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**ASHTON COAL PROJECT**

**SUBSIDENCE RISK ASSESSMENT FOR THE  
MINING OF PIKES GULLY SEAM,  
LONGWALLS 6-8**

AR0939 - Version 23/10/2012

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## 1 INTRODUCTION

The objective of this subsidence risk assessment is to identify subsidence related hazards associated with mining Longwalls 6 to 8 (LW6-8) in the Pikes Gully Seam (PG) with the Bowmans Creek diversion in place at the Ashton Coal Project (ACP) and to determine what subsidence related controls, if any, are required to reduce or eliminate any identified hazards to tolerable levels as far as practicable.

This plan is designed to fit within the Ashton Coal Environmental Management Strategy (see Figure 3 of the Extraction Plan) which provides the strategic context for the environmental management of the ACP. The Extraction Plan forms part of the Environmental Management Strategy, is required by the ACP development consent and provides a framework for the management of subsidence impacts associated with ACOL's underground mining activities.

This Risk Assessment was conducted to address changes in the mine plan associated with the Bowmans Creek diversion and updates a risk assessment conducted as part of the approved Subsidence Management Plan (SMP) for "Longwall & Miniwall Panels 5 to 9" dated October 2008. SMP Approval for LW/MW 5-8 was granted in July 2009 and subsequently varied to include LW/MW9 in June 2010. The approved SMP includes those lands in which the partial diversion of Bowmans Creek is located.

This risk assessment was undertaken prior to the approval of the Bowmans Creek diversion and was undertaken on the assumption the Bowmans Creek diversion will be approved and in place prior to extraction of LW6-8. The risk assessment was carried out on 07/05/2010 in anticipation of this approval being granted.

### 1.1 PARTICIPANTS

Participants in the risk assessment are listed in **Table 1**.

**Table 1 Risk Assessment Participants**

	NAME	COMPANY AND POSITIONS	RELEVANT YEARS EXPERIENCE
1	Paul John Anink	Marine Pollution Research Pty Ltd Principal	36 Years
2	John-Paul King	PEA Pty Ltd Director / Senior Ecologist	15 Years
3	Liz Wyatt	Insite Heritage Pty Ltd Archaeologist	5 Years
4	Steve Perrens	Evans and Peck Principal	40 Years
5	Peter Dundson	Aquaterra Senior Principal	38 Years
6	Ken Mills	SCT Operations Pty Ltd Director / Senior Geotech	30 Years
7	Renae Gifford	AECOM Principal Environmental Scientist	15 Years
8	Joanne Woodhouse	AECOM Senior Environmental Scientist	10 Years

	NAME	COMPANY AND POSITIONS	RELEVANT YEARS EXPERIENCE
9	Phil Fletcher	Ashton Coal Technical Services Manager	17 Years
10	Cassandra Ferguson	Ashton Coal Environmental Co-ordinator	5 Years

## 1.2 FACILITATOR QUALIFICATIONS

Shane Chiddy holds an Associate Diploma in Engineering (Electrical), is an Officer of the Institution of Engineers (Australia) and is a member of the Maintenance Engineering Society of Australia (MESA). He has also completed Conveyancing Law through Macquarie University and Establish the Risk Management Systems (Mine 7033 - G3) through Queensland University.

Prior to commencing his consulting career, Shane Chiddy qualified as an electrician and worked underground for 9 years. He then occupied a number of engineering roles within Rio Tinto, including such roles as Electrical Supervisor, Development Engineer and Senior Production Engineer. This latest role was responsible for the Longwall, underground diesel equipment and conveyors.

Additionally Shane Chiddy has been trained and accredited by John Moubray in the UK as a certified RCM II practitioner, and has conducted a number of extensive Reliability-centred Maintenance II analyses including underground and surface equipment such as Longwalls, Continuous Miners and conveying systems. He has facilitated RCM II analysis and delivered training in the mining, defence and telecommunications industries.

His consulting experience includes the application of Reliability-centred Maintenance II and extensive Risk Management and Project Management assignments. Shane is also experienced in software development and in the development and presentation of training packages.

## 2 RISK ASSESSMENT

### 2.1 ASSUMPTIONS AND CONSTRAINTS

The following assumptions and limitations were applied to this risk assessment:

- Bowmans Creek Diversion is in place;
- Reference to Bowmans Creek, within this assessment, refers to the diverted creek;
- This risk assessment relates to Longwalls 6 to 8 (LW6-8) in the Pikes Gully Seam (PG) only; and
- All commitments, including monitoring will proceed as identified in the EA.

Related Documents Include:

- AS/NZS ISO 31000:2009 Risk management—Principles and guidelines;
- MDG1010 - Risk Management Handbook for the Mining Industry. Dated May 1997;
- MDG1014 - Guide to Reviewing a Risk Assessment of Mine Equipment and Operations Dated July 1997;
- Guidelines for Applications for Subsidence Management Approval 2003;
- BCD Environmental Assessment, Evans and Peck 2009;
- BCD Response to Submissions, Wells, May 2010-06-01; and

LW 5-9 SMP, AECOM 2009 (Approved as LW 5-6 & MW 7-8 in July 2009).

### 2.2 QUALITATIVE RISK ANALYSIS

This risk analysis has been performed using Qualitative Risk Analysis techniques and has been performed in compliance with the Department of Mineral Resources Guideline MDG1010. A general description of these techniques is provided in **Appendix A**.

The risk assessment followed the following steps outline: the systematic identification of hazards, ranking of risks, and identification of new and/or improved controls; that will were used in the risk assessment workshop:

1. Introduce team to risk assessment plan document, including scope and method of the risk assessment;
2. Break system being assessed down into discrete sub-systems;
3. Identify and add potential deviation steps;
4. Review each sub-system and identify loss scenarios (potential incidents and accidents);
5. For each hazard, evaluate the risk using the risk rank method by determining the probability, consequence, and risk rank of each loss scenario;
6. Identify existing controls for each hazard;
7. Specify additional controls required to control the hazard(s);
8. Close the risk assessment;
9. Document and distribute to the senior representatives of the team for proof reading; and
10. Verification of the assessment by a nominated person.

The group were introduced to the Risk Assessment Process at the commencement of the session by the facilitator. The various steps were explained and the group reviewed the Likelihood, Consequence and Risk Ranking matrix (provided below).

