediate west, would be placed in the void and shaped to accommodate the various structures and equipment.

2.3.3 Facilities Area

The project facilities area would be constructed to the immediate west of the coal crushing area on the existing coarse reject stockpile area and contain demountable style buildings for site offices, first aid room, crib room and toilet/washing facilities. The facilities area would also provide parking for all employees' light vehicles (12).

2.3.4 Internal Haul Road

An internal haul road would be constructed along the existing open cut floor to provide access for mobile equipment and haul trucks between the coal crushing area and active coal recovery and rehabilitation activities. The road would follow the alignment of the existing out-of-pit spoil dumps, thereby providing the maximum distance from the high wall, avoiding disturbance to the established vegetation on these spoil dumps and providing a degree of noise attenuation. Coarse reject from the on-site reject emplacement would be used to construct the road which would be approximately 6m wide. Overburden would be progressively placed to cover the internal haul road as the open cut is rehabilitated.

2.3.5 Services

The establishment of the following services would be required prior to commencement of the project.

Water Requirements: Potable and ablutions water would be sourced from the Fish River Pipeline main to Invincible Colliery, which runs between Back Cullen Road and the Invincible Colliery, just beyond the northern boundary of the Project Site (see **Figure 2.1**).

Electricity: Power for the buildings, coal crushing plant and other Project Site facilities would be provided by the existing 11kV power supply line to the existing Ivanhoe No. 2 Colliery ventilation fan (see **Figure 2.1**).

Communications: Off-site and on-site communications would be by mobile communications and 2-way radio.

Sewage: Sewage would be captured within a septic tank and pumped out and transferred to the Lithgow Sewage Treatment Plant as required.

Fuel: Storage of diesel and refuelling facilities for the earthmoving fleet, would comprise a single 30 000 Litre self-bunded fuel tank and a refuelling bay located within the facilities area adjacent to the internal haul road.



2.4 COAL RECOVERY OPERATIONS

2.4.1 Introduction

The relocation of overburden to create a final landform comparable to that of the surrounding topography would continually expose the four coal seams.

2.4.2 Land Preparation

Those areas to be cleared of existing vegetation would generally be restricted to the areas directly upslope from the abandoned high wall. A firewood contractor would be commissioned to initially remove the larger trees over the entire area to be disturbed. As Ben Bullen State Forest, within which the Project Site is located, is an operational forest supplying the timber industry, a royalty would be paid to DPI (Forests) for the timber removed. Clearing of the remaining vegetation would then be undertaken progressively with only an area sufficient for the ensuing 3 to 4 months of operations.

Once all the larger vegetation has been removed, topsoil would be stripped and transported to completed sections of the final landform for immediate respreading. Where this is not practicable, ie. following initial stripping activities, topsoil would be transferred and stockpiled within existing areas of disturbance or at the perimeter of proposed activities to allow immediate replacement once suitable areas of the final landform are created. Topsoil and any subsoil would be stockpiled separately. Topsoil stockpiles would be less than 2m in height with 2:1 (V:H) batter slopes.

2.4.3 Overburden Removal and Replacement

2.4.3.1 Overburden Removal and Replacement Methods

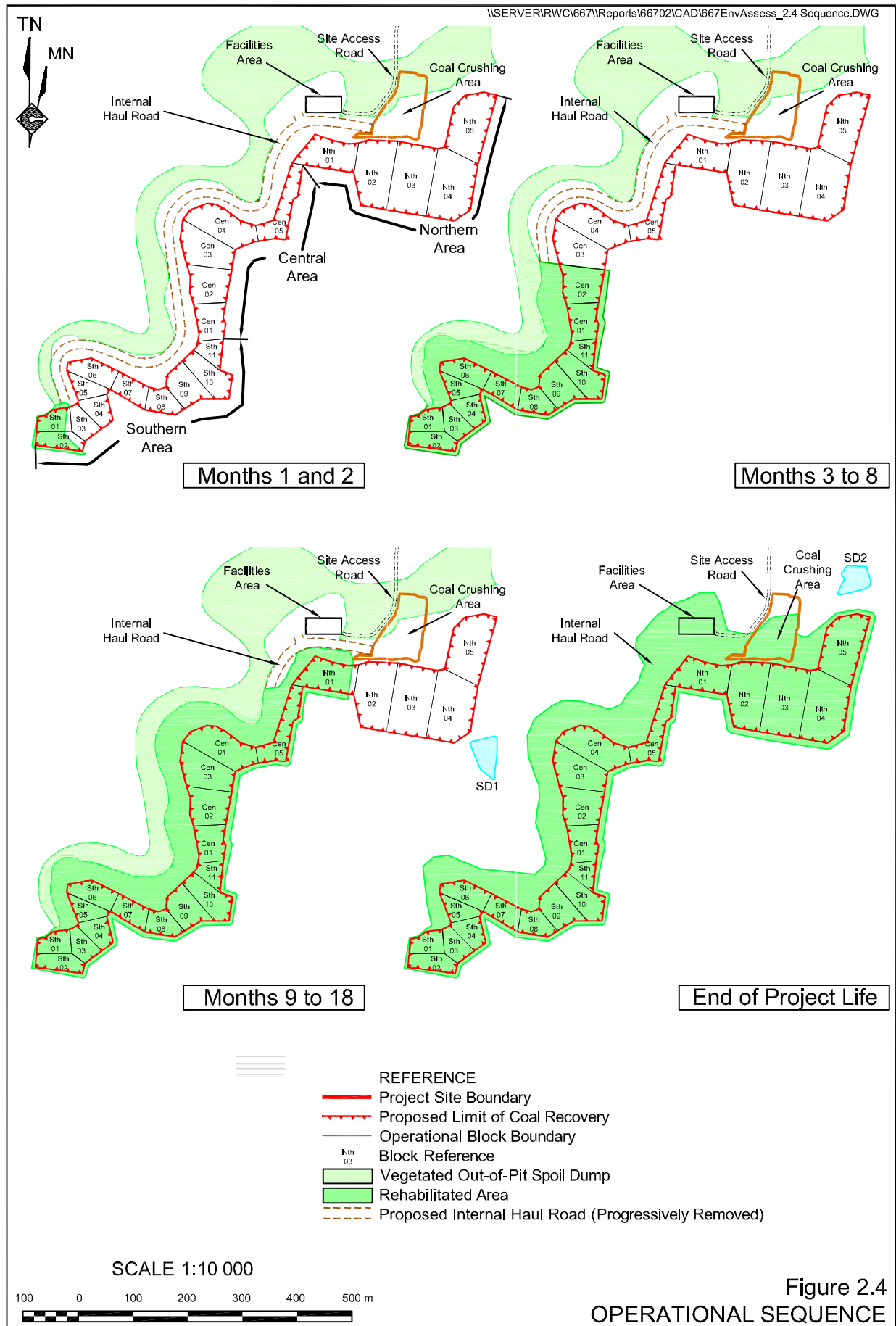
In order to plan the overall rehabilitation and coal recovery operation, the areas to be rehabilitated are divided into three areas, namely: “Southern” (Sth), “Central” (Cen) and “Northern” (Nth). Each of these areas are then divided into operational blocks, eg. Block Sth03, Cen04 and Nth01.

Overburden removal would commence in Blocks Sth01 and Sth02 (see **Figure 2.4**) where the removed material would be transferred to the north of the Project Site to create the hardstand for the coal crushing area. Following the recovery of coal from Block Sth01, overburden removal would then transfer to Block Sth02, followed by Block Sth03 etc. with overburden replaced in the worked out sections of preceding blocks.

Overburden would be removed by one of the two following methods.

- (i) **Bulldozer Push:** involving the ripping of the material by bulldozer and the pushing of the ripped material to a completed section of the block.
- (ii) **Load and Haul:** involving ripping by bulldozer with the ripped material loaded into 50t haul trucks by a 992 front-end loader or 75t excavator for delivery to more distant sections of the former open cut.





Overburden would be removed at a rate of approximately 5 000m³ per day, however, as the same equipment would be used for both overburden removal and the recovery and transportation of coal, when the coal is being recovered, no overburden removal activities would be undertaken and vice versa. As such, overburden removal would not be undertaken every day.

There would be no blasting required in association with the project.

2.4.4 Coal Recovery

The exposed coal seams would be ripped by bulldozer or the bucket of the excavator and loaded into haul trucks by excavator or front-end loader for delivery to the ROM coal stockpile within the coal crushing area. During each coal recovery campaign, up to 7 500 tonnes of coal would be removed and transferred to the ROM stockpile within the coal crushing area each day. Each campaign is anticipated to last between 1 and 5 days with a similar period between each campaign.

2.4.5 Water Management Overview

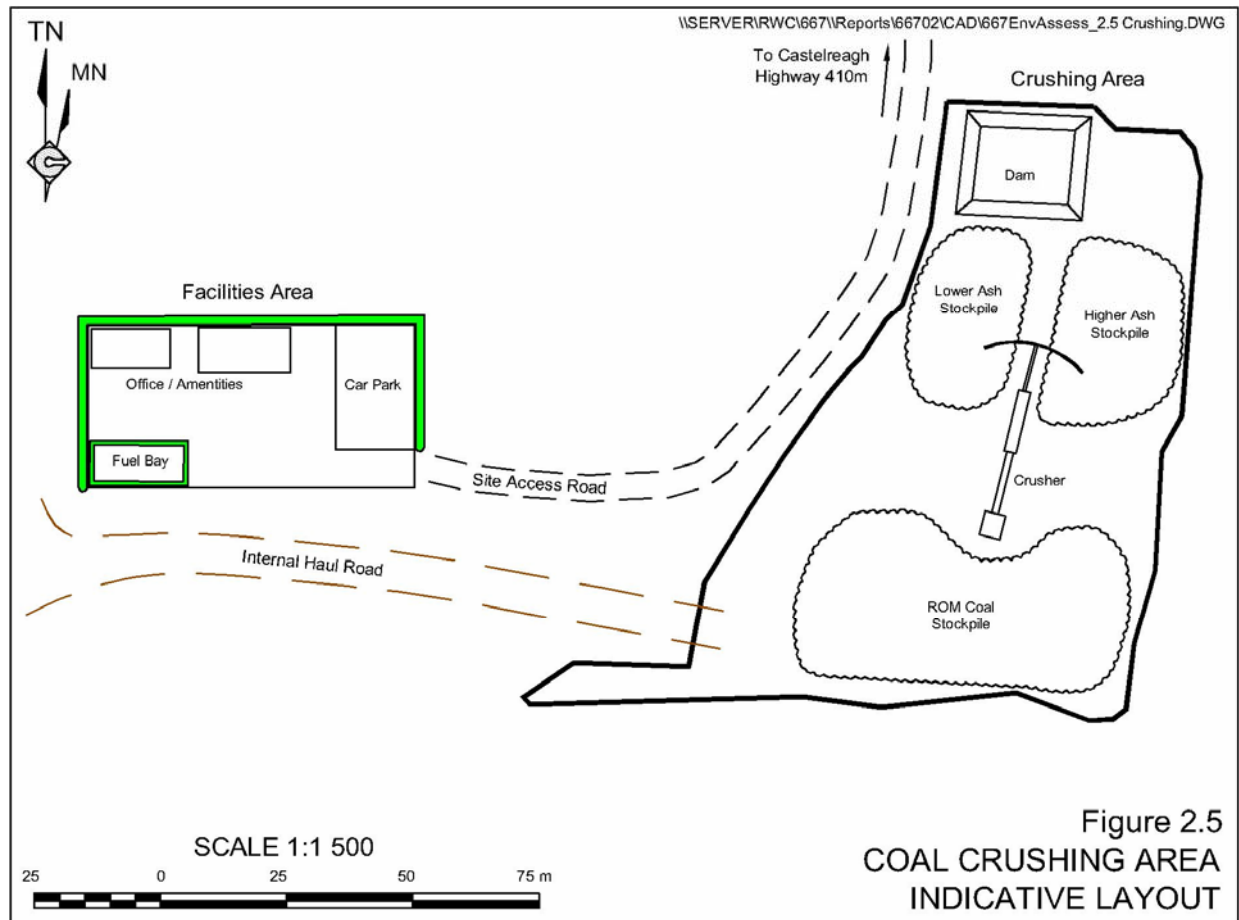
The management of water on the Project Site would focus on the separation of ‘clean’ water (ie. water which has not been exposed to disturbed / active areas), from ‘dirty’ water (ie. water falling on, or flowing over, disturbed / active areas). This would be achieved primarily through the construction of several clean water dams and diversion drains upstream of the proposed area of disturbance, retention of water within the proposed area of disturbance in temporary sediment basins / ponds with overflow from these directed to either of two sediment dams constructed downstream of the proposed areas of disturbance. Section 5.3 presents further detail on the objectives / proposed management of surface water on the Project Site along with an assessment of potential impacts.

2.5 COAL CRUSHING AND STOCKPILING

Figure 2.5 presents the indicative layout of the coal crushing area which has been designed and located to minimise noise impact at the nearest residences.

ROM coal would be transported between the active coal recovery area and the coal crushing area typically in haul trucks travelling along the designated internal haul road (see **Figure 2.1**). The ROM coal would be unloaded and temporarily stockpiled on a ROM pad in stockpile(s) <5m in height. The coal crushing area would provide a ROM pad stockpiling capacity of approximately 15 000 tonnes or approximately two day’s production.





Coal stockpiled within the ROM coal stockpile would be loaded by front-end loader into a crusher (structures of approximately 4m in height). Crushed coal would then be directed by a stacker to one of two crushed product stockpiles to await despatch. The two product stockpiles would be maintained to segregate the lower ash (12% - 18%) product, for sale to the export market, from the higher ash (18% - 26%) product, for sale to local power stations. Approximately 30% of the recovered coal would be lower ash with the remaining 70% higher ash. The crushed coal stockpiles would together contain a maximum of 15 000 tonnes, as the product would generally be transported from the Project Site on the day it is crushed.

The crusher plant would normally operate on a campaign basis for between 15 and 20 days per month at up to 400 tonnes per hour to provide the proposed 300kt/yr.

2.6 COAL REJECT MANAGEMENT

2.6.1 Processing Reject

The crushing of the ROM coal would result in the production of a small proportion of stone or oversize material rejected by the crusher. This material, which would be predominantly shales, siltstones, mudstones and conglomerate (ie. coal seam interburden), would be benign and returned to the active overburden replacement area.

2.6.2 Existing Stockpiled Reject

An estimated 40 000m³ of coal reject has previously been stockpiled within the existing coarse reject emplacement of MPL 79 (**Figure 2.1**). This reject is typically coarse (up to 75mm), comprises predominantly carbonaceous shale and sandstone and has a low potential for acid and salt generation. The Proponent intends to relocate the bulk of this material into the voids within the northern area towards the end of the project life, thus rehabilitating the existing reject emplacement area and leaving a final landform consistent with the surrounding topography.

2.7 PRODUCT TRANSPORTATION

Crushed coal from the product stockpiles would be loaded by front-end loader and despatched off site using highway trucks (semi-trailers or rigid-bodied trucks with trailers) typically with an average 30t pay load. Based on the proportion of lower and higher ash coal, approximately 70% of all truck movements would be between the Project Site and either the Mt Piper or Wallerawang Power Stations, a one-way journey of 3.2km or 10.6km respectively. The remaining 30% of truck movements would be split between the Western Main Colliery, 5.5km from the Project Site and Lidsdale Siding, 10.6km from the Project Site. The transport routes to each of these locations are illustrated on **Figure 2.6**.

Based on the proposed production of 300 000t of coal per year and an average truck load of 30t, the project would generate 10 000 truck loads from the Project Site each year. This would require the despatch of an average of 35 truck loads per day. The Proponent would not however, despatch coal from the Project Site each day, rather coal despatch would occur in campaigns of up to 4 days per week to match the coal crushing operations, (ie. 15 to 20 days each month). As a result, the average number of truck loads despatched from the Project Site would vary between 0 and approximately 50 per day.

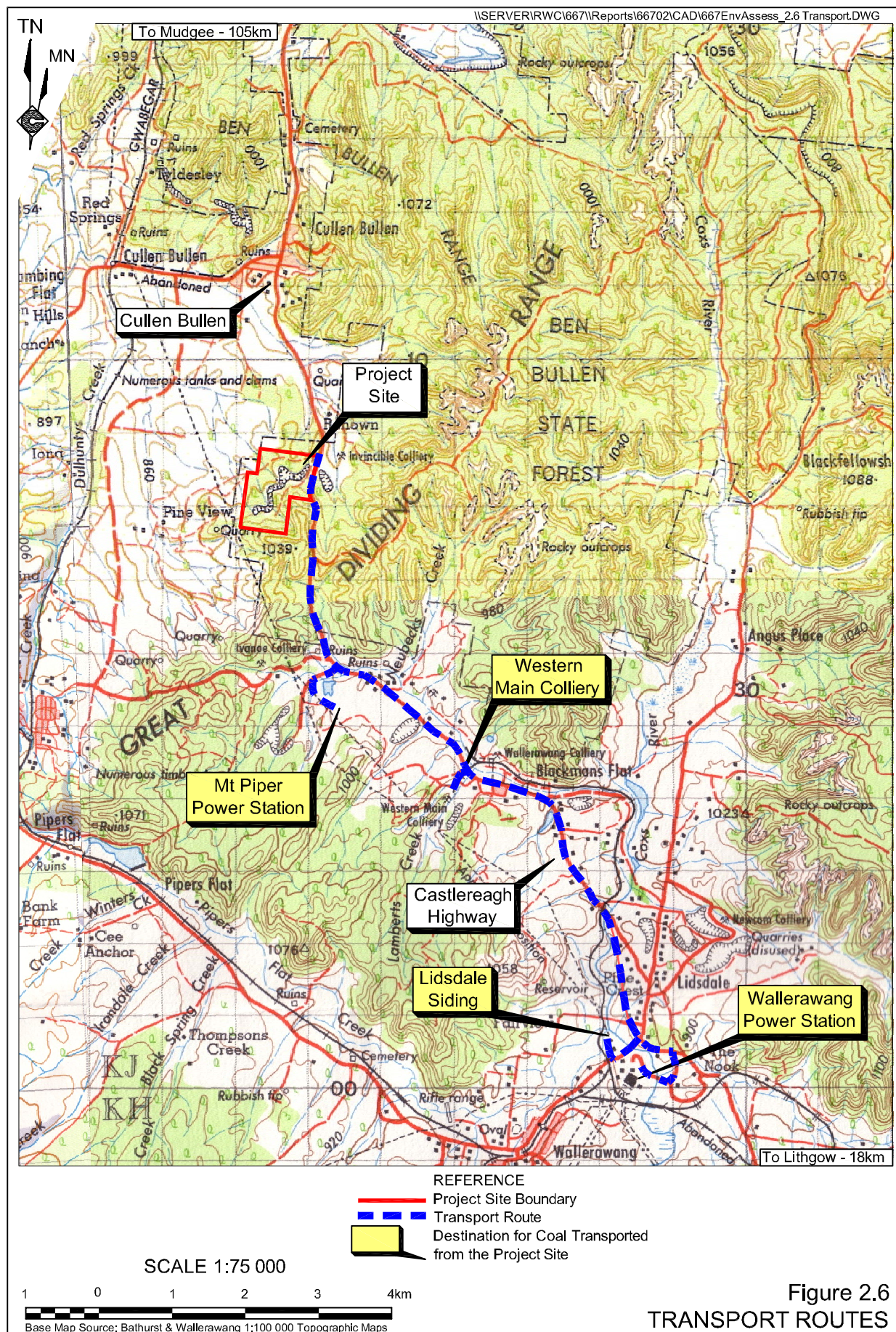
2.8 HOURS OF OPERATION AND PROJECT LIFE

Normal operating hours on site would be between 7:00am and 6:00pm, Monday to Saturday. Some essential equipment maintenance may need to take place outside these hours.

All coal transportation would occur between 7:00am and 5:00pm, Monday to Friday, ie. the first truck entry would occur after 7.00am and last truck exit before 5.00pm.

From commencement to final rehabilitation of the created landform, the overall project life would be approximately 2 years.





2.9 REHABILITATION AND DECOMMISSIONING

2.9.1 Final Landform

Figure 2.7 presents the proposed final landform which recreates the natural slope of the land surrounding the abandoned Cullen Main West open cut. The recreated final slopes would vary from between 6° within sections of the Southern Area and 14° within sections of the Northern Area. This approximates the topography of the existing natural landform where the slopes vary between <5° on the rural land to the west and >20° towards the top of the ridgeline adjacent to the Castlereagh Highway. Natural drainage lines that currently traverse the abandoned Cullen Main West open cut would be reinstated and the entire site revegetated with native woodland species endemic to the local area.

2.9.2 Rehabilitation Procedures

2.9.2.1 Overburden Shaping

A bulldozer would be used to profile the backfilled operational blocks to the final landform presented in **Figure 2.7**.

2.9.2.2 Soil Replacement

Topsoil would be placed on the shaped landform with the materials being preferentially sourced from active stripping areas or, if no such activity is being undertaken at the time, from previously established stockpiles. The thickness of the topsoil and subsoil layers to be replaced would be determined on the basis of the actual volumes of these materials stripped as part of site operations.

Tree trunks and branches <300mm diameter and other smaller vegetative debris removed during vegetation clearing activities would be spread over the topsoiled landform.

2.9.2.3 Drainage Installation

The pre-mining drainage lines of the Project Site would be reinstated as part of the rehabilitation activities. Greater detail on channel construction is provided as Section 5.3.

2.9.2.4 Revegetation

The emphasis to be placed upon the direct transfer of topsoil is specifically to assist in the natural regeneration of a range of trees, plants and shrubs that currently inhabit the Project Site. A program of supplementary seeding of trees and shrubs would be undertaken, principally through direct seeding.

Table 2.2 lists the preferred tree and shrub species to be used to re-establish the native woodland on site.



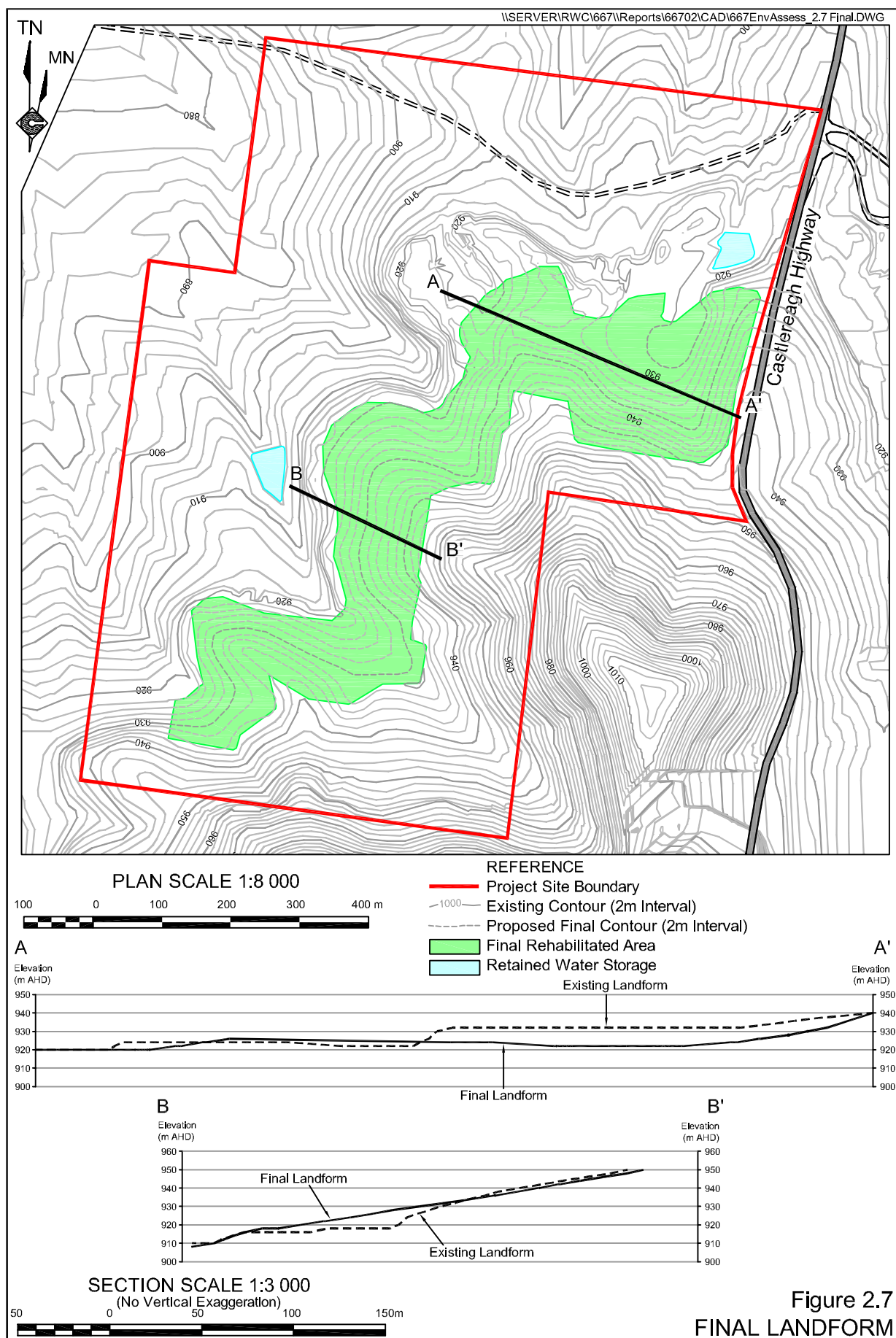


Table 2.2
Tree, Shrub and Grass Species

Common Name, Scientific Name	Common Name, Scientific Name
Trees	
Red Stringybark, <i>Eucalyptus macrorhyncha</i>	Yellow Box*, <i>Eucalyptus melliodora</i>
Western Scribbly Gum, <i>Eucalyptus rossii</i>	Apple Box*, <i>Eucalyptus bridgesiana</i>
Brittle Gum, <i>Eucalyptus praecox</i>	Long-leaved Box*, <i>Eucalyptus goniocalyx</i>
Broad-leaved Peppermint, <i>Eucalyptus dives</i>	Blakely's Red Gum*, <i>Eucalyptus blakelyi</i>
Narrow-leaved Stringybark, <i>Eucalyptus sparsifolia</i>	
Shrubs	
Silver Wattle, <i>Acacia dealbata</i>	Mountain Holly, <i>Podolobium ilicifolium</i>
<i>Bossiaea neo-anglica</i>	<i>Brachyloma daphnoides</i>
Chinese Scrub, <i>Cassinia arcuata</i>	<i>Monotoca scoparia</i>
<i>Persoonia linearis</i>	<i>Lissanthe strigosa</i>
<i>Pultenaea microphylla</i>	<i>Acacia buxifolia</i>
<i>Hibbertia obtusifolia</i>	
Grasses[#]	
Wallaby Grass, <i>Danthonia racemosa</i>	<i>Goodenia hederacea</i>
Redanther Wallaby Grass, <i>Joycea pallida</i>	<i>Gonocarpus tetragynus</i>
Rock Fern, <i>Cheilanthes sieberi</i>	<i>Dianella revoluta</i>
Snow Grass, <i>Poa sieberiana</i> ssp. <i>sieberiana</i>	<i>Hydrocotyle laxiflora</i>
Blue-leaved Snow Grass, <i>Poa sieberiana</i> ssp. <i>cyanophylla</i>	
* On the lower slopes only Source: Modified after Gingra (2005)	
# Generally only in drainage lines requiring stabilisation	

2.9.3 Monitoring and Maintenance

The Project Site would be regularly inspected following the completion of all rehabilitation activities. During regular inspections, aspects of rehabilitation to be monitored would include:

- evidence of any erosion or sedimentation from areas with establishing vegetation cover;
- success of tree and shrub growth and grass re-establishment;
- adequacy of drainage controls; and
- general stability of the site.

