



Preliminary Environmental Assessment

Awaba Colliery Continuation of Mining

February 2010



Prepared on behalf of Centennial Coal Company Limited by:



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EXECUTIVE SUMMARY

Awaba Colliery is a small underground coal mine operated by Centennial Newstan Pty Ltd (Newstan), a wholly owned subsidiary of Centennial Coal Company Ltd (Centennial). The mine is located within the Newcastle coalfield, south of the Awaba village on the western side of Lake Macquarie, near Newcastle NSW. Awaba Colliery is a small operation with approximately 100 employees, historically producing approximately 850,000 tonnes of thermal coal annually.

This Preliminary Environmental Assessment (PEA) has been prepared by GSS Environmental (GSSE) to introduce a proposal by Centennial for *continued operations* at Awaba Colliery. An application for a Part 3A Project Approval has been lodged by Centennial for the **Awaba Colliery Continuation of Mining Project** (the "Project"), which will seek approval from the Minister for Planning to allow ongoing underground mining and associated surface operations. The Project will extend the mine life of Awaba Colliery by up to five years (until 2015) and will recover approximately 2.0 million tonnes of coal. To allow for potential productivity improvements, approval is sought for approximately 880,000 tonnes per financial year. The application for the proposed Project will be supported by an Environmental Assessment ("EA").

No significant changes to existing coal handling and annual throughput are proposed. Minimal changes are proposed to existing surface operations, with a proposed new surface disturbance relating to increased Pollution Control Dam (PCD) capacity.

Awaba Colliery is seeking a project approval from the Minister of Planning under the provisions of Part 3A of the EP&A Act to:

- Undertake bord and pillar development and pillar extraction within narrow panels by continuous miners within the proposed East B Area
- Produce approximately 880,000 tonnes of Run of Mine coal per annum (financial year)
- Expand the final pollution control dam

In addition, Awaba Colliery proposes to have its current mining and surface operations included in any Part 3A approval.

The proposed **East B Area** contains a proportion of coal that extends beyond the footprint of mining at Awaba Colliery and includes areas of both some existing workings and areas requiring new workings to be developed. This area is located to the east of the Main South Stage 2 Area and the previously mined 3 North Area. The overlying surface in the East B Area is predominantly bushland on crown land leased to Centennial and contains no significant surface infrastructure. This area forms **Study Area 3** for the Project, as illustrated on **Figures 2.1a and 2.1b**.

Mining will also be continued at Awaba Colliery in two (2) separate areas, these have been outlined below and illustrated on **Figures 2.1a and 2.1b**:

- **Remaining sections of Stage 2 of the Main South Area** (currently being mined) – this area was approved by NSW Industry and Investment (I&I) in September 2008 following a SMP application under the NSW *Mining Act, 1992*. This area forms **Study Area 2** for the Project, as illustrated on **Figures 2.1a and 2.1b**.
- **Revised Stage 3 Area** (of Main South Area) – this area has recently undergone a number of specialist surveys relating to a SMP application that was submitted in December 2009. Approval of this area is still being assessed by I&I. Along with Stage 2 of the Main South Area, this area forms **Study Area 2** for the Project, as illustrated on **Figures 2.1a and 2.1b**.

These areas will all employ a method of pillar extraction within narrow panels, developed in consultation with NSW Industry and Investment (I&I) and successfully employed within the current mining areas in recent years. The method involves bord and pillar mine development (first workings) followed by total extraction of coal pillars within narrow panels using continuous miners. Barrier pillars are left between adjacent extracted narrow panels. These narrow panels are designed around pre-determined maximum void widths to provide long term stability. The pillars to be extracted (and left as barriers) are a combination of old pillars formed many years ago and pillars developed as part of the current operation. Maximum subsidence within these areas using these methods is predicted to be less than 200 mm and generally within 90-135 mm. Notwithstanding this, as part of the conservative and risk-based approach employed at Awaba Colliery (outlined below), assessment also considers the highly unlikely (and unpredicted) worst case scenario of 'plug failure' resulting in approximately 2000 mm of subsidence.

Detailed and conservative mine planning considerations have been undertaken in the preparation of mine designs for the above mining areas to avoid potential impacts to the natural environment and man-made surface features, and have deliberately included:

- providing for pillar supports to remain in place under surface infrastructure which occurs in Revised Stage 3 Area and the remaining Stage 2 Area (no infrastructure in East B Area);
- no secondary extraction (buffer zones established) under creeks of 2nd order or higher;
- providing minimum depths of cover exceeding 20 m (first workings) and 25 m (secondary workings) to avoid potential for surface impacts such as significant cracking or sink holes;
- specialist subsidence assessment by Seedsman Geotechnics for the proposed mine designs
- A risk-based approach to subsidence impact assessment and management including specialist environmental studies for key environmental aspects as outlined below.

Awaba Colliery utilises a Risk Assessment process to identify environmental, safety and business risks to its operation with a focus on the inter-relationship between people, machinery, methods of work, the environment and the community. A Preliminary Broad-Brush Risk Assessment (BBRA) for the Project was completed in January 2010 by an appropriate risk team specifically assembled for the Project with the aim of identifying all issues to be considered under the Part 3A process. The wider BBRA for the Project is also supported by separate and specific **Subsidence Risk Assessments** undertaken for each of the three (3) mining areas, including those submitted as part of SMP applications for approval by the I&I.

Following consideration with existing control measures in place, the Preliminary BBRA for the Project identified the following **risks** in order of priority ranking for assessment and management for the Project:

HIGH

- Public and Personnel Safety* (Main South Area Stage 2 only);
- Non-Mine Owned Infrastructure* (MSA Stage 2 area only);
- Groundwater; and
- Surface Water.

SIGNIFICANT

- Socio-Economic;
- Aboriginal Cultural Heritage; and
- Community Consultation.

MODERATE

- Subsidence (with existing controls);
- Life of mine and Rehabilitation;
- European Heritage;
- Traffic and Transport;
- Noise;
- Air Quality; and
- Contaminated Land.

** Only 'raw' risk (considered with no existing controls in place) was conservatively assessed for original risk assessment for Main South Area in 2005. Controls were identified but not re-ranked, with general approach that identified controls were adequate to address risks to suitable levels. A full copy of the risk report is appended to the BBRA for the Project contained in Appendix 1 to this PEA.*

Subsequently, specific investigations and assessments will be undertaken for the Environmental Assessment being prepared for the Project, including specialist consultant reports for key environmental aspects including groundwater, surface water, ecology, Archaeology and Heritage, and mine subsidence.

With no significant changes proposed to existing operations, and with significantly conservative mine design and appropriate risk control measures and investigations in place, Centennial envisages that continued operations at Awaba Colliery can be approved within the required timeframe.

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ABBREVIATIONS

AHD	Australian Height Datum
BBRA	Broad Brush Risk Assessment
CCL	Consolidated Coal Lease
CPP	Coal Preparation Plant
DECCW	NSW Department of Environment, Climate Change and Water
DoP	NSW Department of Planning
DPI-MR	NSW Department of Primary Industries (Mineral Resources)
EA	Environmental Assessment
EAR	Environmental Assessment Requirements
ECD	Environment and Community Database
EEC	Endangered Ecological Communities
EMS	Environmental Management System
EP&A	Environmental Planning and Assessment
EPBC	Environment Protection and Biodiversity Conservation
EPL	Environment Protection Licence
GDE	Groundwater Dependant Ecosystem
GHG	Greenhouse Gas
GSSE	GSS Environmental
I&I	Industry and Investment, NSW
ILUA	Indigenous Land Use Agreement
INP	Industrial Noise Policy
KLALC	Koompahtoo Local Aboriginal Lands Council
LDP	Licensed Discharge Point
LEP	Local Environmental Plan
LGA	Local Government Area
LMCC	Lake Macquarie City Council
MPL	Mining Purposes Lease
MSA	Main South Area
NSW	New South Wales
PCD	Pollution Control Dam
PEA	Preliminary Environmental Assessment
POEO	Protection of the Environment Operations
REP	Regional Environmental Plan
ROM	Run of Mine
RTA	Roads and Traffic Authority
SEP	Stakeholder Engagement Plan
SEPP	State Environmental Planning Policy
SMP	Subsidence Management Plan

1.0 INTRODUCTION

1.1 Background

Awaba Colliery is a small underground coal mine operated by Centennial Newstan Pty Ltd (Newstan), a wholly owned subsidiary of Centennial Coal Company Ltd (Centennial). The mine entry and primary surface facilities are located approximately one kilometre south of the Awaba village and 5.5 kilometres (km) south west of Toronto on the western side of Lake Macquarie, near Newcastle NSW. Awaba Colliery has been producing coal by bord and pillar method since 1947. The locality of the mine is illustrated on **Figure 1.1**.

Awaba Colliery is a small operation with approximately 100 employees, historically producing around 850,000 tonnes of thermal coal annually. Since commencing mining operations in 1947, over 30 million tonnes of coal has been won from the Great Northern Seam using a combination of first workings development, pillar extraction, pillar quartering, and pillar stripping. Pillar extraction within the old existing workings using modern continuous mining methods is now extending the mine life, as outlined further below.

Awaba Colliery currently operates pursuant to section 109 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and clause 6B of the *State Environmental Planning Policy (Major Development) 2005*. An application for a Part 3A Project Approval has been lodged by Centennial for the **Awaba Colliery Continuation of Mining Project (the "Project")**, which seeks approval from the Minister of Planning to allow ongoing underground mining and associated surface operations. The **Project Application Area** (including focus study areas) is detailed further in **Section 2.2**, and is illustrated on **Figure 1.2**.

Minimal changes are proposed to existing surface operations, with one proposed new surface disturbance relating to increased pollution control dam capacity. **No significant changes** to coal handling and annual throughput are proposed. Underground mining areas requiring approval to allow continued mine operations and production are detailed in **Section 2.3** and **Section 4** respectively.

The Project will extend the mine life of the Awaba Colliery by up to five years (until 2015) and will recover approximately 2.0 million tonnes of coal. The application for the proposed Project will be supported by an Environmental Assessment ("EA").

A form of pillar extraction of narrow panels is used to recover coal in pillars developed previously by bord and pillar methods. This development of bords (roadways) and pillars is ongoing but in some areas were developed many years ago. This mining method currently utilises continuous miners. Mine planning ensures panels are not extracted where depth of cover or surface constraints preclude total extraction. This mining method was developed in consultation with the Department of Primary Industries – Mineral Resources (now known as Industry and Investment, NSW (I&I)) and has been utilised successfully to date as outlined below, and is proposed to be continued for the Project.

Mining has been ongoing in the Main South Area (MSA) following staged SMP approvals received from I&I in 2005 and 2008 under the *NSW Mining Act, 1992*. Existing mining operations are described in detail in **Section 3.1**. In addition, it is also noted that mining has also recently been successfully completed in the smaller 3 *North Area*, adjoining part of the eastern side of the MSA (refer **Section 3** for further details and **Figure 3.2**).

1.2 The Preliminary Environmental Assessment

This Preliminary Environmental Assessment (PEA) has been prepared by GSS Environmental (GSSE) under the provisions of Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act), and relates to the continuation of mining at the Awaba Colliery. This PEA is intended to brief the Department of Planning (DoP) on the proposed development, identify and overview the key environmental issues of the Project, and provide sufficient information to allow the Department to issue appropriately targeted Environmental Assessment Requirements (EARs). On this basis, this PEA comprises the following information:

1. A brief description of the Project Application Area and locality (**Section 2**);
2. A summary of the key activities currently undertaken at the Awaba Colliery (**Section 3**);
3. An overview of the proposed activities for the Project to be assessed and determined under Part 3A (**Section 4**);
4. The statutory provisions applying to the Project (**Section 5**);

5. A preliminary assessment of the predicted key environmental issues associated with the Project (**Section 6**);
6. The community consultation approach for the Project (**Section 7**); and
7. An indicative Project Schedule (**Section 8**).

This PEA will also be provided to relevant government agencies as part of the Project consultation activities.

1.3 The Proponent

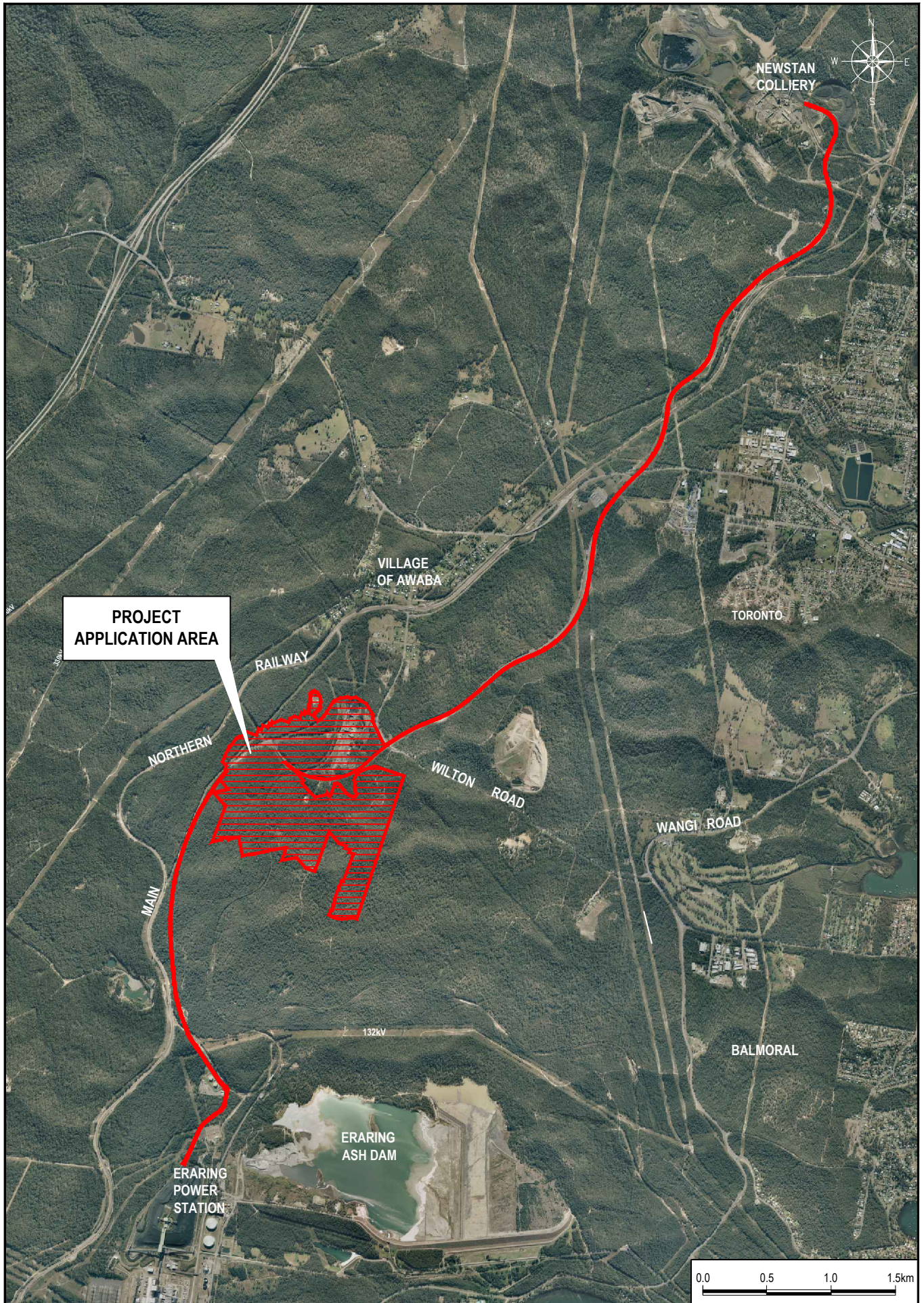
The Proponent is Centennial Newstan Pty Limited – Awaba Colliery. Centennial Newstan Pty Limited (Newstan) is a 100% subsidiary of Centennial Coal Company Limited (Centennial) which supplies thermal and semi soft coking coal to domestic and export markets, providing NSW with coal for approximately 47% of the State's coal fired electricity. Centennial is the largest independent coal company in Australia in terms of production and operates 9 coal mines in NSW, making it one of the largest underground coal producers in NSW. Approximately a third of Centennial's coal is sold to the export market and is exported through the Port of Newcastle and Port Kembla, NSW. Awaba Colliery operates as an underground coal mining operation, producing coal by continuous mining methods.

1.4 Project Approval Pathway and Indicative Timeline

Based on current Project timing, Centennial intends to lodge the draft Environmental Assessment with the Department of Planning for adequacy review in May 2010. Approval for the Project is sought by 31 July 2010 to meet current mine planning requirements and allow continued operations under (required) formal development consent. A summary of the indicative Project approval timeline is outlined in **Table 1.1** below.

Table 1.1 – Awaba Colliery Project Approval Pathway and Indicative Timeline

Action	Indicative Timeline
Submit the Major Projects Application, Preliminary Environmental Assessment, and Political Donations Disclosure Statement.	February 2010
Major Projects Application posted on DoP website (within 14 days of it being submitted)	March 2010
Planning Focus Meeting (if considered necessary)	March 2010
Receive EAR's (within 28 days of Planning Focus Meeting)	April 2010
Submit Environmental Assessment for adequacy review (21 days for Director-General refusal)	May 2010
Exhibit EA and invite public submissions (minimum 30 days)	June 2010
Submit a response to submissions	July 2010
Ministers Determination	August 2010



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Project Application Area

Figure 1.2

2.0 SITE DESCRIPTION

2.1 Site Location

The Awaba Colliery entry and primary surface facilities are located approximately one kilometre south of the Awaba village and 5.5 km south west of Toronto on Wilton Road on the western side of Lake Macquarie. The site is situated on crown land under lease to Centennial for the purpose of mining, and is adjacent to the Newstan-Eraring haul road owned by Eraring Energy. A locality plan is included as **Figure 1.1**.

Awaba Colliery is situated within the Newstan Colliery Holding, and operates within the bounds of Consolidated Coal Lease (CCL) 746 issued (as a renewal) pursuant to Section 114(1)(a) of the *Mining Act 1992*. Underground mining has been continuous in the existing Consolidated Coal Lease area since 1947.

2.2 Project Application Area

The **Project Application Area** (the “Application Area”) is introduced in **Section 1.1**, and is illustrated on **Figure 1.2**. The Application Area has been identified as the footprint of the proposed Project including proposed mining areas and related surface operations that are considered relevant to the continuation of Awaba Collieries operations, as well as, the existing workings areas that will continue to be relied upon for ventilation and other mining related purposes, access to proposed mining areas or for any required emergency evacuation.

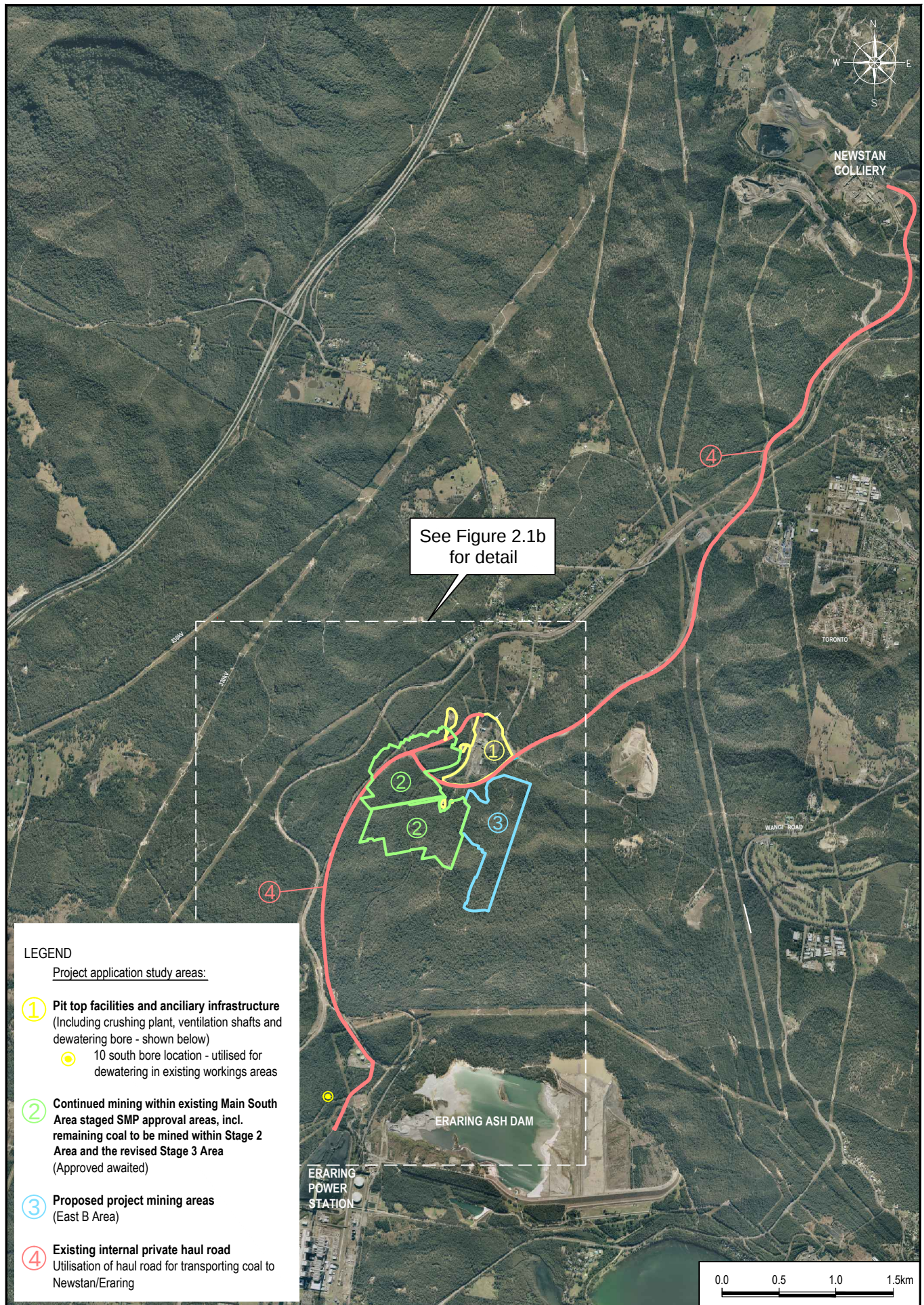
The existing operations and proposed continuation of operations have been described in **Section 3** and **Section 4**, respectively. Generally, **there are no significant changes** to the existing coal throughput or surface facilities of the mine proposed. Environmental assessments of the Project, including specialist assessments to be prepared for the EA, are discussed in **Section 6**.

Key sections of the Application Area have been broken into a number of Study Areas based on the types of activities to be undertaken for the Project. These Study Areas are outlined below in **Section 2.3**. The extent of the existing workings has not been included as a Study Area as it is considered that there will be no further environmental impacts in these areas caused by the Project.

2.3 Study Areas

The Study Areas that will be assessed as part of this EA are shown on **Figures 2.1a** and **2.1b** and include the following:

- **Study Area 1 – Surface Facilities and Ancillary Infrastructure** – This area includes the colliery pit top facilities (including office and amenities buildings, existing coal crushing plant, workshop and storage areas) ventilation shafts, an existing quarry and mine dewatering bore (10 South Bore).
- **Study Area 2 – Continued Mining within Existing Main South Area staged SMP Approval Areas (including the Remaining Coal to be Mined within Stage 2 and the Revised Stage 3)** – The impacts associated with mining in these areas have previously been assessed in Subsidence Management Plan (SMP) Applications. The Stage 2 Area application was approved by Industry and Investment in September 2008, with the SMP Application for the Revised Stage 3 Area submitted to I&I in December 2009 awaiting approval. These areas are defined by a 26.5 degree angle of draw (as per DPI-MR SMP Guidelines, 2003). The outcomes from the SMP assessment will be summarised along with any impacts that are not considered to have been adequately addressed for this EA. It is important to note that, in relation to Stage 2 Area, only the coal remaining from the 1st of August will require approval for this Project (this boundary has been indicated on **Figure 2.1b**); and
- **Study Area 3 – Proposed Project Mining Areas** - Consideration of the proposed Mining Area (East B Area) defined as the proposed workings plus 26.5 degree angle of draw (i.e. as per DPI-MR SMP Guidelines, 2003);
- **Study Area 4 – Existing Internal Private Haul Road** – This haul road will be utilised for transporting coal from the Awaba Colliery operations to Newstan Collieries existing Run of Mine Stockpile or Rail Loop for processing and subsequently transported to the Port of Newcastle or Port Kembla for shipping to export markets (to be undertaken in accordance with the Newstan development consent DA 73-11-98) and also to the Eraring Power Station.



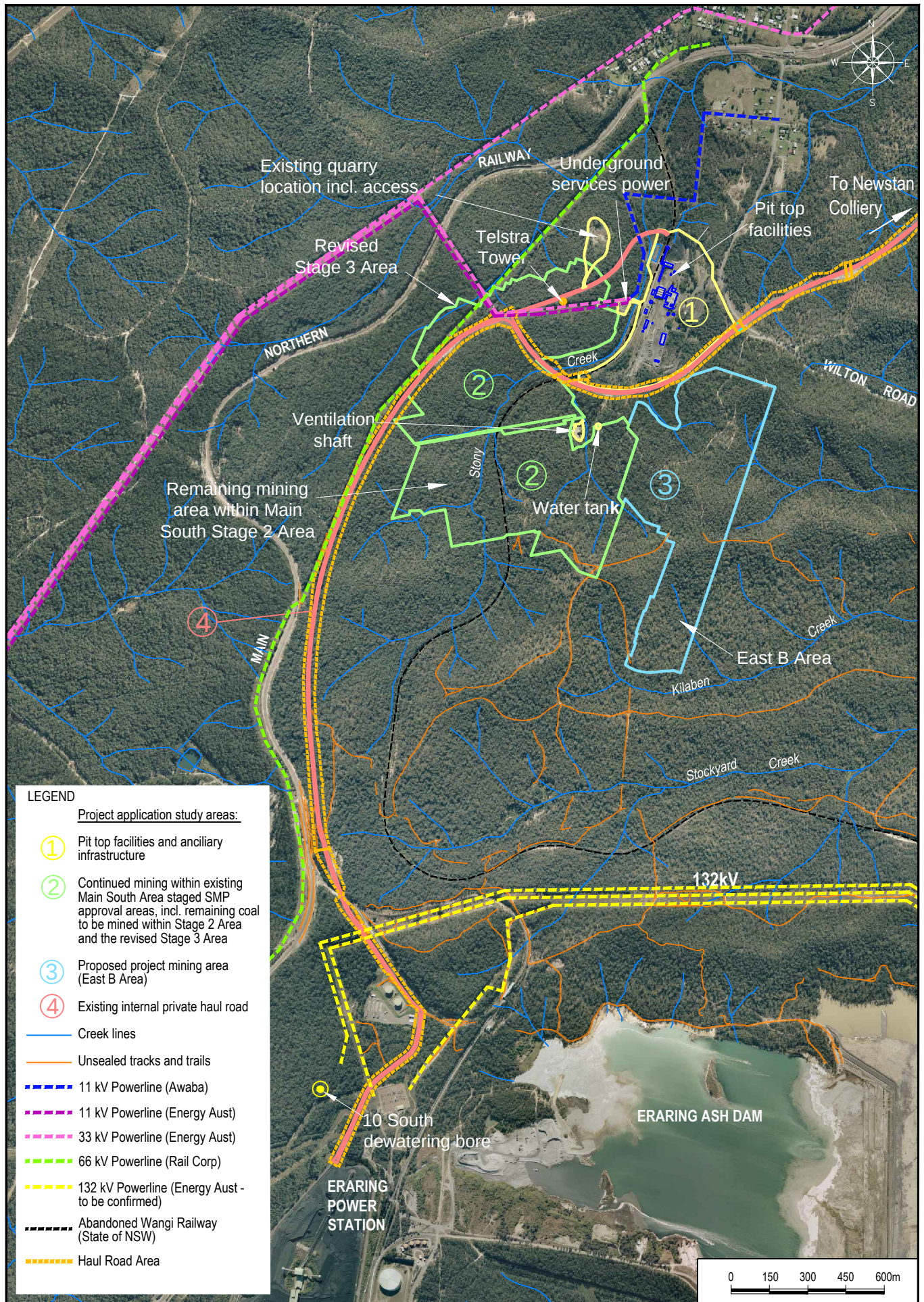
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Project Application Study Areas

Figure 2.1a



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Project Application Study Areas Detailed

Figure 2.1b

In general, potential environmental impacts associated with mine access, ventilation and other services provided through the existing workings areas to the active and proposed mining areas will also be addressed.

2.4 Land Use and Ownership

Awaba Collieries surface facilities are located in hilly forested country, on the western slopes of a north-south trending spur which is approximately 1 km south of the Awaba village. The immediate vicinity is bushland, located on Crown Land, generally extending at least 2 km in all directions from the colliery, except to the north where the Awaba village is located. The closest residence (in Olney Street, Awaba) is approximately 550 m north of Awaba Colliery.

Figure 2.2 presents the land ownership in and surrounding the Application Area, and **Figure 2.3** illustrates the existing mining leases held over the Application Area. There are no private lands or dwellings within the Application Area. The Application Area borders privately owned land (Aboriginal land owned by Koopahtoo Local Aboriginal Land Council (KLALC)) on the eastern side as illustrated on **Figure 2.2**.

Approximately 1 km east of Awaba Colliery is the Awaba Waste Disposal Site and an area of bushland used by the Westlakes Automobile Club. Approximately 1 km west of the colliery is the Main Northern Railway line.

Wilton Road, linking the Toronto-Morriset road to the Awaba village, passes approximately 150 m east of Awaba Colliery. The Newstan-Eraring private coal haul road links Awaba Colliery with Newstan to the north and Eraring Power Station to the south.

The historic land use for the Application Area and surrounds includes mining, with the area having been extensively undermined by previous mining activities. Newstan operates within close proximity to the north east of Awaba Colliery. There are also a number of surface disturbances (powerline corridors, rail lines, roads) within the Application Area.

The private Haul Road used to transport coal from Awaba Colliery is owned by Eraring Energy with whom Newstan has an agreement with for its use. The road is located on crown land used under Permissive Occupancy #16313 held by Eraring Energy. A small section of the haul road access from the Awaba Colliery stockpile area to the junction with the main haul road (T-junction) is owned by Centennial. The road is constructed on Crown Lands leased by Centennial.

The remainder of the Application Area is located on Crown Lands under lease to Awaba Colliery.

2.5 Climate

The following climatic summary has been derived from long term data collected by the Bureau of Meteorology at Norah Head Lighthouse to the south of the project area and the meteorological station operating at Newstan.

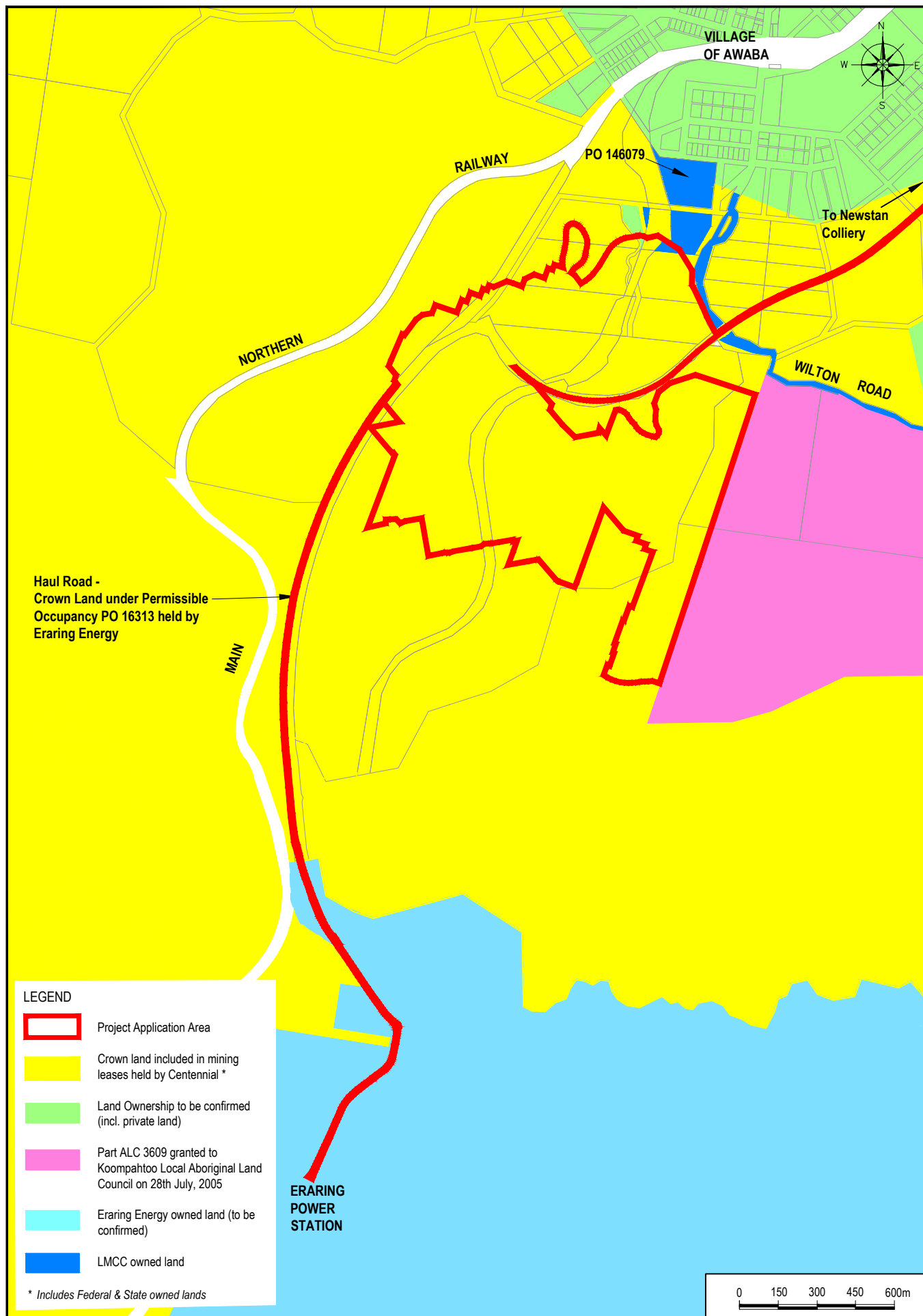
The climate of the area is warm temperate with a maritime influence. Temperature and precipitation variations are evident mainly due to the effect of local topography forcing upward movement of air (orographic effects) and its close proximity to the coast. Temperatures range from 3°C to 40°C and occasional frosts are experienced. Annual rainfall (2006 and 2007) for the project area was recorded at 573 mm and 1373 mm respectively. Higher rainfall in the area is often associated with summer periods in December through to April. Summer winds are usually from the south-south east, and there is a trend for onshore north easterly winds on the coast in the afternoon while Winter winds are predominantly from the south or south west.

2.6 Soils, Geology and Topography

The Application Area occurs on rolling low hills of the Awaba Hills soil landscape. This soil landscape is situated on predominately coarse-grained sediments of the Narrabeen Group and Newcastle Coal Measures. The soils of this landscape tend to be shallow, hard setting and stony (Murphy, 1993).

The Application Area is comprised of mainly forested undulating land ranging from 25 m to 90 m AHD in elevation. Slope gradients are generally between 10-25%. The majority of the Application Area is located within the Stony Creek catchment with a small portion of the Application Area on the eastern side flowing into either of the Kilaben Creek in the south or an unnamed creek in the north.

Awaba Colliery is located to the north of the Sydney Basin. The coal deposits within the Application Area belong to the late Permian Age Newcastle Coal Measures.

