Longwalls 201 to 204

Roads & Maritime (RMS) - Built Features Management Plan

November 2017

DOCUMENT CONTROL

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				Name/Position	Date
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1 INTRODUCTION

Ashton Coal Operations Pty Ltd (ACOL), a subsidiary of Yancoal Australia Limited (Yancoal), owns the Ashton Coal Project (ACP), an underground coal mine located approximately 14 kilometres north-west of Singleton in the Hunter Valley in NSW.

The ACP was granted consent on 11 October 2002 by the Minister of Planning pursuant to the provisions of the Environmental Planning and Assessment Act 1979 (DA 309-11-2001-i). The Mine is approved to produce up to 5.45 million tonnes per annum (Mtpa) of run of mine (ROM) coal and operate until 2024. The consolidated Development Consent has been modified on ten occasions, with the most recent amendment approved on 20 June 2016.

The underground mine is approved for multiseam longwall extraction, targeting four coal seams in descending order (Pikes Gully (PG), Upper Liddell (ULD), Upper Lower Liddell (ULLD) and Lower Barrett (LB)). Development of the underground mine commenced in December 2005 and is accessed through the southern wall of the Arties Pit under the New England Highway.

ACOL has subsequently prepared an Extraction Plan for longwall mining of LW201 to 204 in the ULLD Seam of the Ashton Underground Coal Mine, varying between 105 metres and 230 metres below the surface, which was approved by the Department of Planning & Environment (DPE) on the 16 May 2017. Longwall mining in the Extraction Plan area of 201 to 204 (the **Extraction Plan Area** – refer **Figure 1**) commenced on the 7 July 2017, and is planned to take place over a three-year period.

The location of Ashton's mining areas, and previous mining is shown with the Ashton Mine Complex in **Figure 1**.

2 SCOPE & OBJECTIVE

This RMS Built Features Management Plan (BFMP) has been prepared to identify and manage predicted subsidence impacts on NSW Roads and Maritime Services (RMS) assets associated with the Ashton Coal Project (ACP). The scope of this management plan only covers RMS assets potentially impacted by secondary extraction associated with Longwall (LW) 201 to 204 in the Upper Lower Liddell (ULLD) Seam.

The ACOL Environmental Management Strategy provides the strategic context for the environmental management of the ACP. Extraction Plans form part of the Environmental Management Strategy and are required by the ACP Development Consent. Impacts to man-made features are addressed through the *overarching BFMP*, under which individual BFMP's detail the proposed consultation, monitoring and management of infrastructure for each asset-owner.

This RMS BFMP outlines ACOL's statutory requirements relating to subsidence management for RMS assets potentially affected by subsidence from LW 201 to 204, as well as consultation, monitoring and reporting requirements. Relevant RMS features have been identified and are detailed in **Section 5.2.**

This BFMP forms part of the Ashton Longwalls 201 to 204 Extraction Plan and should not be read in isolation.

3 BACKGROUND

ACOL has previously mined a series of longwall panels in the PG Seam and ULD Seam adjacent to the RMS owned New England Highway. The mining of Longwalls 201 – 204 in the ULLD Seam will be the third episode of mining in this area (see **Figure 2**).

The panels in each seam are arranged in a regular, parallel, offset geometry. In this arrangement, the 1st (PG) and 3rd (ULLD) seams are superimposed. The 2nd (ULD) and 4th (LB) seams are also superimposed but with a 60-metre offset to the west relative to the other two seams.

Longwalls 1 – 8 in the PG Seam and longwalls 101 – 104B in the ULD Seam have successfully been mined adjacent to the New England Highway in the past, with no adverse impacts having been reported.

4 LEGAL REQUIREMENTS AND GUIDELINES

This document has been prepared in accordance with the consent conditions, relevant legislation and guidelines.

4.1 DEVELOPMENT CONSENT

Schedule 3, Condition 32(g) of DA 309-11-2001-i states that ACOL must prepare a Built Features Management Plan, which has been prepared in consultation with the owners of such features and DPE, to manage the potential impacts and consequences of subsidence on any built features.

4.2 CONSULTATION REQUIREMENTS

Should significant amendments to this document be required prior to, or during implementation, the amendments will be made in consultation with the RMS, and to the satisfaction of DPE. Contact details of the relevant stakeholders are listed in **Table 4.1**.

Organisation	Contact	Phone	Address
Roads and Marine Services (RMS)	Asset Manager	(02) 4908 7857	59 Darby St, Newcastle NSW 2300 (Locked Bag 30)
Department of Planning & Environment (DPE)	Principal Subsidence Engineer	(02) 4931 6644	PO Box 344 Hunter Region Mail Centre NSW 2310

5 ASSETS & IMPACTS

This management plan addresses potential subsidence impacts to RMS assets potentially affected by underground mining (secondary extraction) of LW 201 to 204 in the ULLD Seam only. The subsidence predictions, affected assets and likely subsidence impacts are summarised below.

5.1 PREDICTED SUBSIDENCE

In this section, the subsidence estimates for mining in the ULLD Seam (LW 201-204) are presented in the form of incremental and cumulative subsidence (see **Table 5.1**). Incremental subsidence is the subsidence that is expected from mining in the ULLD Seam, whereas cumulative subsidence is the subsidence expected from the already mined ULD and PG Seams and proposed mining in the ULLD Seam.

Table 5.1 Incremental and Cumulative Subsidence Parameters Predicted due to the Extraction of Each of the Proposed Longwalls

ULLD Seam Longwall Panels and Depth (m) and Depth Range (in brackets)	Longwall 201 – 204 ULLD Seam Predictions				
	ULLD Subs (m)	ULLD Tilt (mm/m)		ULLD Strain (mm/m)	
	Background and Stacked Edges	General Background	Stacked Edges	General Background	Stacked Edges
Incremental Subsidence Parameters					
LW201 115 (105-175)	2.5	76	150	43	76
LW202 135 (125-190)	2.7	70	140	40	70
LW203 155 (145-210)	2.7	61	120	35	61
LW204 165 (150-230)	2.7	57	120	33	57
Cumulative Subsidence Parameters					
LW201 115 (105-175)	5.7	120	350	74	170
LW202 135 (125-190)	5.7	110	300	63	150
LW203 155 (145-210)	5.8	94	260	56	130
LW204 165 (150-230)	5.7	86	240	52	120

Subsidence from mining Longwalls 201 – 204 in the ULLD Seam is expected to cause additional incremental subsidence of up to 2.7m. The total cumulative subsidence is expected to be up to 5.8m in the central part of the areas where there is overlap between longwalls panels in three seams.

A conservative approach is adopted for estimating the total subsidence. The estimated incremental subsidence profile for the ULLD Seam is based on 85% of the planned mining height of this seam plus an allowance for the amount of latent subsidence to be recovered from around pillar and abutment edges in the overlying seam (or seams). The allowance for latent subsidence is somewhat interpretative but is consistent with the improved understandings of multi-seam subsidence gained from the monitoring conducted to date.

5.2 DESCRIPTION OF ASSETS & SUBSIDENCE IMPACTS

Strata Control Technology (SCT 2016) assessed subsidence impacts on key features within or in close proximity to the LW 201 – 204 Extraction Plan area, including the New England Highway and associated cutting.

No perceptible impacts are expected at the New England Highway or associated bridge over Bowmans Creek as a result of mining Longwalls 201 – 204.

The New England Highway is located approximately 140m north of the nearest corner of the Extraction Plan Area. Subsidence monitoring experience above previous longwall panels in the PG Seam and ULD Seam indicates that subsidence movements above the finishing end of the panels are largely restricted to within the footprint of the longwall panels and do not extend across the very large barrier to the highway.

5.3 SUBSIDENCE MONITORING PROGRAM

A *Subsidence Monitoring Program* has been prepared for LW 201 – 204. This is a separate document which outlines:

- Overview of the *Subsidence Monitoring Program* – natural and built features;
- Subsidence reporting;
- Plan illustrating proposed subsidence monitoring locations; and
- Summary of survey standards and methods.

In accordance with the Extraction Plan Approval, the *Subsidence Monitoring Program* is typically reviewed by DPE prior to the commencement of longwall extraction in each longwall panel. To avoid repetition, specific Built Features Management Plans reference the *Subsidence Monitoring Program*.

5.4 SUBSIDENCE PARAMETER DEFINITIONS

Subsidence, tilt and strain are the subsidence parameters normally used to define the extent of the surface movements that will occur as mining proceeds.

