



Ashton Coal Mine Longwalls 205 to 208 Extraction Plan

October 2020



TITLE BLOCK


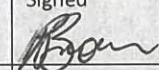
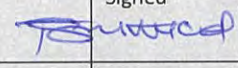
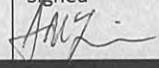
DOCUMENT DETAILS	Title	Ashton Coal Mine Longwalls 205-208 Extraction Plan		
	Applicant	Ashton Coal Operations Pty Ltd		
	Name of Mine	Ashton Coal Mine		
	Development Consent	DA 309-11-2001-i		
	Mining Leases	ML1533		
	Document Status	Final		
	Approval Date			
ORIGINATOR	Jeff Peck	Registered Surveyor	Signed 	Date 13/10/2020
ORIGINATOR	Phillip Brown	Environment & Community Superintendent	Signed 	Date 13.10.20
REVIEWED	Tony Sutherland	Technical Services Manager	Signed 	Date 13/10/20
APPROVED	Aaron McGuigan	Operations Manager	Signed 	Date 13.10.20
Version	Date	Revision Details		
1	October 2020	Final for Submission		

TABLE OF CONTENTS

Page

1	INTRODUCTION	4
1.1	SCOPE & OBJECTIVE	4
1.2	DOCUMENT STRUCTURE	8
2	OVERVIEW.....	10
2.1	ENVIRONMENTAL CONTEXT.....	10
2.1.1	Environmental Setting.....	10
2.1.2	Land Ownership and Tenure.....	11
2.1.3	Natural and Built Features within the Extraction Plan Area	13
2.2	MINE PLANNING, DESIGN AND RESOURCE RECOVERY	14
2.2.1	Extraction Plan Area.....	14
2.2.2	Mining Domains	14
2.2.3	Mining Method	14
2.2.4	Mining Parameters.....	14
2.2.5	Mine Design in Relation to Subsidence Management.....	17
2.3	SUBSIDENCE PREDICTIONS.....	18
2.3.1	Reliability and Accuracy of Subsidence Forecasts.....	18
2.3.2	Extraction Plan Area Subsidence Predictions.....	20
2.4	SUMMARY OF SUBSIDENCE IMPACTS.....	23
2.5	PERFORMANCE OBJECTIVES.....	30
2.5.1	Performance Measures and Indicators.....	31
3	DEVELOPMENT	33
3.1	EXTRACTION PLAN TEAM	33
3.2	AGENCY CONSULTATION.....	34
3.2.1	Department of Planning, Industry and Environment.....	34
3.2.2	NSW Resources Regulator.....	34
3.2.3	Biodiversity Conservation Division.....	34
3.2.4	DPIE Water	34
3.2.5	Heritage NSW and Registered Aboriginal Parties	35
3.3	LANDHOLDER CONSULTATION.....	35
3.3.1	Community.....	35
3.3.2	Private Landholders	35
3.4	INFRASTRUCTURE OWNER CONSULTATION	35
3.5	RISK ASSESSMENT	36
4	SUBSIDENCE MONITORING AND MANAGEMENT	38
4.1	FRAMEWORK.....	38
4.2	EXTRACTION PLAN TARP	38
4.3	EXTRACTION PLAN SUBSIDENCE MONITORING AND MANAGEMENT FLOWCHART	38
5	PLAN IMPLEMENTATION	40

5.1	REPORTING FRAMEWORK.....	40
5.1.1	Annual Review.....	40
5.1.2	Regular Stakeholder Extraction Plan Update Reporting	40
5.1.3	Incident Reporting.....	40
5.2	REVIEW OF THE EXTRACTION PLAN	40
5.3	COMPLAINTS HANDLING.....	41
5.4	EXTRACTION PLAN ROLES AND ACCOUNTABILITIES	41
6	REFERENCES	42

FIGURES

Figure 1	Ashton Mine Complex
Figure 2	General Arrangement
Figure 3	Upper Lower Liddell Seam Longwall Layout
Figure 4	Mining Titles and Land Ownership

GRAPHICAL PLANS (END OF MAIN TEXT)

Plan 1a	LW205 - LW208 Extraction Plan showing Existing and Proposed Workings
Plan 1b	LW205 - LW208 Aerial Photograph
Plan 2	LW205 - LW208 Surface Features
Plan 3	LW205 - LW208 Seam Thickness & Depth of Cover Contours
Plan 4a	LW205 - LW208 Pikes Gully Seam & Depth of Cover Contours
Plan 4b	LW205 - LW208 Upper Liddell Seam Thickness & Depth of Cover Contours
Plan 4c	LW205 - LW208 Lower Barrett Seam Thickness & Depth of Cover Contours
Plan 5	LW205 - LW208 Mining Titles and Land Ownership
Plan 6	LW205 - LW208 Geological Strata Sections
Plan 7	LW205 - LW208 Subsidence Monitoring

APPENDICES

Appendix A	Project Approval Conditions
Appendix B	Extraction Plan Flowchart & TARP
Appendix C	Water Management Plan Addendum
Appendix D	Land Management Plan Addendum
Appendix E	Flora and Fauna Management Plan Addendum
Appendix F	Heritage Management Plan Addendum
Appendix G	Built Features Management Plan (including Asset Management Plans)
Appendix H	Public Safety Management Plan
Appendix I	Coal Resource Recovery Plan
Appendix J	Subsidence Monitoring Program
Appendix K	Revised Rehabilitation Management Plan (MOP)

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 New South Wales (NSW) (**Figure 1**).

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 multi-seam longwall extraction, targeting four coal seams in descending order (Pikes Gully (PG), Upper Liddell (ULD), Upper Lower Liddell (ULLD) and Lower Barrett (LB)) (**Figure 2**). 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.

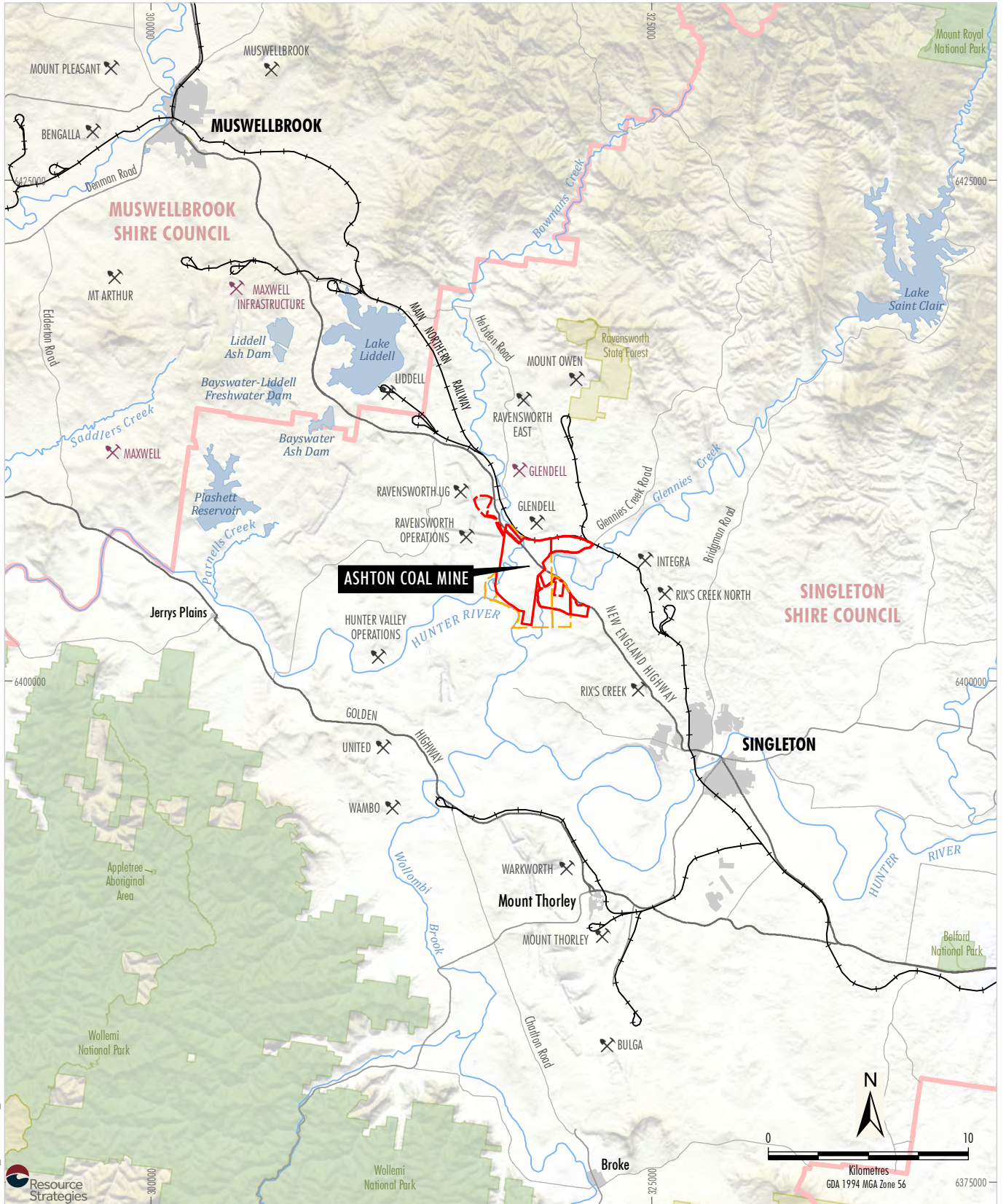
ACOL has subsequently prepared an Extraction Plan for mining of Longwalls 205 to 208 in the ULLD Seam of the Ashton Underground Coal Mine, varying between 185 metres (m) and 260 m below the surface. Proposed mining of Longwalls 205 to 208 (the **Extraction Plan Area** – refer **Figure 3**) is due to commence in March 2021 and is planned to take place over a three-year period.

1.1 SCOPE & OBJECTIVE

The Extraction Plan for Longwalls 205 to 208 has been prepared in accordance with the requirements of Schedule 3, Condition 32 of DA 309-11-2001-i (MOD 5).

The objective of this Extraction Plan is to identify the framework for management of subsidence induced impacts on natural and built features within the Longwalls 205-208 Extraction Plan area as a result of the secondary extraction of Longwalls 205-208 within the ULLD Seam. The objective of the Extraction Plan will be achieved by:

- providing an overview of the planned coal resource recovery methods;
- identifying the natural and built features within the Extraction Plan area;
- identifying the predicted subsidence impacts and/or environmental consequences for the natural and built features within the Extraction Plan area;
- identifying the management activities (including consultation, monitoring and remediation methods) prepared to address the predicted subsidence impacts; and
- identifying the review and reporting activities to allow for assessment of the performance of subsidence management measures implemented by ACOL, and identification of areas where either continual improvement may be achieved, or management of unpredicted subsidence impacts can be managed.



AKO-20-04-EP-1W205-208_2014



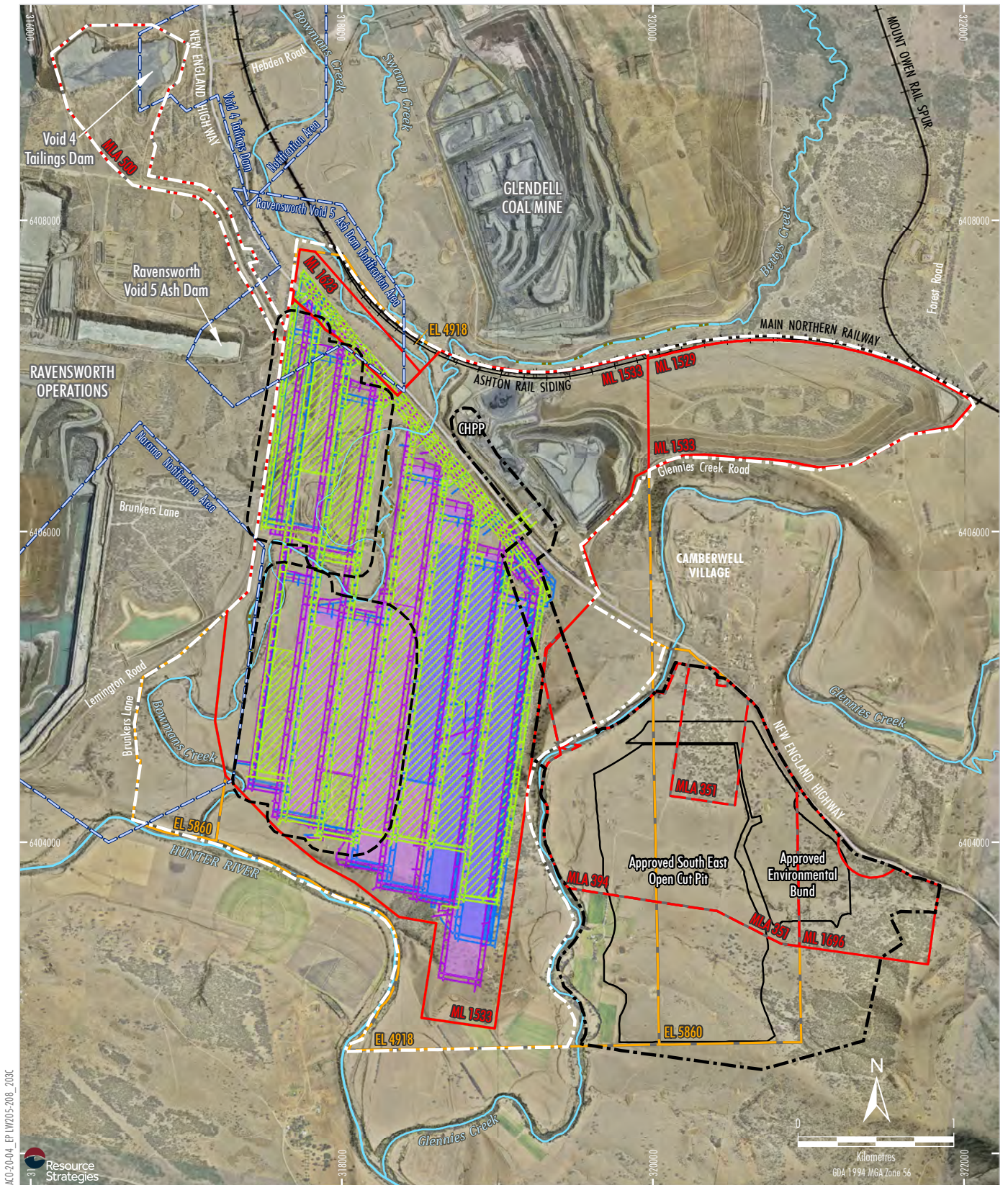
Source: NSW Spatial Services (2020)



- LEGEND**
- Mining Operation
 - Proposed Mining Operations (Application Lodged)
 - Local Government Area
 - State Forest
 - National Parks and Wildlife Estate
 - Exploration License Boundary
 - Mining Lease Boundary
 - Mining Lease Application Boundary


ASHTON COAL MINE
 Regional Location

Figure 1



AKO20-04-EP-1W2015-208_2019C

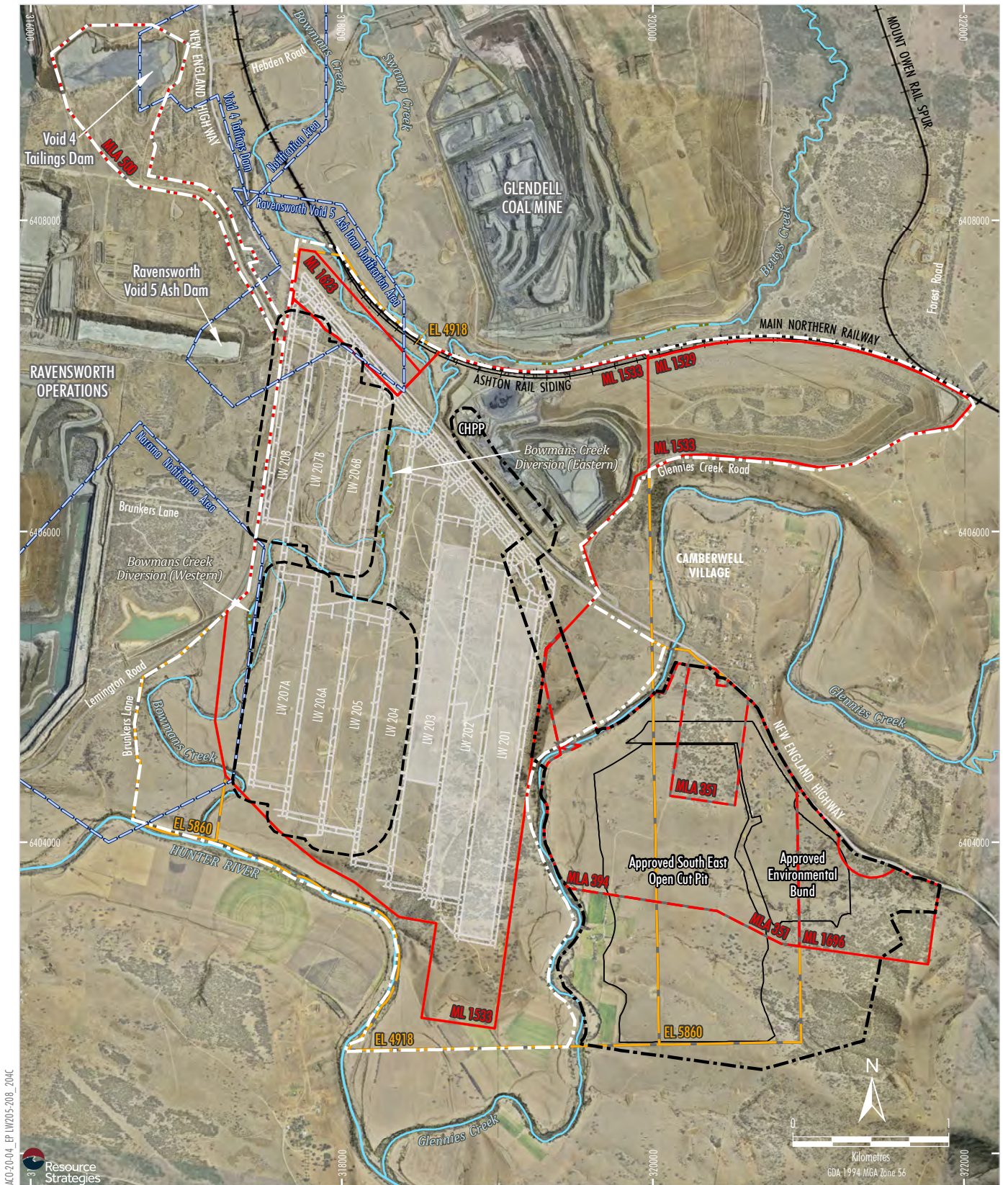


Source: NSW Spatial Services (2020)
 Orthophoto: Ashton Coal (Dec 2019); NSW Spatial Services (2019)

- LEGEND**
- Exploration Licence Boundary
 - Mining Lease Boundary
 - Mining Lease Application Boundary
 - Prescribed Dam Notification Area
 - Project Approval Boundary
 - South East Open Cut Approval Boundary
 - Pike's Gully Seam Longwall
 - Upper Liddell Seam Longwall
 - Upper Lower Liddell Seam Longwall
 - Extraction Plan Application Area


 ASHTON COAL MINE
 General Arrangement

Figure 2



AKO20-04-EP LW2015-208_2014C



- LEGEND**
- Exploration Licence Boundary
 - Mining Lease Boundary
 - Mining Lease Application Boundary
 - Prescribed Dam Notification Area
 - Project Approval Boundary
 - South East Open Cut Approval Boundary
 - Upper Lower Liddell Seam Longwall
 - Extraction Plan Application Area

Source: NSW Spatial Services (2020)
 Orthophoto: Ashton Coal (Dec 2019); NSW Spatial Services (2019)



ASHTON COAL MINE
 Upper Lower Liddell Seam Longwall Layout

Figure 3

1.2 DOCUMENT STRUCTURE

The Extraction Plan has been prepared to address conditions of DA 309-11-2001-i (MOD 5), and structured in accordance with the *Guidelines for the Preparation of Extraction Plans (Draft V5)* (Extraction Plan Guidelines) provided to ACOL by the Department of Planning and Environment in 2016. The document structure for this Extraction Plan is outlined below:

Extraction Plan	Asset Management Plans (AMP)	Specialist Assessments	Graphical Plans
<ul style="list-style-type: none"> • Main Document (this document). • Water Management Plan (Reference Addendum Report) • Land Management Plan (Reference Addendum Report). • Flora and Fauna Management Plan (Reference Addendum Report) • Heritage Management Plan (Reference Addendum Report). • Built Features Management Plan (including Asset Management Plans). • Public Safety Management Plan. • Subsidence Monitoring Program. • Coal Resource Recovery Plan. 	<ul style="list-style-type: none"> • Ausgrid. • TransGrid. • Glencore. • Transport for New South Wales. • AGL Macquarie. • Telstra. • Singleton Council. 	<ul style="list-style-type: none"> • Subsidence Assessment (SCT, 2020). • Surface and Groundwater Report (AGE, 2020). • Surface Water Assessment (HEC, 2020). • Risk Assessment Workshop (STAC Consulting, 2020). • Archaeological Assessment (Insite Heritage, 2020). • Flora and Fauna Assessment (EcoLogical, 2020). 	<ul style="list-style-type: none"> • Prepared internally by ACOL Surveyors.

