

THE AWABA COLLIERY MINING PROJECT BROAD BRUSH RISK ASSESSMENT

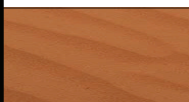
INCLUDING:

**APPENDIX A: PART 3A BROADBRUSH RISK
ASSESSMENT WORKSHOP**

**APPENNDIX B: SMP RISK ASSESSMENT -
REVISED STAGE 3**

**APPENDIX C: SMP RISK ASSESSMENT - EAST
B AREA**

**APPENDIX D: SMP RISK ASSESSMENT -
MAIN SOUTH AREA**





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 coalmine 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 800,000 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.

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 Mining Project** (the “Project”), which will seek approval from the Minister for Planning to allow an extension of underground mining (East B Area) and the ongoing use of associated surface operations. At present, it is anticipated that the Project will recover approximately 2.0 million tonnes of coal which will be extracted from those areas depicted in Study Area 2 and Study Area 3 (refer Section 4) over a period of approximately five years or more, depending on actual mining conditions and relevant market drivers. To allow for potential productivity improvements, approval will be sought for approximately 880,000 tonnes per financial year. An Environmental Assessment (“EA”) that will assess the key environmental issues as considered by this BBRA will support the application for the proposed Project.

Minimal changes are proposed to existing surface operations, with one proposed additional surface disturbance relating to increased pollution control dam capacity located in a previously disturbed area. No significant changes to coal handling are proposed. Underground mining areas requiring approval to allow continued mine operations and production are outlined in Sections 1.2 and 1.3 below.

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 potentially high risk issues relating to the project (including where this is due to further investigation or information being required to better assess environmental risk). This is to be used to ensure the potentially high risk aspects are adequately investigated and 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 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. It is noted that a modification to the Newstan Colliery development consent (DA 73-11-98) will be applied for under Section 96(1A) of the EP&A Act to allow for the preparation of coal sourced from the Awaba Colliery using the existing Newstan Colliery infrastructure.

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 been addressed in specific Subsidence risk assessments completed for those areas. Cross-reference to the highest potential 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, water management 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	
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 Jolliffe	Principal Water Engineer	GHD	30	ian.jolliffe@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.				

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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.				

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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

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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 NGERS.				
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				



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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 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.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 7.4.d. Watercourse assessment was carried out for Awaba East Stage 1 Exploration REF study area.	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.
	There is a risk to Awaba from ::: Surface Cracking in the Main South Stage 2 Area ::: Caused by: Mining operations 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.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). 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.	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.

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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				



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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	C (Pb)	4 (E)	18 (M)	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				



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

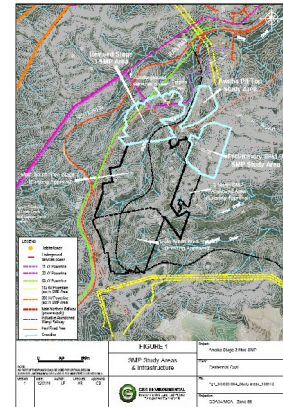
Part 3A Broad Brush RA General Introduction to Workshop Participants

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

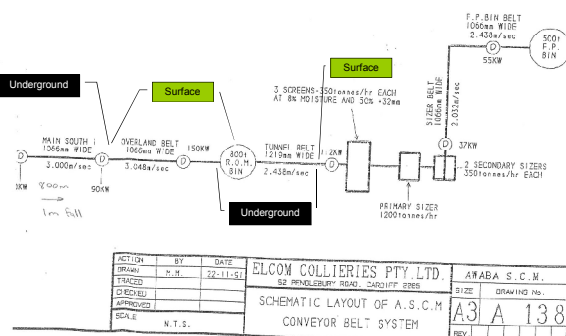
- Proposed Application Area consists of existing first workings developed from 1947.
- Partial extraction mining method chosen to satisfy mine safety, resource recovery, surface subsidence and production requirements.
- Pillar and barrier design evaluated by Seedsman.