Subsidence is the vertical distance (usually measured in millimetres) that the ground surface lowers as a result of mining, and depends on the depth of the coal seam, the thickness of the seam, the width of the extraction area and the characteristics of the overburden.

Tilt is calculated as the change in subsidence between two points divided by the distance between those points (i.e. change in slope of the surface landform as a result of mining). The maximum tilt, or the steepest portion of the subsidence profile, occurs approximately 50 metres from the edge of the longwall panel. Tilt is usually expressed in millimetres per metre.

Strain results from horizontal movements in the strata. Strain is determined from monitoring survey data by calculating the change in the horizontal length of a section of a subsidence profile and dividing this by the initial horizontal length of that section. If the section has been extended, the ground is in tension and the change in length and resulting strain are both positive. If the section has been shortened, the ground is in compression and the change in length and strain are both negative. Strain is usually expressed in millimetres per metre.

5.5 LONGWALL MINING RATE AND SEQUENCE

Panel	Start Date	End Date	Estimate Duration (Days)
LW201	July 2017	March 2018	250
LW202	April 2018	November 2018	225
LW203	December 2018	July 2019	215
LW204	August 2019	March 2020	220

6 PERFORMANCE MEASURES

ACOL will aim to ensure that all built features owned by RMS affected by subsidence area always maintained as safe and serviceable where subsidence related impacts are realised. Any subsidence damage from ACOL's mining activities will be repaired as necessary, or else replaced or fully compensated or dealt with under the terms of an access or compensation agreement.

The subsidence impact performance measures relevant to RMS assets under Schedule 3, Condition 29 of DA 309-11-2001-i are summarised in **Table 6.1**, while more specific objectives and performance measures developed by ACOL are listed in **Table 6.2** below.

ACOL must ensure that underground mining does not cause any exceedance of the performance measures in **Table 6.1** (DA 309-11-2001-i).

Table 6.1 Subsidence Impact Performance Measures

Subsidence Impact	Performance Measure
Built Features	
New England Highway, including the bridge over Bowmans Creek and cutting.	Always safe and serviceable. Damage that does not affect the safety or serviceability must be fully repairable, and must be fully repaired.
Public Safety	
Public Safety	No additional risk due to mining

Table 6.2 RMS New England Highway Management Objectives

Objective	Performance Measures
• To prevent damage to the New England Highway. • To prevent public safety hazards resulting from subsidence damage to the New England Highway. • To ensure the New England Highway is maintained as safe and serviceable (as it relates to impacts from subsidence). • To monitor and remediate subsidence induced impacts to roads. • Subsidence management as per the Development Consent	• Mine plan is designed to provide sufficient barriers and controls to prevent subsidence related impacts to the New England Highway. • First workings are designed to remain long-term stable. • Subsidence monitoring of the New England Highway to confirm negligible subsidence related movement. • No road hazards or disruptions to traffic occur as a result of subsidence impacts. • All subsidence related damage is identified and remediated as soon as practicable. • Managed to meet conditions of the Development Consent.

Any dispute between ACOL and RMS over the interpretation, application or implementation of the performance measure in **Table 6.1** is to be settled by the Secretary of the DPE, following consultation with Subsidence Advisory NSW and DPE. Any decision by the Secretary shall be final and not subject to further dispute resolution under DA 309-11-2001-i.

ACOL must rehabilitate the site in a manner that is consistent with the rehabilitation objectives in the Environmental Assessment and **Table 6.3**, to the satisfaction of the DPE.

Table 6.3 Rehabilitation Objectives

Feature	Objective
Built features affected by subsidence	Repair to pre-mining condition or equivalent unless: • The owner agrees otherwise; or • The damage is fully restored, repaired or compensated under the *Mine Subsidence Compensation Act 1961.*

7 SUBSIDENCE MANAGEMENT

The actions that ACOL undertakes to fulfil the consent condition outlined in **Section 4** and to meet performance measures outlined in **Section 6** are outlined in the relevant tables below. Monitoring, management and incident response for RMS is summarised below in **Table 7.1**.

A Control Management Summary is provided in **Table 7.2** which has been developed in conjunction with the RMS.

A Risk Register is provided as Table **7.3**.

Table 7.1 Monitoring, Management and Incident Response Actions

Item	Action	Trigger/Timing	Responsibility	Reporting
1.0	**Monitoring**			
1.01	See **Table 7.2**			
2.0	**Management**			
2.01	Studies by ACOL have determined that the probability of a pothole on the New England Highway is negligible.	No requirement for additional studies	Ashton Technical Services Manager	Notify RMS if an issue occurs.
2.02	Maintain a Risk Register (refer to **Table 7.3**).	Prior to, during and post mining.	Ashton Technical Services Manager	Copy to RMS from ACOL Document Management System.
3.0	**Incident Response**			
3.01	Refer to and implement controls in the Ground/Strata Failure Management Plan.	If damage is caused to New England Highway by subsidence from longwall mining.	Ashton Technical Services Manager	Monthly Status Report
3.02	Notify the RMS and re-survey in accordance with the Control Management Summary (**Table 7.2**)	Subsidence progresses within the road reserve.	Ashton Technical Services Manager / Mine Surveyor	Notify RMS.
3.03	In consultation with the Subsidence Advisory provide funds to repair any subsidence- related damage to the New England Highway road reserve.	If damage is caused to New England Highway by subsidence from longwall mining.	Ashton Technical Services Manager / Mine Surveyor	Monthly Status Report

Table 7.2 Monitoring, Management and Incident Response Actions

MITIGATION/ACTION	FUNCTION	HOW	WHEN
PRE-MINING ACTIVITES			
Activities Already Completed			
Monitoring of the New England Highway Area as part of the LW 1-8 extraction of the Pikes Gully Seam *Note: subsidence monitoring marks which were established by ACOL on the edge of the road pavement have been buried by RMS road maintenance works. All marks east of Bowmans Bridge have been covered with a 2 – coat spray seal whereas all marks west of the bridge have been covered with a hot mix seal at varying depths (up to ~200mm thick). It is proposed to re-survey the road pavement marks only if 2 or more road reserve marks have subsided >20mm because of the current LW extraction* Monitoring of the New England Highway Area as part of the LW 101-105 extraction of the Upper Liddell Seam	ACOL	Survey monitoring was completed for: • Road pavement; • Road reserve; • Drainage structures; • Cutting; • Fill Embankment; and • Bowmans Bridge. This included survey mark installation, photo monitoring and pre-condition survey.	Completed as part of LW 1-8 Pikes Gully Seam Completed as part of LW 101-106A Upper Liddell Seam
Proposed Activities			
Subsidence monitoring of centre-lines, cutting, road reserve and Bowmans Bridge marks to determine baseline. *It is proposed to re-survey the road pavement marks only if 2 or more road reserve marks have subsided >20mm because of the current LW extraction*	ACOL	Subsidence monitoring to be undertaken as per the *Subsidence Monitoring Program (Appendix B).*	Prior to effects of mining of LW201 and subsequent LWs
Road monitoring and maintenance by RMS.	RMS	RMS to continue the monitoring and maintenance program on the New England Highway as per RMS's nominated program.	As per the RMS monitoring and maintenance program.
DURING-MINING ACTIVITIES			

MITIGATION/ACTION	FUNCTION	HOW	WHEN
Subsidence monitoring of northern centre-lines and XL8 during longwall retreat and at the end of the completion of each longwall.	ACOL	Subsidence monitoring to be undertaken as per the *Subsidence Monitoring Program (Appendix B).*	During mining of LW201 – 204. At the completion of each longwall.
Visual monitoring of key features associated with the New England Highway.	ACOL	Subsidence monitoring to be undertaken as per the *Subsidence Monitoring Program (Appendix B).* This would then include: • Visual survey (photo monitoring) of the road pavement, bridge, cutting and fill embankments which are within the area of influence of the project subsidence. •	Prior to the longwall being within 200m of the road reserve and in consultation with RMS if two or more of the road reserve survey marks indicate subsidence greater than 20mm due to the current LW extraction
Subsidence monitoring of highway including bridge and roadway	ACOL	Survey monitoring of Bowmans Bridge and highway	Pre and post mining on Bowmans Bridge. Survey monitoring of the highway pavement will commence if two or more of the road reserve survey marks indicate subsidence greater than 20mm due to current Longwall extraction
Road monitoring and maintenance by RMS	RMS	RMS to continue the monitoring and maintenance program on the New England Highway as per RMS's nominated program.	As per the RMS monitoring and maintenance program.
POST-MINING ACTIVITIES			
Subsidence monitoring of centre lines and XL8 to determine any subsidence impacts.	ACOL	Subsidence monitoring to be undertaken as per the *Subsidence Monitoring Program (Appendix B).*	At the end of mining in LW 201 – 204.
Final photo monitoring undertaken.	ACOL	Subsidence monitoring to be undertaken as per the *Subsidence Monitoring Program (Appendix B).*	At the end of mining in LW 201 – 204.
Road monitoring and maintenance by RMS	RMS	RMS to continue the monitoring and maintenance program on the New England Highway as per RMS's nominated program.	As per the RMS monitoring and maintenance program.