It should be noted that Addendum documents have been prepared for the Water Management Plan, Land Management Plan, Flora and Fauna Management Plan and Heritage Management Plan for this Extraction Plan. These Addendum documents reference the relevant sections of the current approved management plans, rather than preparing standalone documents.

The document structure includes the following elements:

- **Section 2** includes an overview of the mine planning and design, overall subsidence predictions, and performance objectives.
- **Section 3** includes details on the development of the Extraction Plan, including details of consultation with relevant agencies and other stakeholders within the Extraction Plan area.
- **Section 4** provides an overview of subsidence management measures including plans prepared to address impacts to relevant environmental and/or built features. The individual management plans are contained in Appendices to the Extraction Plan.
- **Section 5** addresses the key elements of how the Extraction Plan is implemented, including reporting, regular review and key responsibilities.

An important component of the Extraction Plan are the key component plans referred to in **Section 4**. These plans are described in **Table 1**.

Table 1. Extraction Plan Key Component Plans

Plan	Description	Location
Water Management Plan*	To manage the potential environmental consequences of second workings on surface and ground water.	Appendix C
Land Management Plan*	To manage the potential environmental consequences of second workings on steep slopes and land in general.	Appendix D
Flora and Fauna Management Plan*	To manage the potential environmental consequences of second workings on aquatic and terrestrial flora and fauna.	Appendix E
Heritage Management Plan*	To manage the potential environmental consequences of second workings on heritage sites and values.	Appendix F
Built Features Management Plan	To manage the potential environmental consequences of second workings on any built feature.	Appendix G
Public Safety Management Plan	To ensure public safety in the Extraction Plan area.	Appendix H
Subsidence Monitoring Program	A program to collect actual measured subsidence data, and conduct inspections for environmental consequences of subsidence to compare against predicted impacts which may trigger a response, or set of responses.	Appendix I
Coal Resource Recovery Plan	To demonstrate effective recovery of available resources obtained through underground mining activities.	Appendix J

**Due to the mine layout a standalone document has not been prepared as the impacts associated with the Extraction Plan are addressed in the existing site wide management plans.*

Graphical Plans which are required by the Extraction Plan Guidelines, and referred to in this Extraction Plan, are included as **Graphical Plans** at the end of the Main Extraction Plan text.

2 OVERVIEW

2.1 ENVIRONMENTAL CONTEXT

2.1.1 Environmental Setting

The Extraction Plan area surface expression is located in Camberwell, approximately 14 kilometres north-west of Singleton in the Hunter Valley of NSW (**Figure 1**).

The surface topography within the Extraction Plan area consists primarily of a number of ephemeral streams and drainage lines that flow mainly in the direction of Bowmans Creek. A series of farm dams are located on these drainage lines.

Bowmans Creek flows from the foothills of the Mount Royal Range in a south south-westerly direction, through the Extraction Plan area before joining the Hunter River to the south. This watercourse was previously diverted by ACOL in two locations to allow for more efficient recovery of the coal resource. The Bowmans Creek western diversion flows alongside the western boundary of the Extraction Plan area and the Bowmans Creek eastern diversion flows alongside the eastern boundary of the Extraction Plan area. A portion of both the original creek alignment and the eastern diversion channel are within the Extraction Plan area adjacent to Longwalls 206B and 207A. The mine layout has been designed to minimise potential impacts to Bowmans Creek.

The Hunter River, as defined by the edge of the Hunter River Alluvium, is located outside the southern edge of the Extraction Plan Area.

Glennies Creek resides to the east of the previous Extraction Plan area for Longwalls 201-204 and is significantly removed from the Longwalls 205-208 Extraction Plan area. The boundary of the alluvium associated with the Hunter River, Bowmans Creek and Glennies Creek bounds the Extraction Plan area on three sides. Portions of Longwalls 205-207B reside directly below the Bowmans Creek alluvium.

Other natural features in the vicinity of the Extraction Plan area include two remnant woodlands, one of these is a Conservation Area located immediately north of the Property 130 boundary and the other woodland is alongside a tributary of Bowmans Creek near the middle of Longwall 204. Both of these are outside the Extraction Plan area.

The climate of the region is classified as warm temperate, characterised by seasonal variations from hot wet summers to mild dry winters. Rainfall is summer dominant, often occurring as short duration high intensity storms, with an average of approximately 650-660 millimetres (mm) of rain falling in the region per annum.

2.1.2 Land Ownership and Tenure

Land ownership within and proximate to the Extraction Plan Area is shown in **Figure 4**, The Extraction Plan Area is located within Mining Lease 1533 (refer to **Figure 1** and Graphical Plan 5).

Land use surrounding the Extraction Plan area is primarily rural to the east and south, with mining immediately to the west and north. The dominant land use within and surrounding the area is grazing and mining, however it also includes rural residential and vegetated land. The village of Camberwell is located approximately 2 km north-east of the Extraction Plan area.

The Extraction Plan area is predominantly cattle grazing land owned by ACOL other than a small portion in the north-west which is owned by AGL Macquarie (AGLM).

Roads in the vicinity of the Extraction Plan area include the New England Highway, which is a Transport for NSW controlled road, and Lemington Road, which is a Singleton Council road.

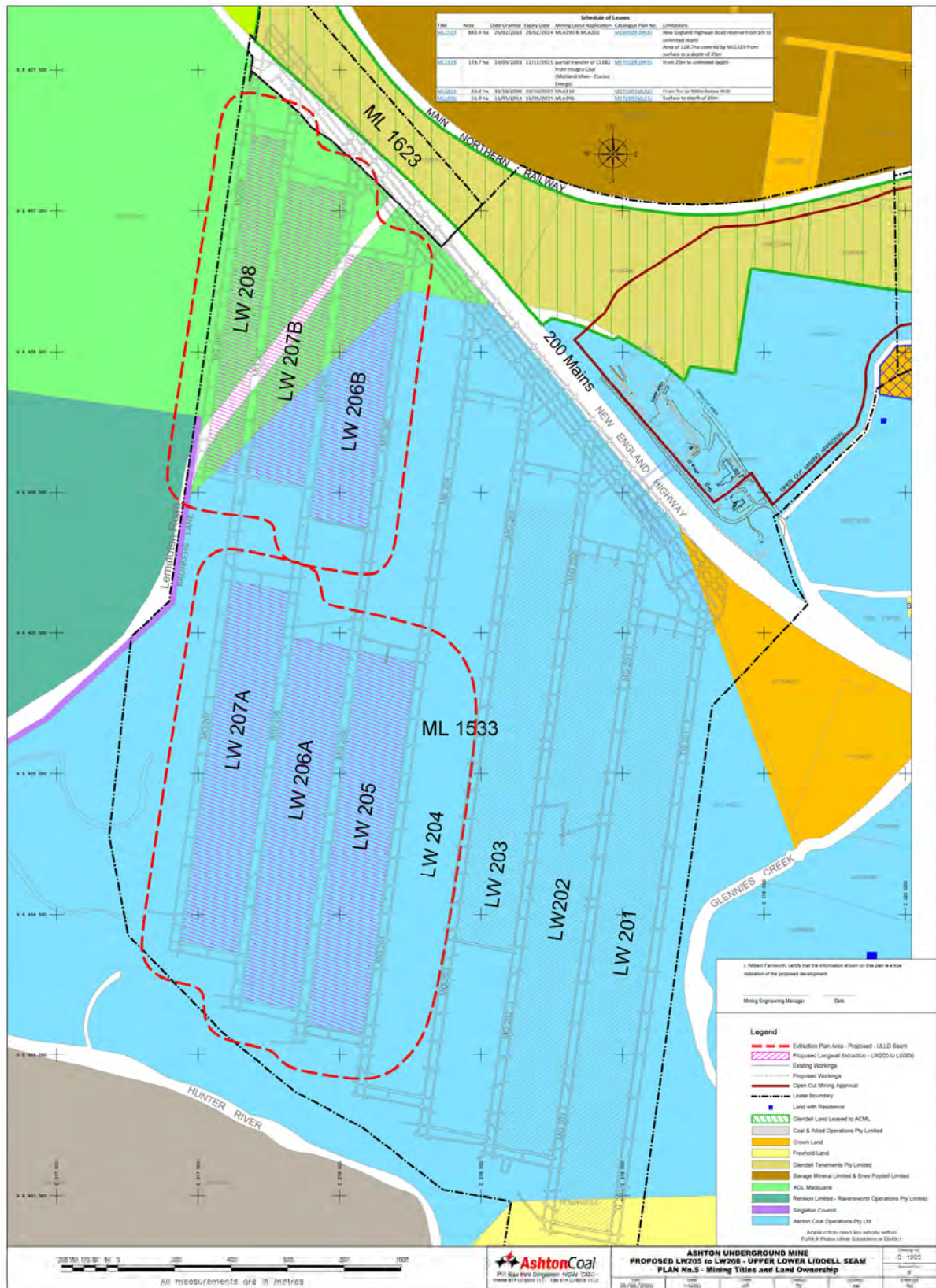


Figure 4: Mining Titles and Land Ownership

2.1.3 Natural and Built Features within the Extraction Plan Area

A summary of natural features within the Extraction Plan Area is provided below:

- No groundwater dependent ecosystems within the Extraction Plan area (EcoLogical, 2020).
- No threatened flora species have been recorded in the Extraction Plan area during previous ecological surveys. A total of 24 fauna species listed under the NSW *Biodiversity Conservation Act 2016* and *Environment Protection and Biodiversity Conservation Act 1999* have been recorded within the Project Site Boundary (EcoLogical, 2020).
- A number of extant historic and Aboriginal heritage sites are located within the Extraction Plan area, outlined within the specialist Archaeological Assessment (Insite Heritage, 2020).
- Several minor ephemeral drainage lines within the Extraction Plan area and flow mainly into Bowmans Creek (HEC, 2020).
- Vegetation communities within the Extraction Plan area include Narrow-leaved Ironbark-Bull Oak – Grey Box Shrub (associated with the Central Hunter Grey Box – Ironbark Woodland listed as an EEC), Swamp Oak – Weeping Grass – Grass riparian forest of the Hunter Valley and Derived Grassland of NSW (EcoLogical, 2020).

Built features within the Extraction Plan area are shown on **Graphical Plan 2** and include:

- Communications infrastructure (local copper cables and fibre optic cables).
- Water supply pipelines.
- Sediment dams.
- Road infrastructure (New England Highway, Lemington Road and South Access Road).
- Ausgrid above ground 132 kV and 11 kV powerlines.
- Rural property infrastructure owned by ACOL (private access tracks, sheds, tanks, farm dams and fences).
- TransGrid 330 kV above ground transmission lines.
- Glencore 33 kV above ground transmission lines.

2.2 MINE PLANNING, DESIGN AND RESOURCE RECOVERY

2.2.1 Extraction Plan Area

The Extraction Plan area under consideration is the area likely to be affected by the mining of Longwalls 205 to 208 in the ULLD seam. The Extraction Plan area (also shown as **Extraction Plan Area** in **Graphical Plans**) is defined as the surface area enclosed by the predicted limit of vertical subsidence, taken as the likely extent of subsidence effects resulting from the extraction of Longwalls 205 to 208.

2.2.2 Mining Domains

Longwalls 205 to 208 are located within the ULLD Seam. This is the third seam of longwall mining at the Ashton Coal Mine, following on from the PG Seam (Longwalls 1 – 8) and ULD Seam (Longwalls 101 – 106A).

The Extraction Plan area is contained within Mining Lease 1533. Retreat will be from the southern end of each panel in a northerly direction to the nominated finish position at which point the equipment will be relocated to the following panel.

2.2.3 Mining Method

ACOL intends to continue to mine the ULLD seam by conventional retreating longwall mining methods. Seam thickness varies between 1.6m to 3m within the Extraction Plan area however is mostly within the range of 2m to 2.8m. Extraction height will typically be 2.5m to 2.7m.

Extraction will take place generally in a south to north direction towards the Mains Headings.

Long term mains development pillars are designed to be long term stable and non-subsiding, thus rendering the roads serviceable for the life of the mine. Development roads are generally driven at 2.7m high x 5.4m wide by single pass continuous miners. Coal quality, geotechnical, geological and equipment issues will be the main drivers for variation in development or longwall extraction heights.

2.2.4 Mining Parameters

The Ashton Coal Project is approved as a multi-seam longwall operation. Following mining in the ULLD seam, mining will progressively access the reserves within the Lower Barrett (LB) Seam as approved under the Development Consent.

A minimum interburden thickness of 15 m is required between mining seams to ensure geotechnical integrity. ULD to ULLD Seam interburden thickness for Longwalls 205-208 ranges from approximately 20 m to 40 m however is more typically in the range of 25 m to 35 m.

The estimated recovery of the resource within the Extraction Plan Area is provided in **Table 2**.

Table 2. Extraction Plan Area Estimated Resource Recovery

Total tonnes of coal (resource within Extraction Plan area)	8.4 Mt
Total tonnes extracted through development	0.64 Mt
Tonnes extracted by Longwall	5.78 Mt
Percentage recovery	77%

Individual longwall tonnages are described in **Table 3**. The longwall rate and mining sequence is described in **Table 4** and longwall geological attributes are described in **Table 5**.

Table 3. Individual Longwall Tonnages

Panel	Panel Length (m)	Panel Width (void m)	Average Extraction Height (m)	Panel Extraction Tonnes (t)
Longwall 205	1,343	215.4	2.6	1,241,742
Longwall 206A	1,309	215.4	2.6	1,205,240
Longwall 206B	957	215.4	2.6	796,032
Longwall 207A	1,304	215.4	2.6	1,098,252
Longwall 207B	1,065	215.4	2.6	855,840
Longwall 208	1,203	124.0	2.6	585,899

Table 4. Longwall Mining Rate and Sequence

Panel	Start Date	End Date	Estimated Duration (Days)
Longwall 205	March 2021	October 2021	160
Longwall 206A	November 2021	April 2022	150
Longwall 206B	May 2022	August 2022	92
Longwall 207A	September 2022	January 2023	124
Longwall 207B	February 2023	May 2023	95
Longwall 208	June 2023	October 2023	116

Table 5. Longwall Geological Attributes

Panel	Depth of Cover (m)	Seam Thickness (m)	Roof and Floor Conditions	Geological Anomalies
Longwall 205	185-225	2.20m-2.60m	Distal from fault zones the roof is expected to be competent with some zones of potentially soft floor.	<p>Eastern fault zone on TG side of the panel expected within block including in the installation face and back road as mapped and projected down from overlying workings.</p> <p>Western fault zone on MG side of the panel including MG205 A and B Hdgs and chain pillars outbye of the installation face to 27ct, in the installation face and back road as mapped and projected down from overlying workings.</p>
Longwall 206A	205-240	2.20m-2.70m	Distal from fault zones the roof is expected to be competent with some zones of potentially soft floor.	Fault zone on TG side and in central part of the panel including MG205 A and B Hdgs and chain pillars outbye of the installation face to 27ct and further outbye in the block, possibly in the installation face and back road once driven as mapped and projected down from overlying workings.
Longwall 206B	175-210	2.10m-2.40m	The roof is expected to be competent with some zones of potentially soft floor.	NIL geological anomalies.
Longwall 207A	220-260	1.90m-2.30m	The roof is expected to be competent with some zones of potentially soft floor.	NIL geological anomalies.
Longwall 207B	190-225	2.15m-2.40m	The roof is expected to be competent with some zones of potentially soft floor.	NIL geological anomalies.
Longwall 208	210-240	1.90m-2.20m	The roof is expected to be competent with some zones of potentially soft floor.	NIL geological anomalies.

2.2.5 Mine Design in Relation to Subsidence Management

At the Ashton Underground Mine, Longwalls 1 – 8 were mined in the PG seam, the uppermost of the four mining horizons proposed to be mined. The ULD Seam is located approximately 35m – 40m below the PG Seam. The ULD Seam longwalls are located in substantially the same area as those in the PG Seam except that the geometry of the ULD Seam longwalls is offset 60m to the west and the start and finish lines for the longwalls are different. Mining has been completed in Longwalls 101 – 106A in the ULD Seam. The ULLD Seam longwalls are located approximately 20m – 35m below the ULD Seam and are positioned directly below the PG Seam layout and are therefore offset 60m to the east of the ULD Seam longwalls.

The subsidence monitoring undertaken to date indicates that the maximum subsidence can be estimated with reasonable confidence and the subsidence profile is also relatively predictable although the specific mechanics of the interaction between the seams needs to be recognised.

Subsidence from mining Longwalls 205-208 in the ULLD Seam is expected to cause additional incremental vertical subsidence of up to 2.8m. The cumulative vertical subsidence in the central part of longwalls, where there is overlap between panels in three seams, is expected to be generally less than 5.8m. Maximum subsidence is expected to occur within the mining footprint and diminish with distance from the outermost edge of mining. The angle of draw from the outermost goaf edge in a multi-seam mining environment is expected to be similar to the angle of draw in a single seam operation (SCT, 2020).