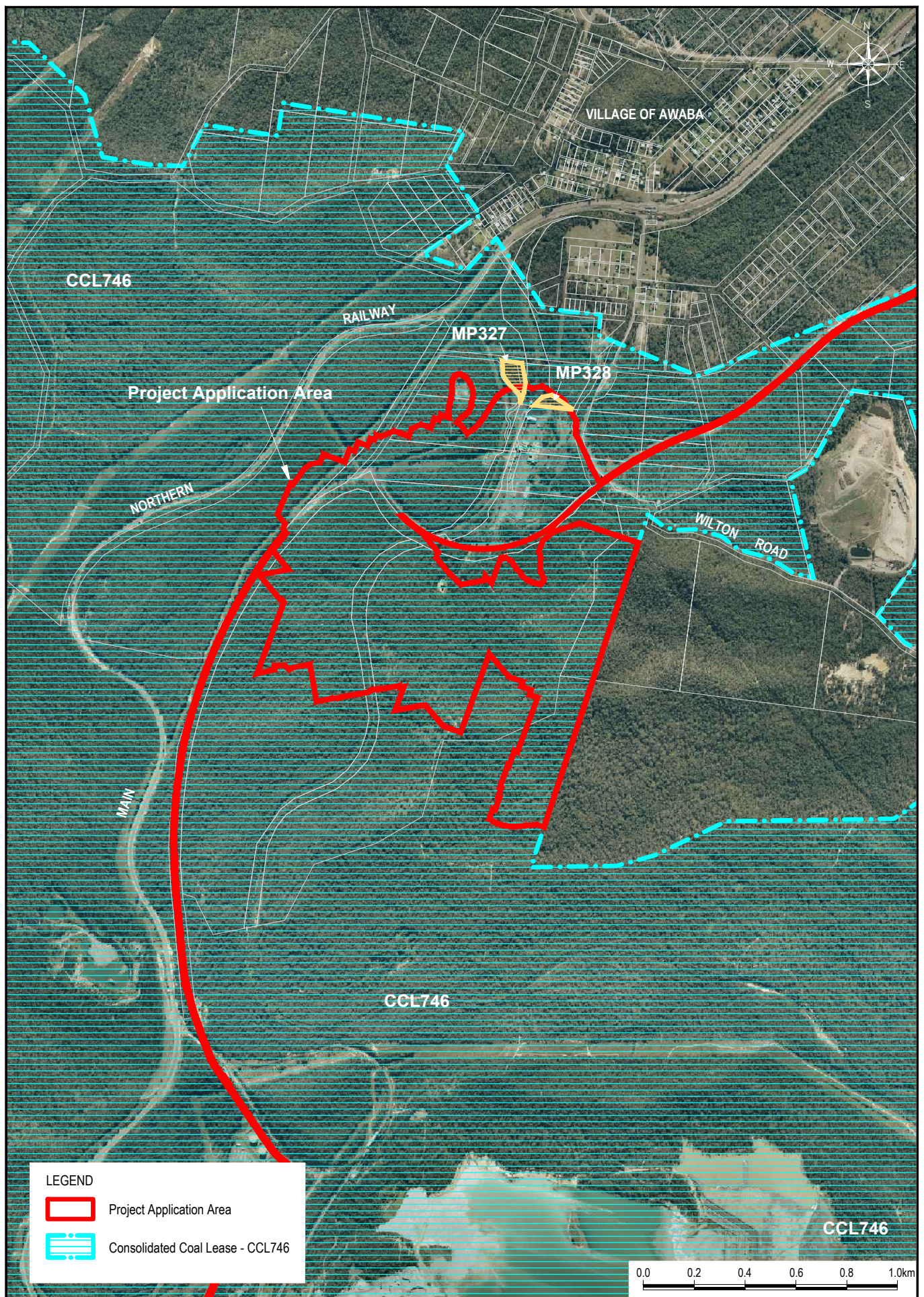


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Land Ownership
Figure 2.2



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Mining at the Awaba Colliery has been concentrated in the Great Northern Seam. The formation underlying the Great Northern seam is the Awaba Tuff. The formation overlying the Great Northern Seam is the Teralba Conglomerate. This unit immediately overlies the Great Northern Seam and continues to the surface. The Teralba Conglomerate will commonly maintain unsupported roof spans of more than 50 m for an indefinite period.

The Great Northern seam is the only coal seam currently worked at the Awaba Colliery although there are extensive resources in the Fassifern, Young Wallsend, Borehole and West Borehole Seams. Existing workings in the Great Northern Seam are quite extensive, having terminated against the major north/south zone of seam deterioration in the east, the colliery boundary in the south, and outcrop in the South East and North West. The remaining reserves that can be economically recovered by underground mining in the Great Northern Seam are located within the Application Area.

3.0 EXISTING MINE OPERATIONS

This section will provide a brief description of the existing operations currently being undertaken at Awaba Colliery and other key relevant approvals currently held relating to the operations (for example Subsidence Management Approvals from I&I).

Awaba Colliery forms part of the Newstan Colliery Holding and operates under one mining lease (Consolidated Coal Lease 746) and two mining purposes leases (MPL327 and MPL328). These mining leases provide consent for first working development while secondary extraction is undertaken subject to approvals obtained from I&I in accordance with Clause 88 of the *Coal Mines Health and Safety Regulation 2006* and Subsidence Management Plan applications. Currently all mining operations are controlled by the conditions contained within the above mentioned mining leases and the provisions of the *Coal Mine Health and Safety Act 2002* and the *Mining Act 1992*.

In general terms the Awaba Colliery operations are comprised of the following features listed within **Table 1.3**, and are further explained below in **Sections 3.1 to 3.8**.

Table 3.1 – Summary of Existing Awaba Colliery Mine Operations

Key Feature	Description of Existing Operations	Proposed Change
Mining Method	Bord and Pillar development and Pillar Extraction within narrow panels by continuous miners. This method was developed in consultation with I&I and successfully used since 2007 in the Main South Area and 3 North Area.	No change
Mining Areas	Mining is ongoing in existing/historical workings areas of the Main South Area in remaining areas of Stage 2 (SMP Approved 2008). Mining will similarly continue into the existing workings of the Revised Stage 3 Area .	Proposed East B Area includes both existing/historical workings areas and new mining areas.
Predicted Subsidence in Mining Areas	Predicted maximum subsidence is assessed to be less than 200 mm (upper limit used for assessment) although generally subsidence is within a range of 90-135mm. Maximum subsidence measured to date is 119mm. Prudently, Awaba Colliery also undertakes a very conservative risk-based approach through also considering the highly unlikely <i>worst case</i> scenario of a “plug” failure event (2000mm subsidence) in mining areas.	No significant change Key environmental aspects will be reviewed and assessed for potential impacts in each mining area within the Environmental Assessment for the Project.
Production	Approximately 850,000 tonnes per annum.	No significant change, but allowing for potential productivity improvements 880,000 tonnes
Hours of Operation	24 hours per day, 7 days per week	No change
Employment	Approximately 100 staff and contractors employed personnel	No significant change
Coal Preparation	Coal is crushed on-site at the Awaba Colliery Coal Preparation Plant (CPP). (Note: No reject material)	No change
Land Preparation	As Awaba Colliery is a well established <u>underground</u> mine with adequate support infrastructure and a well defined resource boundary there is minimal land	No change for mining areas. Minor change in surface facilities area to expand capacity of the

Key Feature	Description of Existing Operations	Proposed Change
	preparation undertaken for exploration or construction purposes.	site's Pollution Control Dam, which will be undertaken in a previously disturbed area. No other changes proposed.
Infrastructure	Infrastructure and support facilities at Awaba Colliery generally includes infrastructure for mine access and ventilation, coal handling, preparation and transport, workshop and administration, water management and pollution control.	No change
Mine Access	Access to Awaba Collieries Surface Facilities is off Wilton Road.	No change
Product Coal Transport	Coal is loaded into trucks, from the Final Product Bin or by a front end loader (when coal has been stockpiled), for transport along a private haul road to either Newstan Run of Mine stockpile or Rail Loop (export) or Eraring Power Station.	No change
Water Management	The aim of water management system is to divert clean water away from areas of potential "dirty" water, such as, coal stockpiles and some hardstand areas. Dirty water is pumped from the surface into the underground where it is filtered through goaf areas before being discharged through a number of existing licensed discharge points or the 10 South Bore into the Eraring Energy Ash Dam.	Minor change in surface facilities to expand capacity of the site's Pollution Control Dam. Assessment of the existing water management system (including underground dewatering via 10 South Bore) will be undertaken within the EA.
Rehabilitation	Rehabilitation is currently undertaken in accordance with the site's existing Life of Mine Plan (approved by I&I). Rehabilitation that occurs at Awaba Colliery generally relates to the filling of any sink holes.	No significant change. All rehabilitation will continue to be undertaken in accordance with the site's existing Life of Mine Plan Small portions of the area used for services and infrastructure are to be decommissioned and rehabilitated progressively as deemed appropriate.

3.1 Mining

Mining at Awaba Colliery has been ongoing in the Great Northern Seam since 1947. The mine in this time has extended to the limits of its boundaries and is now retreating to extract the remaining safely accessible coal. The Great Northern Seam ranges from less than 2.0 m to more than 4.0 m in thickness but generally varies between 2.5 and 3.5 m. The Great Northern seam within the Awaba Colliery is shallow, ranging from 15 to 100 m depth of cover. The seam dips generally in the westerly direction, and is generally thinner to the east.

The primary method of production in recent years has been pillar extraction within narrow panels leaving coal pillars or barriers between adjacent narrow panels. The majority of the pillars are pre-existing, having been developed many years ago.

In areas where there are large pre-existing pillars or blocks of "virgin coal", roadways are driven and supported with additional pillars (in virgin coal) formed using traditional bord and pillar mining methods. These pillars are then subsequently extracted (or left

as barriers). All coal is won using continuous miner machines. The mining sequence involves extracting between three or four rows of pillars and leaving at least one row as support. Depending on geotechnical advice, the resulting voids from this method may range between approximately 40 m and 100 m in width (key design parameter), and up to 500 m in length.

Mine planning ensures panels are not extracted where depth of cover or surface constraints preclude total extraction. This mining method was developed in consultation with I&I and has been utilised successfully to date as outlined below.

The mining method is based on the requirement to maximise resource recovery while preventing any rapid uncontrolled collapse of the overlying Teralba Conglomerate impacting on the goaf edge stability, safety for the underground miners or subsidence on the surface. The proposed layout minimises the risk of rapid collapse of the conglomerate by keeping spans in the extraction panels to less than approximately 100 m. There is a high level of confidence in this design as the Teralba Conglomerate is known to be a relatively consistent unit across the majority of the mining area. In general, void widths of up to 100 m are considered conservative and ongoing geotechnical advice is sought to confirm the void widths before extraction. Predicted maximum subsidence for the current mining method is typically assessed to be less than 200 mm (upper limit used for assessment) although generally subsidence is predicted to be within a range of 90-135 mm.

Mining has been ongoing in the Main South Area (MSA) following staged SMP approvals received from the I&I in 2005 and 2008 under the *NSW Mining Act, 1992*. Mining undertaken to date in the MSA has involved the following:

- **Stage 1** – This area is located at the southern end of the MSA and received SMP approval in 2005. This was the first area to utilise the current mining method, developed in consultation with I&I, of pillar extraction using narrow panels. Mining within Stage 1 area was completed in June 2009.
- **Stage 2** – The second stage of the MSA gained SMP approval in September 2008. Mining in this area was undertaken using the same total extraction method used successfully in Stage 1. Mining is currently being undertaken in this area and will continue for the life of the operation.

It is noted that *Stage 3* of the MSA is yet to be commenced and comprises part of the proposed Project as detailed in **Section 4**.

In addition, it is also noted that mining has recently been successfully completed in the smaller **3 North Area**, (adjoining part of the eastern side of the MSA) using the previously described pillar extraction mining method. The 3 North Area received SMP approval in March 2009 and mining was completed in January 2010.

The operating hours at Awaba Colliery are 24 hours 7 days per week.

The current operational structure includes two (2) production panels working up to three (3) unit shifts per day each.

3.2 Coal Handling, Preparation and Stockpiles

Mined coal is transferred to the surface by a number of conveyors and through the Run of Mine (ROM) Bin before arriving at the Coal Preparation Plant (CPP) located at the Awaba Colliery pit top area. The CPP is comprised of three screens that coal is initially passed through before entering the primary and one of the two secondary crushers. The final product size is adjusted to suit market demands and is generally less than 100 mm. This material is then delivered to the Final Product Bin by conveyor. From the Final Product Bin coal can be loaded into trucks for transport off-site, or, stockpiled in an adjacent area.

Awaba Colliery has the capacity to stockpile up to 30,000 tonnes of ROM coal.

3.2.1 Coal Handling of Materials Delivered from Awaba Colliery to Newstan

Coal from Awaba Colliery is delivered by truck to Newstan and is received at the existing 80,000 tonne capacity Newstan Run of Mine (ROM) coal stockpile. From this ROM stockpile the coal is reclaimed into the washery through reclaim tunnels. From the point of reclaim, the coal handling and processing is the same as that used for Newstan coal as approved and described in the Newstan Colliery Life Extension Project EIS (Newstan EIS) (Umwelt, 1998). The amount of coal received by Newstan will not exceed the approved rate of coal into the washery under the existing Newstan consent (i.e. 4 million tonnes per annum).

Coal from Awaba Colliery may be washed at Newstan in accordance with the process described in the Newstan EIS. The washed product is then stored on the rail loop pad for export. This coal handling process and all storage volume limits are consistent with the Newstan consent.

3.2.2 Coal Handling of Materials Delivered from Awaba Colliery to Eraring

Coal is also transported from Awaba Colliery to Eraring at varying rates, depending on market demands. This coal is delivered by trucks via the private haul road and placed within the Eraring approved coal storage area.

3.3 Land Preparation

Mine infrastructure will be limited to the items included in **Section 3.4** and any other existing facilities utilised at Awaba Colliery. Any construction conducted at Awaba Colliery is related to necessary maintenance of existing plant and infrastructure.

3.4 Mine Support Facilities and Site Access

Awaba Colliery is a well established mine operating since 1947. Centennial purchased the operation from Powercoal in 2002 and has been operating the mine since this time.

All existing surface and underground infrastructure at Awaba Colliery, including previous surrounding workings (for ongoing ventilation and access), will continue to be relied upon. Existing mine infrastructure and surface facilities are illustrated on **Figure 3.1**.

Surface infrastructure at Awaba Colliery comprises:

- Mine Access & Associated Infrastructure
- Coal Handling, Preparation & Transport Infrastructure
- Workshop, Services and Administration Infrastructure
- Water Management Infrastructure
- Pollution Control Infrastructure
- Other Miscellaneous Infrastructure (site security etc)
- Non-mine Owned Infrastructure

These items are each outlined further in the following sections below.

3.4.1 Mine Access and Associated Infrastructure

- Former Men and Materials Drift (1947) – ventilation only
- Tunnel Conveyor Drift (1947) & associated 800 tonne in-seam bin
- Men and Materials Drift (1987)
- Overland Conveyor Drift (1987)
- Up-cast ventilation shaft and apparatuses
- Downcast Shaft

3.4.2 Coal Handling, Preparation and Transport Infrastructure

- Coal handling facilities for breaking, crushing, sizing and storing product.
- Surface covered conveyor systems.
- Private haul road connecting to Newstan and Eraring Power Station (Eraring Energy Haul Road). The haul road is of bitumen construction and has previously been undermined by total extraction

3.4.3 Workshop, Services and Administration Infrastructure

- Workshop facilities.
- Workshop annex wash down facilities
- Enclosed and bulk open material and equipment stores facilities

- Administration and bathroom facilities
- Air compressors
- Electrical substation, powerlines and associated equipment
- Quarry used to win material for rehabilitation of subsidence cracks, construction, road works and track maintenance;
- Access roads and car-parking facilities
- Surface storage areas – open hard stand
- High tension electrical switchyard.
- Fire station and integrated fire equipment

3.4.4 Water Management Infrastructure

- Grey water facility (LDP008)
- Barnes Dam Pump Station (LDP005)
- 6 additional licensed discharge points (pump stations).
- 3 x 200,000L emergency water storage tanks
- 10 South Pump Station
- Incoming water supply from Toronto
- Sewerage facility

3.4.5 Pollution Control Infrastructure

- Pollution Control Dam (PCD) to manage 'dirty' water (mine water) within Pit Top Facilities. It is noted that this is earmarked for capacity increase under the proposed Project.
- Hard stand area reporting to an oil/water separator & associated oil collection systems.
- Coal Handling Plant drive in sumps and retention area
- Dust suppression system for CPP trucking
- Continuous telemetry equipment which monitors the water levels of the Pollution Control Dam

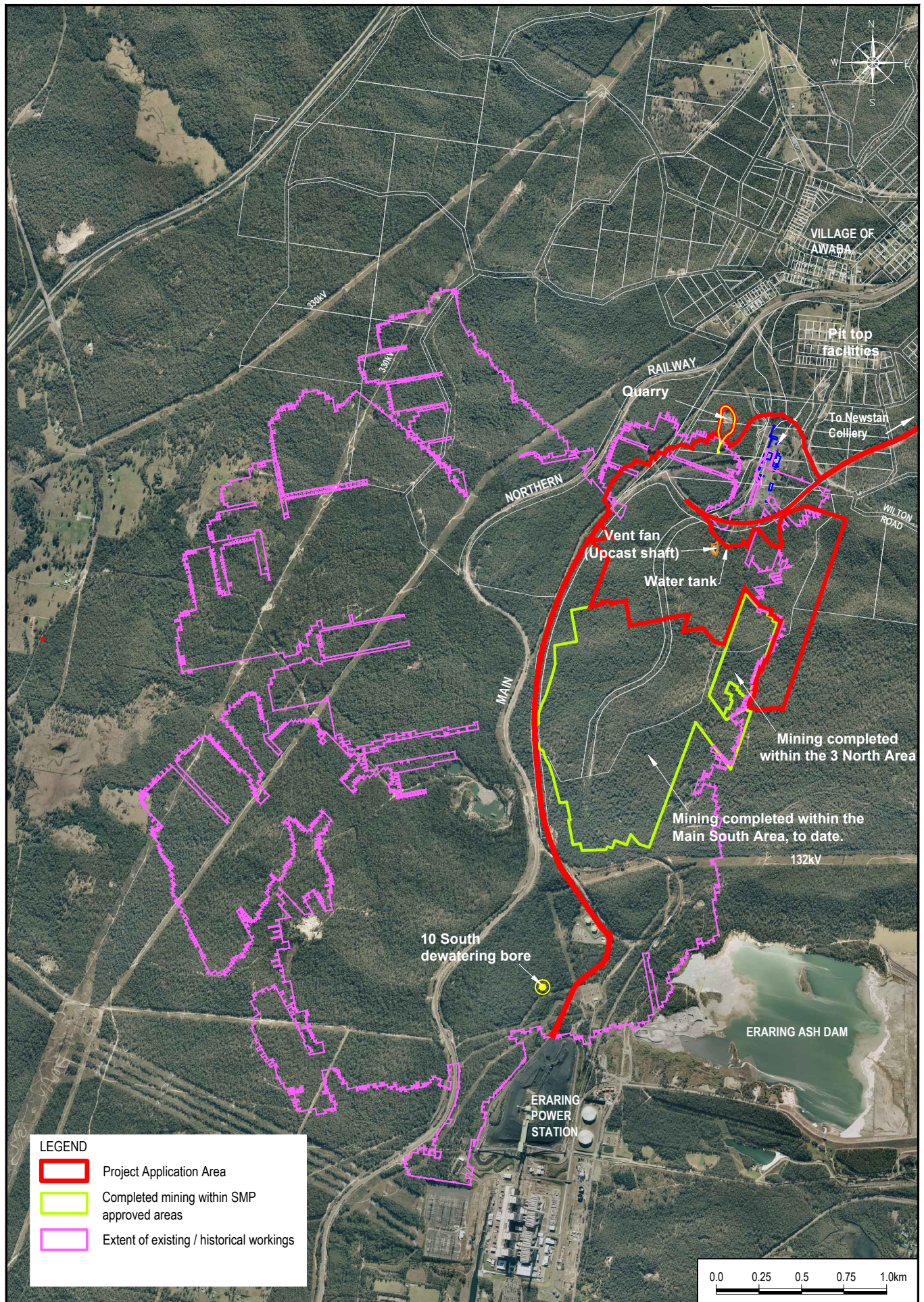
3.4.6 Other Infrastructure

The pit top area is fenced with a chain mesh and barbed wire security fencing. Colliery gates are closed and locked where appropriate.

3.4.7 Non-mine Owned Infrastructure

There are a number of non-mine owned infrastructure within and surrounding the Application Area. These are concentrated in the Main South Stage 2 Area and Revised Stage 3 Area. None of these occur within East B Area (part of Study Area 3). These include (but are not limited to), the following:

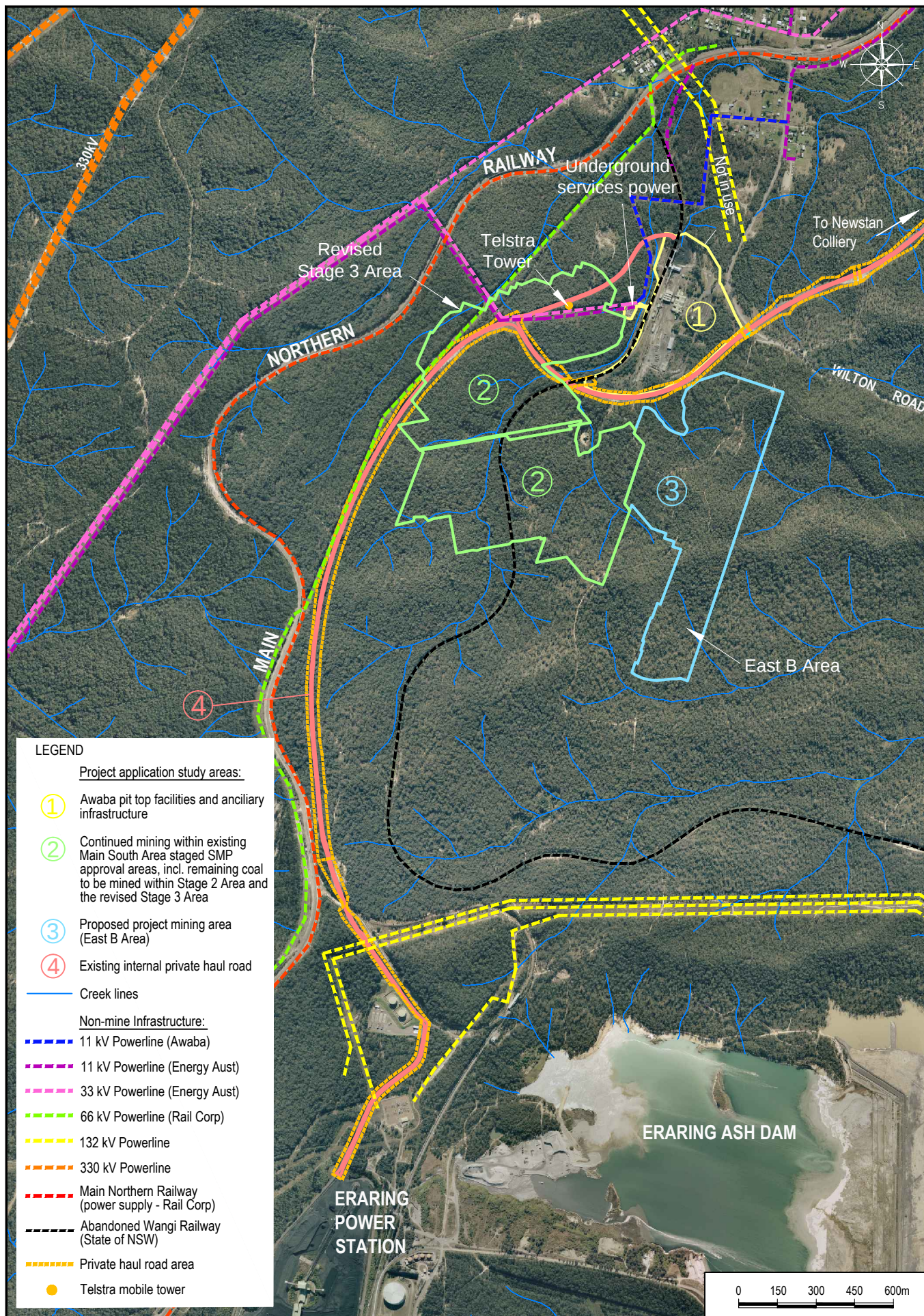
- Telstra telecommunications tower (within Revised Stage 3 Area);
- Underground services power;
- Powerlines (including 11kV, 33kV and 66kV power supplies);
- Abandoned Wangi Railway (crosses Main South Stage 2 Area and Revised Stage 3 Area);
- Main Northern Railway (outside Project Application Area to the west); and
- Awaba Waste Disposal Site (outside Project Application Area to northeast).



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Existing Mine Infrastructure and Surface Facilities

Figure 3.1



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Non-mine Infrastructure
Figure 3.2

The location of these infrastructure items in relation to the Application Area is shown on **Figure 3.2**. It is noted that consultation has been undertaken with each of the infrastructure owners during preparation of the relevant SMP applications for the Revised Stage 3 Area and the remaining Main South Stage 2 Area. As there are **no infrastructure items within the East B Area**, it has been considered appropriate that no further consultation in relation to subsidence impacts upon non-mine owned infrastructure will be required for the EA.

3.4.8 Site Access

Access to Awaba Collieries surface facilities is off a local council road, Wilton Road. Site access has been successfully operating without major incident since 1947.

It should be noted that a basic preliminary traffic investigation including consultation with Lake Macquarie City Council will be undertaken to demonstrate that the continued use of the site access is appropriate.

3.5 Plant and Equipment

Awaba Colliery utilises two continuous miners for coal extraction and a range of other ancillary equipment both in the underground workings and during operations at the Surface Facilities. Equipment is outlined in **Table 3.2**.

Table 3.2 – Existing Plant and Equipment Details

Activity	Equipment Details	Quantity
Coal Mining	• Joy 12CM12 Continuous Miner (Engart dust scrubbing system)	1
	• Eimco 25M3 continuous miner	1
	• Joy 15SC shuttle car	6
	• Stamler Feeder breaker	1
	• Klockner Becorit Feeder Breaker	1
	• Hexham breaker feeder	1
	• VA Breaker line Supports (BLS)	4
	• Fletcher Mobile Roof Supports (MRS)	2
	• ARO twin boom 1400 Series rotary percussive bolter	1
	• Joy / Cram single mast rotary percussive bolter	4
Coal Processing	• Screen (350 tonnes/hr)	3
	• Primary sizer (1200 tonnes/hr)	1
	• Secondary sizer (350 tonnes/hr)	2
	• Conveyor belt (ranging from 37KW to 150KW)	5
	• 800t run of mine bin (660 tone /hr)	1
Ancillary Equipment	• Eimco 913 LHD (Underground)	5
	• Noyes MPV Mkl	1
	• MineCat skid steer loader (ug)	1
	• Surface Fork Lift 10 tonne	1
	• 4WD vehicles for inspection etc.	1

Activity	Equipment Details	Quantity
	Underground man transport vehicles (PJB / SMV)	4
Coal Loading	front end loader (utilised during occasions where coal is stockpiled)	1
	500t final product bin (1000t/hr)	1
Product Coal Haulage	Road Trains (88t Gross – 58t Net)	5

3.6 Transportation

Crushed and screened coal is transported to the Newstan Coal Preparation Plant (CPP) (around 8 km north of Awaba Colliery) via the privately owned Newstan-Eraring Haul Road under existing agreements with the road owner (Eraring Energy). Once the coal reaches the Newstan facilities (refer **Section 3.2.1** above) at the CPP, it is washed, stockpiled and railed to the Port of Newcastle or Port Kembla. The private haul road is shown as **Study Area 4** on **Figures 2.1a** and **2.1b**.

Coal is also transported south on the private haul road to Eraring Power Station's facilities (refer **Section 3.2.2** above) for use by the power station under agreements between Centennial and Eraring Energy.

Typically during a financial year all ROM coal is transported off site to these two customers. The proportion sent to each depends on market demand at the time. It is possible that 100% of production in a year may be sent to either Newstan or Eraring.

3.7 Water Management

The Awaba Colliery pit top is located adjacent to Stony Creek. The aim of Awaba Collieries Draft Water Management Plan is to ensure that clean water is diverted away from potential contamination areas and discharged directly into Stony Creek downstream of disturbed areas.

The pit top area surface water management is separated into two water streams:

- "clean water" is the water that has not passed over areas likely to contain coal fines and/or hydrocarbons; and
- "dirty water" is all water likely to have passed over parts of the site that contain fines and/or hydrocarbons.

The surface water defined as "clean" is diverted around the "dirty areas" using a series of stormwater drains under the pit top area and is directed to the adjacent watercourse (Stony Creek). This is in accordance with the Awaba Colliery Environmental Management System (EMS) and the Draft Water Management Plan which provides the framework to reduce the risk of downstream contamination and to achieve compliance with EPL 443.

Clean water is diverted from buildings including the main administration building, bathhouse, workshop complex and hard stand areas via a network of downpipes, dish drains and underground storm water pipes directly into Stony Creek. This minimises the potential for contamination and maximises the effectiveness of the water pollution control system in the event of excessive rainfall.

Contaminated runoff ('dirty' mine water) is retained within the Pollution Control System and pumped to underground workings for residence time and filtration through goaf areas before being discharged through a number of existing licensed discharge points or the 10 South Bore into the Eraring Energy Ash Dam.

Awaba Colliery utilises a Pollution Control Dam (PCD) on site for the management of the dirty water system. The PCD comprises of water that is initially directed to an oil separator (i.e. runoff from areas likely to contain hydrocarbons exposed to rainfall or runoff from the vehicle wash down area), as well as, water from areas that potentially contain coal fines (i.e. near the bin loading facility, Coal Handling Plant (CHP) and/or temporary coal stockpile area). Water can be discharged from the PCD into the underground workings or be released through a Licensed Discharge Point (LDP009) in accordance with strict discharge water quality criteria.

During normal dry weather conditions, the PCD is kept to minimum level so as to maximise the available retention volume during a storm event. There are two pumps located in the dam that are triggered using automatic levels. In these events water is then pumped underground to prevent an uncontrolled discharge from LDP009.

Currently, if the water level exceeds the capacity of the pumps within the PCD, then the dam fills up and discharges via the spillway (LDP009) into Stony Creek (during these times of discharge a sample must be taken, where it will be analysed to ensure the discharge is within EPL 443 conditions).

Water that has been pumped to the underground workings migrates with the water filtering through the existing workings area to the southern area of the mine. From here the water is allowed to settle out prior to being pumped to the surface via a borehole (10 South). This water is then pumped to the Eraring ash dam surface settling ponds. An additional bore pump station (LDP005) is currently operational on a limited basis.

Awaba Colliery also has a number of Licensed Discharge Points (LDPs) that have been rehabilitated (LDP001, LDP002, LDP003 and LDP006 at the southern end of the Hussey Quarry) and are no longer in use. LDP004 and LDP007 have also been rehabilitated - however the bores are still in place and are currently used to monitor water levels.

3.8 Rehabilitation and Final Landuse

Rehabilitation of the site is undertaken in accordance with the *Life of Mine Plan* for Awaba Colliery approved by I&I in June, 2009. As mentioned above, recent rehabilitation at Awaba Colliery has involved the decommissioning of pump stations (LDP001, LDP002, LDP003 and LDP006) and repairs to sink holes in the western areas of the Awaba Colliery mining lease. Disturbed areas are rehabilitated using a cover crop and a local native seed mix to minimise the potential for erosion and to re-establish native vegetation in the area.

4.0 PROJECT DESCRIPTION

Awaba Colliery is seeking a project approval from the Minister of Planning under the provisions of Part 3A of the EP&A Act to:

- Undertake bord and pillar development and pillar extraction within narrow panels by continuous miners within the East B Area
- Produce approximately 880,000 tonnes of Run of Mine coal per annum (financial year)
- Expand the final pollution control dam

In addition, Awaba Colliery proposes to have its current mining and surface operations included in any Part 3A approval.

Current mining operations in the remaining areas of the Main South Stage 2 Area and Revised Stage 3 Area (outlined below) will be continued and involves extraction within previous mined bord and pillar workings. All supporting infrastructure and workings will continue to be relied upon for the life of the Project (no significant change).

The Application Area for the Project has been described in **Section 2.2** and is illustrated on **Figure 1.2**.

4.1 Mining

There will be no significant changes to mining methods explained in **Section 3.1** for the Project. This includes predicted subsidence levels, operational structure and production rates.

The proposed East B Area contains a proportion of coal that extends beyond the footprint of mining at Awaba Colliery and includes areas of both some existing workings and areas requiring new workings to be developed. This area is located to the east of the Main South Stage 2 Area and the previously mined 3 North Area. This area will be accessed from the main headings of the Main South Area. The overlying surface in the East B Area is predominantly bushland on crown land leased to Centennial and contains no significant surface infrastructure. This area forms **Study Area 3** for the Project, as illustrated on **Figures 2.1a** and **2.1b**.

Mining will also be continued at Awaba Colliery in two (2) separate areas, these have been outlined below and illustrated on **Figures 2.1a** and **2.1b**:

- **Remaining sections of Stage 2 of the Main South Area** (currently being mined) – this area was approved by I&I in September 2008 following a SMP application under the NSW *Mining Act, 1992*. This area forms **Study Area 2** for the Project, as illustrated on **Figures 2.1a** and **2.1b**.
- **Revised Stage 3 Area** (of Main South Area) – this area has recently undergone a number of specialist surveys relating to a SMP application that was submitted in December 2009. Approval of this area is still being assessed by I&I. Access to this area will be gained from the northern end of the Main South Stage 2 Area. This access route has previously been incorporated within the Main South Area – Stage 2 SMP approval. Along with Stage 2 of the Main South Area, this area forms **Study Area 2** for the Project, as illustrated on **Figures 2.1a** and **2.1b**.

It is expected the Project will take up to 5 years to complete. At cessation of operations Awaba Colliery will be placed on care and maintenance in accordance with the approved Life of Mine Plan (I&I NSW, 2009).

Annual production of approximately 880,000 tonnes per financial year is required.

Existing mining areas, as detailed in **Section 3.1** and illustrated on **Figure 3.1**, will continue to be utilised for ongoing mining operations including (but not limited to) mine access, emergency management and underground services and infrastructure.

4.2 Coal Handling, Preparation and Stockpiles

No changes are proposed to the current coal handling, preparation or stockpile procedures to the existing operations are detailed in **Section 3.2**.

4.3 Mine Support Facilities and Site Access

No changes are proposed to the current infrastructure and facilities described in **Section 3.4**, excluding the expansion of the Pollution Control Dam explained further below in **Section 4.7**, with related water management considerations detailed in **Section 6**.

Mine access from Wilton Road will continue to be utilised and no significant change is anticipated from current use.

4.4 Plant and Equipment

No changes are proposed to the current equipment fleet described in **Section 3.5**.

4.5 Transport

No changes are proposed to the current transport procedures. The Project will continue to use the Newstan-Eraring private haul road to transport coal from the operations to Newstan and Eraring as described in **Section 3.6**. The private haul road is shown as **Study Area 4** on **Figures 2.1a** and **2.1b**.

4.6 Water Management

The Project will involve the expansion of the existing Pollution Control Dam (PCD), such that the dam will have a capacity to store a 1 in 10 year Annual Recurrence Interval 24 hour storm. This expansion will improve the Water Management for Awaba Colliery by increasing the site's dirty water storage capacity. Further assessment regarding the PCD will be included in the Surface Water Assessment for the EA to be prepared by specialist consultants.

The 10 South Bore described in **Section 3.7** will continue to be used for groundwater management and underground dewatering under both operational and care and maintenance conditions. Further discussion regarding the 10 South Bore will be included in the Groundwater Assessment for the EA.

As part of the proposed Project, it is intended to increase the size of the PCD to improve site water treatment for the dirty water. Construction of the enlarged PCD will occur on an area of the site that has previously been disturbed

The proposed coal extraction rate will be the same as that currently at site and no increase in potable water demand rate is expected.

The domestic wastewater generation rate from the Pit Top facilities will be similar to that which currently exists as there is no plan for a change in staff numbers. Disposal of the domestic wastewater will remain as currently exists at site.

4.7 Rehabilitation and Final Landform

Rehabilitation will continue to be undertaken in accordance with the approved Life of Mine Plan described in **Section 3.8**. During the life of the Project it is proposed that small portions of the 17 ha used for services and infrastructure are to be decommissioned and rehabilitated progressively as deemed appropriate.

Following the completion of mining within the proposed areas for the Project, Awaba Colliery will be placed into care and maintenance until a final life of mine strategy can be developed in consultation with relevant stakeholders (including government and community).

4.8 Project Life

The Project is expected to extend the life of the mine by up to 5 years, depending on mining conditions and market drivers, until 2015. From this time Awaba Colliery will be placed in care and maintenance in accordance with the *Life of Mine Plan* conditionally approved by I&I in 2009, until such time that a final Detailed Life of Mine Strategy has been developed as described above.

5.0 PLANNING CONSIDERATIONS

The Project will be subject to the legislative requirements of the Commonwealth and State, as well as local planning and environmental frameworks where applicable. This section describes the approval pathway for the Project, as well as discussing the Project in the context of these legislative requirements.

5.1 Commonwealth Legislation

5.1.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) commenced on 16 July 2000 and is administered by the Commonwealth Department of the Environment, Water, Heritage and the Arts.

Part 3 of the EPBC Act states that an action which “has, will have or is likely to have a significant impact on a matter of National Environmental Significance” may not be undertaken without prior approval of the Commonwealth Minister for Environment, Heritage and the Arts (the Minister).

In January 2007 the Commonwealth and NSW governments signed a Bilateral Agreement which allows the assessment regimes under Part 3A, Part 4 and Part 5 of the EP&A Act to be automatically accredited under the EPBC Act. The Bilateral Agreement applies only to proposals that the Minister has determined are controlled actions under the EPBC Act, with the exception of nuclear actions (DoP 2007).

The preliminary flora and fauna investigations carried out for the Project to date have determined that there are threatened species and EEC's listed in the EPBC Act within the Application Area. Therefore, Centennial will provide a referral to the Minister under the EPBC Act for determination. Further information on flora and fauna is provided in **Section 6.4.1**.

5.2 NSW State Legislation

5.2.1 Environmental Planning and Assessment Act 1979

Awaba Colliery currently operates the mine pursuant to Section 109 of the Environmental Planning and Assessment Act 1979 (EP&A Act) and Clause 6B of the State Environmental Planning Policy (Major Development) 2005.

Part 3A of the EP&A Act provides an approval process for projects deemed to be Major Projects.