In summary, survey monitoring of the New England highway will occur when the following criteria is met.

1. Surveys within the road reserve (point 2 below) will occur if the northern end of the longitudinal subsidence line for the current longwall has consistently subsided >20mm

2. Two or more survey marks within the road reserve have subsided >20mm because of the current longwall extraction

Table 7.3 Risk Register with General Mitigation – Subsidence Impacts on H9 New England Highway

Asset	Failure type	Event/Hazard	Code	INFRASTRUCTURE			FUNCTION			SAFETY			COMMENTS	MITIGATION MEASURES
				F	C	R	F	C	R	F	C	R		
Pavement	Excessive ground movement	Rapid pavement failure leading to hump of step >50mm	H1	D	1	L	D	2	L	D	1	L	If this were to occur it is likely to spread over a few metres and would be of minimal safety concern.	Weekly visual and Survey monitoring/RMS ops to carryout repairs once identified
		Cracking>50mm	H2	D	1	L	D	1	L	D	1	L	Wide longitudinal cracking is of greater concern than wide transverse cracking, due to the potential effects on motorcycles	Weekly visual and Survey monitoring/RMS ops to carryout repairs once identified
		Loss of sight distance	H3	F	3	L	F	3	L	F	3	L	Considering the existing road geometry and subsidence predictions the likelihood of reduced stopping sight distance is barely credible	Weekly visual and Survey monitoring and survey monitoring/RMS ops to carryout repairs once identified
		Crossfall changes	H4	D	2	L	D	2	L	D	2	L	Considering the subsidence predictions, the likelihood of cross-fall changes is remote	Weekly visual monitoring and survey monitoring/RMS ops to carryout repairs once identified
		Ponding	H5	D	1	L	D	2	L	D	2	L	Considering the subsidence predictions, the likelihood of cross-fall changes is remote	Weekly visual monitoring and survey monitoring/RMS ops to carryout repairs once identified
Drainage Structures	Excessive ground movement	Cracking of RC Pipes	H6	D	1	L	D	1	L	E	1	L	Cracking of pipes may result in sink hole forming. The likelihood of this occurring is remote	Weekly visual monitoring/RMS ops to carryout repairs once identified
		Pipe Joint displacement	H6	D	1	L	D	1	L	E	1	L	Pipe Joint displacement may result in sink hole forming. The likelihood of this occurring is remote	Weekly visual monitoring/RMS ops to carryout repairs once identified
		Cracking of Pits	H6	D	1	L	D	1	L	E	1	L	Cracking of pits would have minimal impact on either function or safety	Weekly visual monitoring/RMS ops to carryout repairs once identified
		Kerb cracking/buckling	H6	D	1	L	D	1	L	E	1	L	This would have minimal impact on either function or safety	Weekly visual monitoring/RMS ops to carryout repairs once identified
Cutting	Excessive ground movement	Cracking of shotcrete	H7	D	2	L	D	1	L	E	1	L	Cracking of shotcrete would have minimal impact on function and safety. The likelihood of this occurring is remote	Weekly visual monitoring/RMS ops to carryout repairs once identified
		Cracking/stepping of concrete surface drains (i.e. bench, table and cut drains)	H7	D	1	L	D	1	L	E	1	L	This would have minimal impact on either function or safety	If survey triggers occur, then monthly inspections to be carried out by RMS ops
	Closure of cutting due to ground movement	Slope effects	H8	D	2	L	D	2	L	D	2	L	Considering the subsidence predictions, the likelihood of collapse is remote	Weekly visual monitoring and survey monitoring to be carried out. Survey monitoring to assess closure of cutting will identify if there are impacts on the cutting/RMS ops to carryout repairs once identified
Fill embankments	Excessive ground movement	Cracks, water, instability.	H9	D	2	L	D	2	L	E	2	L	This would have minimal impact on either function or safety.	Survey monitoring will identify if the embankments will be effected. Movement is identified by survey then weekly visual monitoring will commence
		Effects on embankment	H9	E	2	L	E	2	L	E	1	L	Considering the subsidence predictions, the likelihood of collapse is remote	Survey monitoring will identify if the embankments will be effected. Movement is identified by survey then weekly visual monitoring will commence. RMS Ops will be carryout emergency works if collapse occurs
Bowmans Bridge	Destructive movements in bridges	Differential horizontal movements and/or tilts over a period of time causing excessive stresses and damage to structure	H10	D	1	L	D	1	L	D	1	L	This would have minimal impact on either function or safety.	Weekly Visual and Survey monitoring will be carried out to assess movement

Risk Matrix Legend

L	-	LOW
M	-	MODERATE
H	-	HIGH
E	-	EXTREME

LOOK UP TABLE

FREQUENCY

Level	Descriptor	Alt. Description	Description	Chance %	Frequency
0	**Absolutely Certain**	Definite	This event will occur – known to occur now *-Will occur several (many) times each year and many times (constantly) during this project*	99.99	Several times each year
A	**Almost Certain**	Frequent	This even is expected to occur in most circumstances *-Expected to occur more than once during the duration of this project (LW 701 to 704)*	95	1 / year
B	**Likely**	Probable	This event will probably occur in most circumstances *- Expected to occur once during the duration of the project*	10	at least 1 / 10 years
C	**Possible**	Occasional	This even might (should) occur at some time *- Not likely to occur in the life of project, but it is possible*	1	at least 1 / 100 years
D	**Unlikely**	Remote	This event could occur at some time *- Unlikely (very) to occur in life of project*	0.1	at least 1 / 1,000 years
E	**Rare**	Very Unlikely	This event may occur in exceptional circumstances *- Examples of this have occurred historically, but it is not anticipated for this project*	0.01	at least 1 / 10,000 years
F	**Hypothetical**	Barely credible	Theoretically possible but never occurred to date (anywhere in the world) *- Often applied to natural events*	1.00E-03	Every Million years

LOOK UP TABLE

CONSEQUENCES

Level	Descriptor	Infrastructure			Function			Safety / Societal Cost
		Pavement etc	Bridges	Cost	Access	Speed	Political	
1	**Insignificant**	Minor damage	Minor repairable damage	< $50k	Some loss in condition	No traffic effect	No political impact	No injuries or health effects
2	**Minor**	Noticeable damage	Damage that will deteriorate if not repaired quickly	< $100k	On lane closed for <half day. One planned lane closure < 1 day	Speed reduction for < 1month – 80 kph	Minimal political impact (brief press coverage	First aid treatment or minor damage to vehicles
3	**Moderate**	Significant Damage	Significant Damage	< $ 1 M	One lane closed for < 1 day	Speed reduction for > 1 month – 80 kph < 1 day – 40 kph	Political impact (press coverage)	Medical treatment required
4	**Major**	Extensive damage	Major damage – restricted speed	< $10 M	One land closed for > 1 day	Speed reduction for < 1 month – 40 kph	Significant political impact (extensive negative press coverage	Extensive injuries or one to two permanent disabilities
5	**Catastrophic**	Loss of use of carriageway	Extensive damage. One carriageway closed until repaired	< $50 M	One carriageway closed for > 1 day or both carriageways for < 2 day	Speed reduction for > 1 month – 40 kph	Major political impact (Commission of Enquiry)	Single fatality or severe permanent disabilities to several people
6	**Untenable**		Total failure of bridge or closed until repaired	> $ 50M	Both carriageways closed for > 2 days	Speed restriction for > 12 months – 40 kph		Multiple fatalities

LOOK UP TABLE

RISK MATRIX

	Consequences					
LIKELIHOOD	**1 (Insignificant)**	**2 (Minor)**	**3 (Moderate)**	**4 (Major)**	**5 (Catastrophic)**	**6 (Unthinkable)**
(Multiple	**H**	**E**	**E**	**E**	**E**	**E**
A (Almost Certain)	**H**	**H**	**E**	**E**	**E**	**E**
B (Likely)	**M**	**H**	**H**	**E**	**E**	**E**
C (Possible)	**L**	**M**	**H**	**E**	**E**	**E**
D (Unlikely)	**L**	**L**	**M**	**H**	**E**	**E**
E (Rare)	**L**	**L**	**M**	**H**	**H**	**E**
F (Hypothetical)	**L**	**L**	**L**	**M**	**H**	**H**

Low	Low risk; managed by routine procedures
Moderate	Moderate risk; requires above normal attention
High	High risk; ALARP must be applied
Extreme	Extreme risk; not acceptable and must be reduced

8 RESPONSIBILITIES

8.1 ASHTON OPERATIONS MANAGER

The Operations Manager must:

- Promptly notify the Resource Regulator Mining Engineering Inspector of any identified public safety issue.