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Risk Matrix	Hazard Effect/ Consequence				
	1 Insignificant	2 Minor	3 Moderate	4 Major	5 Catastrophic
<b>Loss Type</b>					
<b>Harm to People (P)</b>	Slight injury or health effects – first aid/ minor medical treatment level	Minor injury or health effects – restricted work or minor lost workday case	Serious bodily injury or health effects – major lost workday case/ permanent disability	Single fatality, permanent total disabilities.	Multiple fatalities
<b>Environmental Impact (E)</b>	Environmental nuisance – unreasonable interference with and environmental value or contamination or pollution with a cost less than \$1,000	Minor environmental harm – not trivial or negligible, potential health risks for community or pollution or contamination with costs between \$1,000 & \$5,000	Serious environmental harm – high local impact or impacts to and area(s) of local conservation value, actual community health impacts or significance or pollution or contamination with a costs between \$5k and \$50k	Major environmental harm – high impact in district or actual impacts to an area of regional conservation significance, health statistics in community alter as a result of this incident or pollution or contamination with costs between \$50k & \$500k	Extreme environmental harm – irreversible harm to environmental values of extreme and widespread areas, impacts to conservation areas of national significance, community fatalities or pollution or contamination with costs greater than \$500k
<b>Asset Damage &amp; Other Consequential Losses (A)</b>	Slight damage <\$0.1M or < 1 shift disruption to operation	Minor damage \$0.1M to \$1.0M. or 1 Shift – 1 day disruption to operation	Local damage \$1.0M to \$5.0M. 1 day to 1 week - disruption to operation	Major damage \$5.0M to \$30.0M. 1 week – 1 month - Partial loss of operation	Extreme damage > \$30.0M. > 1 month - Substantial or total loss of operation
<b>Impact on Reputation (R)</b>	Slight impact – public awareness may exist but no public concern	Limited impact – some local public concern	Considerable impact – regional public concern	National impact – national public concern	International impact – international public attention

Likelihood	Likelihood Examples (use only as a guide)	Risk Rating				
		<b>A (Almost certain)</b>	Likely that the unwanted event could occur several times per year at this location	<b>15 (M)</b>	<b>10 (H)</b>	<b>6 (H)</b>
<b>B (Likely)</b>	Likely that the unwanted event could occur several times per year in the Australian mining industry; or could happen annually	<b>19 (M)</b>	<b>14 (M)</b>	<b>9 (H)</b>	<b>4 (Ex)</b>	<b>3 (Ex)</b>
<b>C (Possible)</b>	The unwanted event could well have occurred in the Australian mining industry at some time in the past 10 years	<b>22 (L)</b>	<b>18 (M)</b>	<b>13 (H)</b>	<b>8 (H)</b>	<b>5 (Ex)</b>
<b>D (Unlikely)</b>	The unwanted event has happened in the Australian mining industry at some time; or could happen in 50 years	<b>24 (L)</b>	<b>21 (L)</b>	<b>17 (M)</b>	<b>12 (H)</b>	<b>7 (H)</b>
<b>E (Rare)</b>	The unwanted event has never been known to occur in the Australian mining industry; or is highly unlikely that it could ever occur	<b>25 (L)</b>	<b>23 (L)</b>	<b>20 (M)</b>	<b>16 (M)</b>	<b>11 (H)</b>

Risk Rating	Risk Level	Guidelines for Risk Control Barriers
1 to 5	<b>(E) – Extreme</b>	Immediate intervention required from Senior Management, do not proceed with activity
6 to 13	<b>(H) – High</b>	Imperative to eliminate or reduce risk by introduction of controls, do not proceed with activity until reviewed by Senior Management
14 to 20	<b>(M) – Medium</b>	Corrective action to be determined, do not proceed without authorisation from Shift Coordinator
21 to 25	<b>(L) – Low</b>	Safe to continue activity once hazards minimised



### 2.3 SUBSYSTEMS ANALYSED

The identification of sub-systems was based on the categories of potentially affected features provided in the SMP Guidelines (Department of Mineral Resources, 2003). This list is provided in **Table 2**.

**Table 2 Sub-systems Analysed**

		NAME	
1	Natural Features	A	1.01 Catchment areas or Declared Special Areas
		B	1.02 Rivers or creeks (Bowmans Creek, Hunter River and Glennies Creek)
		C	1.03 Aquifers or known groundwater resources
		D	1.04 Springs
		E	1.05 Sea or lake
		F	1.06 Shorelines
		G	1.07 Natural dams
		H	1.08 Cliffs or pagodas
		I	1.09 Steep slopes
		J	1.10 Escarpments
		K	1.11 Land prone to flooding or inundation
		L	1.12 Swamps, wetlands or water related ecosystems
		M	1.13 Threatened or protected species
		N	1.14 National Parks
		O	1.15 State Conservation Areas
		P	1.16 State Forests
		Q	1.17 Natural vegetation
		R	1.18 Areas of major geological interest
		S	1.19 Any other feature considered significant
2	Public Utilities	A	2.01 Railways
		B	2.02 Roads (All Types)
		C	2.03 Bridges
		D	2.04 Tunnels
		E	2.05 Culverts
		F	2.06 Water, gas or sewerage infrastructure
		G	2.07 Liquid fuel pipelines
		H	2.08 Electricity transmission lines or associated plants
		I	2.09 Telecommunications lines or associated plants

		NAME	
		J	2.10 Water tanks, water or sewerage treatment works
		K	2.11 Dams, reservoirs or associated works
		L	2.12 Air strips
		M	2.13 Any other public utilities
	Public amenities	A	3.01 Hospitals
		B	3.02 Places of worship
		C	3.03 Schools
		D	3.04 Shopping centres
		E	3.05 Community centres
		F	3.06 Office buildings
		G	3.07 Swimming pools
		H	3.08 Bowling greens
		I	3.09 Ovals or cricket grounds
		J	3.10 Race courses
		K	3.11 Golf courses
		L	3.12 Tennis courts
		M	3.13 Visual amenity
4	Farm land and facilities	A	4.01 Agricultural utilisation or agricultural suitability of farm land
		B	4.02 Farm buildings or sheds
		C	4.03 Gas or fuel storage
		D	4.04 Poultry sheds
		E	4.05 Glass houses
		F	4.06 Hydroponic systems
		G	4.07 Irrigation system
		H	4.08 Fences
		I	4.09 Farm dams
		J	4.10 Wells or bores
		K	4.11 Any other feature considered significant including access tracks
5	Industrial, commercial and business establishments	A	5.01 Factories
		B	5.02 Workshops
		C	5.03 Business or commercial establishments
		D	5.04 Gas or fuel storages or associated plants