The subsidence behaviour observed indicates:

- Regular, repeatable form of incremental subsidence.
- General smoothing and reduction in peak values with increasing overburden depth.
- Maximum vertical and horizontal movements occur substantially within the footprint of the active panel.
- Movements over the previous panel are less than 200mm and insignificant for all practical purposes.

The maximum values of subsidence parameters such as strain and tilt are typically of a similar or lower magnitude to the subsidence parameters measured in the first seam despite greater subsidence. The maximum values of tilt and strain are typically less than the maximum calculated assuming single seam mining conditions but occasionally increase to the same magnitude as parameters measured during mining in the PG Seam. This behaviour is thought to be due to a general softening effect of the multi-seam mining and the difference in behaviour between strata that is undisturbed by previous mining and strata that has already been subsided.

The layout of Longwalls 205 – 208 in the ULLD Seam is consistent with keeping all secondary extraction at least 40m (in a horizontal direction) from the high bank of Bowmans Creek in its diverted function form as per Schedule 3 Condition 23 of DA 309-11-2001-i.

The alignment of longwall orientation with the principal stress direction (being sub parallel) is favourable geotechnically, as this minimises the “stress notching” effect on longwall retreat.

Design of the panel width and chain pillar width thus has been a primary consideration and input into the subsidence and impact assessment whilst still allowing safe and productive mining. The parameters used for Longwalls 205-207 are:

- Panel width (void) = 216m.
- Minimum Chain Pillar width (solid) = 24.6m.

Longwall 208 maintains the same minimum chain pillar width (24.6m) but has a reduced panel width (124m) due to the overall mine geometry.

Chain pillar lengths are nominally 100m, however a small number of pillars of shorter length will also be used. As the length of these pillars are greater than the above stated minimum widths, the variations in lengths are expected to have minimal subsidence impact, as it will be the minimum pillar widths that have the most impact on subsidence levels.

Geological and geotechnical information across the Extraction Plan area has been drawn from a number of historical boreholes and mining information compiled during overlying PG and ULD Seam development and longwall mining.

The main geological feature identified at the Ashton Underground Coal Mine is an igneous dyke that was intersected with PG Seam Longwall 2, ULD Seam Longwall 102 and ULD Seam Longwall 202. A step change was observed at the location of the geological dyke structure following mining. This step change occurred in an area of bushland remote from any surface infrastructure. Fault zones have been intersected during the development drivage of Longwall 205 Installation Road, which reflect that experienced in both the PG and ULD seams (See Plan No. 6). These faults diminished in magnitude in the PG and ULD seam in that they were practically imperceptible some 1km north of the respective installation roads. There is some potential for a step change in ground behaviour associated with this faulting during the extraction of Longwall 205 and for some part of Longwall 206A.

It is also likely that some localised irregularities will occur in the subsidence profiles due to near surface geological features. The irregular movements are accompanied by elevated tilts and strains, which often exceed the conventional predictions.

2.3 SUBSIDENCE PREDICTIONS

2.3.1 Reliability and Accuracy of Subsidence Forecasts

The prediction methodology for Longwalls 205-208 was used for Longwalls 201-204 and has been validated by subsequent mining and monitoring of Longwalls 201-203. The method used to predict subsidence for the ULD Seam longwalls was originally based on 80-85% of the combined seam mining thickness (after Li *et al.*, 2010). These guidelines presented by Holla (1991) for the Western Coalfields were used to estimate tilts and strains. This methodology is considered suitable to inform environmental assessment processes and future subsidence impacts. Detailed description of the prediction technique used, factors that may affect the development of subsidence, and the relevance of input data are provided in the Subsidence Assessment for Longwalls 205-208 (SCT, 2020).

To date, ACOL has adopted a conservative approach by using a maximum subsidence of 85% of combined mining thickness. The practice of assessing the impacts of 100%, 200% and 300% maximum subsidence referred to in the Subsidence Management Plan Guidelines is not considered credible at the Ashton Underground Mine given that maximum subsidence is already assessed as 85% of combined seam thickness.

Table 6 summaries the maximum predicted values after mining in three seams from previous assessments and the forecast for Longwalls 205-208 in the ULLD Seam. It is recognised that the original subsidence predictions in the EIS for ACP were made in 2001 by G.E. Holt and Associates (GHA 2001) prior to multi-seam subsidence studies by Li *et al.* (2007 and 2010). Incremental and cumulative vertical subsidence was predicted but no cumulative predictions of tilt and strains were presented in GHA (2001).

Table 6. Comparison of Previously Predicted Subsidence Parameters

Assessment	Maximum Subsidence (m)	Maximum Tilt (mm/m)	Maximum Strain (mm/m)
ACP EIS (GHA 2001)	4.2 ¹	123 ²	25 ³
BCD Modification 6 Environmental Assessment PG, ULD, & ULLD (SCT, 2009)	5.8	240	110
LW1 – 8 ULD EP PG & ULD only (SCT, 2012)	4.5	132	53
LW105 – 107 EP PG & ULD only (SCT, 2015)	4.0	213	107
Forecasts in this assessment			
LW205 – 208 EP (LW206B, 207A, 207B, 208) PG & ULLD	4.4	177	88
LW205 – 208 EP (LW205, 206A) PG, ULD & ULLD	5.8	219	110

1. Maximum cumulative subsidence predicted (for LW5 in ULLD Seam).
2. Maximum incremental tilt predicted (for LW1 in PG Seam).
3. Maximum incremental strain predicted (for LW1 in PG Seam).

Changes to forecast maximum subsidence effects reflect the improved understanding of multi-seam subsidence behaviour at the Ashton Coal Mine since the ACP was approved, changes to the mining plan layout and variations in seam thickness or proposed mining heights. The improved understanding is based on monitoring of multi-seam subsidence at Ashton Coal Mine. Latent subsidence from overlying seams, differences in subsidence behaviour near stacked goaf edges and remote from panel edges and the influence of mining direction on subsidence behaviour are all processes that have been quantified as a result of monitoring experience.

The forecasts presented for Longwalls 205-208 are consistent with, or less than, the predictions in the Bowmans Creek Diversion Mod 6 Environmental Assessment (SCT, 2009).

2.3.2 Extraction Plan Area Subsidence Predictions

The predicted subsidence, tilt and strains have been obtained using a review of subsidence data and prediction methodologies, as described in **Section 2.3.1**. The impacts predicted by SCT (2020) are expected to remain within the Subsidence Performance Measures of the Development Consent (DA309-11-2001-i).

2.3.2.1 Maximum Predicted Subsidence Impacts for Longwalls 205 – 208

Table 7 describes the maximum predicted subsidence estimates detailed in the subsidence assessment for Longwalls 205-208 (SCT Operations, 2020). Subsidence impacts have been categorised as:

- incremental subsidence: subsidence as a direct result of mining in the ULLD Seam; and
- cumulative subsidence: combined subsidence as a result of mining the ULLD Seam and previously mined seams (i.e. PG Seam and ULD Seam).

Further details and figures regarding subsidence impacts such as subsidence contours (after the completion of Longwalls 205 – 208), incremental subsidence predictions and the location of stacked of goaf edges are discussed in the SCT (2020) Subsidence Assessment.

Subsidence from mining Longwalls 205-208 in the ULLD Seam is expected to cause additional incremental vertical subsidence of up to 2.8 m. The cumulative vertical subsidence in the central parts of longwalls, where there is overlap between panels in three seams, is expected to be generally less than 5.8 m. Maximum subsidence is expected to occur within the mining footprint and diminish with distance from the outermost edge of mining.

Very high tilts and strains are expected when the panel being mined undercuts the overlying goaf edge by a distance by approximately 0.3 times the interburden between the seams. Within the area of Longwalls 205 – 208, the only place a full undercut occurs is when Longwall 207A mines under the finish line of Longwall 7A. High dynamic strains and tilts and large cracks are expected approximately 40-50 m south of the finish line of Longwall 7A in the PG Seam when Longwall 207A approaches and mines under this area. Strains and tilts are expected to reach their maximum when Longwall 207A is approximately 20 m past the finish line of Longwall 7A.

No triples stacked goaf edges are formed from mining of Longwalls 205-208. Double stacked goaf edges are formed with the PG Seam goaf along the edges of Longwalls 206B, 207A, 207B and 208. Near double stacked goaf edges are formed at the start and finish of all panels except the finish of Longwall 207A and the start of Longwall 207B. Permanent and elevated strains and tilts and large cracks are expected in all these areas.

Table 7. Incremental and Cumulative Subsidence Parameters Predicted due to the Extraction of Each of the Proposed Longwalls

ULLD Seam Longwall Panels (depth range in brackets [m])		Longwalls 205-208 Forecast						
		ULLD Subs (m)	ULLD Strain (mm/m)			ULLD Tilt (mm/m)		
			General	Stacked Edges	Undercut Edges	General	Stacked Edges	Undercut Edges
Incremental Subsidence Parameters								
LW205	(185-225)	2.8	30	53	N/A	53	106	N/A
LW206A	(205-240)	2.8	27	48	N/A	48	96	N/A
LW206B	(175-210)	2.5	29	50	N/A	56	100	N/A
LW207A	(220-260)	2.6	24	41	47	45	83	95
LW207B	(190-225)	2.5	26	46	53	52	92	105
LW208	(210-240)	2.2	21	37	N/A	33	73	N/A
Cumulative Subsidence Parameters								
LW205	(185-225)	5.8	47	110	N/A	94	219	N/A
LW206A	(205-240)	5.8	42	99	N/A	85	198	N/A
LW206B	(175-210)	3.9	33	78	N/A	67	156	N/A
LW207A	(220-260)	4.4	30	70	80	60	140	160
LW207B	(190-225)	4.2	33	77	88	66	155	177
LW208	(210-240)	3.1	22	52	N/A	44	103	N/A

2.3.2.2 Unconventional Subsidence Movements

Unconventional subsidence movements considered include far field horizontal movements outside the mining area, horizontal movements associated with strata dilation in uneven topography, shear movements on low strength bedding planes leading to formation of ripples on the surface and stepping in the ground surface associated with geological structures.

All four of these mechanisms have been observed during mining in the PG and ULD Seams, however none of the occurrences of these unconventional movements caused significant impacts to the surface infrastructure.

Far field horizontal subsidence movements observed outside the mining area during mining in the PG and ULD Seams were small beyond the panel edges (<100mm at 50m) and changed so gradually that they are imperceptible for all practical purposes. The same low magnitudes of horizontal movement outside the mining area are expected during mining in the ULLD Seam.

There has been a consistent pattern of horizontal movement in an upslope direction over each of the mined panels. This pattern is associated with the same mechanism that causes valley closure. The magnitude of this uniform upslope component of horizontal movement is in the range 200-300mm above Longwalls 201, 202 and 203. Similar strata dilation effects are expected above Longwalls 205-208.

Evidence of low strength bedding plane shear movements causing a surface ripple near the northern end of Longwalls 4 and 104 has been observed. Differential horizontal movements of about 500mm were measured across the ripple on the longitudinal line at the end of Longwall 4 at the completion of mining in the PG Seam. A further 300mm of movement was measured during mining of the ULD Seam. In both cases some regrading of the access road was undertaken to smooth the effects of the ripple. Some further differential movement is expected during mining in the ULLD Seam, but the incremental magnitude is expected to continue to decrease with each additional seam mined.

Bedding plane shearing has not been observed in areas above Longwalls 205-208, but the potential for similar features and similar ground behaviour in response to mining still exists and may become apparent during mining ULLD Seam.

Conventional horizontal movements do not directly impact on natural and built features, rather impacts occur as the result of differential horizontal movements. Strain is the rate of change of horizontal movement. The impacts of strain on the natural and built features are addressed in the impact assessments for each feature which have been summarised in the Land Management Plan (**Appendix D**) and the Built Features Management Plan (**Appendix G**).

Significant cracking occurring around stacked edges has been successfully remediated using a variety of techniques including ripping, excavation and backfilling. Photographs of the impacts of subsidence along the stacked goaf edge as well as impacts after remediation are provided in **Photo 1** and **Photo 2**.

Photo 1: Example of subsidence cracking along stacked goaf edge and after crack remediation



Photo 2: Example of subsidence cracking along stacked goaf edge and after crack remediation



2.4 SUMMARY OF SUBSIDENCE IMPACTS

A summary of potential subsidence impacts associated with mining Longwalls 205-208 is outlined within **Table 8** and **Table 9** below.

Table 8. Summary of Impacts to Surrounding Infrastructure

Feature	Owner/Manager	Brief Description	Impact
Property 130	Property 130	Privately owned property located approximately 600m to the south-east of the Extraction Plan area.	No mining related subsidence impacts to Property 130 are expected from the planned mining of Longwalls 205-208.
South Access Road	AGLM	An access road which extends from the intersection with Lemington Road (overlying Longwall 207B) to the north-western boundary of the Extraction Plan area.	<p>Maximum incremental subsidence of 2.5m and 2.2m and maximum cumulative subsidence of 4.2m and 3.1m are expected over the centres of Longwalls 207B and 208, respectively. A maximum incremental strain of 26mm/m is expected along the centre of Longwall 207B with strains over the western edges of Longwalls 207B and 208 of up to 46mm/m and 37mm/m, respectively. Maximum incremental tilts of 52mm/m are expected over the centreline of Longwall 207B with permanent tilts over the western edges of Longwalls 207B and 208 of 92mm/m and 73mm/m, respectively.</p> <p>These strains and tilts are expected to cause surface cracking up to 200-300mm wide and compression humps greater than 100mm high as well as localised steep gradients along and across the road. Most of the surface cracks are expected to occur at the same locations as those that formed when Longwalls 7B and 8 were mined.</p>
New England Highway	Transport for NSW	Section of the road reserve within the Extraction Plan Area near the northern end of Longwall 208.	No perceptible subsidence impacts are expected from the mining of Longwalls 205-208.
330kV Transmission Line	TransGrid	Located west of Lemington Road traversing the western boundary of the Extraction Plan area parallel to Longwall 208.	No impacts are expected to this transmission line from the planned mining of Longwalls 205-208.

Feature	Owner/Manager	Brief Description	Impact
132kV Transmission Line	Ausgrid	Powerline traversing east-west in the southern part of the Extraction Plan area.	Impacts are expected to be minor and manageable under existing management plans. Installation of replacement poles (during the mining of the PG and ULD Seam longwalls) and completion of planned upgrades prior to extraction of LW207A and other engineering features to accommodate subsidence have made this transmission line more tolerant of the subsidence movements. There is some potential for some poles, in areas where surface ponding is expected, to become periodically submerged.
11kV Transmission Line (north-south alignment)	Ausgrid	Powerline traversing north-south in the southern part of the Extraction Plan area.	Prior to subsidence effects from Longwalls 205-208, most poles on this section of the transmission line are to be relocated, in consultation with Ausgrid, into an area where subsidence movements should be small enough not to require any further mitigation or remediation works. One pole near the finishing end of Longwall 205 will need monitoring and management of subsidence effects and impacts.
11kV Transmission Line (east-west alignment)	Ausgrid	Powerline traversing east-west adjacent to the New England Highway.	This 11kV transmission line is adjacent to the New England Highway and is beyond the extent of the northern ends of Longwalls 206B, 207B and 208. No significant impacts are expected to this 11kV transmission line from the planned mining of Longwalls 205-208.
Telstra Cables	Telstra	Buried copper cables servicing ACOL properties and a fibre optic cable which runs alongside Lemington Road and services Ravensworth Operations.	Subsidence impacts to the copper and fibre optic cable are expected to affect the serviceability of cables without mitigation and remediation works being conducted.
Fences and Farm Infrastructure	AGL Macquarie	Minor infrastructure owned by AGL Macquarie.	Minor impacts requiring visual inspection and regular maintenance. The minor impacts expected to the farm dams are likely to be easily repairable with a small amount of remediation work. Any impacts to fences or gates are expected to be minor and repairable. Temporary electric fencing is recommended for stock control.

Feature	Owner/Manager	Brief Description	Impact
33kV Transmission Line	Ausgrid/Glencore	A 33kV transmission line located within or immediately adjacent to the Extraction Plan area. Seven transmission poles are located above or between Longwalls 207B and 208.	Subsidence impacts to the 33kV transmission line are expected to have the potential to affect serviceability of the infrastructure without mitigation and remediation works. The seven poles located above or between Longwalls 207B and 208 are expected to experience the full range of temporary and permanent subsidence effects. Poles located near the panel edges are expected to experience the maximum subsidence effects. Maximum cumulative subsidence of up to 4.2m in the centre of Longwall 207B and tilt of up to 155mm/m near the stacked goaf edges of Longwall 207B.
Ravensworth Operations #2 Bayswater Pit	Glencore	The Ravensworth Operations (RO) No. 2 Bayswater Pit is located within the limits of the Extraction Plan area along the western boundary.	The RO No. 2 Bayswater Pit within the Extraction Plan area is expected to experience no significant impacts as a result of mining Longwalls 205-208.
Ravensworth Void 5 Ash Dam	Glencore	The Ravensworth Void 5 Ash Dam located approximately 260m from the edge of Longwall 208 and outside the Extraction Plan area.	Only Longwall 208 will be within the Notification Area for the Void 5 Ash Dam and within the 1.2D and 1.7D zones from the dam wall. Vertical and horizontal subsidence movements from the mining of Longwalls 205-208 are expected to be imperceptible at the dam wall and have no potential to cause any impact to the dam structure (SCT, 2020)
Pipeline from Narama Dam to Mt Owen Mine	Glencore	Within the Extraction Plan area, the pipeline crosses Lemington Road once, and the southern AGLM access road twice, as well as crossing double stacked goaf edges above Longwall 207B and 208.	Potential impacts include damage to the pipeline, loss of water supply and a possible environmental issue associated with unlicensed discharge. Cumulative maximum strain is expected to reach 77mm/m at the stacked edges and 33mm/m more generally. If all the strain is localised at single, pre-existing fractures, as is expected, there is potential for the pipeline to be damaged.
Ravensworth Underground Mine #5 Ventilation Shaft	Glencore	The shaft is outside the Extraction Plan area and not connected to the underground workings but has been assessed because of its proximity to the Extraction Plan area.	Mining of Longwalls 205-208 may cause horizontal shear movements within the overburden strata that extend as far as the shaft, however, the magnitude of these movements is likely to be so small as to be of no practical significance for the operational integrity of the shaft if it is to be used in the future (SCT, 2020).