8.2 ASHTON TECHNICAL SERVICES MANAGER

The Ashton Technical Services Manager must:

- Authorise the Plan and any amendments thereto;
- Ensure that the required personnel and equipment are provided to enable this Plan to be implemented effectively;
- Inform the Operations Manager of impacts requiring notification to Resource Regulator & and/or RMS; and
- Liaise with officers of RMS and remediation consultants and contractors as required.

8.3 ASHTON ENVIRONMENT & COMMUNITY MANAGER

The Environment & Community Manager must:

- Inform the Landholders of impacts requiring remediation; and
- Report monitoring results in the AEMR.

8.4 ASHTON REGISTERED MINING SURVEYOR

The Registered Mining Surveyor must:

- Ensure that subsidence inspections are conducted to the required schedule and that the persons conducting the inspection are trained in the requirements of this plan and understand their obligations;
- Review and assess subsidence monitoring results and inspection checklists; and
- Promptly notify Technical Services Manager of any identified public safety issue.

8.5 ASHTON TECHNICAL SERVICES TEAM

The Ashton Technical Services Team members must:

- Conduct the subsidence inspection within the applicable subsidence zone to the standard required and using the subsidence inspection checklist;

- Take actions to remediate any public safety issue identified during inspections; and
- Where actions are beyond their capabilities immediately attempt to notify the landowner or infrastructure owner and Technical Services Manager.

8.6 RMS

RMS must:

- Arrange repairs as necessary; and
- Any necessary repairs to be arranged through consultation between RMS and ACOL.

8.7 PAYMENT OF COSTS IN RELATION TO REPAIRS

ACOL will liaise with the Subsidence Advisory NSW (SANSW) in relation to payment for any necessary repairs such that no cost will be borne by RMS.

9 TRAINING

All personnel who conduct inspections will be trained in the requirements of the Ashton LW201 to LW204 Built Features Management Plan, LW201 to LW204 Subsidence Monitoring Program and the LW201 to LW204 RMS Built Features Management Plan.

Training will be conducted on the identification of the various subsidence impacts detailed in Public Safety Management Plan and will include any safety aspects of those inspections.

10 AUDIT AND REVIEW

10.1 AUDIT

The requirements of the Longwalls 201 to 204 RMS – Built Features Management Plan are to be audited as required.

10.2 REVIEW

A review of this plan will be undertaken:

- If the mine design criteria are changed;
- If subsidence Impacts are greater than predicted;
- If required by RMS; and
- Following each audit.

11 REFERENCES

Strata Control Technology (ASH4552_REV3 2016). Ashton Coal Operations Pty Ltd: S*ubsidence Assessment for the Extraction Plan for Longwalls 201 – 204 in the Upper Lower Liddell Seam*, Report Number ASH4552.