		NAME	
		E	5.05 Waste storages or associated plants
		F	5.06 Buildings, equipment or operations that are sensitive to surface movements
		G	5.07 Surface mining (open cut) voids or rehabilitated areas
		H	5.08 Mine infrastructure including tailings dams or emplacement areas
		I	5.09 Any other industrial, commercial or business features
6	Areas of archaeological and / or heritage importance	A	6.01 Areas of archaeological and/or heritage significance
7	Items of architectural importance	A	7.01 Items of architectural significance
8	Permanent Survey Control Marks	A	8.01 Permanent Survey Control Marks
9	Residential Establishments	A	9.01 Houses
		B	9.02 Flats or Units
		C	9.03 Caravan Parks
		D	9.04 Retirement or Aged Care Villages
		E	9.05 Associated Structures such as Workshops, Garages, On-Site Waste Water Systems, Water or Gas Tanks, Swimming Pools or Tennis Courts
		F	9.06 Any Other Residential Features of relevance
10	Any Other Item Of Importance	A	10.01 Any Other Item of Importance

## 2.4 RISK RANKING AND CONTROLS

The risk ranking was done with consideration to existing controls being in place. Controls were developed using the following forms.

- **Avoiding the risk.** By deciding not to start or continue with the activity that gives rise to the risk (where this is practicable). Risk avoidance can occur inappropriately if individuals or organisations are unnecessarily risk-averse. Inappropriate risk avoidance may increase the significance of other risks or may lead to the loss of opportunities for gain.

- **Changing the likelihood** of the risk, to reduce the likelihood of the negative outcomes.
- **Changing the consequences**, to reduce the extent of the losses. This includes pre-event measures such as reduction in inventory or protective devices and post-event responses such as continuity plans.
- **Sharing the risk**. This involves another party or parties bearing or sharing some part of the risk, preferably by mutual consent. Mechanisms include the use of contracts, insurance arrangements and organisational structures such as partnerships and joint ventures to spread responsibility and liability. Generally there is some financial cost or benefit associated with sharing part of the risk with another organisation, such as the premium paid for insurance. Where risks are shared in whole or in part, the organisation transferring the risk has acquired a new risk, in that the organisation to which the risk has been transferred may not manage the risk effectively.
- **Retaining the risk**. After risks have been changed or shared, there will be residual risks that are retained. Risks can also be retained by default, e.g. when there is a failure to identify or appropriately share or otherwise treat.

A risk treatment schedule and action plan was developed as part of the risk assessment and has been circulated internally (not published in this report).

## **2.5 AUDIT AND REVIEW**

An audit system needs to be in place to ensure all recommendations from this assessment are carried out prior to the required dates identified within the assessment. This Risk Assessment should be reviewed within 12 months of approval of to ensure all risks have been identified and controls put in place.

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## Appendix A Risk Assessment Worksheets

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1 – Natural Features										
Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
A	1.01 Catchment Areas or Declared Special Areas	1	The Application Area does not include any catchment areas or declared special areas and did not require further assessment.							
B	1.02 Rivers or Creeks (Bowmans Creek, Hunter River and Glennies Creek)	1	Water flow and quality changes to Bowmans Creek due to mine subsidence. Changes to channel stability. Flow on environmental impacts result. (Excluding restricted mining i.e. Miniwalls)	Mine designed to minimise effects on the creeks and rivers. Restricted width mining under Bowmans Creek.	E	2	D	21	Bowmans Creek Diversion – Block Blanks	
		2	Water flow and quality changes to Bowmans Creek due to mine subsidence. Changes to channel stability. Flow on environmental impacts result. (Restricted mining areas i.e. Miniwalls.)	Mine designed to minimise effects on the creeks and rivers. Restricted width mining under Bowmans Creek.	R	3	C	13	Review monitoring time frame to review effects of the miniwall subsidence to Bowmans Creek to the end of the Ashton Coal Project. Review miniwalls within Bowmans Creek diversion SMP.	Ashton Coal  Ashton Coal
		3	Water flow and quality changes to Hunter River due to mine subsidence. Changes to channel stability. Flow on environmental impacts result.	200 metres offset from the Hunter River alluvium for Longwalls 5, 6 and 7. Mine designed to minimise effects on the creeks and rivers.	E	2	D	21	None Identified	

1 – Natural Features										
Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
		4	Water flow and quality changes to Glennies Creek due to mine subsidence. Changes to channel stability. Flow on environmental impacts result.	Mine designed to minimise effects on the creeks and rivers.	E	2	D	21	None Identified	
		5	Water flow and quality changes to minor tributary creeks due to mine subsidence. Changes to channel stability. Flow on environmental impacts result.	EA includes commitments to maintain a free draining landform.	E	1	C	22	None Identified	
		6	Geomorphology changes to Bowmans Creek impact to natural flow regimes and fish passage. Group considered that there were no hazards additional to those already identified in the previous EA Risk Assessment.	EA includes assessment of impact to natural flow regimes and fish passage.						
C	1.03 Aquifers or Known Groundwater Resources	1	Alluvial ground water level and quality changes due to mine subsidence. Group considered that there were no hazards additional to those already identified in the previous EA Risk Assessment.							



1 – Natural Features										
Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
		2	Hard Rock ground water level and quality changes due to mine subsidence. Group considered that there were no hazards additional to those already identified in the previous EA Risk Assessment.							
D	1.04 Springs	1	The Application Area does not include any springs and did not require further assessment.							
E	1.05 Sea or Lake	1	The Application Area does not include any seas or lakes and did not require further assessment.							
F	1.06 Shorelines	1	The Application Area does not include any shorelines and did not require further assessment.							
G	1.07 Natural Dams	1	The Application Area does not include any natural dams and did not require further assessment.							
H	1.08 Cliffs or Pagodas	1	The Application Area does not include any cliffs or pagodas and did not require further assessment.							