Natural Features



Typical Bushland

Coal Processing flow diagram





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				



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	Regular incidents	Infrequent incidents	Unlikely to occur. Very few recorded or known incidents.	May occur in exceptional circumstances. Almost no recorded incidents.
							Operations – within 3 months	Operations – within 2 years	Operations – within 5 years	Operations – within 10 years	Operations – within 30 years
							Project – Every project	Project – Every 2 projects	Project – Every 5 projects	Project – Every 10 projects	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)

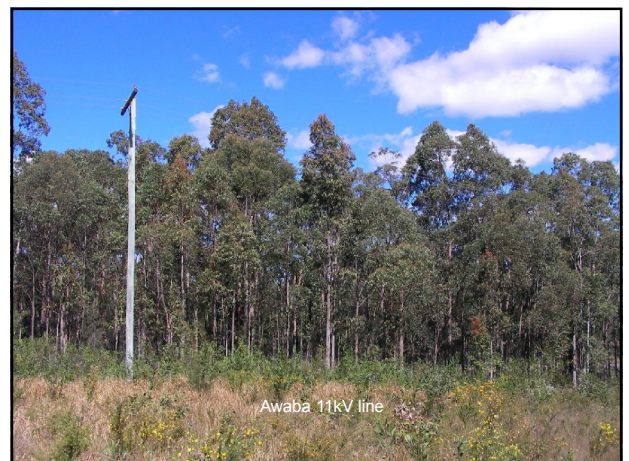


Risk Rating	Risk Category		Generic Management Actions
1 to 4	E	Extreme	Immediate intervention required from senior management to eliminate or reduce this risk
5 to 9	H	High	Imperative to eliminate or reduce risk to a lower level by the introduction of control measures. Management planning required at 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





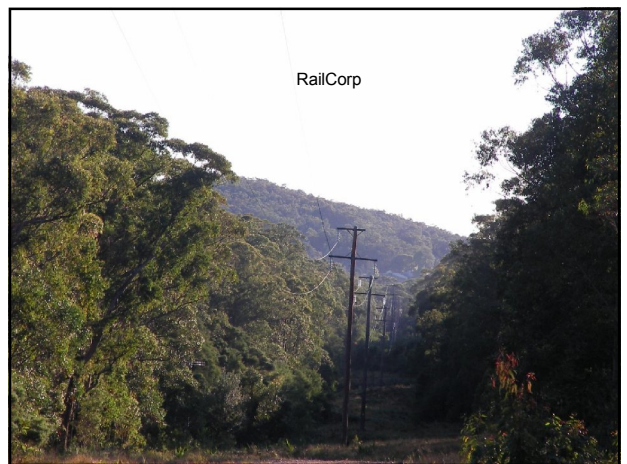
Awaba /Energy Aust lines (Turn point)



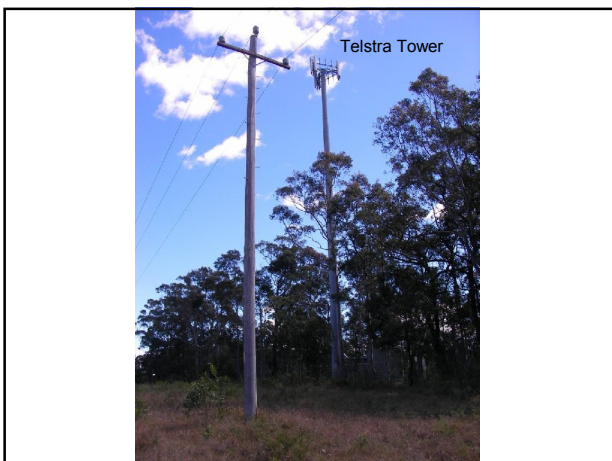
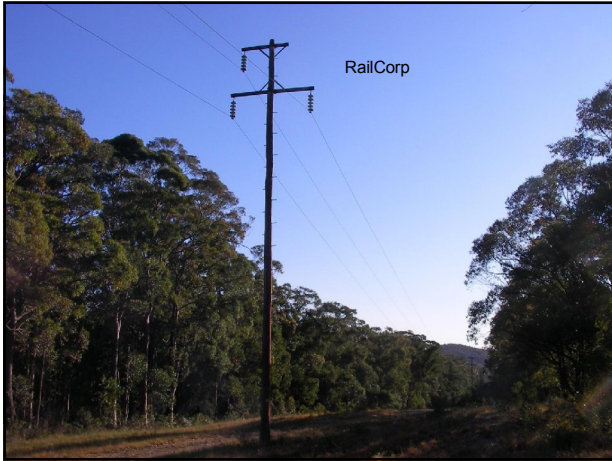
Eraring Haul Road