Feature	Owner/Manager	Brief Description	Impact
Lemington Road	Singleton Council	Lemington Road is a two-lane sealed road within the Extraction Plan area.	<p>Longwalls 206B, 207 and 208 are planned to undermine approximately 850m of Lemington Road.</p> <p>Longwall 206B is expected to impact only a short section of Lemington Road with impacts likely to be limited to an area smaller than that impacted during mining of Longwall 6B.</p> <p>Longwall 207B is expected to impact a section of Lemington Road that is up to approximately 500m long. Approximately 150-200m of the road is expected to be affected at any given time. Impacts include changes in grade from tilting of the road surface and the appearance of cracks in the pavement. The tilting and cracks are expected to start above the longwall face and reach their maximum at about 50-70m behind the face. The grade is expected to flatten again and cracks to substantially close again by 150m behind the face with some ongoing changes out to 200m. Impacts predicted above the centre of the panel are a maximum incremental subsidence of 2.5m, maximum strain of 26mm/m and maximum tilt of 52mm/m. Over the stacked edges of the panels, the maximum strain is predicted to be 53mm/m and maximum tilt is 105mm/m.</p> <p>Longwall 208 is expected to impact a section of Lemington Road that is approximately 500m long and includes a 150m section located above Longwall 207B. The impacts are expected to be generally less than those observed over Longwall 207B because of the narrower panel width. In the centre of the panel, maximum incremental subsidence of 2.2m is expected with maximum strains of 21mm/m and maximum tilts of 33mm/m. At the stacked edges, maximum strains of 37mm/m and maximum tilts of 73mm/m are expected to develop. Existing subsidence fractures caused by mining in the PG Seam are expected to reopen along the stacked edge causing cracks up to 200-300mm wide.</p>
Lemington Road Culverts	Singleton Council	Culverts that allow drainage from the north-western side of Lemington Road to the south-eastern side.	<p>Longwall 207B is expected to cause vertical subsidence in the range of 2.0-2.5m at the northern culvert. Incremental strains and tilts are likely to be at general background levels with transient levels up to 25mm/m and 45mm/m respectively.</p> <p>Subsidence effects at the southern culvert are expected to be less, but permanent, due to this culvert being located close to a chain pillar.</p>

Table 9. Summary of Impacts of Natural Features and Heritage

Feature	Brief Description	Impact
Bowmans Creek and Diversions	Main channel of Bowmans Creek located to the east and west of the Extraction Plan area and crosses between the northern and southern panels. The creek has been diverted in two diversion channels located on either side of the Extraction Plan area.	No perceptible subsidence impacts are expected along the main channel of Bowmans Creek. Vertical and horizontal movements at the main channel are expected to be less than 50mm and 100mm respectively and imperceptible for all practical purposes. Parts of the natural sections of Bowmans Creek excised by the formation of the diversion channels are above Longwalls 206B, 207A and 207B. These parts would be lowered by the anticipated vertical subsidence forming features similar to other natural ponds on the flood plain. These sections would not be free draining, but ponded water is expected to flow downward through the overburden strata into the mine.
Bowmans Creek Alluvium	The boundary of the Bowmans Creek Alluvium covers sections of each of the planned longwalls.	Maximum incremental subsidence of 2.8m and maximum cumulative subsidence of up to 5.8m is expected below areas of Bowmans Creek Alluvium. Some depressurisation of the alluvium is expected, but past experience over Longwall 6B indicates that this depressurisation may be temporary.
Hunter River and Alluvium	Located a minimum of 300m to the south of the Extraction Plan area.	No additional impacts expected.
Glennies Creek and Alluvium	Creek located to the east of the Extraction Plan area.	No significant additional subsidence impacts.
Groundwater Quantity	Groundwater system within the Extraction Plan area as outlined within the Groundwater Impact Assessment (AGE, 2020).	Total mine inflows ranging from approximately 410 ML/yr (1.12 Megalitres/day [ML/day]) to 417 ML/yr (1.14 ML/day). See Section 5.2.3 of the Groundwater Impact Assessment (AGE, 2020) for details.
Groundwater Quality		Mining activities are not expected to cause an increase in the groundwater salinity of creeks and alluvial aquifers; however, there may be a slight decrease in salinity due to the reduced discharge from the Permian strata. See Section 5.2.4 of the Groundwater Impact Assessment (AGE, 2020) for details.
Groundwater Baseflow Impacts		The overall impact of the mine is a general decrease in baseflow over the life of the project, however the decrease in baseflow gain rate is within approved impacts. See Section 5.2.2 of the Groundwater Impact Assessment (AGE, 2020) for details.
Landform Drainage	-	General lowering of the landform by up to an additional 2.8m (5.8m in total) in some areas expected to cause ponding on drainage lines within the Extraction Plan area. Steep grades and tensile cracking are possible at stacked goaf edges.

Feature	Brief Description	Impact
Remnant Woodlands	Located in the south of the Extraction Plan area.	Mining of the ULLD seam is considered unlikely to have a significant impact on any known or potentially occurring threatened species, threatened ecological communities, endangered populations or migratory species listed under the BC Act or EPBC Act (Eco Logical Australia, 2020).
Aboriginal Heritage	Several sites within Extraction Plan area including artefact scatters and grinding grooves.	<p>Some of the archaeological sites overlying the EP area will be partially impacted, to varying degrees, by subsidence (cracking, knick points and rilling, ponding or by the development of surface infrastructure) (Insite, 2020). However, it is noted that ACOL holds AHIPs which authorise these impacts.</p> <p>A water hole site of high scientific and cultural significance resides in proximity to the LW 205-208 project area. The site is to be retained with no disturbance from mining activities (Insite, 2020).</p> <p>In 2011, two areas of subsurface archaeological deposits containing a high concentration of artefacts associated with the Bowmans Creek Terrace (37-3-0496) site were identified during the course of archaeological salvage works undertaken for the Bowmans Creek Diversion project (Insite Heritage, 2016a and 2016b). Due to the concentration of artefacts recovered from these locations, the proposed impacts, a temporary Haul Road, was diverted around these locations to allow for site conservation. Both locations lie outside of the predicted area of subsidence cracking and ponding for LW207A and LW208 as presented in SCT Operations (2020).</p>
Historic Heritage	Three European heritage sites identified in proximity to the ACP. Two additional sites of historic occupation in the project area.	<p>The three European heritage sites are located outside of the LW 205-208 project area and will not be impacted by underground mining at the ACP.</p> <p>The two additional sites of historic occupation identified overlying Longwall 208 will be impacted by mining of Longwalls 205-208.</p>
Ecology	Ecology Assessment completed by EcoLogical (2020) to accompany the EP.	<p>EcoLogical (2020) identified subsidence impacts associated with ponding and cracking/stepping are likely to require remediation works to approximately 4 hectares of Swamp Oak – Weeping Grass grassy riparian forest, with the majority of predicted subsidence impacts occurring within non-native vegetation.</p> <p>EcoLogical (2020) considered it unlikely that the proposed mining of Longwalls 205 to 208 in the ULLD Seam would have significant adverse impacts on known or potentially occurring threatened and protected flora and fauna species, populations and ecological communities that currently or could occur within the Extraction Plan area. This is based on the conclusion of SCT (2020) that predicted impacts are not expected to be substantially different compared to the impacts predicted for mining of Longwalls 105 to 107.</p>

2.5 PERFORMANCE OBJECTIVES

Performance objectives in relation to subsidence impacts at Ashton are presented in **Table 10**. These objectives have been used when developing management strategies of this Extraction Plan.

Table 10. Performance Objectives from DA 309-11-2001-i

Condition No.	Condition Requirement																														
Schedule 3, Condition 29	<p>Performance Measures The Applicant must ensure that underground mining does not cause any exceedance of the performance measures in Table 10.</p> <p><i>Table 10: Subsidence Performance Measures</i></p> <table border="1"> <thead> <tr> <th colspan="2" style="background-color: #e0e0e0;">Water</th> </tr> </thead> <tbody> <tr> <td><i>Bowmans Creek</i></td> <td><i>No greater subsidence impact or environmental consequences than predicted in the EA and the previous EIAs</i></td> </tr> <tr> <td><i>Bowmans Creek – Eastern and Western Diversions</i></td> <td><i>Hydraulically and geomorphologically stable</i></td> </tr> <tr> <td><i>Bowmans Creek alluvial aquifer</i></td> <td><i>No greater subsidence impact or environmental consequences than predicted in the EA and the previous EIAs</i></td> </tr> <tr> <th colspan="2" style="background-color: #e0e0e0;">Biodiversity</th> </tr> <tr> <td><i>Threatened species, populations, habitat or ecological communities</i></td> <td><i>Negligible impact</i></td> </tr> <tr> <th colspan="2" style="background-color: #e0e0e0;">Aboriginal Heritage Features</th> </tr> <tr> <td><i>Waterhole Site</i></td> <td><i>Negligible impact</i></td> </tr> <tr> <td><i>Other Aboriginal heritage sites</i></td> <td><i>No greater subsidence impact or environmental consequences than approved under a permit issued under section 90 of the National Parks and Wildlife Act 1974</i></td> </tr> <tr> <th colspan="2" style="background-color: #e0e0e0;">Built Features</th> </tr> <tr> <td><i>New England Highway, including the bridge over Bowmans Creek</i></td> <td><i>Always safe and serviceable. Damage that does not affect safety or serviceability must be fully repairable and must be fully repaired.</i></td> </tr> <tr> <td><i>Lemington Road and Brunkers Lane</i></td> <td><i>In accordance with recommendations of the report prepared under condition 36</i></td> </tr> <tr> <td><i>Other built features, including other public infrastructure</i></td> <td><i>Always safe Serviceability should be maintained wherever practicable. Loss of serviceability must be fully compensated. Damage must be fully repaired or replaced, or else fully compensated.</i></td> </tr> <tr> <th colspan="2" style="background-color: #e0e0e0;">Public Safety</th> </tr> <tr> <td><i>Public safety</i></td> <td><i>No additional risk due to mining</i></td> </tr> </tbody> </table> <ul style="list-style-type: none"> • Requirements regarding “safe” or “serviceable” do not prevent preventative or mitigatory actions being taken prior to or during mining in order to achieve or maintain these outcomes. • Compensation required under this condition includes any compensation payable under the Mine Subsidence Compensation Act 1961 and/or the Mining Act 1992. 	Water		<i>Bowmans Creek</i>	<i>No greater subsidence impact or environmental consequences than predicted in the EA and the previous EIAs</i>	<i>Bowmans Creek – Eastern and Western Diversions</i>	<i>Hydraulically and geomorphologically stable</i>	<i>Bowmans Creek alluvial aquifer</i>	<i>No greater subsidence impact or environmental consequences than predicted in the EA and the previous EIAs</i>	Biodiversity		<i>Threatened species, populations, habitat or ecological communities</i>	<i>Negligible impact</i>	Aboriginal Heritage Features		<i>Waterhole Site</i>	<i>Negligible impact</i>	<i>Other Aboriginal heritage sites</i>	<i>No greater subsidence impact or environmental consequences than approved under a permit issued under section 90 of the National Parks and Wildlife Act 1974</i>	Built Features		<i>New England Highway, including the bridge over Bowmans Creek</i>	<i>Always safe and serviceable. Damage that does not affect safety or serviceability must be fully repairable and must be fully repaired.</i>	<i>Lemington Road and Brunkers Lane</i>	<i>In accordance with recommendations of the report prepared under condition 36</i>	<i>Other built features, including other public infrastructure</i>	<i>Always safe Serviceability should be maintained wherever practicable. Loss of serviceability must be fully compensated. Damage must be fully repaired or replaced, or else fully compensated.</i>	Public Safety		<i>Public safety</i>	<i>No additional risk due to mining</i>
Water																															
<i>Bowmans Creek</i>	<i>No greater subsidence impact or environmental consequences than predicted in the EA and the previous EIAs</i>																														
<i>Bowmans Creek – Eastern and Western Diversions</i>	<i>Hydraulically and geomorphologically stable</i>																														
<i>Bowmans Creek alluvial aquifer</i>	<i>No greater subsidence impact or environmental consequences than predicted in the EA and the previous EIAs</i>																														
Biodiversity																															
<i>Threatened species, populations, habitat or ecological communities</i>	<i>Negligible impact</i>																														
Aboriginal Heritage Features																															
<i>Waterhole Site</i>	<i>Negligible impact</i>																														
<i>Other Aboriginal heritage sites</i>	<i>No greater subsidence impact or environmental consequences than approved under a permit issued under section 90 of the National Parks and Wildlife Act 1974</i>																														
Built Features																															
<i>New England Highway, including the bridge over Bowmans Creek</i>	<i>Always safe and serviceable. Damage that does not affect safety or serviceability must be fully repairable and must be fully repaired.</i>																														
<i>Lemington Road and Brunkers Lane</i>	<i>In accordance with recommendations of the report prepared under condition 36</i>																														
<i>Other built features, including other public infrastructure</i>	<i>Always safe Serviceability should be maintained wherever practicable. Loss of serviceability must be fully compensated. Damage must be fully repaired or replaced, or else fully compensated.</i>																														
Public Safety																															
<i>Public safety</i>	<i>No additional risk due to mining</i>																														
Schedule 3, Condition 41	<p>Rehabilitation Objectives The Applicant must rehabilitate the site in a manner that is consistent with the rehabilitation objectives in the EA and Table 11, to the satisfaction of RR.</p> <p><i>Table 11: Rehabilitation Objectives</i></p> <table border="1"> <thead> <tr> <th style="background-color: #e0e0e0;">Feature</th> <th style="background-color: #e0e0e0;">Objective</th> </tr> </thead> <tbody> <tr> <td><i>Sections of Bowmans Creek within the underground mining area (except those sections of channel made redundant by diversion)</i></td> <td><i>Restore pre-mining surface flow and pool holding capacity as soon as reasonably practicable. Hydraulically and geomorphologically stable, with riparian vegetation that is the same or better than existed prior to mining.</i></td> </tr> <tr> <td><i>Bowmans Creek – Eastern and Western Diversions</i></td> <td><i>Hydraulically and geomorphologically stable, with riparian vegetation that is the same or better than existing in the adjacent channel prior to mining.</i></td> </tr> </tbody> </table>	Feature	Objective	<i>Sections of Bowmans Creek within the underground mining area (except those sections of channel made redundant by diversion)</i>	<i>Restore pre-mining surface flow and pool holding capacity as soon as reasonably practicable. Hydraulically and geomorphologically stable, with riparian vegetation that is the same or better than existed prior to mining.</i>	<i>Bowmans Creek – Eastern and Western Diversions</i>	<i>Hydraulically and geomorphologically stable, with riparian vegetation that is the same or better than existing in the adjacent channel prior to mining.</i>																								
Feature	Objective																														
<i>Sections of Bowmans Creek within the underground mining area (except those sections of channel made redundant by diversion)</i>	<i>Restore pre-mining surface flow and pool holding capacity as soon as reasonably practicable. Hydraulically and geomorphologically stable, with riparian vegetation that is the same or better than existed prior to mining.</i>																														
<i>Bowmans Creek – Eastern and Western Diversions</i>	<i>Hydraulically and geomorphologically stable, with riparian vegetation that is the same or better than existing in the adjacent channel prior to mining.</i>																														

Condition No.	Condition Requirement	
	<i>Other land affected by development</i>	<i>Restore ecosystem function, including maintain or establishing self-sustaining ecosystems comprised of:</i> <ul style="list-style-type: none"> <i>Local native plant species (unless RR agrees otherwise); and</i> <i>A landform consistent with the surrounding environment.</i>
	<i>Built features affected by subsidence</i>	<i>Repair to pre-mining condition or equivalent unless:</i> <ul style="list-style-type: none"> <i>The owner agrees otherwise; or</i> <i>The damage is fully restored, repaired or compensated under the Mine Subsidence Compensation Act 1961.</i>
	<i>Community</i>	<i>Ensure public safety. Minimise the adverse socio-economic effects associated with mine closure.</i>

2.5.1 Performance Measures and Indicators

Table 11 below has been developed to address Schedule 3 Condition 32 (d) of the DA 309-11-2001-i.

The detailed performance indicators are monitored through a combination of management plans proposed under this Extraction Plan and existing approved management plans for the site.

Table 11. Performance Measures and Indicators

Aspect	Performance Measure	Indicator
Water		
Bowmans Creek	No greater subsidence impact or environmental consequences than predicted in the EA and the previous EIAs.	Water Management Plan (WMP) Section 3.5 (Bowmans Creek Diversion Management Plan) outlines performance and completion criteria. Surface Water Impact Assessment Criteria – Section 6.2 of the Water Management Plan. Table 17 of the WMP outlines trigger levels for surface water. Indicators include water quality and streamflow.
Bowmans Creek – Eastern and Western Diversions	Hydraulically and geomorphologically stable.	WMP Section 4 (Bowmans Creek Diversion Management Plan) outlines completion criteria (indicators), including geomorphology and channel stability and stream health. This includes: <ul style="list-style-type: none"> Presence or absence of scouring; Geometry of diversion channels; Bed load transport; and Fish passage and aquatic ecology of diversion sections.
Bowmans Creek alluvial aquifer	No greater subsidence impact or environmental consequences than predicted in the EA and the previous EIAs.	Groundwater Impact Assessment Criteria – Section 7.2 of the Water Management Plan. Table 23 in the WMP outlines trigger levels for groundwater. Indicators including water level, pressure, field parameters and comprehensive analysis.
Biodiversity		
Threatened species,	Negligible impact	ACOL Flora and Fauna Management Plan (Appendix E) Section 2.2. Commitment for

Aspect	Performance Measure	Indicator
populations, habitat or ecological communities		monitoring is covered in Section 6 of the Flora and Fauna Management Plan. Indicator of monitoring is negligible impacts to threatened species, populations, habitat or ecological communities. EcoLogical (2020) Flora and Fauna Assessment for LW205 to 208.
Aboriginal Heritage Features		
Waterhole Site	Negligible impact.	Performance Measures are described in Section 3.2 of the Heritage Management Plan.
Other Aboriginal heritage sites	No great subsidence impact or environmental consequences than approved under a permit issued under section 90 of the <i>National Parks and Wildlife Act 1974</i> .	ACOL ACHMP Section 3.2 Section 2.2 of the Heritage Assessment (Insite 2020) refers to no disturbance to waterhole site. Also, Section 4 outlines predicted subsidence impacts to aboriginal heritage and Section 3 outlines performance measures and success criteria. See the Subsidence Monitoring Program (Appendix J) for details of subsidence monitoring and inspections.
Built Features		
New England Highway, including the bridge over Bowmans Creek	Always safe and serviceable. Damage that does not affect safety or serviceability must be fully repairable, and must be fully repaired.	Covered under Built Features Management Plan (Appendix G). See Subsidence Monitoring Program (Appendix J).
Lemington Road and Brunkers Lane	In accordance with recommendations of the Subsidence Assessment (SCT,2020) to the satisfaction of Condition 36, Schedule 3 of DA 309-11-2002-1.	Covered under the Built Features Management Plan (Appendix G).
Other built features, including other public infrastructure	Always safe. Serviceability should be maintained wherever practicable. Loss of serviceability must be fully compensated. Damage must be fully repaired or replaced, or else fully compensated.	Covered under the Built Features Management Plan (Appendix G). See the Subsidence Monitoring Program (Appendix J) for details of subsidence monitoring and inspections.
Public Safety		
Public safety	No additional risk due to mining.	Covered under Public Safety Management Plan.

3 DEVELOPMENT

3.1 EXTRACTION PLAN TEAM

In accordance with Schedule 3 Section 32(a) of the Development Consent, the team that has prepared the Extraction Plan was endorsed by the Director, Resource Assessments of the Department of Planning, Infrastructure and Environment (DPIE) on 20 May 2020. The Extraction Plan Team is presented in **Table 12**.