Section 75B(1) of the EP&A Act defines projects to which Part 3A applies:

This Part applies to the carrying out of development that is declared under this section to be a project to which this Part applies:

- (a) *by a State environmental planning policy, or*
- (b) *by order of the Minister published in the Gazette (including by an order that amends such a policy). ...*

Schedule 1 of the State Environmental Planning Policy (SEPP) (Major Development) 2005, also referred to as the Major Development SEPP, describes development that is declared to be a project to which Part 3A of the EP&A Act applies. The Project was considered to be a project to which Part 3A of the EP&A Act applies under Schedule 1, Group 2 (*Mining, petroleum production, extractive industries and related industries*) clause 5, subclause (1)(a) of the Major Development SEPP:

- 5 *Mining*
 - (1) *Development for the purpose of mining that:*
 - (a) *is coal ... mining, ...*

Centennial Newstan considers it reasonable for the Minister for Planning to determine the Part 3A approval.

5.2.2 Other NSW legislation

Mining Act 1992

Centennial currently holds ML's CCL 746 over the majority of the Application Area (excluding the private haul road), as illustrated in **Figure 3.1**. An SMP Application for the Revised Stage 3 Area was submitted to I&I in December 2009. An SMP for Stage 2 of the Main South Area was approved in 2005 and updated in 2008 by I&I for the current mining method.

Protection of the Environment Operations Act 1997 (POEO Act)

The POEO Act is administered by the Department of Environment, Climate Change and Water (DECCW) and requires licensing for environmental protection, including waste generation and disposal, water, air, and noise pollution. Awaba Colliery currently operates under current Environment Protection Licence 443 (**EPL443**) and would continue to do so for the life of the Project. A variation to EPL443 may be sought for inclusion of any relevant changes under the project.

Water Management Act 2000 and Water Act 1912

The *Water Act 1912* and *Water Management Act 2000* contain provisions for the licensing of water capture and use. It is understood that a formal Water Sharing Plan recognised under the *Water Management Act 2000* is not currently in place for the area of the Project. Subsequently, the *Water Act 1912* is relevant to the Project with respect to potential licencing requirements.

The Project may require approvals and/or water licences under the *Water Act 1912*, administered by NSW Office of Water, for groundwater and surface water extraction, where applicable. These would be obtained, as required, in accordance with the prescriptions of the Act.

National Parks and Wildlife Act 1994

Under section 75U(1)(d) of the EP&A Act, administered by Department of Environment, Climate Change and Water (**DECCW**), a permit under section 87 or consent under section 90 of the NP&W Act is not required for a project approved under Part 3A of the EP&A Act.

Heritage Act 1977

Under section 75U(1)(c) of the EP&A Act, administered by DoP, an approval under Part 4, or an excavation permit under section 139, of the *Heritage Act 1977* is not required for a project approved under Part 3A of the EP&A Act. In addition, section 75U(2) of the EP&A Act, Division 8 of Part 6 of the *Heritage Act 1977* does not apply to prevent or interfere with carrying out of an approved Project.

Threatened Species Conservation Act 1995

The Environmental Assessment will identify any threatened species in the Application Area, as well as strategies for the management and mitigation of impacts. Preliminary results of the ecological assessment are discussed further in **Section 6.4.1**.

5.2.3 State Environmental Planning Policies

The following State Environmental Planning Policies (SEPP's) were considered regarding the Project.

SEPP (Major Development) 2005

SEPP (Major Development) 2005 defines certain developments that are major projects requiring assessment under Part 3A of the EP&A Act and determination by the Minister for Planning. It was formerly known as the SEPP (Major Projects) 2005. Schedule 1 of the SEPP identifies development for the purposes of coal mining as a project to which Part 3A applies.

SEPP (Mining, Petroleum Production and Extractive Industries) 2007

This SEPP aims to provide for the proper management and development of mineral, petroleum and extractive material resources for the social and economic welfare of the State. Clause 5 of the SEPP addresses its relationship with other environmental planning instruments. Subclause (3) and subclause (4) are relevant to the Project.

- (3) *Subject to subclause (4), if this Policy is inconsistent with any other environmental planning instrument, whether made before or after this Policy, this Policy prevails to the extent of the inconsistency.*
- (4) *Subclause (3) does not apply to any inconsistency between this Policy and any of the following State Environmental Planning Policies:*
- (a) *State Environmental Planning Policy (Major Development) 2005,*
 - (b) *State Environmental Planning Policy No. 14 – Coastal Wetlands,*
 - (c) *State Environmental Planning Policy No. 26 – Littoral Rainforests,*

Regardless of when the inconsistency arises.

Therefore, if there were any inconsistencies between the *Lake Macquarie LEP 2004*, and the *SEPP (Mining, Petroleum Production and Extractive Industries) 2007*, the latter would prevail. Clause 7(1) of the SEPP states that underground mining may be carried out on any land with development consent. The proposed development is for underground mining and is therefore permissible with consent in the location of the Application Area.

This SEPP also removed mining developments from Schedule 1 of SEPP 11 – Traffic Generating Development, meaning that SEPP 11 no longer applies to mining projects.

The following clauses within this SEPP will also need to be considered during approval of this Project:

- **Clause 13** – addresses the relationship between the proposed development and potential impact on land use(s)
- **Clause 14** - addresses the relationship between the proposed development and the potential impact on natural resource and environmental management. Subclause 2 states an assessment of greenhouse gas emissions from the development must be assessed as part of this development.
- **Clause 15** - states that the consent authority must consider the efficiency of the development in terms of resource recovery, reuse, recycling and minimisation of waste.
- **Clause 16** - refers to a number of transport conditions including transportation by public roads, limitation of truck movements and consultation requirements with the RTA.
- **Clause 17** - refers to a number of rehabilitation conditions, including:
 - Preparation of a plan showing the end use of rehabilitation
 - Waste generation and soil contamination
 - Ensure rehabilitation practices during and at the completion of rehabilitation do not jeopardise public health.

SEPP 33 – Hazardous and Offensive Development

SEPP 33 - Hazardous and Offensive Developments requires the consent authority to consider whether an industrial proposal is potentially hazardous industry or potentially offensive industry. The aim of this policy is to link the permissibility of a proposal to its safety and pollution control performance. The assessment process establishes whether the proposal is potentially hazardous and if this is not the case, SEPP 33 is not applicable.

If the storage of Dangerous Goods is required, then a licence will be applied for from the WorkCover Authority NSW.

SEPP 44 – Koala Habitat Protection

The aim of SEPP 44 is to encourage the *'proper conservation and management of areas of natural vegetation that provide habitat for Koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline.'* Schedule 1 lists the local government areas to which SEPP 44 applies, and requires an investigation be carried out to determine if 'core' or 'potential' Koala habitat is present and is likely to be disturbed. Lake Macquarie LGA is currently listed under Schedule 1. SEPP 44 applies to the extent that a consent authority is restricted from granting development consent from proposals on land identified as core koala habitat without the preparation of a Plan of Management. Due to the limited amount of disturbance proposed by the Project this SEPP is not likely to be applicable but will be considered during an ecological assessment prepared for the EA.

5.3 Regional Environmental Plans

As of 1st July 2009, Regional Environmental Plans (REPs) are no longer part of the hierarchy of environmental planning instruments in NSW. All previous REPs are now deemed SEPPs.

The Hunter Regional Environmental Plan 1989 has been repealed by the SEPP (Repeal of REP Provisions) and therefore has not been considered for this Project. Furthermore, while the Hunter REP 1989 (Heritage), which is now a deemed SEPP, applies to the Lake Macquarie LGA, there are no items listed within the schedules to which this SEPP applies that occur within the Application Area.

5.4 Local Environmental Plan

5.4.1 Lake Macquarie Local Environmental Plan 2004

The Study Area is located within the Lake Macquarie Local Government Area. With regard to the *Lake Macquarie Local Environmental Plan 2004* (LEP) the pertinent matters are:

- Zonings - the site is part Zone 9 Natural Resources and part Zone 7(2) Conservation (Secondary); and
- Clause 19 – development for the purpose of a mine.

Despite these provisions of the LEP, the relevant, prevailing planning instrument is the Mining SEPP as discussed in **Section 5.2.3**.

6.0 KEY ENVIRONMENTAL ISSUES

6.1 Environmental Management

6.1.1 Introduction

Awaba Colliery utilises a Risk Assessment process to identify environmental, safety and business risks to its operation. This process involves its employees (and contractors where appropriate) identifying existing and recommending any necessary additional controls for all risks identified. The focus is on the inter-relationship between people, machinery, methods of work, the environment and the community.

6.1.2 Policy

Centennial has an Environmental Policy that clearly states that it values its role in sustainable development and aims to manage its business to achieve balanced environmental, economic and social aspects. The Policy states Centennial's commitment to minimising environmental impacts and to continual improvement in environmental management and performance.

6.2 Preliminary Broad-Brush Risk Assessment & Supporting Subsidence Risk Assessments

A Preliminary Broad-Brush Risk Assessment (BBRA) for the the Project was completed in January 2010, with the aim of identifying all issues to be considered relating to the Project. The workshop was facilitated by GSSE (Craig Bagnall, Project Manager), with stakeholders from Centennial and technical specialist consultants attending. A primary objective of the BBRA was to assemble the relevant stakeholders in the Project to identify the activities, aspects and possible impacts associated with the proposed activities of the Project. The issues that were specifically assessed included:

- | | |
|---------------------------|-----------------------------------|
| • Land Ownership | • Aboriginal/Cultural Heritage |
| • Flora and Fauna | • Site Services |
| • Surface and Groundwater | • Visual Amenity |
| • Traffic and Transport | • Soils and Land Capability |
| • Noise and Vibration | • Rehabilitation and Life of Mine |
| • Subsidence | • Community Consultation |
| • Air Quality | • Waste Management |
| • Greenhouse Gas | • Socio-Economic |
| • European Heritage | |

The purpose of the over-arching preliminary BBRA was to identify those issues relating to the Project that had the potential to present the greatest risk to the environment and surrounding community. Once they were identified, the various Project risks were assessed while considering the existing management controls already in place at Centennial (i.e. documented in management plans and operational procedures).

Specific risk assessments for potential **subsidence-related** environmental impacts and management for underground mining areas of the Project were undertaken separately to the Preliminary BBRA. These form supporting documents to the over-arching BBRA for the Project and are cross referenced within (and appended to) the BBRA. The subsidence risk assessments included:

- **Revised Stage 3 Area Subsidence Risk Assessment** (September 2009) – undertaken for the SMP Application for Revised Stage 3 Area submitted to I&I in December 2009 (approval awaited). This area forms part of **Study Area 2** for the Project;
- **East B Area Subsidence Risk Assessment** (February 2010) – prepared for this Part3A application. This area forms **Study Area 3** for the Project;

- **Main South Area** Subsidence Risk Assessment, including Stage 2 Area (October, 2005) – prepared as part of the SMP application for Main South Area (approved). This area forms part of **Study Area 2** for the Project.

The above processes included specialist investigations for subsidence predictions and key environmental impacts. Full details are provided in the reports for each area above (included all existing and proposed controls identified), as appended to the overarching BBRA report which forms **Appendix 1** to this PEA.

For all risk assessments, where the risks were considered unacceptable, or a knowledge gap was identified in the information available, specialist consultants have been engaged to undertake further assessments and to identify potential mitigation measures that may be required. With respect to the BBRA, this process was therefore used to identify and prioritise key environmental issues which would require particular attention in the Environmental Assessment.

A Risk Assessment Report (including the risk register), attached as **Appendix 1**, was prepared to document the outcomes for all aspects of the Project identified throughout the BBRA process. This includes appendices providing full risk assessment reports of the related subsidence risk assessments for the proposed mining areas outlined above.

A list of the most significant environmental issues identified in the BBRA in order from most significant to least significant according to risk rank is provided below. These are the environmental issues considered to require particular attention in the Environmental Assessment by the risk assessment team. **Table 6.1** below summarises the high, significant, and moderate risks found by the team with existing controls in place (refer **Appendix 1** for details of existing controls if required), including proposed additional controls and the status of progress on these required actions. **Table 6.2** provides a summary of management requirements in accordance with the Centennial Risk Standard and Risk Matrix.

Table 6.1 - Priority Risk Categories For Management and Status of Proposed Additional Controls

Risk Category	Highest Risk Ranking (RR) with Existing Controls	Proposed Additional Controls	Status
High Risks			
Public & Personnel Safety due to subsidence	7* (high) (Stage 2 area only)	• Original 2005 SMP risk assessment for Stage 2/Main South Area didn't assess with existing controls in place (i.e. 'raw' risk). Considered adequate with controls in place, including significantly conservative mine design, minimum depths of cover to avoid significant surface cracking/plug failures, plans of management for infrastructure and public safety. • Notwithstanding this, Infrastructure and Public Safety Management Plans will prudently be reviewed during EA to ensure all risk aspects and controls captured.	Completed <i>Commenced</i>
Non-Mine Infrastructure due to subsidence	7* (high) (Stage 2 Area only)	• Original 2005 SMP risk assessment for Stage 2/Main South Area didn't assess with existing controls in place (i.e. 'raw' risk). Considered adequate with controls in place, including mine plan is altered to protect surface features (eg poles), subsidence monitoring & review, consultation with stakeholders, plans of management for infrastructure. It is noted that with controls in place, damage to infrastructure in the similar Revised Stage 3 Area was considered a low risk by the risk team (2009). • Notwithstanding this, plans of management for infrastructure will be prudently reviewed during EA to ensure all risk aspects and controls captured.	Completed <i>Commenced</i>

Risk Category	Highest Risk Ranking (RR) with Existing Controls	Proposed Additional Controls	Status
Groundwater	9 (high)	- Creation of a hydro-geological model for the Awaba Colliery based on Centennial Newstan. - Specialist groundwater assessment including cumulative impacts required for Part 3A application including any required mitigation measures (including required additional regulatory approvals for 10 South Bore dewatering).	Commenced (by GHD) Commenced (by GHD)
Surface Water	9 (high) (pit top areas only)	- Specialist surface water assessment of Pit Top Area operations including cumulative impacts required for Part 3A application including any required mitigation measures. - Annual water balance to quantify site water usage. - Proposed additional mine dirty water dam capacity budgeted. - Review of SMP investigations and assessments (including cumulative impacts) required for Part 3A application (EA) including any additional required mitigation measures. - Surface water flow path analysis recommended assessing downstream impacts in the event of worst case ('plug failure') scenario.	Commenced (by GHD) As above As above Commenced (by Hunter Eco (H.E)) Commenced (by H.E.)
Significant Risks			
Socio Economic impact from Project refusal	12 (significant)	No additional controls are proposed	
Aboriginal & Cultural Heritage	13 (significant)	- Specialist archaeology assessment required for Part 3A application including any required mitigation measures. - Commence additional Aboriginal Community Consultation. - Review Newstan Colliery Holding Aboriginal Heritage Management Plan and update as required.	Commenced (by RPS HSO)
Community Consultation	13 (significant)	- Consultation log to be developed for Part 3A application consultation process. - Complete consultation for East B mining area	Commenced (by Centennial and RPS HSO)
Moderate Risks			
Subsidence	17 (moderate)	- Specialist studies will conservatively review previous SMP investigations and risk assessment and the adequacy of these controls for the current mining method and mine layout for the the current mining areas in Main South Stage 2 Area. - Controls recommended within the completed East B Area Subsidence Risk Assessment (App C to the BBRA) are considered adequate for this Project. - Controls recommended within the completed	Original risk assessment completed, review commenced Completed Completed

Risk Category	Highest Risk Ranking (RR) with Existing Controls	Proposed Additional Controls	Status
		<i>Revised Stage 3 Area</i> subsidence risk assessment (App B to the BBRA) are considered adequate for this Project.	
Life of mine & Rehabilitation	17 (moderate)	- No additional controls are proposed at this stage. - Life of Mine and Rehabilitation Risk Assessment to be conducted prior to commencement of closure works.	
European Heritage	17 (moderate)	Specialist archaeology assessment required for Part 3A application including any required mitigation measures.	<i>Commenced (by RPS HSO)</i>
Traffic & Transport	17 (moderate)	No additional controls proposed however Awaba Colliery will undertake consultation with DoP and Council/RTA to determine their EA requirements.	<i>Soon to commence</i>
Contaminated Land	18 (moderate)	- No additional controls are proposed at this stage. - Contaminated Land will be considered for the Life of Mine and Rehabilitation planning.	
Noise	18 (moderate)	Specialist noise assessment including cumulative impact required for Part 3A application.	<i>Commenced (by Heggies)</i>
Air Quality	18 (moderate)	Specialist air quality assessment including cumulative impacts required for Part 3A application.	<i>Commenced (by Heggies)</i>

* Only 'raw' risk (considered with no existing controls in place) was conservatively assessed for original risk assessment for Main South Area in 2005. Controls were identified but not re-ranked, with general approach that identified controls were adequate to address risks to suitable levels. A full copy of the risk report is appended to the BBRA for the Project contained in Appendix 1 to this PEA.

It is anticipated that, with the exception of socio-economic, life of mine and rehabilitation, traffic and transport and contaminated land, these matters will form the basis of the Director General's targeted EARs for the Project. As discussed further in **Section 6.4** no further assessment for socio-economic, life of mine and rehabilitation, traffic and transport and contaminated land is considered necessary due to the current controls and management strategies employed by Awaba Colliery.

Table 6.2 - Requirements for Management of Risks in accordance with the Centennial Risk Standard

Risk Ranking	Risk Category		Generic Management Actions
1 to 4	E	Extreme	Immediate intervention required from senior management to eliminate or reduce this risk.
5 to 9	H	High	Imperative to eliminate or reduce risk to lower level by the introduction of control measures. Management planning required at senior level.
10 to 15	S	Significant	Corrective action required, senior management attention needed to eliminate or reduce risk.
16 to 19	M	Moderate	Corrective action to be determined, management responsibility must be specified.
20 to 25	L	Low	Monitor and manage by corrective action were practicable.

A summary of the other minor risks and environmental issues considered for the Project has also been included in this PEA and includes:

LOW

- Ecology;
- Greenhouse Gas Emissions (GHG);
- Waste Management;
- Soils;
- Visual Amenity;
- Site Services; and
- Land Ownership.

Whilst ranked as low risks, for completeness some of these aspects will have additional specialist assessment completed for the EA, in particular an **Ecology** and **Greenhouse Gas Assessment**. This includes referring the Project to the Department of the Environment, Water, Heritage and the Arts under the EPBC Act.

6.3 Key Environmental Issues

6.3.1 Groundwater

It is noted that **during mining**, groundwater system/aquifer impacts, as well as inflows of groundwater to underground workings, were not considered by the risk team to represent a high risk for management. Historical mining experience indicates very minor inflows occur during mining conditions that are easily manageable. The age of the workings further indicates depressurisation of the main aquifers (coal seams) since mining began in 1947. The majority of water historically reporting to the underground is understood to enter from the surface via subsidence cracks which are being progressively rehabilitated.

The risk team identified that, whilst inflow rates are relatively minor in the short term, given the remaining life of the mine, in the **long-term** groundwater inflows could have potential to cause environmental impacts through the potential filling of underground workings over time. Subsequently inflows post-closure were considered a potential high risk requiring further assessment and management. GHD have been engaged by Centennial to develop a hydrogeological model of the Great Northern Seam workings at Awaba Colliery as outlined below.

Due to the mine design and planning and limited subsidence impacts predicted, there is little risk of effecting shallow aquifers which could in turn impact upon any Groundwater Dependant Ecosystems (GDE's) present (HunterEco, 2009). The assessment of these impacts has been well documented through various reports undertaken for specific SMP Applications in recent years for 3 North Area and more recently Revised Stage 3 Area.

Groundwater inflows to the mine are currently managed and discharged through two locations, these being Barnes Dam (LDP005) and the 10 South Bore. The adequacy of this management system is under review for the EA with specialist groundwater consultants engaged to develop a hydrogeological model of the Great Northern Seam workings at Awaba Colliery.

A detailed groundwater impact assessment of the proposal will be conducted for inclusion in the Project EA. The groundwater assessment will include:

- Collation and review of existing data for Awaba including (but not limited to) floor elevation, surface topography, pumping rates between underground water storages and hydrogeological information for the Great Northern Seam, as well as, the overlying Teralba conglomerate and underlying Awaba tuff;
- Development of a hydrogeological model of the Great Northern Seam workings at Awaba Colliery using the above information; and
- Assessment of the capacity of the Awaba Colliery underground workings to receive decant water from Awaba Colliery and the associated dewatering requirements under both operational and post-closure (care and maintenance) conditions.

6.3.2 Surface Water

Surface Facilities Areas (Study Area 1):

The potential to impact surface waters in pit top operational areas (dirty water management) and in active mining areas (creeks, see further below) has been recognised by the Broad Brush Risk Assessment as a priority for assessment, particularly with respect to mine dirty water management in pit top surface areas.

A detailed surface water impact assessment of the surface facilities area will be conducted for inclusion in the Project EA. It is anticipated the scope of the assessment will include:

- Documentation of the Pit Top area clean water and dirty water management systems, as they exist;
- Documentation of the proposed PCD upgrade and its projected effectiveness and frequency of discharges and any other mitigation measures or recommendations; and
- A site water balance for potable water demand, mine water make and domestic wastewater (annual water balance).

Proposed Mining Areas (Study Areas 2 and 3)

The potential to impact on surface watercourses due to mine subsidence/cracking was considered by the risk team and, given the substantial existing controls in place to avoid impacts the risks in all three (3) mining areas (East B, Revised Stage 3, and remaining sections of Stage 2 of main South Area) were considered to be **low**.

A detailed surface water impact assessment for the mining areas will be conducted for inclusion in the Project EA.

6.3.3 Socio-Economic Assessment

Awaba Colliery directly employs approximately one hundred (100) personnel and contractors. Failure to obtain approval for the Project will result in a reduced life of mine, with substantial adverse socio-economic impacts associated with available coal resources not being recovered, loss of jobs, and reduction in flow-on benefits.

Given the above aspects, the risk team assembled for the BBRA identified that socio-economic aspects have potential as a significant risk requiring management (risk ranking of 12), and identified the requirement to commence and continue consultation with DoP and Stakeholders during the PEA and EA. Further, both the positive and potentially adverse social and economic impacts associated with the Project will be addressed within the EA.

6.3.4 Aboriginal Archaeology

Given that the Project proposes only minimal surface disturbance, in areas that have been previously disturbed, the likelihood of the Project impacting upon an Aboriginal site is considered likely to be low. Additionally, any potential for subsidence-related impacts has been considered in the subsidence risk assessments for the proposed mining areas (refer Section 6.1), and are also considered to be relatively low with no recorded Aboriginal sites within these areas.

The small proposed disturbance area (the Pollution Control Dam expansion) will be surveyed along with all remaining and proposed mining areas to ensure that any archaeological sites within the area are identified, and appropriate mitigation measures developed in consultation with all relevant stakeholders, including Aboriginal communities and the Department of Environment, Climate Change and Water (DECCW).

Awaba Colliery is a party to an Indigenous Land Use Agreement (ILUA) with the Wonnarua People and the NSW Aboriginal Land Council, and the requirements of this Agreement will be abided by in the undertaking of the Heritage Assessment, particularly in relation to East B Area in which mining triggers this Agreement.

An Aboriginal and Cultural Heritage Assessment of the Project will be undertaken by archaeologists from RPS HSO. The Aboriginal and Cultural Heritage Assessment will involve the following:

- A search of the relevant State and Federal heritage registers and listings, including the DECCW and the register for native title claimants;
- Identification of Aboriginal Land Councils, Elders and other interested parties through consultation with DECCW;

- Consultation with Aboriginal communities and other stakeholders in the area. This will include a field survey of the area with Aboriginal Stakeholders to identify sites of potential archaeological significance;
- Assessment of archaeological and cultural heritage values;
- Evaluate potential impacts; and
- Preparation of mitigation and management strategies.

Community consultation regarding cultural heritage will be undertaken in accordance with the *Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DECC, 2005).

6.3.5 Traffic and Transport

The potential for the Project to impact upon public safety on the local road network caused by movements to and from the Awaba Colliery is considered moderate. It should be noted that, there are no significant changes proposed to the existing operations, including traffic volumes and site access, which have been successfully operated at the mine to date. On top of this, the domestic coal to be transported to Newstan or Eraring will be undertaken along the private haul road eliminating any public safety risks through the transport of coal from Awaba Colliery.

Although traffic volumes will remain at the existing rate it has been considered that, in the interest of public safety, Centennial will undertake consultation with the Department of Planning and Lake Macquarie City Council (road owner) to confirm satisfaction with current traffic use and management for the mine entry.

As identified by the BBRA process for the Project, with respect to continued use of the existing private haul road by coal haulage trucks from Awaba Colliery, noise and air quality (dust) management have been identified as the key environmental risk aspects requiring consideration within the EA. These aspects will be dealt with in separate specialist assessments for both noise and air quality, as discussed in **Section 6.3.9** and **Section 6.3.10** respectively.

6.3.6 Life of Mine and Rehabilitation

Given the remaining mine life expectancy, life of mine management and rehabilitation was identified as a moderate risk by the risk team requiring management and mine planning at Awaba Colliery. An existing approved **Life of Mine Plan** (approved by I&I in 2009) will continue to be the guiding document in relation to the Project.

This plan addresses mine decommissioning, final landform design, rehabilitation, and post-mine-life maintenance and monitoring of lands pursuant to the mining leases within Awaba Colliery. Due to investigations currently underway assessing the potential for further use of Awaba Colliery, it is envisaged that following the completion of mining, Awaba Colliery will be placed in **Care and Maintenance**. Following a final decision by Centennial for future use or final closure of the site, a *Detailed Life of Mine Plan* will be developed.

6.3.7 Mine Induced Subsidence

The risk for mining to cause adverse environmental impacts due to subsidence were assessed in three separate risk assessments for each of the remaining and proposed mining areas for the Project as detailed in **Section 6.2**, these being for:

- **East B Area** (adjoining part of the eastern side of the Main South Area (MSA));
- **Revised Stage 3 Area** (of MSA)
- **Main South Stage 2 Area** – specifically for this project the remaining mining to be completed *within* Stage 2 of the MSA

Due to the current bord and pillar mining method with total extraction, which was developed in consultation with the I&I, and resulting in maximum predicted subsidence levels of <200 mm (and historically within 90-135 mm), subsidence is considered to have a low impact on most environmental aspects.

A highly conservative 'worst case' assessment has been undertaken for a 'plug failure' scenario for proposed mining in East B and Revised Stage 3 Area, to ensure that all possible impacts have been considered and appropriately addressed.

Plug failure is the result of the overlying conglomerate failing to span a void, this could result in approximately 2 m of subsidence. Whilst this is not a subsidence prediction, it has been conservatively considered in the risk-based approach to mine planning and management.

The most significant potential risk posed by subsidence in the worst case plug failure scenario is to public safety. Substantial mine planning, mine design considerations, and specialist subsidence investigations have been undertaken to completely minimise this risk. This risk is managed by the Public Safety Management Plan which is reviewed and updated for each subsequent SMP application. Further, Awaba Colliery undertakes routine inspections of access tracks and provides fences and signage as conservative precaution measures.

Both Revised Stage 3 Area and Main South Stage 2 Area were subject to a subsidence assessment prior to secondary extraction being undertaken. These subsidence assessments were included in subsidence management plan applications to I&I and were completed by Seedsman Geotechnics. Subsidence Management Plan approval has been granted for the Main South Stage 2 Area for the current mining method (2007), and approval is currently awaited from I&I for the Revised Stage 3 Area (SMP Application submitted in December, 2009).

Seedsman Geotechnics has been further engaged to undertake an assessment of the subsidence impacts for the East B Area.

6.3.8 European Heritage

Due to the mining history in the area and the age of the mine there is a potential for some parts of Awaba Colliery to be considered as culturally significant European heritage. "Awaba State Coal Mine" was listed within the LMCC Heritage Study (1993) as item AW-07, and is currently not listed in Council's Local Environment Plan (LEP), but is treated as a *provisional heritage item* under Council's Development Control Plan #1 (2004). Given that the Project proposes only minimal surface disturbance, in areas that have been previously disturbed, the likelihood of the Project impacting upon an item with European heritage values should be low. Any further considerations with respect to life of the mine in future are dealt with under the approved *Life of Mine Plan* and will be expanded upon in a *Detailed Life of Mine Plan* when required.

European heritage will be addressed by archaeologists from RPS HSO as part of the Archaeological Assessment for the Project in accordance with NSW Heritage Act 1997. This will include identification of any need to conduct an assessment of built heritage items in accordance with the NSW Heritage Branch Significance Assessment Criteria. The archaeology assessment will include a Heritage Assessment for a number of mine buildings and workings in the pit top area. Management strategies with regard to the management of any European heritage items will be considered in the archaeology assessment to be included in the EA.

6.3.9 Noise Management

The nearest residences in Awaba village are located approximately 500 m from the nearest noise source within the Application Area. The risk team considered that the risk of potential noise impact is **moderate** for the following reasons:

- The mine has been operating since 1947;
- There are no significant changes to operations at Awaba Colliery proposed as part of the Project;
- Standard work procedures and maintenance tasks have been developed and implemented at Awaba Colliery to minimise noise levels; and
- Noise monitoring is conducted at Awaba Colliery in accordance with the Newstan quarterly noise monitoring program.

A detailed noise assessment of the proposal will be undertaken by Heggies for inclusion in the EA. The noise impact assessment will be done in accordance with the NSW Industrial Noise Policy (INP) to assess potential noise impacts associated with the subject site.

6.3.10 Air Quality and Greenhouse Gas

Air Quality:

The nearest residences (sensitive receptors) are located in the Awaba village approximately 500m from the Application Area. The risk team assembled for the Project BBRA for the EA (refer **Appendix 1**) considered that the risks of potential particulate impact from surface facilities operations and also coal haulage are **low to moderate** with a range of existing control measures employed by the mine.

The following aspects of the existing operations minimise air quality impacts:

- No additional operational activities or significant increase in production
- Minimal additional construction activities and surface disturbances (only expansion of a pollution control dam as a minor temporary activity);
- Particulate sources at Awaba Colliery are few, and therefore the dispersion of particulate in concentrations greater than the Department of Environment, Climate Change and Water (DECCW) assessment guidelines is unlikely.
- There is a number of particulate mitigation measures employed on the site, further reducing the emissions (see further below).
- The distance to the nearest receiver is approximately 500 m, which, when considering the low emission levels for particulates, and the topography and natural vegetation between Awaba Colliery and the Awaba village an adequate buffer for the dilution of particulate emissions should be provided.

A specialist air quality assessment has commenced for the EA by Heggies. This detailed Air Quality Impact Assessment will be undertaken in accordance with the NSW DECCW's *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (DECC, 2005), and other relevant air quality assessment guidelines.

The target air quality parameters for this assessment will be limited to:

- Particulate Matter (PM₁₀).
- Total Suspended Particulate (TSP).
- Dust Deposition.

Greenhouse Gases:

Awaba Colliery currently reports greenhouse gas emissions annually in accordance with the *National Greenhouse and Energy Reporting Act 2007*. Greenhouse gas emissions from Awaba Colliery are considered to present a low environmental impact.

The emission of greenhouse gases from the Awaba Colliery will be assessed as part of the air quality impact assessment. The Greenhouse Gas Assessment will include the following:

- Conduct greenhouse gas estimations for the on-site activities associated with the proposed development in accordance with the requirements of the *National Greenhouse and Energy Reporting (NGER) Act 2007*; and
- Assess the significance of greenhouse gas emissions for the Project in relation to national greenhouse gas objectives and report on the Project's greenhouse gas implications in terms of Federal and NSW Government policies and protocols.

6.4 Other Environmental and Community Issues

The Preliminary Broad-Brush Risk Assessment found that in relation to the Project, the following environmental issues will not present a significant risk to the environment and surrounding community and therefore no further investigation will be required. These issues are described for completeness below.

6.4.1 Ecology

The potential for the Project to impact upon threatened flora and fauna was considered in the BBRA to be a **low risk**. Previous ecological investigations for Awaba indicate that the habitat over the area under which mining is proposed consists of the following vegetation communities:

- MU30 Coastal Plains Smooth-barked Apple Woodland;
- MU31 Coastal Plains Scribbly Gum Woodland;
- MU15 Coastal Foothills Spotted Gum - Ironbark Forest;
- MU37 Swamp Mahogany Paperbark Forest; and

- an undefined riparian community dominated by Sydney Peppermint (*Eucalyptus piperita*).

Of these communities, the MU37 community has a floristic content that is consistent with that described in the NSW Scientific Committee determination for the listed endangered ecological community Swamp Sclerophyll Forest on Coastal Floodplains. Additionally, the threatened flora species *Acacia bynoeana*, *Grevillea parviflora* subsp *parviflora* and *Tetradlea juncea* are generally found in the MU30 and MU31 communities. The overall habitat would also be suitable for a number of threatened fauna species.

Due to the current mining methods and the associated maximum predicted subsidence levels and the detailed flora and fauna surveys conducted as part of the SMP process for Main South Area Stage 2 and Revised Stage 3 Areas, and, part of East B Area it has been considered that there is a low potential for the Project to impact upon flora or fauna within the Application Area.

Despite the BBRA suggesting that the Project has a low potential to impact upon the flora or fauna, Hunter Eco has commenced an ecological assessment for the Project. This assessment will consider whether there would be any circumstances related to the Project which would result in an impact on any threatened species or endangered communities. This assessment will be included in the EA and will specifically address the proposed mining areas, as well as the area of proposed disturbance (namely the proposed expansion of the PCD).

6.4.2 Waste Management

Waste generated at Awaba Colliery is managed in accordance with the regulatory requirements of the *Protection of the Environment Operations (POEO) Act 1997*. Wastes generated at Awaba Colliery include waste oil and grease, scrap metal, paper and cardboard, recyclable plastics, wooden pallets and general waste. These wastes are collected and segregated into appropriate bins for recycling, reuse and land-fill waste. The waste segregation is monitored via weekly environmental inspections to ensure its compliance within the POEO Act.

The waste management systems currently employed at Awaba Colliery, including those for both production and non-production waste streams, will continue to be utilised for the Project. No further assessment is considered to be required within the EA for the Project.

6.4.3 Soils and Land Capability

The only disturbance relating to the Project involves the expansion of an existing Pollution Control Dam. The location of the dam has been deliberately located in a previously disturbed area where soil conditions are considered appropriate for the dam.

Consideration of erosion and sediment control and remedial works for any potential subsidence cracks have been conservatively considered within the subsidence risk assessments undertaken for each mining area. No further assessment is considered to be required within the EA for the Project.

6.4.4 Visual Amenity

There are no proposed significant changes to existing operations proposed. The natural surface topography and existing vegetation provide a natural screen between the Awaba Colliery and the Awaba village, as well as screening the view from Wilton Road. These are considered adequate controls with respect to the visual amenity. No further assessment is considered to be required within the EA for the Project.

6.4.5 Site Services

There are no additional operational activities, site services or personnel proposed for the project, thus there are no potential impacts related to the existing services. No further assessment is considered to be required within the EA for the Project.

6.4.6 Contaminated Land

The potential for contamination to occur at Awaba Colliery within the Application Area has been considered in the BBRA completed for the Project (refer **Appendix 1**) and was considered by the risk team to be a **moderate risk**.

Awaba Colliery currently stores hydrocarbons and other potential contaminants in designated and appropriately designed storage areas. Hydrocarbon management and storage is further outlined separately in **Section 6.4.6**. No further assessment is considered to be required within the EA for the Project.

6.4.7 Hydrocarbon Management

Diesel fuel is stored on-site at Awaba Colliery in one portable self bunded 30,000 litre above-ground tank. Oils and greases are also stored within a bunded area. The quantities of these hydrocarbons are below the manifest quantities requiring notification of storage to Workcover as listed under the *Occupational Health & Safety Act 2000*.

In accordance with the regulatory requirements of the POEO Act, waste oil is collected within an oil separator located within the Awaba Colliery surface facilities area. A licensed contractor working within the waste tracking provisions of the POEO Act removes all waste hydrocarbons from site.

Regular inspections are conducted and systems are maintained as required.

7.0 CONSULTATION

A Stakeholder Engagement Plan (SEP) has been developed for the Project, with all engagement to be undertaken in accordance with this Plan. The purpose of this plan is to provide a consistent management framework to identify and consult with stakeholders with an interest in the Project and to ensure appropriate monitoring and reporting of community initiated enquiries. The SEP will be implemented throughout the approval process. A record of all stakeholder engagement for the Project will be maintained on the Centennial Environment & Community Database (ECD).

The Stakeholder Engagement Plan has been developed to perform the following tasks:

- Identify Awaba Collieries stakeholder groups;
- Manage and facilitate the engagement of our stakeholders;
- Identify mechanisms for communicating with our stakeholders;
- Define means of recording feedback from our stakeholders and the mine's response;
- Ensure appropriate monitoring and reporting of community initiated enquiries and contact; and
- Ensure contact information is maintained and monitored in the Centennial Environment and Community Database (ECD).

In addition to this, Awaba Colliery maintains an environmental complaints database on-site as part of their operation in order for any community concerns to be received.

7.1 Summary of Consultation

An indicative timetable of consultation to be undertaken for the Project is included below in **Table 7.1**.