Eraring Haul Road



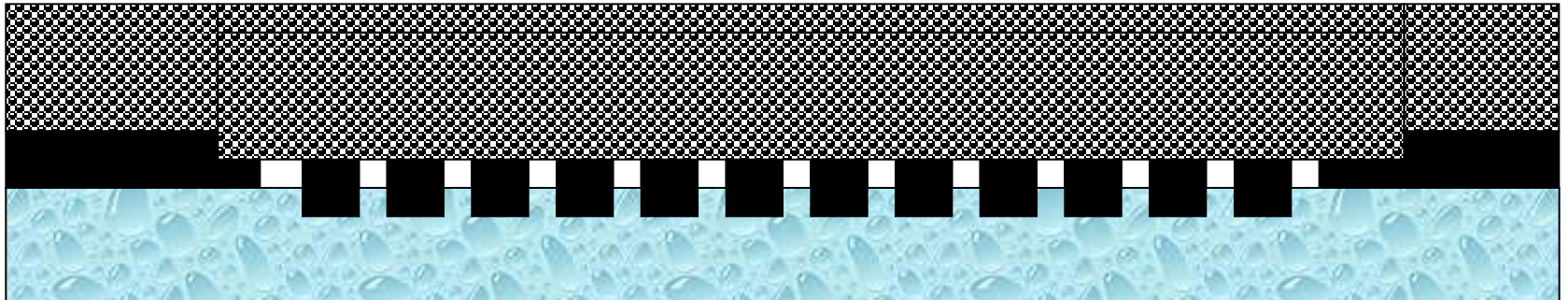
RailCorp





Appendix 2 – Subsidence Presentation

The problem is wide spans on pillars with weak foundations



Constraints

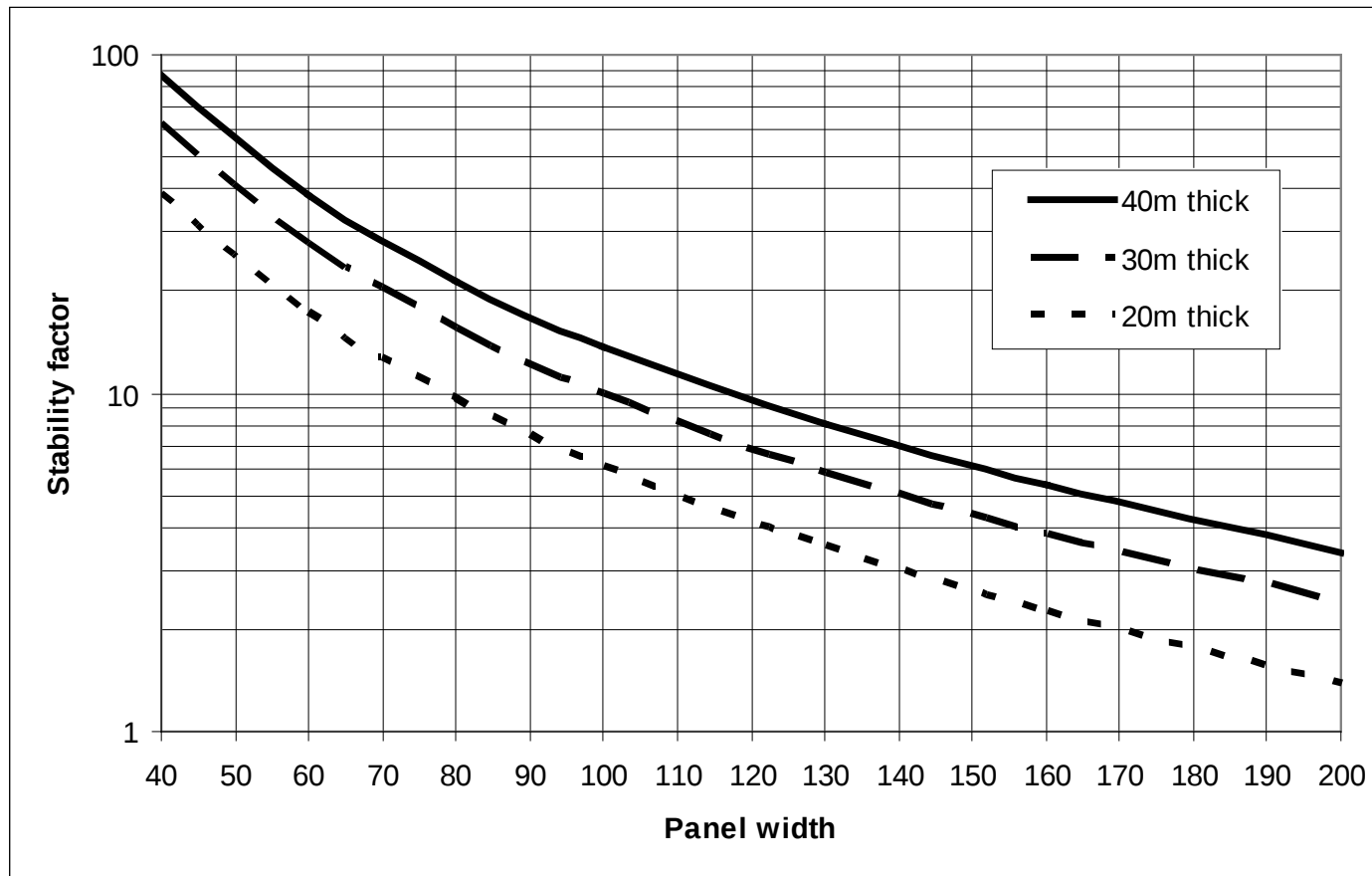
- No collapse of the Teralba Conglomerate
- Manage the wind blast hazard
- Extract standing pillars
- Inability to fully characterize floor
- Remote control miners
- Breaker line supports
- Maximum cutout of 15m when stripping
- Depths of 40m-60m
- Maximum extraction height of 3.8m
- 100m stand-off from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