Figures

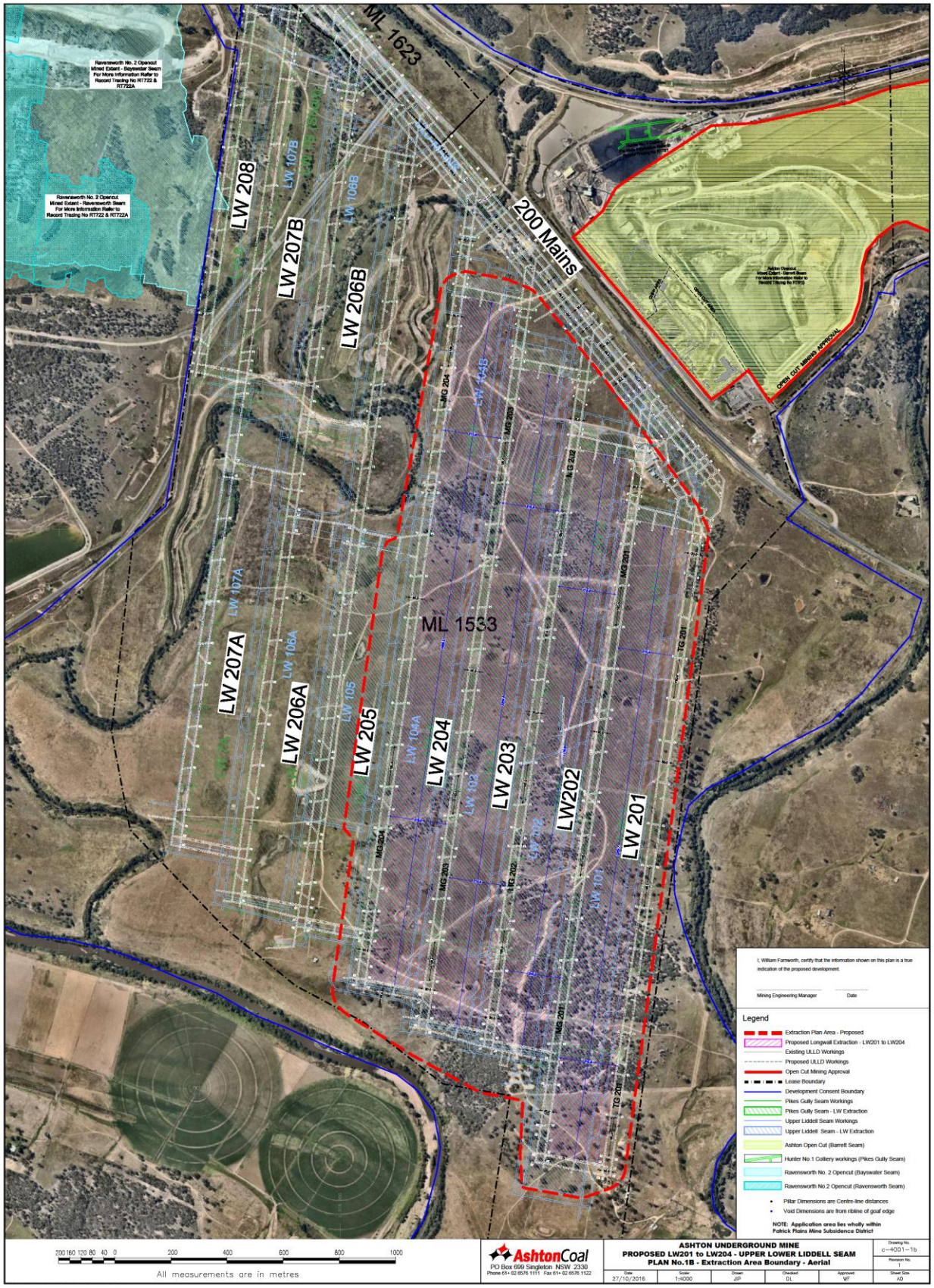


Figure 1 Extraction Plan Area

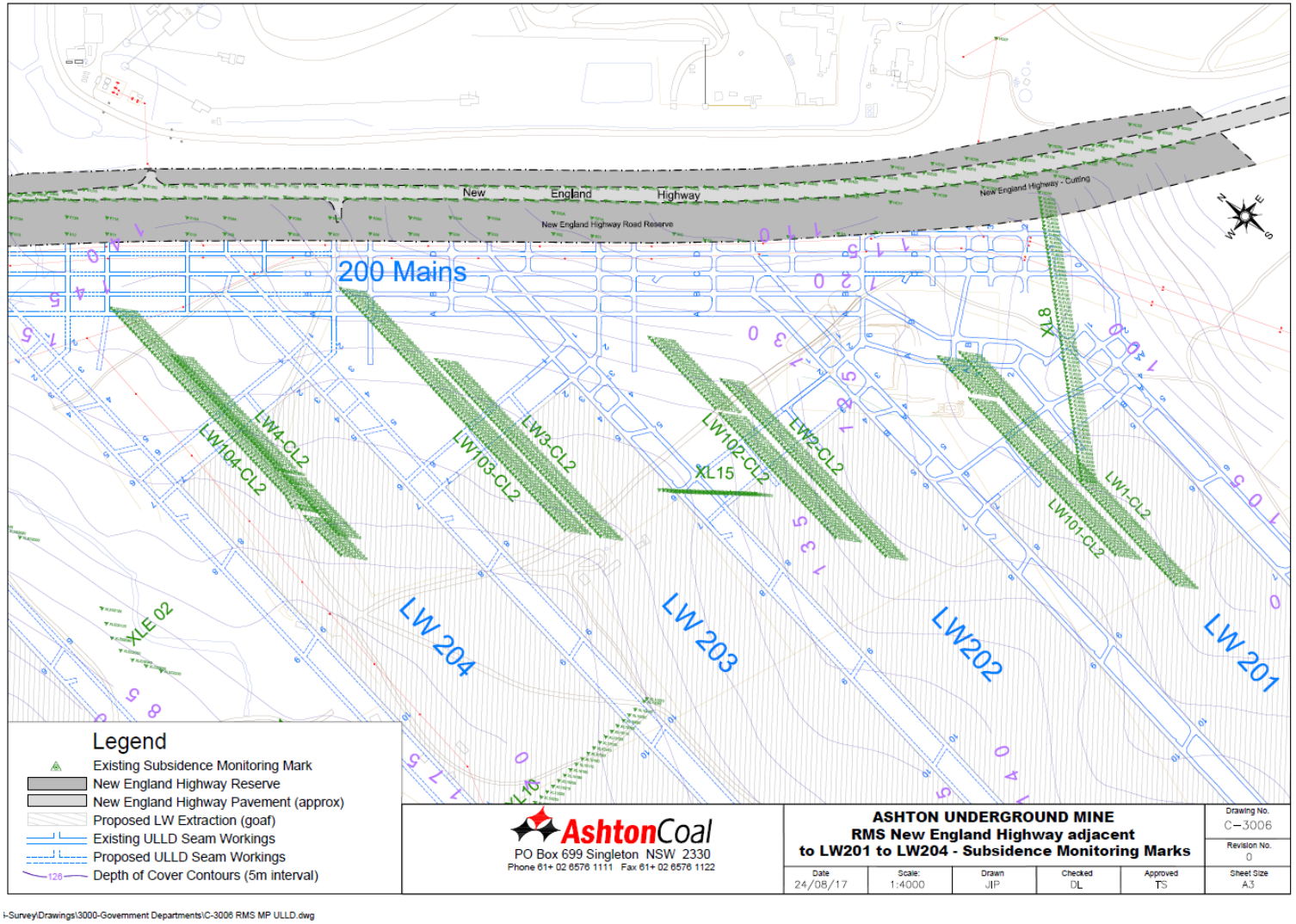


Figure 2. Plan Showing Location of RMS New England Highway adjacent to LW201 to LW204 and Subsidence Monitoring Lines

Appendices

Appendix A

Stakeholder Contact Details

LW201 to LW204 Extraction Plan Stakeholder List

Position	Name	Phone
ASHTON		
Operations Manager	Aaron McGuigan	6570 9104
Technical Services Manager	Tony Sutherland	6570 9110
Environment and Community Manager	Phil Brown	6570 9219
Mine Surveyor	Jeff Peck	6570 9125
Mining Engineer	Thomas Kaltschmidt	6570 9124
After Hours	Control Room	6570 9160
GOVERNMENT		
Subsidence Advisory NSW	Newcastle Office	4908 4300 24-hour emergency hotline 1800 248 083
DPE Mine Safety – Coal Mine Inspector	Maitland Office	4931 6666
ROADS & MARITIME SERVICE		
RMS – Asset Manager, Hunter Region	Joe Krsul	4908 7857
RMS – Singleton	Greg Wilkinson	4908 7811
LANDHOLDERS	Refer to Ashton internal contact register	

Appendix B

Subsidence Monitoring Program

Longwalls 201 to 204

Subsidence Monitoring Program

May 2017

DOCUMENT CONTROL

DOCUMENT DETAILS	**Title**	LW201 – 204 Subsidence Monitoring Program		
	Reference	Ashton Longwalls 201 to 204 Extraction Plan		
	Document Status	FINAL		
APPROVAL DATE	**Revision**	**Revision Details**	**Prepared**	**Approved**
7/11/2016	0	Original document	D Lee J Barben	Tony Sutherland
05/05/2017	1	Modified Monitoring frequencies on subsidence lines (Table 1A) Updated "Subsidence Impacts Monitoring" Table A2 to reflect approved Asset Management Plans (Ausgrid and Telstra) Revised plans to reflect shortening of LW201 block	J Peck	Tony Sutherland
14/11/2017	2	Updated RMS section in Table A2	D Lee	Tony Sutherland

TABLE OF CONTENTS **Page**

APPENDICES

1 INTRODUCTION

Ashton Coal Operations Pty Ltd (ACOL) was granted approval for underground mining of Longwalls in the Camberwell area by the Minister for Planning on 11 October 2002 (DA309-11-2001). ACOL has subsequently prepared an Extraction Plan for longwall mining of LW201 to 204 in the Upper Lower Liddell (ULLD) Seam of the Ashton Underground Coal Mine, varying between 105 metres and 230 metres below the surface. Proposed longwall mining in the Extraction Plan area of 201 to 204 (the Extraction Plan Area – refer **Figure 1**) is due to commence in July 2017, and is planned to take place over a three-year period.

This Subsidence Monitoring Program (the **SM Program**) has been prepared as part of the Extraction Plan for Longwalls LW201 to LW204 and in accordance with condition 32(g) of the development consent DA309-11-2001-i.

1.1 SCOPE & OBJECTIVE

The scope of the SM Program includes the Extraction Plan Area for LW201 to LW204 (the **Extraction Plan Area**).

The objective of the SM Program is to provide:

- A formal program for monitoring of subsidence parameters and subsidence effect observations on land within the Extraction Plan Area;
- Provide data to assist in the management of those risks associated with subsidence;
- Validate the subsidence predictions; and
- Analyse the relationship between the subsidence effects and impacts under the Extraction Plan and any ensuing environmental consequences.

To achieve the objective the SM Program will:

- Describe subsidence monitoring procedures to measure actual subsidence parameters for the Extraction Plan Area; and
- Describe observations/inspections of the general landform and environmental condition in the Extraction Plan area.

The monitoring results from the SM Program will allow review against subsidence predictions, and to allow a trigger for any required remediation and/or review management measures based on measurements of observations.

The process for collecting subsidence monitoring data, review against the relevant TARP, and trigger of actions from relevant Extraction Plan sub-plans is provided in the main Extraction Plan document.

1.2 BUILT FEATURES SUBSIDENCE MONITORING

Monitoring specific to individual built features (e.g. powerlines, telecommunications, and private property improvements) will be detailed in individual Built Features Management Plans prepared in consultation with the relevant owner.

2 SUBSIDENCE MONITORING PROGRAM

2.1 LAND OWNERSHIP AND LAND ACCESS

Surface land in the Extraction Plan Area is predominately cattle grazing land owned by ACOL other than a small part in the far southeast known as Property 130. Property 130 is a privately owned dairy farm and is serviced on a daily basis across ACOL land located above the underground mine provided via a 'right of way' agreement. Placement and monitoring of subsidence marks and general condition monitoring can only be conducted with agreement with the relevant landowners.

Ashton is in the process of securing access for monitoring purposes over Property 130 in the Extraction Plan Area. Survey monitoring points were established for prior mining and are proposed to be utilised again.

2.2 SUBSIDENCE PARAMETERS OVER LONGWALLS – SURVEY PROGRAM

The proposed layout and monitoring details of the subsidence lines are outlined in **Appendix A**. In essence, all subsidence lines will be monitored to capture the effects of subsidence from the associated longwall as well as any adjacent longwall/s.