Table 7.1 – Indicative Timeline of Consultation for the Project

Action	Indicative Timeline
Distribution of a newsletter by Centennial about the Project. This newsletter will be hand delivered to Awaba village residents and will also be made available on the Centennial Coal website.	March 2010
Publication of an article about the Project in the monthly Centennial Coal page in The Lakes Mail.	March 2010
Planning Focus Meeting (if considered necessary)	March 2010
Public Exhibition of the Environmental Assessment	June 2010

8.0 CONCLUSION

The Project will extend the life of the Awaba Colliery by up to five years. The Project is considered to be a major project as defined by the *State Environmental Planning Policy (Major Development) 2005*, and therefore requires approval from the Minister for Planning under Part 3A of the EP&A Act.

There are no significant proposed changes to existing operations and the existing mining method (including production rates, mine design, operating hours and employees), coal handling, preparation and stockpiles, plant and equipment or transport. Aside from this, a conservative risk based process has been undertaken to identify and prioritise key risks, and mine planning has specifically considered key environmental and surface features in providing surface support where necessary to avoid or minimise potential for impact.

Specialist investigations have commenced for priority risk aspects, including those prepared as part of SMP applications previously submitted to I&I for approval for two (2) of the three (3) mining areas subject to the Project, and these are considered adequate for the EA. The remaining proposed mining area, *East B Area*, will include detailed mine subsidence assessment and consideration under the Part 3A process.

This document acts as a formal request for the DoP to issue Environmental Assessment Requirements for the Project. The Preliminary Environmental Assessment (PEA), as presented in this document, indicates that the priority issues associated with the Project comprise potential impacts on:

HIGH

- Public and Personnel Safety* (Main South Area Stage 2 only);
- Non-Mine Owned Infrastructure* (MSA Stage 2 area only);
- Groundwater; and
- Surface Water.

SIGNIFICANT

- Socio-Economic;
- Aboriginal Cultural Heritage; and
- Community Consultation.

MODERATE

- Subsidence (with existing controls);
- Life of mine and Rehabilitation;
- European Heritage;
- Traffic and Transport;
- Noise;
- Air Quality; and
- Contaminated Land.

* Only 'raw' risk (considered with no existing controls in place) was conservatively assessed for original risk assessment for Main South Area in 2005. Controls were identified but not re-ranked, with general approach that identified controls were adequate to address risks to suitable levels. A full copy of the risk report is appended to the BBRA for the Project contained in Appendix 1 to this PEA.

These issues, with the exception of socio-economic, life of mine rehabilitation, transport and traffic and contaminated land, will be assessed in detail as part of the Environmental Assessment of the Project. Other additional environmental issues will be included

in the EA but are not considered likely to have the same level of significance nor require specialist assessment. For completeness it is noted that specialist ecology and greenhouse gas assessments will still be completed for the Environmental Assessment.

Upon receipt of the DoP's Environmental Assessment Requirements, Awaba Colliery will finalise an Environmental Assessment and submit the assessment to the DoP in support of this Project Application. Project Approval is sought within the required timeframe in order to allow:

- mining within the East B Area
- approximately 880,000 tonnes per financial year
- Expansion of the final pollution control dam

9.0 REFERENCES

- AECOM, July 2009. *Phase 1 Environmental Site Assessment. "Awaba Colliery, Wilton Road Awaba NSW, Final"*.
- Australasian Groundwater & Environmental Consultants Pty Ltd. May 2008. *"Definition of Limit of the Stoney Creek Alluvium, Awaba Colliery"*.
- Centennial Awaba Pty Ltd, November 2008. *"Life of Mine Plan"*, as approved by I&I June 2009.
- Centennial Coal Pty Ltd, February 2010. *"Stakeholder Engagement Plan, Awaba"*.
- Centennial Newstan Pty Ltd, March 2008. *"Stoney Creek Proposed Riparian Monitoring Transects."* (figure)
- GSS Environmental, November 2008. *"Awaba Colliery SMP Environmental Risk Assessment Workshop Presentation"*.
- GSS Environmental, April 2009. *"Centennial Coal, Preliminary Environmental Assessment – Olstan Project"*.
- GSS Environmental, November 2008. *"SMP -3 North Risk Assessment Document, Awaba Colliery."*
- GSS Environmental, December 2008. *"Awaba Colliery, Subsidence Management Plan Application – 3 North Area"*
- GSS Environmental, December 2009. *"Awaba Colliery, Revised Stage 3 SMP Area - Subsidence Management Plan Application (including supporting specialist reports)"*.
- GSS Environmental, February 2010. *"Part 3A Broad Brush (Environmental) Risk Assessment Report, Awaba Colliery"*;
- GSS Environmental Pty Ltd, February 2010 *"Proposed East B Area – Risk Assessment for Mine Subsidence Impact and Management"*;
- Hansen Bailey, April 2007. *"Newstan Colliery Modifications to Development Consent"*.
- Hansen Bailey, March 2007. *"Mannering Colliery Continuation of Mining – Environmental Assessment"*.
- Hansen Consulting. March 2007. *"Mannering Colliery, Environmental Assessment – Appendix E – Stakeholder Consultation"*.
- Harper Somers O'Sullivan Pty Ltd, Australia. November 2008. *"SMP Archaeological Assessment & Revised Predictive Model for 3 North Area, Awaba East."*
- HunterEco, 2009, *"Awaba East Stage 3 SMP: Ecology Assessment"*.
- HunterEco, November 2008, *"Awaba Underground Mine 3-North Outbye Project SMP – Ecology Assessment"*.
- HWR Pty Ltd, August 2007, *"Flora and Fauna Assessment of Proposed Subsidence Monitoring Lines for Main South Area of Awaba Colliery"*.
- HWR Pty Ltd, 2009, *"Ecological Monitoring of Riparian Vegetation Along Stony Creek at Awaba – 2009 Survey"*.
- HWR Pty Ltd, 2008, *"Baseline Ecological Description of Riparian Vegetation Along Stony Creek at Awaba"*.
- Murphy C.L, 1993, *Soil Landscapes of the Gosford-Lake Macquarie 1:100 000 Sheet Report*, Department of Conservation and Land Management.
- Centennial Coal Pty Ltd, January 2010, *"Part 3A Broad Brush RA: General Introduction to Workshop Participants Presentation – by Roger Davis, Mine Manager"*.
- Seedsman Geotechnics Pty Ltd, November 2008, *"Extraction in 3 North Area – Subsidence"*.

Seedsman Geotechnics Pty Ltd, November 2008, *"Audit Against SMP Guidelines (3 North Area)"*.

Strata Engineering (Australia) Pty Ltd, 2005. *Long-Term Pillar Stability Assessment with Regard to Potential Secondary Extraction Opportunities*.

Umwelt, 1998, *Newstan Life Extension Area (LEA) Environmental Impact Statement (EIS)*.

PART 3A PROJECT BROAD BRUSH RISK ASSESSMENT & RISK REGISTER

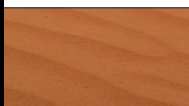
INCLUDING:

APPENDIX A: RISK ASSESSMENT WORKSHOP PRESENTATIONS

APPENDIX B: REVISED STAGE 3 AREA: SUBSIDENCE RISK ASSESSMENT

APPENDIX C: EAST B AREA: SUBSIDENCE RISK ASSESSMENT

APPENDIX D: MAIN SOUTH AREA: SUBSIDENCE RISK ASSESSMENT



APPENDIX 1



Centennial Coal
Awaba

Risk Assessment Document

Awaba Colliery

Part 3A Environmental Assessment - Awaba Colliery

Broad Brush Risk Assessment No.: 20100113

1. INTRODUCTION

Background:

Awaba Colliery is a small underground coal mine operated by Centennial Newstan Pty Ltd (Newstan), a wholly owned subsidiary of Centennial Coal Company Ltd (Centennial). The mine is located within the Newcastle coalfield, south of the Awaba village on the western side of Lake Macquarie, near Newcastle NSW. Awaba Colliery is a small operation with approximately 100 employees and contractors, historically producing approximately 850,000 tonnes of thermal coal annually.

This Broad Brush Risk Assessment (BBRA) has been prepared by GSS Environmental (GSSE) to assess the key environmental issues relating to a proposal by Centennial for continued operations at Awaba Colliery. An application for a Part 3A Project Approval will be lodged by Centennial for the ***Awaba Colliery Continuation of Mining Project*** (the “Project”), which will seek approval from the Minister for Planning to allow ongoing underground mining and associated surface operations. The Project will extend the mine life of Awaba Colliery by up to five years (until 2015) and will recover approximately 2.0 million tonnes of coal. To allow for potential productivity improvements, approval will be sought for approximately 880,000 tonnes per financial year. The application for the proposed Project will be supported by an Environmental Assessment (“EA”) that will assess the key environmental issues as considered by this BBRA.

No significant changes to existing coal handling and annual throughput are proposed. Minimal changes are proposed to existing surface operations, with a proposed new surface disturbance relating to increased Pollution Control Dam (PCD) capacity.

Context of the BBRA:

Subsidence impacts from the proposed mining areas for the Project have been dealt with in separate specific risk assessments attached as Appendix B (Revised Stage 3 Area), Appendix C (East B Area) and Appendix D (Main South Stage 2 Area). This Broad Brush Risk Assessment should consider the environmental risks posed by the entire Project as required for a Part 3A Environmental Assessment, excluding subsidence-related environmental impact risks dealt with in the specific Risk Assessments completed for each of the mining areas. The scope of this BBRA is outlined in **Section 4** (Risk Assessment Boundary Definition).

Presentation to the Risk Team During the BBRA Workshop:

A project background presentation (powerpoint) for the Part 3A Environmental Assessment - Awaba Colliery was presented to the risk team by GSSE at the risk assessment workshop (see **Appendix A** and further detail in **Section 7**). This provided an overview of the Part 3A process, as well as providing background to the mining areas including previous history, natural and man-made features and expected subsidence behavior, which differ significantly for the three proposed mining areas. The presentations also outlined the mining method and explained subsidence controls.

2. Objective:

The following Hierarchy of Controls offers a framework for considering the effectiveness of controls. Note that the effectiveness of a control that is intended to reduce a risk decreases from top to bottom of the list. In other words, the closer the control type is to the top of the hierarchy, the more potentially effective the control.

- Eliminate the hazard or energy source (do not use the energy)
- Minimise or replace the hazard or energy source (reduce the amount of energy to a less damaging level or replace the energy with another that has less potential negative consequences)
- Control the hazard or energy using engineered devices (ex. Lock outs, chemical containers, mechanical roof support, gas monitors, etc.)
- Control the hazard or energy by using physical barriers (ex. machine guarding, warning signs, etc.)
- Control the hazard or energy with procedures (ex. Isolation procedures, standard operating procedures, etc.)
- Control the hazard or energy with personal protective equipment (ex. hard hats, boots with toe caps, gloves, safety glasses, welding gear, etc.)
- Control the hazard or energy with warnings and awareness (ex. posters, labels, stickers, verbal warnings, etc.)

The following **key objectives** of this preliminary Broad Brush Risk Assessment (BBRA) for the **Part 3A Environmental Assessment - Awaba Colliery** include:

- To establish an appropriate risk assessment team of suitably qualified and experienced Centennial staff, specialist consultants and key stakeholders;
- Discuss and review existing information known for the Study Areas and experience in adjacent mining areas;
- To provide the basis for the development of a priority action plan which identifies the various key high risk issues relating to the project. This is to be used to ensure the high risk aspects are adequately addressed in the Environmental Assessment work and are included in further consideration during the environmental impact assessment phase of project;
- To establish a Draft Risk Register (WRAC Worksheet) and risk report for the Project for review and comment by the risk team;
- The identification of additional controls required (including with respect to any need for updating Centennial management plans); and
- To produce a Project Broad Brush Risk Assessment Report (including Risk Register/WRAC Worksheet) for the Environmental Assessment to the DoP.

The aim is to provide the basis for identifying issues prior to the commencement of the environmental impact assessment phase of the project. It is intended that this BBRA would be used in the preparation of an Environmental Assessment (EA) to be submitted to the Department of Planning (DoP) under Part 3A of the Environmental Planning and Assessment Act and form part of the “risk based” justification for the level of assessment for the various aspects of the project.

The Centennial risk assessment standard lists the following Hierarchy of Controls and was followed in undertaking this risk assessment. Note that the effectiveness of a control that is intended to reduce a risk decreases from top to bottom of the list. Which in other words, the closer the control type is to the top of the hierarchy, the more potentially effective the control.



3. Potential Hazards:

Potential hazards for the Project were considered within the context of risks discussed and assessed by the risk team (as a minimum) for the following environmental related hazard categories/aspects:

- Community Consultation;
- Soils and Land Capability;
- Flora and Fauna;
- Heritage (indigenous and Non-Indigenous);
- Air Quality and Greenhouse Gas;
- Surface Water;
- Groundwater;
- Subsidence;
- Traffic and Transport;
- Visual Amenity;
- Site Services;
- Waste Management;
- Closure and Rehabilitation;
- Land Ownership;
- Contaminated Land;
- Socio-Economic; and
- Noise and Vibration.

4. Risk Assessment Boundary Definition:

The **boundary** of this BBRA is formed by the Project Application Area for the Environmental Assessment, which is comprised of four (4) key study areas for consideration in this risk assessment. This includes the following areas:

- **Study Area 1 – Surface Facilities and Ancillary Infrastructure** – This area includes the colliery pit top facilities (including office and amenities buildings, existing coal crushing plant, workshop and storage areas) ventilation shafts, an existing quarry and mine dewatering bore (10 South Bore).
- **Study Area 2 – Continued Mining within Existing Main South Area staged SMP Approval Areas (including the Remaining Coal to be Mined within Stage 2 and the Revised Stage 3)** – The impacts associated with mining in these areas have previously been assessed in Subsidence Management Plan (SMP) Applications. The Stage 2 Area application was approved by Industry and Investment in September 2008, with the SMP Application for the Revised Stage 3 Area submitted to I&I in December 2009 awaiting approval. These areas are defined by a 26.5 degree angle of draw (as per DPI-MR SMP Guidelines, 2003). The outcomes from the SMP assessment will be summarised along with any impacts that are not considered to have been adequately addressed for this EA. It is important to note that, in relation to Stage 2 Area, only the coal remaining from the 1st of August will require approval for this Project;
- **Study Area 3 – Proposed Project Mining Areas** - Consideration of the proposed Mining Area (East B Area) defined as the proposed workings plus 26.5 degree angle of draw (i.e. as per DPI-MR SMP Guidelines, 2003); and
- **Study Area 4 – Existing Internal Private Haul Road** – This haul road will be utilised for transporting coal from the Awaba Colliery operations to Newstan Collieries existing Run of Mine Stockpile or Rail Loop for processing and subsequently transported to the Port of Newcastle or Port Kembla for shipping to export markets (to be undertaken in accordance with the Newstan development consent DA 73-11-98) and also to the Eraring Power Station.

Further, the **scope** of the risk assessment for the ***Awaba Colliery Continuation of Mining Project*** included:

- Consideration of the three (3) Mining Areas – Remaining Mining within the SMP Approved Main South Area (Stages 2 and revised Stage 3), and the proposed East B Area, each defined as the proposed workings plus 26.5 degree angle of draw (i.e. as per SMP Guidelines). excluding subsidence-related impacts which have already addressed in specific Subsidence RA's completed for those areas. Cross-reference to the highest risks within each of these risk assessments has been made within this BBRA;
- The Awaba pit top facilities (Surface Operations) associated with the crushing and loading of coal to trucks for transport to Centennial Newstan or Eraring Power Station by internal private Haul Road;
- Transport of coal along the internal haul road to either of the Newstan or Eraring receival facilities;
- The use of an existing quarry on a campaign basis with material used for construction, road building and related purposes. It should be noted that there is no further disturbance proposed for the Project and will only involve the removal of stockpiled material;
- All potential environmental impacts associated with mine access, ventilation and other services provided through the existing workings areas to the active and proposed mining areas.



5. Risk Assessment Methods:

Yes/No	Method
	PROACTIVE TOOLS
Yes	Workplace Risk Assessment and Control (WRAC) – including a 'worst case' failure scenario
	Fault Tree Analysis (FTA)
	SIL Analysis to Australian Standard 61508 - Under Development
	Bow Tie Analysis (BTA)
	Failure Modes and Effects Analysis (FMEA)
	REACTIVE TOOLS:
	Root Cause Analysis (RCA) - Under Development

6. Previous Risk Assessment and other documents to be used and/or referenced:

Title	Author	Version	Referenced Document Date
Revised Stage 3 SMP Area – SMP Application	GSS Environmental	Final	01-Dec-2009
Revised Stage 3 SMP Area – Risk Assessment	GSS Environmental	Final	11-Sep-2009
3 North SMP Area Risk Assessment	GSS Environmental	Final	07-Nov-2008
Awaba East Exploration Risk Assessment	GSS Environmental	Final	04-Apr-2008
SMP Risk Assessment for Main South Area (incl Stage 2 Area)	Environmental Resource Management	Final	10-Jan-2005
3 North Area – SMP Application	GSS Environmental	Final	01-Dec-2008
Awaba East Exploration Review of Environmental Factors (REF), including environmental risk mapping and specialist reports for ecology & Aboriginal heritage	GSS Environmental	Final	04-Aug-2008
2005 SMP Application - Main South Area	Environmental Resource Management	Final	05-Dec-2005
DPI Staged Approval Conditions for Main South Area and 3 North Area	DPI-MR	Final	Stage 1 – Sep-2007 Stage 1 variation – Aug-2008 Stage 2 – Sep-2008 3 North – Mar-2009
Environmental Monitoring Program (<i>incorporating Public Safety MP & Watercourse MP</i>), Subsidence Monitoring Plan	Various		
Alluvium Groundwater study	Australasian Groundwater and Environmental Consultants	Final	07-Jan-2008
Review of Panel & Pillar Layout	Seedsman Geotechnics	Final	04-Aug-2008

7. Information Required for Risk Assessment:

Presentations were made by the Centennial Mine Manager and GSS Environmental to the risk assessment team at the start of the risk assessment workshop (refer **Appendix A – Risk Assessment Presentations – GSSE and Centennial**), which provided an overview of the key characteristics of the Project study areas, and aspects required for discussion and assessment during the risk assessment. The presentations illustrated the study areas, outlined the mining method, predicted subsidence behavior and history of mining and subsidence in the area. The risk assessment team was given the opportunity to comment on the material in each presentation.

Following the initial presentation provided at the risk assessment workshop the scope of the Part 3A application was updated. These changes in scope have been incorporated into this Risk Assessment report and were communicated to the risk team who were then given the opportunity to comment on the risk assessment in light of the revised scope.

Preliminary mapping/figures were presented for natural and constructed surface features and land ownership within the Study Area. Comment was provided on each relevant aspect by the specialists present at the risk assessment meeting for ecology, archaeology/Aboriginal heritage, noise, air quality, surface water and mine subsidence.



8. Venue and Time:

Date	Description	Location	Start Time	End Time	Comment
1. 13-Jan-2010	Scoping	Awaba Colliery	9:00 AM	10:30 AM	Completion of presentations. Discussions with stakeholders regarding mining method & controls to minimise subsidence
2. 13-Jan-2010	Assessment	Awaba Colliery	10:30 AM	2:00 PM	Completion of RA
3. 21-Jan-2010	Review	Various Locations (emailed to risk team)	21/01/10	27/01/10	Draft risk assessment report sent to risk team for review and comment before finalisation
4. 19-Feb-2010	Review	Various Locations (emailed to risk team)	19/02/10	22/02/10	Draft risk assessment report updated with revised scope to include aspects such as the private haul road use and the existing quarry, etc. then sent to risk team for review and comment before finalisation

9. Risk Assessment Team Selection

Name	Title	Company	Yrs. of Exp.	E-Mail Address
Roger Davis	(former) Mine Manager	Awaba Colliery (now Myuna Colliery)	32	roger.davis@centennialcoal.com.au
Grant Watson*	(new) Mine Manager	Awaba Colliery	19	grant.watson@centennialcoal.com.au
Craig Cluderay	Surveyor	Awaba Colliery	26	craig.cluderay@centennialcoal.com.au
Mary-Anne Crawford	Group Environment Manager	Centennial Coal	15	maryanne.crawford@centennialcoal.com.au
Jeff Dunwoodie	Environmental Coordinator	Newstan/Awaba Colliery	7	jeffrey.dunwoodie@centennialcoal.com.au
Craig Bagnall	Project Manager	GSS Environmental	16	bagnell@gssenvironmental.com
Eryn Bath	Project Manager	GSS Environmental	10	bath@gssenvironmental.com
Anthony Reid	Environmental Scientist	GSS Environmental	2	reid@gssenvironmental.com
Colin Driscoll	Environmental Biologist	Hunter Eco	30	cd_enviro@bigpond.com
Lisa-Maree Campbell	Archaeologist	RPS HSO	5	lisa-maree@rpshso.com.au
Ian Joliffe	Principal Water Engineer	GHD	30	ian.joliffe@ghd.com
Katie Teyhan	Noise Consultant	Heggies	7	katie.teyhan@heggies.com
Jason Watson*	Air Quality / GHG Consultant	Heggies	12	jason.watson@heggies.com
Veronica Warren	Environmental Officer	Newstan/Awaba Colliery	2	Veronica.warren@centennialcoal.com.au
Lee-Ann Snowden	Commercial Support Officer	Centennial Coal	28	leeann.snowden@centennialcoal.com.au

* Reviewed Risk Report and Risk Register including risk workshop presentations, did not attend workshop.



WRAC Analysis Worksheet

L= Likelihood; MRC= Maximum Reasonable Consequence; RR= Risk Rank

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
1. Stakeholder Consultation	There is a risk to Awaba from ::: Part 3A Project application ::: Caused by: Lack of adequate/appropriate consultation or Objections received during exhibition period Resulting in: Delays to project approval.	1.1.a. Centennial Corporate Community Consultation Procedures and experience.	C (Pb)	3 (F)	13 (S)	1. Complete consultation for finalised East B mining area.
		1.1.b. Stakeholder Engagement Plan.				2. Consultation log to be developed for Part 3A application consultation process.
		1.1.c. Stakeholder (including Aboriginal and infrastructure) consultation undertaken for revised Stage 3 mining area SMP (2009).				
		1.1.d. Stakeholder (including Aboriginal) consultation undertaken for preliminary East B mining area (2009).				
2. Soils	There is a risk to Awaba from ::: Surface operations ::: Caused by: Surface disturbance Resulting in: Erosion and sedimentation.	2.1.a. Minimal additional construction activities and surface disturbances.	D (Pb)	4 (E)	21 (L)	
		2.1.b. Erosion sediment control installed for any surface disturbance.				
		2.1.c. PCD.				
3. Flora and Fauna	There is a risk to Awaba from ::: Surface operations ::: Caused by: Surface disturbance Resulting in: Disturbance to threatened species and/or endangered communities.	3.1.a. Minimal additional construction activities and surface disturbances.	D (Pb)	4 (E)	21 (L)	3. Specialist ecology assessment including cumulative impacts required for Part 3A application including any required mitigation measures.
		3.1.b. Flora and Fauna Management Plan including permit to clear.				
		3.1.c. Area proposed for new dam is already disturbed.				
	There is a risk to Awaba from ::: Underground operations ::: Caused by: Underground mining subsidence (plug failure) Resulting in: Disturbance to threatened species	3.2.a. Mine design (extraction only in areas of adequate depth of cover).	D (Pb)	4 (E)	21 (L)	4. Specialist ecology assessment including cumulative impacts required for Part 3A application including any required mitigation measures.
		3.2.b. Specialist Ecological Assessment undertaken for revised Stage 3 Area SMP 2009.				

WRAC Analysis Worksheet

L= Likelihood; MRC= Maximum Reasonable Consequence; RR= Risk Rank

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	and/or endangered communities including GDE.					
	There is a risk to Awaba from ::: Potential to trigger detailed requirements (incl. consultations) of the federal Environment Protection & Biodiversity Conservation (EPBC) Act ::: Caused by: Federally listed Threatened Species being disturbed within the project area Resulting in: Breach of the EPBC Act, potential delays in project or failure to receive approval.	3.1.a. Flora and Fauna Management Plan including permit to clear. 3.1.b. Specialist Ecological Assessment undertaken for Revised Stage 3 Area SMP 2009.	D (Pb)	4 (E)	21 (L)	5. a) Specialist ecology assessment including cumulative impacts required for Part 3A application including any required mitigation measures. 5.b) Submit formal referral to DEWHA for instruction.
4. Heritage (indigenous and Non-Indigenous)	There is a risk to Awaba from ::: Surface operations ::: Caused by: Surface disturbance Resulting in: Disturbance to Aboriginal sites.	4.1.a. Minimal additional construction activities and surface disturbances.	C (Pb)	3 (E)	13 (S)	6. Specialist archaeology assessment required for Part 3A application including any required mitigation measures.
		4.1.b. Specialist archaeological assessment and Aboriginal community consultation for revised Stage 3 Area and preliminary East B area.				7. Commence additional Aboriginal Community Consultation.
		4.1.c. Area proposed for new dam is already disturbed but still to be assessed by archaeologist.				8. Review Newstan Colliery Holding Aboriginal Heritage Management Plan and update as required.
		4.1.d. Centennial procedure requires Permit to Clear for all surface disturbances.				
	There is a risk to Awaba from ::: Surface operations ::: Caused by: Surface disturbance Resulting in: Disturbance to European Heritage items.	4.2.a. Minimal additional construction activities and surface disturbances.	D (Pb)	3 (L)	17 (M)	9. Specialist archaeology assessment required for Part 3A application including any required mitigation measures.
		4.2.b. Specialist archaeological assessment for revised Stage 3 Area and preliminary East B area.				
		4.2.c. Centennial procedure requires Permit to Clear for all surface disturbances.				

WRAC Analysis Worksheet

L= Likelihood; MRC= Maximum Reasonable Consequence; RR= Risk Rank

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	There is a risk to Awaba from ::: Underground operations ::: Caused by: Underground mining subsidence (plug failure) Resulting in: Disturbance to Aboriginal sites. or Disturbance to European Heritage items.	4.3.a. Mine design (extraction only in areas of adequate depth of cover). 4.3.b. Specialist Aboriginal and European archaeological assessment for revised Stage 3 Area and preliminary East B area.	D (Pb)	3 (E)	17 (M)	10. Specialist archaeology assessment required for Part 3A application including any required mitigation measures.
5. Air Quality	There is a risk to Awaba from ::: Surface operations ::: Caused by: Plant and machinery (fixed and mobile) Resulting in: Exceedance of relevant DECCW criteria.	5.1.a. No additional operational activities or significant increase in production. 5.1.b. Minimal additional construction activities and surface disturbances. 5.1.c. Dust Management Plan including onsite controls. 5.1.d. Monthly dust monitoring.	C (IF)	4 (E)	18 (M)	11 Specialist air quality assessment including cumulative impacts required for Part 3A application including any required mitigation measures.
	There is a risk to Awaba from :::Dust emissions::: Caused by: Transport of coal by trucks to either Newstan or Eraring on private haul road Resulting in: Exceedance of relevant DECCW criteria and/or receipt of complaints at residences.	5.2.a. Coal transport trucks have loads covered 5.2.b. No additional operational activities or significant increase in production 5.2.c. Dust Management Plan including onsite controls. 5.2.d. Monthly dust monitoring.	D (Pb)	4 (E)	21 (L)	12 Specialist air quality assessment including cumulative impacts required for Part 3A application including any required mitigation measures.
6. Greenhouse Gas	There is a risk to Awaba from ::: Mine operations ::: Caused by: Plant and machinery (fixed and mobile), transportation, fugitive emissions, power consumption, additional burning of coal (all scope 1 and 2 emissions - NGERS)	6.1.a. No additional operational activities or significant increase in production. 6.1.b. Awaba Colliery has historically had very low methane emissions. 6.1.c. Awaba emissions currently below 25,000 tonnes CO2 NPI trigger level.	D (Pb)	4 (E)	21 (L)	13 Greenhouse Gas impacts to be assessed as part of the Part 3 A application.

WRAC Analysis Worksheet

L= Likelihood; MRC= Maximum Reasonable Consequence; RR= Risk Rank

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	Resulting in: Significant increase in greenhouse gas emissions and associated impacts.	6.1.d. Existing monthly audited assessments. 6.1.e. Annual Reports to NGRS.				
7. Surface Water	There is a risk to Awaba from ::: Pit top dirty water ::: Caused by: Rainfall and failure of stormwater drainage system Resulting in: Unintended discharge from the LDP009 (non compliance with EPL quality criteria).	7.1.a. No additional operational activities or significant increase in surface water management requirements from existing operations.	B (Op)	3 (L)	9 (H)	14 Specialist surface water assessment including cumulative impacts required for Part 3A application including any required mitigation measures.
		7.1.b. Existing pollution control dam (PCD).				15 Proposed additional dam capacity budgeted.
		7.1.c. Existing oil water separator.				16 Annual water balance to quantify site water usage.
		7.1.d. Separation of clean and dirty waters (diversions, piping etc).				
		7.1.e. Ability to pump water underground (from PCD).				
		7.1.f. Routine monitoring and level alarms.				
		7.1.g. EPL licence discharge.				
		7.1.h. Staff training and equipment for spill response.				
		7.1.i. Bunded storage areas, eg diesel.				
	There is a risk to Awaba from ::: Pit top clean water ::: Caused by: Spill or failure of the bunded storage area introducing pollutants into clean water system Resulting in: Discharge of polluted water.	7.2.a. No additional operational activities or significant increase in surface water management requirements from existing operations.	D (Pb)	4 (E)	21 (L)	17 Specialist surface water assessment including cumulative impacts required for Part 3A application including any required mitigation measures.
		7.2.b. Separation of clean and dirty waters (diversions, piping etc).				
		7.2.c. Staff training and equipment for spill response.				
		7.2.d. Bunded storage areas, eg diesel.				
	There is a risk to Awaba from ::: Surface Cracking in the Revised Stage 3 Area ::: Caused by: Mining operations	7.3.a. No secondary extraction under second or third order creeks or their alluvial deposits	E (Pb)	4 (R)	23 (L)	18. Review of SMP investigations and assessments (including cumulative impacts) required for Part 3A application (EA) including any additional required mitigation measures.
		7.3.b. Mine design (extraction only in areas of adequate depth of cover).				
		7.3.c. Flow path analysis assessment completed by HunterEco for the Revised Stage 3 Area				



WRAC Analysis Worksheet

L= Likelihood; MRC= Maximum Reasonable Consequence; RR= Risk Rank

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	Resulting in: Cracking of banks and first order tributaries of creek beds, loss of water flows, iron deposits, increased sediment in drainage lines, loss of aquatic habitat.	7.3.d. Watercourse Management Plan				
	There is a risk to Awaba from ::: Surface Cracking in the East B Area ::: Caused by: Mining operations	7.4.a No second order or higher creek sections within the East B Area 7.4.b. Mine design (extraction only in areas of adequate depth of cover). 7.4.c. Surface Water Management Plan	E (Pb)	4 (R)	23 (L)	19. Review of SMP investigations and assessments (including cumulative impacts) required for Part 3A application (EA) including any additional required mitigation measures. 20. Surface water flow path analysis recommended assessing downstream impacts in the event of worst case ('plug failure') scenario.
	Resulting in: Cracking of banks and first order tributaries of creek beds, loss of water flows, iron deposits, increased sediment in drainage lines, loss of aquatic habitat.	7.4.d. Watercourse assessment was carried out for Awaba East Stage 1 Exploration REF study area.				
	There is a risk to Awaba from ::: Surface Cracking in the Main South Stage 2 Area ::: Caused by: Mining operations	7.5.a No secondary extraction including prescribed buffer zones under second or third order creeks or their alluvial deposits 7.5.b. Mine design (extraction only in areas of adequate depth of cover).	E (Pb)	4 (R)	23 (L)	21. Review of SMP investigations and assessments (including cumulative impacts) required for Part 3A application (EA) including any additional required mitigation measures. 22. Surface water flow path analysis recommended assessing downstream impacts in the event of worst case ('plug failure') scenario.
	Resulting in: Cracking of banks and first order tributaries of creek beds, loss of water flows, iron deposits, increased sediment in drainage lines, loss of aquatic habitat.	7.5.c. Approved Subsidence Management Plan including risk assessment for subsidence impacts				
		7.5.d. Watercourse Management Plan				
		7.5.e. Surface water assessment was carried out for Awaba East Stage 1 Exploration REF study area.				

WRAC Analysis Worksheet

L= Likelihood; MRC= Maximum Reasonable Consequence; RR= Risk Rank

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
8. Groundwater	There is a risk to Awaba from ::: Mine operations - coal seam aquifers ::: Caused by: Underground mining Resulting in: Ground water system impacts or Inflow of ground water to underground workings.	8.1.a. Historical underground workings since 1947 have depressurised the aquifer.	D (IF)	4 (E)	21 (L)	
		8.1.b. Historical minimum water observed from coal seam (dry seam).				
		8.1.c. Routine mine inspections.				
		8.1.d. AGECE Groundwater Investigations - 2008.				
	There is a risk to Awaba from ::: Mine operations - shallow aquifers ::: Caused by: Underground mining subsidence (plug failure) Resulting in: Impact on ground water dependent ecosystems.	8.2.a. AGECE Groundwater Investigations - 2008.	D (Pb)	4 (E)	21 (L)	
		8.2.b. Mine design (extraction only in areas of adequate depth of cover).				
		8.2.c. Mining extraction barriers around second and third order streams.				
	There is a risk to Awaba from ::: Groundwater Infill of Mine Workings ::: Caused by: Inadequate post closure (long-term) groundwater strategy Resulting in: Impacts (including seepage) upon infrastructure or lands not owned by Centennial.	8.3a. Awaba Part 3A BBRA (2010)	B (Pb)	3 (E)	9 (H)	23. Creation of a hydro-geological model for the Awaba Colliery based on Centennial Newstan.
		8.3.b Existing Licenced Discharge Points (LDPs) under the site's EPL with volumetric discharge limits				
		8.3 c Surface inspections for subsidence cracking and appropriate rehabilitation where required prior to closure (wrt cracks as potential long term water egress points)				
	There is a risk to Awaba from ::: Groundwater management::: Caused by: Mine Dewatering	8.4.a. Groundwater pumped through LDP (Barnes Dam) in accordance with Awaba's EPL	B (Pb)	3 (L)	9 (H)	24. Specialist groundwater assessment including cumulative impacts required for Part 3A application including any required mitigation measures (including required additional regulatory approvals for 10 South Bore dewatering). Includes consideration of the hydrogeological model being developed (see above).
		8.4.b. Discharge of mine water via 10 South Bore to Eraring Ash Dam (in accordance with agreements with				



WRAC Analysis Worksheet

L= Likelihood; MRC= Maximum Reasonable Consequence; RR= Risk Rank

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	Resulting in: Breach of applicable regulatory requirements relating to discharge (including quality and quantity).	Eraring Energy).				
9. Subsidence	There is a risk to Awaba from ::: Subsidence::: Caused by: Underground Mining Resulting in: Subsidence impacts upon public safety, natural and man-made surface features, including areas of environmental significance (as per SMP Guidelines, 2003).	9.1.a. Main South Area Subsidence Risk Assessment (Appendix B) *note highest risk within RA was to public safety ("plug" failure resulting in risk of accident to truck drivers) ** this risk was ranked without considering controls which include no secondary extraction under roads and limits for mining at particular depths of cover	D (Op)	1 (PI)	7** (H)	25 Specialists studies will review previous investigations for the Main South Area SMP 2005/2007 and the adequacy of these controls for the proposed mining method and mine layout for the remaining areas with Main South Stage 2 Area. Refer Appendix B for full copy of the subsidence risk assessment for Main South Area (incl Stage 2).
		9.1.b. East B Area Subsidence Risk Assessment (Appendix C) *note: highest risk within RA was to public safety ("plug" failure resulting in personal injury, vehicle damage & vegetation instability) and Archaeology (various aspects). **this risk was ranked considering current controls implemented.	D (IF)	3 (PI)	17 (M)	26. Controls recommended within the East B Area subsidence risk assessment are considered adequate for this Project. Noted that East B area has no surface infrastructure (unlike other areas). Refer Appendix C for full copy of the subsidence risk assessment for East B Area.
		9.1.c. Revised Stage 3 Area Subsidence Risk Assessment (Appendix D) *note highest risk within RA was to public safety ("plug" failure resulting in risk of accident to truck drivers). **this risk was ranked considering current controls implemented.	E (Op)	3 (PI)	20 (L)	27. Controls recommended within the Revised Stage 3 Area subsidence risk assessment are considered adequate for this Project. Refer Appendix D for full copy of the subsidence risk assessment for Revised Stage 3 Area.
10. Traffic and Transport	There is a risk to Awaba from ::: Mine operations ::: Caused by: Employee/contractor movements to and from site, deliveries, off site maintenance Resulting in:	10.1.a. No additional operational activities or personnel proposed under Part 3A (continuing existing operations).				28 Undertake consultation with DoP and Council/RTA to determine their EA requirements.
		10.1.b. Majority of vehicles entering and exiting are light vehicles.	D (IF)	3 (PI)	17 (M)	
		10.1.c. Mine entrance has good visibility and is a low traffic density road.				
		10.1.d. Mine's projected cessation is late				



WRAC Analysis Worksheet

L= Likelihood; MRC= Maximum Reasonable Consequence; RR= Risk Rank

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	Interaction and public safety risks.	2011.				
	There is a risk to Awaba from ::: Transport of coal ::: Caused by: Truck movements Resulting in: Interaction and public safety risks.	10.2.a. No additional operational activities or significant increase in production. 10.2.b. All coal transported on private haul road (no transport on public roads). 10.2.c. Fencing, gate and signage to prevent public access to haul road.	E (IF)	3 (PI)	20 (L)	
11. Visual Amenity	There is a risk to Awaba from ::: Surface operations ::: Caused by: Surface infrastructure Resulting in: Unacceptable visual impacts.	11.1.a. Minimal additional construction (no additional operational activities) 11.1.b. Natural topographical and vegetation screening. 11.1.c. Low density of surrounding residential receptors. 11.1.d. Complaints Register kept (no complaints to date).	E (Pb)	4 (R)	23 (L)	
12. Site Services	There is a risk to Awaba from ::: Not Applicable ::: Caused by: Resulting in: Not applicable.	12.1.a. No additional operational activities, site services or personnel proposed under Part 3A (continuing existing operations).				
13. Waste Management	There is a risk to Awaba from ::: Domestic waste water management ::: Caused by: Operation of surface facilities Resulting in: Discharge of water beyond licence requirements.	13.1.a. No additional operational activities or personnel proposed under Part 3A (continuing existing operations). 13.1.b. Monthly water quality monitoring. 13.1.c. Weekly inspections of irrigation system. 13.1.d. EPL licence discharge.	D (Pb)	4 (E)	21 (L)	
	There is a risk to Awaba from	13.2.a. No additional operational activities or personnel proposed under Part	D (Pb)	4 (E)	21 (L)	



WRAC Analysis Worksheet

L= Likelihood; MRC= Maximum Reasonable Consequence; RR= Risk Rank

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	∴ Solid general waste ∴ Caused by: Mining operations Resulting in: Pollution due to incorrect disposal and inefficient use of resources.	3A (continuing existing operations). 13.2.b. Waste contract. 13.2.c. Recycling and waste sorting program.				
14. Closure and Rehabilitation	There is a risk to Awaba from ∴ Inadequate closure and rehabilitation ∴ Caused by: Poor planning Resulting in: Failure to meet mine closure criteria (including environmental) and reclaim mine security deposit from the DII.	14.1.a. Approved Mine Closure Plan. 14.1.b. Security deposit. 14.1.c. Successful corporate experience in mine closure and site rehabilitation.	D (Pb)	3 (E)	17 (M)	29. Mine Closure and Rehabilitation Risk Assessment to be conducted prior to commencement of closure works.
15. Land Ownership	There is a risk to Awaba from ∴ Not Applicable ∴ Caused by: Resulting in: Not applicable.	15.1.a. Entire Project area is Crown Land - Held by Centennial Newstan Pty Ltd (CCL746).				
16. Socio-Economic	There is a risk to Awaba from ∴ Failure to attain project approval under Part 3A ∴ Caused by: Application refusal Resulting in: Adverse socio economic impact, ie loss of jobs and flow on effects or Loss of revenue from coal sales.	16.1.a. Commenced development approval process.	D (Pb)	2 (F)	12 (S)	30. Commence and continue consultation with DoP and Stakeholders.