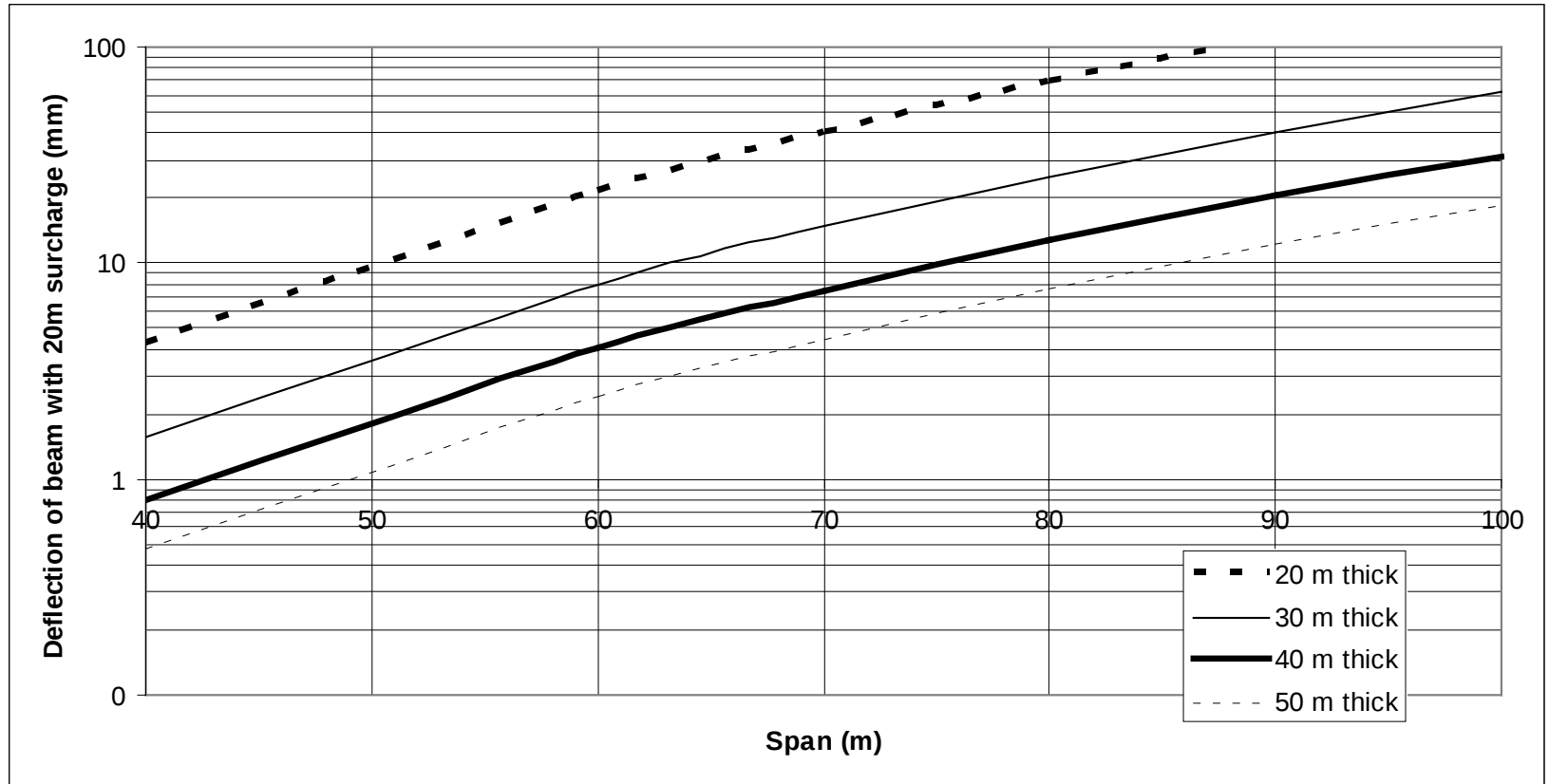
Some things on our side

- 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