The proposed subsidence monitoring strategy consists of:

1. Existing longitudinal subsidence monitoring lines over Longwalls 201 – 204 (LW1-CL1, LW1-CL2, LW101-CL1, LW101-CL2, LW2-CL1, LW2-CL2, LW102-CL1, LW102-CL2, LW3-CL1, LW3-CL2, LW103-CL1, LW103-CL2, LW4-CL1, LW4-CL2, LW104-CL1, and LW104-CL2);

2. An existing subsidence monitoring cross line over Longwalls 201 – 204 (XL5);

3. Existing subsidence monitoring cross lines over Longwall 201 (XL22, XL1, XL2, XL3, XL4, XL6, XL7, and XL8); and

4. An existing subsidence monitoring cross line over Longwall 204 (XL10).

Survey particulars include:

- The subsidence lines generally consist of star pickets at nominal 5m and 10m intervals depending on depth of cover.
- Expected survey accuracy will be within:
  - i. ± 10mm for horizontal movements
  - ii. ± 10mm for vertical movements
- Data will be kept in an excel spreadsheet and will be accompanied by an updated subsidence plan (which will show the longwall face positions at the time of each survey).
- Survey data will be provided to the DRE via the Subsidence Data Portal within 1 week of completing data acquisition.
- Monitoring frequency as per attached table in **Appendix A**.

2.3 GENERAL LANDFORM CONDITION INSPECTIONS

Mine personnel will also conduct surface inspections of the area as outlined in **Appendix A: Table A1**. Regular inspections will be conducted in the zone defined as being 200 metres behind and 100 metres in front of the current face position will include inspection of:

- Surface cracking particularly around edges of extraction void, travelling abutments and steep slopes
- Surface humps near centre of extracted panels, travelling abutments and topographic lows of adjacent steep slopes
- Step changes in land surface
- Serviceability of access tacks
- Slope, boulder and tree instability
- General vegetation condition observations
- Condition of creeks, tributaries/drainage lines observations

Additional visual monitoring of the 'right of way' access track will occur as per the following protocols:

Action	Timing	Person Responsible
Routine visual inspection of track condition to inspect for possible subsidence damage.	Fortnightly within 100m of the track	Ashton Mine Surveyor or delegate
Increased visual inspections of the track for cracking and humps or drainage issues.	Weekly within 50m of the track	Ashton Mine Surveyor or delegate
Visual inspection every 3 days of the track for cracking and humps or drainage issues.	Every 3 days as a minimum when undermining. Increased frequency if required.	Ashton Mine Surveyor or delegate

The proposed surface condition monitoring form to be completed during each inspection is included in **Appendix B**. Natural landform features within the Extraction Plan Area (including steep slopes and drainage lines) are included with the monitoring form in **Appendix B**.

3 ADAPTIVE MANAGEMENT

3.1 INCREASE IN MONITORING FREQUENCY

The Extraction Plan TARP indicates scenarios where the frequency of subsidence monitoring may be increased to more frequent intervals than that presented in **Appendix A**. This may occur where greater than predicted subsidence parameters are measured, or abnormal surface conditions are observed.

3.2 REVIEW

This SM Program shall be reviewed after the completion of each longwall. The plan will also be reviewed as a result of an incident, if subsidence levels are significantly higher than predicted, if any significant changes to the mine plan occur, or after submission of an Annual Review or Independent Environmental Audit.

Significant changes to the SM Program (such as alteration of proposed monitoring lines, or a reduction in monitoring frequency based on monitoring results) will be undertaken in consultation with relevant government agencies.

4 SM PROGRAM ROLES AND ACCOUNTABILITIES

Detailed below are key personnel involved with implementing this SM Program, their roles and responsibilities.

Role	Responsibilities
Technical Services Manager (TSM)	• Owner of the SM Program • Coordinate Mine Surveyor to ensure subsidence monitoring is undertaken in accordance with the SM Program • Review subsidence monitoring data against predictions and TARPs in order to trigger any actions required on the basis of subsidence results • Review and update the SM Program as required • Ensure visual monitoring requirements are completed by a trained and competent person
Environment and Community Manager (ECM)	• Liaise with Landholders in relation to gaining access for monitoring of the SM Program • Notify and liaise with neighbours and community in relation to mining timing and monitoring performance;
Mine Surveyor	• Ensure that all subsidence monitoring is completed to the requirements of the Subsidence Monitoring Program and provided to the TSM for review.

Appendix A

Subsidence Monitoring Survey and Inspection Program

Table A1: Subsidence Monitoring Survey Program

Subsidence Line	Location	Purpose	Survey Marks	Mark Spacing	Monitoring Frequency
Longitudinal (Southern)	Longitudinal lines located over the southern ends of Longwalls 201-205	Measure the development of the subsidence then capture the combined subsidence effect of the adjacent longwall blocks.	Star Pickets	5-10m	Pre subsidence impacts on multi-goaf and PG centrelines for previous adjacent longwall, if applicable. Pre subsidence impacts for current longwall. Active Subsidence monitoring. Survey the multi-goaf centreline every 100m of retreat as the longwall passes beneath the subsidence line until the longwall is ~200m past the end of the subsidence line. Post subsidence impacts on Multi-goaf and PG centrelines for current longwall when longwall face is ~500m past the end of the subsidence line. Post subsidence impacts when subsequent adjacent longwall face is ~500m past the end of the subsidence line, if applicable.
Longitudinal (Northern)	Longitudinal lines located over the northern ends of Longwalls 201-205	Measure the development of the subsidence then capture the combined subsidence effect of the adjacent longwall	Star Pickets	5-10m	Pre subsidence impacts on multi-goaf and PG centrelines for previous adjacent longwall, if applicable. Pre subsidence impacts for current longwall. Active Subsidence monitoring. Survey the

Subsidence Line	Location	Purpose	Survey Marks	Mark Spacing	Monitoring Frequency
Longitudinal (Northern) (Continued)		blocks.			multi-goaf centreline every 100m of retreat as the longwall passes beneath the subsidence line until the longwall has finished. Post subsidence impacts ~3 months after completion of extraction of current longwall. Post subsidence impacts ~3 months after completion of extraction of the subsequent adjacent longwall.
XL5	Perpendicular line located over LW201-204	To capture the cross line subsidence profile across the multi goaf zone.	Star Pickets	5m when depth of cover is <100m to the Pikes Gully Seam otherwise 10m	Pre subsidence impacts for the current longwall Active subsidence impacts as the longwall passes beneath XL5 at -50m, 0m, 80m and 400m (+/- 20m) past XL5 Only the section of XL5 associated with the current longwall to be surveyed. A full XL5 survey from Glennies Creek to Bowmans Creek to be done after the completion of LW204
XL1, XL2, XL3, XL4, XL6 & XL7	Starting at eastern base of steep slopes associated with Glennies Creek and extending west up to	Monitor effects of first longwall of each seam on steep slopes adjacent to Glennies	Star Pickets	Generally 5m	Pre and post subsidence impacts associated with the extraction of LW201.

Subsidence Line	Location	Purpose	Survey Marks	Mark Spacing	Monitoring Frequency
XL1, XL2, XL3, XL4, XL6 & XL7 (continued)	the approximate mid-point of LW201 Perpendicular to Longwall Centrelines.	creek.			
XL22	Sub parallel line located on fence and adjacent to access track on Property 130	To capture the subsidence profile across the multi goaf zone adjacent to the access track.	Marks placed in base of fence posts	Approx. 8m	Pre and post subsidence impacts using GNSS surveying techniques – if required by property owner (refer to Property 130 Management Plan)
XL8	Starting at top of New England Highway cutting and running diagonally (SW direction) over LW201	Monitor effects of adjacent longwall on Highway cutting.	Star Pickets	5m	When LW201 is ~150m from take-off position and then for every 100m of retreat (+/- 20m), then after completion of LW201. A final survey ~3 months after completion of LW201 and then after completion of LW202
XL10	Perpendicular line located over LW204	Monitor effects of adjacent longwall on steep slopes adjacent to creek.	Star Pickets	10m	Prior to retreating face of LW203 being within 200m of cross line. When LW204 is within 100m of cross line, then when LW204 is approximately adjacent to cross line, then some 200m past cross-line (+/- 20m).