The success of vegetation re-establishment would be undertaken through photo monitoring across the final landform.

Where rehabilitation success appears limited, maintenance activities would be initiated. These may include re-seeding and possibly, re-topsoiling and/or the application of specialised treatments such as composted mulch to areas with poor vegetation establishment. If drainage controls are found to be inadequate for their intended purpose or compromised by grazing wildlife, these would be replaced and/or temporary fences installed to exclude grazing of native vegetation by wildlife.



Section 3

Environmental Setting

3.1 SITE HISTORY

The Cullen Main West open cut was a contour mining operation which operated shortly after World War II. The open cut, which is situated immediately to the northwest of Ivanhoe Colliery's No.2 underground workings was abandoned following the cessation of mining in the early 1950s. With the approval of DPI (Mineral Resources), the Proponent has used approximately 20% (2.0ha) of the abandoned open cut (through Mining Purpose Lease (MPL) 79) for mine ventilation for the Ivanhoe Colliery and placement of coarse reject generated by the Ivanhoe and Invincible Collieries. The Proponent has rehabilitation obligations over this area. The abandoned open cut remains unrehabilitated although there has been significant tree regrowth on parts of the open cut floor and "out-of-pit" spoil dumps. Rehabilitation obligations over the remaining 80% (11.4ha) of the Project Site area lie with the NSW Government.

The rehabilitation status of the existing landform is best described by its component parts. These are presented on **Figure 3.1** and considered in greater detail as follows.

- Out-of-Pit Spoil Dumps (see **Plate 3.1** of **Figure 3.1**): Overburden, or spoil, removed by the former open cut was placed along the perimeter of the open cut floor over an area of approximately 5.3ha. The spoil was left at an angle of repose (between 45° and 60°) with some soil material spread over the created landform.
- Abandoned high wall (see **Plate 3.2** of **Figure 3.1**): Developed along the contours of the gentle to moderate slopes of the Project Site, the high wall varies in height from little more than 2m in some sections to greater than 12m in others.
- Open Cut Floor (see **Plate 3.3** of **Figure 3.1**): Varying between less than 5m to almost 20m in width, the open cut floor has created a slight depression in the landscape between the high wall and the out-of-pit spoil dumps. This depression has created several water storages with several artificial drainage lines created to allow the escape of this water.
- Ivanhoe No. 2 Ventilation Entry (see **Plate 3.4** of **Figure 3.1**): The former ventilation entry for the underground mining operation for Ivanhoe Colliery remains adjacent to a section of remnant high wall near the northeastern corner of the former open cut.
- Coarse Reject Emplacement (see **Plate 3.5** of **Figure 3.1**): Elevated plateau covering an area of approximately 3.2ha with a steep slope of >70° created by the placement of coarse reject from the Ivanhoe and Invincible Collieries against the abandoned high wall.



- Constructed Diversion Works (see **Plate 3.6** of **Figure 3.1**): Above the high wall a diversion drain exits (presumably to channel surface water away from the open cut).
- Surface Water Drainage: Four natural drainage lines traverse the existing open cut. These are described in Section 3.3.3.

The remainder of the Project Site is a comparatively well vegetated eucalypt woodland over gentle to moderate slopes. There is a relatively thin topsoil and subsoil layer over a competent conglomerate base rock. Numerous roads / tracks traverse the Project Site.

3.2 LAND OWNERSHIP, LAND USE AND TENURE

3.2.1 Existing Tenements

The Project Site is located wholly within the Ben Bullen State Forest and partly covered (20%) by MPL 79, (an Ivanhoe Coal Pty Ltd surface lease of 12.2ha).

3.2.2 Land Ownership and Land use

3.2.2.1 Project Site

The Ben Bullen State Forest is Crown land without any specific land titles. As a State Forest, the land is managed by the NSW Department of Primary Industries (DPI (Forests)). The project has been approved in principle by DPI (Forests) who have indicated appropriate compensation will be payable under the proposed mining lease.

3.2.2.2 Surrounding Land

Table 3.1 and **Figure 3.2** present the ownership details and dwellings on the land surrounding the Project Site.

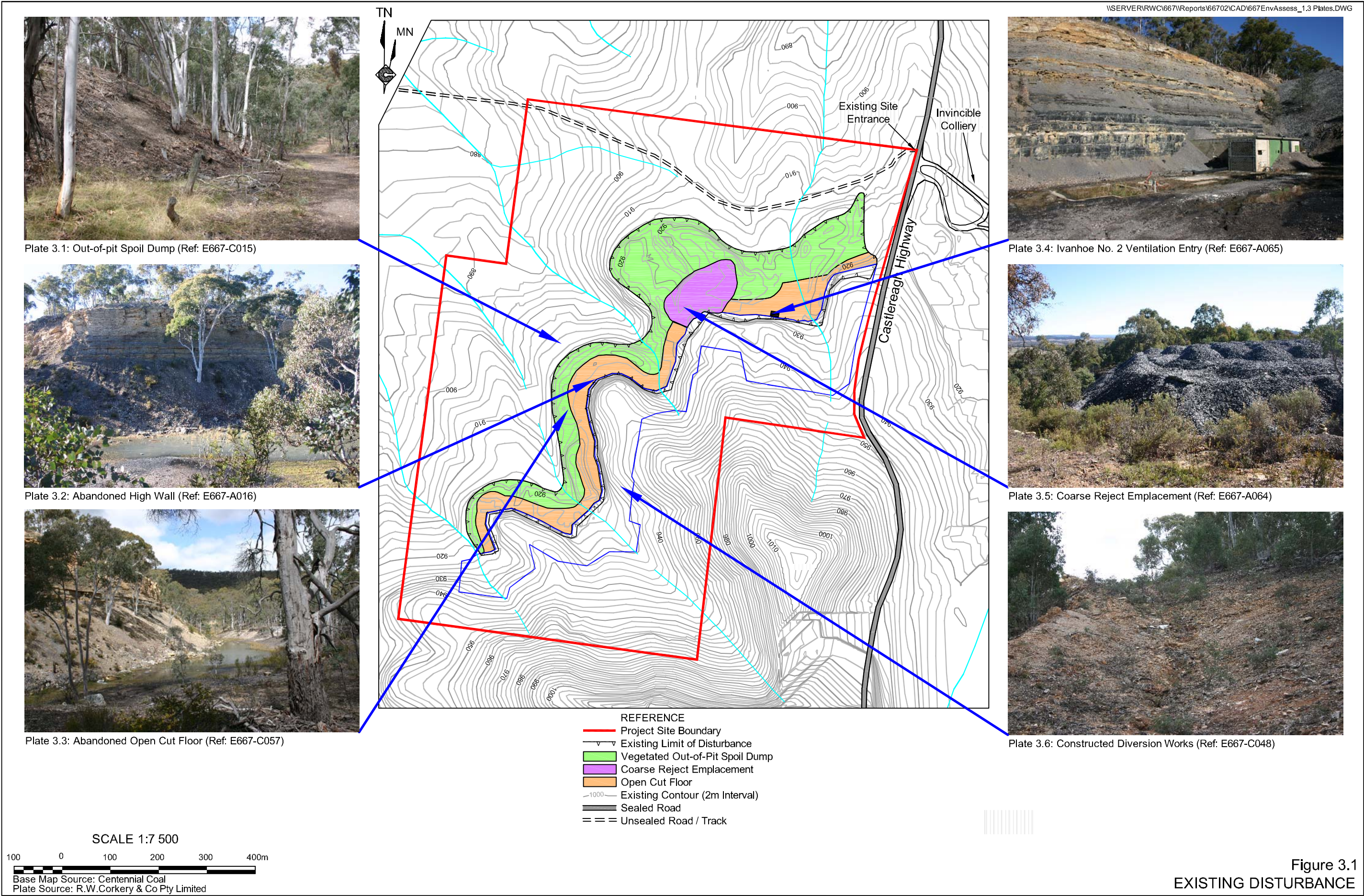
Table 3.1
Land Ownership

Ref*	Land Parcel (Lot / DP Number)	Land Owner	Residence(s)
1	Lot 11, DP 249955, Lot 4, DP 1008594 and Lot 112, DP 877190	M. Bulkeley	D
2	Lots 1 and 2, DP 860892	B. Muenzer	B, K
3	Lot 10, DP 249955	I. Palmer	C
4	Lot 13, DP 755769, Lot 17, DP 755769 & Lot 177, DP 755769	V. & F. Fava, C. Rositano, F. Tedesco, E. Todorello	E
5	Lot 38, DP 755769, Lot 68, DP 755769, Lot 69, DP 755769, Lot 72, DP 755769, Lot 73, DP 755769, Lot 76, DP 755769 Lot 280, DP 755769 and Lot 281, DP 755769	S. & D. Taylor	G
6	Lot 14, DP 755769, Lot 15, DP 755769, & Lot 178, DP 755769	A. & K. Brown	F
7	Lot 264, DP 755769, Lot 263, DP 755769 & Lot 186, DP 755769	J. & S. Taylor	H
8	Lot 18, DP 755769, Lot 22, DP 755769, Lot 64, DP 755769, Lot 185, DP 755769, Lot 5, DP 1071704 & Lot 6, DP 1071704	R. Clark	I
9	Lot 1, DP 1016508	G. & J. Clark	J
10	Lot 362, DP 740604, Lot 366, DP 740604	Delta Electricity	
11	Lot 11, DP 614429	Hyrock Pty Limited	
12	Lot 1, DP 180294 and Lot 113, DP 877190	Coalpac Pty Limited	A
13	Ben Bullen State Forest (no title)	Crown Land	

Source: Land Property Information Service

* see **Figure 3.2**





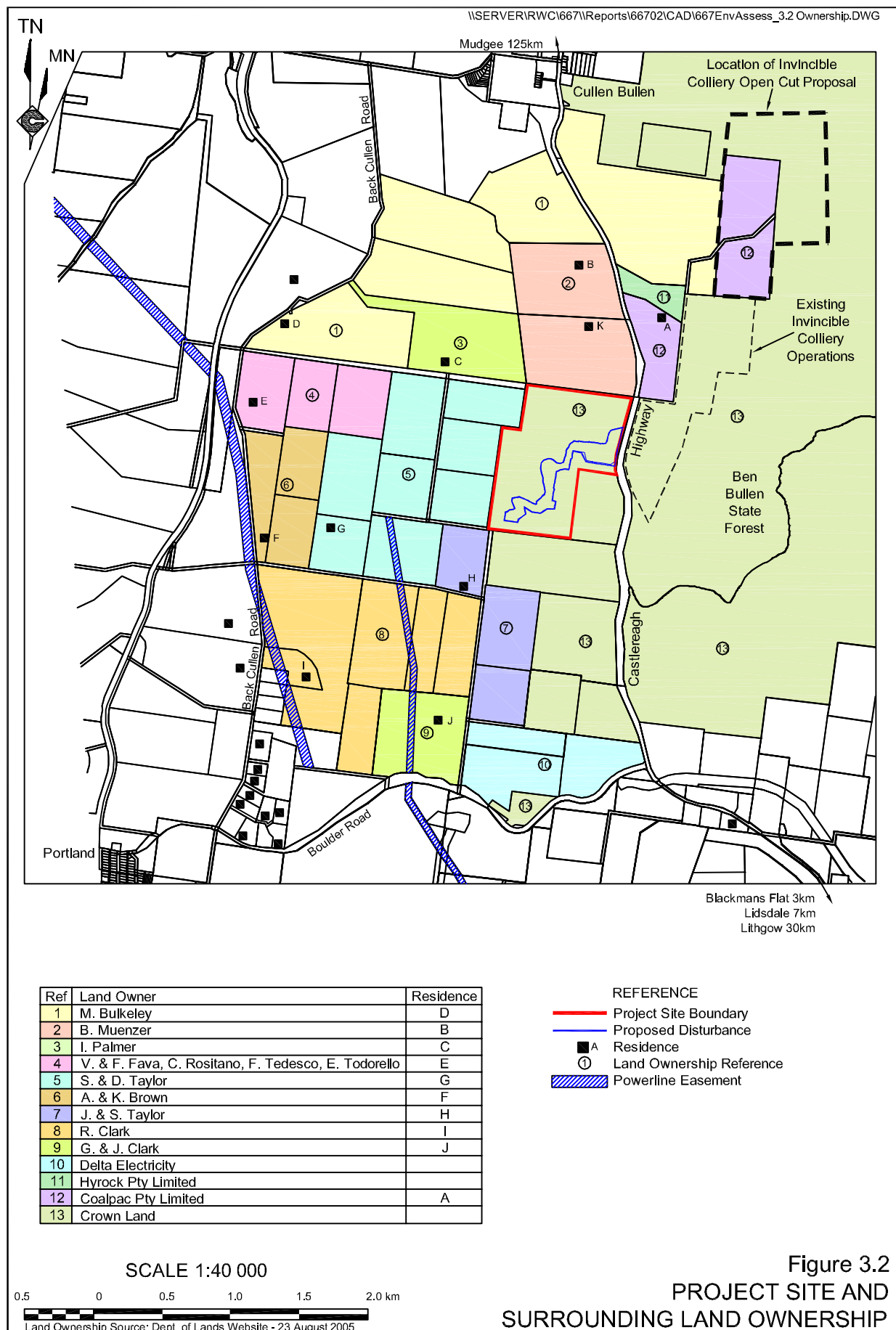


Figure 3.2
PROJECT SITE AND
SURROUNDING LAND OWNERSHIP



Land use surrounding the Project Site consists of agricultural grazing and rural residential properties, and forestry and nature conservation within Ben Bullen State Forest. Ben Bullen State Forest also contains the coal mining operation of the Invincible Colliery to the immediate east of the Project Site (see **Figure 3.2**).

3.2.2.3 The Invincible Colliery – Proposed Open Cut Operations

The Invincible Colliery is currently on a care and maintenance program since operations ceased in 2001, however, Coalpac Pty Limited (“Coalpac”) is in the process of seeking project approval from the Minister for Planning for the commencement of open cut mining operations in an area north of the existing colliery pit top (see **Figure 3.2**). The following is a summary of the proposed operations at the Invincible Colliery, as described by a draft EIS prepared for the proposed open cut project by Craven, Elliston and Hayes Pty Limited, for commencement during 2006.

The proposed Invincible Colliery open cut would disturb approximately 10ha of land within Ben Bullen State Forest to produce approximately 720 000t of coal. This coal would be processed using the existing and/or upgraded infrastructure of the Invincible Colliery to produce between 100 000tpa and 350 000tpa (at a production rate of 150t to 1200t per day) for delivery to local power stations and other domestic customers. The coal would be transported via the Castlereagh Highway and other roads and at a rate increasing from approximately 100 000tpa in its first year to 350 000tpa in subsequent years. It has been estimated that at this maximum production rate, this would require on average 90 to 100 truck movements each day.

The proposed Invincible Colliery open cut project would employ up to 12 people and operate between the hours of 6.00am and 8.00pm Monday to Friday with some work undertaken on weekends. Given the proposed resource to be mined and yearly production schedule, the project would operate for between 3 and 6 years.

Coalpac has proposed a progressive rehabilitation program for the project which would retain the steep slopes of the open cut and revegetate the area with native woodland species.

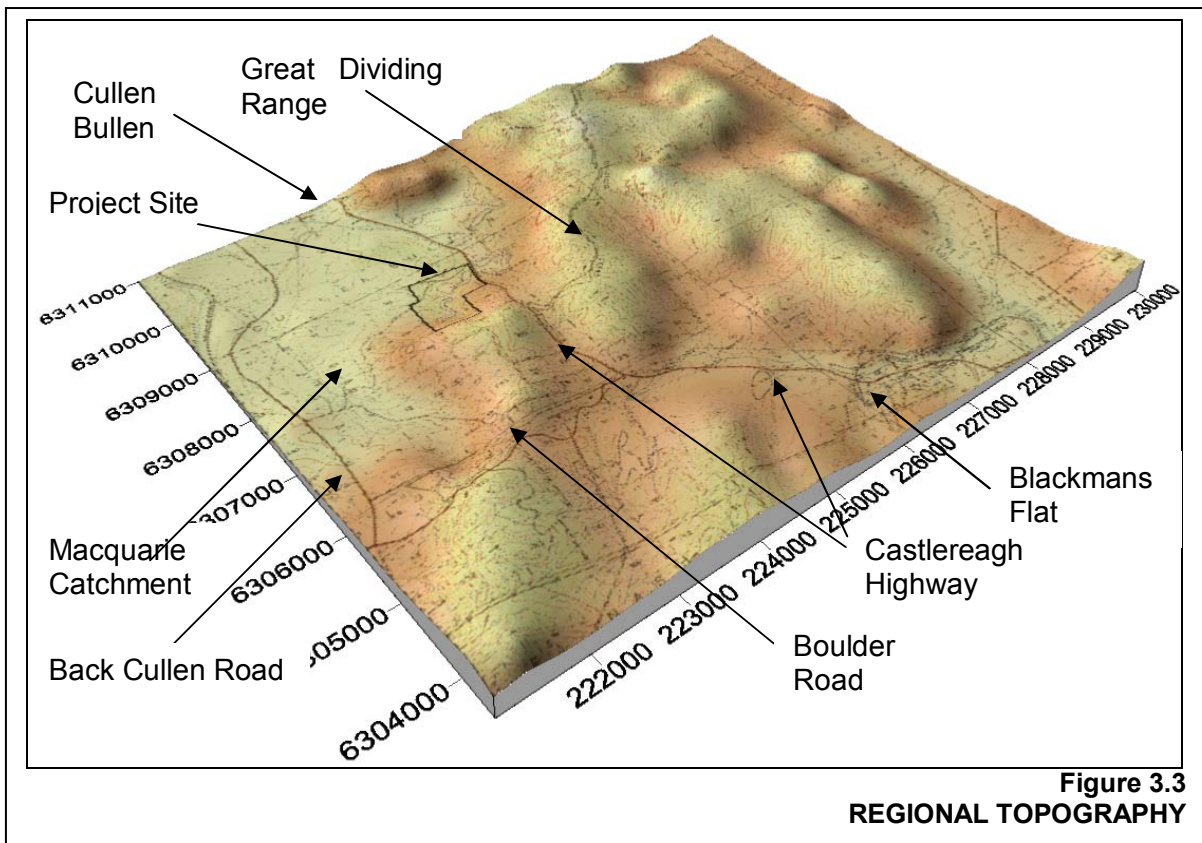
3.3 BACKGROUND ENVIRONMENTAL INFORMATION

3.3.1 Topography

The Project Site is located at an elevation of 890m to 970m AHD on the slopes of the Great Dividing Range to the immediate west of the catchment divide between the Coxs and Turon River Catchments in western NSW. The topography of the region is typified by rocky slopes and escarpments to the east and gentler slopes to the west (see **Figure 3.3**).

The hill slope on which the Project Site is located consists of a moderately steep slope of up to 13° decreasing to a more gentle slope of <7° to the north and northwest of the former open cut.





3.3.2 Soils, Land Capability and Overburden Characteristics

A Soil and Land Capability Study (GCNRC, 2006) has been undertaken to determine the nature of the soils across the Project Site. The soils were found to be generally shallow, infertile and moderately erodible. The soils are currently relatively stable, although minor areas of sheet and gully erosion are evident on the slopes and gullies/tracks, respectively.

The pre-disturbance Land Capability of the Project Site is Class VII, which is land best protected by green timber. The Agricultural Land Suitability of the site is Class 5, that is, land unsuitable for agriculture (GCNRC, 2006).

The overburden is predominantly well stratified, partially friable sandstone and carbonaceous shale that can be readily ripped using a D11, or similar sized bulldozer. The carbonaceous shale and sandstone of the Blackmans Flat Conglomerate and Long Swamp Formation have low sulphur content and would therefore exhibit a low acid generating potential. Groundwater availability maps (DIPNR, 1995-2003), note groundwater in the local area is 'brackish', suggesting the overburden may have some salinity tendencies.

3.3.3 Drainage

The Project Site is located within the upper catchment of the Turon River near the divide between the Turon River and Cocks River catchments. The location of the Project Site within the Turon River and larger Macquarie River catchment is presented on **Figure 3.4**. Surface water flows on the Project Site drain locally to two sub-catchments of the Turon River identified as Sub-catchment C, which drains to Cullen Creek, and Sub-catchment H, which drains to Hunts Creek (see **Figure 3.4**).



Within the area to be disturbed by the project activities, four ephemeral and “first order” drainage lines or streams (Strahler, 1957) have been identified (see **Figure 3.4**). **Table 3.2** summarises the relevant features of each of these drainage lines.

Table 3.2
Project Site Drainage Lines

Drainage Line	Sub-catchment	Catchment area (above high wall)	Comments
Stream 1	C	12ha	Previous mining activities disturbed the natural flow path of Stream 1 with current flows to an artificial channel, constructed as part of the previous mining works.
Stream 2	H	5ha	Most of the surface flow is now captured within the open cut floor of the former open cut.
Stream 3	H	24ha	Has been largely left undisturbed by previous mining activities and has been allowed to flow along its natural flow path. Significant gully erosion evident
Stream 4	H	3ha	Has been largely left undisturbed by previous mining activities and has been allowed to flow along its natural flow path.
Source: Modified after GSS (2006) – Section 4.6			

3.3.4 Meteorology

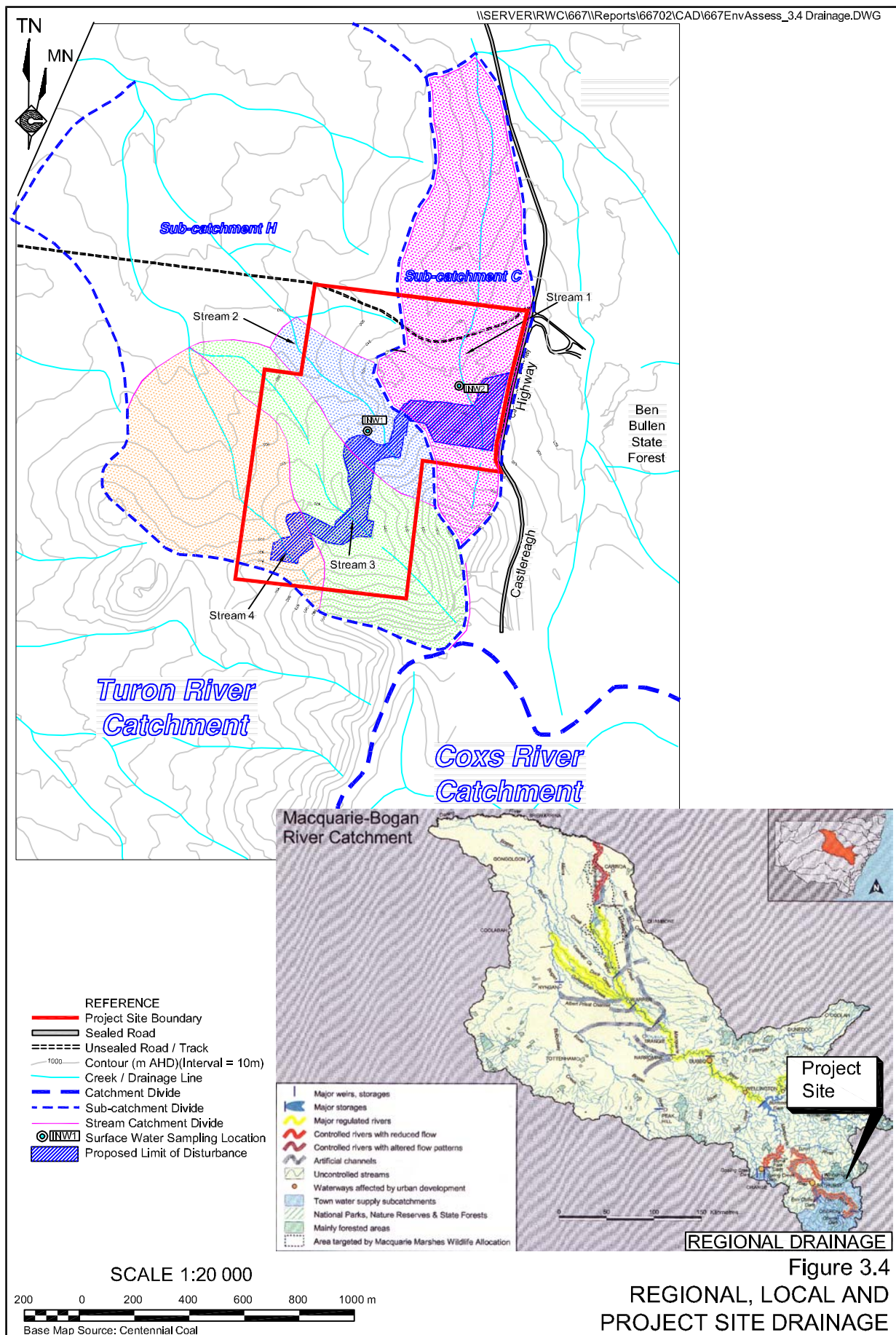
The Cullen Bullen area lies within the cool-temperate climatic zone and is characterised by mild summers and cold winters. Rainfall is seasonally distributed with higher falls during the warmer months. On a more localised scale, the climatic regime is largely influenced by factors such as topography, altitude, aspect and exposure. In general, diurnal temperature range, frost, fog and snow incidence increase with increasing altitude.