1 – Natural Features										
Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
I	1.09 Steep Slopes	1	The Application Area does not include any natural steep slopes and did not require further assessment.							
J	1.10 Escarpments	1	The Application Area does not include any escarpments did not require further assessment.							
K	1.11 Land Prone to Flooding or Inundation	1	Land Prone to Flooding or Inundation changes due to mine subsidence. Group considered that there were no hazards additional to those already identified in the previous EA Risk Assessment.							
L	1.12 Swamps, Wetlands or Water Related Ecosystems	1	Swamps, wetlands or water related ecosystems changes due to mine subsidence. Group considered that there were no hazards additional to those already identified in the previous EA Risk Assessment. (See Section 10.2.5 and Section 5 of the EA.)							

1 – Natural Features										
Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
M	1.13 Threatened or Protected Species	1	Threatened or protected species impacted due to mine subsidence. (e.g. Woodland Birds, Micro-bats)	Group considered that there were no hazards additional to those already identified in the previous EA Risk Assessment. Statement of commitment included in the EA. (See Section 7).						
N	1.14 National Parks	1	The Extraction Plan Application Area does not include any national parks and did not require further assessment.							
O	1.15 State Conservation Areas	1	The Extraction Plan Application Area does not include any State Conservation Areas and did not require further assessment.							
P	1.16 State Forests	1	The Extraction Plan Application Area does not include any State Forests and did not require further assessment.							

1 – Natural Features										
Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
Q	1.17 Natural Vegetation	1	Natural vegetation changes due to mine subsidence (including River Red Gums). Group considered that there were no hazards additional to those already identified in the previous EA and SMP Risk Assessment (see Section 10 and Section 5 of the EA. Section 4.2.6 and Section 6.0 of the approved LW6-9 SMP).							
R	1.18 Areas of Major Geological Interest	1	The Application Area does not include any areas of major geological interest and did not require further assessment.							
S	1.19 Any other feature considered significant	1	The Application Area does not include any other feature considered significant and did not require further assessment.							

2 – Public Utilities										
Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
A	2.01 Railways	1	The Application Area does not include any railways and did not require further assessment.							
B	2.02 Roads (All Types)	1	Roads (New England Highway) changes due to mine subsidence. Group considered that there were no hazards additional to those already identified in the previous EA Risk Assessment (see Section 5 of the EA and Section 4.3.1 of the approved LW6-9 SMP).	Development consent conditions 3.16 include no tunnelling or mining shall occur directly underneath the piers or abutments of Bowmans Creek Bridge. The RTA must approve access tunnel layouts in the vicinity of the Bridge. Development consent conditions 3.16 includes the angle of draw for the mine subsidence after removal of the coal is to be kept outside of the New England Highway Road Reserve						

2 – Public Utilities										
Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
		2	Roads (Brunkers Lane and MacGen access road as a private road) changes due to mine subsidence. Loss of road usage (included in assessments as part of gap analysis of previous assessments).	In accordance with the Statement of Commitments contained in the EA and Response to Submissions, ACOL commit to the maintenance of Brunkers Lane in its current form and status (not a public road) in a manner which is safe, serviceable and repairable.	A	3	D	17	None Identified	
		3	Roads (Property 130 access road as a private road) changes due to mine subsidence.  Access road is not affected by mine subsidence associated with this Application Area.							

2 – Public Utilities										
Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
C	2.03 Bridges	1	Bridge (New England Highway) changes due to mine subsidence. Group considered that there were no hazards additional to those already identified in the previous EA Risk Assessment (see Section 5 of the EA and Section 4.3.1 of the approved SMP).	Development consent conditions 3.16 include no tunnelling or mining shall occur directly underneath the piers or abutments of Bowmans Creek Bridge. The RTA must approve access tunnel layouts in the vicinity of the Bridge.						
D	2.04 Tunnels	1	The Application Area does not include any tunnels and did not require further assessment.							
E	2.05 Culverts	1	New England Highway culvert damaged due to mine subsidence. Loss of usage. Culvert is not affected by mine subsidence associated with this Application Area.							
F	2.06 Water, Gas or Sewerage Infrastructure	1	The Application Area does not include any water, gas or sewerage infrastructure and did not require further assessment.							

2 – Public Utilities										
Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
G	2.07 Liquid Fuel Pipelines	1	The Application Area does not include any liquid fuel pipeline and did not require further assessment.							
H	2.08 Electricity Transmission Lines or Associated Plants	1	Damage to Electricity transmission lines due to mine subsidence. Transmission lines requires repair.	Existing Electricity Transmission Line Management Plan	A	2	D	21	Management Plans to include commitment to maintain safe, serviceable and repairable Electricity Transmission Lines. Review the existing Electricity transmission line management plan	Ashton Coal  Ashton Coal
I	2.09 Telecommunication Lines or Associated Plants	1	Damage to domestic Telstra Local Network due to mine subsidence. Telecommunication lines requires repair.	Telecommunications Line Management Plan	A	1	C	22	Review the existing Telecommunication Line Management Plan	Ashton Coal
		2	Damage to AAPT Powertel fibre optic cable due to mine subsidence. Telecommunication lines requires repair. Interruption to services result (Cable is located outside the area of application).	Telecommunications Line Management Plan	A	4	E	16	Review the existing Telecommunications Line Management Plan	Ashton Coal



2 – Public Utilities										
Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
J	2.10 Water Tanks, Water or Sewage Treatment Works	1	The Application Area does not include any public water tanks, water or sewerage treatment works and did not require further assessment.							
K	2.11 Dams, Reservoirs or Associated Works	1	The Application Area does not include any dams, reservoirs or associated works and did not require further assessment.  (Narama Dam Void 5 and Sediment Ponds are addressed in Section 5 Industrial, Commercial and Business Establishments.)							
L	2.12 Air Strips	1	The Application Area does not include any air strips and did not require further assessment.							
M	2.13 Any Other Public Utilities	1	Disruption to NOW flow gauging station. Loss of data and calibration. Impact to licensed users. (HUAWSP)	Commitment to maintain the flow gauging station in a safe, serviceable and repairable condition.	A	1	D	24	Review relocating the flow gauging station with NOW.  Review the existing Telecommunications Line Management Plan.	Ashton Coal

<b>3 – Public Amenities</b>										
<b>Step ID</b>	<b>Process / Sub Process</b>	<b>Haz ID</b>	<b>Hazard and Potential Consequences</b>	<b>Existing Controls</b>	<b>Loss Type</b>	<b>C</b>	<b>L</b>	<b>Risk Rating</b>	<b>Potential Controls</b>	<b>Person Responsible &amp; Completion date</b>
A	3.01 Hospitals	1	The Application Area does not include any hospitals and did not require further assessment.							
B	3.02 Places of Worship	1	The Application Area does not include any places of worship and did not require further assessment.							
C	3.03 Schools	1	The Application Area does not include any schools and did not require further assessment.							
D	3.04 Shopping Centres	1	The Application Area does not include any shopping centres and did not require further assessment.							
E	3.05 Community Centres	1	The Application Area does not include any community centres and did not require further assessment.							
F	3.06 Office Buildings	1	The Application Area does not include any office buildings and did not require further assessment.							
G	3.07 Swimming Pools	1	The Application Area does not include any public swimming pools and did not require further assessment.							
H	3.08 Bowling Greens	1	The Application Area does not include any bowling greens and did not require further assessment.							