WRAC Analysis Worksheet

L= Likelihood; MRC= Maximum Reasonable Consequence; RR= Risk Rank

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
17. Noise and Vibration	There is a risk to Awaba from ::: Surface operations ::: Caused by: Plant and machinery (fixed and mobile) Resulting in: Exceedance of Industrial Noise Policy criteria.	17.1.a. No additional operational activities proposed under Part 3A.	C (D)	4 (E)	18 (M)	31 Specialist noise assessment including cumulative impact . required for Part 3A application including any required mitigation measures.
		17.1.b. Minimal additional construction activities and surface disturbances.				
		17.1.c. Partially enclosed plant.				
		17.1.d. Limited trucking operations between 12am and 6am.				
		17.1.e. Low density of surround residential receptors.				
		17.1.f. Natural topographical and vegetational screening.				
		17.1.g. Scheduled maintenance of surface vehicles and plant.				
		17.1.h. Operational controls in CP to minimise noise.				
	There is a risk to Awaba from ::: Underground operations ::: Caused by: Blasting Resulting in: Exceedance of relevant DECCW criteria.	17.2.a. No blasting is proposed under the Part 3A.	E (Pb)	4 (L)	23 (L)	
		17.2.b. No blasting undertaken at Awaba for approximately the past 20 years.				
	There is a risk to Awaba from :::noise emissions::: Caused by: Transport of coal by trucks to either Newstan or Eraring by private haul road Resulting in: Exceedance of relevant DECCW criteria.	17.3.a. No significant change to operational activities proposed under Part 3A (continuation of existing operations/"business as usual").	D (If)	4 (E)	21 (L)	32 Specialist noise assessment including cumulative impact . required for Part 3A application including any required mitigation measures.
		17.3.b. No noise complaints to date regarding haulage				
		17.3.c. Limited trucking operations between 12am and 6am.				
		17.3.d. Low density of surround residential receptors.				
		17.3.e. Natural topographical and vegetational screening.				



WRAC Analysis Worksheet

L= Likelihood; MRC= Maximum Reasonable Consequence; RR= Risk Rank

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
		17.3.f. Scheduled maintenance of surface vehicles and plant.				
18. Contaminated Land	There is a risk to Awaba from ::: Mining and Surface operations ::: Caused by: Spills and/or leakage in storage and refueling areas Resulting in: Contamination of soil and groundwater exceeding relevant DECCW criteria.	18.1.a. Phase 1 Contamination Study completed to identify potential contaminants				33. Review the Phase 1 Assessment to determine if there are any reporting requirements to the DECCW.
		18.1.b. Designated storage areas for hydrocarbons and other contaminants	C (Pb)	4 (E)	18 (M)	



RISK MANAGEMENT STANDARD

Management Standard-004

CENTENNIAL RISK MATRIX							Likelihood					Description (D)
Rating	Consequence						A Certain	B Probable	C Possible	D Remote	E Improbable	
	Note: Consequence may result from a single event or may represent a cumulative impact over a period of 12 months. Use the worst case reasonable consequence if there is more than one.						Common"	Has Happened within Centennial"	"Could Happen & has happened in non-CEY operations	Not Likely	"Practically impossible	Probability (Pb)
	Impact to Annual Business Plan (F)	Personal Injury (PI)	Business Interruption (BI)	Legal (L)	Reputation (R)	Environment (E)	Frequent incidents	Regular incidents	Infrequent incidents	Unlikely to occur. Very few recorded or known incidents	May occur in exceptional circumstances. Almost no recorded incidents.	Incident Frequency (IF)
							Operations – within 3 months	Operations – within 2 years	Operations – within 5 years	Operations – within 10 years	Operations – within 30 years	Operations (Op)
							Project – Every project	Project – Every 2 projects	Project – Every 5 projects	Project – Every 10 projects	Project – Every 30 projects	Project (Pr)
1. Catastrophic	>\$50m	Multiple Fatalities	> 1month	Prolonged litigation, heavy fines, potential jail term	Prolonged International media attention	Long term impairment habitats/ ecosystem	1 (E)	2 (E)	5 (H)	7 (H)	11 (S)	
2. Major	\$10m - \$50m	Single Fatality	1 week to 1 month	Major breach/ major litigation	International media attention	Long term effects of ecosystem	3 (E)	4 (E)	8 (H)	12 (S)	16 (M)	
3. Moderate	\$1m - \$10m	Serious/ Disabling Injury	1 day to 1 week	Serious breach of regulation. prosecution/ fine	National media attention	Serious medium term environmental effects	6 (H)	9 (H)	13 (S)	17 (M)	20 (L)	
4. Minor	\$100k - \$1m	Lost Time Injury	12 hrs to 1 day	Non-compliance, breaches in regulation	Adverse local public attention	Minor effects to physical environment	10 (S)	14 (S)	18 (M)	21 (L)	23 (L)	
5. Insignificant	<\$100k	First Aid Treatment Only	< 12 hrs	Low level compliance issue	Local complaints	Limited physical damage	15 (S)	19 (M)	22 (L)	24 (L)	25 (L)	



Risk Rating	Risk Category		Generic Management Actions
1 to 4	E	Extreme	Immediate intervention required from senior management to eliminate or reduce this risk
5 to 9	H	High	Imperative to eliminate or reduce risk to a lower level by the introduction of control measures. Management planning required at senior levels
10 to 15	S	Significant	Corrective action required, senior management attention needed to eliminate or reduce risk
16 to 19	M	Moderate	Corrective action to be determined, management responsibility must be specified
20 to 25	L	Low	Monitor and manage by corrective action where practicable

THIS DOCUMENT IS UNCONTROLLED UNLESS VIEWED ON THE INTRANET

APPENDIX A

RISK ASSESSMENT WORKSHOP PRESENTATIONS

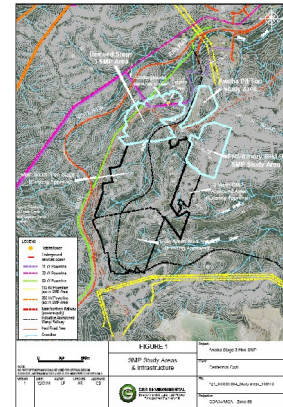
Part 3A Broad Brush RA General Introduction to Workshop Participants

Awaba Colliery Conference Room
13 January 2010

Mine Manager - Roger Davis

Study Area

- 2 Continuous Miner Units
- Bord & Pillar and Partial Pillar Extraction
- Approx. 800 000 Tpa
- Bord & Pillar and Partial Pillar Extraction
- Recover remaining final reserves in 18 months
- Expected completion Dec. 2011
- Mostly Crown Land
- Mining title which includes the surface over the majority of the lease.
- Predominately undulating bush land



Description of Proposal

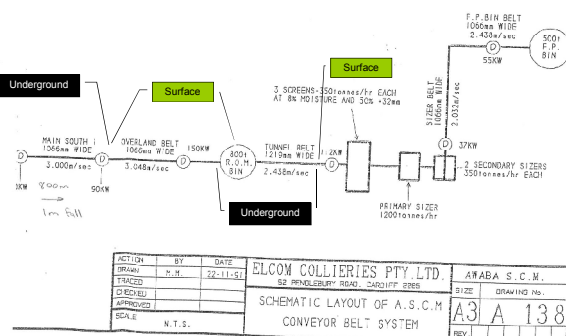
- Proposed Application Area consists of existing first workings developed from 1947.
- Partial extraction mining method chosen to satisfy mine safety, resource recovery, surface subsidence and production requirements.
- Pillar and barrier design evaluated by Seedsman.

Natural Features



Typical Bushland

Coal Processing flow diagram





Awaba Colliery
Part 3A Environmental Assessment
Project Broad Brush Risk Assessment (BBRA) Workshop:
Mining and Processing of Coal from Revised Stage 3 Area and East B Mining Areas
Wednesday 13th January, 2010





GSS ENVIRONMENTAL
Environmental, Land and Project Management Consultants

Agenda

- Key Objectives & Outcomes
- Scope of the Environmental Assessment
- Study Areas
 - Background: Historical & Proposed Mining
 - Previous Studies & Available Info
 - Land Ownership
 - Constructed (Man-made) Surface Features
 - Natural Surface & Sub-surface Features
 - Expected Subsidence Behavior
- Associated Operational Impacts (i.e. processing, transport, etc)
- Centennial Risk Standard and Risk Matrix
- Risk Assessment Methodology
- Risk Rankings
 - A) Project BBRA (including processing)
 - B) East B Area (re-rank based on very similar 3 North Area existing SMP RA)
 - C) Revised Stage 3 Area (SMP RA already completed)

Key Objectives & Outcomes

- Outline scope of the project and provide background information for the study areas for assessment.
- *Focus is on high risks or potentially severe consequence*
- Identification of additional controls required (*particularly with regard to Centennial management plans*)

Following on from today:

- Draft Project Broad Brush Risk Assessment (BBRA) Report (*for review by the Project Risk Team*)
- Finalised Project BBRA Report and associated Risk Registers appended to the Environmental Assessment.

Part 3A – Environmental Assessment
Why Part 3A?

- Historically mining at Awaba since 1947
- Since 2005 there have been a number of SMP Approvals for partial pillar extraction in Main South (Stage 1 and 2) Areas and 3 North Area and in 2009 an application for the Revised Stage 3 SMP Area was submitted
- Mining until now has continued under “existing use rights” – timing criteria for limits of existing disturbance
- Part of East B Area not previously mined by first workings. Centennial legal review considers triggers need for Environmental Assessment
- Coal Mining projects required to be assessed under Part 3A of EP&A Act by SEPP (Major Development) 2005

Part 3A – Environmental Assessment
The Part 3A Process

- Pre-Project Risk Assessment - Today
- Preliminary Environmental Assessment (PEA) submitted to the DoP seeking confirmation of approval pathway and EARs/DGRs
- Planning Focus Meeting - if considered necessary
- DGRs/EARs - Formal advice issued by the DoP regarding approval pathway and EARs/DGRs
- Consultation - Government, community and stakeholder as required (ongoing)
- Specialist Reports - consultants finalise assessments and prepare reports for inclusion within the EA
- Prepare EA and lodge for Adequacy with the DoP (and related agencies DECCW, NOW etc)
- DoP adequacy review and acceptance of the EA (following revisions and responses from Centennial if required by the adequacy review)
- Finalisation of EA and advertised DoP exhibition of the EA
- DoP Assessment Report and submission to the Minister
- Response to Public Submissions and Minister's Determination

Part 3A – Environmental Assessment
What to Assess?

- **Mining Areas** → Revised Stage 3 and East B Areas
 - Potential for mining impacts upon Flora & Fauna, Archaeology, Natural and Man-Made Surface Features, Groundwater, Surface Water, GHG, etc.
- **Processing onsite at Awaba Colliery** (i.e. crushing and truck loading to Internal Haul Road)
 - Potential for associated impacts from crushing and loading operations (eg noise, vibration, dust, water management etc)

(Note: Majority of processing of Awaba coal is undertaken at Newstan under a separate existing development consent and is not part of the scope for this Environmental Assessment. Only the impacts associated with mining and preparing coal for transport (up until trucks are dispatched onto the internal Haul Road) needs to be assessed)

Study Areas – Aerial Photo

Existing Risk Assessments:

• Mining Areas:

- Revised Stage 3 Area - Existing SMP Risk Assessment for Revised Stage 3 Area **already completed** in 2009 (→ **completed, cross reference**)
- East B Area – Existing SMP Risk Assessment for adjacent and very similar **3 North Area** was completed in Dec 2008 and considered appropriate as basis for East B Area (→ **re-rank for East B Area**)

• Processing & Loading Areas (Pit Top):

- New risk assessment required under this Project BBRA

Study Area – Mining Areas Background

Revised Stage 3 Area

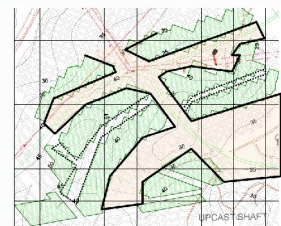
- Bord & Pillar workings since 1947
- Great Northern Seam
- Mining within CCL746
- In 2005, Awaba Colliery submitted an SMP for the entire Main South Area, consisting of 3 stages (starting south to north). DPI-MR adopted a 'staged' approach to issuing approvals for the overall Main South Area and approval for Stage 3 was not granted at this time.
- SMP Application for the Revised Stage 3 SMP Area submitted in December 2009, with revised area from the original as submitted in 2005.

East B Area

- The East B SMP Area consists of limited previously mined bord & pillar workings (since 1947) and **mainly proposed virgin mining areas**
- Located east of the Main South Area and immediately north of the similar 3 North Area
- Great Northern Seam
- Mining within CCL746
- Extraction within the East B Area will occur by establishing a mine plan essentially the same as the partial pillar extraction method
- Some specialist studies have been undertaken for the non-extended East B Area (to be updated).

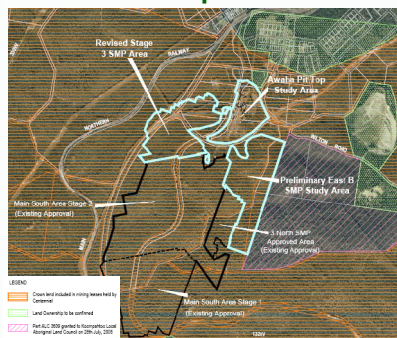
Study Area – Mining Areas Mining Method

- Mining method to be used: 'partial pillar extraction'
- The process involves extracting rows of pillars (**void**) and leaving rows (**pillars**) as support (see figure for proposed extraction in the Revised Stage 3 Area).
- The same mining method has been successfully implemented onsite in the 3 North Area.



Study Area – Mining Areas Land Ownership

- No privately-owned land or residences (all crown land bush under lease to Centennial).
- No areas under management of NSW Forests.
- No Aboriginal-owned land (KLALC) (adjacent lands but not inside SMP areas)



Study Area – Mining Areas Natural Surface Features

Revised Stage 3 Area

- **Surface Water**
 - Stony Creek (a third order creek) and three associated first order tributaries
 - Two first order creek sections of an unnamed creek to the west
- **Groundwater**
 - Three main hydro-geological units in the Awaba Colliery area include: *Shallow Weathered Zone Aquifers*, *Triassic & Permian Strata Aquifers* and *Alluvium Aquifers*. Generally major groundwater bearing strata depressurised and dewatered by the long term existing old workings.
- **Ecology**
 - No threatened Flora or Fauna species found although suitable habitat for *Tetratheca juncea* and *Grevillea parviflora* subsp. *parviflora*
 - Endangered Ecological Community identified along Stony Creek within area
 - Hunter Eco (2009) assessed no significant impacts upon ecology given predicted subsidence scenarios

Archaeology

- No Aboriginal or Heritage Sites located within the area (RPSHSO, 2009)

East B Area

- **Surface Water**
 - Four first order upper most creek sections are located in the area. Two drain to Stony Creek in the north/west and two drain to Killaben Creek and an unnamed creek in the east/southeast.
- **Groundwater**
 - Three main hydro-geological units in the Awaba Colliery area include: *Shallow Weathered Zone Aquifers*, *Triassic & Permian Strata Aquifers* and *Alluvium Aquifers*
- **Ecology**
 - Hunter Eco (Colin Driscoll) engaged to complete an ecological assessment for the East B SMP Area
- **Archaeology**
 - RPS HSO engaged to complete an archaeological assessment. This includes a field assessment and consultation with the Aboriginal community.

Study Area – Mining Areas

Man-made Surface Features

Revised Stage 3 Area

2009 SMP Application concluded there would be no significant impact for the predicted subsidence scenario on the following items within the area:

- **11KV Awaba Powerline**
This powerline is owned by Awaba and runs in same alignment as Energy Australia line.
- **33KV Energy Australia Powerline**
This transmission line is owned by Energy Australia and provides the 33KV power supply for Awaba Colliery.
- **66KV RailCorp Powerline**
This transmission line provides 66KV power supply for the Main Northern Railway Line.
- **Eraring Haul Road**
The haul road provides a link between the Awaba and Newstan Collieries and Westside Open Cut.
- **Abandoned Wangi Railway**
The railway line was abandoned in 1972. Approval for total extraction under the Wangi Railway was granted in 1988 and has since been undermined with no significant impact.

East B Area

- **Unsealed Tracks and Trails**
There are a limited number of tracks and trails that traverse the site, these are all unsealed and are of variable condition.

There are no other infrastructure items in the area.

Study Area – Mining Areas

Expected Subsidence

Revised Stage 3 Area

- Seedsman Geotechnics prepared the Subsidence Assessment for the SMP application.
- Maximum predicted subsidence for the area in the order of 90-135mm.
- Subsidence mainly occurring at the in-pillars, caused by compression of the floor and deformation of the pillar.

East B Area

- Seedsman Geotechnics have been engaged to undertake Subsidence Assessment for the Area
- Based on previous mining experience in the adjacent and similar 3 North Area, Centennial expects similar subsidence behaviour in East B Area (to be confirmed by subsidence report).
- Risk Assessment to base on this assumption.

Study Area – Mining Areas

Relevant Previous Studies

- 2009 SMP Application – Revised Stage 3 Area
- 2009/10 Surface Water Study (GHD) (*commenced*)
- 2009/10 Noise & Vibration Study (Heggies) (*commenced*)
- 2008 SMP Application – 3 North Area
- 2008 Awaba East Exploration REF
(including environmental risk mapping and specialist reports for ecology & Aboriginal heritage).
- 2005 SMP Application - Main South Area
- DPI Staged Approval Conditions for Main South Area
(Stage 1 Sep 2007, Stage 1 variation Aug 2008, Stage 2 Sep 2008)
- Documents developed for SMP Approval Compliance
- Environmental Monitoring Program (*incorporating Public Safety MP & Watercourse MP*)
- Subsidence Monitoring Programme
- Alluvium Groundwater study (*AGEC, May 2008*)
- Subsidence Assessment for Rev. Stage 3 Area (*Seedsman Geotechnics Nov 2009*)
- Review of Panel & Pillar Layout (*Seedsman Geotechnics Aug 2008*)

Study Area – Processing Areas

Overview

- Coal Coved from UG to Surface –
- Stockpiling –
- Crushing –
- Truck Loading –
- Water Management –
- Noise & Vibration Control –
- Dust Control –
- Other?

Centennial Risk Standard & Risk Matrix

- Centennial Risk Management Standard 004
- Key Process Steps
 - Forming a team of knowledge experts from all main operational processes
 - Identify all major operational processes and process steps
 - Identify hazards and calculate the risk of each hazard
 - Prioritise hazards in accordance to risk ranking
 - Review existing and additional controls required
 - Develop an action plan
 - Implement and monitor the action plan
- Centennial Risk Matrix (*Probability and Consequence Matrix*)
- AS4360 – AS for Risk Management (2004)

Risk Assessment Methodology

- Centennial Coal risk assessment standard - WRAC method
- For **Mining Areas**, the WRAC method in those cases also includes assessment of key potential failure scenario (see below).
- With respect to the two Mining Areas, risk assessment considers the potential environmental impacts for two scenarios:
 1. A higher than predicted scenario (worst case scenario) - 'Plug Failure' scenario of approximately 2m shear failure of the Teralba conglomerate spanned (unsupported) roof areas, and;
 2. The base case (expected maximum mining subsidence scenario) – To be confirmed with Seedsman Geotechnics.
- The undertaking of a worst case scenario assessment *first* allowed focus on key risk aspects if and where identified and, subsequently, consideration could be made for the base case scenario (expected maximum subsidence scenario) of whether the identified risks and controls required any further specific consideration and assessment.

APPENDIX B

REVISED STAGE 3 AREA: SUBSIDENCE RISK ASSESSMENT



Centennial Coal
Awaba

Risk Assessment Document

Awaba

SMP - Revised Stage 3 SMP Area

Risk Assessment No.: **20090911**

1. Background:

Centennial Newstan - Awaba Colliery are proposing to undertake pillar extraction within narrow panels in an area known as the "Revised Stage 3 SMP Area". The process is known as partial pillar extraction and involves extracting rows of pillars (void) and leaving rows remaining as support (pillars). The entire "Revised Stage 3 SMP Area" has been previously undermined by Awaba, through bord and pillar mining.

In 2005, Awaba Colliery submitted a SMP Application for the entire Main South Area, which consisted of 3 stages (starting south to north). However, NSW Department of Industry and Investment -DII (formally DPI) adopted a 'progressive/staged' approach to issuing approvals for the overall Main South Area, and as such approval for Stage 3 was not granted at this time. As part of the 2005 SMP application, a large section of the Revised Stage 3 SMP Area was studied at this time. An additional area, north east of the original 2005 SMP Area will now be also assessed for this SMP Application. This section of the Revised Stage 3 SMP Area was not studied for the 2005 SMP, with field assessments now required for this SMP Application.

A new SMP Application is required for the Revised Stage 3 SMP Area which is to be submitted to NSW DII for determination. In accordance with the NSW Department of Primary Industries – Mineral Resources (DPI-MR) *Guideline for Applications for Subsidence Management Approvals* (2003), a risk based process and assessment is required for the application. Specifically, risk aspects are to be considered in accordance with the requirements of sections s6.10.2 and s6.10.3 of the guidelines.

Two project background presentations (powerpoint) for the Revised Stage 3 SMP Area were presented to the risk team by the Awaba mine manager and subsidence consultant at the risk assessment workshop (see **Appendix 1 and 2** and further detail in Section 7). This provided an overview of the key natural and manmade features within the SMP area, as well as outlining the mining method, expected subsidence behavior and subsidence controls. The presentations also outlined the mining method and explained subsidence controls.

2. Objective:

The following key objectives of the risk assessment for the **Revised Stage 3 SMP Area** include:

- To establish an appropriate SMP risk assessment team of suitably qualified and experienced Centennial staff, specialist consultants and key stakeholders;
- Discuss and review existing information known for the Revised Stage 3 SMP Area and experience in adjacent mining areas;
- Identify, assess & evaluate potential subsidence impacts to surface and subsurface features (natural & man-made) for the aspects required by the DPI-MR *Guideline for Applications for Subsidence Management Approvals* (2003), and in accordance with the Centennial Risk Management Standard (004) using the Centennial Risk Matrix (probability matrix of consequence and likelihood), with a focus on identifying and addressing potentially high risks or potentially severe consequences. This will consider both expected/predicted maximum subsidence, and higher than predicted subsidence (worst case) scenario of 'plug failure';
- To establish a Draft SMP Risk Register (WRAC Worksheet) and risk report for the Revised Stage 3 SMP Area for review and comment by the risk team;
- The identification of additional controls required (including with respect to updating Centennial management plans for the SMP application); and
- To produce a Final SMP Risk Assessment Report (including the SMP Risk Register/WRAC Worksheet) for the Revised Stage 3 SMP Area Application to DPI-MR.

The Centennial risk assessment standard lists the following Hierarchy of Controls and was followed in undertaking this risk assessment. Note that the effectiveness of a control that is intended to reduce as a risk decreases from top to bottom of the list. Which in other words, the closer the control type is to the top of the hierarchy, the more potentially effective the control.

- Eliminate the hazard or energy source (do not use the energy);
- Minimise or replace the hazard or energy source (reduce the amount of energy to a less damaging level or replace the energy with another that has less potential negative consequences);
- Control the hazard or energy using engineered devices (ex. Lock outs, chemical containers, mechanical roof support, gas monitors, etc);
- Control the hazard or energy by using physical barriers (ex. machine guarding, warning signs, etc);
- Control the hazard or energy with procedures (ex. Isolation procedures, standard operating procedures, etc);
- Control the hazard or energy with personal protective equipment (ex. hard hats, boots with toe caps, gloves, safety glasses, welding gear, etc); and
- Control the hazard or energy with warnings and awareness (ex. posters, labels, stickers, verbal warnings, etc).



3. Potential Hazards:

The primary hazard assessed was surface cracking and deformation resulting from subsidence. This potential hazard was risk assessed for all the aspects listed in Section 4.

During the risk assessment, some stakeholders discussed the potential risk of pillar run. Concern was raised in that the unlikely event of a plug failure, subsidence impacts would spread and result in potential impact to the main northern railway which is approximately 100m from the closest proposed point of mining. This issue was addressed by the subsidence consultant, who responded saying that even in the unlikely event of plug failure, far field impacts would not occur. This will be further addressed in the specialist subsidence report.

4a. Risk Assessment Boundary Definition:

The scope of the risk assessment for the Revised Stage 3 SMP Area included:

- Consideration of the Revised Stage 3 SMP Area defined as the proposed workings plus 26.5 degree angle of draw;
- The risk assessment considered the potential subsidence impacts to surface and subsurface features (natural and man-made) for the worst case scenario of plug failure (2m shear failure of the Teralba conglomerate spanned (unsupported) roof areas). If a risk was determined to be medium or high for the plug failure scenario, the risk assessment team would assess the same risk under the predicted mining subsidence scenario (subsidence of approximately 90-135mm which was conservatively risk assessed up to 200mm, and negligible tilt or strain). However, the risk assessment team did not assess the predicted mining subsidence scenario as no risks were determined to be medium or high during the plug failure scenario.

The undertaking of the worst case scenario assessment first allowed focus on key risk aspects if identified and, subsequently, consideration under the base case scenario (expected mining predicted subsidence scenario) of whether the identified risks and controls required further consideration and assessment.

In accordance with DPI-MR *Guideline for Applications for Subsidence Management Approvals* (2003), the following subsidence and environmental related hazard categories/aspects were considered within the context of risks discussed and assessed by the risk team (as a minimum):

- Public Safety;
- Areas of high environmental, heritage or archaeological significance;
- Wetlands, swamps and water related ecosystems;
- Catchment Areas causing or exacerbating erosion and drainage pattern changes;
- Significant water courses including surface flows, water quantity and quality, and ecological integrity;
- Significant groundwater resources including levels and quality;
- Threatened & protected species under TSC Act 1995;
- Stability of escarpments & significant clifflines, pagodas or steep slopes;
- The serviceability of major public utilities and/or amenities;
- Surface improvements (including roads) causing damage beyond safety, serviceability and reparability;
- Agricultural suitability or productivity;
- Industrial, commercial and business establishments;
- Foreshores and land prone to flooding or inundation;
- Prescribed Dams or structures under the Dam Safety Act 1978; and
- Any other areas or features causing significant concern to the community, local and state government agencies.



5. Risk Assessment Methods:

Yes/No	Method
	PROACTIVE TOOLS
Yes	WRAC
	Fault Tree Analysis (FTA)
	SIL Analysis to Australian Standard 61508 - Under Development
	Bowtie Analysis - Under Development
	Failure Modes and Effects Analysis (FMEA)
	REACTIVE TOOLS:
	Root Cause Analysis (RCA) - Under Development

6. Previous Risk Assessment and other documents to be used and/or referenced

Title	Version	Referenced Document Date
2008 3 North SMP Area Risk Assessment	Initial	7 November 2008
2008 Awaba East Exploration Risk Assessment	Initial	4 th April 2008
2005 SMP Risk Assessment for Main South Area	initial	2005
2008 SMP Application – 3 North Area	Initial	December 2008
2008 Awaba East Exploration Review of Environmental Factors (REF), including environmental risk mapping and specialist reports for ecology & Aboriginal heritage	Initial	August 2008
2005 SMP Application - Main South Area	initial	December 2005
DPI Staged Approval Conditions for Main South Area		<i>Stage 1 Sep 2007, Stage 1 variation Aug 2008, Stage 2 Sep 2008</i>
Documents developed for SMP Approval Compliance		
Environmental Monitoring Program (<i>incorporating Public Safety MP & Watercourse MP</i>), Subsidence Monitoring Plan		
Alluvium Groundwater study (AGEC)		2008
Review of Panel & Pillar Layout (<i>Seedsman Geotechnics</i>)		August 2008



7. Information Required for Risk Assessment:

Two presentations were viewed and discussed by the risk assessment team at the start of the risk assessment workshop (refer **Appendix 1- Photos of SMP Area** and **Appendix 2 – Subsidence Presentation**), which provided an overview of the key characteristics of the Revised Stage 3 SMP Area, and aspects required for discussion and assessment during the risk assessment. The first presentation illustrated photos of the natural and manmade features within the SMP Area. The second presentation outlined the mining method of partial pillar extraction, predicted subsidence behavior and history of mining and subsidence in the area. Stakeholders were given the opportunity to comment on the material in each presentation.

Preliminary mapping/figures were presented for natural and constructed surface features and land ownership within the SMP Area. Comment was provided on each relevant aspect by the specialists present at the risk assessment meeting for ecology, archaeology/Aboriginal heritage and mine subsidence.



8. Venue and Time

Date	Description	Location	Start Time	End Time	Comment
1. 11-Sep-2009	Scoping	Awaba Colliery	9:00 AM	10:30 AM	Completion of presentations. Discussions with stakeholders regarding mining method and controls to minimise subsidence.
2. 11-Sep-2009	Assessment	Awaba Colliery	10:30 AM	2:00 PM	Completion of risk assessment



9. Risk Assessment Team Selection

Name	Title	Company	E-Mail Address	Role
Roger Davis	Mine Manager	Awaba Colliery	roger.davis@centennialcoal.com.au	Risk Assessment Owner (Awaba representative)
Craig Cluderay	Mine Surveyor	Awaba Colliery	craig.cluderay@centennialcoal.com.au	Awaba representative
Jeff Dunwoodie	Environmental Coordinator	Awaba Colliery	jeffrey.dunwoodie@centennialcoal.com.au	Awaba representative
Dr Ross Seedsman	Director	Seedsman Geotechnics Pty Ltd	sgplross@bigpond.com	Specialist subsidence consultant
Colin Driscoll	Environmental Biologist	Hunter Eco	cd_enviro@bigpond.com	Specialist ecological consultant
Chris Jones	Environmental Scientist	GSS Environmental	jones@gssenvironmental.com	Assisting in facilitating of workshop
Darrell Rigby	Archaeology Manager	RPS HSO	darrell@rpshso.com.au	Specialist Archaeological consultant
Nicole Armit	Environmental Engineer	GSS Environmental	armit@gssenvironmental.com	Risk Assessment Facilitator
Sandy Pfeiffer	Senior Engineering Geologist	RailCorp	sandy.pfeiffer@railcorp.nsw.gov.au	Representing Infrastructure owner
David Eccles	Overhead Mains Design Manager	Energy Australia	deccles@energy.com.au	Representing Infrastructure owner
Richard Grant	Rail Corridor Management Group - Metro North Coordinator	RailCorp	Richard.Grant@railcorp.nsw.gov.au	Representing Infrastructure owner
Eddie Blackwell	External Interface Manager	RailCorp	eddie.blackwell@railcorp.nsw.gov.au	Representing Infrastructure owner
Kate Hendrikson	External Party Works Manager - North District	RailCorp	kate.hendrikson@railcorp.nsw.gov.au	Representing Infrastructure owner
Geoff Byrnes	Fuel Manager	Eraring Energy	geoff.byrnes@eraring-energy.com.au	Representing Infrastructure owner



WRAC Analysis Worksheet

L= Likelihood; MRC= Maximum Reasonable Consequence; RR= Risk Rank

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
1. Public safety	There is a risk to Awaba from ::: Surface cracking ::: Caused by: Mining operations Resulting in: Personnel injury, vehicle damage & vegetation instability.	1.1.a. Inspections of access tracks 1.1.b. Public Safety Management Plan signed off 1.1.c. Signage 1.1.d. Underground conditions	E (Op)	3 (I)	20 (L)	1. Erect signage in potential subsidence access zones.
2. Areas of high Environmental, Heritage or Archaeological Significance	There is a risk to Awaba from ::: Aboriginal heritage beliefs ::: Caused by: Mining operations Resulting in: Damage to Aboriginal heritage material along ridge and drainage landforms.	2.1.a. Heritage assessment undertaken for Awaba East Stage 1 Exploration REF 2.1.b. RPS HSO completed Archaeological field assessment for the previous SMP area (no artefacts found) 2.1.c. Sensitivity risk mapping for this area has been performed and found to be low for majority of area. 2.1.d. Newstan Archaeological Management Plan	D (Op)	4 (I)	21 (L)	
	There is a risk to Awaba from ::: Surface cracking :::	2.2.a. Subsidence is predicted as minimal 2.2.b. Locations of sites at	E (Op)	4 (I)	23 (L)	2. Field survey to be conducted.