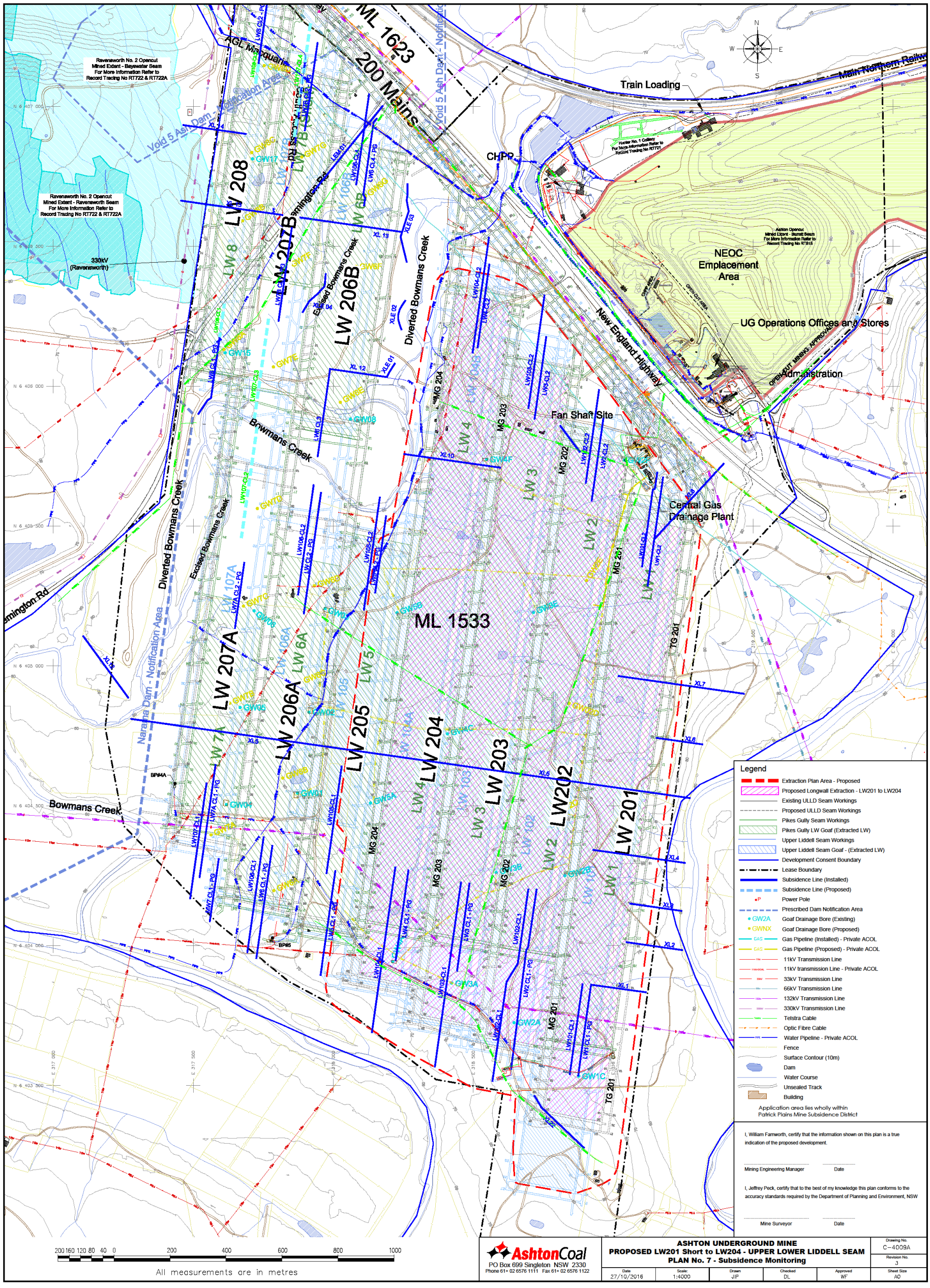
Table A2: Subsidence Impacts Monitoring

Management Plan	Aspect/Feature	Frequency	Monitoring Measures
Public Safety Management Plan (summary of monitoring actions only – full details provided in relevant management plans)	Surface Cracking including steep slopes	Weekly around active mining area	Visual inspection of the area immediately behind the longwall faces passage to identify/map subsidence cracking. Documented inspection of steep slopes along the Hunter River and Glennies Creek to identify cracking requiring remediation.
	Dams	Weekly whilst in active mining area	Monitoring of dams within the Application Area to detect any subsidence impacts that may require management. Monitor water level using markers.
	Access Track (Right of Way)	Every 3 days as a minimum whilst in active subsidence area. Increased frequency if required	Visual inspection of tracks to identify any subsidence impacts that could affect the safety of vehicles. Alternate right of way to be in place during undermining where applicable.
	Flooding and Access	After and during significant rain events	Visual inspection of tracks to identify any ponding impacts that could affect the safety and access of vehicles.
Built Features Management Plan (Summary of monitoring actions only – full details provided in actual management plan)			
Ausgrid 132kV BFMP	Power Poles	As a minimum pre and post mining surveys will be carried out as well every 50 metres of retreat when the longwall is 50m from the poles to 150 metres past on affected power poles	Monitoring will be by total station survey to provide x, y and z values to establish movement of poles. Also, radiations measured to top of each pole to measure for any possible tilt

Management Plan	Aspect/Feature	Frequency	Monitoring Measures
	Power poles and Transmission Lines inspections	pre-mining and every 3 days when the Longwall has approached within 50m of the poles, till the completion of subsidence	Visual inspections will be carried out to assess impact on the ground surface adjacent to the poles, pole footings, wires and conductors. Observed impacts on the ground surface may indicate an impact on the powerlines.
Ausgrid 11kV BFMP Northern end of LW204 Only	Power Poles	TBD	Management plan under construction in conjunction with asset owner
	Transmission Lines	TBD	Management plan under construction in conjunction with asset owner
Telstra BFMP	Telstra Copper Cables	Ground subsidence survey data to be provided progressively to Telstra & Consultant at critical times for cable line as each longwall progresses	ACOL to carry out Subsidence Survey along agreed subsidence lines, provide results within 48 hours to Telstra members of Plan Review Meeting as each longwall approaches the cable line
RMS New England Highway BFMP	New England Highway	Ground subsidence surveys to be undertaken progressively as each longwall progresses towards the New England Highway	ACOL to carry out subsidence surveys along agreed subsidence lines and pieces of infrastructure. Any identified issues will be communicated to the RMS.
Property 130 MP	Access Track (Right of Way)	Every 3 days as a minimum whilst in active subsidence area. Increased frequency if	Visual inspection of tracks to identify any subsidence impacts that could affect the safety of vehicles. Alternate right of way to be in place during undermining where applicable.

Management Plan	Aspect/Feature	Frequency	Monitoring Measures
		required	
	Fences & Gates	Pre and Post subsidence impacts and weekly whilst in active mining area	Visual inspection of fences and gates to identify any subsidence impacts that could affect the integrity of the fences and gates.
	Farm Dam	Pre and Post subsidence impacts and weekly whilst in active mining area	Monitoring of farm dam to detect any subsidence impacts that may require management. Monitor water level using markers.
	General Landform	Pre and Post subsidence impacts and weekly whilst in active mining area	Visual inspection of the area immediately behind the longwall faces to identify/map subsidence cracking that may require remediation.
Environmental Management Plans (Summary of monitoring action only – full details provided in actual management plan. Monitoring programs are subject to changes should the approved management plan be varied during the course of the Extraction Plan)			
Land Management Plan (Mining Operations Plan)	General Land Surface	During and post mining	Visual inspection of cracking and subsidence to manage erosion, impacts to flora and fauna and drainage.
	Farmland Monitoring	Biannually (twice yearly)	Monitoring to ensure farmland is maintained to the same or higher land capability and agricultural suitability than prior to mining
Flora and Fauna (Biodiversity Management Plan)	Conservation Area	Biannually (twice yearly)	Monitoring flora and fauna for any possible mining related impacts

Management Plan	Aspect/Feature	Frequency	Monitoring Measures
	Bowmans Creek	Biannually (twice yearly)	Aquatic fauna and habitat, stream health and water quality will be monitored at established locations to detect any possible mining or diversion related impacts
	Glennies Creek	Biannually (twice yearly)	Aquatic fauna and habitat, stream health and water quality will be monitored at established locations to detect any possible mining related impacts
Water Management Plan	Hunter River	Monthly	Routine monitoring for pH, electrical conductivity (EC), total dissolved solids (TDS) and total suspended solids (TSS) to detect any possible mining related impacts
	Bowmans Creek	Monthly	Routine monitoring for pH, electrical conductivity (EC), total dissolved solids (TDS) and total suspended solids (TSS) to detect any possible mining related impacts
	Glennies Creek	Monthly	Routine monitoring for pH, electrical conductivity (EC), total dissolved solids (TDS) and total suspended solids (TSS) to detect any possible mining related impacts



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Appendix B

Subsidence Inspection Checklist

SUBSIDENCE INSPECTION CHECKLIST		
LW Panel		
Date		
Face Position		
Subsided Inspection Zone		
Pre-Subsidence Inspection Zone		
Area Inspected by (Print Name and sign)		
INSPECTION ITEM	**CHECKED**	**COMMENTS**
Surface cracking		
Surface humps (compression)		
Hunter River, Waste Water and Gas drainage pipelines		
Access roads and tracks		
Fences, gates, cattle grids		
Damage to Power-poles, Cross-arms, Insulators and Conductors (Ausgrid) e.g. leaning poles, increased sag in conductors, reduced ground clearance		
Dams		
Structures (houses, outbuildings)		
Other (den and/or nest trees)		

****Any Impacts observed are to be photographed, located and marked on a plan.**

SUBSIDENCE INSPECTION CHECKLIST

Where to Inspect

200 metres behind and 100 metres in front of the current face position.