Table 12. Extraction Plan Team

Extraction Plan Component	Team Members
Extraction Plan Coordination and Preparation	Ashton/Yancoal: <ul style="list-style-type: none"> • Tony Sutherland – Technical Services Manager. • Phillip Brown - Environment and Community Superintendent. • Jeff Peck – Mine Surveyor. Resource Strategies (document preparation): <ul style="list-style-type: none"> • Josh Peters. • Matthew Copeland.
Built Features Management Plan	Ashton/Yancoal – Tony Sutherland/Phillip Brown
Public Safety Management Plan	Ashton/Yancoal – Tony Sutherland/Phillip Brown
Land Management Plan	Ashton/Yancoal – Tony Sutherland/Phillip Brown
Coal Resource Recovery Plan	Ashton/Yancoal – Tony Sutherland/Phillip Brown
Biodiversity Management Plan Flora and Fauna Assessment for LW 205-208	Existing Ashton Coal approved Management Plan EcoLogical – Kayla Abbey/Elise Keane/Andrew Butler
Water Management Plan Surface Water Assessment for LW205-208	Existing Ashton Coal approved Management Plan Hydro Engineering & Consulting Pty Ltd – Tony Marszalek.
Groundwater Assessment for LW 205-208	Australasian Groundwater and Environmental Consultants Pty Ltd (AGE) – Andrew Durick.
Heritage Management Plan Heritage Assessment for LW 205-208	Existing Ashton Coal approved Management Plan Insite Heritage Pty Ltd – Angela Besant/Elizabeth Wyatt
Subsidence Predictions	Strata Control Technology (SCT) – Ken Mills and Stephen Wilson

3.2 AGENCY CONSULTATION

3.2.1 Department of Planning, Industry and Environment

The Extraction Plan is required to be completed to the satisfaction of and approved by the Secretary of the DPIE. Extensive consultation has taken place with DPIE during the preparation, assessment and approvals processes for the Ashton Coal Project, including the Bowmans Creek Diversion Modification Environmental Assessment.

3.2.2 NSW Resources Regulator

There are several components of the Extraction Plan that are required to be completed in consultation with and to the satisfaction of the Resource Regulator (RR). These components include:

- Coal Resource Recovery Plan;
- Subsidence Monitoring Program;
- Built Features Management Plan;
- Public Safety Management Plan; and
- Revised Rehabilitation Plan (MOP).

A copy of the Extraction Plan (including the documentation listed above) has been provided to the NSW Resources Regulator. The satisfaction of the NSW Resources Regulator will be sought prior to commencement of mining.

In accordance with Condition 31, Schedule 3 of DA309-11-2001-i, correspondence was provided to the Division of Resources and Geoscience (now NSW Resources Regulator) in March 2019 and in March 2020 outlining the design specifications of the first workings for Longwalls 205-208 including the main headings, TG and MG panels. The NSW Resources Regulator provided a response in July 2020 stating that it was satisfied the workings would remain long term stable and non-subsiding.

3.2.3 Biodiversity Conservation Division

The Biodiversity Conservation Division (BCD) of DPIE received a copy of the draft Flora and Fauna Management Plan Addendum on 31 July 2020. No comments have been received to date.

3.2.4 DPIE Water

DPIE-Water received a copy of the draft Water Management Plan Addendum on 26 August 2020. No comments have been received to date.

3.2.5 Heritage NSW and Registered Aboriginal Parties

Heritage NSW and the ACOL Registered Aboriginal Parties received a copy of the draft Heritage Management Plan Addendum on 24 July 2020. No comments have been received to date.

3.3 LANDHOLDER CONSULTATION

The land above the Extraction Plan area is predominately cattle grazing land owned by ACOL. A small portion of Land in the north west above Longwalls 208, 207B and 206B owned by AGL Macquarie Generation. Landholders will continue to be consulted in accordance with the Built Features Management Plan.

3.3.1 Community

ACOL holds regular Community Consultative Committee (CCC) meetings with a number of community representatives. ACOL will provide an update on the progress of the Longwalls 205-208 Extraction Plan application at the next CCC meeting currently scheduled for 15 October 2020.

3.3.2 Private Landholders

ACOL continues to liaise with landholders prior to subsidence impacts as detailed in the Built Features Management Plan (BFMP). The BFMP also includes details of remediation strategies to land (as necessary). Property 130 is located more than 600m to the southeast of the Extraction Plan area and is the only private property in the vicinity of the Ashton Underground Coal Mine. SCT (2020) has predicted subsidence impacts to Property 130 and concluded no mining related subsidence impacts are expected from the planned mining of Longwalls 205 to 208.

Regular updates on the status of mining progression and environmental performance, including results of subsidence monitoring, and timing for mining will be provided directly to the landholder above the Extraction Plan area, and is presented to the Ashton CCC, with minutes of these meetings uploaded to the Ashton website (www.ashtoncoal.com.au).

3.4 INFRASTRUCTURE OWNER CONSULTATION

The BFMP was developed in consultation with infrastructure owners and stakeholders to manage potential subsidence effects. Owners include:

- Ausgrid;
- TransGrid;
- Glencore;
- Telstra;

- Transport for NSW;
- AGL Macquarie; and
- Singleton Council.

3.5 RISK ASSESSMENT

A risk assessment was conducted on 5 May 2020 to review and identify the subsidence-related hazards that may affect the environment and community as a result of the resource extraction from Longwalls 205-208. A copy of the risk assessment is included as **Technical Report 4**.

Risks were identified and assessed through the review of known surface and sub-surface features within the Extraction Plan Area. For each specific risk/hazard identified in the risk assessment, controls that are already in place were identified. The risk assessment team assigned a risk ranking to each hazard using the risk matrix. The risk ranking (low, moderate, high or extreme) assigned to each risk/hazard was determined on the basis of group consensus. Where appropriate, additional controls were identified and recorded on the risk register. The outcome of the risk assessment forms the basis for this Extraction Plan.

Risks were identified and assessed through the review of known surface and sub-surface features within the Extraction Plan Area. This risk assessment was facilitated by Kylie Hannigan (STAC Consulting) with contribution by the following Ashton workforce representatives and external content/technical experts:

- Tony Sutherland (ACOL – Technical Services Manager);
- Phil Brown (ACOL – Environmental and Community Relations Superintendent);
- Jeff Peck (ACOL – Mining Surveyor);
- David Cooke (ACOL – Operator/Site Safety and Health Representative);
- Lachlan Crawford (ACOL – Environment and Community Coordinator);
- Josh Peters (Resource Strategies – Senior Environmental Project Manager);
- Matthew Copeland (Resource Strategies – Environmental Project Manager);
- Dr Ken Mills (Principal Geotechnical Engineer/Director – SCT Operations Pty Ltd); and
- Andrew Durick (Director/Principal Modeller – AGE).

The risk assessment identified a total of:

- Low Risks – 18;
- Moderate Risks – 9;
- High Risks – 7; and
- Extreme Risks – 0.

A total of five built features were classified as having a potentially high risk of subsidence impacts with the consequences relating to damage to infrastructure resulting in impacts to the environment or potential safety concerns. The infrastructure identified with potentially high risks included:

- Lemington Road and two associated culverts;
- ACOL mine water pipeline;
- ACOL tailings pipelines;
- Glencore Mt Owen Water Supply Pipeline; and
- ACOL dewatering bores.

Specific controls and management measures for these built features (and all other relevant assets) are detailed in the Built Features Management Plan (**Appendix G**).

The two remaining high risks identified are related to surface water and groundwater impacts. The surface water risk related to water losses from the surface due to subsidence (including Bowmans Creek and diversion). The Surface Water Assessment (Hydro Engineering & Consulting Pty Ltd, 2020) and Groundwater Assessment (AGE, 2020) have been prepared in consideration of these risks.

The second-high risk related to alluvial groundwater level and quality changes due to mine subsidence being greater than predicted. Groundwater management controls for the site are outlined in the Water Management Plan (**Appendix C**) which covers the entire ACOL operations. The Surface Water Assessment (Hydro Engineering & Consulting Pty Ltd, 2020) and Groundwater Assessment (AGE, 2020) have been prepared in consideration of these risks.

The full risk assessment report including a full list of risks in assessment order, risk rank order and consequence order respectively is provided in **Technical Report 4**.

4 SUBSIDENCE MONITORING AND MANAGEMENT

4.1 FRAMEWORK

The overall framework for subsidence monitoring and management of impacts of this Extraction Plan may be described as:

- A **Subsidence Monitoring Program** (actual measured subsidence, and inspections for environmental consequences of subsidence to compare against predicted impacts) which may trigger a response or set of responses.

The response is commensurate with the nature of the measurement or the impact which has been identified. The Extraction Plan relies on a set of individual management plans which are intended to address impacts to particular environmental or built features within the Extraction Plan Area. These plans include:

- **Water Management Plan** – to manage the potential environmental consequences of second workings on surface and groundwater;
- **Land Management Plan** – to manage the potential environmental consequences of second workings on steep slopes and land in general;
- **Biodiversity Management Plan** – to manage the potential environmental consequences of second workings on aquatic and terrestrial flora and fauna (additional **monitoring** specific to Biodiversity is also collected to assess impact);
- **Heritage Management Plan** – to manage the potential environmental consequences of second workings on heritage sites or values (additional **monitoring** specific to Aboriginal Cultural Heritage is also collected to assess impact);
- **Built Features Management Plan** – to manage the potential environmental consequences of second workings on any built feature; and
- **Public Safety Management Plan** – to ensure public safety in the Extraction Plan area.

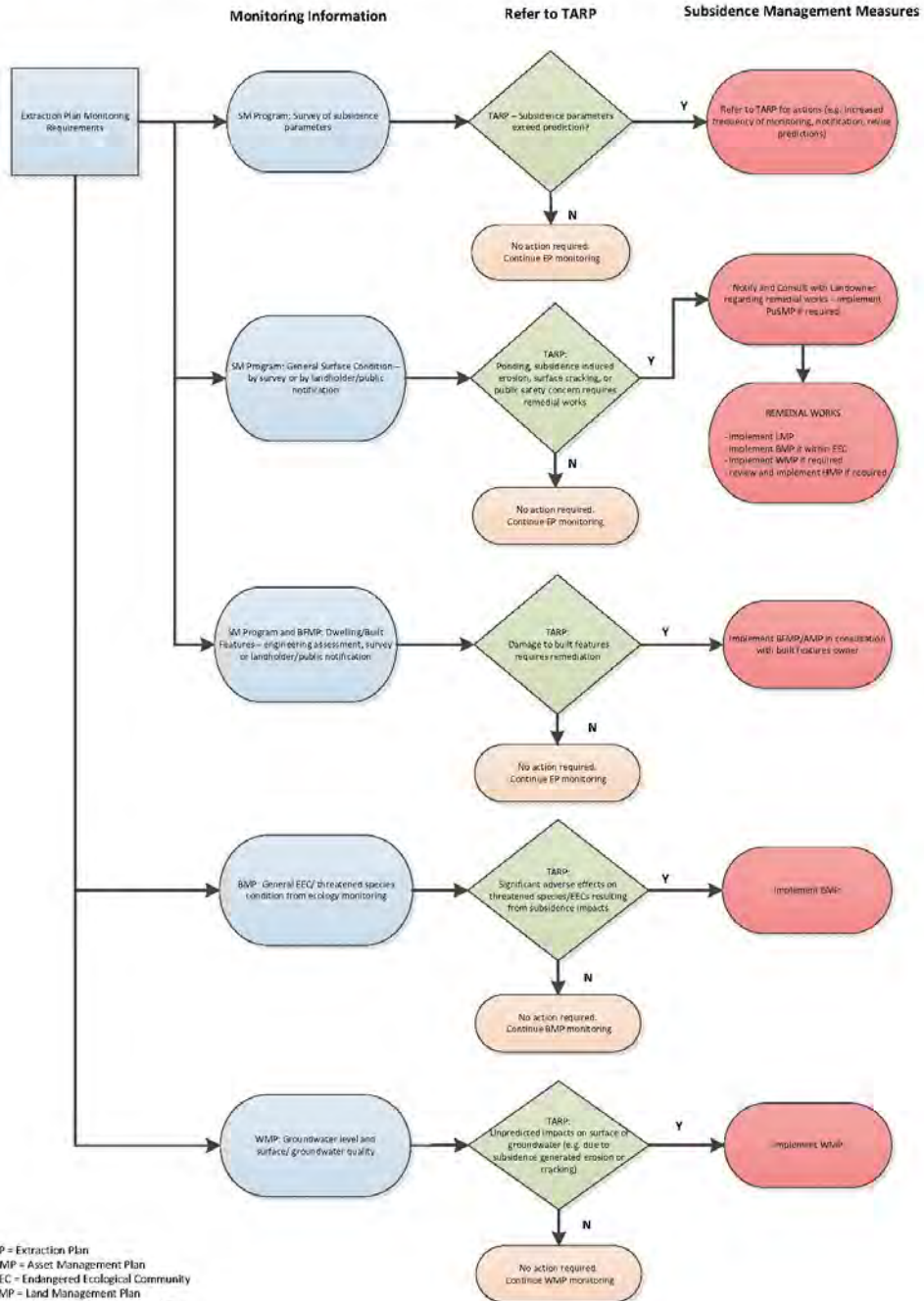
4.2 EXTRACTION PLAN TARP

ACOL has developed an overall subsidence management **LW205 to LW208 Extraction Plan Trigger Action Response Plan** (TARP) to manage subsidence within the Extraction Plan Area. This TARP is included in **Appendix B** and includes individual triggers to instigate actions, including public safety activities, remedial works or review of subsidence predictions. The TARP also specifically includes both adaptive and contingency management based on results of monitoring.

4.3 EXTRACTION PLAN SUBSIDENCE MONITORING AND MANAGEMENT FLOWCHART

ACOL has developed a **flowchart** to illustrate the mechanics of how the relevant Subsidence Monitoring Program, sub-management plans, and the TARP are used at Ashton to manage subsidence impacts. The flowchart is provided below and is included in **Appendix B** with the TARP.

EXTRACTION PLAN SUBSIDENCE MONITORING AND MANAGEMENT FLOWCHART – LONGWALLS 205 TO 208



EP = Extraction Plan
 AMP = Asset Management Plan
 EEC = Endangered Ecological Community
 LMP = Land Management Plan
 BMP = Biodiversity Management Plan
 PuSMP = Public Safety Management Plan
 BFMP = Built Features Management Plan
 HMP = Heritage Management Plan
 WMP = Water Management Plan
 SM Program = Subsidence Monitoring Program

5 PLAN IMPLEMENTATION

5.1 REPORTING FRAMEWORK

5.1.1 Annual Review

The Annual Review details ACOL's environmental performance for the reporting year and is prepared in accordance with Schedule 5, Condition 10 of DA 309-11-2001-i and to satisfy Mining Lease conditions.

5.1.2 Regular Stakeholder Extraction Plan Update Reporting

The Ashton Coal Mine CCC is given regular updates on the status of the progress and activities of the operations.

Landholders and stakeholders within the affected Extraction Plan area will be provided with regular updates on the progress of mining, results of subsidence monitoring, and of any particular subsidence induced consequences and the remediation measures employed. The frequency of reporting will occur nominally on a bi – monthly (every two months) basis. More regular reporting may be provided during active subsidence of key assets and this will be detailed in the relevant Asset Management Plans.

5.1.3 Incident Reporting

In accordance with Condition 8 Schedule 5 of DA 309-11-2001-i, ACOL will notify the DPIE and any other relevant agencies, of any incident that has caused, or threatens to cause, material harm to the environment or any other incident associated with the Ashton Mine Complex, as soon as practicable after ACOL becomes aware of the incident.

Within seven days of the date of the incident ACOL will provide DPIE and any other relevant agencies with a detailed report on the incident and any such further reports as may be requested.

5.2 REVIEW OF THE EXTRACTION PLAN

Review of the Extraction Plan and/or any of the sub-plans, and revision if necessary, shall occur where significant unpredicted impacts and/or environmental consequences are identified through the monitoring and management strategies proposed in the Extraction Plan.

Review of the Extraction Plan and/or any of the sub-plans is also required following any modification to DA 309-11-2001-i, or if directed by the Secretary of DPIE.

Any revision to the Extraction Plan including component sub-plans must be completed to the satisfaction of the Secretary of DPIE where required.

5.3 COMPLAINTS HANDLING

Complaints in relation to the management of subsidence will be managed using the established protocols in the Ashton Environmental Management System.

5.4 EXTRACTION PLAN ROLES AND ACCOUNTABILITIES

Detailed below in **Table 13** are key personnel involved with implementing this Extraction Plan to manage subsidence, their roles and responsibilities.

Table 13. Roles and Responsibilities

Role	Responsibilities
Operations Manager	<ul style="list-style-type: none"> • Ensure sufficient resources are available to implement the requirements of this plan.
Technical Services Manager	<ul style="list-style-type: none"> • Facilitate the Extraction Plan. • Coordinate with the Mining Surveyor to ensure subsidence monitoring is undertaken in accordance with the Extraction Plan and sub environmental management plans. • Manage / implement subsidence management actions required by the Extraction Plan in relation to built features and general landforms. • Manage / implement subsidence management actions required by the Extraction Plan in relation to Infrastructure. • Liaise with Subsidence Advisory NSW in relation to built features. • Provide support and guidance in relation to subsidence effects to Environment & Community Superintendent. • Ensure visual monitoring requirements are completed by a trained and competent person.
Environment and Community Superintendent	<ul style="list-style-type: none"> • Liaise with Government Agencies and Community members in relation to subsidence matters and the Extraction Plan subsidence predictions and monitoring program. • Liaise with Landholders in relation to environmental consequences of subsidence and in relation to access for the Extraction Plan monitoring program and any remediation works. • Coordinate Mine Surveyor and facilitate subsidence monitoring undertaken in accordance with the Extraction Plan. • Review subsidence monitoring data against predictions and TARPs in order to trigger any actions required on the basis of subsidence results. • Review subsidence predictions based on monitoring information and the TARPs.
Registered Mining Surveyor	<ul style="list-style-type: none"> • Ensure that all subsidence monitoring is completed to the requirements of the Subsidence Monitoring Program and provided to the TSM for review. • Provide training for subsidence impact measurements and observations in accordance with Subsidence Monitoring Program.

6 REFERENCES

Ashton Coal Operations Pty Ltd (2020) *Ashton Coal Project Flora and Fauna Management Plan*.

Ashton Coal Operations Pty Ltd (2017) *Ashton Coal Project Heritage Management Plan*.

Ashton Coal Operations Pty Ltd (2020) *Ashton Coal Project Water Management Plan*

Ashton Coal Operations Pty Ltd (2018) *Mining Operations Plan 2018-2024*. Revision 3, September 2019.

Australasian Groundwater and Environmental Consultants Pty Ltd (2020) *Yancoal Ashton Longwalls 205-208 Extraction Plan Surface and Groundwater Impact Assessment*.

Eco Logical Australia (2020) *Longwall 205-208 Extraction Plan Flora and Fauna Assessment*.

HLA Envirosiences (2001) *Environmental Impact Statement – Ashton Coal Project*. Project reference U842.

Hydro Engineering and Consulting Pty Ltd (2020) *Ashton Coal Mine Longwalls 205-208 Extraction Plan Surface Water Technical Report*.