With the exception of wind data, all meteorological data is presented in **Table 3.3**. The meteorological data provides a basis for project planning particularly with respect to noise, air quality, water management and rehabilitation.

Relevant climate-related information provided by **Table 3.3** is as follows.

- January is the warmest month (average maximum 25°C and average minimum 12°C) and July the coldest month (average maximum 10°C and average minimum approximately 1°C).
- Frosts are common within the area with most occurrences between May and September. Mean frost days range from zero in January and February to 15 in July. Radiation inversions, the main type of temperature inversion likely to cause noise enhancement, tend to occur on frosty mornings and on days when fogs are present. During winter, temperature inversions would be expected to occur on at least one third of mornings.





Most rain falls in summer while least falls in winter. Conversely, the mean monthly number of rain days is marginally greater in winter and spring than summer and autumn.

Table 3.3
Mean Monthly Meteorological Data

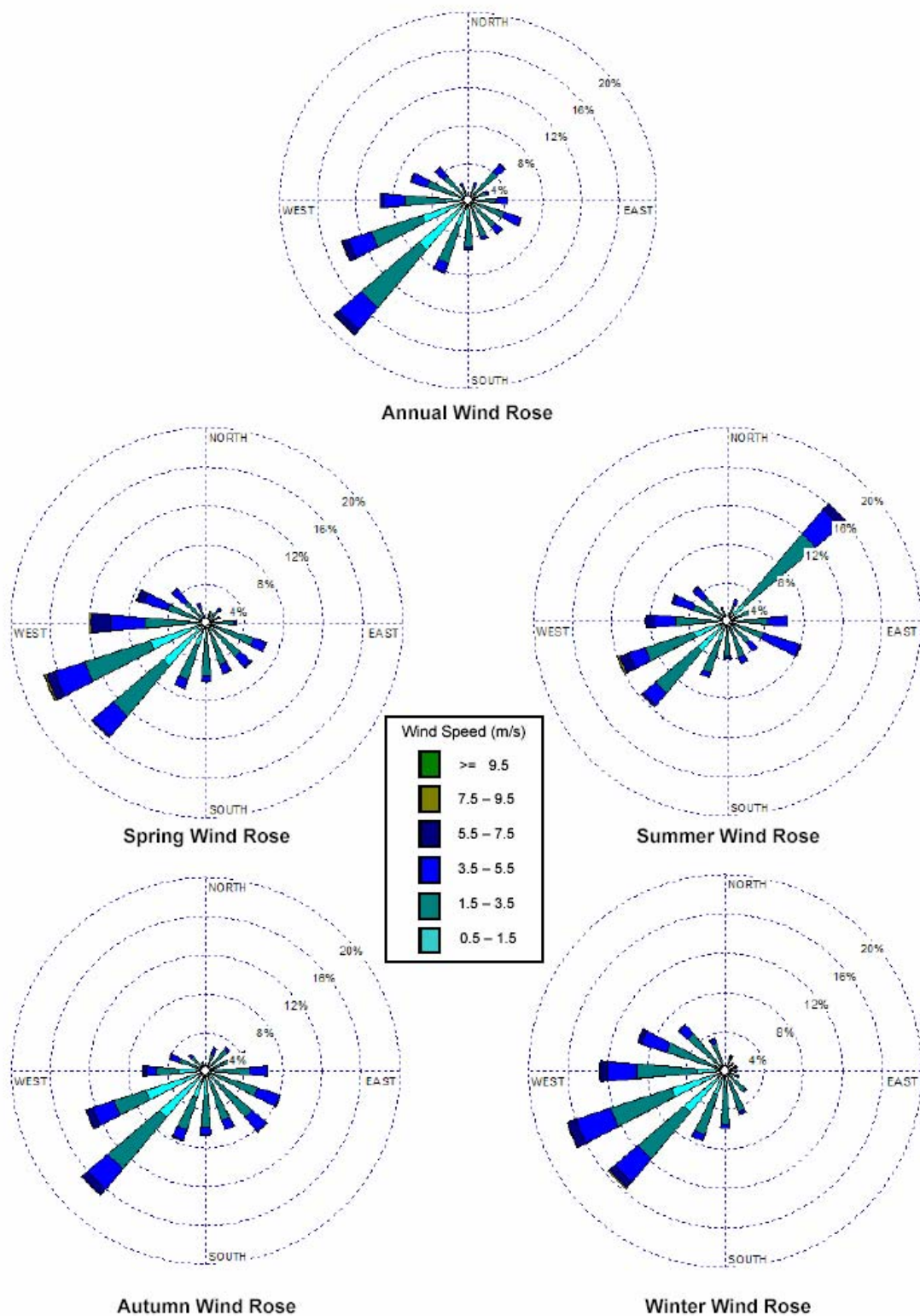
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
TEMPERATURE - °C - Lithgow (81 years of records)													
Mean Daily	25	25	22	18	14	11	10	12	15	19	22	25	
Maximum Daily	12	12	10	7	4	2	1	1	3	6	8	10	
Mean Minimum													
RAINFALL - mm - Lithgow (90 years of record)													
Mean	94	84	86	64	65	68	68	64	59	67	69	76	863
Median	83	65	68	51	47	83	51	48	53	59	65	67	864
Mean Raindays	11	10	11	9	11	12	12	11	10	10	10	10	126
RAINFALL - mm – Lidsdale State Forest (40 years of records)													
Mean	109	85	71	59	67	75	52	67	60	84	74	74	877
Median	109	80	51	46	50	59	48	61	56	74	63	58	826
EVAPORATION - mm - Bathurst Agricultural Research Centre (31 years of records)													
Mean	211	162	140	84	50	33	34	56	78	124	156	208	1 351
Highest	285	210	186	123	150	42	43	80	117	170	258	297	1 961
Lowest	145	109	105	54	34	30	28	40	66	77	117	164	969
RELATIVE HUMIDITY - % - Lithgow (32 years of records)													
9.00 am	64	71	72	75	81	82	77	72	64	60	60	60	70
3.00 pm	52	57	56	55	62	65	60	54	51	50	48	46	55
FOG FREQUENCY - Lithgow (32 years of record)													
Average No./Month	1	1	1	1	2	2	1	1	1	1	1	1	
FROST FREQUENCY - Lithgow (32 years of record)													
Average No./month	0	0	0	2	8	11	15	13	9	3	1	0	
SNOW DAYS - Lithgow (32 years of records)													
Average No./Month	0	0	0	0	0	0	1	1	1	0	0	0	
Maximum No. recorded/Month	0	0	0	0	1	2	3	3	4	1	1	0	
Source: Bureau of Meteorology													

Figure 3.5 presents the annual and seasonal wind behaviour, as simulated by The Air Pollution Model (TAPM), as wind roses (Heggies, 2006b). The wind roses indicate the following.

- In spring, the prevailing winds are from the west and southwest.
- In summer, the wind direction varies from the southwest and northeast.
- In autumn, the prevailing winds are experienced predominantly from the southwest.
- In winter, the prevailing wind direction is from the west and southwest.

On an annual basis, the prevailing wind for the Project Site is from the southwest.





Source: Heggies Australia Pty Limited (2006) – Appendix A3

Figure 3.5
TAPM GENERATED WIND ROSES



Section 4

Key Issue Identification

4.1 ISSUE IDENTIFICATION

4.1.1 Key Assessment Requirements of the Director-General's Requirements

The Department of Planning, through the preparation of Director-General's Requirements (DGR's) for the project, has identified key assessment requirements for the preparation of the Environmental Assessment. These key assessment issues, along with relevant reference material, for which the Environmental Assessment must assess the potential impacts (including any potential cumulative impacts that may arise, particularly in association with the proposed expansion of the Invincible Colliery), and describe what measures would be implemented to avoid, minimise, mitigate, offset, manage and/or monitor these impacts, are listed as follows.

- Transport – refer to the *Guide to Traffic Generating Development and Road Design Guide* (Roads & Traffic Authority), or relevant Austroad standards;
- Noise – refer to the *NSW Industrial Noise Policy and Environmental Criteria for Road Traffic Noise* (Department of Environment and Conservation);
- Blasting – refer to the *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration* (ANZECC);
- Air – refer to *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (Department of Environment and Conservation);
- Soil & Water – include a detailed water balance, and refer to the *Guidelines for Fresh and Marine Water Quality* (ANZECC), *Managing Urban Stormwater: Soils & Construction* (Landcom), and the various *State Groundwater Policy* documents (Department of Natural Resources);
- Flora & Fauna – refer to the draft *Guidelines for Threatened Species Assessment* (Department of Environment and Conservation);
- Heritage – refer to the draft *Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation* (Department of Environment and Conservation); and
- Visual.

It is noted that the project does not require blasting and therefore, this key assessment requirement has not been included in the Environmental Assessment.



4.1.2 Stakeholder Consultation

In addition to the Department of Planning, key stakeholders in the assessment of the project including, the local community, Lithgow City Council and other relevant NSW government agencies were consulted.

Table 4.1 identifies the issues raised by the local community following a consultation program undertaken by the Proponent.

Table 4.1
Issues Identified Following Community Consultation

Environmental Issue	Frequency Raised	Comments
Operational Noise	7	Residents were concerned about the noise from the operation affecting their amenity.
Visual Amenity	4	Residents were concerned about the interruption to their views and landscape scars affecting their amenity.
Air Pollution (dust)	5	Residents were concerned about the dust from the operation affecting their amenity and health.
Property Values	3	Residents were concerned about potential decreases in property values as a result of the operation and potential landscape scars.
Traffic	2	Resident was concerned about increased traffic on local roads.

Other issues identified by local and NSW government agencies included:

- Water Resources.
- Rehabilitation / Final Landform.
- Soil.
- Aboriginal heritage.
- Contaminated land.
- Bushfire and spontaneous combustion.

Appendix 3 presents the complete record of consultation undertaken.

4.2 ISSUE IDENTIFICATION AND PRIORITISATION

Based on the issues identified in Section 4.1, a risk assessment was undertaken to quantify the environmental risk posed by each issue. For each of the key assessment requirements identified by the DGR's and other issues identified through stakeholder consultation, a list of potential environmental impacts was derived. The environmental risk associated with each was then determined through consideration of both the potential consequence and likelihood of occurrence of each impact and categorised as low, medium or high risk. **Table 4.2** presents the summarised results of this risk assessment, presented in full as **Appendix 4**.

Section 5 provides a detailed assessment of the key assessment requirements and other environmental issues categorised as medium or high risk, concentrating on the major risks posed by each, and a basic assessment of those issues categorised as low risk.



Table 4.2
Risk Assessment Results

Environmental Issue	Assessment of Risk	Greatest Risks Associated With:
Traffic	Low to Medium	• Traffic impacts on the Castlereagh Highway (Low). • Increased traffic congestion (Low). • Degradation of the road surface (Low).
Noise	Low to Medium	• Minor, marginal and major noise exceedances associated with operational activities (Medium). • Minor, marginal and major noise exceedances associated with project-related traffic (Low).
Surface Water Resources	Low to Medium	• Discharge of “dirty” water from the Project Site (Medium). • Hydrocarbon spill discharge to natural drainage lines (Medium). • Erosion of natural drainage lines (Low). • Erosion of rehabilitated final landform (Low). • Flooding of active operational areas (Low).
Air Quality	Low	• Dust generated by the rehabilitation and coal recovery activities (Low). • Particulate matter generated by the rehabilitation, coal recovery and coal crushing activities (Low).
Visual Amenity	Medium	• Visibility of exposed operational areas to the north-northwest, west and southwest (Medium).
Flora and Fauna	Medium	• Disturbance to native vegetation (Medium). • Disturbance to threatened flora and fauna (Medium). • Possible local extinctions of threatened flora and fauna (Medium).
Property Values	Low to Medium	• Possible temporary and/or long term devaluation of local properties (Low / Medium)
Soils	Low	• Disturbance to soils and possible degradation of soil quality (Low).
Rehabilitation	Low to Medium	• Temporary disturbance to the landform (Low). • Possibility of permanent alteration to the local landform (Low).
Contaminated lands	Low	• Hydrocarbon spills to undisturbed lands (Low). • Contamination of landform by coal reject already stockpiled or generated by the project (Low).
Bushfire and Spontaneous Combustion	Low to Medium	• Localised spontaneous combustion event (Low). • Initiation of bushfire on the Project Site (Low). • Spread of bushfire initiation on the Project Site to Ben Bullen State Forest and beyond (Medium).
Aboriginal Heritage	Low	• No major risks.
Groundwater Resources	Low	• No major risks.



Section 5

Assessment and Management of Key Environmental Issues

5.1 TRAFFIC AND TRANSPORT

5.1.1 Introduction

Based on the risk assessment undertaken for the project (see **Appendix 4**), traffic and transport related issues that require assessment include:

- traffic impacts on the Castlereagh Highway (medium risk);
- increased traffic congestion (medium risk); and
- degradation of the road surface (low risk).

In addition, the Director-General's Requirements issued by DoP require that this assessment refer to the Guide to Traffic Generating Development and Road Design Guide (Roads & Traffic Authority), or relevant Austroads standards.

5.1.2 Existing Environment

As presented in **Figure 2.6**, the crushed coal product would be delivered to local power stations, the Lidsdale Siding and Western Main Colliery via the Castlereagh Highway and local roads already used by similar heavy vehicle traffic types. The existing road and traffic conditions are as follows.

Project Site – Castlereagh Highway Intersection

The current entrance to the Project Site comprises a gravel shoulder and unsealed road off the Castlereagh Highway, approximately opposite the entrance to the Invincible Colliery. Sight distance to the north and south is 250m and 300m, respectively.

Traffic Volumes

Traffic on the Castlereagh Highway has exhibited a 1.2% annual increase since 1980 (Barnson, 2006 – Appendix 2) and a current proportion of heavy vehicles of 11% (Barnson, 2006 – Section 3.1). Based on a continued increase of 1.2% and maintenance of the proportion of heavy vehicles, a projection of annual traffic volumes has been made for 2006 to 2010 (**Table 5.1**) (Barnson, 2006 – Section 3.1).



Table 5.1
Traffic Projections

Year	Vehicles per day	Heavy Vehicles per day
2006	2580	284
2007	2610	287
2008	2630	289
2009	2660	293
2010	2690	296
Source: Modified after Barnson (2006) –Table 3		

Current Coal Traffic

The Proponent notes that two collieries to the north of the Project Site currently despatch coal carrying trucks via the Castlereagh Highway for delivery to similar destinations as proposed for the project.

- Cullen Valley Colliery produces and despatches up to 800 000tpa.
- Baal Bone Colliery produces and despatches approximately 500 000tpa.

Production from Cullen Valley Colliery is likely to decrease to approximately 200 000tpa as local power stations begin to take up contracts with alternative coal suppliers.

Road Pavement and Condition

At three representative locations (see **Figure 5.1**), the pavement type was described as consisting of a granular type material with a bitumen seal (Barnson, 2006 – Section 4.3). According to Barnson (2006), the condition of the pavement seal was considered good at the Project Site Entrance and Blackmans Flat (Plates 1, 2 and 4 – **Figure 5.1**) but was displaying signs of deterioration at the Castlereagh Highway – Boulder Road intersection (Plate 3 – **Figure 5.1**)

Intersection Level of Service

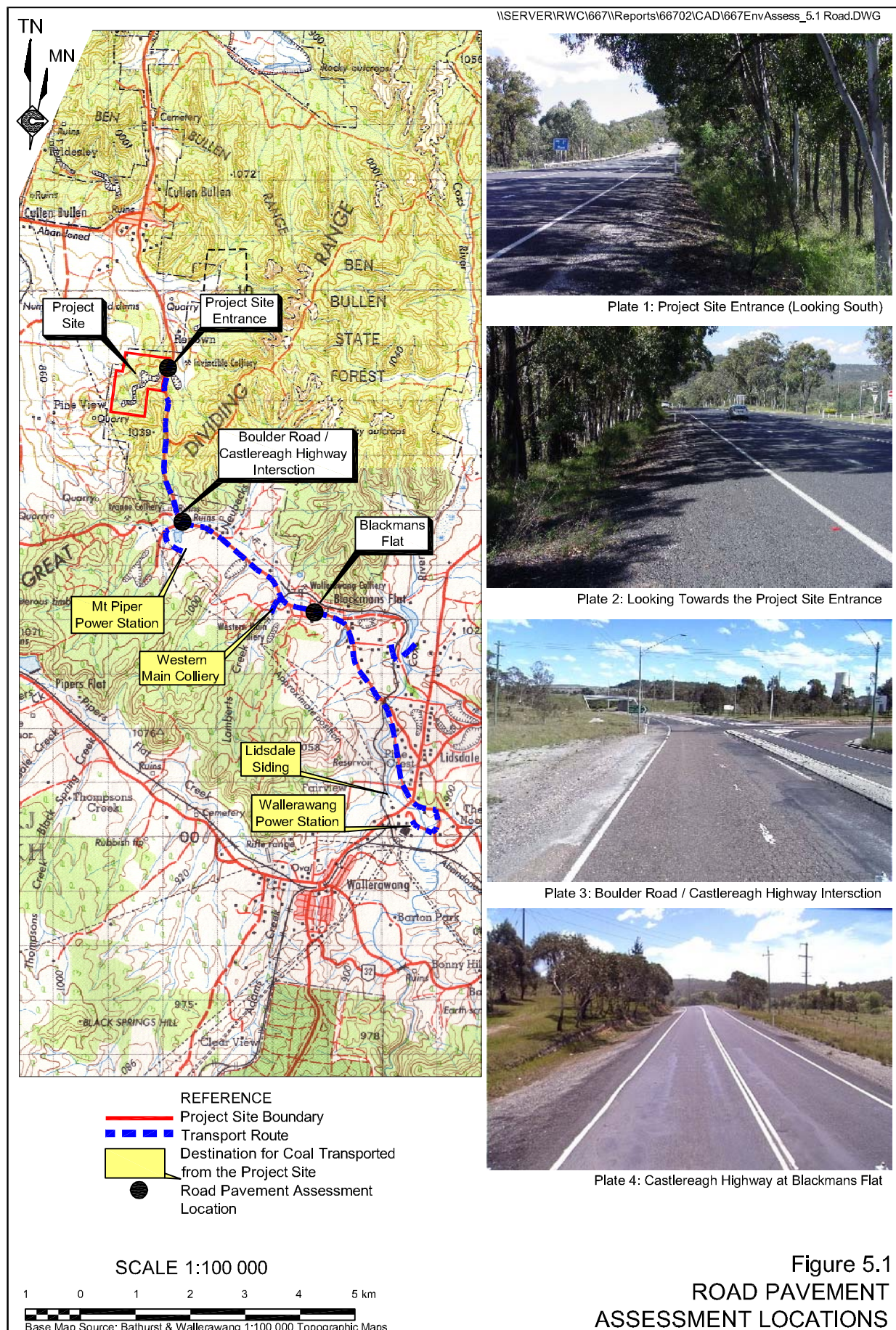
Level of Service (LOS) refers to the freedom of flow of traffic along a road or through an intersection. The Austroads document “*Guide to Traffic Engineering Practice*, Roadway Capacity, Part 2” references six levels of service, designated from A to F, with LOS A representing the best operating condition (i.e. free flow) and LOS F the worst (i.e. forced or break down flow). In an assessment of the all intersections that would be used by coal carrying trucks, ie. between the Project Site and proposed destinations, Barnson (2006) determined that each are of LOS B. LOS B is in the zone of stable flow where most drivers will have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream.

5.1.3 Proposed Management

Castlereagh Highway Intersection

The intersection would require minor road widening works, realignment, the establishment of acceleration and deceleration lanes and the removal/pruning of trees to improve visibility (see **Figure 2.6**). A geotechnical investigation undertaken in consultation with the RTA will be performed to finalise design criteria prior to construction.





Barnson (2006) outlines the key design elements, construction and maintenance requirements as:

- the throat of the access needs to be able to cater for the entry of a 19m semi-trailer or the largest vehicle expected to access the site;
- the access needs to cater for two way traffic with a median island appropriate;
- the appropriate layout for the throat of the access is RTA Road Design Guide Type BAL for articulated vehicles;
- the gate needs to be set back a minimum of 30m, already achieved by the existing gate;
- the access needs to be fully sealed; and
- appropriate signage and line marking needs to be provided in accordance with the RTA Signs and Markings Manual.

The proposed intersection presented in **Figure 2.6**, designed by Barnson (2006) in consultation with the RTA and with reference to the *Road Design Guide* (RTA, 1989), provides for these key design elements and requirements.

Traffic Volumes and Road Safety

The project would result in the generation of heavy vehicle traffic from the Project Site on to the Castlereagh Highway. While this is likely to be well within the design capacity of this road, the Proponent intends to implement the traffic management recommendations and mitigation measures provided by Barnson (2006) – Section 5. These include:

- construction of the upgraded intersection with the Castlereagh Highway (see **Figure 2.6**), to allow for the safe entry and exit of vehicles from both the Project Site and the Invincible Colliery (if operating);
- minor trimming of existing vegetation either side of the proposed intersection to allow a sight distance of at least 225m to be maintained in both directions; and
- preparation of procedures prohibiting travel directly between the Project Site and Invincible Colliery and the simultaneous entry of heavy vehicles to the Castlereagh Highway from the Project Site and Invincible Colliery.

The Proponent would also attempt, through negotiation with the operators of the Invincible Colliery, to despatch coal on alternate days to Invincible Colliery which would decrease the amount of coal truck traffic on the road at any one time.

Additional operational safeguards would include an induction process for coal truck drivers to re-iterate the requirements for haulage on the transport route. These requirements would include:

- the cleaning of coal from the sides and tarping of trucks prior to leaving the Project Site;
- being courteous to members of the public at all times;
- obeying speed limits; and
- travelling in single file and at least 60m apart at all times.



5.1.4 Impact Assessment

The traffic and transport related issues identified as of greatest potential impact are associated with the safety and efficiency of the Project Site – Castlereagh Highway and proposed destination intersections, traffic volumes and pavement deterioration along the proposed coal transport route (see Section 4 and **Appendix 4**). The assessment of each of these issues was undertaken by Barnson (2006) with reference to the RTA document “*Guide to Traffic Generating Development*” (RTA, 2002). The following provides a summary of the assessment of Barnson (2006).

Castlereagh Highway Intersection

The impact of coal trucks entering and leaving the Project Site from the existing dirt access road across the existing Castlereagh Highway would be unacceptable from a road safety perspective. Therefore, the intersection has been redesigned and realigned in consultation with the RTA and with reference to the *Road Design Guide* (RTA, 1989) to provide a safe intersection with merging and acceleration/deceleration lanes and appropriate visibility. The details of the redesign process which have been agreed to in principle by the RTA are presented (Barnson, 2006) and summarised in Section 5.1.3.

Traffic Volumes and Traffic Congestion

In order to assess the impact on Castlereagh Highway traffic following the commencement of operations of the Ivanhoe North Rehabilitation Project, projected traffic data has been analysed based on a number of possible (including the worst case) scenarios. The initial three scenarios provide for a realistic assessment of coal production from within the local area (ie. it is assumed that production at Cullen Valley Colliery would reduce to 200 000tpa as its contract with Delta Electricity has not been renewed) whereas the fourth scenario assumes the worst case situation where production from Cullen Valley does decrease or cease. The assessed scenarios are as follows.