### 3 – Public Amenities

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
I	3.09 Ovals or Cricket Grounds	1	The Application Area does not include any ovals or cricket grounds and did not require further assessment.							
J	3.10 Race Courses	1	The Application Area does not include any race courses and did not require further assessment.							
K	3.11 Golf Courses	1	The Application Area does not include any golf courses and did not require further assessment.							
L	3.12 Tennis Courts	1	The Application Area does not include any public tennis courts and did not require further assessment.							
M	3.13 Visual Amenity	1	The Application Area does not include any public visual amenity and did not require further assessment.							

4 – Farm Land And Facilities										
Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
A	4.01 Agricultural Utilisation or Agricultural Suitability of Farm Land	1	Changes to the agricultural Utilisation or Agricultural Suitability of Farm Land.	EA includes commitments to maintain a free draining landform.	A	1	C	22	Review the requirement for preparation of an Agricultural Suitability assessment.	Ashton Coal
B	4.02 Farm Buildings or Sheds	1	Damage to Farm buildings/sheds due to mine subsidence. Farm buildings/sheds require repair.  Group considered that there were no hazards additional to those already identified in the previous SMP Risk Assessment.							
C	4.03 Gas or Fuel Storage	1	The Application Area does not include any substantial Gas or Fuel Storage facilities and did not require further assessment.							
D	4.04 Poultry Sheds	1	The Application Area does not include any poultry sheds and did not require further assessment.							
E	4.05 Glass Houses	1	The Application Area does not include any glass houses and did not require further assessment.							

**4 – Farm Land And Facilities**

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
F	4.06 Hydroponic Systems	1	The Application Area does not include any hydroponic system and did not require further assessment.							
G	4.07 Irrigation Systems	1	The Application Area does not include any irrigation system and did not require further assessment.							
H	4.08 Fences	1	Damage to fences due to mine subsidence. Fences require repair.  Group considered that there were no hazards additional to those already identified in the previous SMP Risk Assessment.							
I	4.09 Farm Dams	1	Damage to Farm dams due to mine subsidence. Reduced storage capacity. Farm dams require repair.  Group considered that there were no hazards additional to those already identified in the previous SMP Risk Assessment.							

4 – Farm Land And Facilities										
Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
J	4.10 Wells or Bores	1	Damage to Wells or Bores due to mine subsidence. Repairs required. Group considered that there were no hazards additional to those already identified in the previous SMP Risk Assessment.						Confirm the status of identified well at Longwall 6.	Ashton Coal
K	4.11 Any other feature considered significant including access tracks	1	Damage to Access Tracks due to mine subsidence. Access Tracks require repair. Group considered that there were no hazards additional to those already identified in the previous SMP Risk Assessment.							

**5 – Industrial, Commercial And Business Establishments**

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
A	5.01 Factories	1	The area of subsidence under analysis does not include any factories and did not require further assessment.							
B	5.02 Workshop	1	The Application Area does not include any workshops and did not require further assessment.							
C	5.03 Business or Commercial Establishments	1	The Application Area does not include any Business or Commercial Establishments and did not require further assessment.							
D	5.04 Gas or Fuel Storages or Associated Plants	1	The Application Area does not include any Gas or Fuel Storages or Associated Plants and did not require further assessment.							
E	5.05 Waste Storages or Associated Plants	1	The Application Area does not include any Waste Storages or Associated Plants and did not require further assessment.							

**5 – Industrial, Commercial And Business Establishments**

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
F	5.06 Buildings, Equipment or Operations that are Sensitive to Surface Movements	1	The Application Area does not include any Buildings, Equipment or Operations that are Sensitive to Surface Movements and did not require further assessment.							
G	5.07 Surface Mining (Open Cut) Voids or Rehabilitated Areas	1	Subsidence to Surface Mining / Open Cut back filled voids (former Ravensworth open cut) or Rehabilitated Areas. Possible slope instability / erosion control. Group considered that there were no hazards additional to those already identified.							
H	5.08 Mine Infrastructure Including Tailings Dams or Emplacement Areas	1	Damage to Narama Dam, loss of water storage. Flow into downstream water systems. Possible safety and environmental hazards.	Monitoring plan in place for the Narama Dam	A	2	E	23	Review the modification of the Narama Dam (Ashton-1) approval with the DSC for the modified mine plan.	Ashton Coal



**5 – Industrial, Commercial And Business Establishments**

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
		2	Damage to proposed Void 5 Dam, loss of fly ash storage. Flow into downstream water systems. Safety and environmental hazards.	DSC approves dam building standards and will take into account subsidence predictions. ACOL currently notify the location of workings to the DSC as part of the Narama Dam (Ashton -1) approval requirements.	E	3	E	20	None Identified	
		3	Damage to MacGen sediment ponds, loss of storage. Flow into downstream water systems. Safety and environmental hazards.		E	2	C	18	Review function of the MacGen sediment ponds, and future requirements. Incorporate the MacGen sediment ponds into existing management plan.	Ashton Coal  Ashton Coal

**5 – Industrial, Commercial And Business Establishments**

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
		4	Damage and interruption to the Mount Owen water supply pipeline. Possible production and environmental issues. Group considered that there were no hazards additional to those already identified in the previous EA Risk Assessment.		E	2	C	18	Prepare Pipelines Subsidence Management Plan prior to the commencement of LW6B	Ashton Coal
		5	Damage and interruption to the Ashton Coal return water / tailings Poly pipelines. Possible production and environmental issues. Group considered that there were no hazards additional to those already identified in the previous EA Risk Assessment.						Label all pipelines on the Subsidence Plans	AECOM