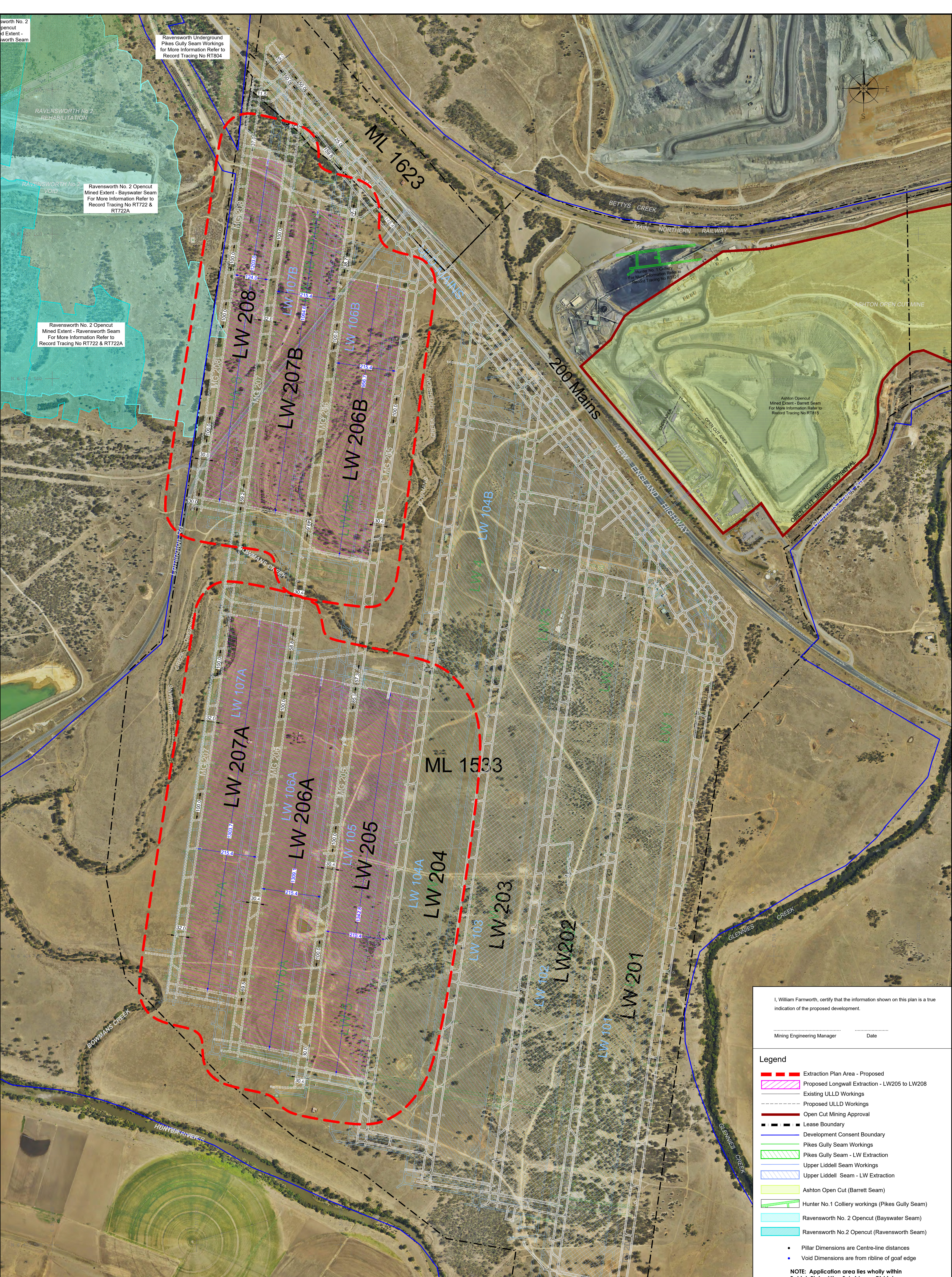
Insite Heritage (2020) *Archaeological Assessment Longwalls 205-208 Extraction Plan Ashton Coal Project Camberwell NSW*.

Li G., Steuart P., Paquet R., and Ramage R. (2010). *A Case Study on Mine Subsidence Due to Multi-Seam Longwall Extraction*. Proceedings of Second Australasian Ground Control in Mining Conference - Sydney N.S.W. 23-24 November 2010 pp 191-200.

Umwelt Environmental Consultants Pty Ltd (2010) *Ravensworth Operations Project, Historical Heritage Assessment*. Unpublished report prepared for Xstrata.

Strata Control Technology (2020) *Subsidence Assessment for the Extraction Plan for Longwalls 205 – 208 in the Upper Lower Liddell Seam*, Report Number ASH4927.

Graphical Plans



Ravensworth No. 2
pencil
d Extent -
worth Seam

Ravensworth Underground
Pikes Gully Seam Workings
For More Information Refer to
Record Tracing No RT804

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

Hunter No. 1 Colliery
For More Information Refer to
Record Tracing No RT721

Ashton Open Cut
Mined Extent - Barrett Seam
For More Information Refer to
Record Tracing No RT815



I, William Farworth, 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 - LW205 to LW208
- 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



All measurements are in metres

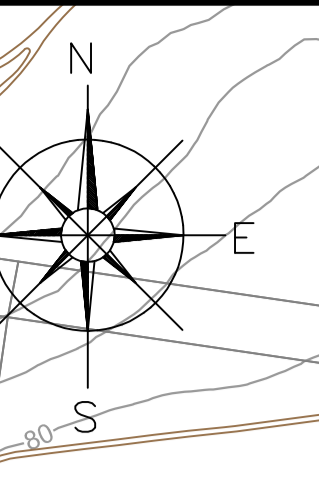
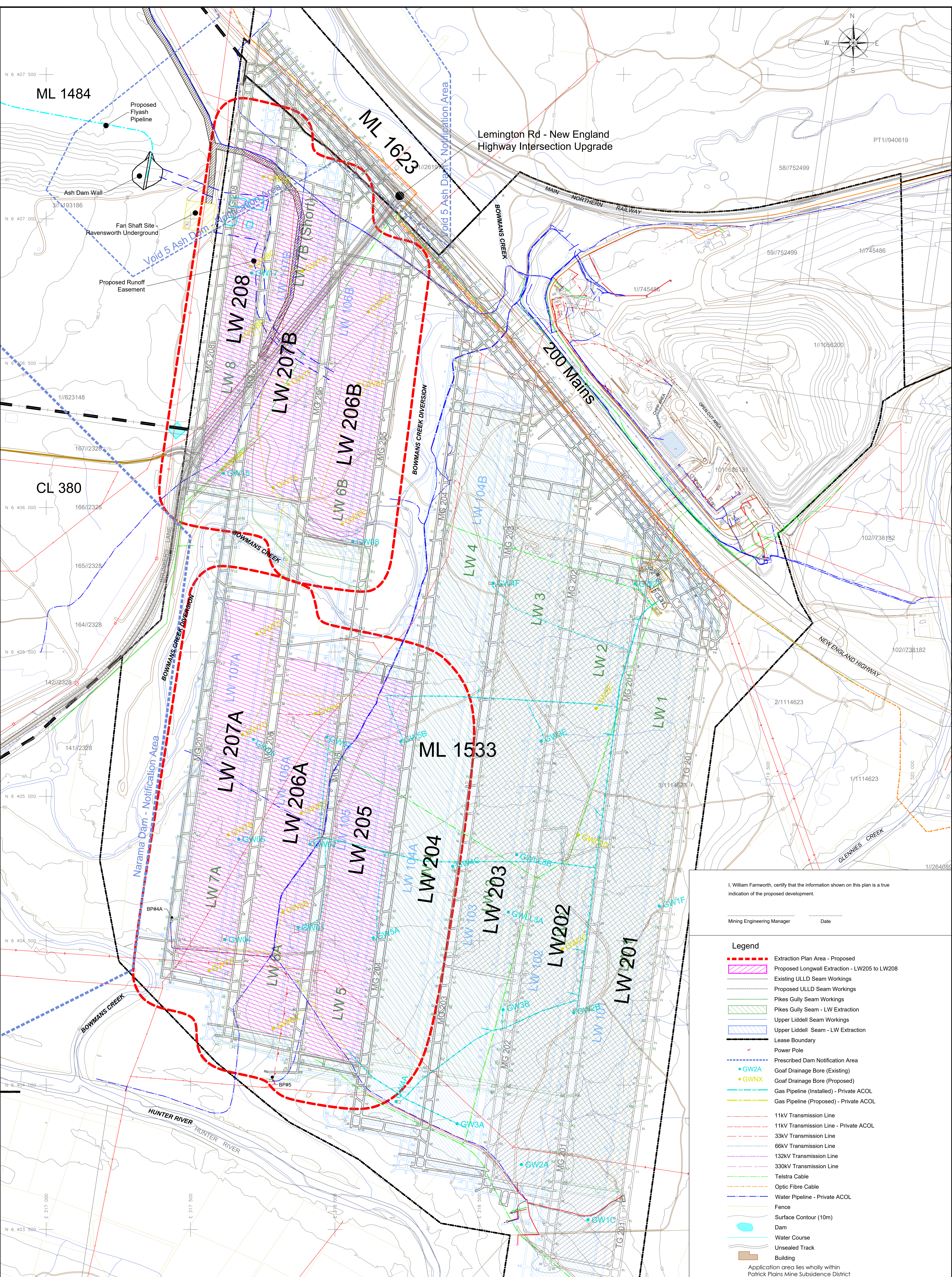
AshtonCoal
PO Box 699 Singleton NSW 2330
Phone 61+ 02 6576 1111 Fax 61+ 02 6576 1122

**ASHTON UNDERGROUND MINE
PROPOSED LW205 to LW208 - UPPER LOWER LIDDELL SEAM
PLAN No.1B - Extraction Area Boundary - Aerial**

Date	Scale:	Drawn	Checked	Approved
05/08/2020	1:4000	JIP	TS	WF

Drawing No.	C-4023_1B
Revision No.	3
Sheet Size	A0

U:\MG-Drawing\4000-SMP Plans\C-4023 ULLD LW205-208 Extraction - Plan1.dwg



ML 1484

ML 1623

Lemington Rd - New England Highway Intersection Upgrade

PT1/940619

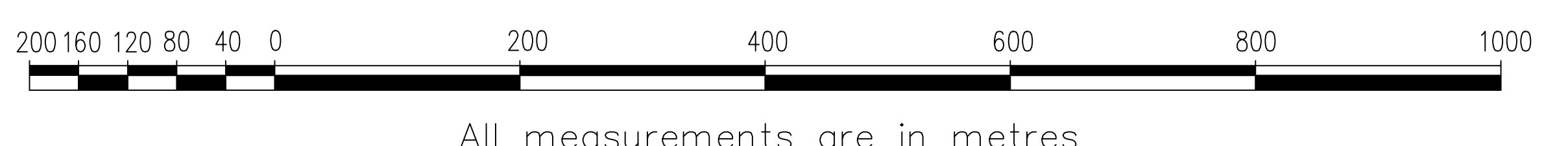
CL 380

ML 1533

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 - LW205 to LW208
 - Existing ULLD Seam Workings
 - Proposed ULLD Seam Workings
 - Pikes Gully Seam Workings
 - Pikes Gully Seam - LW Extraction
 - Upper Liddell Seam Workings
 - Upper Liddell Seam - LW Extraction
 - Lease Boundary
 - Power Pole
 - Prescribed Dam Notification Area
 - Goaf Drainage Bore (Existing)
 - Goaf Drainage Bore (Proposed)
 - Gas Pipeline (Installed) - Private ACOL
 - Gas Pipeline (Proposed) - Private ACOL
 - 11kV Transmission Line
 - 11kV Transmission Line - Private ACOL
 - 33kV Transmission Line
 - 66kV Transmission Line
 - 132kV Transmission Line
 - 330kV Transmission Line
 - Telstra Cable
 - Optic Fibre Cable
 - Water Pipeline - Private ACOL
 - Fence
 - Surface Contour (10m)
 - Dam
 - Water Course
 - Unsealed Track
 - Building
- Application area lies wholly within Patrick Plains Mine Subsidence District



All measurements are in metres

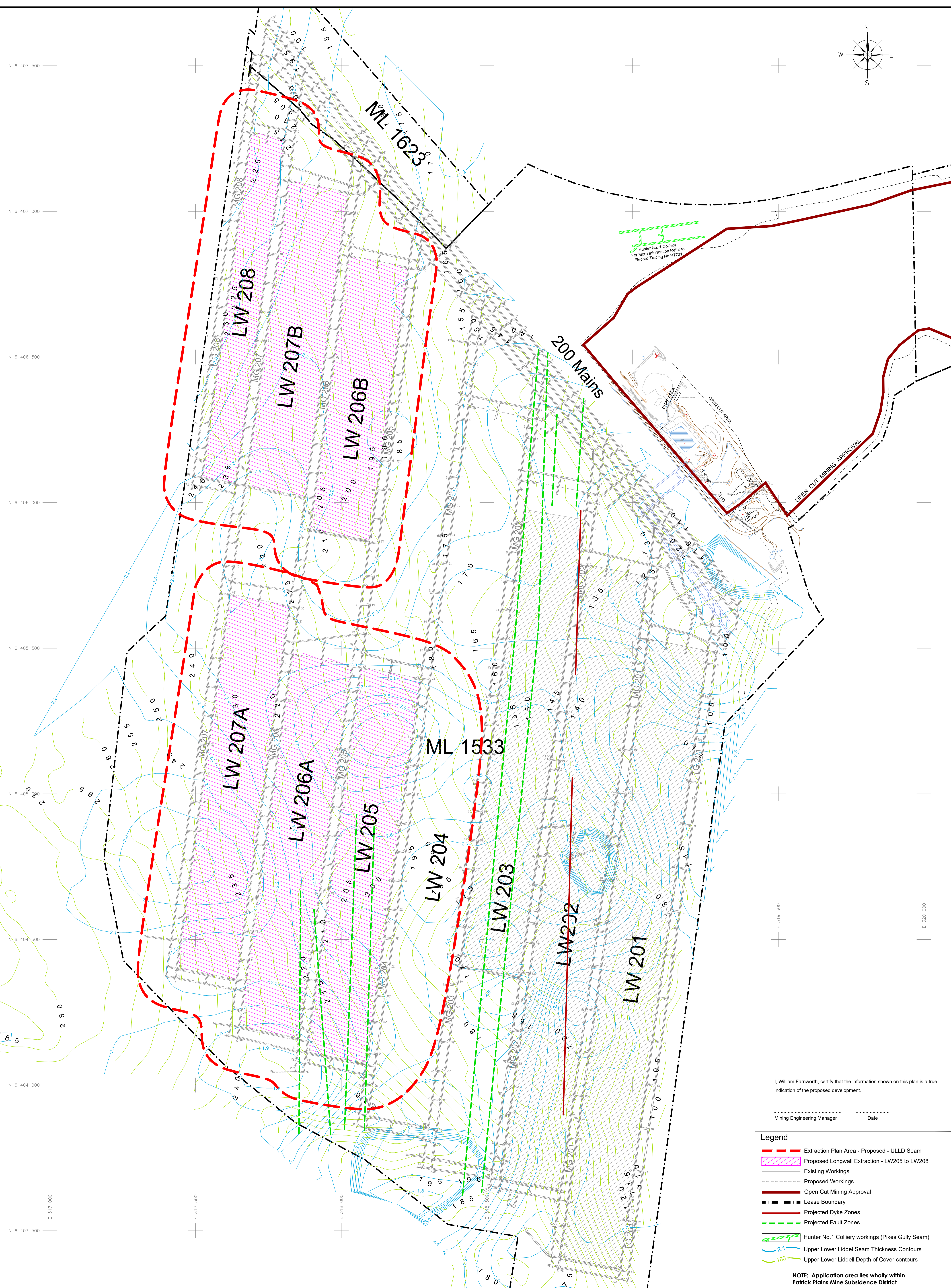
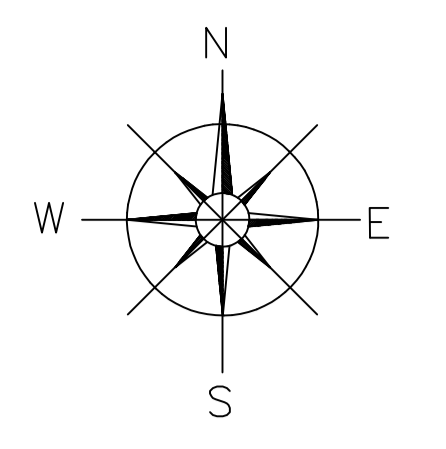
AshtonCoal
 PO Box 699 Singleton NSW 2330
 Phone 61+ 02 6576 1111 Fax 61+ 02 6576 1122

**ASHTON UNDERGROUND MINE
 PROPOSED LW205 to LW208 - UPPER LOWER LIDDELL SEAM
 PLAN No.2 - Surface Features**

Date	Scale:	Drawn	Checked	Approved
05/08/2020	1:4000	JJP	TS	AM

Drawing No.
C-4024
 Revision No.
3
 Sheet Size
A0

U:\MG-Survey\Drawings\4000-SMP Plans\C-4024 ULLD LW205-208 Extraction - Plan2.dwg



Hunter No. 1 Colliery
For Store Information Refer to
Record Tracing No RT721

OPEN CUT MINING APPROVAL

200 Mains



All measurements are in metres

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 - ULLD Seam
 - Proposed Longwall Extraction - LW205 to LW208
 - Existing Workings
 - Proposed Workings
 - Open Cut Mining Approval
 - Lease Boundary
 - Projected Dyke Zones
 - Projected Fault Zones
 - Hunter No.1 Colliery workings (Pikes Gully Seam)
 - Upper Lower Liddell Seam Thickness Contours
 - Upper Lower Liddell Depth of Cover contours