1. Ivanhoe North Rehabilitation Project and Invincible Colliery not operational, other local collieries continue to transport at 2005 rates (ie. Cullen Valley and Baal Bone Collieries at 800 000tpa and 500 000tpa respectively).
2. Ivanhoe North Rehabilitation Project operational, Invincible Colliery not operational, Cullen Valley Colliery production reduced to 200 000tpa and Baal Bone Colliery maintained at 500 000tpa.
3. Ivanhoe North Rehabilitation Project and Invincible Colliery operational, operations at Cullen Valley Colliery reduced to 200 000tpa and Baal Bone Colliery maintained at 500 000tpa.
4. Ivanhoe North Rehabilitation Project and Invincible Colliery operational, operations at Cullen Valley Colliery and Baal Bone Colliery maintained at 800 000tpa and 500 000tpa respectively.

Table 5.2 presents the projected vehicles per day for the four scenarios. This assumes an existing proportion of heavy vehicles using the road of 11%, which includes existing coal transport from the Baal Bone and Cullen Valley Collieries.



Table 5.2
Traffic Projection Data

	2006 Projection						
	Scenario 1	Scenario 2		Scenario 3		Scenario 4	
		Average	Peak ⁴	Average	Peak ⁴	Average	Peak ⁴
Heavy vehicles per day ³	284	214	314	284	344	424	584
Vehicles per day ³	2580	2540 ¹	2630 ¹	2670 ²	2830 ²	2810	2960
Note 1: Includes an estimated 30 light vehicle movements per day associated with the project work force. Note 2: Includes an estimated 60 light vehicle movements per day associated with the combined projects work forces. Note 3: Refers to traffic movements, ie. two-way trip. Note 4: Peak traffic from the proposed project(s), and a reduction in the average traffic from the Cullen Valley Colliery							

Scenarios 2 and 3 are likely scenarios given the contract arrangements for the delivery of coal to Delta Electricity over the next 2 years. Under Scenario 2, the projected average daily volume of heavy vehicle traffic would decrease. The projected daily volume of heavy vehicle traffic would slightly increase under Scenario 3, although this increase is likely to be within the naturally fluctuating daily traffic volume of the Castlereagh Highway.

Under the worst case scenario, an increase in daily heavy vehicle traffic from 11% to 19.7% is projected on peak traffic generating days (see Barnson, 2006 – Section 6.1). Despite this increase, the overall number of vehicles per day on the Castlereagh Highway would remain low with respect to the road design and capacity.

Further mitigating the impact on traffic would be the construction of the proposed Project Site – Castlereagh Highway intersection which would provide for safe entry and exit of heavy vehicles on and off the road and appropriate mine traffic management procedures. Hence, even under the worst case situation, there would be minimal impact from the commencement of operations of the Ivanhoe North Rehabilitation Project and Invincible Colliery on the travelling public.

Intersection Performance

Barnson (2006) assessed the possible impact on the level of service of the proposed additional heavy vehicle movements at the four proposed destinations. Of the four, traffic was considered to be negligibly impacted at three, namely:

- Boulder Road – Mt Piper Power Station;
- Castlereagh Highway – Wallerawang; and
- Main Street – Lidsdale Siding.

At the Castlereagh Highway – Western Main Colliery intersection Barnson (2006) considered that highway traffic would experience some impact from the proposed use of this intersection by heavy vehicles of the Proponent under the current intersection arrangement, ie. it is questionable whether following vehicles would have sufficient room to safely negotiate around a slowing or stopped truck. Further assessment of the required intersection modifications is ongoing and will be forwarded to DoP and RTA when complete.



Road Pavement Condition

In the event both the project and the Invincible Colliery commence operation and Cullen Valley Colliery continues to produce and despatch similar volumes of coal to current levels, pavement life at the Castlereagh Highway – Boulder Road intersection would probably be reduced (acknowledging the fact that the pavement surface is already deteriorating) (Barnson, 2006). However, considering the reduction of production from Cullen Valley Colliery is expected, the percentage of heavy vehicles and total number of vehicle movements would not increase and as such there would be no additional impact on pavement life.

5.1.5 Maintenance and Monitoring

The Proponent would maintain the Site Entrance – Castlereagh Highway intersection such that a sight distance of at least 225m from the intersection is retained. The Proponent would also regularly monitor the conduct of its haulage operators and pavement conditions on the transport route. Haulage operators not abiding by the Proponent's transport protocols would be disciplined using a warning and suspension system whilst appreciable pavement deterioration or defects would be reported to the RTA.

5.2 NOISE

5.2.1 Introduction

Based on the risk assessment undertaken for the project (see Section 4), noise related issues that require assessment include:

- noise associated with operational activities (medium risk); and
- noise associated with project-related traffic (low risk).

In addition, the Director-General's Requirements issued by DoP require that the assessment of noise and noise impacts refer to the *NSW Industrial Noise Policy* and *Environmental Criteria for Road Traffic Noise* (Department of Environment and Conservation).

5.2.2 Existing Environment

The existing sources of noise in the vicinity of the Project Site are typical of a rural environment with the major contribution coming from traffic, especially heavy vehicle traffic, on the Castlereagh Highway. Given the rural setting of the Project Site, the likely background noise levels would approximate 30 dB(A) and as such the 30dB(A) default background level identified in the *Industrial Noise Policy* (INP) (EPA, 2000) would be appropriate for assessment of potential noise impact (Heggies, 2006a - Part 5 of the *Specialist Consultant Studies Compendium*)

5.2.3 Environmental Noise Criteria

Noise criteria for operational noise and traffic noise are as follows.



Operational Noise

The INP states that in situations where there is no existing major noise generating industry in the vicinity of the Project Site, the governing noise criterion for the project is the “intrusiveness” criterion. This limits L_{Aeq} noise levels from industrial sources to the Rating Background Level (RBL) + 5dB(A), ie:

$$\underline{30dB(A) + 5dB(A) = 35dB(A)}.$$

Traffic Noise

Based on NSW *Environmental Criteria for Road Traffic Noise* (ECRTN) (EPA, 1999), the Castlereagh Highway is classified as a “freeway/arterial” road and the applicable noise criteria is therefore 60dB(A) during daytime hours (7:00am to 10:00pm) and 55dB(A) during night time hours (10:00pm to 7:00am). The ECRTN also states that in all cases where existing traffic noise levels exceed or are within 2dB(A) of the nominated criteria, traffic associated with the development should not lead to an increase in the existing noise traffic levels of more than 2dB(A).

5.2.4 Proposed Management

The principal design features of the project to attenuate noise, which have been factored into the noise modelling undertaken by Heggies (2006a) are as follows.

- (i) Positioning of the coal crushing area for the project within the partially filled void surrounding the Ivanhoe No.2 ventilation shaft entry point, thereby providing acoustic shielding of approximately 5m.
- (ii) Retaining the out-of-pit spoil dumps would afford the internal haul road acoustic shielding of up to 3m.

Additional operational safeguards, recommended by Heggies (2006a – Section 9) to be adopted by the Proponent would include:

- (i) restricting noise-generating activities to the nominated hours of operation;
- (ii) preferential use of equipment with lower sound power levels;
- (iii) regular maintenance of all equipment;
- (iv) maintenance of the on-site road network to limit body noise from empty trucks; and
- (v) initiation and maintenance of dialogue with neighbours and the local community to ensure any concerns over construction or operational noise are addressed.

The Proponent would develop a complaints management protocol such that in the event a community complaint is received a swift response is initiated. Central to the protocol would be the requirement for a verbal response to the complainant within 4 hours (during the nominated hours of operation) detailing the source of the noise and mitigation measures proposed (or underway) to reduce the risk of future elevated noise levels. Section 9.4.2 of Heggies (2006a) provides greater detail on the likely content of a complaints management protocol at the site.



5.2.5 Impact Assessment

The assessment of Heggies (2006a), which is summarised in the following sub-sections, considered operational noise, road traffic noise and cumulative noise impacts in accordance with the INP and ECRTN.

Operational Noise

Two operational scenarios were modelled by Heggies (2006a – Section 5) to predict the potential noise-related impacts at 11 surrounding residences under prevailing weather conditions.

- (i) Scenario A predicts noise levels resultant from project activities in the southwestern operational blocks, ie. Blocks Sth01 and Sth02 (see **Figure 5.2a**).
- (ii) Scenario B predicts noise levels resultant from project activities in the northeastern operational blocks, ie. Blocks Nth02 and Nth03 (see **Figure 5.2b**).

Given site establishment / construction activities would use similar equipment and occur in similar locations to the Scenario B model, compliance with operational noise criteria under this scenario would indicate compliance with construction noise criteria, RBL + 10dB(A).

Table 5.3 presents the results of the modelling.

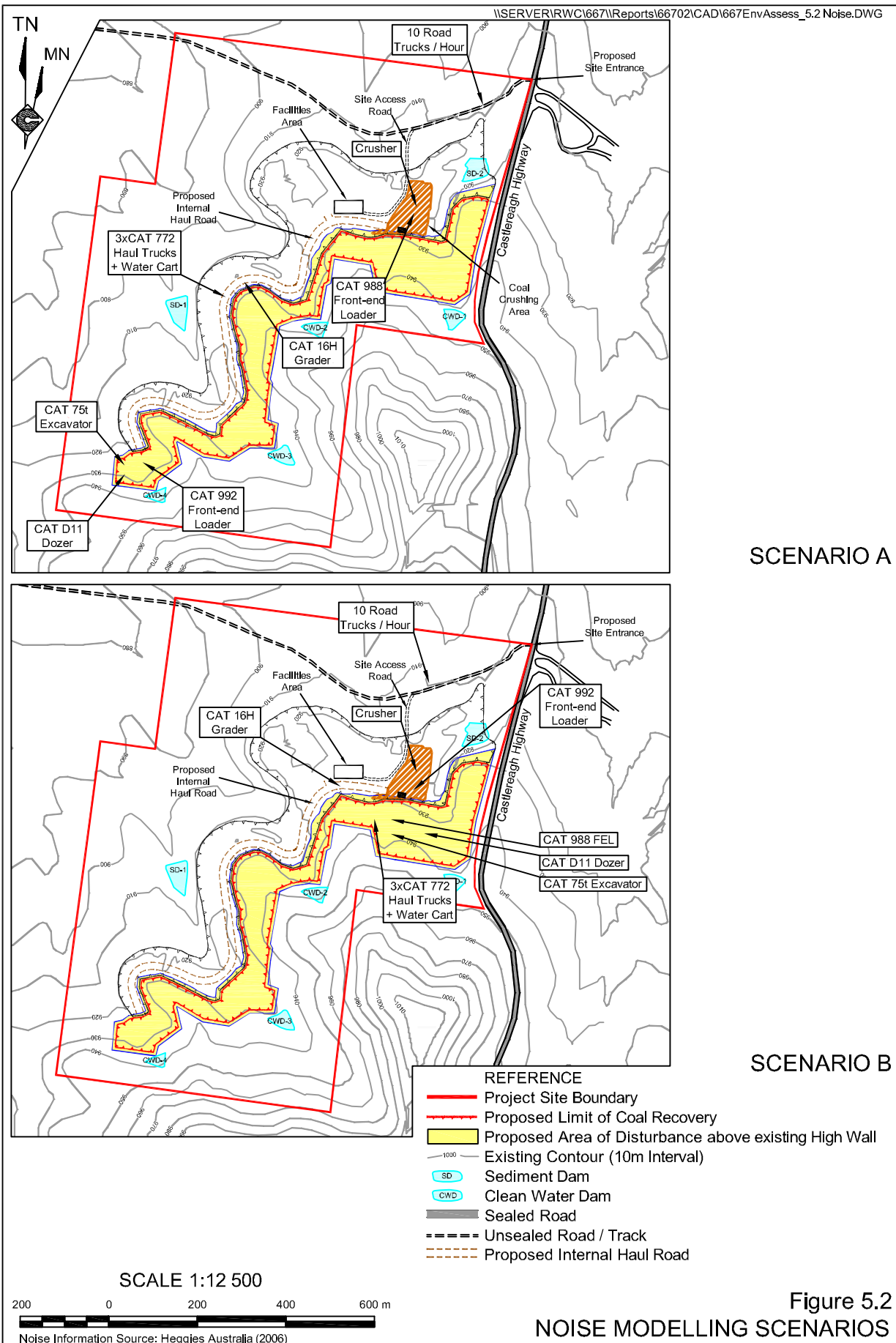
Table 5.3
Predicted Operational Noise Levels – dB(A)

Residence - Owner	Property No.	Criteria LA _{eq} (15min.)	Predicted Noise Level LA _{eq} (15min.)		Predicted Noise – Criterion Differential	
			Scenario A	Scenario B	Scenario A	Scenario B
A – Coalpac	12	35	30	36	-5	+1
B – B. Muenzer	2	35	29	32	-6	-3
C – I. Palmer	3	35	35	33	0	-2
D – M. Bulkeley	1	35	26	24	-9	-11
E – V. & F. Fava, C. Rosiltano, F. Tedesco, & E. Todorello	4	35	26	23	-9	-12
F – A. & K. Brown	6	35	27	19	-8	-16
G – S. & D. Taylor	5	35	30	15	-5	-20
H – J. & S. Taylor	7	35	22	11	-13	-24
I – R. Clark	8	35	20	14	-15	-21
J – G. & J. Clark	9	35	14	4	-21	-31
K – B. Muenzer	2	35	27	36	-8	+1

Source: Modified after Heggies (2006) – Table 9 & 10

The results of noise modelling indicate that with the exception of Residences A and K during Scenario B, the project would comply with noise criteria at each of the surrounding residences. Both exceedances are considered minor as 1dB(A) is a level of noise generally imperceptible to the human ear and therefore, the predicted noise level of 36dB(A) would not sound different to that of a compliant 35dB(A) noise level. Additional consideration was given to the following.





- The hours of operation for the project are 7:00am to 6:00 am Monday to Saturday.
- The major noise generating activities, haul trucks and bulldozer (RHA, 2006a), would gradually move closer to Residences A and K, allowing for an extended period of noise acclimatisation.
- Residence A, is owned by Coalpac, operators of Invincible Colliery and currently making application for project approval for the recommencement of mining.
- Activities in the northern blocks would be limited in duration (<6 months), limiting any inconvenience caused by operational noise to this time period.

Based on the above rationale, the minor exceedances are considered acceptable and within the INP objective 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.

Road traffic Noise

Based on the predicted future traffic levels, including the concurrent operation of the project and Invincible Colliery, the predicted road traffic noise levels at off-set distances between 25m and 500m are presented in **Table 5.4**.

The predicted future daytime $L_{Aeq(15hour)}$ traffic noise levels are lower than the 60dB(A) criterion at all residential offset distances greater than 50m and less than 2dB(A) above the existing traffic noise level at all offset distances, therefore complying with the ECRTN daytime $L_{Aeq(15hour)}$ traffic noise criterion.

Table 5.4
Predicted Operational Noise Levels – dB(A)

Receiver Offset Distance	LAeq(15hour) Noise Level - dB(A)		
	Existing	Predicted Future	Increase in Noise Level
25m	64.1	65.0	0.9
50m	59.5	60.4	0.9
75m	56.8	57.8	1.0
100m	54.9	55.9	1.0
200m	50.4	51.3	0.9
300m	47.7	48.6	0.9
400m	45.8	46.7	0.9
500m	44.3	45.2	0.9
Note 1: Shaded cells are within 2dB(A) of or higher than the relevant daytime (7:00am to 10:00pm) traffic noise criterion.			
Note 2: Predicted future noise levels are based on Scenario 3 of Section 5.1.4, ie. operation of the project, Invincible Colliery at 350 000tpa, Baal Bone Colliery at 500 000tpa and Cullen Valley Colliery at 200 000tpa.			
Source: Modified after Heggies (2006) – Table 11			

Cumulative Impacts

Results of noise modelling for the recommencement of mining at the Invincible Colliery by Environmental Resources Management (ERM) predicted noise levels of 41dB(A) and 40dB(A) under calm weather conditions at Residences B and K respectively. Under adverse weather conditions, the predicted noise level at the two residences would increase to 49dB(A). As the addition of a noise source >5dB(A) less than an established noise source will not effect the perceived noise level (Heggies, 2006a – Section 8), the noise generated by the Ivanhoe North Rehabilitation Project would not effect the noise received at Residences B and K.



5.2.6 Monitoring

Noise monitoring would assist in validating the noise modelling predictions of Heggies (2006a), identifying the need for any additional mitigation measures, such as time restrictions, changes in work sequences/practices, changes in layout, or the selection of alternative items of equipment prior to significant disturbance occurring or complaints being received.

In order to validate noise modelling predictions and/or identify the need for any additional mitigation measures, three types of monitoring would be conducted:

- (i) operator-attended monitoring of near-field noise emissions from plant and equipment;
- (ii) operator-attended monitoring of construction and operational noise at potentially sensitive residential locations; and
- (iii) supplementary unattended and/or attended noise monitoring to identify issues of concern in response to any complaints.

Monitoring would most likely be undertaken at Residences C and G during operations in the Southern and Central Areas, and Residences C and K for operations within the Northern Area.

5.3 SURFACE WATER MANAGEMENT

5.3.1 Introduction

Based on the risk assessment undertaken for the project, water-related issues that require assessment include:

- discharge of “dirty” water from the Project Site (medium risk);
- hydrocarbon spill discharge to natural drainage lines (medium risk);
- erosion of natural drainage lines (low risk);
- erosion of rehabilitated final landform (low risk); and
- flooding of active operational areas (low risk).

In addition, the Director-General’s Requirements issued by DoP require that the assessment of soil and water include a detailed water balance, and refer to the *Guidelines for Fresh and Marine Water Quality* (ANZECC), and *Managing Urban Stormwater: Soils & Construction* (Landcom).

5.3.2 Existing Environment

Regional, local and Project Site drainage was described in Section 3.3.3.

Samples of surface water taken from pooling and flowing surface water within the former open cut indicate the water quality to be generally within recommended criteria range of the ANZECC Australian Water Quality Guidelines for Fresh and Marine Waters (ANZECC, 2000), and the Water Quality and River Flow Interim Objectives for the Macquarie/Bogan River Catchments (EPA, 2000) (GSS, 2006 - Part 1 of the *Specialist Consultant Studies Compendium – Section 4.6*).



The dip of the rock strata (and coal), site observations and underground water levels for Ivanhoe Colliery indicate that there is negligible groundwater discharge from the coal seams (or other strata) at the exposed high wall areas within the Project Site (GSS, 2006 – Section 4.9).

As there is little groundwater or potential for the overburden to leach produce acid or saline leachate, runoff sediment and erosion control is the main issue in relation to water management.

5.3.3 Proposed Management

The principal design aspect for runoff sediment and erosion control is to minimise disturbance and separate “clean” and “dirty” water systems (GSS, 2006 – Section 7). This will be achieved by the construction of a clean water catch dam (CWD) in each ephemeral drainage line above the area of disturbance and a sediment dam (SD) in each drainage line below the area of disturbance (all dams sized to capture a 1:5 ARI event). The locations of the water catch dams CWD-1 to CWD-4 and the Sediment Dams SD-1 to SD-2 are displayed on **Figure 5.3**. A contour cut off drain is proposed to intercept and direct overland runoff to the clean water catch dams. A 100mm HDPE pipe line would discharge overflowing water from each clean water dam to the drainage line below the sediment dams (see **Figure 5.3**). These, and any other surface water management structures or erosion and sediment controls will be designed and constructed in accordance with *Managing Urban Stormwater: Soils & Construction* (Landcom, 2004).

Each ephemeral watercourse would be restored, and water re-directed into the natural channel once rehabilitation of the disturbed area is satisfactorily stable.

Throughout the life of the project surface water runoff and the control of erosion and sedimentation would be managed in accordance with the recommendations of GSS (GSS, 2006 – Section 7.2). The following is a summary of these recommendations.

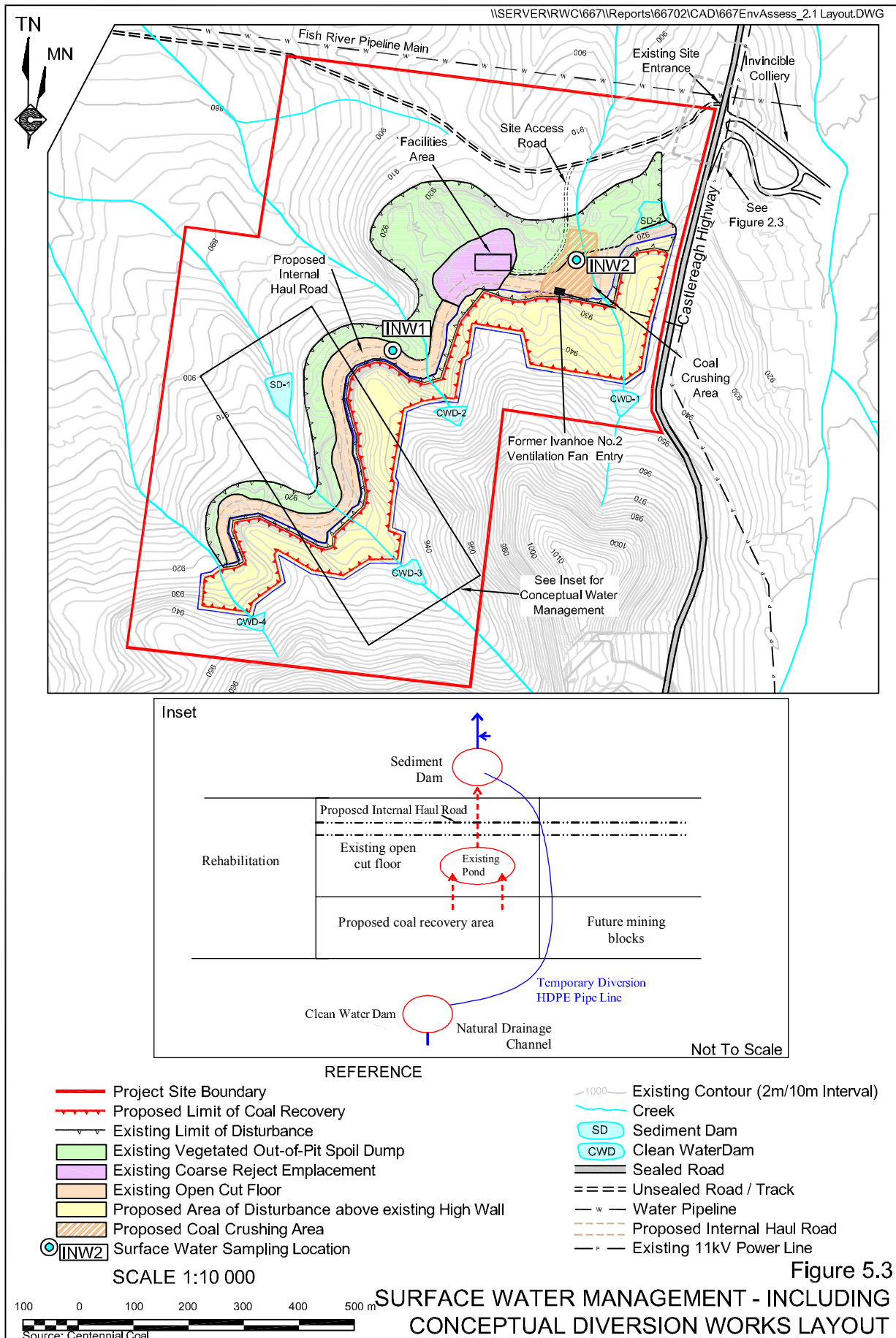
- (i) Disturbance would be minimised and progressively rehabilitated (GSS, 2006 – Section 7.2.1 and 7.2.8).
- (ii) Soil would be stockpiled and respread over the final landform to minimise the potential for erosion and sedimentation (GSS, 2006 – Section 7.2.2).
- (iii) Project Site roads would be designed to direct / divert dirty water towards the internal sediment control structures (GSS, 2006 – Section 7.2.6).

Streams 1 to 4 would be re-established along their pre-mining alignments and riparian corridors established as part of final landform creation activities (GSS, 2006 – Section 7.2.7).

In addition, as all SDs and CWDs would be designed to capture runoff from a 1:5 ARI event, there is the potential that these may overflow following rainfall events > 1:5 ARI. As such, it is expected the potential discharge points from and below SD1 and SD2 would be licensed by DEC, with the water quality to meet the following criteria.

- pH 6.5 – 8.0.
- Electrical conductivity <1 500µs/cm.
- Total grease <10mg/L.
- Total suspended solids <50mg/L.





5.3.4 Conceptual Water Balance

The Director-General's Requirements issued by DoP require the preparation of a water balance for the project. A detailed balance of water sources, uses and possible discharges in dry, average and wet years would be prepared on approval of the project. For the purpose of this EA, a conceptual water balance has been prepared by GSS (2006 – Section 8) accounting for the major water uses and potential sources of this water, as follows.

<u>Water Requirements</u>	<u>Water Sources</u>	<u>Balance</u>
- Daily application of water to suppress dust on Project Site roads, hardstand surfaces and other disturbed areas. - Based on an application rate of 2L/m²/application and an average of 4 applications per day, total annual water consumption would be approximately 30ML.	- Clean Water Dams. Capacity = 1.75ML. - Sediment Dams. Capacity = 3.3ML. - The Fish River Pipeline. No limit on capacity.	Depending on rainfall, sufficient water may be available in the water storages on the Project Site, however, as the Proponent is committed to obtaining additional water from the Fish River Pipeline, sufficient water for dust suppression would always be available.

5.3.5 Impact Assessment

Implementation of the project design features, operational strategies and mitigation measures summarised in Section 5.3.3 would ensure the following.

- Flooding of active work areas would be avoided through the temporary diversion and storage of clean water flows upstream.
- Erosion and sedimentation would be minimised within the operational areas of the Project Site through retention of water containing sediment either within the internal sediment basins or downstream sediment dams (SD-1 and SD-2) and soil stockpiling and replacement procedures.
- The quality of water discharged from the Project Site is expected to fall within the quality criteria objectives identified in Section 5.3.3, ie:
 - pH 6.5 – 8.0;
 - electrical conductivity <1 500µs/cm;
 - total grease <10mg/L; and
 - suspended solids <50mg/L.