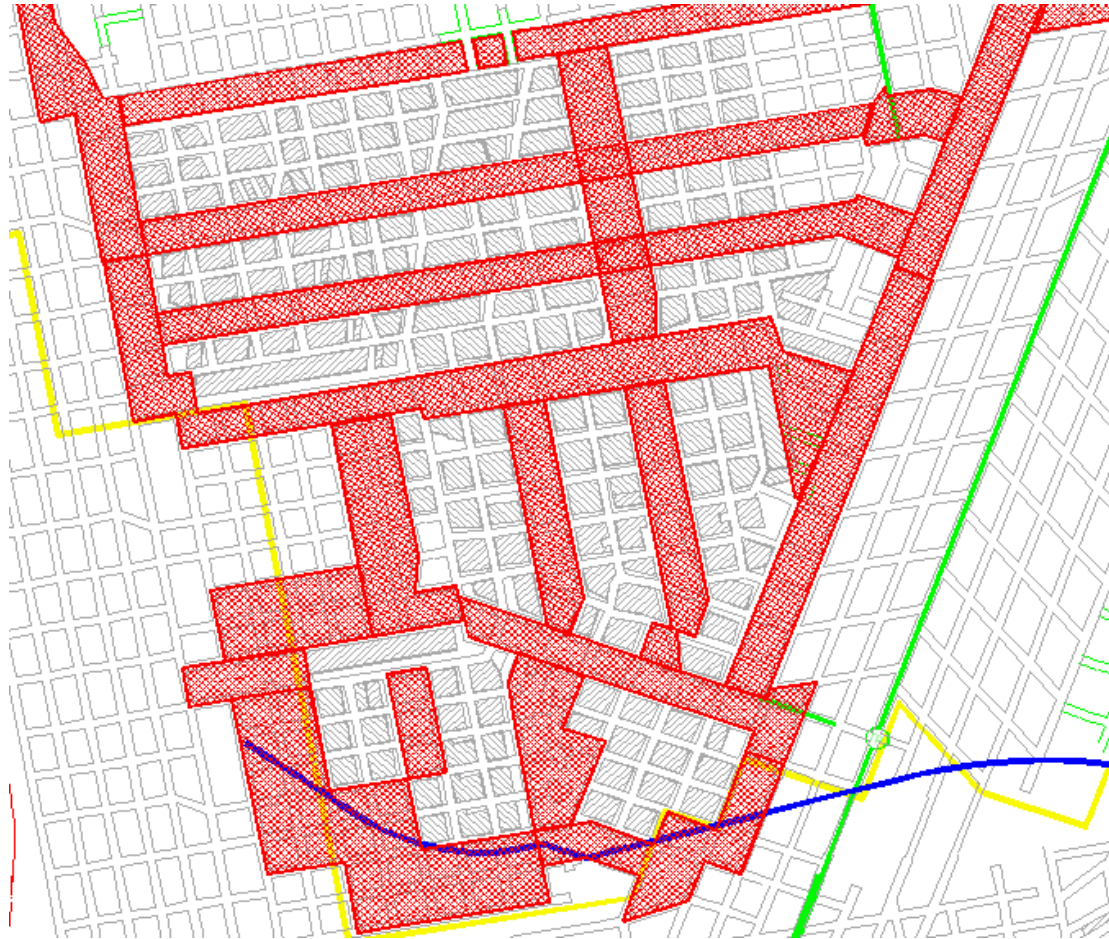


Deflection of conglomerate



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