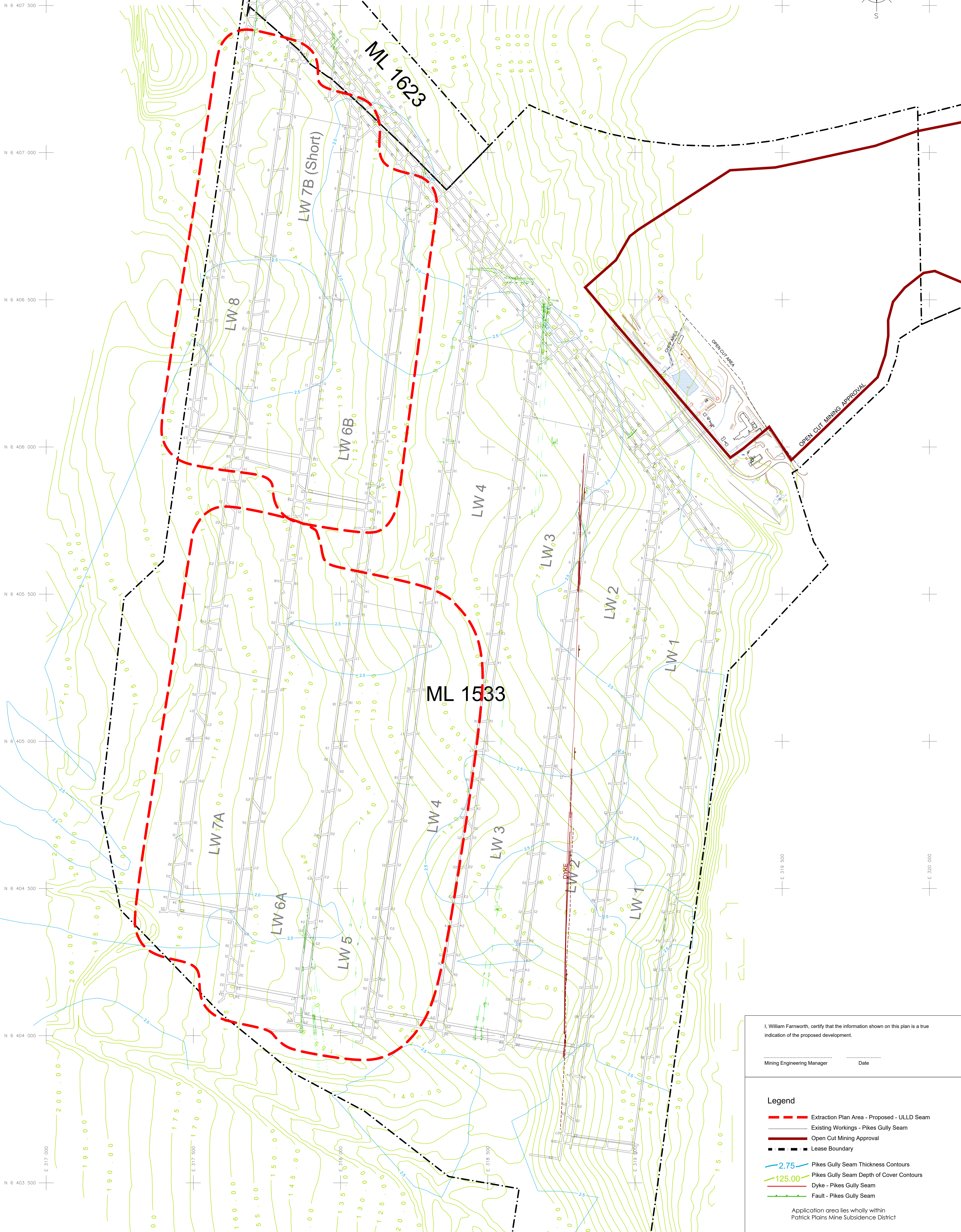
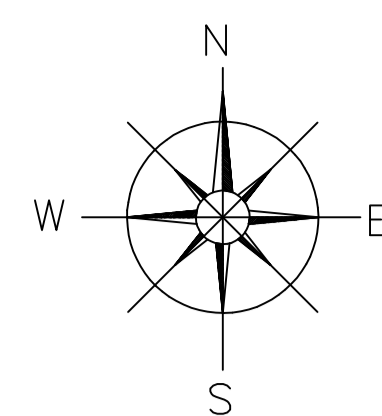
NOTE: Application area lies wholly within Patrick Plains Mine Subsidence District

AshtonCoal
PO Box 699 Singleton NSW 2330
Phone 61+ 02 6576 1111 Fax 61+ 02 6576 1122

ASHTON UNDERGROUND MINE
PROPOSED LW205 to LW208 - UPPER LOWER LIDDELL SEAM
Plan No.3 - Seam Thickness & Depth of Cover Contours

Date	Scale:	Drawn	Checked	Approved
05/08/2020	1:4000	JJP	TS	AM

Drawing No.	C-4025
Revision No.	2
Sheet Size	A0



N 6 407 500
N 6 407 000
N 6 406 500
N 6 406 000
N 6 405 500
N 6 405 000
N 6 404 500
N 6 404 000
N 6 403 500



All measurements are in metres

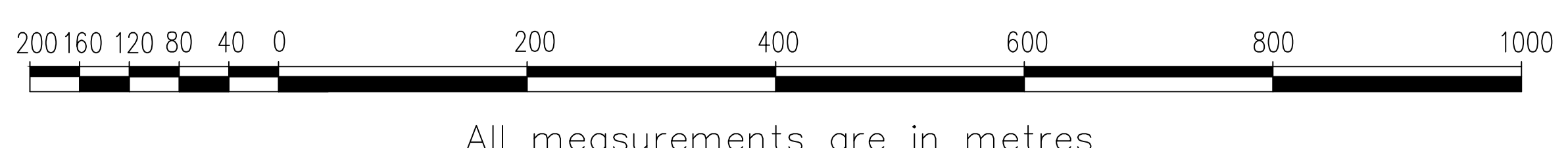
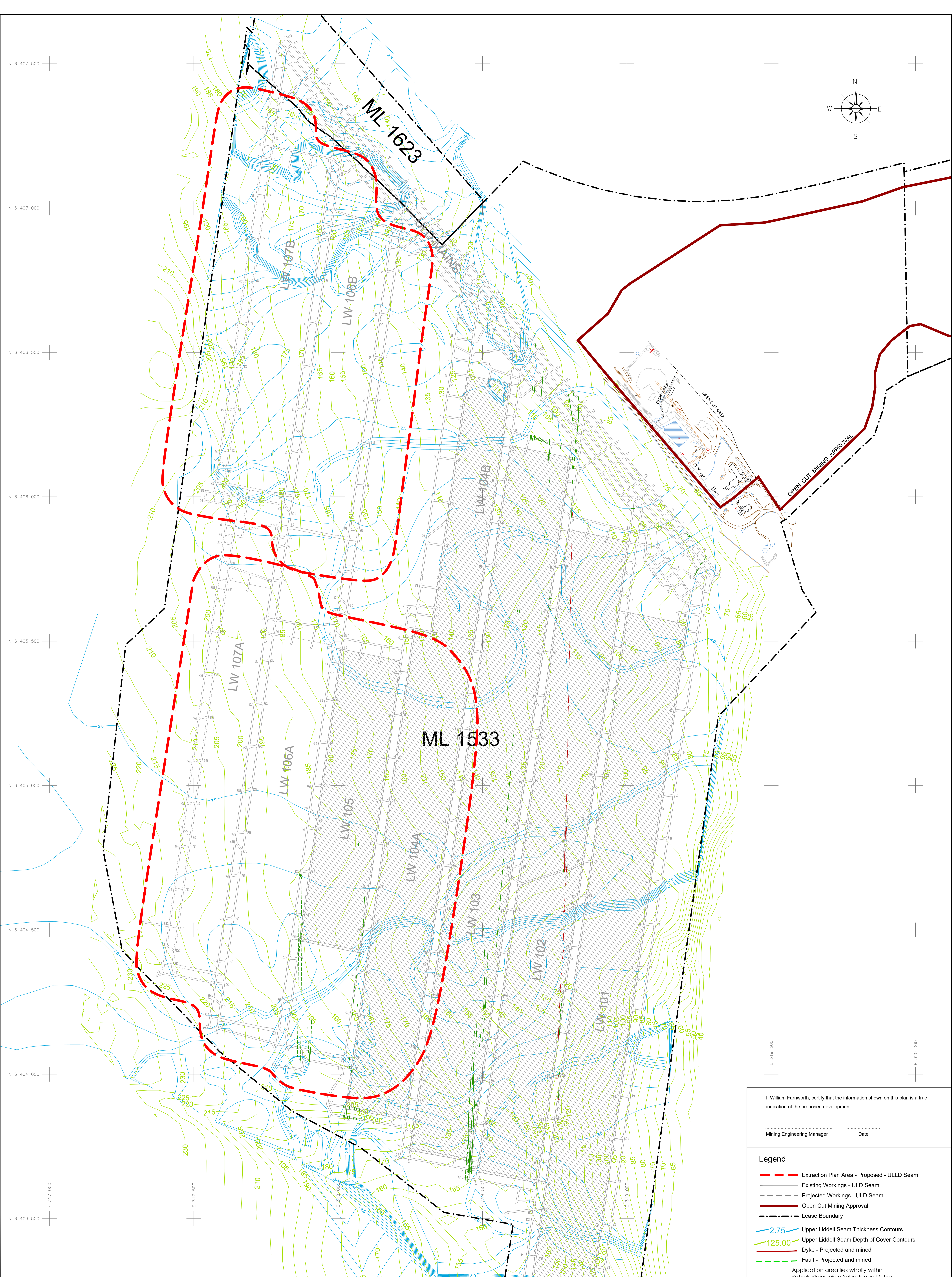
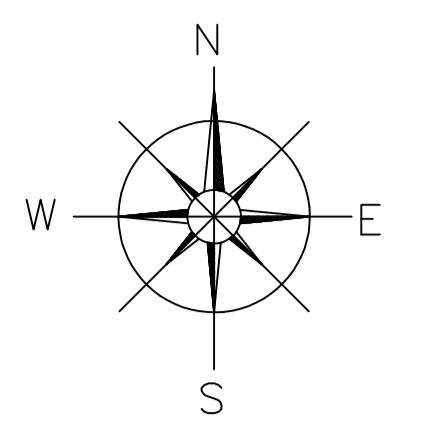
I, William Farnworth, certify that the information shown on this plan is a true indication of the proposed development.
Mining Engineering Manager _____ Date _____

- Legend**
- Extraction Plan Area - Proposed - ULLD Seam
 - Existing Workings - Pikes Gully Seam
 - Open Cut Mining Approval
 - Lease Boundary
 - 2.75 Pikes Gully Seam Thickness Contours
 - 125.00 Pikes Gully Seam Depth of Cover Contours
 - Dyke - Pikes Gully Seam
 - Fault - Pikes Gully Seam
- Application area lies wholly within Patrick Plains Mine Subsidence District

AshtonCoal
PO Box 699 Singleton NSW 2330
Phone 61+ 02 6576 1111 Fax 61+ 02 6576 1122

ASHTON UNDERGROUND MINE					Drawing No. C-4026
PROPOSED LW205 to LW208 - UPPER LOWER LIDDELL SEAM					Revision No. 2
PLAN No.4a - Pikes Gully Seam Thickness & Depth of Cover Contours					Sheet Size A0
Date 05/08/2020	Scale 1:4000	Drawn JJP	Checked TS	Approved AM	

L:\UG-SurveyDrawings\4000-SMP Plans\C-4026 ULLD LW205-208 Extraction - Plan4a.dwg



All measurements are in metres

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 - ULLD Seam
 - Existing Workings - ULD Seam
 - Projected Workings - ULD Seam
 - Open Cut Mining Approval
 - Lease Boundary
 - 2.75 Upper Liddell Seam Thickness Contours
 - 125.00 Upper Liddell Seam Depth of Cover Contours
 - Dyke - Projected and mined
 - Fault - Projected and mined
- Application area lies wholly within Patrick Plains Mine Subsidence District

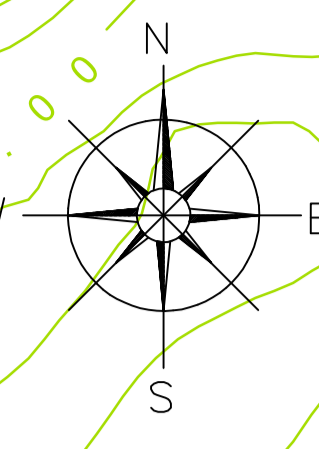
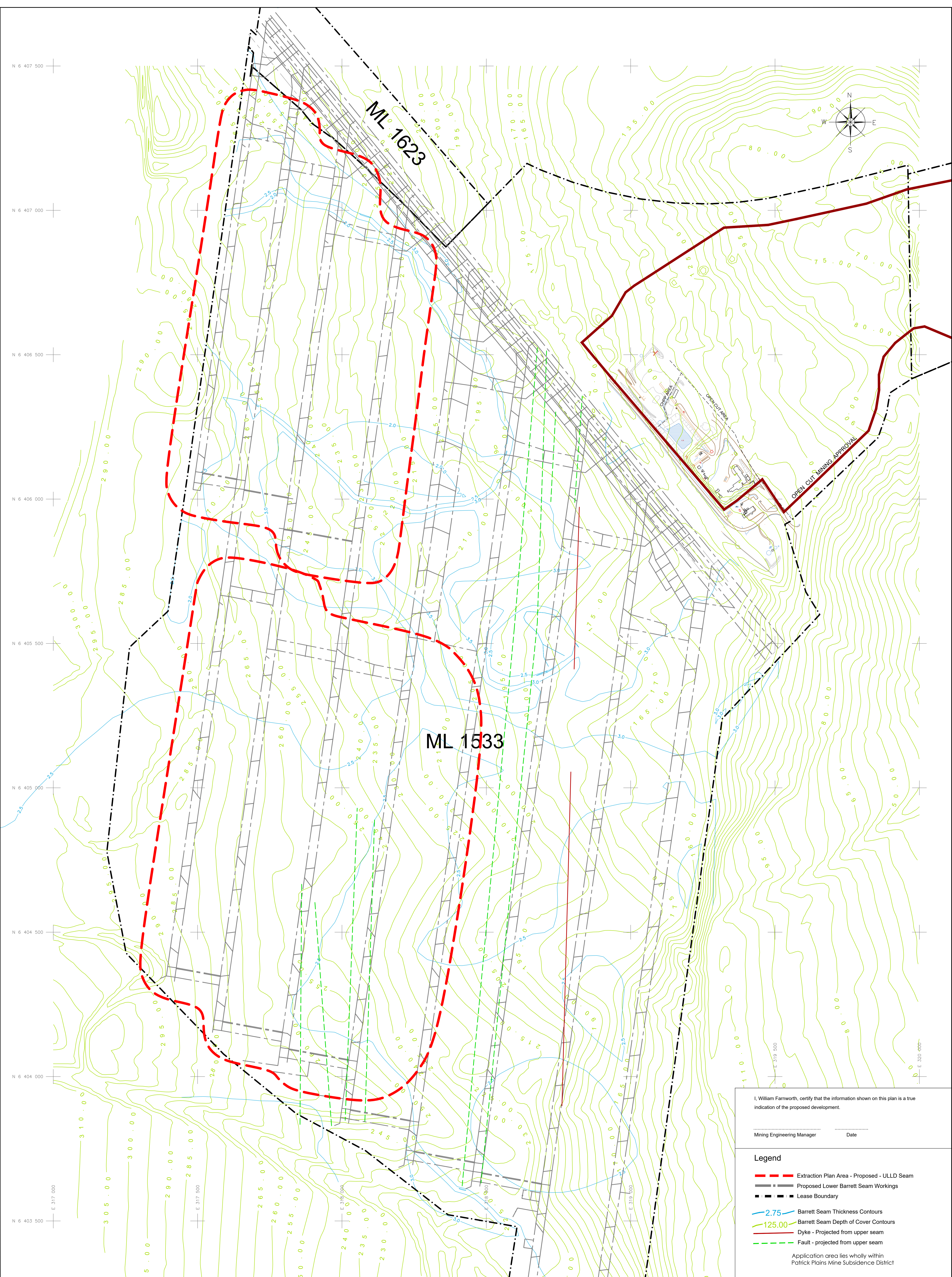
AshtonCoal
PO Box 699 Singleton NSW 2330
Phone 61+ 02 6576 1111 Fax 61+ 02 6576 1122

ASHTON UNDERGROUND MINE
PROPOSED LW205 to LW208 - UPPER LOWER LIDDELL SEAM
PLAN No.4b - Upper Liddell Seam Thickness & Depth of Cover Contours

Date	Scale	Drawn	Checked	Approved	Drawing No.
05/08/2020	1:4000	JJP	TS	AM	C-4027

Revision No.	Sheet Size
2	A0

U:\MG-SurveyDrawings\4000-SMP Plans\C-4027 ULID LW205-208 Extraction - Plan4b.dwg



ML 1623

ML 1533

OPEN CUT MINING APPROVAL

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 - ULLD Seam
 - - - Proposed Lower Barrett Seam Workings
 - - - Lease Boundary
 - 2.75 Barrett Seam Thickness Contours
 - 125.00 Barrett Seam Depth of Cover Contours
 - Dyke - Projected from upper seam
 - - - Fault - projected from upper seam
- Application area lies wholly within Patrick Plains Mine Subsidence District



All measurements are in metres

AshtonCoal
 PO Box 699 Singleton NSW 2330
 Phone 61+ 02 6576 1111 Fax 61+ 02 6576 1122

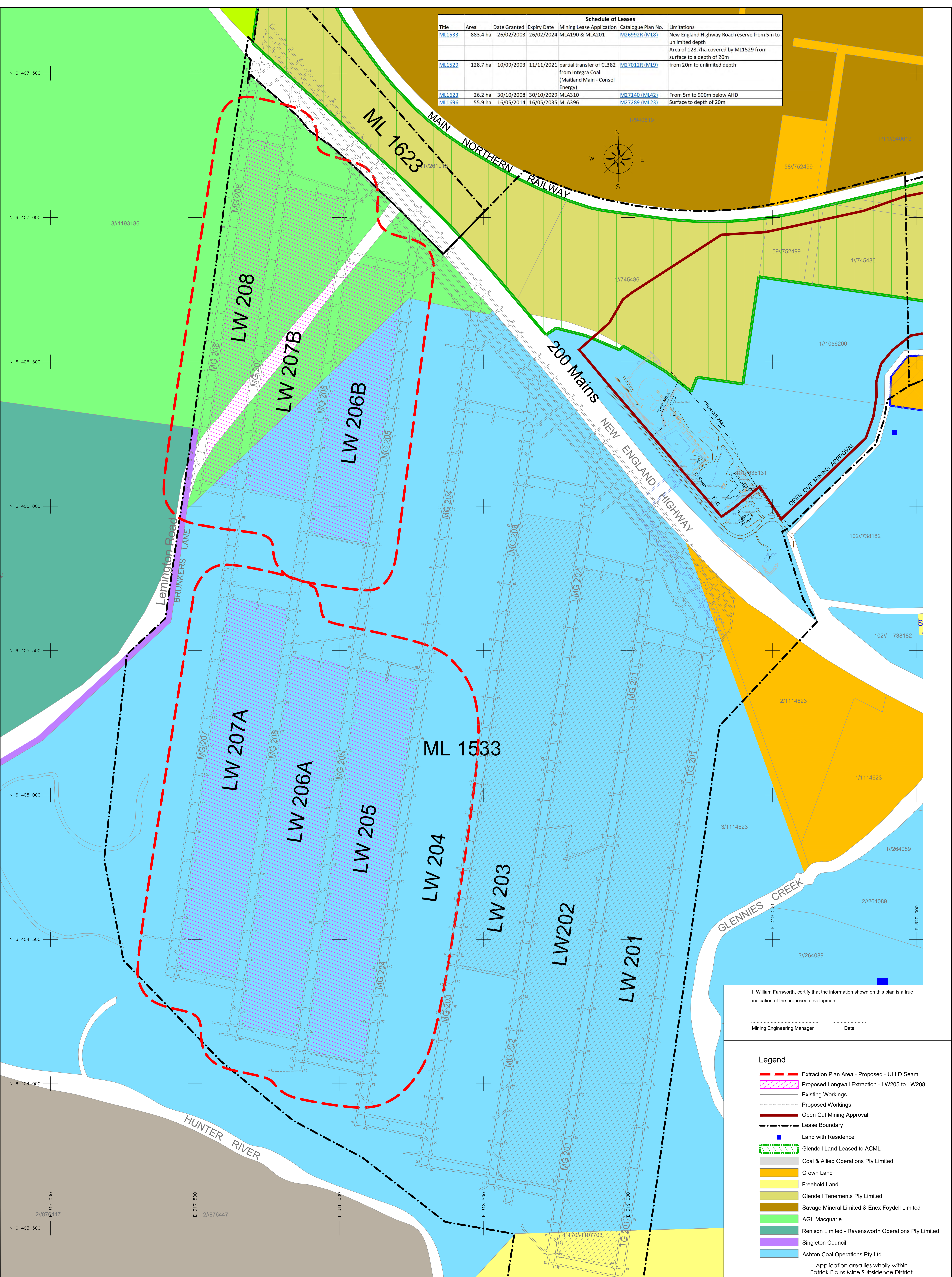
ASHTON UNDERGROUND MINE
PROPOSED LW205 to LW208 - UPPER LOWER LIDDELL SEAM
PLAN No.4c - Lower Barrett Seam Thickness & Depth of Cover Contours