These criteria fall within the water quality criteria identified within ANZECC (2000).

- The re-establishment of natural surface water flows within the four identified drainage lines traversing the operational areas of the Project Site. These would be constructed and maintained in accordance with the expectations of DNR.

The project is considered to have an acceptable impact on surface water and would ultimately improve the environment through the re-establishment of Streams 1 to 4 to their natural alignments.



5.3.6 Maintenance and Monitoring

Maintenance of the Project Site would be undertaken in accordance with the recommendations of GSS (2006) – Section 7.3 & 7.4. Section 6.3 provides the specific commitments of the Proponent in relation to Project Site maintenance.

The Proponent would also implement the recommended monitoring regime of GSS (2006), whereby surface water quality would be monitored quarterly, with samples taken from the existing sites INW-1 & INW-2 (see **Figure 5.3**), until these are removed by progressive rehabilitation of the Project Site, and the clean water catch dams and dirty water sediment dams.

Water samples would be analysed for key parameters, including:

- pH;
- electrical conductivity;
- total grease; and
- suspended solids.

Opportunistic grab samples may also be taken periodically from streams during significant rainfall events. These samples would be analysed for the same parameters as above.

5.4 AIR QUALITY

5.4.1 Introduction

Based on the risk assessment undertaken for the project, air quality related issues that require assessment include:

- dust generated by the rehabilitation and coal recovery activities (low risk); and
- <10µm particulate matter generated by the rehabilitation, coal recovery and coal crushing activities (low risk).

In addition, the Director-General's Requirements issued by DoP require the assessment of impact on air quality refer to *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (Department of Environment and Conservation).

5.4.2 Existing Environment and Environmental Air Quality Goals

In the absence of site-specific air quality data, and in accordance with the DEC's *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*, Heggies Australia Pty Ltd ("Heggies") obtained estimates for background dust and other particulates through an assessment of the local environment and comparison to monitoring undertaken at similar and/or nearby sites (see Heggies (2006b) - Part 6 of the *Specialist Consultant Studies Compendium*) (see **Table 5.5**).

Table 5.5 also presents the project specific air quality goals based on adherence to the documented targets for particulate matter, TSP and deposited dust of the DEC and the National Environment Protection Council (NEPC).



Table 5.5
Background Air Quality Environment for Assessment Purposes

Air Quality Parameter	Averaging Period	Estimated Background Level	Project Air Quality Goals
Deposited Dust	Annual	1.8g/m ² /month	3.8g/m ² /month
Total Suspended Particulate Matter	Annual	36µg/m ³	90µg/m ³
PM ₁₀	24-Hour	Daily varying [†]	50µg/m ³
	Annual	18µg/m ³	30µg/m ³
[†] Daily-varying 24-hour average PM ₁₀ concentrations have been used within the PM ₁₀ modelling.			
Source: Modified from Heggies (2006b) – Section 3 and 4			

5.4.3 Proposed Management

The Proponent would implement a dust control strategy during the life of the project incorporating the following components.

- The location of the project crusher within the partially filled void surrounding the Ivanhoe No.2 ventilation shaft entry point to provide shielding from winds likely to result in the “lift-off” of dust from coal stockpiles.
- Watering of internal haul roads at a rate of approximately 2L/m² per application.
- Minimising the drop heights between front-end loader buckets and trucks carrying coal or overburden.
- Disturbance would be limited to that required for 3 to 4 months operations and soil stockpiles retained for periods greater than 3 months would be sown with a sterile cover crop.
- In the event of strong winds blowing dust towards residences, the Proponent would cease any dust-generating activity(ies).

5.4.4 Impact Assessment

Using the Ausplume Gaussian Plume Dispersion Model software (Version 6.0), Heggies (2006b) modelled the assumed worst case scenario for dust generating operations on the Project Site. The complete methodology of the modelling, conducted in accordance with the DEC’s *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* including all assumptions used and an inventory of activity related emissions, is presented in Heggies (2006b – Section 5).

Table 5.6 presents the predicted dust deposition, maximum 24-hour PM₁₀ concentration and the annual average PM₁₀ concentration at the nearest residences surrounding the Project Site. **Figure 5.4** presents contour plots generated for dust deposition, maximum 24-hour PM₁₀ concentration and the annual average PM₁₀ concentration at the nearest residences surrounding the Project Site. The contour plots are indicative of the concentrations that can be potentially reached under the conditions modelled.



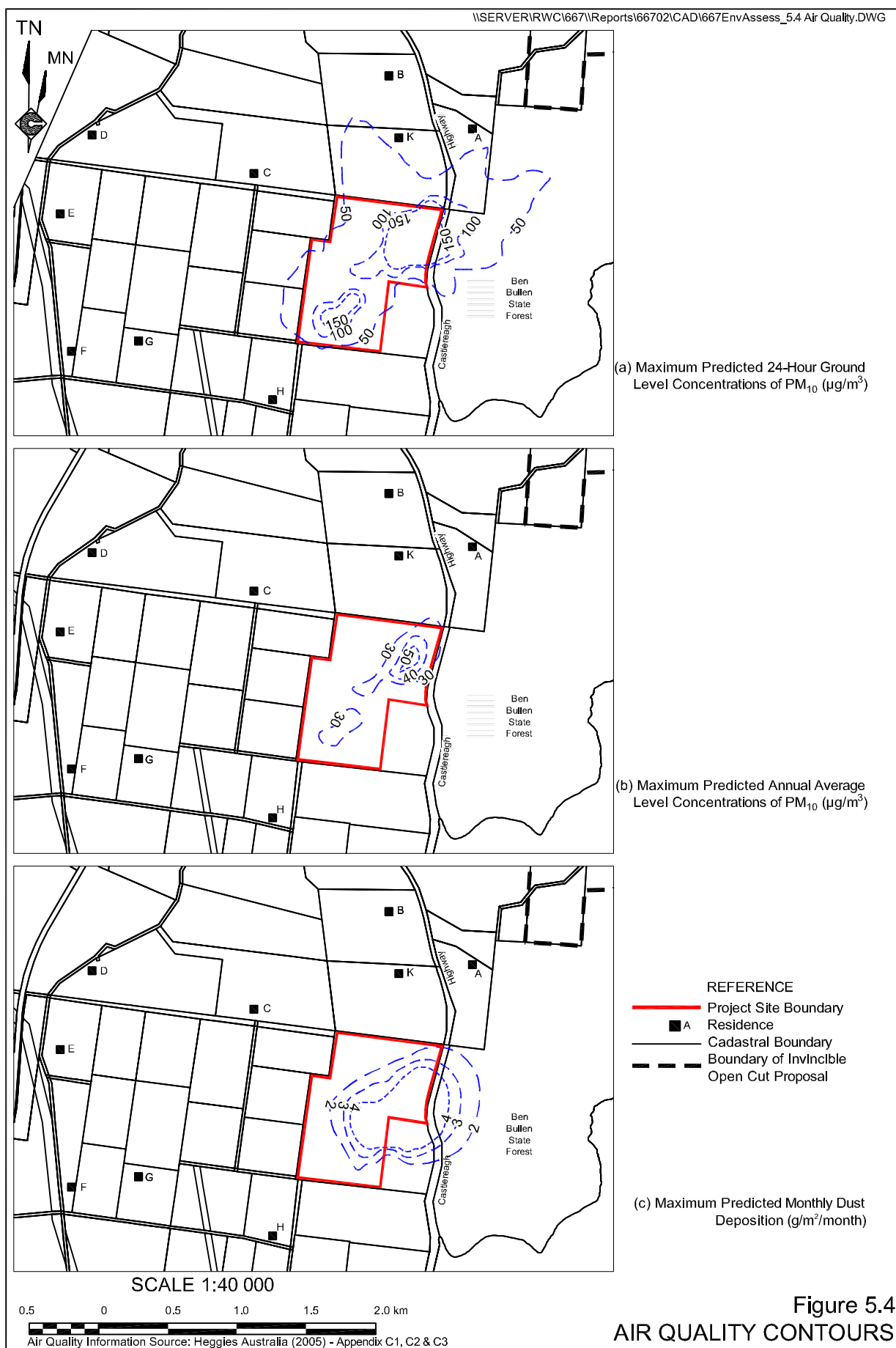


Figure 5.4
AIR QUALITY CONTOURS

Table 5.6
Predicted Dust Deposition and Particulate Matter

Residence	Background	Background + Increment	Project Goal	Differential
Dust - Annual Average (g/m²/month)				
H	1.8	1.9	3.8	-1.1
G	1.8	1.9	3.8	-1.1
C	1.8	2.0	3.8	-1.8
K	1.8	2.1	3.8	-1.7
A	1.8	2.4	3.8	-1.4
PM₁₀ - 24-Hour Maximum (µg/m³)				
H	47.5	47.6	50	-2.4
G	47.2	47.3	50	-2.7
C	46.9	48.4	50	-2.6
K	46.9	48.6	50	-2.4
A	46.1	47.8	50	-2.2
PM₁₀ - Annual Average (µg/m³)				
H	17.6	17.9	30	-12.1
G	17.6	17.8	30	-12.2
C	17.6	18.1	30	-11.9
K	17.6	18.5	30	-11.5
A	17.6	18.7	30	-11.3

Source: Modified after RHA (2006b) – Tables 7, 8 & 9

The predicted concentrations for dust deposition are well below the project goals and therefore, particulate matter and dust attributable to the project are anticipated to comply with the current NSW DEC (and NEPM) air quality goals at each of the surrounding residences.

5.4.5 Monitoring

Dust monitoring would be in the form of two permanent deposited dust gauges, analysed on a monthly basis, most likely located at Residences C and K, to provide a reasonable estimate of deposited dust at all stages of the proposed project.

5.5 VISUAL AMENITY

5.5.1 Introduction

Based on the risk assessment undertaken for the project, visual amenity-related issues that require assessment include:

- visibility of exposed operational areas to the north-northwest, west and southwest (medium risk).

The Director-General's Requirements issued by DoP also require visual impacts of the project to be assessed.

5.5.2 Existing Environment

Figure 5.5 presents the residences and other vantage points with views of parts of the Project Site. Notably the existing disturbance associated with the former open cut is now barely visible following approximately 50 years of native vegetation regrowth.



5.5.3 Proposed Management

The topography and vegetation of the Project Site and local area would provide significant natural screening of the proposed activities on the Project Site. However, to further ensure the visual impact of the project is minimised, the following additional controls would be implemented.

- The extent of disturbance in advance of project activities would be restricted.
- The existing spoil dumps of the former open cut, which provide an established cover of native vegetation, would not be disturbed.
- The coal crushing area would be located and constructed within the partially backfilled void above the Ivanhoe No. 2 ventilation fan entry, placing it below the sight line to surrounding residences and other public and private vantage points.
- The progressive rehabilitation of the Project Site would quickly create a vegetated landform similar to that of the surrounding Ben Bullen State Forest.

5.5.4 Impact Assessment

Impact on visual amenity is considered in relation to the views of the identified residences and other public vantage points of the Project Site of **Figure 5.5** as follows.

- **North and Northwest.** The Project Site would not be visible from Residences B and K which are screened by native vegetation and intervening topography. The Project Site would be visible from some residences and vantage points in Cullen Bullen (notably Watson Avenue and Farnell Street), although distance to the Project Site (>3km) and intervening native vegetation and topography would limit the impact. Residence D would have distant and relatively direct views of the Project Site (see x-section on **Figure 5.5**). Residence C would have a relatively direct view of activities from a distance of approximately 1km.
- **West and Southwest.** Of the three residences identified in this direction from the Project Site (Residences E, F and G on **Figure 5.5**), Residences F and G would have their views of the Project Site activities largely obscured by native vegetation along a hill slope oriented approximately along the southern boundary of the Project Site. Residence E, however, although approximately 2km from the closest project-related activities, would have relatively direct views of some of these activities.
- **South.** Residence H may have limited views of project activities in the southern extraction blocks, however, the majority of the Project Site would be obscured by the hill slope oriented approximately along the southern boundary of the Project Site. This hill slope would obscure the views of all other residences to the south.
- **East.** The northern-most section of the Project Site would be visible to traffic on the Castlereagh Highway.



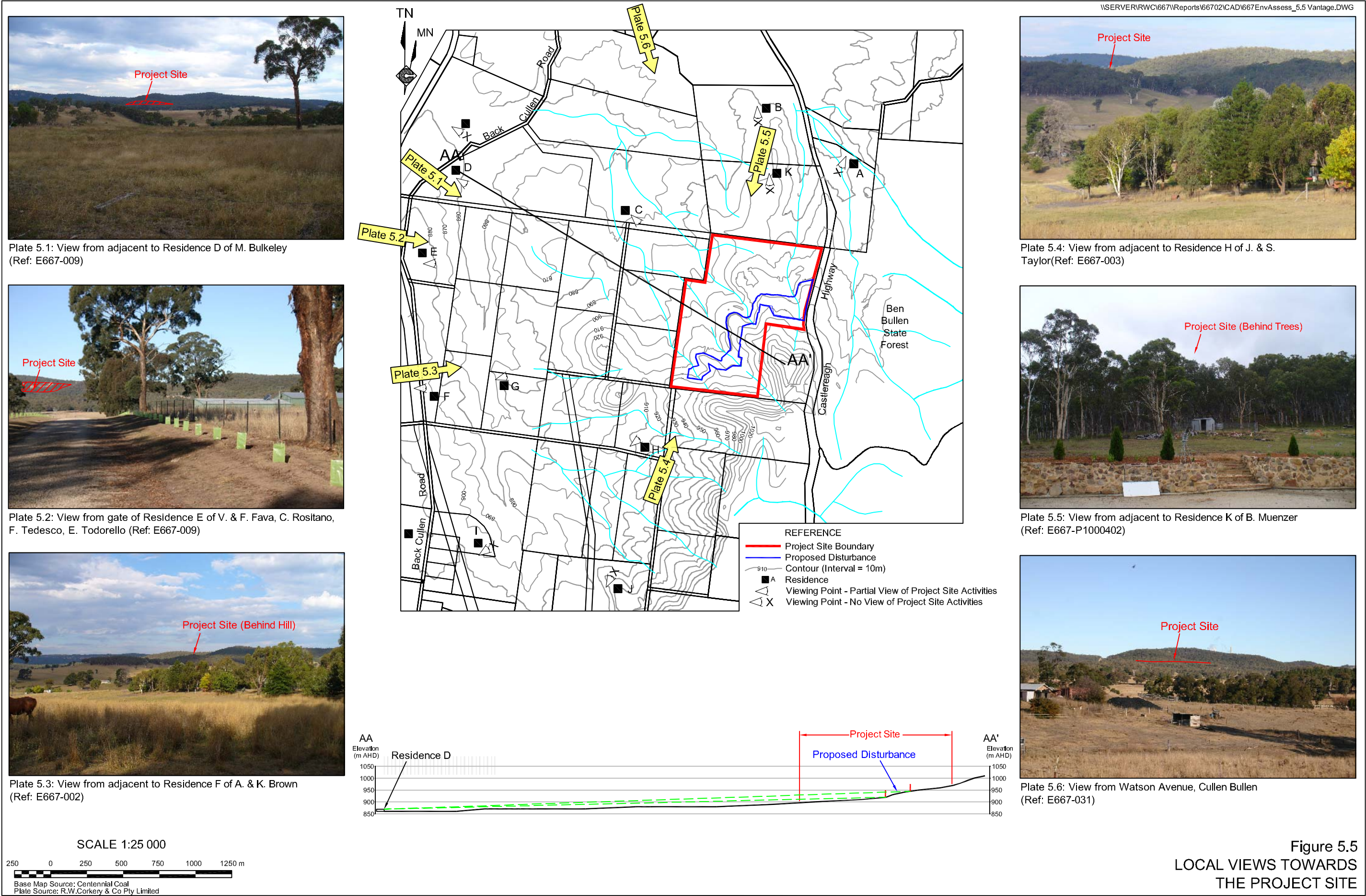


Figure 5.5
LOCAL VIEWS TOWARDS
THE PROJECT SITE

All impacts on the visual amenity of the Project Site would be short term in their duration given the objective of the project to rehabilitate the Project Site to recreate the pre-mining landform and vegetation. Ultimately, the project would provide a net benefit through the removal of the abandoned high wall and open cut floor and revegetation of the created landform with native woodland vegetation.

5.6 FLORA AND FAUNA

5.6.1 Introduction

Based on the risk assessment undertaken for the project, flora and fauna-related issues that require assessment include:

- disturbance to native vegetation (medium risk);
- disturbance to threatened flora and fauna (medium risk); and
- possible local extinctions of threatened flora and fauna (medium risk).

In addition, the Director-General's Requirements issued by DoP requires the assessment of flora and fauna to refer to the draft *Guidelines for Threatened Species Assessment* issued by the DEC (DEC, 2005). In accordance with these guidelines, Gingra Ecological Surveys Pty Ltd undertook a preliminary desktop assessment to identify a list of threatened species that could potentially occur in the area, followed by a field survey and assessment, an evaluation of impacts and presentation of recommendations to avoid or mitigate impacts. As the survey and assessment commenced prior to 1 November 2005, when reforms to the *Threatened Species Conservation Act 1995 Act* (referred to by (DEC, 2005) were officially enacted, and was completed within the transitional period up to 1 April 2006, Gingra (2006) completed an 8-part test to determine the level of significance and key thresholds for each threatened species identified.

The description of the flora and fauna of the Project Site and surrounds, and assessment of impacts that follows, has been summarised from Gingra (2006), which is presented in full as Part 2 of the *Specialist Consultant Studies Compendium*.

5.6.2 Existing Environment

5.6.2.1 Regional Setting

The Project Site is located within the Sydney Basin Bioregion of the Central Tablelands Botanical Subdivision. In a recent review of vegetation distribution throughout NSW, Keith (2004) classified the vegetation of the area within which the Project Site is located, as Southern Tablelands Dry Sclerophyll Forest. This vegetation type typically occurs on the ridges and ranges of the central and southern tablelands between elevations of 600m and 1 100m AHD. It is well represented in conservation areas but requires ongoing management for control of bushfires and feral animal grazing.



5.6.2.2 Project Site Flora

Two vegetation types (“Vegetation Map Units” – VMUs) occur on the Project Site. These are described as follows.

VMU 1 - Tablelands Grassy Woodland Complex

This VMU occurs across those sections of the Project Site which continue to support native vegetation, ie. have not been disturbed for the purposes of mining or forestry.

VMU 2 - Regeneration on the Former Open Cut

This area supports some regenerating plants of VMU1 and some exotic weeds although many bare areas remain as a result of the previous mining operation.

Gingra (2006) provides a complete inventory of all flora species identified within the each VMU of the Project Site.

5.6.2.3 Project Site Fauna

Gingra (2006) identified three fauna habitats on the Project Site.

- (i) Native woodland and/or open forest: which displays a low, fairly open canopy with sparse shrub and ground cover strata. Due to the low nutrient status of the underlying soils, fauna densities are likely to be low but important habitat features are tree hollows, a variety of perching/roosting sites, a degree of structural complexity, decorticated bark, fallen timber, grass cover and leaf litter.
- (ii) Cleared or disturbed areas: which have little habitat value for fauna, as the only vegetation is some limited regrowth of trees and shrubs.
- (iii) Ponds and drainage lines: afford habitat for a narrow range of frogs and those reptiles that prey upon them. There is no dense, fringing vegetation around the ponds nor are there any large pools in the creeks that would widen the range and increase the abundance of frogs present.

5.6.3 Conservation Significance

No flora or fauna species of conservation significance were identified on the Project Site and the Project Site does not support any endangered ecological communities (Gingra, 2006).

For assessment purposes, Gingra (2006) assumed the Project Site provided suitable habitat for the two species of flora and eleven fauna species of conservation significance, six of which were considered likely to occur (see **Table 5.7**).



Table 5.7
Potential Flora and Fauna of Conservation Significance

Flora	Fauna
Capertee Stringybark, <i>E. cannonii</i>	Glossy Black Cockatoo, <i>Calyptrorhynchus lathamii</i>
Clandulla Geebung, <i>Persoonia marginata</i>	Powerful Owl, <i>Ninox strenua</i>
	Greater Broad-nosed Bat, <i>Scoteanax rueppellii</i>
	Eastern False Pipistrelle, <i>Fasistrellus tasmaniensis</i>
	The Large-eared Pied Bat, <i>Chalinolobus dwyeri</i>
	Eastern Bentwing Bat, <i>Scoteanax rueppellii</i>
Source: Modified after Gingra (2006) – Sections 5.2 & 5.4	

5.6.4 Proposed Management

To minimise the potential impact on the vegetation and fauna habitats of the Project Site, the Proponent would implement the operational safeguards and mitigation measures recommended by Gingra (2006 – Section 8). In summary:

- disturbance and access would be restricted to those areas required for operational purposes;
- pre-start inspections would be performed to ensure minimal impact on arboreal fauna;
- fauna microhabitats, including Project Site dams and ponds and felled or fallen timber would be managed to maximise habitat benefits; and
- rehabilitation works associated with the proposed operation would seek to re-establish the local plant communities of the Project Site (VMU 2).

Section 6.6 provides a more detailed list of the operational safeguards and mitigation measures the Proponent has committed to adopt throughout the life of the project.

Given the primary objective of the project would be to rehabilitate a currently derelict mine, it was established at the Planning Focus Meeting for the project that no biodiversity off-sets would be required.

5.6.5 Impact Assessment

The project would result in the clearance of approximately 12.3ha of relatively undisturbed native vegetation, and areas of the three identified fauna habitats. Gingra (2006 – Section 6.1 and 6.2) notes the vegetation type to be cleared is well represented both locally and regionally and no species or communities to be disturbed by the project are considered threatened. Considering this, and the objectives of the project to rehabilitate the site with locally occurring species, the impact associated with the temporary disturbance is minimal.

Gingra (2006 – Section 7.1) undertook an eight part test for each of the threatened species identified as potentially occurring on the Project Site. When considering the objectives of the project and operational safeguards to be implemented by the Proponent, Gingra (2006) concludes that none of these species would be significantly affected by the project.



5.6.6 Maintenance and Monitoring

The rehabilitated areas of the Project Site would be regularly inspected during the operational phase of the project, and for a period of at least 2 years following the completion of all project related activities, to assess establishment and growth rates. This will enable revegetation works to be adaptive to any particular problems experienced during the re-establishment phase.

5.7 REHABILITATION AND FINAL LANDFORM

5.7.1 Introduction

Based on the risk assessment undertaken for the project, rehabilitation and final landform related issues that require assessment include:

- temporary disturbance to the landform (medium risk); and
- the possibility of permanent alteration to the local landform (low risk)

5.7.2 Existing Environment

As noted in Section 3.1, the Project Site supports highly disturbed areas associated with the high wall and open cut floor of the abandoned Cullen Main West open cut, areas of regenerating native vegetation on the out-of-pit spoil dumps and undisturbed areas supporting native woodland vegetation.

5.7.3 Proposed Management

Through the removal and replacement of overburden, a landform commensurate with that of the surrounding Ben Bullen State Forest would be created. This would be progressively revegetated with native tree, shrub and grass species collected locally (see **Table 2.2**).

5.7.4 Impact Assessment

The short term disturbance to relatively undisturbed vegetation would be offset by the proposed rehabilitation of a derelict mine showing no signs of naturally revegetating over large sections of the open cut. The impact would ultimately be a positive one.

5.8 SOILS

5.8.1 Introduction

Based on the risk assessment undertaken for the project, rehabilitation and final landform related issues that require assessment include:

- disturbance to soils and possible degradation of soil quality (low risk).



5.8.2 Existing Environment

Geoff Cunningham Natural Resources Consultants (GCNRC, 2006 - Part 4 of the *Specialist Consultant Studies Compendium*) identifies the Project Site as being mapped as Hassans Walls Soil Landscape, surrounded by Cullen Bullen Soil Landscape within the Wallerawang 1: 100 000 scale Soil Landscapes map sheet area (King, 1992a; 1992b).

Based on six test pits and an additional four surface scrapes, GCNRC (2006) identified two Soil Mapping Units (SMUs) (see **Figure 5.6**). **Table 5.8** presents a summary of the soil profiles and characteristics of the two identified SMUs.

Table 5.8
Summary of Soil Mapping Units within the Project Site

General	Topsoil	Subsoil
SMU 1		
<i>Occurrence:</i> drainage depressions <i>Soil depth:</i> 215cm to 250cm <i>Surface:</i> firm <i>Stones:</i> surface stone absent or some angular surface stone 2cm-10cm	<i>Horizons:</i> single A horizon <i>Texture:</i> silty clay loam; silty clay or medium to heavy clay; many roots present <i>pH:</i> 5.5 to 6.5 <i>Colour:</i> brown / grey coloured	<i>Horizons:</i> up to three B horizons <i>Texture:</i> medium to heavy clay <i>pH:</i> 4.5 to 6.0 <i>Colour:</i> shades of white, grey, pink, yellow, brown and grey
SMU 2		
<i>Occurrence:</i> slopes and crests <i>Soil depth:</i> to 72cm deep <i>Surface:</i> soft, loose or firm <i>Stones:</i> usually some rounded or angular blocky surface stone 2cm-8cm present, occasionally surface stone absent.	<i>Horizons:</i> single A horizon <i>Texture:</i> loamy sand, silty clay loam, sandy clay loam or medium clay <i>pH:</i> 5.0 to 6.5-7.0 <i>Colour:</i> shades of brown, light brown and pink	<i>Horizons:</i> Three B horizons <i>Texture:</i> medium clay or medium to heavy clay <i>pH:</i> not noted <i>Colour:</i> variously coloured brown, white, yellowish red
Source: Modified after GCNRC (2006) – Section 5.		