**5 – Industrial, Commercial And Business Establishments**

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
		6	Damage and interruption to the Ashton Coal Hunter River water supply Poly pipelines. Possible production and environmental issues.  Group considered that there were no hazards additional to those already identified in the previous EA Risk Assessment.							
		7	Narama Dam discharge compromised due to change in the flow regime of Bowmans Creek.	EA includes assessment of subsidence impacting the Bowmans Creek flow regime on the Narama Dam discharge.	R	2	E	23	None Identified	
		8	Damage to the Brunkers Lane culverts. Impacts to Brunkers Lane. Possible interruption to the Mount Owen water supply pipeline. Possible production and environmental issues.	EA includes assessment of subsidence impacting the Brunkers Lane culverts.	R	2	C	18	Confirm location of culverts and poly lines on subsidence plans	AECOM

**5 – Industrial, Commercial And Business Establishments**

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
		9	Impact on the Ravensworth Underground mine operations. Geotechnical and ground water interactions between mining operations.	Commitment made in EA use subsidence and groundwater experts to assess the western longwall to ensure concurrent operations of the RUM and ACOL underground mines can be undertaken safely.  EA includes assessment of Impact on the Ravensworth Underground mine operations.	P	2	D	21	None Identified	

**6 – Areas Of Archaeological Or Heritage Importance**

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
A	6.01 Areas of Archaeological and/or Heritage Significance	1	Damage to Archaeological sites due to mine subsidence. Group considered that there were no hazards additional to those already identified in the previous EA and SMP Risk Assessment. There are no known European Heritage Significant sites within the area.	Development consent (as modified for Bowmans Creek) includes controls for managing items in areas of cultural significance.	R	2	C	18	None Identified	
		2	Damage to water hole site due to mine subsidence. (Grinding grooves). Group considered that there were no hazards additional to those already identified in the previous EA and SMP Risk Assessment.							

**7 – Items Of Architectural Importance**

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
A	7.01 Items of Architectural Significance	1	The Application Area does not include any Items of Architectural Significance and did not require further assessment.							

**8 – Permanent Survey Control Marks**

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
A	8.01 Permanent Survey Control Marks	1	The Application Area does not include any Permanent Survey Control Mark and did not require further assessment.							

**9 – Residential Establishments**

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
A	9.01 Houses	1	Damage to Houses and property improvements due to mine subsidence. Houses and property improvements require repair. Owners' emotional stress associated with uncertainty of events. Aston Coal owns all occupied houses within the Application Area.							
B	9.02 Flats or Units	1	The Application Area does not include any Flats or units and did not require further assessment.							
C	9.03 Caravan Parks	1	The Application Area does not include any caravan parks and did not require further assessment.							
D	9.04 Retirement or Aged Care Villages	1	The Application Area does not include any Retirement or Aged Care Villages and did not require further assessment.							

**9 – Residential Establishments**

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
E	9.05 Associated Structures such as Workshops, Garages, On-Site Waste Water Systems, Water or Gas Tanks, Swimming Pools or Tennis Courts	1	Damage to Associated Structures due to mine subsidence. Houses and property improvements require repair. Owners' emotional stress associated with uncertainty of events. Aston Coal owns all occupied houses within the Application Area.							



**10 – Any Other Item Of Importance**

Step ID	Process / Sub Process	Haz ID	Hazard and Potential Consequences	Existing Controls	Loss Type	C	L	Risk Rating	Potential Controls	Person Responsible & Completion date
A	10.01 Any Other Item of Importance	1	Safety to personnel or stock due to surface cracking caused from mine subsidence (falls, vehicle accidents, stock injuries, and wildlife injury).	Public safety management plan Rehabilitation works Fencing Management plan Warning Signs installed	P	2	D	21	None Identified	
		2	Safety to personnel investigating subsidence, injuries result due to blasting at nearby open cut Narama Mine.	None at present	P	3	D	17	Confirm that Narama Mine has developed a Blasting Management plan, and this plan includes notification to Ashton of impending blasts.	Ashton Coal
		3	Inrush of water into the Ashton Underground mine. Injuries result.	None at present	P	2	D	21	Review in Clause 88 Risk Assessment the hazard of Inrush event occurring from surface water (i.e. major flood event).	Ashton Coal

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## Appendix B – Qualitative Risk Analysis

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## ***Qualitative Risk Analysis***

This Risk Analysis has been performed using Qualitative Risk Analysis techniques and has been performed in compliance with the Department of Mineral Resource Guideline MDG1010.

The Risk Assessment has followed the WRAC (Workplace Risk Assessment and Control) principals as outlined in the guideline.

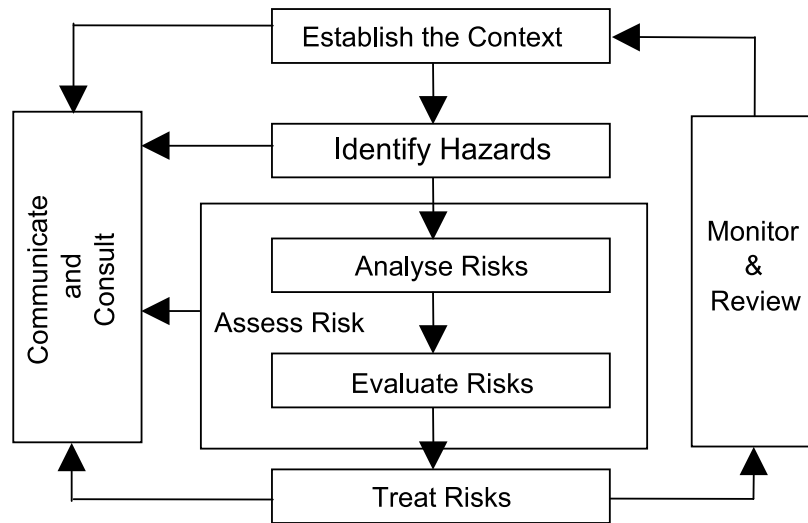
The Qualitative approach succeeds by using local expert knowledge and relevant historical data.

This system of analysis uses a participative approach which is very powerful for identifying potential hazard scenarios.

The following steps outline; the systematic identification of hazards, ranking of risks, and identification of new and/or improved controls; that will be used in the Risk Assessment session.