WRAC Analysis Worksheet

L= Likelihood; MRC= Maximum Reasonable Consequence; RR= Risk Rank

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	Caused by: Mining operations	Awaba mapped for previous Awaba East Stage 1 Exploration REF and for SMP area				
	Resulting in: Changes to surface drainage lines & displacing of surface arefacts.	2.2.c. Sensitivity risk mapping for this area has been performed and found to be low for majority of area				
		2.2.d. Newstan Archaeological Management Plan				
	There is a risk to Awaba from ::: Indigenous land agreement :::	2.3.a. ILUA/ NTA applies to a very small area in north east of SMP area	E (Op)	4 ()	23 (L)	
	Caused by: Mining operations	2.3.b. Landform risk mapping undertaken for Awaba East Stage 1 Exploration REF.				
	Resulting in: Non compliance with current Indigenous Land Use Agreement/Native Title.	2.3.c. Newstan Archaeological Management Plan				
	There is a risk to Awaba from ::: Surface cracking :::	2.4.a. Sensitivity risk mapping for this area has been performed and found to be low for majority of area	E (Op)	4 ()	23 (L)	
	Caused by: Mining operations	2.4.b. Considered unlikely that earthworks will be required.				
	Resulting in: Earthworks required to fill in surface cracking exposes or	2.4.c. Newstan Archaeological				



WRAC Analysis Worksheet

L= Likelihood; MRC= Maximum Reasonable Consequence; RR= Risk Rank

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	displaces surface artefacts.	Management Plan				
	There is a risk to Awaba from ::: Surface cracking ::: Caused by: Mining operations Resulting in: Impact on European heritage with SMP Area.	2.5.a. Abandoned Wangi Railway Line present in SMP area however no extraction planned in this area	E (Op)	5 ()	25 (L)	
3. Wetlands, swamps and water related ecosystems	There is a risk to Awaba from ::: Not Applicable ::: Caused by: Resulting in: Not applicable.	3.1.a. Not applicable	(Op)	()		
4. Catchment areas	There is a risk to Awaba from ::: Subsidence ::: Caused by: Mining operations Resulting in: Erosion within stream bed and bank during re- establishment of creek grades.	4.1.a. Not mining under Stony Creek	E (Op)	4 ()	23 (L)	
	There is a risk to Awaba from	4.2.a. Newstan/Awaba Water	E	3	20	



WRAC Analysis Worksheet

L= Likelihood; MRC= Maximum Reasonable Consequence; RR= Risk Rank

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	::: Subsidence ::: Caused by: Mining operations Resulting in: Temporary ponding & reduction in surface water flows in creeks crossing the SMP study area.	Management Plan 4.2.b. Any subsidence will be remediated to reduce long term impact	(Op)	()	(L)	
	There is a risk to Awaba from ::: Surface cracking ::: Caused by: Mining operations Resulting in: Loss of water into overburden strata resulting in reduced surface flows.	4.3.a. No routine surface flows (ephemeral) 4.3.b. Extraction depth is greater than 25m 4.3.c. Inspections 4.3.d. Timely response for surface rehabilitation 4.3.e. Demonstrated successful rehabilitation strategies.	E (Op)	3 ()	20 (L)	
5. Surface Water - Significant water courses	There is a risk to Awaba from ::: Surface cracking ::: Caused by: Mining operations Resulting in: Cracking of banks & first order tributaries of creek bed, loss of water flows, iron deposits,	5.1.a. Surface Water Management Plan 5.1.b. No extraction under second or third order creeks or their alluvial deposits	E (Op)	4 ()	23 (L)	

WRAC Analysis Worksheet

L= Likelihood; MRC= Maximum Reasonable Consequence; RR= Risk Rank

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	increased sediment in drainage lines & loss of aquatic habitat.					
6. Groundwater - Significant groundwater resources including groundwater level and quality	There is a risk to Awaba from ::: Surface cracking ::: Caused by: Mining operations Resulting in: Aquifer cracked leading to loss of ground water or Impact on third party user outside SMP area or Inflow of ground water into underground working.	6.1.a. Water Management Plan 6.1.b. Extensive groundwater monitoring program	E (Op)	4 (I)	23 (L)	3. Confirm no registered ground water users.
7. Flora & Fauna - Threatened and protected species under the Threatened Species Conservation Act (1995)	There is a risk to Awaba from ::: Subsidence ::: Caused by: Mining operations Resulting in: Changes to water courses including stream bed and banks or Destruction or damage to habitat impacting in species population decline.	7.1.a. Newstan/Awaba Water Mgt Plan 7.1.b. Partially completed Ground Survey undertaken and risk mapping developed for threatened species 7.1.c. Rehab works will be carried out per Centennial's Environmental Management Plan	E (Op)	5 (I)	25 (L)	11. Ground survey undertaken for subsidence line installation. 2. Field survey to be conducted.
8. Groundwater Dependent Ecosystems	There is a risk to Awaba from ::: Surface cracking :::	8.1.a. Only the very upper sections of first order tributaries occur within SMP Area and that cover	E (Op)	5 (I)	25 (L)	13. 8.1.a. Ecologist to assess potential impact of potential groundwater dependant ecosystems.



WRAC Analysis Worksheet

L= Likelihood; MRC= Maximum Reasonable Consequence; RR= Risk Rank

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	Caused by: Mining operations	depths maintained >25m				
	Resulting in: Groundwater loss or inflow impacting on Groundwater dependant ecosystems.	8.1.b. No extraction under second or third order creeks or their alluvial deposits				14. Complete catchment analysis.
9. Public and Private Utilities and other Infrastructure (including roads)	There is a risk to Awaba from ::: Surface cracking :::	9.1.a. Inspections of surface				4. Confirm buffer around each pole is sufficient.
		9.1.b. Public Safety Management Plan				5. Consultation with Telstra regarding Telstra Tower and fiber optic cable (Telstra to complete Management Plan).
	Caused by: Mining operations	9.1.c. Pillars under poles and Telstra fiber optic cable are not extracted	E (Op)	4 ()	23 (L)	7. RailCorp to check mine induction knowledge and reporting structure of surface cracking etc.
		9.1.d. 20m buffer around poles				8. Mine to notify infrastructure owners at commencement of mining extraction.
						10. Installation of subsidence monitoring line across closest point to rail line.
	There is a risk to Awaba from ::: Surface cracking :::	9.2.a. Inspections of surface				8. Mine to notify infrastructure owners at commencement of mining extraction.
		9.2.b. Public Safety Management Plan				
	Caused by: Mining operations		E (Op)	4 ()	23 (L)	
	Resulting in: Damage to fire trails or Personnel injury.					
	There is a risk to Awaba from	9.3.a. Inspections of surface by	(Op)	()		9. The group considered the scenario and is not applicable



WRAC Analysis Worksheet

L= Likelihood; MRC= Maximum Reasonable Consequence; RR= Risk Rank

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	Centennial Surface cracking Caused by: Mining operations Resulting in: Damage to Haul Road or Personnel injury to operators.	9.3.b. No extraction underneath haul road (20m barrier either side of edge of road) 9.3.c. Public Safety Management Plan 9.3.d. Regular inspections of haul road by Eraring Energy 9.3.e. Reporting of abnormalities by truck operators				due to 9.3.b
10. Surface improvements causing damage beyond safety, serviceability and reparability	There is a risk to Awaba from Not Applicable Caused by: Not applicable Resulting in: Not applicable.	10.1.a. Not applicable	(Op)	()		
11. Agricultural suitability and productivity	There is a risk to Awaba from Not Applicable Caused by: Not applicable Resulting in: Not applicable.	11.1.a. Not applicable	(Op)	()		



WRAC Analysis Worksheet

L= Likelihood; MRC= Maximum Reasonable Consequence; RR= Risk Rank

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
12. Industrial, commercial and business establishments	There is a risk to Awaba from ::: Not Applicable ::: Caused by: Not applicable Resulting in: Not applicable.	12.1.a. Not applicable	(Op)	()		
13. Foreshores and land prone to flooding or inundation	There is a risk to Awaba from ::: Not Applicable ::: Caused by: Not applicable Resulting in: Not applicable.	13.1.a. Not applicable	(Op)	()		
14. Prescribed Dams (including stored waters and reservoirs) and / or structures Awaba East Stage 1 Exploration Referred to by the Dam Safety Act (1978)	There is a risk to Awaba from ::: Not Applicable ::: Caused by: Not applicable Resulting in: Not applicable.	14.1.a. Not applicable	(Op)	()		
15. Other (Underground Fire)	There is a risk to Awaba from ::: Surface cracking :::	15.1.a. Inspections	D (Op)	4 ()	21 (L)	
		15.1.b. Timely response for surface rehabilitation				
		15.1.c. Spontaneous				



WRAC Analysis Worksheet

L= Likelihood; MRC= Maximum Reasonable Consequence; RR= Risk Rank

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	Caused by: Mining operations	Management Plan. (SMP version)				
	Resulting in: A surface fire spreading into the underground workings. or Spontaneous combustion underground.	15.1.d. Spontaneous Management Plan				



WRAC Analysis Sorted by Risk Ranking

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
1. Public safety	There is a risk to Awaba from ::: Surface cracking ::: Caused by: Mining operations Resulting in: Personnel injury , vehicle damage & vegetation instability.	1.1.a. Inspections of access tracks 1.1.b. Public Safety Management Plan signed off 1.1.c. Signage 1.1.d. Underground conditions	E (Op)	3 (I)	20 (L)	1. Erect signage in potential subsidence access zones.
4. Catchment areas	There is a risk to Awaba from ::: Subsidence ::: Caused by: Mining operations Resulting in: Temporary ponding & reduction in surface water flows in creeks crossing the SMP study area..	4.2.a. Newstan/Awaba Water Management Plan 4.2.b. Any subsidence will be remediated to reduce long term impact	E (Op)	3 (I)	20 (L)	
4. Catchment areas	There is a risk to Awaba from ::: Surface cracking ::: Caused by: Mining operations Resulting in: Loss of water into overburden strata resulting in reduced surface flows.	4.3.a. No routine surface flows (ephemeral) 4.3.b. Extraction depth is greater than 25m 4.3.c. Inspections 4.3.d. Timely response for surface rehabilitation 4.3.e. Demonstrated successful rehab. strategies	E (Op)	3 (I)	20 (L)	



WRAC Analysis Sorted by Risk Ranking

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
2. Areas of high Environmental, Heritage or Archaeological Significance	There is a risk to Awaba from ::: Aboriginal heritage beliefs ::: Caused by: Mining operations Resulting in: Damage to Aboriginal heritage material along ridge and drainage landforms.	2.1.a. Heritage assessment undertaken for Awaba East Stage 1 Exploration REF	D (Op)	4 ()	21 (L)	
		2.1.b. RPS HSO completed Archaeological field assessment for the previous SMP area (no artefacts found)				
		2.1.c. Sensitivity risk mapping for this area has been performed and found to be low for majority of area				
		2.1.d. Newstan Archaeological Management Plan				
15. Other (Underground Fire)	There is a risk to Awaba from ::: Surface cracking ::: Caused by: Mining operations Resulting in: A surface fire spreading into the underground workings. or Spontaneous combustion underground.	15.1.a. Inspections	D (Op)	4 ()	21 (L)	
		15.1.b. Timely response for surface rehabilitation				
		15.1.c. Spontaneous Management Plan. (SMP version)				
		15.1.d. Spontaneous Management Plan.				
2. Areas of high Environmental, Heritage or Archaeological Significance	There is a risk to Awaba from ::: Surface cracking :::	2.2.a. Subsidence is predicted as minimal	E (Op)	4 ()	23 (L)	2. Field survey to be conducted
		2.2.b. Locations of sites at Awaba mapped for				



WRAC Analysis Sorted by Risk Ranking

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	Caused by: Mining operations	previous Awaba East Stage 1 Exploration REF and for SMP area				
	Resulting in: Changes to surface drainage lines & displacing of surface arefacts.	2.2.c. Sensitivity risk mapping for this area has been performed and found to be low for majority of area				
		2.2.d. Newstan Archaeological Management Plan				
2. Areas of high Environmental, Heritage or Archaeological Significance	There is a risk to Awaba from ::: Indigenous land agreement :::	2.3.a. ILUA/ NTA applies to very small area in north east of SMP area				
	Caused by: Mining operations	2.3.b. Landform risk mapping undertaken for Awaba East Stage 1 Exploration REF	E (Op)	4 ()	23 (L)	
	Resulting in: Non compliance with current Indigenous Land Use Agreement/Native Title.	2.3.c. Newstan Archaeological Management Plan				
2. Areas of high Environmental, Heritage or Archaeological Significance	There is a risk to Awaba from ::: Surface cracking :::	2.4.a. Sensitivity risk mapping for this area has been performed and found to be low for majority of area.				
	Caused by: Mining operations	2.4.b. Considered unlikely that earthworks will be required.	E (Op)	4 ()	23 (L)	
	Resulting in: Earthworks required to fill in surface cracking exposes or displaces surface artefacts.	2.4.c. Newstan Archaeological Management Plan				
4. Catchment areas	There is a risk to Awaba from	4.1.a. Not mining under Stony	E	4	23	



WRAC Analysis Sorted by Risk Ranking

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	::: Subsidence ::: Caused by: Mining operations Resulting in: Erosion within stream bed and bank during re- establishment of creek grades.	Creek	(Op)	()	(L)	
5. Surface Water - Significant water courses	There is a risk to Awaba from ::: Surface cracking ::: Caused by: Mining operations Resulting in: Cracking of banks & first order tributaries of creek bed, loss of water flows, iron deposits ,increased sediment in drainage lines &loss of aquatic habitat.	5.1.a. Surface Water Management Plan	E (Op)	4 ()	23 (L)	
		5.1.b. No extraction under second or third order creeks or their alluvial deposits				
6. Groundwater - Significant groundwater resources including groundwater level and quality	There is a risk to Awaba from ::: Surface cracking ::: Caused by: Mining operations Resulting in: Aquifer cracked leading to loss of ground water or Impact on third party user outside SMP area or	6.1.a. Water Management Plan 6.1.b. Extensive groundwater monitoring program	E (Op)	4 ()	23 (L)	3. Confirm no registered ground water users.



WRAC Analysis Sorted by Risk Ranking

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	Inflow of ground water into underground working.					
9. Public and Private Utilities and other Infrastructure (including roads)	There is a risk to Awaba from ::: Surface cracking ::: Caused by: Mining operations Resulting in: Damage to power poles (RailCorp, Energy Australia &Centennial Awaba) or Damage to Telstra Tower (and associated fiber optic cable) or Loss of power and possible injury to personnel.	9.1.a. Inspections of surface	E (Op)	4 ()	23 (L)	4. Confirm buffer around each pole is sufficient.
		9.1.b. Public Safety Management Plan				5. Consultation with Telstra regarding Telstra Tower and fiber optic cable (Telstra to complete Management Plan).
		9.1.c. Pillars under poles and Telstra fiber optic cable are not extracted				7. RailCorp to check mine induction knowledge and reporting structure of surface cracking etc.
		9.1.d. 20m buffer around poles				8. Mine to notify infrastructure owners at commencement of mining extraction.
						10. Installation of subsidence monitoring line across closest point to rail line.
9. Public and Private Utilities and other Infrastructure (including roads)	There is a risk to Awaba from ::: Surface cracking ::: Caused by: Mining operations Resulting in: Damage to fire trails or Personnel injury.	9.2.a. Inspections of surface	E (Op)	4 ()	23 (L)	8. Mine to notify infrastructure owners at commencement of mining extraction.
		9.2.b. Public Safety Management Plan				
2. Areas of high Environmental, Heritage or Archaeological Significance	There is a risk to Awaba from ::: Surface cracking ::: Caused by: Mining operations	2.5.a. Abandoned Wangi Railway Line present in SMP area however no extraction planned in this area.	E (Op)	5 ()	25 (L)	

WRAC Analysis Sorted by Risk Ranking

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	Resulting in: Impact on European heritage with SMP area.					
7. Flora & Fauna - Threatened and protected species under the Threatened Species Conservation Act (1995)	There is a risk to Awaba from ::: Subsidence ::: Caused by: Mining operations Resulting in: Changes to water courses including stream bed and banks or Destruction or damage to habitat impacting in species population decline.	7.1.a. Newstan/Awaba Water Mgt Plan	E (Op)	5 ()	25 (L)	11. Ground survey undertaken for subsidence line installation.
		7.1.b. Partially completed Ground Survey undertaken and risk mapping developed for threatened species				2. Field survey to be conducted.
		7.1.c. Rehab works will be carried out per Centennial's Environmental Management Plan				
8. Groundwater Dependent Ecosystems	There is a risk to Awaba from ::: Surface cracking ::: Caused by: Mining operations Resulting in: Groundwater loss or inflow impacting on Groundwater dependant ecosystems.	8.1.a. Only the very upper sections of first order tributaries occur within SMP Area and that cover depths maintained >25m	E (Op)	5 ()	25 (L)	13. 8.1.a. Ecologist to assess potential impact of potential groundwater dependant ecosystems.
		8.1.b. No extraction under second or third order creeks or their alluvial deposits				14. Complete catchment analysis.
3. Wetlands, swamps and water related ecosystems	There is a risk to Awaba from ::: Not Applicable ::: Caused by:	3.1.a. Not applicable	(Op)	()		



WRAC Analysis Sorted by Risk Ranking

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	Resulting in: Not applicable.					
9. Public and Private Utilities and other Infrastructure (including roads)	There is a risk to Awaba from ::: Surface cracking ::: Caused by: Mining operations Resulting in: Damage to Haul Road or Personnel injury to operators.	9.3.a. Inspections of surface by Centennial	(Op)	()		9. The group considered the scenario and is not applicable due to 9.3.b.
		9.3.b. No extraction underneath haul road (20m barrier either side of edge of road)				
		9.3.c. Public Safety Management Plan				
		9.3.d. Regular inspections of haul road by Eraring Energy				
		9.3.e. Reporting of abnormalities by truck operators				
10. Surface improvements causing damage beyond safety, serviceability and reparability	There is a risk to Awaba from ::: Not Applicable ::: Caused by: Not applicable Resulting in: Not applicable.	10.1.a. Not applicable	(Op)	()		
11. Agricultural suitability and productivity	There is a risk to Awaba from ::: Not Applicable ::: Caused by: Not applicable	11.1.a. Not applicable	(Op)	()		



WRAC Analysis Sorted by Risk Ranking

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	Resulting in: Not applicable.					
12. Industrial, commercial and business establishments	There is a risk to Awaba from ::: Not Applicable ::: Caused by: Not applicable Resulting in: Not applicable.	12.1.a. Not applicable	(Op)	()		
13. Foreshores and land prone to flooding or inundation	There is a risk to Awaba from ::: Not Applicable ::: Caused by: Not applicable Resulting in: Not applicable.	13.1.a. Not applicable	(Op)	()		
14. Prescribed Dams (including stored waters and reservoirs) and / or structures Awaba East Stage 1 Exploration Referred to by the Dam Safety Act (1978)	There is a risk to Awaba from ::: Not Applicable ::: Caused by: Not applicable Resulting in: Not applicable.	14.1.a. Not applicable	(Op)	()		



WRAC Analysis Sorted by Consequence

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
3. Wetlands, swamps and water related ecosystems	There is a risk to Awaba from ::: Not Applicable ::: Caused by: Resulting in: Not applicable.	3.1.a. Not applicable	(Op)	()		
9. Public and Private Utilities and other Infrastructure (including roads)	There is a risk to Awaba from ::: Surface cracking ::: Caused by: Mining operations Resulting in: Damage to Haul Road or Personnel injury to operators.	9.3.a. Inspections of surface by Centennial 9.3.b. No extraction underneath haul road (20m barrier either side of edge of road) 9.3.c. Public Safety Management Plan 9.3.d. Regular inspections of haul road by Eraring Energy 9.3.e. Reporting of abnormalities by truck operators	(Op)	()		9. The group considered the scenario and is not applicable due to 9.3.b.
10. Surface improvements causing damage beyond safety, serviceability and reparability	There is a risk to Awaba from ::: Not Applicable ::: Caused by: Not applicable Resulting in:	10.1.a. Not applicable	(Op)	()		



WRAC Analysis Sorted by Consequence

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	Not applicable.					
11. Agricultural suitability and productivity	There is a risk to Awaba from ::: Not Applicable ::: Caused by: Not applicable Resulting in: Not applicable.	11.1.a. Not applicable	(Op)	()		
12. Industrial, commercial and business establishments	There is a risk to Awaba from ::: Not Applicable ::: Caused by: Not applicable Resulting in: Not applicable.	12.1.a. Not applicable	(Op)	()		
13. Foreshores and land prone to flooding or inundation	There is a risk to Awaba from ::: Not Applicable ::: Caused by: Not applicable Resulting in: Not applicable.	13.1.a. Not applicable	(Op)	()		
14. Prescribed Dams (including stored waters and reservoirs) and / or structures Awaba East Stage 1 Exploration	There is a risk to Awaba from ::: Not Applicable ::: Caused by:	14.1.a. Not applicable	(Op)	()		



WRAC Analysis Sorted by Consequence

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
Referred to by the Dam Safety Act (1978)	Not applicable Resulting in: Not applicable.					
1. Public safety	There is a risk to Awaba from ::: Surface cracking ::: Caused by: Mining operations Resulting in: Personnel injury , vehicle damage & vegetation instability.	1.1.a. Inspections of access tracks 1.1.b. Public Safety Management Plan signed off 1.1.c. Signage 1.1.d. Underground conditions	E (Op)	3 ()	20 (L)	1. Erect signage in potential subsidence access zones.
4. Catchment areas	There is a risk to Awaba from ::: Subsidence ::: Caused by: Mining operations Resulting in: Temporary ponding & reduction in surface water flows in creeks crossing the SMP study area.	4.2.a. Newstan/Awaba Water Management Plan 4.2.b. Any subsidence will be remediated to reduce long term impact	E (Op)	3 ()	20 (L)	
4. Catchment areas	There is a risk to Awaba from ::: Surface cracking ::: Caused by: Mining operations	4.3.a. No routine surface flows (ephemeral) 4.3.b. Extraction depth is greater than 25m 4.3.c. Inspections 4.3.d. Timely response for surface rehabilitation	E (Op)	3 ()	20 (L)	



WRAC Analysis Sorted by Consequence

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	Resulting in: Loss of water into overburden strata resulting in reduced surface flows.	4.3.e. Demonstrated successful rehab. strategies.				
2. Areas of high Environmental, Heritage or Archaeological Significance	There is a risk to Awaba from ::: Aboriginal heritage beliefs ::: Caused by: Mining operations Resulting in: Damage to Aboriginal heritage material along ridge and drainage landforms.	2.1.a. Heritage assessment undertaken for Awaba East Stage 1 Exploration REF	D (Op)	4 ()	21 (L)	
		2.1.b. RPS HSO completed Archaeological field assessment for previous SMP area (no artefacts found)				
		2.1.c. Sensitivity risk mapping for this area has been performed and found to be low for majority of area.				
		2.1.d. Newstan Archaeological Management Plan				
2. Areas of high Environmental, Heritage or Archaeological Significance	There is a risk to Awaba from ::: Surface cracking ::: Caused by: Mining operations Resulting in: Changes to surface drainage lines & displacing of surface arefacts..	2.2.a. Subsidence is predicted as minimal	E (Op)	4 ()	23 (L)	2. Field survey to be conducted
		2.2.b. Locations of sites at Awaba mapped for previous Awaba East Stage 1 Exploration REF and for SMP area				
		2.2.c. Sensitivity risk mapping for this area has been performed and found to be low for majority of area.				



WRAC Analysis Sorted by Consequence

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
		2.2.d. Newstan Archaeological Management Plan				
2. Areas of high Environmental, Heritage or Archaeological Significance	There is a risk to Awaba from ::: Indigenous land agreement ::: Caused by: Mining operations Resulting in: Non compliance with current Indigenous Land Use Agreement/Native Title.	2.3.a. ILUA/ NTA applies to very small area in north east of SMP area.	E (Op)	4 ()	23 (L)	
		2.3.b. Landform risk mapping undertaken for Awaba East Stage 1 Exploration REF.				
		2.3.c. Newstan Archaeological Management Plan				
2. Areas of high Environmental, Heritage or Archaeological Significance	There is a risk to Awaba from ::: Surface cracking ::: Caused by: Mining operations Resulting in: Earthworks required to fill in surface cracking exposes or displaces surface artefacts.	2.4.a. Sensitivity risk mapping for this area has been performed and found to be low for majority of area.	E (Op)	4 ()	23 (L)	
		2.4.b. Considered unlikely that earthworks will be required.				
		2.4.c. Newstan Archaeological Management Plan				
4. Catchment areas	There is a risk to Awaba from ::: Subsidence ::: Caused by: Mining operations Resulting in: Erosion within stream bed and	4.1.a. Not mining under Stony Creek	E (Op)	4 ()	23 (L)	



WRAC Analysis Sorted by Consequence

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	bank during re- establishment of creek grades.					
5. Surface Water - Significant water courses	There is a risk to Awaba from ::: Surface cracking ::: Caused by: Mining operations Resulting in: Cracking of banks & first order tributaries of creek bed, loss of water flows, iron deposits, increased sediment in drainage lines & loss of aquatic habitat.	5.1.a. Surface Water Management Plan	E (Op)	4 ()	23 (L)	
		5.1.b. No extraction under second or third order creeks or their alluvial deposits				
6. Groundwater - Significant groundwater resources including groundwater level and quality	There is a risk to Awaba from ::: Surface cracking ::: Caused by: Mining operations Resulting in: Aquifer cracked leading to loss of ground water or Impact on third party user outside SMP area or Inflow of ground water into underground working.	6.1.a. Water Management Plan	E (Op)	4 ()	23 (L)	3. Confirm no registered ground water users.
		6.1.b. Extensive groundwater monitoring program				
9. Public and Private Utilities and other Infrastructure (including roads)	There is a risk to Awaba from ::: Surface cracking ::: Caused by:	9.1.a. Inspections of surface	E (Op)	4 ()	23 (L)	4. Confirm buffer around each pole is sufficient.
		9.1.b. Public Safety Management Plan				5. Consultation with Telstra regarding Telstra Tower and fiber optic cable (Telstra to complete Management Plan).
		9.1.c. Pillars under poles and				7. RailCorp to check mine induction knowledge and



WRAC Analysis Sorted by Consequence

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	Mining operations	Telstra fiber optic cable are not extracted				reporting structure of surface cracking etc.
	Resulting in: Damage to power poles (RailCorp, Energy Australia & Centennial Awaba) or Damage to Telstra Tower (and associated fiber optic cable) or Loss of power and possible injury to personnel.	9.1.d. 20m buffer around poles				8. Mine to notify infrastructure owners at commencement of mining extraction. 10. Installation of subsidence monitoring line across closest point to rail line.
9. Public and Private Utilities and other Infrastructure (including roads)	There is a risk to Awaba from ::: Surface cracking ::: Caused by: Mining operations Resulting in: Damage to fire trails or Personnel injury.	9.2.a. Inspections of surface 9.2.b. Public Safety Management Plan	E (Op)	4 ()	23 (L)	8. Mine to notify infrastructure owners at commencement of mining extraction.
15. Other (Underground Fire)	There is a risk to Awaba from ::: Surface cracking ::: Caused by: Mining operations Resulting in: A surface fire spreading into the underground workings. or Spontaneous combustion underground.	15.1.a. Inspections 15.1.b. Timely response for surface rehabilitation 15.1.c. Spontaneous Management Plan. (SMP version) 15.1.d. Spontaneous Management Plan.	D (Op)	4 ()	21 (L)	
2. Areas of high Environmental, Heritage	There is a risk to Awaba from	2.5.a. Abandoned Wangi Railway Line present in	E (Op)	5 ()	25 (L)	



WRAC Analysis Sorted by Consequence

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
or Archaeological Significance	Surface cracking Caused by: Mining operations Resulting in: Impact on European heritage with SMP area.	SMP however no extraction planned in this area.				
7. Flora & Fauna - Threatened and protected species under the Threatened Species Conservation Act (1995)	There is a risk to Awaba from Subsidence Caused by: Mining operations Resulting in: Changes to water courses including stream bed and banks or Destruction or damage to habitat impacting in species population decline.	7.1.a. Newstan/Awaba Water Mgt Plan	E (Op)	5 ()	25 (L)	11. Ground survey undertaken for subsidence line installation.
		7.1.b. Partially completed Ground Survey undertaken and risk mapping developed for threatened species				2. Field survey to be conducted
		7.1.c. Rehab works will be carried out per Centennial's Environmental Management Plan				
8. Groundwater Dependent Ecosystems	There is a risk to Awaba from Surface cracking Caused by: Mining operations Resulting in: Groundwater loss or inflow impacting on Groundwater dependant ecosystems.	8.1.a. Only the very upper sections of first order tributaries occur within SMP Area and that cover depths maintained >25m	E (Op)	5 ()	25 (L)	13. 8.1.a. Ecologist to assess potential impact of potential groundwater dependant ecosystems.
		8.1.b. No extraction under second or third order creeks or their alluvial deposits				14. Complete catchment analysis.



Recommended Controls

Recommended Controls	Place(s) Used	Allocated To	Required By Date	Pulse User No.
Do NOT enter additional Recommended Controls on this sheet.				
1. Erect signage in potential subsidence access zones.	Potential Incident Builder: 1.1	Awaba		
2. Flora and fauna field survey to be conducted	Potential Incident Builder: 2.2, 7.1	Awaba/ Ecologist		
3. Confirm no registered ground water users.	Potential Incident Builder: 6.1	Awaba		
4. Confirm buffer around each pole is sufficient.	Potential Incident Builder: 9.1	Awaba		
5. Consultation with Telstra regarding Telstra Tower and fiber optic cable (Telstra to complete Management Plan).	Potential Incident Builder: 9.1	Awaba		
6. RailCorp to check mine induction knowledge and reporting structure of surface cracking etc.	Potential Incident Builder: 9.1	RailCorp		
7. Mine to notify infrastructure owners at commencement of mining extraction.	Potential Incident Builder: 9.1, 9.2	Awaba		
8. Installation of subsidence monitoring line across closest point to rail line.	Potential Incident Builder: 9.1	Awaba		
9. Ground survey undertaken for subsidence line installation.	Potential Incident Builder: 7.1	Awaba		
10. Ecologist to assess potential impact of potential groundwater dependant ecosystems.	Potential Incident Builder: 8.1	Awaba/ Ecologist		
11. Complete catchment analysis.	Potential Incident Builder: 8.1	Awaba/ Ecologist		



RISK MANAGEMENT STANDARD

Management Standard-004

CENTENNIAL RISK MATRIX							Likelihood				
Rating	Consequence						A Certain	B Probable	C Possible	D Remote	E Improbable
	Note: Consequence may consist of a single event or may represent a cumulative impact over a period of 12 months. Use the worst case consequence if there are more than one.						"Common"	"Has Happened within Centennial"	"Could Happen & has happened in non-CEY operations"	"Not Likely"	"Practically impossible"
	Impact to Annual Business Plan (F)	Personal Injury (PI)	Business Interruption (BI)	Legal (L)	Reputation (R)	Environment (E)	Frequent incidents Operations – within 3 months Project – Every project	Regular incidents Operations – within 2 years Project – Every 2 projects	Infrequent incidents Operations – within 5 years Project – Every 5 projects	Unlikely to occur. Very few recorded or known incidents. Operations – within 10 years Project – Every 10 projects	May occur in exceptional circumstances. Almost no recorded incidents. Operations – within 30 years Project – Every 30 projects
1. Catastrophic	>\$50m	Multiple Fatalities	> 1month	Prolonged litigation, heavy fines, potential jail term	Prolonged International media attention	Long term impairment habitats/ ecosystem	1 (E)	2 (E)	5 (H)	7 (H)	11 (S)
2. Major	\$10m - \$50m	Single Fatality	1 week to 1 month	Major breach/ major litigation	International media attention	Long term effects of ecosystem	3 (E)	4 (E)	8 (H)	12 (S)	16 (M)
3. Moderate	\$1m- \$10m	Serious/ Disabling Injury	1 day to 1 week	Serious breach of regulation, prosecution/ fine	National media attention	Serious medium term environmental effects	6 (H)	9 (H)	13 (S)	17 (M)	20 (L)
4. Minor	\$100k - \$1m	Lost Time Injury	12 hrs to 1 day	Non-compliance, breaches in regulation	Adverse local public attention	Minor effects to physical environment	10 (S)	14 (S)	18 (M)	21 (L)	23 (L)
5. Insignificant	<\$100k	First Aid Treatment Only	< 12 hrs	Low level compliance issue	Local complaints	Limited physical damage	15 (S)	19 (M)	22 (L)	24 (L)	25 (L)

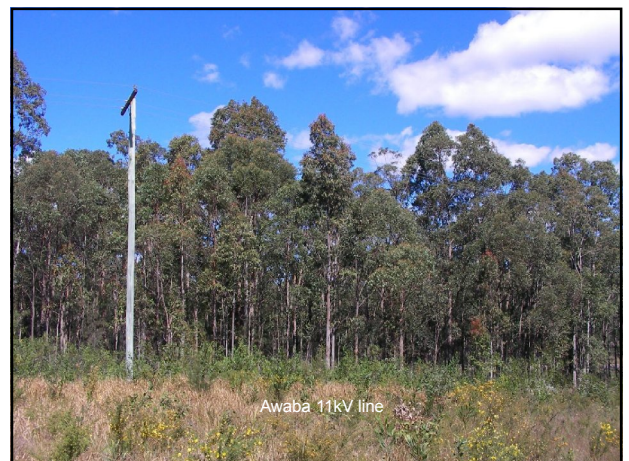


Risk Rating	Risk Category		Generic Management Actions
1 to 4	E	Extreme	Immediate intervention required from senior management to eliminate or reduce this risk
5 to 9	H	High	Imperative to eliminate or reduce risk to a lower level by the introduction of control measures. Management planning required at senior levels
10 to 15	S	Significant	Corrective action required, senior management attention needed to eliminate or reduce risk
16 to 19	M	Moderate	Corrective action to be determined, management responsibility must be specified
20 to 25	L	Low	Monitor and manage by corrective action where practicable

THIS DOCUMENT IS UNCONTROLLED UNLESS VIEWED ON THE INTRANET



Appendix 1 – Photos of SMP Area





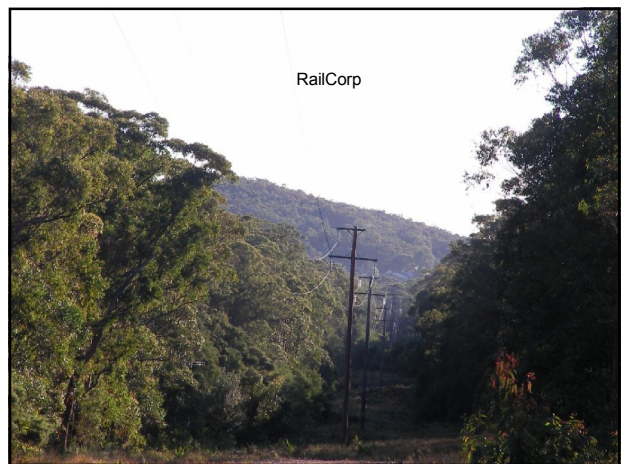
Awaba /Energy Aust lines (Turn point)



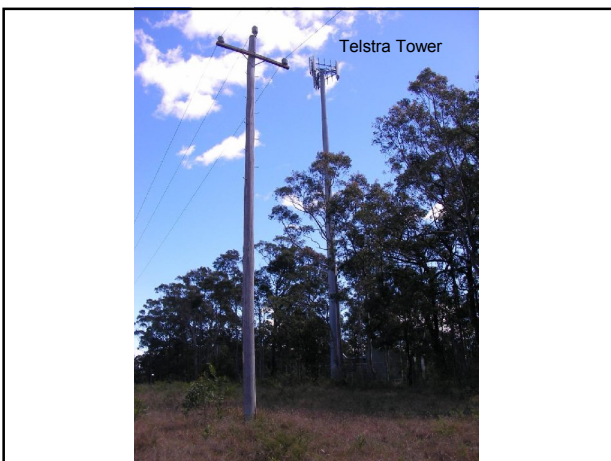
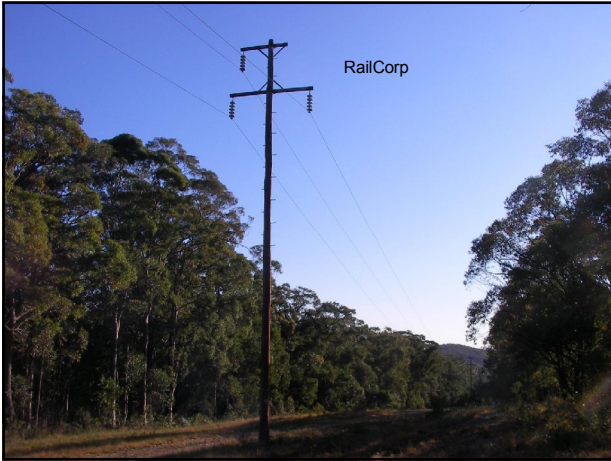
Eraring Haul Road