Based on analysis of physical and chemical properties of representative samples of these SMUs, all Project Site soils were identified as within the pH range optimal for plant growth, displayed no saline tendencies and are considered to exhibit a moderate erodibility hazard.

5.8.3 Proposed Management

Given the moderate erodibility hazard associated with the Project Site soils, soil management would focus on minimising the exposure of these soils to erosive forces as recommended by GCNRC (2006). Soil management would include:

- minimising stockpiling requirements;
- minimising stockpile size;
- establishing a vegetative cover over soil stockpiles and respread soils as soon as practical;
- diverting surface water flows away from exposed soil;
- avoiding excessive handling of the soils and handling wet soils; and
- the use of mulch (or previously cleared vegetation) to counteract the hydrophobic properties of the soils.



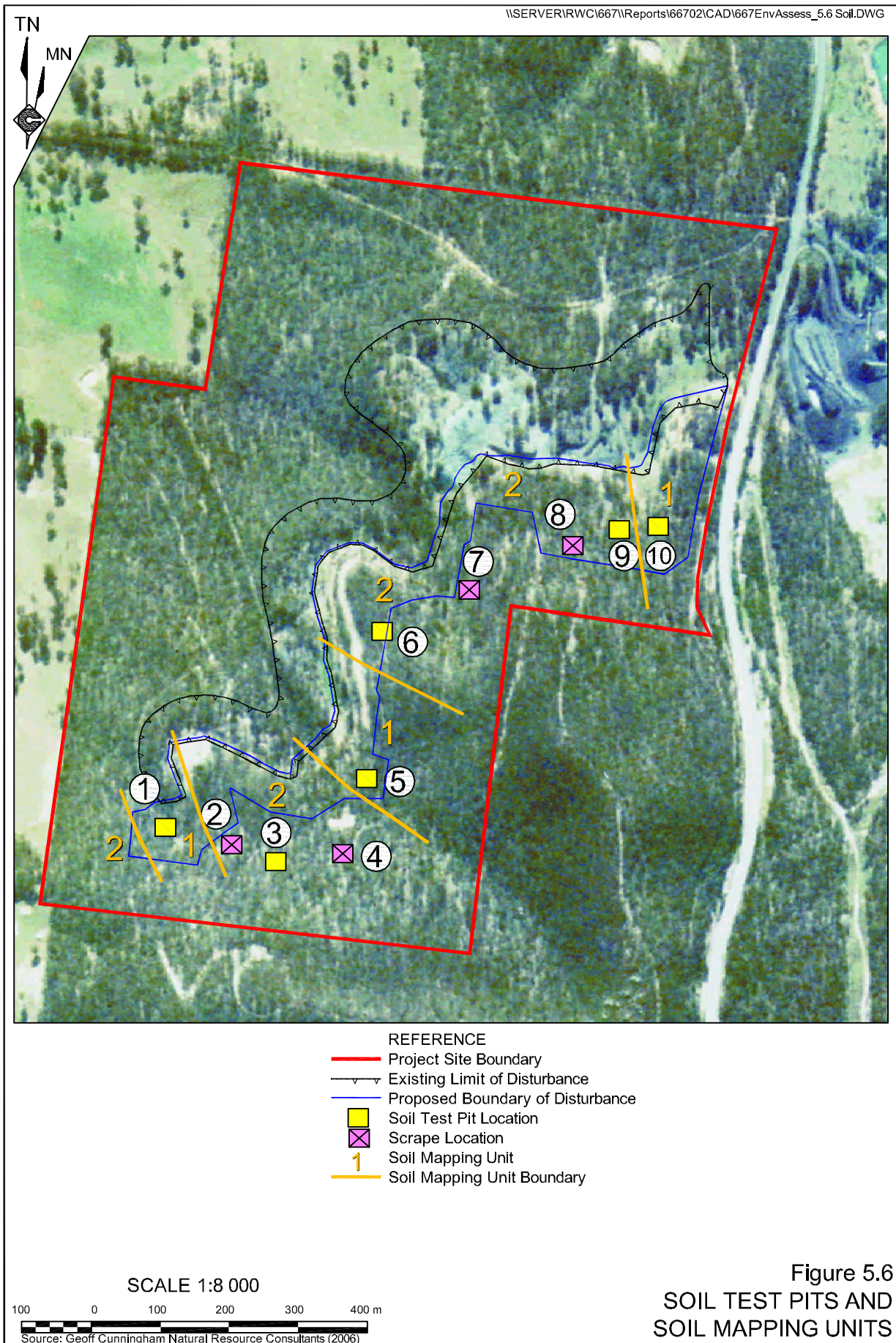


Figure 5.6
 SOIL TEST PITS AND
 SOIL MAPPING UNITS



5.8.4 Impact Assessment

Adherence to the recommended soil stripping, handling and storage procedures would result in a minimal impact from a soils and land capability viewpoint at the Project Site. In fact, the impact from the project would be positive in the long term as the rehabilitated landscape would be more stable than at present and would allow regeneration of native vegetation communities and provide habitat for native fauna.

5.8.5 Monitoring

The Proponent would inspect soil stockpiles and respread soil to identify any erosion or evidence of degradation of soil quality.

5.9 ADDITIONAL ISSUES

5.9.1 Aboriginal Heritage

5.9.1.1 Introduction

OzArk Environmental and Heritage Management Pty Limited (Ozark) was commissioned to identify any artefacts or sites of Aboriginal heritage significance on the Project Site (Ozark, 2006 - Part 3 of the *Specialist Consultant Studies Compendium*). This assessment was undertaken in accordance with the draft *Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation* prepared by the DEC, thereby satisfying a requirement of the Director-General's Requirements of the DoP to refer to this document.

5.9.1.2 Existing Environment

A search of the Aboriginal Heritage Information Management System (AHIMS) – Aboriginal Sites Register within a 10km and 10km square area centred on the Project Site identified a total of 71 recorded sites. No Aboriginal artefacts or sites were identified during a field survey by OzArks archaeologists and the Bathurst Local Aboriginal Land Council representative.

5.9.1.3 Proposed Management

As no Aboriginal sites or artefacts were identified on the Project Site, no specific safeguards or management practices have been proposed. However, site employees and contractors would be advised of their responsibilities under the *National Parks and Wildlife Act 1974* to immediately cease work in the vicinity of any identified or suspected site or artefact until such time as the management of the site/artefact has been discussed with a DEC archaeologist and a representative of the Bathurst Local Land Aboriginal Council.

5.9.1.4 Impact Assessment

Given the lack of any Aboriginal site or artefact, the project would not have any impact on the Aboriginal heritage values of the Project Site.



5.9.2 Property Values

5.9.2.1 Existing Environment

No information was obtained on recent property sales within the local area. Several issues related to property values were noted including:

- (i) the coal industry has been associated with the local area for many years, with nearby and visible premises including the Mt Piper Power Station, Cullen Valley Colliery and Ivanhoe Colliery and Invincible Colliery;
- (ii) the owners of properties 8 and 9 (see **Figure 3.2**) have had an application to sub-divide their land for sale approved by Council; and
- (iii) a relatively high number of 'for sale' signs were noted on properties on Back Cullen Road, indicating a relatively elevated sale period already exists for local properties.

5.9.2.2 Impact Assessment

Informal discussions were held with a local property valuer who noted that on initial commencement, there may be some negative market reaction to land values in the vicinity of the Project Site. In some cases, it is not necessarily the fact that property values fall, rather, the duration of the sale period can be extended during the period of uncertainty relating to the project. Experience would suggest, however, that long term impacts on land values would be a direct reflection on the environmental and social performance of the project operator. That is, following a demonstration that the project operator can comply with all environmental criteria, establishes a progressive rehabilitation program and generally present itself as responsible and competent, the (possible) depression in land values would most likely reverse.

As noted in Section 5.5.4, properties 8 and 9 are sufficiently screened from the project so as not to be impacted visually. Section 5.2.5 and 5.4.4 also indicated dust and noise would be unlikely to affect these properties. As such, sale value of the sub-divided land is unlikely to be significantly affected.

It should also be noted that any impact on property values would be limited to the life of the project, ie. 2 years.

5.9.3 Spontaneous Combustion

Coal and coarse reject from the Lithgow Coal Seam in the Ivanhoe Colliery Mining Lease area adjacent to the site have a low propensity for spontaneous combustion. No occurrences of spontaneous combustion of stockpiled coal or coarse reject have occurred in the history of Ivanhoe Colliery.



5.9.4 Bushfire

5.9.4.1 Existing Environment

The Project Site is characterised by open forest and woodland vegetation, dominated by Eucalyptus tree species and a relatively open sub-strata of shrubs and grasses. A bushfire hazard exists therefore, due to the vegetation type, with this hazard increasing during the warmer summer months and decreasing over the cooler winter months (due to reduced evaporation rates which assist in retaining moisture). This hazard will also be dependant on the fuel load of Ben Bullen State Forest, ie. volume of leaf litter, fallen timber and other flammable material.

5.9.4.2 Proposed Management

In order to reduce the risk of fire within the Project Site, the Proponent would require mobile plant, the coal crushing area and facilities area to maintain fire suppression equipment. Work conditions restricting smoking to cleared areas and prohibiting open flames in vegetated areas would also be enforced.

In the event of a bushfire on the Project Site, all employees would be instructed to follow instructions of DPI (Forest) officers, or if no instruction is provided, evacuate the Project Site.

The Proponent recognises the Statutory Fire Threat Period (1 October to 31 March) of DPI (Forests) and would comply with requests of DPI (Forest) officers in relation to fire control.

5.9.4.3 Impact Assessment

Given the proposed works will be of short duration, generally take place on cleared areas, the availability of fire suppression equipment and the implementation of appropriate work instructions, the risk of bushfire would not be significantly increased as a result of the project.

5.9.5 Groundwater Pollution

5.9.5.1 Existing Environment

Interaction between groundwater and surface water has been identified as restricted to the percolation of surface water to groundwater beneath the Project Site. Due to the angle of dip of the coal seams and interburden strata, any water contained within these does not discharge at exposures caused by the abandoned high wall (GSS, 2006). No groundwater dependent ecosystems were identified by Gingra (2006).

5.9.5.2 Proposed Management

Groundwater would not be intercepted by the project activities and as such, no management controls are proposed to mitigate for possible impacts on groundwater flows.

To safeguard against potential contamination of groundwater, fuel storage on-site would be a 30kL self-bunded tank.



5.9.5.3 Impact Assessment

As groundwater would not be intercepted by the project activities, and the potential for contamination by hydrocarbons mitigated through the use of impermeable bunding, it is unlikely the project would have any impact on local groundwater. The Project will therefore meet the management goal of the “*NSW State Groundwater Policy Framework Document*” (DLWC, 1997) which is:

“To manage the State’s groundwater resources so that they can sustain environmental, social and economic uses for the people of NSW”.

Given that groundwater will not be intercepted, the very low potential for groundwater contamination by hydrocarbons and other pollutants and the lack of groundwater dependent ecosystems on or surrounding the Project Site, the Project will not breach any of the aims or objectives of the three component policies of this framework document, namely:

- *Groundwater Quality Protection Policy* (DLWC, 1998).
- *Groundwater Dependant Ecosystems Policy* (DLWC, 2002).

In the absence of a final “*Groundwater Quality Management Policy*” referred to in DLWC (1997), the Water Policy Advisory Note No. 8 Groundwater Quantity Management (NSW Government, undated) was referenced.

5.9.6 Contaminated Lands

5.9.6.1 Existing Environment

An estimated 40 000m³ of coal reject has been stockpiled within the coarse reject emplacement of MPL 79. This reject is typically coarse (up to 75mm), comprises predominantly carbonaceous shale and sandstone and has a low potential for acid and salt generation.

5.9.6.2 Proposed Management

The Proponent intends to relocate the bulk of this material into the voids within the northern area towards the end of the project life. Any material not used to create the final landform would be reshaped and covered with up to 0.5m of sandstone overburden from an active rehabilitation area, topsoiled and vegetated.

The Proponent would implement a hydrocarbon spill response procedure on-site based around the principles of stop the spill, contain the spill, remove the contaminated material and remediate the remaining land.

5.9.6.3 Impact Assessment

It is not anticipated that the project would lead to contamination of lands.



Section 6

Statement of Environmental Commitments

Page 1 of 6

Objective	Environmental Commitment
6.1 Traffic	
Impacts on traffic flow and road user safety is not to be adversely effected by the project.	All transportation activities are to be undertaken in accordance with the appropriate approval and licence conditions.
	All trucks are to be well maintained and all truck drivers to be instructed to act in a courteous manner and obey all road rules.
	The entering and exiting of heavy vehicles will staggered to prevent the creation of truck convoys.
	Truck drivers will be instructed to not enter the Castlereagh Highway at the same time as trucks from the Invincible Colliery. A management procedure for the coordination of product transportation exiting both the Project Site and the Invincible Colliery will prepared.
	Cross traffic between the Project Site and the Invincible Colliery will prohibited and a procedure prepared and distributed enforcing this.
	Appropriate warning signs and line markings are to be installed in accordance with RTA (2002).
	All trucks exiting the Project Site are to have a covered load.
	A shaker grid will constructed across the outgoing lane of the Project Site entrance, setback 50m from Castlereagh Highway.
	The Proponent will instruct truck drivers to monitor the condition of the roads along the proposed transport route and report any deterioration.
	The sight distance available to truck drivers will be regularly monitored and grass / shrubs slashed accordingly.



Objective	Environmental Commitment
6.2 Noise	
Noise received at surrounding residences is to be kept to below the following levels.	The crushing area for the project will be positioned within the partially filled void surrounding the Ivanhoe No.2 ventilation shaft entry point.
	The internal haul road will be oriented to utilise the existing out-of-pit spoil dumps for acoustic shielding.
	Equipment with lower sound power levels will be used in preference to more noisy equipment.
Residence B: 32dB(A)	
Residence C: 35dB(A)	All equipment used on site will be fully maintained to ensure each item of equipment is operating at the lowest feasible noise level.
Residence D: 36dB(A)	
Residence G: 30dB(A)	The on-site road network will be well maintained to limit body noise from empty trucks travelling on internal roads.
Residence K: 32dB(A)	The Proponent will commission attended monitoring at Residences C, G & K on a 6 monthly basis.
6.3 Water Resources	
Disturbance will be minimised	The areas to be cleared of existing vegetation will be restricted to those areas directly upslope of the abandoned high wall.
	Prior to clearing commencing, the limits of clearing will be marked by pegs placed at intervals on each side of the disturbed area.
	Programming the works so that only the areas sufficient for the ensuing 3 to 4 months of operations will be cleared.
	All proposed erosion and sediment control measures are to be implemented in advance of, or in conjunction with, clearing and stripping operations.
Soil will be stockpiled in a way that reduces the potential for erosion and sedimentation from these.	A maximum topsoil stockpile height of two metres and a batter slope of 2:1 (V:H) will be maintained.
	Temporary sediment control measures such as hay bales and silt-stop fences will be used whenever necessary.
	Stockpiles will be placed away from natural or artificial drainage lines.
Reduce the potential for erosion and sedimentation from profiled sections of the final landform	Topsoil will be spread to a minimum depth of 100mm on 3:1 (V:H) or steeper slopes and to a minimum depth of 50mm on flatter slopes.
	Topsoil will be spread along the contour of replaced overburden to minimise erosion by dumping at the top of slopes and grading downwards and across the contour.
	Re-spread topsoil will be levelled to achieve an even surface, avoiding a compacted or an over-smooth finish.
	Ripping will be undertaken on the contour and ripples directed to the four stabilised drains.
	Contour banks are to be constructed where ripping in the above manner is insufficient to prevent erosion and contour bank directed to the four stabilised drains.
	All topsoiled areas will be contour ripped (after topsoil spreading) to create a "key" between the soil and the overburden.
	Vehicle traffic will be prevented from entering the rehabilitated areas.

Objective	Environmental Commitment
6.3	Water Resources (Cont'd)
Water captured within disturbed areas of the Project Site will be directed to internal erosion controls and water storages prior to discharge.	The existing out-of-pit spoil dump will be retained and operate as a containment bund for water captured within the proposed operational blocks, thereby allowing for dirty water to be directed towards sediment basins and sediment dams.
	The floor of each operational block will be graded such that the “dirty water” is directed to constructed dirty water settling ponds.
	A sediment basin will be constructed within the coal crushing area to capture any runoff from within this area.
	All sediment basins and erosion control structures are to be designed and constructed in accordance with DoH (2004).
Temporary Containment of ‘Clean’ Water in Ephemeral Drainage Lines / Prevention of flow over the active operational areas of the Project Site.	Prior to ground disturbance commencing in a block through which a drainage line flows, clean water will be prevented from entering the active disturbance area through the construction of temporary ‘clean water dams’ (CWD) 1 to 4, immediately upstream of the block, and the construction of appropriately placed cut-off drains immediately above the proposed limit of disturbance to direct catchment flows into the dam.
	Clean water from each CWD will be self siphoned through, or around, the disturbance area via a 100mm HDPE pipeline and back into the natural drainage line downstream of the proposed disturbance area and sediment dams.
	Once overburden and soil replacement in the block is complete, and the final landform is satisfactorily established and stabilised, the flow will be restored to its original flow path and the CWD will be removed.
	Some keys design elements of the CWDs are: – The dams will be designed to capture the 5 year ARI storm event, which is deemed appropriate, given the short two year project life, and each block typically being disturbed for only one to three months. – For Streams 1, 2 & 4, a dam with a minimum capacity of 0.25ML will be constructed (approximately 15m x 15m x 2m deep). Each of these streams has a small catchment upstream of the proposed disturbance area. – For Stream 3 a dam with a minimum capacity of 1ML will be constructed (approximately 25m x 25m x 2m deep) – The dams will be designed and constructed in accordance with the typical design for “Earth Basin – Wet SD 6-4” provided in DoH (2004). – The cut-off drains will be constructed in accordance with the typical design for “Earth Bank – Low Flow SD 5-5” provided in DoH (2004).



Objective	Environmental Commitment
6.3 Water Resources (Cont'd)	
Re-establishment of ephemeral drainage lines along natural alignment.	The channel will be generally trapezoidal in shape with a 2m base width and 3:1 (H:V) batters. The overall width of each channel will be at least 4m for Stream 1, 3.5m for Stream 2, 4.5m for Stream 3 and 3m for Stream 4.
	Natural meanders will be used instead of straight lines to reflect natural stream characteristics.
	The channel will be rock lined and constructed with the placement of proper sized rocks above a filter layer of suitable geotextile.
	Soil will be packed in between rocks to allow sedges and grasses to be established within the channel to provide for the long-term channel stability.
	A riparian corridor will be established with a minimum width of 20m from either bank in accordance with the guideline titled, ' <i>Watercourse and Riparian Zone Rehabilitation Requirements</i> (Version 3)' prepared by the DNR.
Maintain water quality.	Water discharging from the internal controls will be directed to two sediment dams designed and constructed to capture all flows from the contributing catchment in accordance with the typical design for "Earth Basin – Dry SD 6-3" provided in DoH (2004).
	Water discharged from SD-1 and SD-2 will meet the following water quality criteria: – pH 6.5 – 8.0 – Electrical Conductivity < 1500 µs/cm. – Total Grease < 10 mg/L. – Suspended Solids < 50 mg/L.
Design and construct internal roads to minimise erosion and sedimentation potential.	Project Site roads will be designed with the following features. – Cross-fall drainage structures and mitre drains to direct water to the in-pit water management system. – Road runoff will be intercepted at regular intervals (not to exceed 50m) to reduce runoff velocity in each mitre drain. – Steeper sections of the roads will be crowned.
Monitoring will be undertaken to ensure the maintenance of water quality and prevention of erosion and sedimentation.	Surface water quality will be monitored quarterly, with samples taken from the existing sites INW-1 & INW-2, clean water dams CWD1 – 4 and sediment dams SD-1 and SD-2.
	Water samples will be analysed for key parameters, including: – pH; – Electrical Conductivity; – Total Grease; and – Suspended Solids.
	Opportunistic grab samples may also be taken periodically from streams during significant rainfall events (20mm/24hr). These samples will be analysed for the same parameters as above.

Objective	Environmental Commitment
6.4 Air Quality	
Dust deposition at residences surrounding the Project Site will <3.8g/m ² /month.	Internal haul roads will be watered at a rate of approximately 2L/m ² per application.
	The drop heights between front-end loader buckets and trucks carrying coal or overburden will be limited.
	The coal crushing area for the project will be positioned within the partially filled void surrounding the Ivanhoe No.2 ventilation shaft entry point to provide shielding from winds likely to result in the "lift-off" of dust from coal stockpiles.
	The area of exposed surfaces will be limited to that required for a maximum of 2-3 months operations.
	Soil stockpiles retained for periods greater than three months will be seeded to minimise wind erosion.
	The Proponent will cease any dust-generating activity(ies) in the event that strong winds are blowing dust towards residences and dust suppression is ineffective.
	The Proponent will establish a deposited dust monitoring program in consultation with the DEC (EPA). It is anticipated the monitoring will be in the form of two permanent deposited dust gauges, analysed on a monthly basis, most likely located at Residences C and K.
6.5 Visual Amenity	
The visual impact of the project will minimised.	The Project Site will be progressively rehabilitated to create a landform similar to that of the surrounding Ben Bullen State Forest.
	The crushing area will be located and constructed within the partially backfilled void above the Ivanhoe No. 2 ventilation fan entry.
	The out-of-pit spoil dumps of the former open cut will not be disturbed.
	The extent of land disturbance / clearing in advance of project activities will be limited to that required for a maximum of 3 to 4 months operations.
	The Project Site will be maintained in a clean and tidy condition at all times.
6.6 Flora and Fauna	
Areas to be cleared will be minimised, clearly marked and managed to minimise impacts on local fauna.	'No go' areas for employees, vehicles and project equipment will be designated outside nominated areas of disturbance.
	Areas to be disturbed ahead of clearing activities will be clearly marked.
	A pre-start inspection will be carried out by a suitable person prior to removal of hollow-bearing tree.
	Felled or fallen timber will be left on the ground outside the limit of the project activities.



Objective	Environmental Commitment
6.6 Flora and Fauna (Cont'd)	
Re-establishment of plant communities and fauna habitat of the pre-mining environment.	Provenance seed and propagation stock will be obtained from the Project Site prior to, or during, clearing.
	The full range of tree species present in the local area will be planted as part of rehabilitation activities to the extent practical.
	Disturbed areas will be revegetated with a mix of tree, shrub and ground layer species typical of the plant communities which previously existed.
	Seed collection works will be scheduled such that sufficient viable seed and propagation stock is available as the rehabilitation work proceeds.
	Prior to cessation of monitoring of rehabilitated landform, DPI(MR) to "sign-off" on the Proponent's responsibility to maintain the area.
Surface water dams or ponding areas to be kept free of contaminants such as fuel and oil.	See commitments for water resources.
6.7 Soil Resources	
Soil will be stripped and stockpiled in order to maximise its potential for use in rehabilitation of the Project Site.	The topsoil layer from SMU 1 will be stripped to a depth of 15cm, and from SMU 2 to a depth of 10cm.
	Handling when the soils are wet will be avoided.
Stockpiles are to be managed in such a way as to minimise the loss of biological activity and viability for use in rehabilitation.	Topsoil stockpiles, when required, will not exceed 2m in height and, where practical, be maintained as windrows in preference to larger structures.
	The formed stockpile surfaces will be left with a generally even surface that is as 'rough' as possible, in a micro-sense, to assist in runoff control and seed retention and germination.
	Driving of machinery on the topsoil and subsoil stockpiles, as well as the respread soil, will be kept to an absolute minimum.
Stockpiles are to be managed to reduce the potential for erosion and sedimentation.	Silt-stop fencing or similar will be placed immediately down-slope of stockpiles where required, until stable vegetation cover is established. Batter slopes to be ripped along contour and contour drains established where required.
	A cover of previously cleared vegetation or mulch will be spread over the soil prior to seeding to aid in the establishment and maintenance of a vegetative cover.
6.8 Aboriginal Heritage	
The workforce will be educated to their obligations and responsibilities under the <i>National Parks and Wildlife Act of 1974</i> .	The workforce will be instructed to immediately cease work in the vicinity of any suspected or identified site or artefact until such time as the management of the site/arteifact has been discussed with a DEC archaeologist and a representative of the Bathurst Local Land Aboriginal Council.
	Monitoring will be undertaken in response to the identification of an Aboriginal site or artefact with the method to be determined through consultation with the DEC.

Section 7

Evaluation of the Project

7.1 INTRODUCTION

This section evaluates the impacts of the project by consolidating and reviewing the predicted impacts on the biophysical, economic and social environment, as identified in Section 5, against all relevant statutory requirements, guidelines and standards, and the principles of ecologically sustainable development (ESD).

7.2 EVALUATION OF IMPACTS

7.2.1 Biophysical Considerations

Section 5 identified the minor adverse impacts of the project, with these largely restricted to:

- the temporary disturbance of Project Site vegetation and soils;
- increased noise at residences surrounding the Project Site;
- slight increase in dust deposition and the concentration of airborne particulates at residences surrounding the Project Site;
- possible minor increases in heavy vehicle traffic on the Castlereagh Highway;
- adverse affects on the visual amenity of some residences for the duration of the project; and
- the temporary reduction in environmental flows within the four identified ephemeral drainage lines.