Take 2-3 rows, leave 1 row

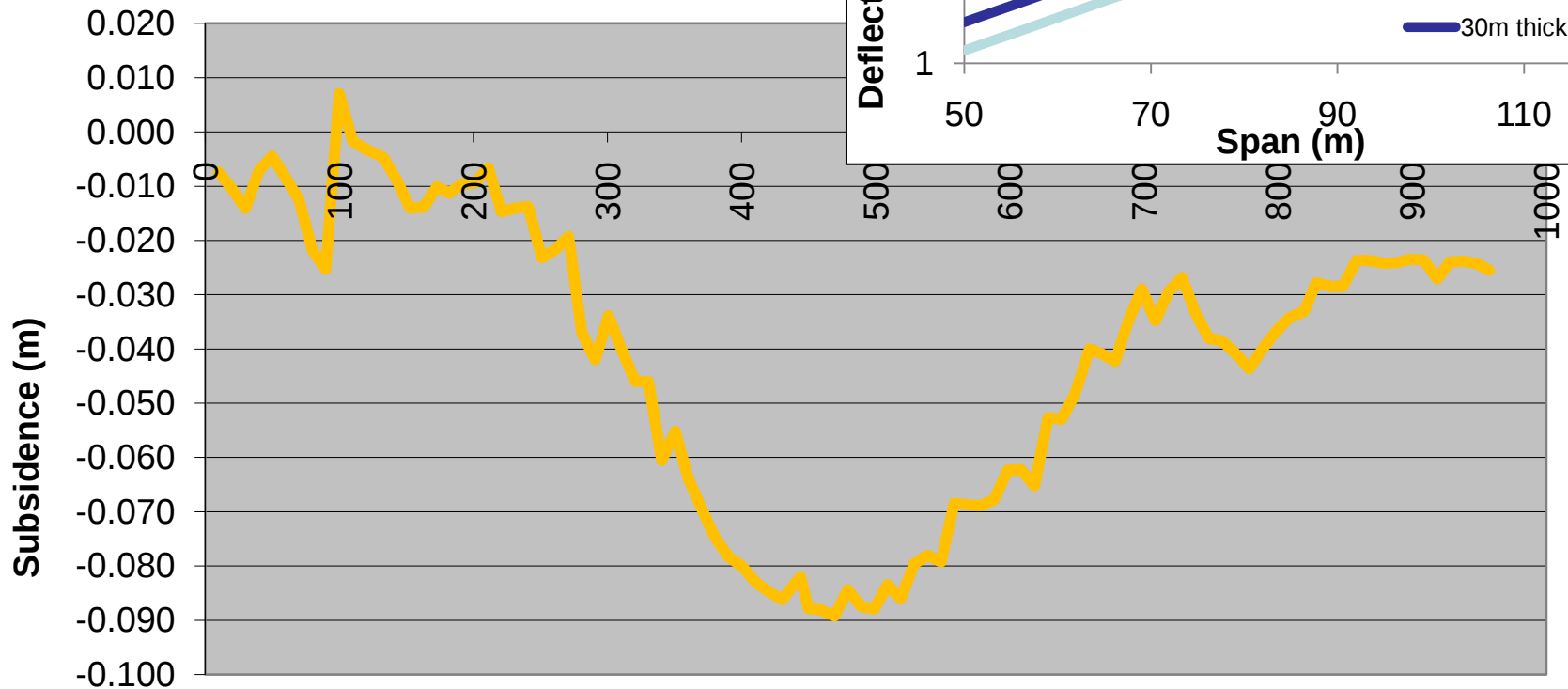
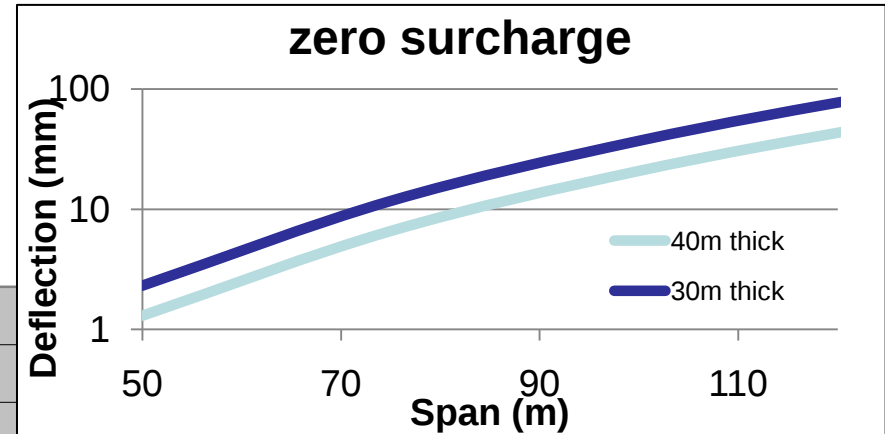