Eraring Haul Road



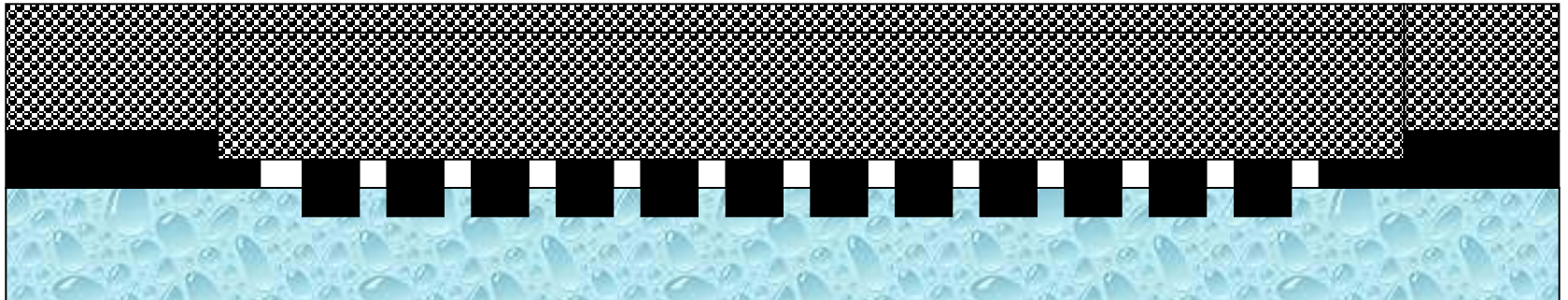
RailCorp





Appendix 2 – Subsidence Presentation

The problem is wide spans on pillars with weak foundations



Constraints

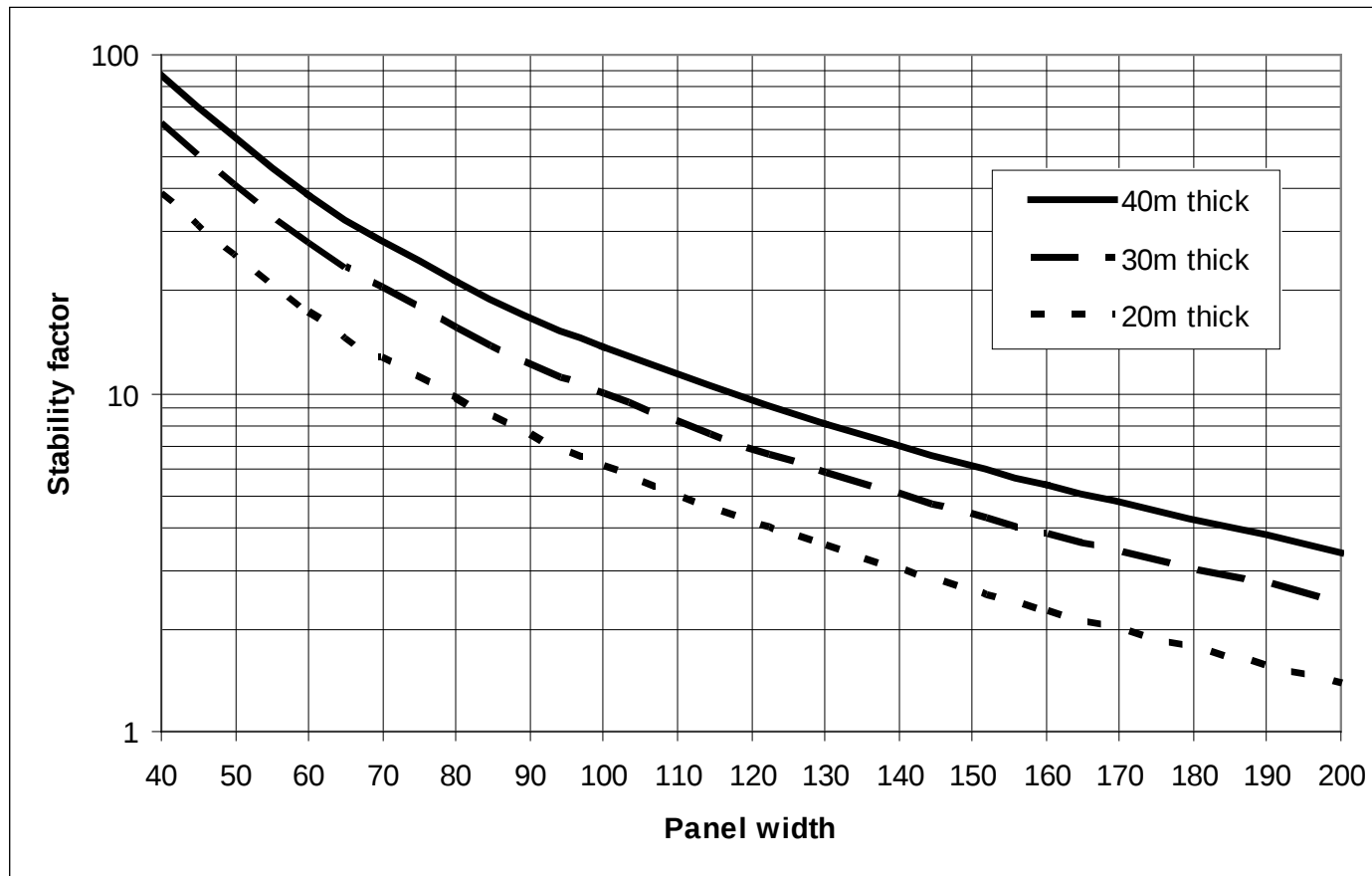
- No collapse of the Teralba Conglomerate
- Manage the wind blast hazard
- Extract standing pillars
- Inability to fully characterize floor
- Remote control miners
- Breaker line supports
- Maximum cutout of 15m when stripping
- Depths of 40m-60m
- Maximum extraction height of 3.8m
- 100m stand-off from proven rail barrier



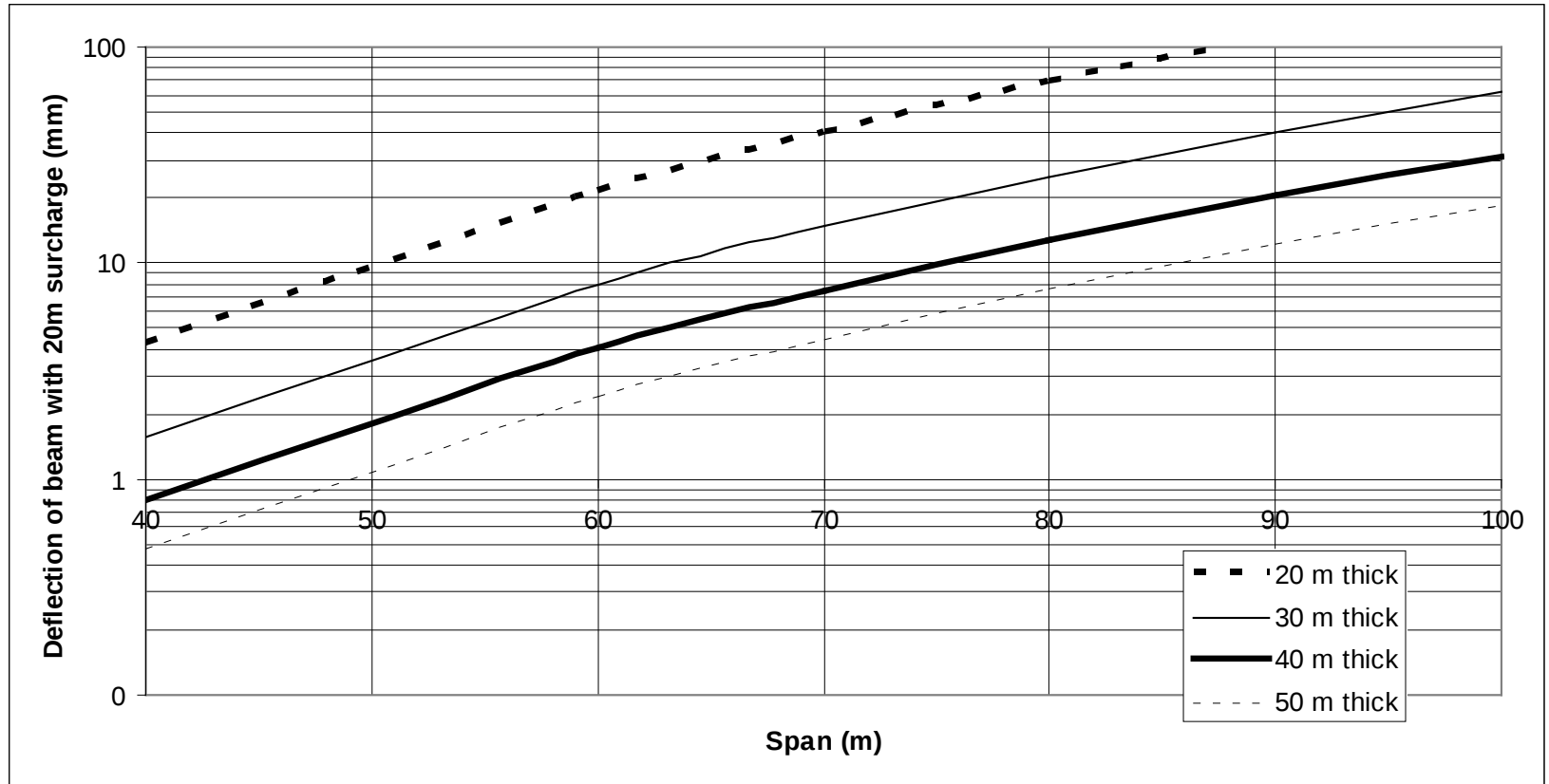
Some things on our side

- No rapid floor heave/subsidence event at widths less than 150m
- Old standing pillars gives the ability to core the floor in selected places prior to second workings
- Validated analytical method with back analysis
- Teralba Conglomerate is very consistent

Confidence in the span

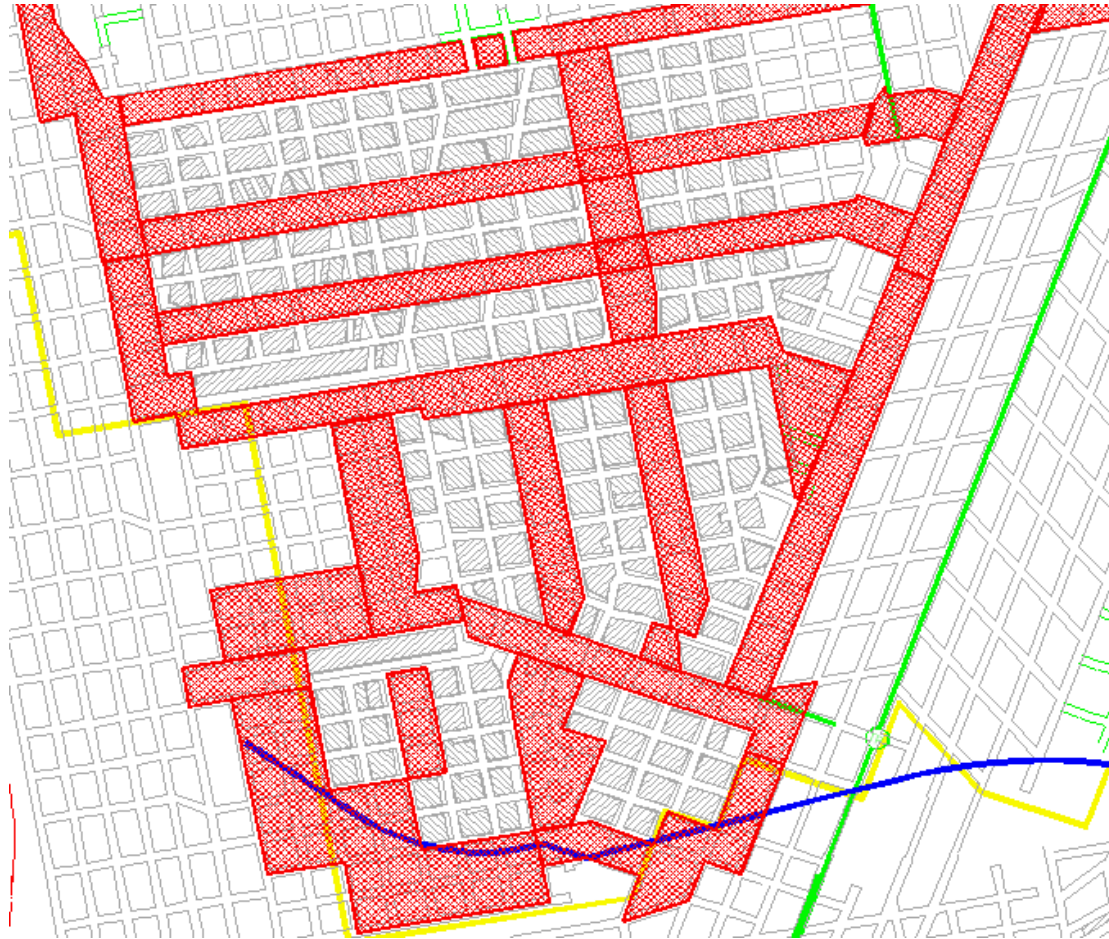


Deflection of conglomerate



By comparison, the compression of the pillar/roof/floor system is estimated to be about 100mm

Take 2-3 rows, leave 1 row

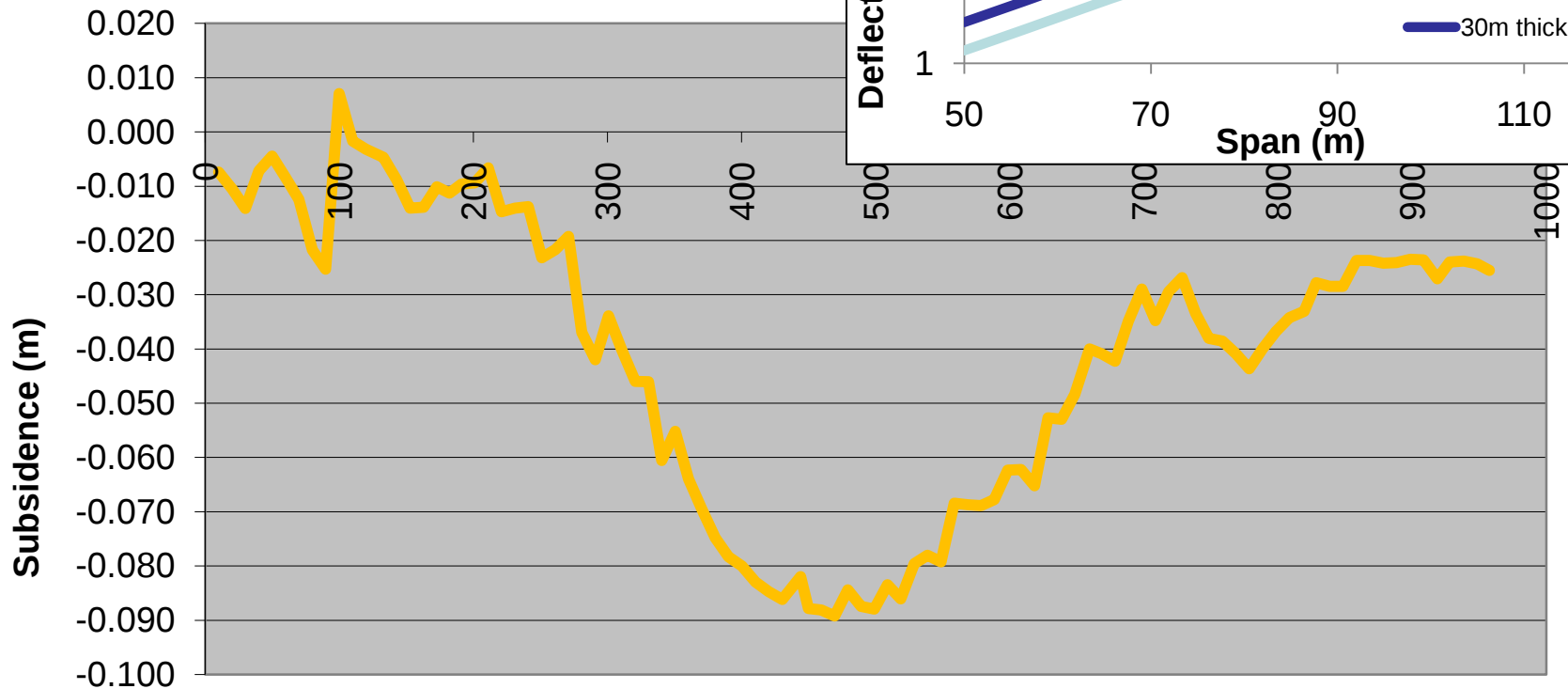
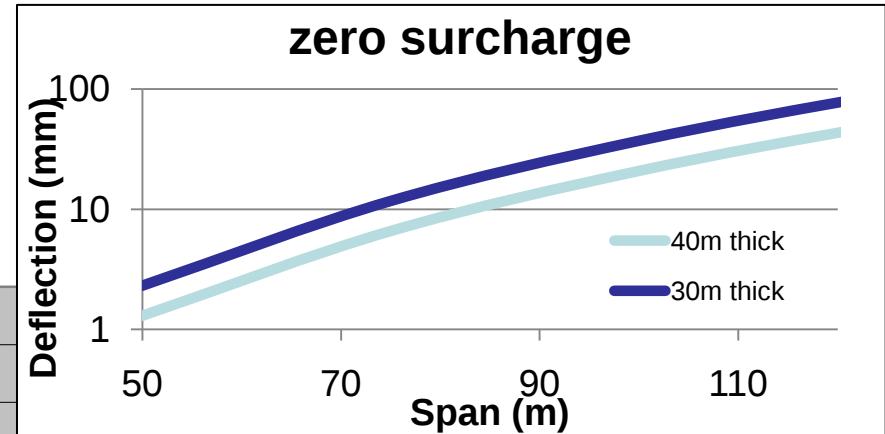


Case study 1 - Awaba

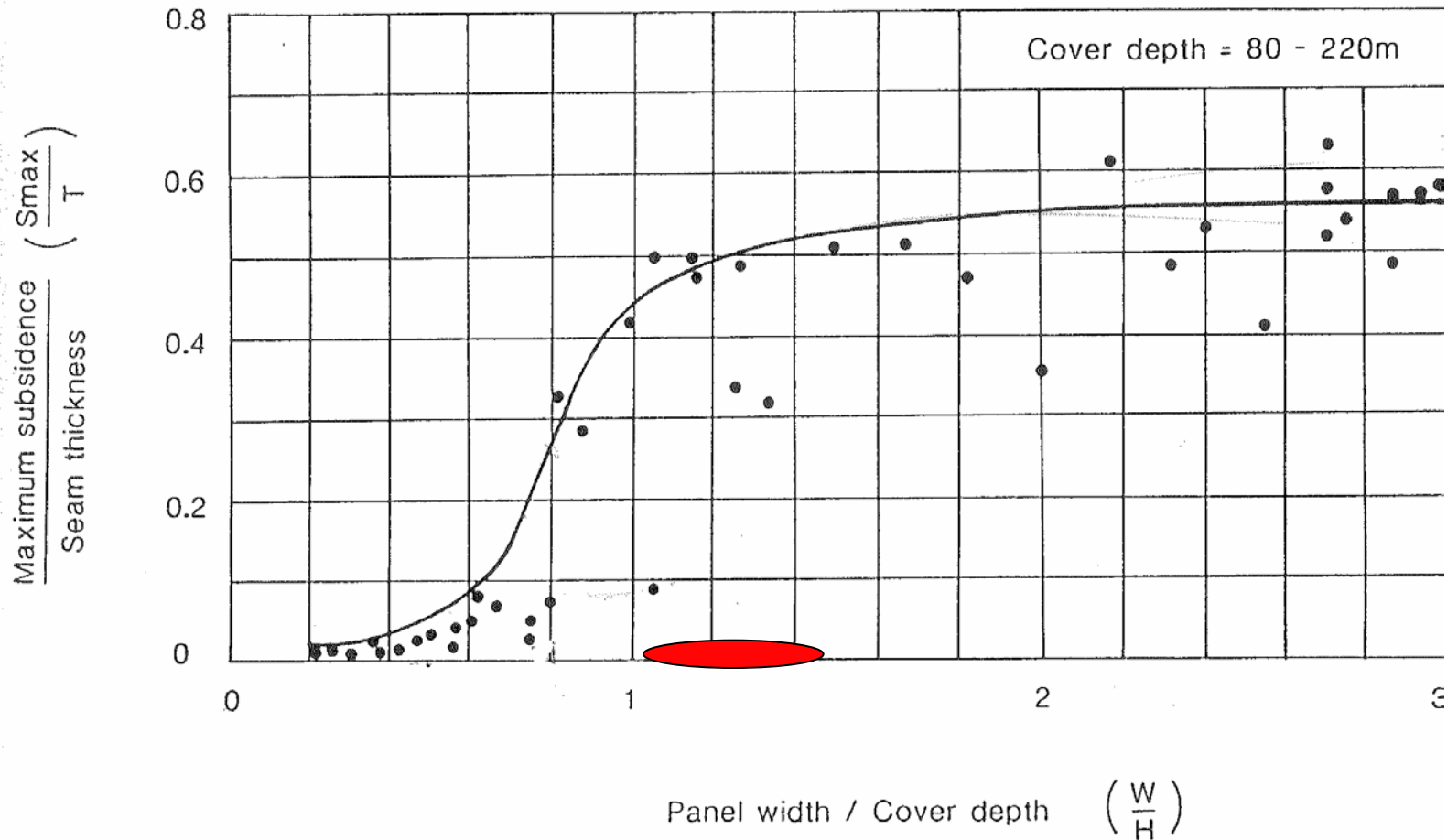
Spans 40m - 90m

Depth 40m - 60m

Panel width/depth = 1 - 2



Where we sit on the Holla plot



APPENDIX C

EAST B AREA: SUBSIDENCE RISK ASSESSMENT



Centennial Coal
Awaba

Risk Assessment Document
Awaba Colliery

**Proposed East B Area – Risk Assessment For Mine Subsidence Impact
and Management**

Risk Assessment No.: 20100120

1. Background:

Awaba Colliery is located on the western side of Lake Macquarie, near Newcastle NSW. The mine is operated by Centennial Newstan – Awaba Colliery (Awaba Colliery), and is a small operation with approximately 100 employees and contractors, historically producing approximately 850,000 tonnes of thermal coal annually which first started producing coal by bord and pillar methods in 1947. The current mining method within the old existing workings using modern continuous miners is extending the mine life.

The proposed “East B” mining area (**‘East B Area’**) is located east of the larger Main South Area. The East B Area comprises one of the study areas of a broader *Environmental Assessment (EA)* for a Part 3A Project Approval being prepared and sought for Awaba Colliery Continued Operations. This specific risk assessment focusing on subsidence impact assessment and management for the proposed East B Area supports a separate (but related) *Broad Brush Risk Assessment (BBRA)* which was undertaken for the broader Environmental Assessment (GSSE, 2010). It is noted that non-mine subsidence related risks are discussed within that broader BBRA.

The East B Area consists of some areas of previously mined workings (first workings) and predominantly new mining areas. Extraction within the East B Area will occur via bord and pillar development followed by pillar extraction within narrow panels using continuous miners. This method was developed in consultation with NSW Industry & Investment (I&I) and has been successfully used since 2007 in the Main South Area and 3 North Area. The process involves extracting rows of pillars (void) and leaving rows as support (pillars).

The whole of the East B Area is within crown lands leased by Centennial. Specialist studies for ecology and archaeology have been partially completed for the East B Area. The East B Area is bordered to the east by Aboriginal owned lands (Kompahtoo Local Aboriginal Land Council).

A new approval for mining and subsidence management is required for the East B Area which is to be submitted to government for determination. A risk based process and assessment is required for the approval process. Prudently, risk aspects considered will include those required in sections s6.10.2 and s6.10.3 of the DPI-MR SMP Guidelines (Dec 2003).

A project background presentation (powerpoint) for the broader Part 3A Environmental Assessment, which included a focus on East B Area, was presented to the risk team at the risk assessment workshop held on Wednesday 13th January 2010 at Awaba Colliery (further detail in Section 7). This included historical mining and subsidence information, lists of previous related studies and risk assessments, preliminary figures/mapping showing natural and constructed surface features, photos of the area, and expected subsidence behaviour based on previous experience. Specialists attending the risk assessment contributed brief discussion and overview on each of their relevant aspects for the presentation. Being located immediately adjacent the 3 North Area, with similar environment, similar mine design and similar expected subsidence behaviour, it was recognised that the existing 3 North Risk Assessment (2008) could be used as a *basis* for the risk assessment for East B Area. Subsequently, the risk register for 3 North Area SMP (Dec 2008) has been used as a base platform for consideration by the risk team, with any additional specific aspects modified (eg for Native Title/ILUA triggers), and circulated for comment and review by the risk team. Majority consensus for risk rankings for the identified risk hazards for the East B Area was then adopted accordingly.



2. Objective:

The following key objectives of the risk assessment for the **East B Area** include:

- To establish an appropriate risk assessment team of suitably qualified and experienced Centennial staff and specialist consultants;
- Discuss and review existing information known for the East B Area and experience in adjacent mining areas;
- Identify, assess & evaluate potential subsidence impacts to the surface and subsurface features (natural & man-made) for the aspects typically required by government regulators for subsidence impact assessment and management (eg the NSW DPI-MR *Guidelines for Subsidence Management Applications* (2003)), and in accordance with the Centennial Risk Management Standard (004) using the Centennial Risk Matrix (probability matrix of consequence and likelihood).
- To focus on identifying and addressing potentially high risks or potentially severe consequences. This will consider both expected/predicted maximum subsidence, and higher than predicted subsidence (worst case) scenario of 'plug failure';
- To establish a Draft Risk Register (WRAC Worksheet) and risk report for the East B Area for review and comment by the risk team;
- The identification of additional controls required (including with respect to updating Centennial management plans);
- To produce a Final Risk Assessment Report (including the Risk Register/WRAC Worksheet) for the East B Area suitable to accompany the Environmental Assessment and provide a complementary risk assessment to the over-arching BBRA for the Environmental Assessment.

The following Hierarchy of Controls offers a framework for considering the effectiveness of controls. Note that the effectiveness of a control that is intended to reduce a risk decreases from top to bottom of the list. In other words, the closer the control type is to the top of the hierarchy, the more potentially effective the control.

- Eliminate the risk hazard;
- Minimise or replace the risk hazard (reduce to a less damaging level or replace with another that has less potential negative consequences);
- Control the risk hazard using hard controls (eg engineered controls);
- Control the risk hazard or energy by using physical barriers (exclusion areas, fencing, warning signs, etc.)
- Control the risk hazard with procedures (eg. standard operating procedures, etc.)
- Control the risk hazard with personal protective equipment (ex. hard hats, boots with toe caps, gloves, safety glasses, welding gear, etc.)
- Control the risk hazard with warnings and awareness



3. Potential Hazards:

In accordance with DPI-MR '*Guidelines for Subsidence Management Applications*' (2003), the following subsidence and environmental related hazard categories/aspects were considered within the context of risks discussed and assessed by the risk team (as a minimum):

- Public Safety
- Areas of high environmental, heritage or archaeological significance
- Wetlands, swamps and water related ecosystems
- Catchment Areas causing or exacerbating erosion and drainage pattern changes
- Significant water courses including surface flows, water quantity and quality, and ecological integrity
- Significant groundwater resources including levels and quality
- Threatened & protected species under TSC Act 1995
- Stability of escarpments & significant clifflines, pagodas or steep slopes
- The serviceability of major public utilities and/or amenities
- Surface improvements (including roads) causing damage beyond safety, serviceability and reparability
- Agricultural suitability or productivity
- Industrial, commercial and business establishments
- Foreshores and land prone to flooding or inundation
- Prescribed Dams or structures under the Dam Safety Act 1978; and
- Any other areas or features causing significant concern to the community, local and state government agencies.

4a. Risk Assessment Boundary Definition:

The scope of the risk assessment for the East B Area included:

- Consideration of the East B Area defined as the proposed workings plus 26.5 degree angle of draw. It is noted that East B Area extraction connects in the west to the existing Main South Area Stage 2 and 3 North Area approved SMP Areas;
- The risk assessment considered the potential subsidence impacts to surface and subsurface features (natural and man-made) for two scenarios:
 - o Firstly, a higher than predicted subsidence scenario (worst case scenario) - represented as a 'Plug Failure' scenario of approximately 2m shear failure of the Teralba conglomerate spanned (unsupported) roof areas, and;
 - o Secondly, the base case (expected maximum mining subsidence scenario) - with maximum expected vertical subsidence in the order of approximately 90-135mm (based on previous mine experience in adjacent areas) which was conservatively risk assessed up to 200mm, and negligible tilt or strain.

The undertaking of the worst case scenario assessment first allowed focus on key risk aspects if identified and, subsequently, consideration under the base case scenario (expected mining maximum subsidence scenario) of whether the identified risks and controls required further consideration and assessment.



5. Risk Assessment Methods:

Yes/No	Method
	PROACTIVE TOOLS
Yes	WRAC (Workplace Risk Assessment & Control)
	Fault Tree Analysis (FTA)
	SIL Analysis to Australian Standard 61508 - Under Development
	Bowtie Analysis - Under Development
	Failure Modes and Effects Analysis (FMEA)
	REACTIVE TOOLS:
	Root Cause Analysis (RCA) - Under Development



6. Previous Risk Assessment and other documents to be used and/or referenced:

Title	Version	Referenced Document Date
2008 3 North SMP Area Risk Assessment	Final	07-Nov-2008
2009 SMP Application – Revised Stage 3 SMP Area	Final	December 2009
2009 Revised Stage 3 SMP Area – Risk Assessment	Final	11 September 2009
2008 Awaba East Exploration Risk Assessment	Final	4 th April, 2008
2008 SMP Application – 3 North Area	Final	December 2008
2008 Awaba East Exploration Review of Environmental Factors (REF), including environmental risk mapping and specialist reports for ecology & Aboriginal heritage	Final	August 2008
Alluvium Groundwater study (AGEC)	Final	2008
Subsidence Assessment for Awaba Stage 3 (<i>Seedsman Geotechnics</i>)	Final	November 2009
Review of Panel & Pillar Layout – 3 North Area (<i>Seedsman Geotechnics</i>)	Final	August 2008

7. Information Required for Risk Assessment:

A presentation was viewed and discussed by the risk team at start of the risk assessment workshop (refer Appendix A of the BBRA (GSSE, 2010) – *Risk Assessment Presentations – GSSE and Centennial*), which provided an overview of key characteristics known for the East B SMP Area and aspects required for discussion and assessment during the risk assessment. This included:

- Key Objectives
- Background to the East B SMP Area
 - Historical & Proposed Mining
 - Natural Surface & Sub-surface Features - ecology (Flora & fauna), Aboriginal Heritage/Native Title, rock formations/outcropping, surface and ground water
 - Land Ownership
 - Constructed (man-made) Surface Features - Non Centennial infrastructure & Centennial owned infrastructure
 - Expected Subsidence Behaviour
 - Previous Studies and Available Info
- Centennial Risk Standard & Risk Matrix
- East B Area Risk Register / WRAC Worksheet.

Preliminary mapping/figures were presented for natural and constructed surface features, cover depths, land ownership and mining titles. Photos of the SMP Area for various aspects were shown.

8. Venue and Time:

Date	Description	Location	Start Time	End Time	Comment
1. 13-Jan-2010	Scoping during related Part 3 A BBRA Workshop	Awaba Colliery	8:00 AM	9:30 AM	Scoping for this risk assessment was completed within the presentation for the Awaba Part 3A BBRA and risk assessment workshop. Risk ranking and the report were completed in the following weeks (Feb 2010) as per below.
2. 11-Feb-2010	Assessment and Risk Ranking	Various (Risk Assessment including figures showing proposed extraction plan emailed to risk team with draft risk rankings for review and comment)	11-Feb-2010	12-Feb-2010	Risk ranking completed by risk team using base model for adjacent and similar 3 North Area risk assessment, modified accordingly for East B area where required (eg Aboriginal Heritage for Native Title/ILUA).

9. Risk Assessment Team Selection

Name	Title	Company	Yrs. of Exp.	E-Mail Address
Grant Watson	Mine Manager	Awaba Colliery	19	roger.davis@centennialcoal.com.au
Craig Cluderay	Mine Surveyor	Awaba Colliery	26	craig.cluderay@centennialcoal.com.au
Mary-Anne Crawford	Group Environment Manager	Centennial Coal	15	maryanne.crawford@centennialcoal.com.au
Jeff Dunwoodie	Environmental Coordinator	Newstan/Awaba Colliery	7	jeffrey.dunwoodie@centennialcoal.com.au
Craig Bagnall	Project Manager / Environ. Engineer	GSS Environmental	16	bagnell@gssenvironmental.com
Eryn Bath	Project Manager / Environ. Planner	GSS Environmental	10	bath@gssenvironmental.com
Anthony Reid	Environmental Scientist	GSS Environmental	2	reid@gssenvironmental.com
Colin Driscoll	Environmental Biologist	Hunter Eco	30	cd_enviro@bigpond.com
Lisa-Maree Campbell	Archaeologist	RPS HSO	5	lisa-maree@rpshso.com.au
Veronica Warren	Environmental Officer	Newstan/Awaba Colliery	2	Veronica.warren@centennialcoal.com.au
Lee-Ann Snowden	Commercial Support Officer	Centennial Coal	28	leeann.snowden@centennialcoal.com.au

WRAC Worksheet (East B Area Risk Register)

L= Likelihood; MRC= Maximum Reasonable Consequence; RR= Risk Rank

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
1. Public safety (<i>Centennial Coal is responsible for the health and safety of all persons whilst on Centennial owned lands (including non staff and general public. This also relates to land that has been leased by Centennial.)</i>)	There is a risk to Awaba from ::: Surface cracking ::: Caused by: Mining operations. Resulting in: Personal injury or vehicle damage.	1.1.a. Inspections of access tracks	D (IF)	3 (PI)	17 (M)	1. Update the Public Safety Management Plan to include East B Area with specific TARP controls (including specific additional controls where required). 2. Update the Public Safety MP to include the following for East B Area: Temporarily close tracks and trails, erect appropriate warning signs, and remediate as soon as practicable in accordance with required environmental protocols for any disturbance works required (see TARPs for details).
		1.1.b. Public Safety Management Plan (existing)				
		1.1 c. Timely response for surface rehabilitation works.				
2. Areas of high Environmental, Heritage or Archaeological Significance <i>(No heritage or archaeological surface sites identified during field survey. Sub-surface unknown)</i>	There is a risk to Awaba from ::: Surface cracking ::: Caused by: Mining operations. Resulting in: Damage/impact of Aboriginal Cultural Heritage material along ridge and drainage landforms (high sensitivity), sloped landforms (moderate sensitivity).	2.1.a. Sensitivity risk mapping for this area has been performed and found to be low for majority of area.	D (Pb)	3 (E)	17 (M)	3. Specialist archaeology assessment required for Part 3A application for East B Area including any required mitigation measures. 4. Commence additional Aboriginal Community Consultation. 5. Review Newstan Colliery Holding Aboriginal Heritage Management Plan and update as required.
		2.1.b. RPS HSO completed Archaeological field assessment for adjacent and similar 3 North area (no artefacts found)				
		2.1.c. Heritage assessment undertaken for Awaba East Stage 1 Exploration REF				
		2.1.d. RPS HSO commenced Archaeological field assessment for the East B Area				
		2.1.e. Newstan Archaeological Management Plan				

WRAC Worksheet (East B Area Risk Register)

L= Likelihood; MRC= Maximum Reasonable Consequence; RR= Risk Rank

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	There is a risk to Awaba from ::: Surface cracking :::	2.2.a. Subsidence is predicted as minimal <200mm, typically 90-135mm.	D (Pb)	4 (E)	21 (L)	6. Specialist archaeology assessment required for Part 3A application for East B Area including any required mitigation measures.
	Caused by: Mining operations. Resulting in: Changes to surface drainage lines and displacing of surface artefacts.	2.2.b. Locations of sites at Awaba mapped for previous Awaba East Stage 1 Exploration REF and for SMP area				
	There is a risk to Awaba from ::: Surface cracking :::	2.3.a. Review of Aboriginal ownership documents and areas for previous assessments.	D (IF)	3 (L)	17 (M)	7. Commence additional Aboriginal Community Consultation in accordance with <i>Awaba Colliery Stakeholder Engagement Plan</i> and DECCW ICCG's.
	Caused by: Mining operations.	2.3.b. Mapping of Land ownership completed				
	Resulting in: Impact to Neighbouring Aboriginal-owned land (KLALC).	2.3.c. East B Area subsidence impact zone is conservative and borders but does not enter KLALC Lands				
	There is a risk to Awaba from ::: Indigenous Land Use Agreement (ILUA) (Native Title):::	2.4.a. Landform risk mapping undertaken for Awaba Colliery Area (including mapping of previously unmined and unsurveyed areas for Aboriginal heritage).	D (IF)	3 (L)	17 (M)	8. Specialist archaeology assessment required for Part 3A application for East B Area including any required mitigation measures. 9. Commence additional Aboriginal Community Consultation and involvement (eg for surveys) in accordance with ILUA requirements and

WRAC Worksheet (East B Area Risk Register)

L= Likelihood; MRC= Maximum Reasonable Consequence; RR= Risk Rank

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	Caused by: Mining operations. Resulting in: Non-compliance with Indigenous Land Use Agreement (ILUA)/ Native Title Agreement Centennial holds with Aboriginal groups for the broader area.	2.4.b. Established ILUA trigger protocols for new mining areas for Awaba Colliery (ie known actions and requirements to be implemented).				established trigger protocols.
	There is a risk to Awaba from ::: Surface cracking ::: Caused by: Mining operations. Resulting in: Remedial earthworks required following subsidence exposing or displacing surface artefacts	2.5.a. Considered unlikely that earthworks will be required. 2.5 b. 'Permit to Clear' process (signed off by Environ. Coordinator)	D (Pb)	4 (E)	21 (L)	10. Prior to any ground disturbance works for remediation, an inspection for due diligence during Permit to Clear process is to be carried out by the Environmental Coordinator.
	There is a risk to Awaba from ::: Surface cracking ::: Caused by: Mining operations. Resulting in:	2.6.a. No European heritage sites found for Awaba East Stage 1 Exploration REF 2.6.b. There are no known significant heritage items perceived to be within the study area	D (Pb)	4 (E)	21 (L)	



WRAC Worksheet (East B Area Risk Register)

L= Likelihood; MRC= Maximum Reasonable Consequence; RR= Risk Rank

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	Impact on European Heritage within the area.					
3. Wetlands, swamps and water related ecosystems (Not Applicable)	There is a risk to Awaba from ::: Not Applicable ::: Caused by: Resulting in: Not Applicable.					
4. Catchment areas causing or exacerbating erosion of drainage lines. <i>(There are several ephemeral watercourses schedule 1 water courses within the SMP area.)</i>	There is a risk to Awaba from ::: Subsidence ::: Caused by: Mining operations. Resulting in: Erosion within stream bed and bank during re-establishment of creek grades following subsidence.	4.1.b. Surface Water Assessment carried out for Awaba East Stage 1 Exploration REF and proposed for SMP area	D (Pb)	4 (E)	21 (L)	11. Update Water course Management Plan for East B Area aspects.
		4.1.c. Mine plan has no extraction for cover < 25 metres of cover. This minimise the impacts on the surface drainage.				
		4.1.d. Water course management plan (existing)				
	There is a risk to Awaba from ::: Subsidence ::: Caused by: Mining operations.	4.2.a. Watercourse Management Plan 4.2 b – Mine design avoids extraction within below 2nd order creeks and higher (avoids impacts to creekline)	D (Pb)	5 (E)	24 (L)	11. Update Water course Management Plan for East B Area aspects.