These minor impacts were identified following the completion of seven specialist environmental studies, each of which referenced the relevant guidelines and standards identified by the Director-General's Requirements.

The project would, however, provide several positive impacts on the biophysical environment, including:

- the creation of a landform commensurate with the surrounding topography;
- revegetation of cleared areas with native vegetation; and
- re-establishment of the natural alignment of the identified drainage lines.



Should the project not be approved, the minor biophysical impacts identified would not occur, however, the opportunity to rehabilitate an abandoned coal mine for which the NSW Government holds the major responsibility would be lost along with the potential long term benefits to the environment and public safety.

7.2.2 Economic Considerations

The economic benefits of the project include:

- (i) the continued supply of coal to local power stations and export markets;
- (ii) provision of fulltime employment for up to 12 people for approximately two years; and
- (iii) the successful rehabilitation of an abandoned coal mine at no cost to the NSW Government.

The impacts of the project not being approved would result in loss of economic benefits to the potential employees of the project, personnel indirectly employed by the Proponent, the communities in which these people reside, and the NSW Government.

7.2.3 Social Considerations

Community concerns relating to noise, dust, traffic and visual-related impacts have been assessed as minimal and acceptable. Therefore, the concerns of the community, while founded, would be adequately managed through the design features, operational safeguards and mitigation measures that would be implemented by the Proponent as outlined in Section 5.

7.2.4 Net Environmental Gain

It has been quite clearly demonstrated that the minor impacts related to noise, dust, visual amenity, traffic and other environmental aspects would be more than adequately compensated through the rehabilitation of an abandoned open cut mine. As such, the project would offer a significant “net environmental gain” and public safety gain, particularly in the longer term.

7.3 ECOLOGICAL SUSTAINABILITY DEVELOPMENT

7.3.1 The Precautionary Principle

The two main issues relevant to the application of the precautionary principle relate to the following, namely:

- careful evaluation to avoid, wherever possible, serious or irreversible damage to the environment; and
- assessment of risk-weighted consequences of needs should be undertaken for various options.



The precautionary principle has been directly or indirectly addressed during project development as the project design was based upon the effective long term rehabilitation of the site, the use of existing infrastructure and the recommendations of independent specialist studies.

7.3.2 Social Equity

Social equity embraces value concepts of justice and fairness so that the basic needs of all sectors of society are met and there is a fairer distribution of costs and benefits to improve the well being and welfare of the community, both within and across generations.

The principles of social equity have been applied to the project as follows.

- Well planned and effective rehabilitation designed to restore the disturbed areas of the Project Site to a landform similar to that of the pre-mining environment.
- Minimisation of disturbance to native vegetation through effective project design.
- The recovery and processing of coal would provide valuable economic and welfare benefit through the continued supply of coal to the Wallerawang and Mt Piper Power Stations thereby providing for continued electricity supply.
- The project, through security of long term access to an economical and accessible coal resource, would provide a greater level of certainty to the electricity industry with respect to the availability of approximately 385 000tpa (ie. 70% total) of coal over a two year period.

7.3.3 Conservation of Biological Diversity and Ecological Integrity

The protection of biodiversity and maintenance of ecological processes and systems are central goals of ESD. It is important that all developments do not threaten the integrity of ecological systems as a whole, or the conservation of threatened species in the short or long term. The project has been designed to achieve compliance with this principle through project design based upon the rehabilitation of the site, re-establishment of a native woodland ecosystem and the recommendations of Gingra (2006) and GSS (2006) into the final project design.

7.3.4 Improved Valuation and Pricing of Environmental Resources

The main issues that form the basis of this principle relate to acceptance that the polluter pays, all resources are appropriately valued, cost-effective environmental stewardship is adopted and the adoption of user pays pricing scheme based upon the full life cycle of environmental costs. The project achieves this through maximising the recovery of the coal resource whilst improving the environment through effective rehabilitation of the abandoned open cut. It is planned that the pricing scheme for the coal product is sufficient to enable the Proponent to appropriately perform all of its environmental related tasks and responsibilities, as detailed throughout this Environmental Assessment.



7.4 CONCLUSION

The proposed Ivanhoe North Rehabilitation Project has been designed to address the issues of concern raised by local landowners and residents, Lithgow City Council, the Director-General's Requirements and relevant government agencies. Each issue was assessed to the level considered appropriate following the completion of an environmental risk assessment (see **Appendix 4**). The predicted impacts associated with the project are considered generally minor and temporary in nature and as such the Minister for Planning can approve the project because it would:

- (i) provide for the rehabilitation and improved public safety of the abandoned Cullen Main West open cut and an improved environment and public safety outcome;
- (ii) with the exception of marginal noise exceedances at two residences, comply with all relevant statutory requirements, guidelines and standards;
- (iii) be operated in accordance with the environmental management measures that are detailed throughout this document and have been developed with respect to the principles of ecologically sustainable development;
- (iv) have minimal impact on most sectors of the biophysical environment whilst allowing for the recovery of the remaining coal resource in a previously disturbed area. Where a predicted impact has been identified, all reasonable and feasible safeguards have been implemented by the Proponent in an effort to minimise the identified impact; and
- (v) release the NSW Government from its rehabilitation obligations for the abandoned open cut mine.



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Section 9

Glossary of Technical Terms, Acronyms, Symbols and Units

Glossary of Technical Terms	–	Page 9-3 to 9-11
Glossary of Acronyms	–	Page 9-12 to 9-13
Glossary of Symbols and Units	–	Page 9-14 to 9-15



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GLOSSARY OF TERMS

A horizon – part of soil profile immediately below the topsoil.

acoustic shielding – a natural or artificial structure (e.g. a hill or a bund) that inhibits the transmission of sound.

adverse weather conditions (in respect of noise and dust) – conditions, such as high wind, that assist the movement of dust or propagation of noise away from the site towards receptors.

aerial photographs – photographs of landscape taken from a plane (typically areas several kilometres across) used for the surveying and interpretation of vegetation type, geology, land use, etc.

aerial survey – survey of a landscape from an aeroplane, typically involving aerial photography, to determine specific characteristics (e.g. mineral potential or land use).

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

air pollution emissions inventory – all information, collection and processing system containing data on emissions of, and sources of, air pollution from both man-made and natural causes.

air quality goals – quantitative relationship between a pollutant's dose, concentration, deposition rate or any other air quality-related factors, and the related effects on receptors, e.g. humans, animals, plants, or materials. Air quality goals serve as the scientific basis for formulating ambient air quality standards or objectives.

ambient level – existing level of a phenomenon without the influence of the proposal.

amenity – the desirability of an area.

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

artefact – anything made by human workmanship, particularly by previous cultures (such as chipped and modified stones used as tools).

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

B horizon – subsoil material located below the A horizon material and above the parent rock.

background dust level – dust level in the absence of mining and processing activities.

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

batter – An engineered slope of soil or rock fill on either side upslope or down slope of a road, embankment or mine waste storage.

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

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

coal seam – a layer of coal within the geological strata.

colliery – coal mine.

community – a combination of plants that are dependent on their environment and influence one another and modify their own environment. They form together, with their common habitat and other associated organisms, an ecosystem, which is also related to neighbouring ecosystems and to the macroclimate of the region.

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

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



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

contour mine – an open cut mine created by developing a high wall along the length of an existing topographic contour line.

cross-section – a two-dimensional diagram of an object presented as if the object had been cut along its length.

crusher – that part of a processing plant where the coal is mechanically crushed into smaller pieces.

crushing – the mechanical process of reducing rock size usually by pressure or impact.

cumulative – increasing by successive additions.

decibel – unit expressing difference in power between acoustic signals.

dip – the angle that rock strata make with a horizontal surface measured at right angles to the strike.

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

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

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

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

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

electrical conductivity (EC) – the ability of a substance (either solid, liquid or gas) to transmit electricity.

ecology – the relationship between living things and their environment.

ecologically sustainable development (ESD) – 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.

ecosystem – the totality of biological processes and interactions within a specified physical environment.

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

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

environmental constraints – limitations on a project by components of the environment.

Environmental Assessment (EA) – a formal description of a project and an assessment of its likely impact on the physical, social and economic environment prepared for projects considered under Part 3A of the EPA Act. It includes an evaluation of alternatives and an overall justification of the project. The EA is used as a vehicle to facilitate public comment and as the basis for analysing the project with respect to granting approval under relevant legislation.

ephemeral – not permanent, e.g. a stream that flows only seasonally or after rainfall or a lake that periodically dries out.

erodibility – the tendency of soil, earth or rock to erode.

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

erosion potential – the susceptibility of a parcel of land to the prevailing agents of erosion. It is dependent on a combination of climate, landform, soil, land use and land management factors.

evaporation – the loss of water as vapour from the surface of a liquid that has a temperature lower than its boiling point.

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

exotic – introduced or foreign, not native.

fauna – a general term for animals (birds, reptiles, marsupials, fish etc.).

fill – material imported and emplaced to raise the general surface level of a site.



front-end loader – machine used to lift and place soil, earth, rocks, coal into a truck.

geotechnical – technical or engineering aspects relating to soil, rock and other materials.

goaf - An area of the mine which has been previously mined and then used as a depository for waste from the workings.

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

groundcover – vegetation that grows close to the ground (such as grasses and herbs) providing protection from erosion.

groundwater – all waters occurring below the land surface; the upper surface of the soils saturated by groundwater in any particular area is called the water table.

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

haul truck – a truck specifically designed for hauling and tipping soil or rock within the Project Site.

heritage – the things of value which are inherited.

high wall – exposed wall of excavation designed to stand open for mine life.

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

indigenous – belonging to, or found naturally in, a particular environment (see also exotic).

infiltration – the process of surface water soaking into the soil.

infrastructure – the supporting installations and services that supply the needs of a project.

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

interburden – rock strata in between coal seams.

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

loam – loose soil composed of clay and sand, especially a kind containing organic matter and of great fertility.

mammal – animal of the class mammalia, distinguished by the presence of hair and mammary glands.

management strategy – a policy or direction that assists in actions required to address issues.

mitigation measures – measures employed to reduce (mitigate) an impact (such as the construction of a perimeter bund to reduce sound emissions).

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

monitoring – systematic sampling and, if appropriate, sample analysis to record changes over time caused by impacts such as mining.

natural – existing in, or formed by, nature (generally excludes anything obviously modified by human beings).

open cut mine – surface excavation for the purpose of removing coal or other resource(s).

open cut void – below surface level space retained during or at the completion of excavation activities.

overburden (spoil) – in the mining context refers to non-economic material to be removed to allow access to the resource.

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

perennial – refers to stream which has flow throughout the year.

permeability – a material property relating to the ability of the material to transmit water.



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

pollution – the alteration of air, soil, or water as a result of human activities such that it is less suitable for any purpose for which it could be used in its natural state.

population – a group of organisms all of the same species occupying a particular area.

potable – water suitable for human consumption.

precautionary principle – a principle of ESD which states that decisions about any proposed development should be guided by careful management to avoid serious and irreversible damage to the environment.

progressive rehabilitation – rehabilitation of mine or disturbed areas as soon as practicable after they are released during the life of the mine.

Project Site – the total area covered by the project, including pit, processing plant, overburden dumps, stockpiles, bunds, ponds, etc.

quadrat – a square survey area.

rehabilitation – the preparation of a final landform after quarrying and its stabilisation with grasses, trees and shrubs.

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

relief – the variation in landscape elevation over a region.

resource – an estimate of potentially usable coal in a defined area based on preliminary information.

revegetation – replacement of vegetation, principally grasses and legumes on disturbed areas.

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

saline – water with high salt concentration.

salinity – the dissolved content of water expressed in terms of milligrams per litre.

sediment basin – a small excavation designed to trap the coarse material washed from disturbed areas.

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

silt-stop fencing – fine mesh fencing normally installed downslope of a sediment source, designed to trap silt and sediment and allow the water to pass through.

soil erosion hazard – the susceptibility of an area of land to erosion and includes rainfall erosivity, slope, soil erodibility and cover.

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

species diversity – a measure of the number of different species in a given area.

spoil – earth and rock excavated from a mine.

stockpile – a pile used to store material (such as low-grade ore) for future use.

stripping – removal of vegetation and topsoil.

structure (soil) – the physical texture of the soil arising from the interrelationship between the grain size, composition, and organic nature of a soil.

subsoil – the layer of soil lying below the topsoil; usually contains less organic matter and is less fertile.

surface waters – all water flowing over, or contained on, a landscape (e.g. runoff, streams, lakes etc).

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

terrestrial – of or relating to the land, as distinct from air or water.

texture (of soil) – variations in composition, grain size distribution, and structure.

topography – the physical relief and contour of a region.



topsoil – the upper layer of soil, usually containing more organic material and nutrients than the subsoil beneath it.

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

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

weathered rock – rock affected to any degree by the processes of chemical or physical weathering.

weed – any plant (in particular an herbaceous one) that survives in an area where it is harmful or troublesome to the desired land use.

wildlife – non-domesticated fauna.

wind direction – the direction from which the wind, averaged over a certain period of time, is blowing.

wind erosion – wearing away of exposed soil, earth, or rock surfaces by the abrasive action of wind-blown particles (e.g. grains of sand).

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

woodland – plant communities dominated by trees whose crowns shade less than 30% of the ground.



GLOSSARY OF ACRONYMS

AADT	Annual Average Daily Traffic.	LGA	Local Government Area.
AHD	Australian height datum (in metres).	NPW Act	National Parks and Wildlife Act 1974 (NSW).
AHIMS	Australian Heritage Information Management System.	POEO Act	Protection of the Environment Operations Act 1997 (NSW).
ANZECC	Australian and New Zealand Environment and Conservation Council.	REP	Regional Environmental Plan.
AS	Australian Standard.	RTA	Roads and Traffic Authority (NSW).
dB(A)	decibels, A-weighted scale.	RBL	Rating Background Level
DEC	Department of Environment and Conservation (NSW).	SEPP	State Environmental Planning Policy.
DEH	Department of Environment and Heritage (Commonwealth).	SMU	Soil Mapping Unit.
DoH	Department of Housing (NSW).	TAPM	The Air Pollution Model.
DoP	Department of Planning	TSC Act	Threatened Species Conservation Act 1995 (NSW).
DNR	Department of Natural Resources	TSP	Total Suspended Particulate
DP	Deposited Plan.		
DPI	Department of Primary Industries (NSW).		
DPI (Agriculture)	Department of Primary Industries (NSW Agriculture) (NSW).		
DPI (Forests)	Department of Primary Industries (NSW Forests) (NSW).		
DPI (Minerals)	Department of Primary Industries (Mineral Resources) (NSW).		
EC	Electrical Conductivity.		
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth).		
EP&A Act	Environmental Planning and Assessment Act 1979 (NSW).		
ESD	Ecologically Sustainable Development.		
INP	Industrial Noise Policy.		
LALC	Local Aboriginal Land Council.		



GLOSSARY OF SYMBOLS AND UNITS

°	degrees.	M	million.
°C	degrees Celsius.	m ²	square metre.
%	percentage.	m ³	cubic metre.
<	less than.	m/s	metres per second.
≤	less than or equal to.	mg	milligram (weight unit = 0.001 gram).
>	greater than.	mg/L	milligrams per litre (parts per million).
≥	greater than or equal to.	ML	megalitre.
cm	centimetre (= 10mm).	MLpa	megalitres per annum.
dB	decibel, unit used to express sound intensity.	mm	millimetre (= 0.001 metres).
dB(A)	the unit of measurement of sound pressure level heard by the human ear, expressed in "A" scale.	mm/s	millimetres per second
g	gram (= 0.001 kilogram).	PM ₁₀	particulate matter <10µm in diameter.
g/m ² /month	grams per square metre per month – unit for deposited dust.	t	tonne (= 1 000kg).
ha	hectare (100m x 100m).	tpa	tonnes per annum.
kL	kilolitre (= 1 000 litres).	V:H	vertical to horizontal ratio
km	kilometre (= 1 000 metres).	µS/cm	microsiemens per centimetre
km/hr	kilometres per hour.	µm	micrometres (= 0.001mm)
L	litre.	µg/m ³	micrograms (1 x 10 ⁻⁶ grams) per cubic metre
L/s	litres per second.		
L _{Aeq}	the L _{Aeq} is the "equal energy" average noise levels, and is used in some instances for the assessment of traffic noise effects or the risk of hearing impairment due to noise exposures.		
L _{Aeq 15 min.}	the "equal energy" average noise level over 15 minutes – used for assessing impacts of noise from motor vehicles.		
m	metre (= 100cm).		
m AHD	metres Australian Height Datum.		



Appendices

(No of pages excluding this page: 24)

Appendix 1: Application for Planning Approval

Appendix 2: Director-General's Requirements

Appendix 3: Consultation Summary

Appendix 4: Environmental Risk Assessment

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Appendix 1

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Major Projects Application to Department of Planning



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Major Projects application



NSW GOVERNMENT
Department of Planning

Date received: ____/____/____

Project Application No. _____

1. Before you lodge

This form is required to apply for the approval of the Minister to carry out a Project to which Part 3A of the *Environmental Planning and Assessment Act, 1979* (the Act) applies.

Before lodging this application, it is recommended that you first consult with the Department of Planning (the Department) concerning your Project.

Please be aware that you may need to conduct a Planning Focus Meeting before lodging this application involving the Department, relevant agencies, Council or other groups identified by the Department. If you are required to conduct a Planning Focus Meeting, you will need to provide details and outcomes arising from the meeting.

To ensure that your application is accepted as being duly made, you must

- complete ALL parts of this form, and
- submit all relevant information required by this form.

All applications must be lodged with the Director-General, by courier or mail.

Ground floor, 23-33 Bridge Street, SYDNEY NSW 2000
GPO Box 39 SYDNEY NSW 2001
DX 10181 Sydney Stock Exchange
t: 02 9228 6111
f: 02 9228 6455

2. Details of the proponent

Company/organisation/agency		ABN	
Ivanhoe Coal Pty Limited		79 064 237 154	
☐ Mr ☐ Ms ☐ Mrs ☐ Dr ☐ Other			
First name		Family name	
STREET ADDRESS			
Unit/street no.		Street name	
		Boulder Road	
Suburb or town		State	Postcode
PORTLAND		NSW	2895
POSTAL ADDRESS (or mark 'as above')			
P.O. Box 98			
Suburb or town		State	Postcode
PORTLAND		NSW	2895
Daytime telephone	Fax	Mobile	
(02) 6355 2656	(02) 6355 2720	0428 104 586	
Email			
brad.radloff@centennialcoal.com.au			



3. Identify the land you propose to develop

STREET ADDRESS

Unit/street no.

Street or property name

Castlereagh Highway

Suburb, town or locality

via Portland

Postcode

2895

Local government area

Lithgow

REAL PROPERTY DESCRIPTION

Part of Ben Bullen State Forest (No Land Title)

OR: detailed description of land attached: ☐

The real property description is found on a map of the land or on the title documents for the land. If you are unsure of the real property description, you should contact the Department of Lands.

Please ensure that you place a slash (/) to distinguish between the lot, section, DP and strata numbers. If the Major Project applies to more than one piece of land, please use a comma to distinguish between each real property description.

Where the Major Project is subject to Clause 8F of the *Environmental Planning and Assessment Regulation 2000* and in lieu of completing the above, a description or detailed plan of the land affected must be included with the documents required with Part 4 below.

4. Proposed Major Project – Description and other Requirements

Provide a brief title for your Project that includes all significant components. If the application relates to only part of a Project, include a clear title that describes the relevant part.

Ivanhoe North Rehabilitation Project – Rehabilitation of the former Cullen Main West Open Cut Coal Mine and recovery of approximately 550 000 tonnes of remnant coal by open cut methods.

Is the application related only to a part of a Project? ☐ Yes ☒ No

You are also required to provide a Project Description Report and address any matters required by the Director-General in accordance with 75E of the Act. Failure to do so may lead to your application being rejected.

Is a Project Description attached:

Hard copy:

☒ Yes ☐ No

Electronic version:

☒ Yes ☐ No

(NB: An electronic copy is required as all applications must be provided on the Department's website. You should contact the Department on the correct electronic format).

Is the Project Description Report consistent with the requirements of any Guideline produced by the Department (including any draft)? ☒ Yes ☐ No

Does the Project Description Report include additional matters required by the Director-General, such as evidence of a Planning Focus Meeting and consultation? ☒ Yes ☐ No

CONCEPT APPROVAL

If you are applying for a concept approval, the Department's *Concept Approval Guideline* should be consulted and the matters identified therein must be addressed as part of your application.

Does the Project Description Report submitted address the relevant guidelines for Concept Approvals? ☐ Yes ☐ No

FULL TIME EQUIVALENT JOBS

Please indicate the number of jobs created by the proposed Major Project. This should be expressed as a proportion of full time jobs over a full year.

Construction jobs (full-time equivalent)

6 (2 months)

Operational jobs (full-time equivalent)

12 (2 years)



5. Approvals from state agencies

Does the proposed Major Project require any of the following: (tick all appropriate)

- ☐ an aquaculture permit under section 144 of the *Fisheries Management Act 1994*
- ☐ an approval under section 15 of the *Mine Subsidence Compensation Act 1961*
- ☒ a mining lease under the *Mining Act 1992*
- ☐ a production lease under the *Petroleum (Onshore) Act 1991*
- ☒ an environment protection licence under Chapter 3 of the *Protection of the Environment Operations Act 1997* (for any of the purposes referred to in section 43 of that Act)
- ☒ a consent under section 138 of the *Roads Act 1993*

6. Application fee

You are required to pay a fee for the assessment of a Major Project. This fee is based on the estimated cost of the Major Project.

The Department requires that you pay a proportion of the total fee with this application and you should consult with the Department before lodging this application to determine the proportion to be paid.

Estimated Project Cost

\$2,000,000.00

7. Owner's Consent

As the owner(s) of the above property, I/we consent to this application being made on our behalf by the Proponent:

Signature

Name

Date

Signature

Name

Date

Note: The Department will not accept an application for a Major Project without having the signature of the owner of the land, unless the Major Project is subject to Clause 8F of the *Environmental Planning and Assessment Regulation 2000*.

8. Proponent's Signatures

As the proponent(s) of the proposed Major Project and in signing below, I/we hereby:

- provide a description of the proposed Project and address all matters required by the Director-General pursuant to Section 75E of the Act, and
- apply, subject to satisfying Clause 8D of the *Environmental Planning and Assessment Regulation 2000*, for the Director-General Environmental Assessment Requirements pursuant to Part 3A of the *Environmental Planning and Assessment Act 1979*, and
- declare that all information contained within this application is accurate at the time of signing.

Signature



Name

Richard John Tacon

Date

02 May 2006

In what capacity are you signing if you are not the proponent

GM: Western CM Operations

Name, if you are not the proponent



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Appendix 2

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Director-General's Requirements of the Department of Planning



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Director-General's Requirements**Section 75F of the *Environmental Planning and Assessment Act 1979***

Project	The proposed Ivanhoe North Rehabilitation Project, which includes: • extracting and processing about 550,000 tonnes of remnant coal from the former Cullen Main West coal mine; • transporting it to local power stations; and • rehabilitating the former mine.
Site	Ben Bullen State Forest land bounded by Lot 1 DP 860892 (North), Castlereagh Highway (East), Pt 110 DP 755769 (South), and Lots 68, 69 & 73 DP 755769 (West).
Proponent	Ivanhoe Coal Pty Limited
Date of Issue	6 January 2006
Date of Expiration	6 January 2008
General Requirements	The Environmental Assessment must: • be scientifically rigorous, and prepared in accordance with best practice; • be certified by the author; • include an executive summary; • describe all stages of the project in detail (including rehabilitation of the site); • describe the consultation that was carried out during the preparation of the Environmental Assessment, and the issues that were raised during this consultation; • include a general environmental risk analysis of the project; • assess the key assessment requirements specified below; • include a draft Statement of Commitments; and • consider the impacts of the project (as a whole), and justify why it should be approved.
Key Assessment Requirements	The Environmental Assessment must assess the following potential impacts of the project (including any potential cumulative impacts that may arise, particularly in association with the proposed expansion of the Invincible Colliery), and describe what measures would be implemented to avoid, minimise, mitigate, offset, manage and/or monitor these impacts: • Transport – refer to the <i>Guide to Traffic Generating Development and Road Design Guide</i> (Roads & Traffic Authority), or relevant Austroad standards; • Noise – refer to the <i>NSW Industrial Noise Policy and Environmental Criteria for Road Traffic Noise</i> (Department of Environment and Conservation); • Blasting – refer to the <i>Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration</i> (ANZECC); • Air – refer to <i>Approved Methods for the Modelling and Assessment of Air Pollutants in NSW</i> (Department of Environment and Conservation); • Soil & Water – include a detailed water balance, and refer to the <i>Guidelines for Fresh and Marine Water Quality</i> (ANZECC), <i>Managing Urban Stormwater: Soils & Construction</i> (Landcom), and the various <i>State Groundwater Policy</i> documents (Department of Natural Resources); • Flora & Fauna – refer to the draft <i>Guidelines for Threatened Species Assessment</i> (Department of Environment and Conservation); • Heritage – refer to the draft <i>Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation</i> (Department of Environment and Conservation); and • Visual.
Consultation	During the preparation of the EA, you must consult with the relevant local, State, and Commonwealth government authorities, service providers, community groups, and affected landowners.
Deemed Refusal Period	60 days



Appendix 3

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Consultation Summary



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CONSULTATION

In order to identify those issues requiring assessment within the Environmental Assessment, the Proponent initiated a program of consultation and literature review. This program included:

- (i) consultation with local and NSW government agencies;
- (ii) consultation with local landowners, residents and other stakeholders; and
- (iii) a review of NSW legislation and state environmental policies and guidelines.