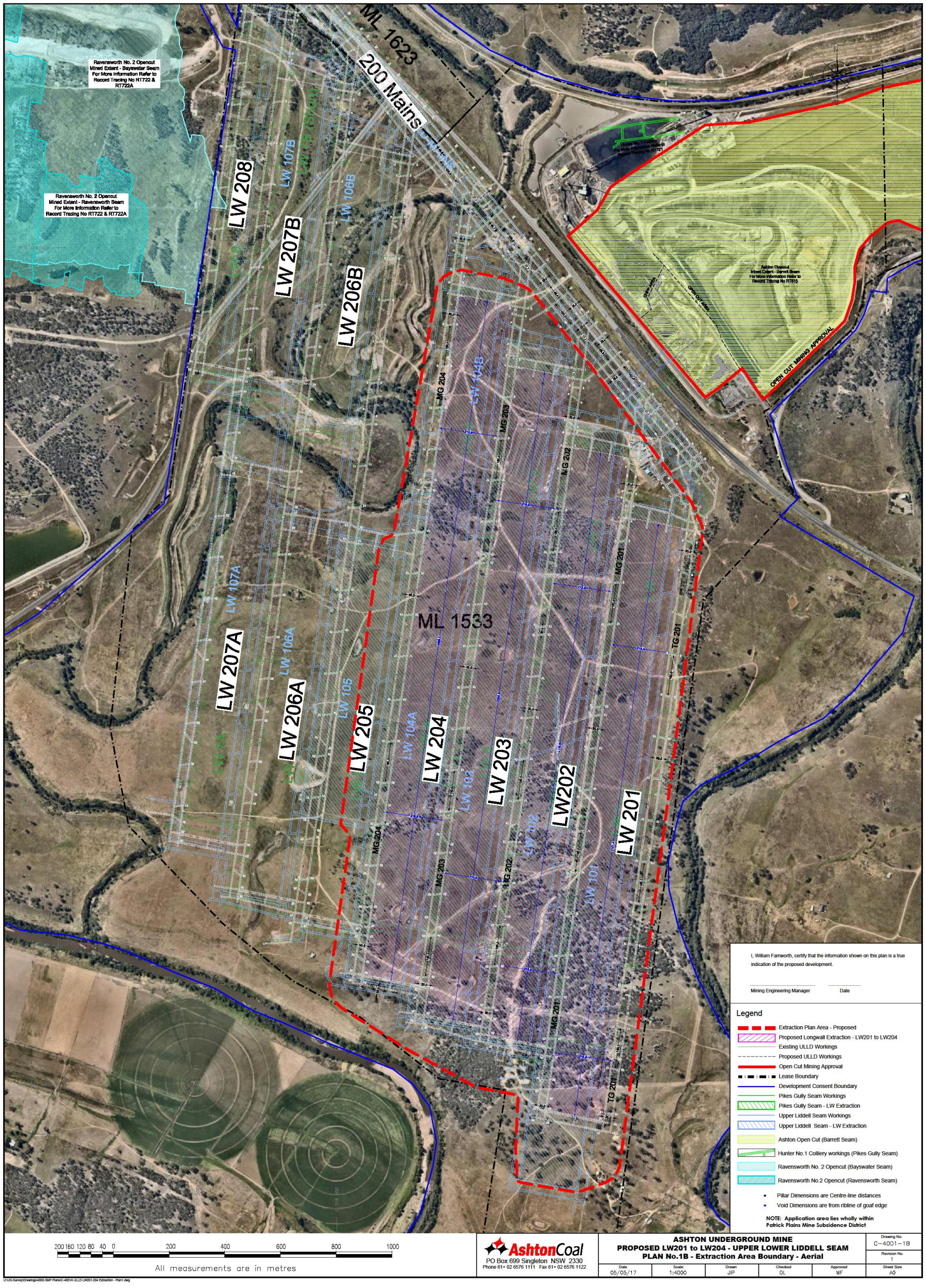
Cover the full subsidence bowl out to the 45° angle of draw.

What to look for

- Surface cracking - edges of extraction void and start and travelling abutments particularly in rock outcrop areas and topographic high;
- Surface humps (compression) - near centre of extracted panels, the travelling abutment and topographic lows if adjacent to steep terrain;
- Step change in land surface - associated with cracking;
- Slope, boulder and tree instability;
- Surface slumping, erosion;
- Serviceability of access tracks;
- Changes to creeks, ponding, sediment load; and
- General vegetation condition (in particular dieback of vegetation)
- Change in conditions of 'right-of-way' access track or surrounding verges including drainage culverts and water flows as well as road cutting stability.
- Power Poles and wires – adverse tilts on poles and ground clearances for wires, especially when crossing access tracks.

Actions if there is a public safety risk

- Implement the **Public Safety Management Plan**; including
- Immediately notify the Landholder or Stakeholder (or responsible person) of the issue (Stakeholder list contained in Appendix A of the Public Safety Management Plan);
- take actions to remediate the issue (if possible);
- erect 'NO ACCESS' tape and warning signs (e.g. traffic control signs, traffic controllers as appropriate) if remediation is not possible; and
- Notify the Environment & Community Manager to coordinate actions.


ML 1623
200 Mains
LW 208
LW 207B
LW 206B
LW 107B
LW 106B
LW 7B (Split)
LW 8
Ravensworth No. 2 Opencut Mined Extent - Bayswater Seam For More Information Refer to Record Tracing No RT722 & RT722A
Ravensworth No. 2 Opencut Mined Extent - Ravensworth Seam For More Information Refer to Record Tracing No RT722 & RT722A
Ashton Opencut Mined Extent - Barrett Seam For More Information Refer to Record Tracing No RT815
OPEN CUT MINING APPROVAL
MG 204
LW 104B
MG 203
MG 202
MG 201
TG 201
ML 1533
LW 107A
LW 106A
LW 105
LW 104A
LW 103
LW 102
LW 101
LW 207A
LW 206A
LW 205
LW 204
LW 203
LW202
LW 201
LW 2A
LW 1A
I, William Farnworth, certify that the information shown on this plan is a true indication of the proposed development.
Mining Engineering Manager
Date
Legend
Extraction Plan Area - Proposed
Proposed Longwall Extraction - LW201 to LW204
Existing ULLD Workings
Proposed ULLD Workings
Open Cut Mining Approval
Lease Boundary
Development Consent Boundary
Pikes Gully Seam Workings
Pikes Gully Seam - LW Extraction
Upper Liddell Seam Workings
Upper Liddell Seam - LW Extraction
Ashton Open Cut (Barrett Seam)
Hunter No.1 Colliery workings (Pikes Gully Seam)
Ravensworth No. 2 Opencut (Bayswater Seam)
Ravensworth No.2 Opencut (Ravensworth Seam)
Pillar Dimensions are Centre-line distances
Void Dimensions are from ribline of goaf edge
NOTE: Application area lies wholly within Patrick Plains Mine Subsidence District
200 160 120 80 40 0 200 400 600 800 1000
All measurements are in metres
AshtonCoal
PO Box 699 Singleton NSW 2330
Phone 61+ 02 6576 1111 Fax 61+ 02 6576 1122
ASHTON UNDERGROUND MINE
PROPOSED LW201 to LW204 - UPPER LOWER LIDDELL SEAM
PLAN No.1B - Extraction Area Boundary - Aerial
Drawing No. C-4001-1B
Revision No. 1
Date 05/05/17
Scale: 1:4000
Drawn JIP
Checked DL
Approved WF
Sheet Size A0