Case study 1 - Awaba

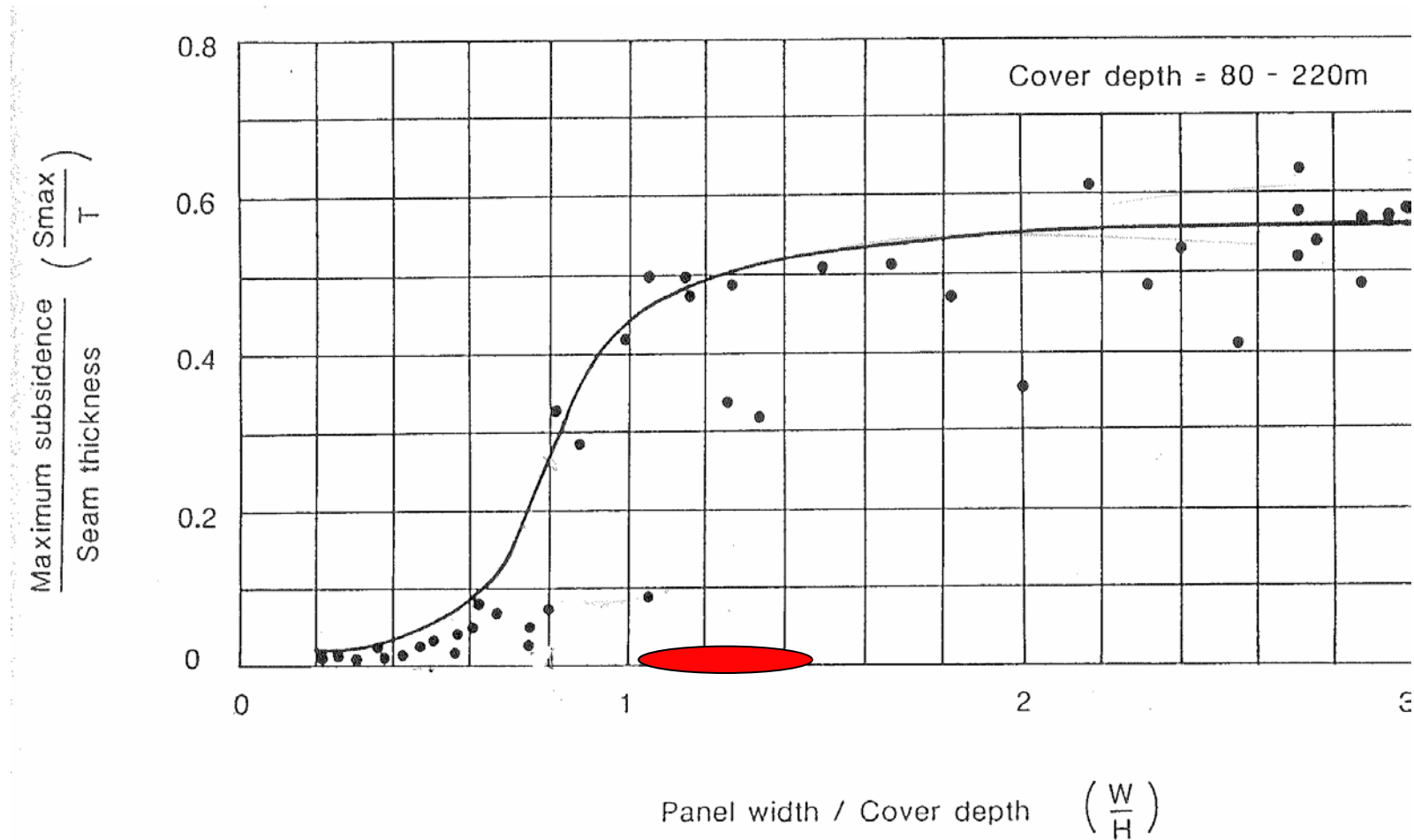
Spans 40m - 90m

Depth 40m - 60m

Panel width/depth = 1 - 2



Where we sit on the Holla plot





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 800,000 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 (Kommpahtoo 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 (including where lack of current information may present potential risk). 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 toecaps, 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 cliff lines, 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 ::: Caused by: Mining operations. Resulting in: Changes to surface drainage lines and displacing of surface artefacts.	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.
		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 ::: Caused by: Mining operations. Resulting in: Impact to Neighbouring Aboriginal-owned land (KLALC).	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.
		2.3.b. Mapping of Land ownership completed				
		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 watercourses within the SMP area.)</i>	There is a risk to Awaba from ::: Subsidence ::: Caused by: Mining operations. Resulting in: Erosion within streambed 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 Watercourse 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 creek line)	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
	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 Watercourse 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 Watercourse Management Plan for East B Area aspects..
6. Groundwater - Significant groundwater resources including groundwater level and quality <i>(Relevance: AGEC groundwater investigations (2008) states 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 is noted by the study as regionally significant groundwater resources. No nearby private extraction bores (users) are currently known. See background AEGC 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 AGEC Groundwater Investigation 2008 (Definition of Stony 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 Watercourse 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, has not 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 Stony Ck Alluvium) 6.4.d DWE Licensed 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 watercourses including streambed 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 upon 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

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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.

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**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@jkgroup.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

Table of Results

REPORT APPENDIX 'C'

October, 2005



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
Case 2	Twice predicted – that is to a maximum of 250mm	Negligible* impact to rail line	Negligible* impact to rail line	* Negligible is 'unmeasurable' or < 10mm
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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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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Awaba Colliery
Risk Assessment on Partial Secondary Pillar Extraction – Surface Subsidence

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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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

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	

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

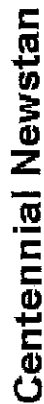
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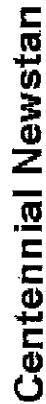


5. General Environment Above Mining Application Area				
Feature	Predicted - up to 115mm	Twice Predicted - up to 250mm	Ten Times - Pillar failure	Plug Failure
Bushland	Insignificant effect	Insignificant effect	Insignificant effect	Localised sink hole
Tracks/ trails	Insignificant effect	Insignificant 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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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)