1. Introduce Team to Risk Assessment Plan document.  
This includes the scope and method of the Risk Assessment.
2. Break system being assessed down into discrete sub-systems.
3. Identify and add potential deviation steps.
4. Review each sub-system and identify loss scenarios,  
(Potential Incidents and Accidents)
5. For those hazards evaluate the risk using the risk rank method by.  
Determining the probability, consequence, and risk rank of each loss scenario.
6. Identify existing controls for each hazard.
7. Specify additional controls required to control the hazard(s).
8. Close Risk Assessment
9. Document and distribute to the senior representatives of the  
team for proof reading.
10. Verification of the assessment by a nominated person.

The available Standards on Risk Management (including MDG1010) define the Risk Management process as that shown below.



## ESTABLISH THE CONTEXT

When establishing the context thought is given to:

1. The strategic context of the organisation and its relationship with the environment. Identifying both internal and external stakeholders. This step focuses on the environment in which the organisation operates.
2. The organisational context is to be understood. The capabilities, goals and objectives and the strategies in place to achieve them.
3. The process that is to be analysed in the organisation and determine the goals, objectives and scope of the analysis. Consideration is given to costs and benefits that are required. The resources required are also determined. The analysis boundaries are also determined.
4. Develop the Risk Evaluation Criteria. Determine risk acceptability and risk treatment. These issues may be based on operational, environmental, financial, legal, social or humanitarian issues.
5. Define the structure of the analysis that is to be performed.

## IDENTIFY HAZARDS

Identification of all the Hazards to be Managed. To correctly apply this step a well structured systematic process must be used as any identified hazards missed at this point in the analysis will mean that no controls will be implemented to reduce or eliminate the hazard and its associated risks.

Identify

1. What Can Happen
2. How and Why it Can Happen

Checklists, Flowcharts and Brainstorming are some methods that can be used to achieve hazard identification.

## **RISK ANALYSIS**

The main objectives of an analysis is to separate minor risks from major risks and to provide data to assist in the evaluation and treatment of hazards.

Risk Analysis involves considering the following

1. Likelihood of the Hazard occurring
2. Consequences if the Hazard does occur
3. Determining any Existing Controls

The combination of the Likelihood and the Consequence determines the level of the risk involved.

During the assessment the consequences are categorised as either

- P - Harm to People
- E - Environmental Impacts
- A - Asset Damage Other Consequential Losses
- R - Impact on Reputation

This consequence category is identified on the Analysis Worksheets in the Column labeled 'T' for Type.

## **RISK EVALUATION**

Evaluation involves comparing the level of risk found during the analysis with a previously established risk criteria.

The output of this part of the process is a list of prioritised hazards for further action.

If the resulting hazards fall into the low or acceptable risk categories they may be accepted with minimal further treatment. Although, low and acceptable hazards should be monitored and periodically reviewed to ensure that they remain acceptable.

If hazards do not fall into the low or acceptable risk category then they should be treated using other options.

## **RISK TREATMENT**

Risk Treatment involves identifying the range of options for treating risks, assessing the options and preparing risk treatment plans and of course implementing them.

Risk Treatment may be in one of the following forms.

1. Risk Avoidance. Decide not to proceed with the activity.
2. Reduce Likelihood. Reduce the chance of the risk occurring.
3. Reduce the Risk Consequences. Reduce the consequence if the risk occurs.
4. Transfer the Risk. Involve other parties to bear or share the risks. This may reduce the hazard to the organisation, however, the risk may not be managed effectively as it still exists.
5. Retain (or accept) the Risk. Plans should be put in place to manage the consequences of these risk in the event that they occur.

Risk Treatment Options should be assessed on the extent of any additional benefits or opportunities created. A number of options may be considered and applied either individually or in a combination.

Risk Treatment Plans should be developed to identify responsibilities, schedules, budgets and performance measures and the review process that is to be put in place.

### **MONITOR AND REVIEW**

It is essential to monitor the effectiveness of the risk management system and the risk treatment implementation.

Risks and the effectiveness of control measures need to be monitored to ensure that the changing environments do not alter risk priorities. Few risks remain static.

Factors effecting Likelihood and Consequence change as do factors regarding suitability of controls.

### **COMMUNICATIONS AND CONSULTATION**

Communication and consultation are important during the entire Risk Management process. It is important to develop a communication plan for both internal and external stakeholders.

This should be a two way consultation not a one way flow of information.

Effectiveness internal and external communications is important to ensure that those responsible for implementing risk management understand the basis on which all decisions have been made and why particular actions are required.

### **ADDITIONAL INFORMATION**

To enable participants to fully understand the Risk Management and Risk Assessment Process it is recommended that they read copies of:

1. Risk Management Handbook for the Mining Industry MDG1010:1997
2. The combined Australian and New Zealand Standard AS/NZS 4360:1999 (Risk Management)
3. The combined Australian and New Zealand Standard AS/NZS 3931:1998 (Risk Analysis of Technology Systems - Application Guide).

This last Standard is also in compliance with the International Standard IEC 60300-3-9:1995 (Application Guide - Section 9: Risk Analysis of Technological Systems).