WRAC Worksheet (East B Area Risk Register)

L= Likelihood; MRC= Maximum Reasonable Consequence; RR= Risk Rank

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	Resulting in: Temporary ponding and reduction in surface water flows in the creeks (all ephemeral) crossing the Study Area.	4.2 c Mine design maintains adequate depth of cover (20m for first workings and 25m for secondary extraction areas) to minimise surface impacts (successfully used at Awaba).				
	There is a risk to Awaba from ::: Subsidence ::: Caused by: Mining operations. Resulting in: Loss of water into overburden strata through surface cracks, with subsequent reduction in surface flows.	4.3.a. Upper drainage lines of 1 st order ephemeral creeks within SMP area only. No routine surface flows. 4.3.b. Mine plan allows Depth of cover maintained to protect surface (20m for 1 st workings, 25m for secondary extraction). 4.3.c. Inspections 4.3.d. Timely response for surface rehabilitation 4.3 e Watercourse Management Plan (existing) 4.3.f. Demonstrated successful rehabilitation strategies.	D (Pb)	5 (E)	24 (L)	12. For completeness, specialist surface water assessment to be undertaken including cumulative impacts required for Part 3A application for East B Area including any required mitigation measures. 13. Surface water catchment flow path analysis will be undertaken within the ecology report for the Part 3A application to assess downstream impacts in the event of worst case ('plug failure') scenario and confirm risk rankings. 11. Update Water course Management Plan for East B Area aspects..
5. Surface Water - Significant water courses <i>(Relevance: 1st Order Tributaries of Kilaben Creek (the major catchment within the SMP Area) and Stony Creek (minor catchment within the SMP Area)</i>	There is a risk to Awaba from ::: Surface Cracking ::: Caused by: Mining operations. Resulting in:	5.1.a No second order or higher creek sections within the East B Area 5.1.b. Mine design (extraction only in areas of adequate depth of cover). 5.1.c. Watercourse Management Plan (existing)	E (Pb)	4 (E)	23 (L)	12. For completeness, specialist surface water assessment to be undertaken including cumulative impacts required for Part 3A application for East B Area including any required mitigation measures. 13. Surface water catchment flow path analysis will be undertaken within the ecology report for the Part 3A application to assess downstream impacts in the event of worst case ('plug failure')



WRAC Worksheet (East B Area Risk Register)

L= Likelihood; MRC= Maximum Reasonable Consequence; RR= Risk Rank

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	Cracking of banks and first order tributaries of creek beds, loss of water flows, iron deposits, increased sediment in drainage lines, loss of aquatic habitat.	5.1.d. Surface water assessment was carried out for Awaba East Stage 1 Exploration REF study area.				scenario and confirm risk rankings. 11. Update Water course Management Plan for East B Area aspects..
6. Groundwater - Significant groundwater resources including groundwater level and quality <i>(Relevance: AGECE groundwater investigations (2008) state there are three (3) main hydrogeological units (aquifers) at Awaba Colliery: Alluvium Aquifers, Shallow Weathered Zone Aquifers, and Triassic & Permian Strata (Bedrock) Aquifers. None of these are noted by the study as regionally significant groundwater resources. No nearby private extraction bores (users) are currently known. See background AGECE report and SMP RA workshop background presentation for further detail.</i>	There is a risk to Awaba from ::: Subsidence :::	6.1.a. Water Management Plan	D (Pb)	4 (E)	21 (L)	
	Caused by: Mining operations.	6.1.b. Extensive regional groundwater monitoring program				
	Resulting in: Cracking of aquifer leading to loss of groundwater.	6.1.c AGECE Groundwater Investigation 2008 (Definition of Stoney Ck Alluvium)				
	There is a risk to Awaba from ::: Surface Cracking :::	6.2.a. Watercourse Management Plan	D (Op)	4 (E)	21 (L)	11. Update Water course Management Plan for East B Area aspects.
	Caused by: Mining operations.	6.2b Conservative mine plan (no mining within buffer zones for 2 nd order and higher creeks)				
	Resulting in: Inflow of groundwater into underground workings.	6.2.c Minimum Depth of Cover maintained in mine design				
		6.2 d Surface inspections for subsidence cracking				
		6.2 e Appropriate rehabilitation of subsidence cracking				
		6.2.b. Extensive groundwater monitoring program				

WRAC Worksheet (East B Area Risk Register)

L= Likelihood; MRC= Maximum Reasonable Consequence; RR= Risk Rank

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	There is a risk to Awaba from ::: Subsidence ::: Caused by: Mining operations. Resulting in: Impact to a third party user outside the SMP area.	6.3.a Well-established mine (1947), no 3rd party users nearby currently known, hasn't presented any issues in neighbouring existing mining areas at Awaba Colliery. 6.3.b Extensive regional groundwater monitoring program 6.3.c AGECE Groundwater Investigation 2008 (Definition of Stoney Ck Alluvium) 6.4.d DWE Licenced Bores register checks for private bores as part of SMP Process (none known in near proximity).	E (Op)	5 (L)	25 (L)	
7. Flora & Fauna - Threatened and protected species under the Threatened Species Conservation Act (1995) (Relevance: <i>Flora: Tetratheca juncea, Grevillea parviflora, associated with vegetation communities MU30 and MU31</i> <i>Fauna: Powerful owl, Masked Owl, Microchiropteran Bats.</i> <i>The site contains some ephemeral streams and drainage lines.)</i>	There is a risk to Awaba from ::: Subsidence ::: Caused by: Mining operations. Resulting in: Destruction or damage to habitat resulting in species population decline.	7.1.a. Newstan/Awaba Flora and Fauna Mgt Plan 7.1.b. A consolidated Flora and Fauna Assessment (<i>based on several past assessments covering/relevant to the SMP Area</i>) was carried out for the Awaba East Stage 1 Exploration REF Study area 7.1.c. Ground survey undertaken and risk mapping developed for threatened species	D (Pb)	5 (E)	24 (L)	
	There is a risk to Awaba from	7.2.a. Watercourse Mgt Plan (existing)	D (Pb)	5 (E)	24 (L)	11. Update Watercourse Management Plan for East B Area aspects.



WRAC Worksheet (East B Area Risk Register)

L= Likelihood; MRC= Maximum Reasonable Consequence; RR= Risk Rank

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	::: Subsidence (or erosion due to subsidence) ::: Caused by: Mining operations. Resulting in: Changes to water courses including stream bed and banks.	7.2.b. Surface water assessment was carried out for Awaba East Stage 1 Exploration REF study area 7.2 c Conservative mine plan – no secondary extraction below 2nd order creek sections 7.2d Conservative mine planning – cover depths maintained above 20m for 1st workings and 25m for extraction areas (historically shown to prevent significant surface cracking / sink holes). 7.2.e. Ground survey undertaken and risk mapping developed for GDE's/threatened species				
8. Groundwater Dependant Ecosystems <i>(Relevance: Ecological field surveys indicate no presence of GDE's within SMP Area)</i>	There is a risk to Awaba from ::: Subsidence ::: Caused by: Mining operations. Resulting in: Groundwater loss or inflow impacting on Groundwater dependent ecosystems.	8.1.a. Ecologist has assessed potential impact of potential groundwater dependent ecosystems 8.1 b Conservative mine planning – cover depths maintained above 20m for 1st workings development, and 25m for secondary extraction areas (historically shown to minimise significant cracking / sink holes) 8.1.b. Conservative mine plan (no secondary extraction under 2nd order or higher creeks) - only the very upper sections of first order tributaries	D (Pb)	5 (E)	24 (L)	



WRAC Worksheet (East B Area Risk Register)

L= Likelihood; MRC= Maximum Reasonable Consequence; RR= Risk Rank

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
		occur within SMP Area				
9. Public and Private Utilities and other Infrastructure - NO public utilities and/ or amenities (<i>Access to fire Tracks</i>)	There is a risk to Awaba from ::: Surface Cracks ::: Caused by: Mining operations. Resulting in: Cracking to fire tracks.	9.1.a. Public Safety Management Plan	D (Pb)	5 (PI)	24 (L)	
		9.1.b. Inspections of tracks				
		9.1.c. All Crown Land leased by Centennial Coal				
		9.1.d. No utilities are known to occur in the area				
10. Surface improvements causing damage beyond safety, serviceability and reparability (<i>Not Applicable</i>)	There is a risk to Awaba from ::: Not Applicable ::: Caused by: Resulting in: Not Applicable.					
11. Agricultural suitability and productivity (<i>Not Applicable</i>)	There is a risk to Awaba from ::: Not Applicable ::: Caused by: Resulting in: Not Applicable.					
12. Industrial, commercial and business establishments (<i>Not Applicable</i>)	There is a risk to Awaba from ::: Not Applicable :::					



WRAC Worksheet (East B Area Risk Register)

L= Likelihood; MRC= Maximum Reasonable Consequence; RR= Risk Rank

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	Caused by: Resulting in: Not Applicable.					
13. Foreshores and land prone to flooding or inundation (Not Applicable)	There is a risk to Awaba from ::: Not Applicable ::: Caused by: Resulting in: Not Applicable.					
14. Prescribed Dams (including stored waters and reservoirs) and / or structures Awaba East Stage 1 Exploration REferred to by the Dam Safety Act (1978) (Not Applicable)	There is a risk to Awaba from ::: Not Applicable ::: Caused by: Resulting in: Not Applicable.					
15. Underground Fire	There is a risk to Awaba from	15.1.a. Inspections	E (Op)	4 (PI)	23 (L)	
	::: Surface Cracking :::	15.1.b. Timely response for surface rehabilitation				
	Caused by: Mining operations.	15.1.c. Spontaneous Combustion Management Plan. (SMP version)				
	Resulting in:					



WRAC Worksheet (East B Area Risk Register)

L= Likelihood; MRC= Maximum Reasonable Consequence; RR= Risk Rank

Step	Potential Incident	Current Controls	L	MRC	RR	Recommended Control
	A surface fire spreading into the underground workings.					
	There is a risk to Awaba from ::: Surface Cracking ::: Caused by: Mining operations. Resulting in: Spontaneous combustion underground.	15.2.a. Spontaneous Combustion Management Plan.	D (Op)	5 (PI)	24 (L)	



RISK MANAGEMENT STANDARD

Management Standard-004

CENTENNIAL RISK MATRIX							Likelihood					Description (D)
Rating	Consequence						A Certain	B Probable	C Possible	D Remote	E Improbable	
	Note: Consequence may result from a single event or may represent a cumulative impact over a period of 12 months. Use the worst case reasonable consequence if there is more than one.						Common	Has Happened within Centennial	"Could Happen & has happened in non-CEY operations	Not Likely	"Practically impossible	Probability (Pb)
	Impact to Annual Business Plan (F)	Personal Injury (PI)	Business Interruption (BI)	Legal (L)	Reputation (R)	Environment (E)	Frequent incidents	Regular incidents	Infrequent incidents	Unlikely to occur. Very few recorded or known incidents	May occur in exceptional circumstances. Almost no recorded incidents.	Incident Frequency (IF)
							Operations – within 3 months	Operations – within 2 years	Operations – within 5 years	Operations – within 10 years	Operations – within 30 years	Operations (Op)
							Project – Every project	Project – Every 2 projects	Project – Every 5 projects	Project – Every 10 projects	Project – Every 30 projects	Project (Pr)
1. Catastrophic	>\$50m	Multiple Fatalities	> 1month	Prolonged litigation, heavy fines, potential jail term	Prolonged International media attention	Long term impairment habitats/ ecosystem	1 (E)	2 (E)	5 (H)	7 (H)	11 (S)	
2. Major	\$10m - \$50m	Single Fatality	1 week to 1 month	Major breach/ major litigation	International media attention	Long term effects of ecosystem	3 (E)	4 (E)	8 (H)	12 (S)	16 (M)	
3. Moderate	\$1m - \$10m	Serious/ Disabling Injury	1 day to 1 week	Serious breach of regulation. prosecution/ fine	National media attention	Serious medium term environmental effects	6 (H)	9 (H)	13 (S)	17 (M)	20 (L)	
4. Minor	\$100k - \$1m	Lost Time Injury	12 hrs to 1 day	Non-compliance, breaches in regulation	Adverse local public attention	Minor effects to physical environment	10 (S)	14 (S)	18 (M)	21 (L)	23 (L)	
5. Insignificant	<\$100k	First Aid Treatment Only	< 12 hrs	Low level compliance issue	Local complaints	Limited physical damage	15 (S)	19 (M)	22 (L)	24 (L)	25 (L)	



Risk Rating	Risk Category		Generic Management Actions
1 to 4	E	Extreme	Immediate intervention required from senior management to eliminate or reduce this risk
5 to 9	H	High	Imperative to eliminate or reduce risk to a lower level by the introduction of control measures. Management planning required at senior levels
10 to 15	S	Significant	Corrective action required, senior management attention needed to eliminate or reduce risk
16 to 19	M	Moderate	Corrective action to be determined, management responsibility must be specified
20 to 25	L	Low	Monitor and manage by corrective action where practicable

THIS DOCUMENT IS UNCONTROLLED UNLESS VIEWED ON THE INTRANET

APPENDIX D

MAIN SOUTH AREA: SUBSIDENCE RISK ASSESSMENT

AWABA COLLIERY
SECONDARY PARTIAL PILLAR
EXTRACTION
SURFACE SUBSIDENCE
MAIN SOUTH AREA
RISK ASSESSMENT

OCTOBER, 2005

FINAL REPORT

ISSUE DATE 16.11.05
VERSION NO.: 04

Prepared by: Jim Knowles Group

APPENDICES ONLY

Appendix A: Team Member Resumes
Appendix B: Scoping Meeting Notes
Appendix C: Results of the Review



APPENDIX 'A'

Team Member Resumés

Eddie Blackwell - External Works Manager, RailCorp

Qualifications:

- ◇ Carpentry Trades
- ◇ Building Foreman certificate of Works
- ◇ Project management

Experience:

- ◇ 3 years in present position
- ◇ 20 years as Senior Project Manager in building construction industry
- ◇ 27 years in total, experience in building construction in a rail environment

Geoff Byrnes - Manager - Fuel, Eraring Energy

Qualifications:

- ◇ Bachelor Engineering
- ◇ Master Engineering Science

Experience:

- ◇ 3 years in present position
- ◇ (other experience not listed)

Phil Enright - Mine Surveyor, Centennial Newstan - Awaba Colliery

Qualifications:

- ◇ Surveyor's Certificate of Competency
- ◇ Undermanager's Certificate of Competency
- ◇ Registered Mining Surveyor (BOSS 1)

Experience:

- ◇ 23 years underground mining experience including:
 - 20 years at Awaba - 13 years as Mine Surveyor and 2 years as Undermanager
 - 7 years at Newstan (some concurrent with Awaba)

**APPENDIX 'A'****Vanessa Garling - Mining Engineer, Centennial Newstan -
Awaba Colliery***Qualifications:*

- ◇ Bachelor Engineering (Mining)
- ◇ MCom (Strategic Value Management)

Experience:

- ◇ 4 years mining experience at Centennial mines, including:
 - Clarence
 - Charbon
 - Myuna
 - Newstan
 - Munmorah
 - Mannering
 - Awaba

**Richard Grant - Project Co-ordinator (Metro North),
RailCorp - Rail Corridor Management Group***Qualifications:*

- ◇ Electrical Trades certificate
- ◇ Joinery Trades certificate
- ◇ Track Awareness certificate
- ◇ Telecommunications qualifications

Experience:

- ◇ 1 year in current position
- ◇ 4 years in RailCorp as Senior Accounts Manager

David Hill - Principal Engineer- Strata Engineering*Qualifications:*

- ◇ BSc (Hons) Mining Engineering
- ◇ Grad Dip Economics (Wits)
- ◇ CoMSA Certificate in Coal Mine Strata Control

Experience:

- ◇ 25 years coal mining experience (UK, South Africa and Australia) including production, planning and technical roles. Primarily involved in the field of underground geotechnical engineering for last 18 years.



APPENDIX 'A'

Andrew Hutton - Principal Environmental Consultant, GSS Environmental

Qualifications:

- ◇ Bachelor Natural Resources (UNE)
- ◇ Masters Business & Environmental Management (Newcastle)

Experience:

- ◇ 4 years as Environmental Officer for BHP Coal Operations, Central Queensland
- ◇ 1 year as Operations Manager for IESA Environmental Consultants
- ◇ 3 years as Environmental Manager, Donaldson coal Mine, Beresfield
- ◇ Last 2 years in current position

Sandy Pfeiffer - Senior Engineering Geologist, RailCorp

Qualifications:

- ◇ Bachelor of Applied Science (Hons)

Experience:

- ◇ 27 years with RailCorp

Sally McPhee - Senior Consultant, Jim Knowles Group

Qualifications:

- ◇ Bachelor Building (UNSW, Kensington)
- ◇ Graduate Diploma in OH&S
- ◇ OH&S Systems Auditor Accreditation

Experience:

- ◇ 20 years of experience in the building construction field. She has been involved at site and senior management level in commercial and industrial building as well as civil engineering projects.
- ◇ Over the past ten years, she has been involved with and facilitated Operational and Design Risk Assessment Workshops in the coal mining and construction industries in Australia and overseas as well as commercial Risk Reviews for corporate and insurance industry clients.



APPENDIX 'B'

Scoping Meeting Notes

Scoping Meeting for
Risk Assessment of Partial Secondary Pillar Extraction in the Great Northern Seam
Surface Subsidence

Held 10.30am Tuesday 27th September, 2005
(Revised)

GENERAL

Centennial Coal's Awaba Colliery is proposing to conduct partial secondary extraction in a section of first workings in the Great Northern Seam (GNS) of the Mine. The area was first worked from around 1955 to the early 1960's leaving a considerable coal resource in the pillars. There has been no recorded subsidence of the workings in the intervening years and all roadways are still open and accessible.

The mine plan is been deliberately conservative to expedite the progress of the project. Maximising recovery of the coal resource while maintaining a safe method of work was also a consideration when developing the plan. Due to other mining activities in the area, the window of opportunity to recover the coal resource from these first workings, is time limited.

The proposed extraction method will result in a predicted subsidence up to 115mm across the mining area. There is a long history of mining in the area both at Awaba and nearby mines and subsidence monitoring data from these as well as world wide empirical information, has been used to assist with the predictions. There is a possibility of failures such as pillar and plug failure, all of which have occurred at Awaba, the subsidence from which has been managed over a number of years.

To support Awaba's application to mine the subject area, a Subsidence Management Plan (SMP) is being prepared and will be submitted to the DPI-Mineral Resources. SMP guidelines require that a risk assessment be conducted to identify potential hazards and to help formulate controls and management plans for those hazards. This scoping session was convened to bring together all interested parties to define the scope, resources, method and required outcomes for the risk assessment that may be used to formulate specific Management Plans.

Community consultation and consultation with surface user stakeholders - Railcorp, Eraring Energy, Xstrata and Energy Australia - has already occurred. All have been invited to attend the risk assessment, however only Railcorp and Eraring Energy have expressed a desire to attend. Other stakeholders will be advised of the results of the risk assessment.

SCOPE OF THE REVIEW

The risk assessment will examine the subsidence effects with the mining area as a result of the proposed partial secondary pillar extraction within the application area. Risks to personal safety of the public and other persons and business interruption to surface users, may all be considered when identifying hazards and loss scenarios.

Inclusions:

- * Proposed area for secondary pillar extraction plus 'buffer' area to be defined
- * All surface facilities within the defined area and 'buffer' zone which may be affected by subsidence or ground movement (lateral)
- * Different cases for subsidence, that is
 - predicted subsidence to a maximum of 115mm
 - twice the predicted subsidence (250mm)
 - ten times predicted - 1.1m (pillar failure)
 - plug failure

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- * Surface Features:
 - Natural bush Crown Land including public access trails / tracks
 - Two water courses
 - Rail lines - adjacent Main Northern, adjacent Ulan loop, overlying abandoned Railcorp Wangi line
 - Eraring haul road
 - Power lines - Railcorp, Energy Australia and Awaba

Exclusions:

- * Future proposed Newstan undermining of Awaba workings - covered under a separate application and risk assessment
- * Eraring ash dam (outside of notification area)
- * Catastrophic events such as earthquakes

INFORMATION TO BE AVAILABLE FOR THE REVIEW WORKSHOP

- (a) Mine plans
- (b) Geotechnical information and subsidence predictions
- (c) Historical data on actual subsidence from other mines such as
 - o Awaba
 - o Newstan
 - o Cooranbong
 - o any other relevant mines

ISSUES TO BE CONSIDERED

- * Subsidence is not as predicted - failures such as plug failure
- * Issues for the public and other users on the surface
- * Subsidence effects on surface environment
 - safety
 - environment
 - business interruption (surface business operations)
- * Short term immediate subsidence (expected to be 90% of final)
- * Long term subsidence effects e.g.
 - plug failure
 - pillar creep
 - pillar failure

OBJECTIVES OF THE REVIEW:

The results of the risk assessment will be used to help define actions and trigger levels for the Awaba Subsidence Management Plan to be included with the application to mine in the proposed area.

PERSONS PRESENT AT SCOPING MEETING:

Neil Alston	Centennial Coal	neil.alston@centennialcoal.com.au
Phil Enright	Centennial Awaba	phil.enright@centennialcoal.com.au
Vanessa Garling	Centennial Awaba	vanessa.garling@centennialcoal.com.au
Paul Williams	Centennial Awaba	paul.williams@centennialcoal.com.au
Ray Ramage	DPI-MR	ray.ramage@minerals.nsw.gov.au
Sally McPhee	Jim Knowles Group	sally.mcphee@jkggroup.com.au

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**REVIEW WORKSHOP DATE**

The review workshop has been rescheduled for one day on Friday 14th October, 2005, commencing at 8.00am at the Awaba Mine offices. (First proposed date of 6th October, postponed)

TEAM MEMBERS

The composition of the team was discussed and the proposed team members are as follows:

Phil Enright	Surveyor / Systems Superintendent
Vanessa Garling	Mining Engineer
Paul Williams	Environmental Officer
Railcorp representative	
Eraring Energy representative	
David Hill	Geotechnical Consultant (Strata Engineering Australia)
Andrew Hutton	Environmental Consultant (GSS Environmental)
Sally McPhee	Facilitator - Jim Knowles Group
Carolyn Gowdy	Facilitation Support- Jim Knowles Group

RISK ASSESSMENT METHOD

The risk assessment will use the standard Centennial Coal risk assessment and ranking method, which is a variation of the WRAC system. In this case, the team will assess each of the four different subsidence cases (see scope) as it applies to each different location and surface feature.

The team may use the following risk ranking criteria. The risk assessment team will discuss these at the workshop and change them as considered necessary to the subject under review.

Consequences

	Descriptor	People	Business Interruption
1	<i>Catastrophic</i>	Fatality	> 1 month
2	<i>Major</i>	Serious injury / Permanent disability	~ 1 week
3	<i>Moderate</i>	Lost Time Injury	~ 1 day
4	<i>Minor</i>	Medical treatment	~ 1 shift
5	<i>Insignificant</i>	First Aid	< ~ 1 hour

Probability

	Descriptor	
A	<i>Highly likely</i>	Common occurrence
B	<i>Likely</i>	Likely - has happened
C	<i>Possible</i>	Moderate - could happen / possible
D	<i>Unlikely</i>	Unlikely - not likely to happen
E	<i>Highly unlikely</i>	Rare - Practically impossible

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**Consequences**

	1	2	4	7	11
2	3	5	8	12	16
3	6	9	13	17	20
4	10	14	18	21	23
5	15	19	22	24	25

Note that a Risk Ranking of 1 represents the highest risk or the worst case.

As a general rule, High Risks ranked from 1 to 6 require action (two hard barriers or the equivalent) that will reduce the risk to an acceptable level for everyday operation. Hazards ranked 7 to 15 are judged medium risks, those ranked from 16 to 25 are deemed to be low or acceptable risks.

These notes were prepared by Sally McPhee of the Jim Knowles Group and will be forwarded to Vanessa Garling for further distribution as necessary.

Sally McPhee
Jim Knowles Group
PO Box 113, Kurri Kurri, NSW 2323
Phone: 4937 5855 Fax: 4937 5844

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APPENDIX 'C'

Results of the Review

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Centennial Newstan

AWABA COLLIERY

Awaba, NSW

Risk Assessment of

Secondary Partial Pillar Extraction Surface Subsidence Main South Area

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JIM KNOWLES GROUP

Consultants in Occupational Health, Safety and Risk Management



1 Railcorp Main Northern Line – nearest points to Mining Application Area		
Mine Area	Closest Point to Rail Line	Depth of Cover
Location 1 (2NW Panel)	51m	30m
Location 2 (7S Panel)	72m	50m

	Subsidence within mine area	Consequences to rail line / Rail Corridor		Comments
		Location 1	Location 2	
Case 1	As predicted – to a maximum of 115mm (expected < 75mm)	Negligible* impact to rail line	Negligible* impact to rail line	Impact to rail line was assessed on potential vertical as well as horizontal movement * Negligible is 'unmeasurable' or < 10mm
Case 2	Twice predicted – that is to a maximum of 250mm	Negligible* impact to rail line	Negligible* impact to rail line	
Case 3	Ten Times predicted – that is in effect, pillar failure – 1.1m to 1.5m	Negligible* impact to rail line	Negligible* impact to rail line	
Case 4	Plug failure	Nil impact to rail line (no possibility of plug failure under rail line from this mining activity)	Nil impact to rail line (no possibility of plug failure under rail line from this mining activity)	

No adverse consequences to rail line from any of the predicted or unpredicted subsidence scenarios, therefore no requirement to assess risk

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2. Eraring Energy Haul Road – Locations where road crosses Mining Application Area		
Mine Area	Type of Partial Pillar Extraction	Depth of Cover
Location 1 - 7S	Single sided	50-60m
Location 2 - 4NW	Single sided	40-45m
Location 3 - 5SW	Single sided	55m
Location 4a - 2NW	Double sided	40-45m
Location 4b - 4N	Single sided	35-40m
Location 5 - 1NW	Double sided*	25-30m
Location 6 - 2SW	Double sided	55m

- * Based on reports from Strata Engineering Australia, no extraction will occur where depth of cover is less than 35m beneath sensitive features. In this case, the pillars beneath the haul road will not be stripped.

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Centennial Newstan

Awaba Colliery
Risk Assessment on Partial Secondary Pillar Extraction – Surface Subsidence

2 Eraring Energy Haul Road – Locations where road crosses Mining Application Area					
		Single sided Lifting in Locations 1, 2, 3 and 4b	Double sided Lifting in locations 4a, 5, and 6		
	Subsidence within mine area	Consequences to rail line / Rail Corridor			
Case 1	As predicted – to a maximum of 75mm with single sided lifting and 115mm with double sided lifting (expected subsidence is considerably less)	Negligible to nil impact on haul road	Negligible to nil impact on haul road		
Case 2	Twice predicted – that is to a maximum of 150mm with single sided lifting and 250mm with double sided lifting	Negligible to nil impact on haul road	Consequence to haul road includes minor surface cracking.		In the past the Eraring Energy Haul road has been fully undermined using full extraction (subsidence up to 1.5m) and also partial extraction – the results of the subsidence during those events was easily managed and is well understood
Case 3	Ten Times predicted – that is in effect, pillar failure – 1.1m to 1.5m	Expected consequence to haul road could include road cracking and localised dipping over 2 to 3 days			
Case 4	Plug failure	Practically impossible due to depth of cover (>35m)	Theoretically possible in 2NW double sided lifting (Location 4a). Localised sink hole up to 1m deep.		

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2 Eraring Energy Haul Road

No	Type of Subsidence	Consequence	P	C	R	Loss	No	Threats	Control Measures	Action By	Date
2.1	Double predicted subsidence – 250mm	Minor surface cracking – - break up integrity of road surface - additional maintenance cost and business interruption	D	4	21	C	2.1.1	Geotechnical information/ predictions are incorrect	- Predictions are based on extensive historical data – local and international - Provided by expert Geotechnical consultants		
							2.1.2	Mine design is compromised	- Awaba will strictly adhere to Mining Plan using - mining plan - supervision - audits - Track, Trail, and Haul Road Safety Management Plan to address variation from mining sequence - Design is deliberately conservative with factors of safety		
2.2	Pillar failure (all areas) – subsidence up to 1.5m	Road cracking and localised dipping or small steps (<100mm) Truck may become destabilised	E	1	11	S	2.2.1	Mine design is compromised – excess extraction reduces pillar size and therefore stability	- Awaba will strictly adhere to Mining Plan using - mining plan - supervision - audits - Track, Trail, and Haul Road Safety Management Plan to address variation from mining sequence - Design is deliberately conservative with factors of safety		

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Centennial Newstan

2 Eraring Energy Haul Road

No	Type of Subsidence	Consequence	P	C	R	Loss	No	Threats	Control Measures	Action By	Date
2.3	Plug failure – double sided lifting particularly at 1NW where cover is 25m	Could result in large step in roadway Risk of accident to truck drivers	D	1	7	S	2.3.1	Increased risk with decreased cover – can be exacerbated by geological anomalies	- Secondary extraction will not occur in 1NW panel under roadway, that is less than or equal to 35m cover - Single sided lifting only where cover is 35–45m directly under roadway		
2.3	Plug failure – double sided lifting particularly at 1NW where cover is 25m	Could result in large step in roadway Risk of accident to truck drivers	D	1	7	S	2.3.2	Mine design not followed	- Awaba will strictly adhere to Mining Plan using - mining plan - supervision - audits - Track, Trail, and Haul Road Safety Management Plan to address variation from mining sequence - Design is deliberately conservative with factors of safety		

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3

Railcorp Power Transmission Poles – 5 identified poles within the Application Area		
Mine Area	Type of Pillar Extraction	Depth of Cover
Location 1 (2NW Panel - 1 pole)	Double sided lifting	35-40m
Location 2 (4N Panel - 4 poles)	Single sided lifting	20-45m

	Subsidence within mine area	Consequences to Timber Power transmission poles	Comments
		All Locations	
Case 1	As predicted – to a maximum of 115mm (expected < 75mm)	maximum 30mm movement at top of pole (any direction)	
Case 2	Twice predicted – that is to a maximum of 250mm	maximum 45mm movement at top of pole (any direction)	
Case 3	Ten Times predicted – that is in effect, pillar failure – 1.1m to 1.5m	Individual pole could drop maximum of 1.1m	
Case 4	Plug failure	Plug failure under pole - could destabilise poles and bring down or break conductors	

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Centennial Newstan

Awaba Colliery
Risk Assessment on Partial Secondary Pillar Extraction – Surface Subsidence

3 Railcorp Power Transmission Poles										
No	Type of Pole Movement from Subsidence	Consequence	P	C	R	Loss	No Threats	Control Measures	Action By	Date
3.1	Predicted Subsidence - 30mm movement at top of pole	Believed to be no adverse consequences. Any deviation would be within acceptable/ manageable limits						▪ Railcorp to check this		
3.2	Twice predicted subsidence - 45mm movement at top of pole	Believed to be no adverse consequences. Any deviation would be within acceptable/ manageable limits						▪ Railcorp to check this		
3.3	Pillar failure - up to 1.1 or 1.5m subsidence under poles	Possible over-stretch of conductors					<i>Where this has occurred in the past (under full pillar extraction) there has been no adverse impacts</i>	▪ Railcorp to check this ▪ This is not expected and mine planning will preclude this ▪ Option to change mine sequencing to protect surface feature (pole)		

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JIM KNOWLES GROUP



Centennial Newstan

Awaba Colliery
Risk Assessment on Partial Secondary Pillar Extraction – Surface Subsidence

3 Railcorp Power Transmission Poles						
No	Type of Pole Movement from Subsidence	Consequence	P	C	R	Loss
3.4	Plug failure under pole - up to 1m drop - destabilisation of pole	Break of conductor - - business interruption to RailCorp - Fire - Public safety (pole falls over)	D	1	7	
			No	Threats	Control Measures	Action By
			S	Failure to follow mine plan	- Mine sequence can be altered to protect surface features eg. poles - Review of subsidence monitoring data collected over the life of the project conducted prior to mining affected area. Consult with RailCorp at that time. - Monitoring - Transmission Pole Safety Management Plan	

4 Energy Australia Power Transmission Poles – 6 identified poles within the Application Area - 3 x 33kv and 3 x 11kv		
Mine Area	Type of Pillar Extraction	Depth of Cover
Location (4N Panel - 6 poles)	Single sided lifting	25m-30m

Comments / Controls

Management for all Energy Australia poles will be the same as for Railcorp poles

NOTE: Awaba has long history of successful management of these types of surface infrastructure over full pillar extraction areas

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5. General Environment Above Mining Application Area				
Feature	Predicted - up to 115mm	Twice Predicted - up to 250mm	Ten Times - Pillar failure	Plug Failure
Bushland	Insignificant effect	Insignificant effect	Insignificant effect	Localised sink hole
Tracks/ trails	Insignificant effect	Insignificant effect	Disruption to tracks or trails	Localised sink hole
Heritage features (Wangi Wangi rail line)	Insignificant effect	Insignificant effect	Insignificant effect	Localised sink hole
Water courses	Insignificant effect	Insignificant effect	Disruption to water flow	Localised sink hole
Aboriginal Heritage	No Aboriginal heritage areas identified			
Threatened Flora & Fauna (permanent water hole/ riparian vegetation)	Insignificant effect	Insignificant effect	Disruption to water habitats	Localised sink hole

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5 General Environment																		
No	Subsidence Affect	Consequence	P	C	R	Loss	Threats	Control Measures	Action By	Date								
5.1	Plug failure produces sink hole in bushland	Hazard to public walking in area	E	2	16	S	Mining plan not followed - areas of very low cover (< 25m) have partial pillar extraction - may produce unstable intersections	- Mine design has identified areas at risk – design 'precludes' possibility of failure under sensitive surface feature – - conservative pillar design - Mine operations will be supervised and monitored to ensure mine plan adhered to - Mining sequence can be varied to accommodate sensitive surface features (preclude probability of event) (TARP to be developed cover etc) - Awaba management plans for surface subsidence monitoring and rectification to include: - Public safety - Track, trail and haul road - watercourses										
5.2	Plug failure - sink hole in riding trail	Damage to environment while repairing sink hole (dozing)	E	3	20	E	NOTE: only instance of plug failure occurred (in first workings) at depth <20m under creek (bord and pillar workings)											
5.3	Plug failure - sink hole in Stakeholders access to infrastructure	Trail bike rider drives into sink hole	E	1	11	S												
5.4	Plug failure sink hole under abandoned rail corridor	Maintenance personnel drive / walk into hole	E	2	16	S												
5.4	Plug failure sink hole under abandoned rail corridor	Damage to surface heritage feature (Wangi line)	E	4	23	E												
5.5	Plug failure under water course	Flooding of mine and loss of creek environment (flora and fauna etc)	E	2	16	PE												
5.6	Plug failure	Protected flora damaged by plug failure / sink hole	E	3	20	E												



5 General Environment										
No	Hazard	Consequence	P	C	R	Loss	Threats	Control Measures	Action By	Date
5.7	Pillar failure - Tracks or trails disrupted	▪ Minor surface steps ▪ Trip hazard	E	4	23	S	Mining plan not followed - produces pillar instability	▪ Mine plan is designed to maintain pillar stability (see 2, 4 in environmental plug failure) ▪ TARP to be developed to identify areas of particular risk related to - depth of cover - system of mining - location within catchment		
5.8	Pillar failure, Watercourses disrupted	▪ Diversion of waters (surface cracking and vertical movement) ▪ Affect on riparian communities	E	2	16	E				

6. Catastrophic / Emergency Events

1. Fire/ spon comb - Covered by Underground Emergency Management Plan. Also covered by Railcorp procedures. No history of sponcom at Awaba and proposed method of mining is not significantly different to previous methods of mining undertaken at Awaba, therefore no increased risk of spontaneous combustion. Fire and Emergency Management Plan includes notification of surface stakeholders. Short and long term effects on Railcorp effects are nil (subsidence)
2. Mine explosion – Same as above
3. Earthquake – Covered by Underground Emergency Management Plan and Fire and Emergency Management Plan. Also covered by Railcorp procedures.
4. Other Issues
 - Fault lines – considered fault lines adjacent to corridor.
 - Solid coal (no voids) under rail-lines with faults which run at high angles relative to the rail line and mine workings.
 - Partial extraction includes 'buffer zone' pillars and conservative large pillar design with high factors of safety.
 - Failure of all of above would result in maximum of 1.5m of subsidence (total extraction effect)

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