The following sections provide a summary of the consultation and review program, identifying those issues requiring assessment within the Environmental Assessment.

Government Consultation

The following State and local government agencies were consulted by the Proponent, R.W. Corkery & Co. Pty. Limited and/or the specialist consultants prior to and/or during the preparation of the Environmental Assessment.

- Department of Planning (Sydney)*.
- Department of Natural Resources (Parramatta)*.
- Lithgow City Council (Lithgow)*.
- Department of Primary Industries (Mineral Resources) (Sydney)*.
- Department of Primary Industries (Forests NSW) (Bathurst)*.
- Department of Environment and Conservation (Environment Protection Authority), (Bathurst)*.
- Roads and Traffic Authority (Parkes).

One or more representatives of those agencies identified with an asterisk (*) attended a Planning Focus Meeting held on 20 July 2005 at the Ivanhoe Colliery, convened and co-ordinated by the DoP. The Planning Focus Meeting provided each agency with an opportunity to gain an understanding of the project and to inspect the Project Site prior to formally providing their written requirements for the Environmental Assessment. The issues raised by the various agencies during the Planning Focus Meeting are presented in **Table 3.1**.

Based on the issues raised at the Planning Focus Meeting and the written submissions of each government agency, DoP prepared and forwarded to the Proponent a list of key issues requiring assessment in the Environmental Assessment. The key issues identified by DoP are also accompanied by the various written requirements from each government agency. This list of issues, referred to as the Director-General's Requirements (DGRs), and issues recorded in correspondence from the government agencies are provided as **Appendix 2** and form the basis for the assessment of impact provided by this Environmental Assessment. This appendix also identifies where each of these issues are addressed in the Environmental Assessment.

It is noted the DGRs refer to blasting, which is not part of the proposed project.



Those issues identified with the DGRs are summarised as follows, with reference provided to the section(s) in which these are assessed.

- Management of soil and water and control of erosion and sedimentation (see Section 4.2 and 4.6).
- Management of Transport (see Section 4.10).
- Management of Noise (see Section 4.7).
- Management of Air Quality (see Section 4.8).
- Management of Flora and Fauna (see Section 4.3 and 4.4).
- Management of Heritage (see Section 4.5).
- Management of Visual Impact (see Section 4.9).

Table A3.1
Requirements of Government Agencies Attending the Planning Focus Meeting

Page 1 of 2

Issue	Requirements
Department of Planning (Sydney)	
Project Description	• Provide a detailed description of the project (some flexibility possible).
Consultation	• Conduct meaningful community consultation with the surrounding community.
Planning and Approvals	• Address SEPP 55, 33 and any others raised by other government agencies. • Define all title / lease agreements of the subject land and detail resolution of leasing issues with DPI (Forests)
Safety and Security	• Address appropriate safety and security protocols to be implemented, ie. to protect against vandalism. • Address the potential for spontaneous combustion of coal
Assessment of Alternatives	• Provide an assessment of alternative transport options.
Cumulative Impacts	• Address the cumulative impacts of the project (with respect to Invincible Colliery).
Soils	• Address the potential for acid mine drainage.
Biological Offsets	• No offset will be required.
Department of Natural Resources (Parramatta)	
Project Description	• Provide a detailed rehabilitation plan including: – methods; – outcomes; and – monitoring outcomes / performance. • Consider retaining specific areas / trees etc., - reinstatement of vegetation. • Avoid any unnecessary vegetation clearing.
Project Justification	• Address net environmental gain given description as rehabilitation project. • Justify any disturbance – existing stability is sufficient.
Specific Rehabilitation Issues	• Address rehabilitation of creek areas. • Focus on creek rehabilitation: – prefer 20m exclusion from middle drainage line; and – stabilisation of watercourses.
Erosion and Sedimentation Control	• Identify active gully erosions and identify areas to be improved.
Water Management	• Ensure separation of clean and dirty water.



Table A3.1 (Cont'd)
Requirements of Government Agencies Attending the Planning Focus Meeting

Page 2 of 2

Issue	Requirements
Council of the City of Lithgow	
Project Description	Provide details of access to the site.
Traffic and Transport	Provide a traffic management plan.
Visual Amenity	Describe the visual amenity from the road.
Noise	Provide noise mitigation measures with respect to adjoining neighbours (echoing).
Department of Primary Industries (Mineral Resources)	
Project Description	Provide an outline for a rehabilitation plan.
General	Address Mining Title issues.
	Amend Mining Operations Plan for Ivanhoe Colliery.
	Provide an extra section in the Ivanhoe Colliery AEMR with respect to the Ivanhoe North Rehabilitation Project.
Resource Definition	Provide a statement of geological reserves and resources.
Safety and Security	Ensure compliance with standard health and safety legislation.
Department of Primary Industries (Forests)	
Bushfire Management	Address bushfire management and access.
Planning and Approvals	Clarify tenure for site /and leasing arrangement.
	Provide landowner agreement.
Safety and Security	Provide detail on security of the site.
	Refer to appropriate legislation for OHS management.
Department of Environment and Conservation (EPA)	
Planning and Approvals	With respect to existing leases, clearly define the premises and interaction with other leases/licences.
Flora / Fauna	Address issues of flora / fauna associated with the project.
Aboriginal Heritage	Address issues of Aboriginal heritage associated with the project.
Air Quality	Address air quality issues associated with the project.
Noise	Address noise issues associated with the project.
Groundwater / Surface	Address water issues associated with the project.

Community Consultation

Between the 5th and 12th of December 2005, Mr Brad Radloff, Environmental Coordinator-West, and Mr Dave McLean, Mine Manager Ivanhoe Colliery, of the Proponent met with the owners or residents of ten properties within an approximate 2km radius of the Project Site. A further three owners or residents were contacted to arrange a meeting, however, no reply was received before this document was finalised. Mr Alex Irwin of R.W. Corkery & Co. met with a further two residents on 27th April 2006. The purpose of these discussions was to introduce the Proponent, inform the owner/resident about the project, explain the project assessment process and identify any issues of concern to these landowners or land users.

Table 3.2 identifies those land owners / residents consulted and presents a summary of their issues of concern and the proposed actions of the Proponent to address these.



Table A3.2
Issues Raised During Community Consultation

Address / Property Reference*	Owner / Resident / Contact	Noted Concerns / Issues
C/- Astrolabe Lithgow NSW 2790	Coalpac Pty. Ltd. - Noel Craven	Nil
C/- Astrolabe Lithgow NSW 2790	Hyrock Pty. Ltd. - Noel Craven	Nil
C/O Delta Electricity	Delta Electricity - Michelle Blakely	Increased Coal Haulage on Public Road.
Property 1	Michael Bulkeley	- Noise, dust and visual impact. - Major concern about property values.
Property 2	B. Muenzer	- No strong issues, however, interested in noise and dust impacts. - Happy there would be no blasting. - Noted local property values would probably be affected. - Some concerns over impacts on health (asthma) of daughter.
Property 3	I.G. and M. Palmer	Nil – Invitation to partake in consultation not accepted.
Property 4	V and F Fava, C. Rositano, F. Tedesco, E. Toderello	Nil – Invitation to partake in consultation not accepted.
Property 5	Stan and Dianne Taylor	No strong issues, however, were interested in noise, dust and visual impacts.
Property 6	Allan and Kerry Brown	Once informed there would be no blasting involved, indicated no strong issues.
Property 7	Jeff Taylor	- Loss of source of firewood. - Existing cracks in paddocks related to subsidence from underground mine. - Concerns over potential extension to the mine to south.
Property 8	Ray and Carol Clark	- Visual, noise and dust. - Major concern on property values based on potential continuation of mining to the south and impact on approved DA for subdivision (approx 40 by 5 acre blocks). - Concerns re extension to south.
Property 9	Geoff and Jen Clark	- Visual, noise and dust. - Major concern on property values and based on potential continuation of mining to the south and impact on house adjacent to the old open cut immediately north of Boulder Road.
Source: Ivanhoe Coal Pty Limited * See Figure 3.2 for property location		

Based on the results of the community consultation, the primary issues of concern related to noise, dust and visual related impacts, the potential increase in heavy vehicles on the roads and the possible decrease in property values caused by the proposed and possible future extension¹ of the Ivanhoe North Rehabilitation Project.

¹ At this time the Proponent does not intend on extending the proposed area of disturbance further to the south. Any proposal to undertake this would be the subject of a separate assessment by the NSW Department of Planning.



LEGISLATIVE AND STATUTORY REQUIREMENTS

Legislative Requirements

The Project Site lies within the Lithgow Local Government Area (LGA) with planning control covered by the Lithgow City Local Environmental Plan 1994.

Lithgow City Local Environmental Plan 1994

Under this LEP, the Project Site is zoned 1 (f) — Rural (Forestry). The objectives of the zone are:

- (i) *to identify land managed by the Forestry Commission under the Forestry Act 1916;*
- (ii) *to preserve existing forests within the City of Lithgow, while allowing compatible development; and*
- (iii) *to prevent pollution of water supply catchments and water quality in major water storages.*

Development for the purpose of mining is permissible within this zone with development consent.

State Environmental Planning Policies

Three State Environmental Planning Policies are relevant to the assessment of the proposed Ivanhoe North Rehabilitation Project.

State Environmental Planning Policy (Major Projects) 2005

This SEPP was gazetted on 25 May 2005 and applies to all development applications for projects satisfying nominated criteria made following this date. The aims of this Policy are:

- “(a) to identify development of economic, social or environmental significance to the State or regions of the State so as to provide a consistent and comprehensive assessment and decision making process for that development;*
- (b) to facilitate the development, redevelopment or protection of important urban, coastal and regional sites of economic, environmental or social significance to the State so as to facilitate the orderly use, development or conservation of those State significant sites for the benefit of the State;*
- (c) to facilitate service delivery outcomes for a range of public services and to provide for the development of major sites for a public purpose or redevelopment of major sites no longer appropriate or suitable for public purposes; and*
- (d) to rationalise and clarify the provisions making the Minister the consent authority for State significant development and State significant sites and to keep those provisions under review so that the consent powers are devolved to councils when the State planning objectives have been achieved.”*



As identified in Schedule 1 for Part 3A projects, the proposed project would be classified as a Group 2 development, ie. mining, petroleum production, extractive industries and related industries.

State Environmental Planning Policy No. 11 (SEPP 11) – Traffic Generating Developments

Clause 7 of SEPP 11 requires that certain development applications be referred to the NSW Roads and Traffic Authority (RTA). Mining is listed under paragraph (m), Schedule 1 of this policy, and hence this proposal must be referred to the RTA.

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

The aims and objectives of this planning instrument are:

- “(a) to amend the definitions of hazardous and offensive industries where used in environmental planning instruments;*
- (b) to render ineffective a provision of any environmental planning instrument that prohibits development for the purpose of a storage facility on the grounds that the facility is hazardous or offensive if it is not a hazardous or offensive storage establishment as defined in this Policy;*
- (c) to require development consent for hazardous or offensive development proposed to be carried out in the Western Division;*
- (d) to ensure that in determining whether a development is a hazardous or offensive industry, any measures proposed to be employed to reduce the impact of the development are taken into account;*
- (e) to ensure that in considering any application to carry out potentially hazardous or offensive development, the consent authority has sufficient information to assess whether the development is hazardous or offensive and to impose conditions to reduce or minimise any adverse impact; and*
- (f) to require the advertising of applications to carry out any such development.”*

Hazardous and offensive industries and potentially hazardous and offensive industries are defined as follows.

“Hazardous Industry - *means a development for the purposes of an industry which, when the development is in operation and when all measures proposed to reduce or minimise its impact on the locality have been employed (including, for example, measures to isolate the development from existing or likely future development on other land in the locality), would pose a significant risk in relation to the locality:*

- to human health, life or property, or*
- to the biophysical environment.”*



“Potentially Hazardous Industry - means a development which, if the development were to operate without employing any measures (including, for example, isolation from existing or likely future development on other land) to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would pose a significant risk in relation to the locality:

- to human health, life or property, or
- to the biophysical environment,

and includes a hazardous industry and a hazardous storage establishment.”

“Offensive Industry - means a development for the purposes of an industry which, when the development is in operation and when all measures proposed to reduce or minimise its impact on the locality have been employed (including, for example, measures to isolate the development from existing or likely future development on other land in the locality), would emit a polluting discharge (including, for example, noise) in a manner which would have a significant adverse impact in the locality or on the existing or likely future development on other land in the locality.”

“Potentially Offensive Industry - means a development for the purposes of an industry which, if the development were to operate without employing any measures (including, for example, isolation from existing or likely future development on other land) to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would emit a polluting discharge (including for example, noise) in a manner which 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.”

In accordance with the risk screening method contained within the document entitled *Applying SEPP 33 2nd edition*, (DUAP, 1997), all hazardous substances and dangerous goods to be held or used on the Project Site are to be identified and classified, with an assessment undertaken as to whether the proposed development represents a hazardous or offensive, or potentially hazardous or offensive, development. The hazardous substances and dangerous goods to be used / stored on the Project Site would be restricted to diesel fuel.

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

This policy aims to promote the remediation of contaminated land for the purpose of reducing the risk of harm to human health or any other aspect of the environment. Under Clause 15 of this policy, any remediation of land required for this project, notably that which might be associated with the existing stockpile of colliery reject on the Project Site, is to be considered ancillary to the development of the project and therefore considered as part of the application for project approval.



Other Legislation, Policies and Guidelines

NSW Legislation

The key reference documents include the following Acts and their respective regulations.

- *Mining Act 1992.*
- *Dangerous Goods Act 1975.*
- *Coal Mines Regulation Act 1982.*
- *Occupational Health and Safety Act 2000.*
- *Environmental Planning and Assessment Act 1979.*
- *Protection of the Environment Administration Act 1999.*
- *Protection of the Environment Operations Act 1997.*
- *National Parks and Wildlife Act 1974.*
- *Water Act 1912.*
- *Water Management Act 2000.*
- *Native Vegetation Conservation Act 1997.*
- *Rivers and Foreshores Improvement Act 1948.*
- *Roads Act 1993.*
- *Local Government Act 1993.*
- *Soil Conservation Act 1938.*
- *Threatened Species Conservation Act 1995.*

Policies and Guidelines

The following policies and guidelines issued by the Department of Primary Industries (Mineral Resources) are, or are potentially, of relevance to the development of an integrated Environmental Management System for the project.

- EDP01 Environmental Policy for Exploration and Mining.
- EDP03 Application and Approval of Mining: Environmental Policy Implementation Principles.
- EDP04 Mining Operations: Environmental Policy Implementation Principles.
- EDP05 Environmental Policy Implementation Principles: Rehabilitation and Mine Closure.
- EDG03 Guidelines to the Mining, Rehabilitation and Environmental Management Process.
- EDG04 Preparation of Mining Operations Plans.
- EDG05 Preparation of Annual Environmental Management Reports.



- EDG07 Environmental Management System: Policies and Guidelines.
- EDG08 Best Practice and Reference Documents.
- MDG1002 Environmental Management Plans and Guidelines for Annual Reporting for Coal Leases NSW.
- MDG1006 Spontaneous Combustion Management Code.
- MDG1010 Risk Management Handbook for the Mining Industry.

The following additional policies and guidelines are, or are potentially, of relevance to the development of an integrated management system for the project.

- The NSW State Rivers and Estuaries Policy (NSW Government, 1991).
- NSW EPA Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (EPA, 1998).
- NSW EPA Approved Methods and Guidance for Modelling in Assessment of Air Pollutants in NSW (EPA, 2001).
- Guidelines for Best Practice Community Consultation in the NSW Mining and Extractive Industries (NSW Minerals Council, 1999).
- Managing Urban Stormwater: Soils and Construction (Department of Housing, 2004).
- Watercourse and Riparian Zone Rehabilitation Requirements (Version 3) (Department of Natural Resources, 2003).
- NSW EPA Environmental Noise Management – NSW Industrial Noise Policy (EPA, 2000).
- Environmental Noise Control Manual (EPA, 1994).



Appendix 4

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Environmental Risk Assessment



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INTRODUCTION

Risk is the chance of something happening that will have an impact upon the objectives or the task, which was initially proposed. It is measured in terms of consequence (severity) and likelihood (probability) of the event happening.

Risk assessment is the formalised means by which hazards and associated dangers are systematically identified, assessed, and ranked according to perceived risk. Based on the perceived risk, the appropriate level of assessment would be undertaken to assess the effectiveness of proposed controls and level of residual impact.

IDENTIFICATION OF ISSUES REQUIRING AN ASSESSMENT OF RISK

Consultation undertaken with local and government stakeholders, and a review of relevant legislation and environmental policies and guidelines, identified a number of environmental issues that required assessment as part of the EA (see **Appendix 3**). **Table A4.1** presents a summary of the issues identified and the frequency with which each was identified.

Table A4.1
Issue Identification

Environmental Aspect	Frequency of Identification				Total
	Government	Community	Specialist Consultant	Legislation, Policies & Guidelines	
Air pollution (dust/odour)	1	4	1	2	8
Erosion/sediment minimisation	1		1	3	5
Surface water pollution	2		1	4	7
Groundwater pollution				1	1
Contaminated or polluted land	1			1	2
Threatened flora protection	1		1		2
Threatened fauna protection	1		1		2
Operational noise / vibration	2	6	1	2	11
Visual amenity, stray light	1	4			5
Aboriginal heritage	1		1		2
Fires and spontaneous combustion	1				1
Bushfire	1				1
Rehabilitation / Final land form	3				3
Soil	1		1	1	3
Traffic	1	1	1		3
Property Values		3			3



Based on the summary of **Table A4.1**, the identified issues are listed in decreasing order of priority (to local and government stakeholders).

- | | |
|---|------------------------------------|
| 1. Water Resources / Erosion and Sediment Control | 8. Rehabilitation / Final Landform |
| 2. Noise | 9. Property Values |
| 3. Air Pollution | 10. Aboriginal heritage |
| 4. Visual Amenity | 11. Contaminated land |
| 5. Flora and Fauna | 12. Bushfire |
| 6. Traffic | 13. Spontaneous combustion |
| 7. Soil | |

It is recognised that for some members of the surrounding community, a different priority may exist for some of these issues. All issues are, however, addressed to the level considered appropriate throughout the EA.

ASSESSMENT OF RISK

For each issue identified as requiring assessment within the EA, the possible impacts were listed and allocated a risk based on the potential consequences and likelihood of occurrence.

The allocation of a consequence rating was based on the definitions contained in the following table.

1	Catastrophic	A major event which could cause severe damage to the environment with actual or potential loss of credibility with key stakeholders, environmental liability, regulatory intervention, national publicity / complaints, or could close the operation prematurely.
2	Major	An event which could have a substantial and permanent consequence to the environment such as an environmental incident which would result in prosecution, adverse local publicity and community complaints
3	Moderate	An event which could create substantial temporary or minor permanent damage to the environment, such as a reportable incident not likely to result in prosecution, eg: a minor water discharge
4	Minor	An event which could have temporary and minor effects on the environment, such as a non-reportable environmental incident. eg: a minor oil spill
5	Insignificant	No detrimental impact on the environment is measurable or envisaged

The likelihood or probability of each impact occurring was rated according to the following definitions.

Probability
E - Rare: practically impossible
D - Unlikely: not likely to happen
C - Moderate: possible, heard of so it might happen
B - Likely to happen at some point
A - Almost certain to happen



Risks were assessed with all proposed controls outlined in the EA in place. Therefore the risk rankings derived represent the residual risk. Risk rankings were allocated for each environmental impact using the ranking method above. The risk assessment team included Brad Radloff (Centennial Coal Pty Limited), Rob Corkery and Alex Irwin (R.W. Corkery & Co). The following risk matrix was used:

Maximum Reasonable Consequence	Probability				
	A	B	C	D	E
	1	2	4	7	11
	3	5	8	12	16
	6	9	13	17	20
	10	14	18	21	23
	15	19	22	24	25
Risk Classification					

1 to 6 (Red)	High (H)
7 to 15 (Yellow)	Medium (M)
16 to 25 (Green)	Low (L)

H (high) is a Class 1 Risk requiring in-depth assessment and high level documentation of the proposed controls and mitigation measures. Ultimately, a Class 1 risk may preclude the development of the project.

M (medium) is a Class 2 Risk requiring a medium level assessment of proposed controls and residual impacts. A Class 2 risk is unlikely to preclude the development of the project but may result in impacts deemed unacceptable to local or government stakeholders.

L (Low) is a Class 3 Risk requiring a basic assessment of proposed controls and residual impacts. Any residual impacts are unlikely to have any major impact on the local environment or stakeholders.

Table A4.2 presents the identified impacts that may be associated with each environmental issue and provides an assessment of risk based on the classifications and definitions provide above. **Table A4.2** provides the basis for the risk rankings presented in **Table 4.1** of Section 4 of the EA.



Table A4.2
Risk Assessment

Environmental Issues and Possible Impacts	Water Resources - Surface Water	Consequence of Occurrence	Likelihood of Occurrence	Assessed Risk
One-off discharge of dirty water from the Project Site		3	C	13 (Medium)
Regular discharge of dirty water from the Project Site		2	D	12 (Medium)
Minor gully erosion of drainage lines		4	D	21 (Low)
Minor sheet or gully erosion of rehabilitated landform		4	D	21 (Low)
Acceleration of existing or initiation of major gully erosion of local drainage lines		3	D	17 (Low)
Flooding of active rehabilitation and coal recovery areas		3	D	17 (Low)
Major hydrocarbon spill / pollution event discharged downstream		2	D	12 (Medium)
	Water Resources - Groundwater			
Minor contamination of groundwater		3	E	20 (Low)
Major contamination of groundwater		2	E	16 (Low)
	Noise			
Increased noise resultant from operational activities	Occasional minor exceedance of noise criteria (1-2dB(A))	3	C	13 (Medium)
	Regular minor exceedance of noise criteria (1-2dB(A))	2	D	12 (Medium)
	Occasional marginal exceedance of noise criteria (3-5dB(A))	3	D	17 (Low)
	Regular marginal exceedance of noise criteria (3-5dB(A))	2	E	16 (Low)
	Occasional major exceedance of noise criteria (>5dB(A))	2	E	16 (Low)
	Regular major exceedance of noise criteria (>5dB(A))	1	E	11 (Medium)
	Occasional minor exceedance of noise criteria (1-2dB(A))	4	E	23 (Low)
	Regular minor exceedance of noise criteria (1-2dB(A))	3	E	17 (Low)
Increased noise resultant from project related traffic	Occasional marginal exceedance of noise criteria (3-5dB(A))	4	E	23 (Low)
	Regular marginal exceedance of noise criteria (3-5dB(A))	3	E	17 (Low)
	Occasional major exceedance of noise criteria (>5dB(A))	3	E	17 (Low)
	Regular major exceedance of noise criteria (>5dB(A))	2	E	16 (Low)

Table A4.2
Risk Assessment

Environmental Issues and Possible Impacts	Consequence of Occurrence	Likelihood of Occurrence	Assessed Risk
Air Quality			
Occasional dust generation	5	B	19 (Low)
Regular dust generation / elevated <PM ₁₀ levels	4	D	21 (Low)
Impacts on health of surrounding residents due to dust and elevated <PM ₁₀ levels	2	E	16 (Low)
Visual Amenity			
Temporary (<2 years) views of disturbed areas	4	A	10 (Medium)
Medium-term (>2, <5 years) views of disturbed areas	3	C	13 (Medium)
Long-term (>5 years) views of disturbed areas	2	D	12 (Medium)
Flora and Fauna			
Disturbance to native vegetation	5	A	15 (Medium)
Disturbance to native vegetation outside nominated areas	3	D	17 (Low)
Disturbance to Threatened flora / fauna	2	D	12 (Medium)
Disturbance leading to local extinction(s)	1	E	11 (Medium)
Traffic			
Alteration to road network	4	A	10 (Medium)
Minor increase in heavy vehicle volume	4	D	21 (Low)
Noticeable increase in heavy vehicles	3	D	17 (Low)
Degradation of road pavement	4	C	18 (Low)
Major impact on traffic flows and accident rates	2	D	12 (Medium)
Creation of traffic black spot as a result of project related traffic	1	E	11 (Medium)
Soil			
Temporary disturbance to soil	5	B	19 (Low)
Degradation of soil quality	3	D	17 (Low)

Table A4.2
Risk Assessment

Environmental Issues and Possible Impacts	Consequence of Occurrence	Likelihood of Occurrence	Assessed Risk
Rehabilitation			
Temporary disturbance to landform	5	A	15 (Medium)
Marginally identifiable change to landscape	5	B	19 (Low)
Highly identifiable change to landscape	3	D	17 (Low)
Permanent scar left on landscape	2	E	16 (Low)
Property Values			
Temporary decrease in property values	4	C	18 (Low)
Long term decrease in property values	2	D	12 (Medium)
Aboriginal Heritage			
Disturbance to Aboriginal site or artefact	2	E	16 (Low)
Contaminated Lands			
Minor hydrocarbon spill to disturbed land and contained within active areas of disturbance	5	C	22 (Low)
Hydrocarbon spill to undisturbed or rehabilitated land	3	D	17 (Low)
Contamination of the final landform by exiting or generated coal reject	2	E	16 (LOW)
Bushfires and Spontaneous Combustion			
Localised spontaneous combustion event	4	D	21 (Low)
Initiation of localised bushfire on the Project Site	3	D	17 (Low)
Initiation and spread of bushfire within Ben Bullen State Forest	2	D	12 (Medium)
Initiation and spread of bushfire to region	1	E	11 (Medium)