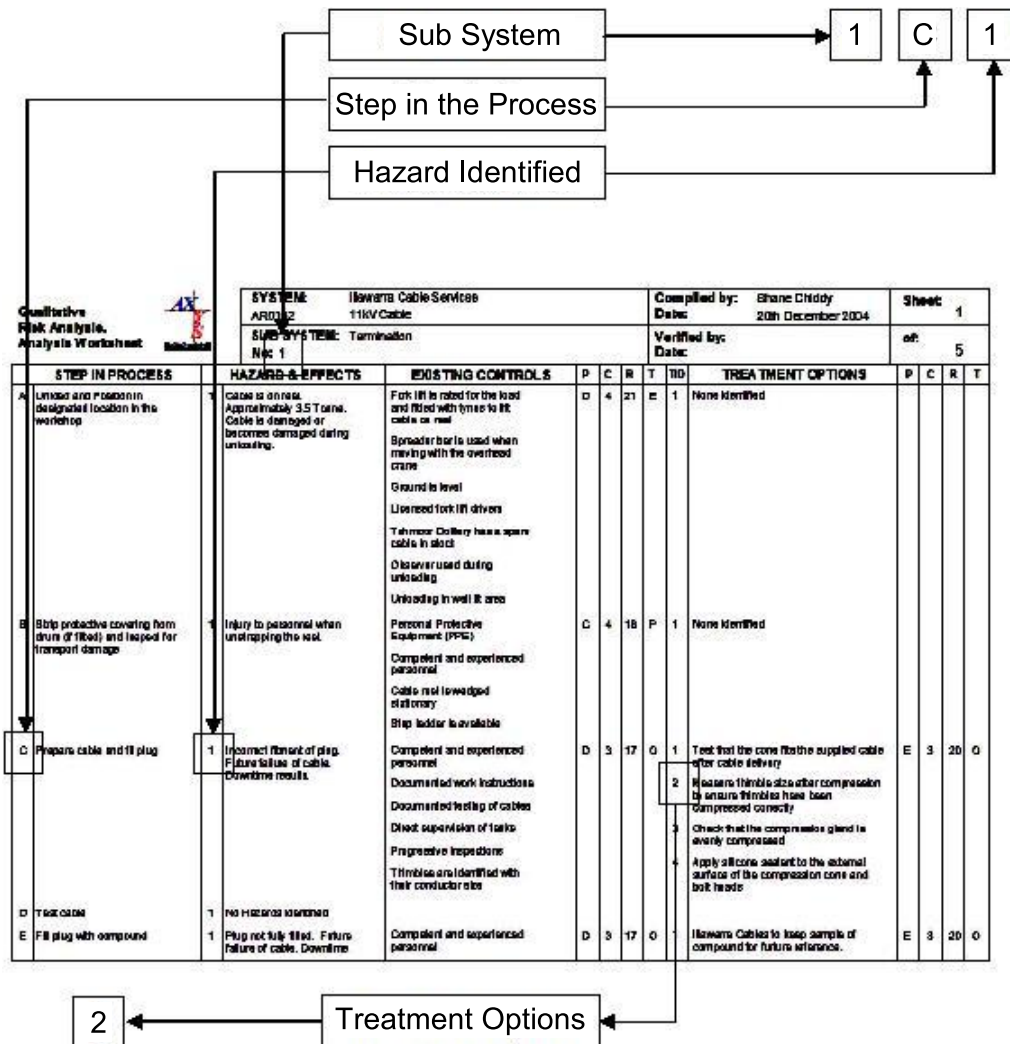


# Assessment Numbering

The assessment uses an alpha numeric numbering system to differentiate each Component, the Step in the Process, the Hazard and the Treatment Options.

The Sub System Number is found in the header of the worksheets, the Step Letter is found in the first column, the Hazard number in the third column and the treatment options in the TID (Treatment ID) column.

Using this method each hazard and treatment option throughout the analysis has a distinct identifier. This identifier then flows through all of the worksheets and can be referenced back to the Analysis Worksheets. As the example below shows the Distinct Identifier for the hazard is 1C1, the treatment option identified below would be identified as 1C1-2.



## RISK RANK METHOD

For each event, the Likelihood (a letter A to E) and Consequence (a number 1 to 5) is selected. If an event effects more than one area of consequence (eg. effects people and operations), the highest rank number is always selected.

### Likelihood

Likelihood examples - to be used as a guide only

A	Almost Certain	Likely that the unwanted event could occur several times per year at this location
B	Likely	Likely that the unwanted event could occur several times per year in the Australian mining industry; or could happen annually
C	Moderate	The unwanted event could well have occurred in the Australian mining industry at some time in the past 10 years
D	Unlikely	The unwanted event has happened in the Australian mining industry at some time; or could happen in 50 years
E	Rare	The unwanted event has never been known to occur in the Aust. mining industry; or is highly unlikely that it could ever

### Consequences

<u>Harm to People</u>	5	- Multiple fatalities
	4	- Single fatality, permanent total disabilities.
	3	- Serious bodily injury or health effects – major lost workday case/ permanent disability
	2	- Minor injury or health effects – restricted work or minor lost workday case
	1	- Slight injury or health effects – first aid/ minor medical treatment level
<u>Environmental Impact</u>	5	- Extreme environmental harm – irreversible harm to environmental values of extreme and widespread areas, impacts to conservation areas of national significance, community fatalities or pollution or contamination with costs greater than \$500k
	4	- Major environmental harm – high impact in district or actual impacts to an area of regional conservation significance, health statistics in community alter as a result of this incident or pollution or contamination with costs between \$50k - \$500k
	3	- Serious environmental harm – high local impact or impacts to and area(s) of local conservation value, actual community health impacts or significance or pollution or contamination with a costs between \$5k - \$50k
	2	- Material environmental harm – not trivial or negligible, potential health risks for community or pollution or contamination with costs between \$1k - \$5k
	1	- Environmental nuisance – unreasonable interference with and environmental value or contamination or pollution with a cost less than \$1k
<u>Asset Damage</u>	5	- Extreme damage >\$30M > 1 Month operational delays
	4	- Major damage \$5M - \$30M 1 Week - 1 Month operational delays
	3	- Local damage \$1M - \$5M 1 Day - 1 Week operational delays
	2	- Minor damage \$0.1M - \$1M 1 Shift - 1 Day operational delays
	1	- Slight damage <\$0.1M <1 Shift operational delays
<u>Reputation</u>	5	- International impact – international public attention
	4	- National impact – national public concern
	3	- Considerable impact – regional public concern
	2	- Limited impact – some local public concern
	1	- Slight impact – public awareness may exist but no public concern

## Risk Ranking Table

LIKELIHOOD	CONSEQUENCE				
	1	2	3	4	5
<b>A</b>	15	10	6	2	1
<b>B</b>	19	14	9	4	3
<b>C</b>	22	18	13	8	5
<b>D</b>	24	21	17	12	7
<b>E</b>	25	23	20	16	11

The preliminary evaluation assumptions and results shall be documented and defined into the following risk categories.

Risk Ranking	Guidelines for Risk Control Barriers
1 - 5	Extreme Risk - Immediate intervention required from Senior Management, do not proceed with
6 - 13	High Risk - Imperative to eliminate or reduce risk by introduction of controls, do not proceed with activity until reviewed by Senior Management
14 - 20	Medium Risk - Corrective action to be determined, do not proceed without authorisation from Shift Supervisors
21 - 25	Low Risk - Safe to continue activity once hazards minimised