Drawing No.
C-4028
 Revision No.
2
 Sheet Size
A0

Date 05/08/2020	Scale: 1:4000	Drawn JJP	Checked TS	Approved AM
--------------------	------------------	--------------	---------------	----------------

L:\UG-SurveyDrawings\4000-SMP Plans\C-4028 ULLD LW205-208 Extraction - Plan4c.dwg

Schedule of Leases						
Title	Area	Date Granted	Expiry Date	Mining Lease Application	Catalogue Plan No.	Limitations
ML1533	883.4 ha	26/02/2003	26/02/2024	MLA190 & MLA201	M26992R (ML8)	New England Highway Road reserve from 5m to unlimited depth Area of 128.7ha covered by ML1529 from surface to a depth of 20m
ML1529	128.7 ha	10/09/2003	11/11/2021	partial transfer of CL382 from Integra Coal (Maitland Main - Consol Energy)	M27012R (ML9)	from 20m to unlimited depth
ML1623	26.2 ha	30/10/2008	30/10/2029	MLA310	M27140 (ML42)	From 5m to 900m below AHD
ML1696	55.9 ha	16/05/2014	16/05/2035	MLA396	M27289 (ML23)	Surface to depth of 20m

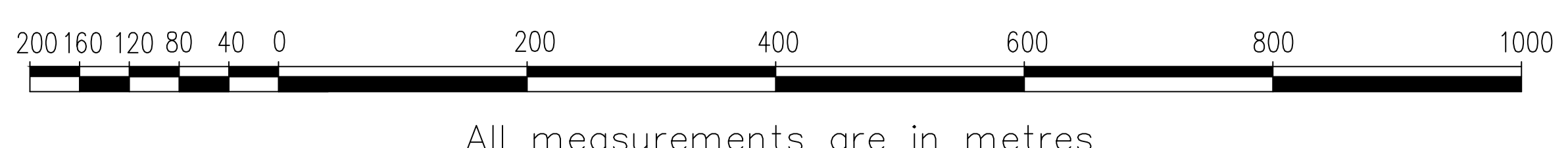


I, William Farnworth, certify that the information shown on this plan is a true indication of the proposed development.

Mining Engineering Manager: _____ Date: _____

- Legend**
- Extraction Plan Area - Proposed - ULLD Seam
 - Proposed Longwall Extraction - LW205 to LW208
 - Existing Workings
 - Proposed Workings
 - Open Cut Mining Approval
 - Lease Boundary
 - Land with Residence
 - Glendell Land Leased to ACML
 - Coal & Allied Operations Pty Limited
 - Crown Land
 - Freehold Land
 - Glendell Tenements Pty Limited
 - Savage Mineral Limited & Enx Foydell Limited
 - AGL Macquarie
 - Renison Limited - Ravensworth Operations Pty Limited
 - Singleton Council
 - Ashton Coal Operations Pty Ltd

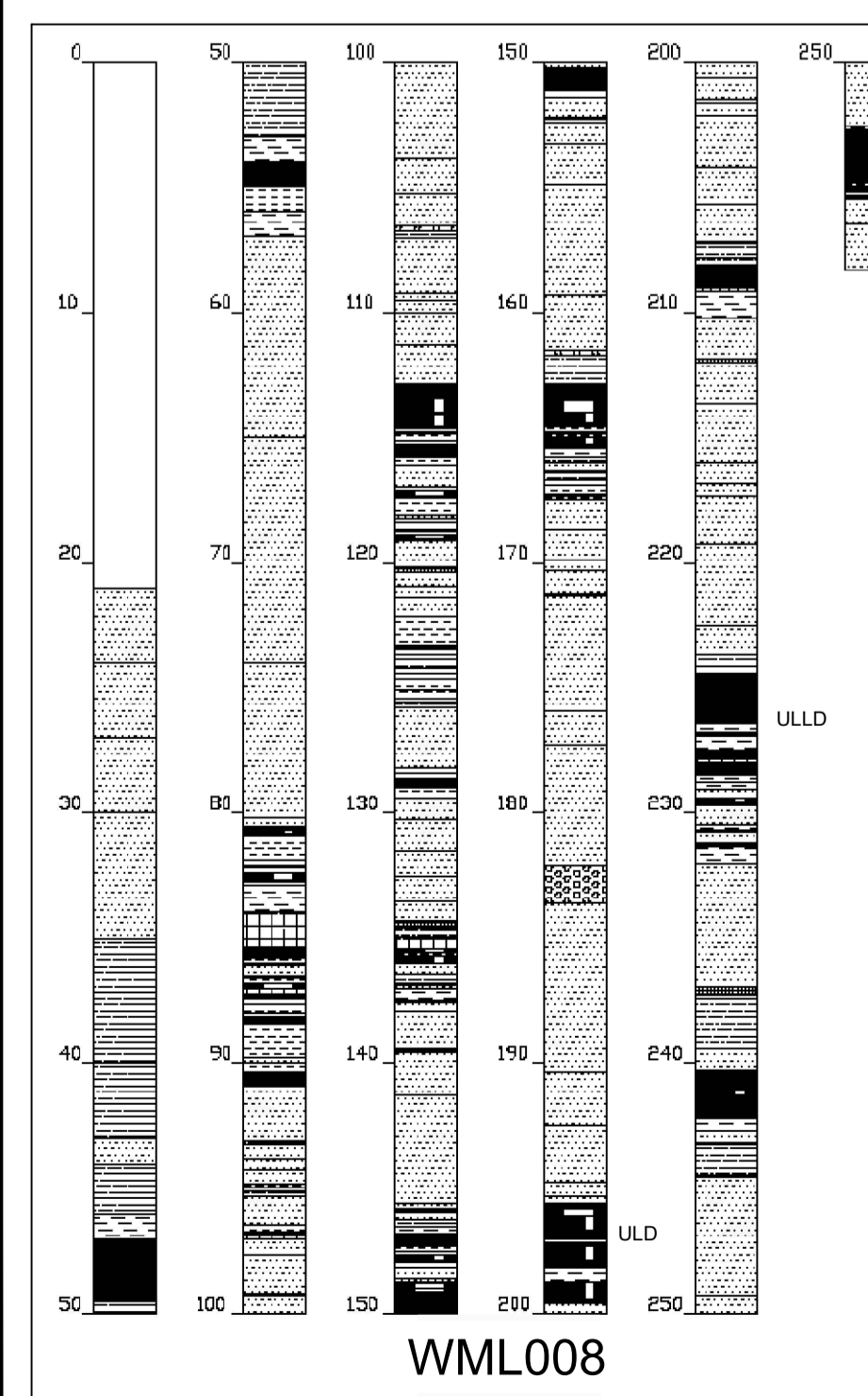
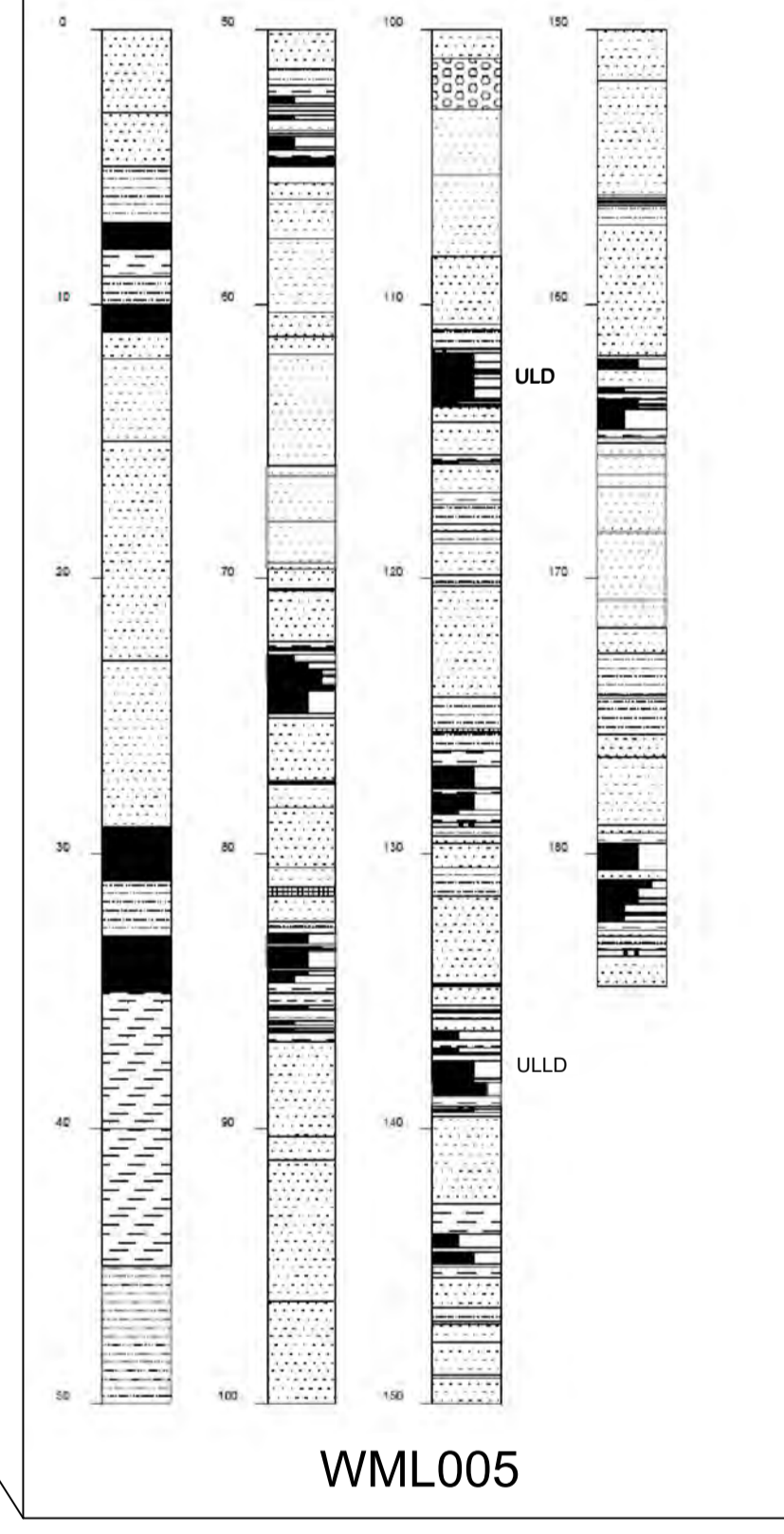
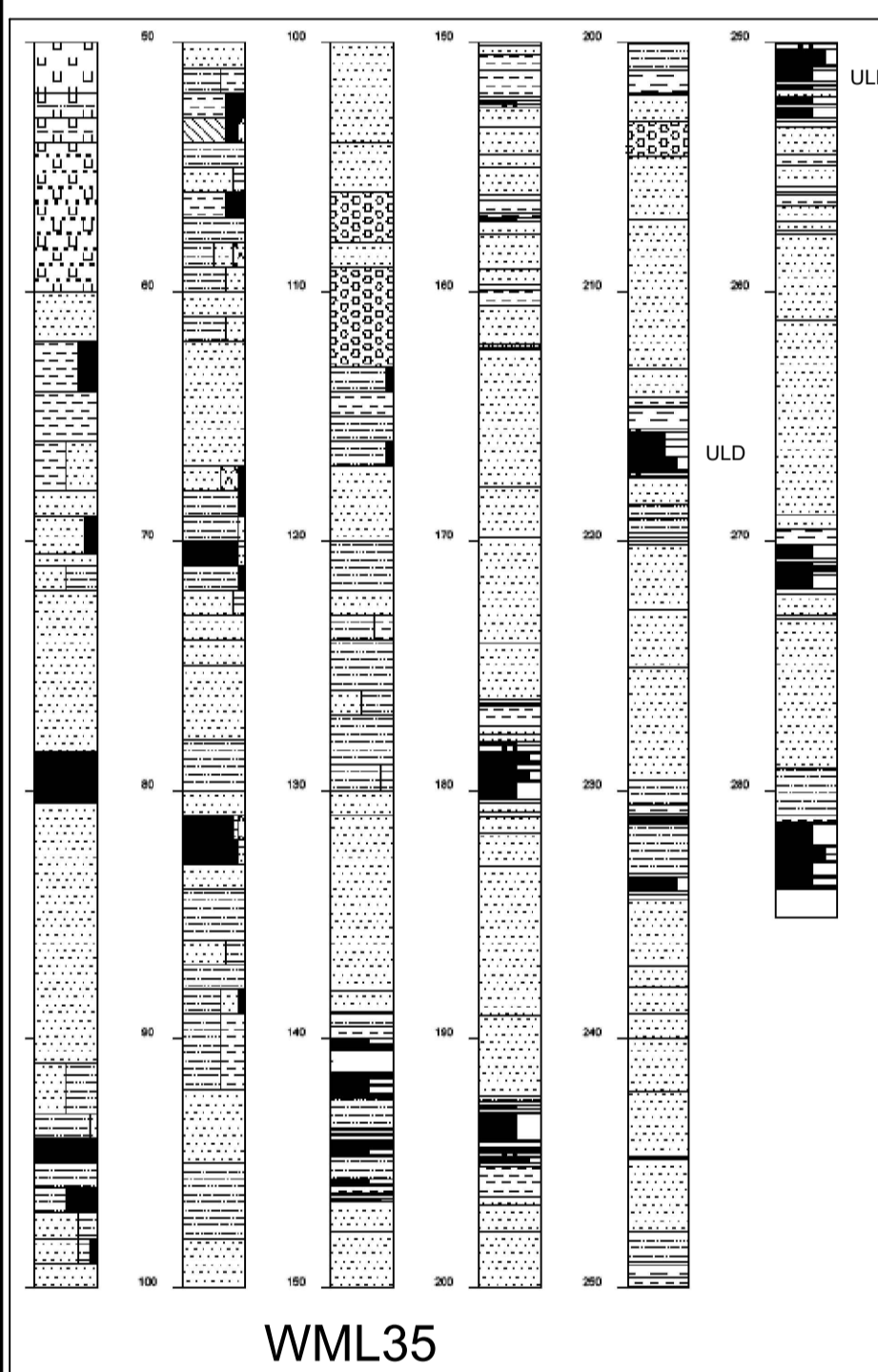
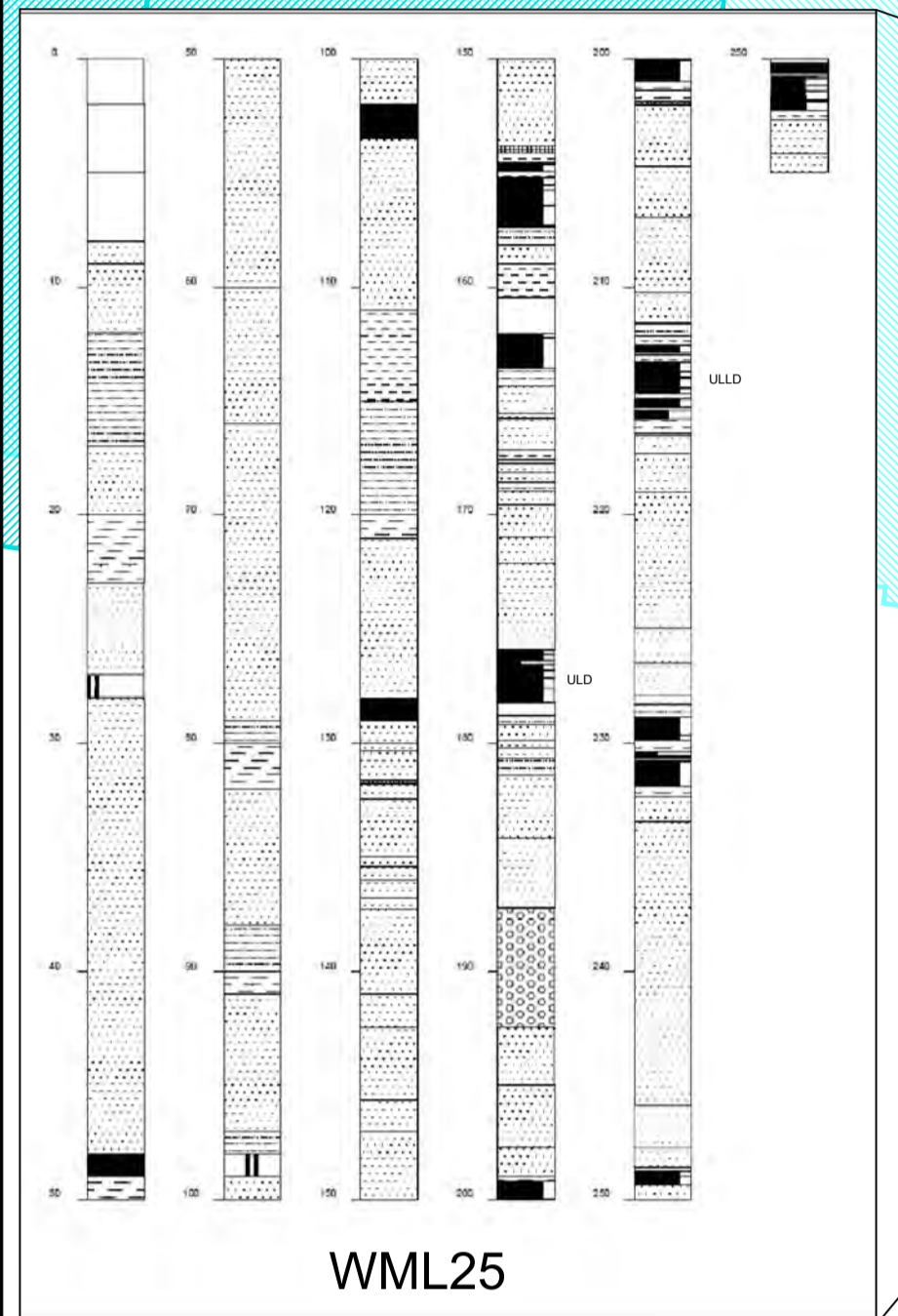
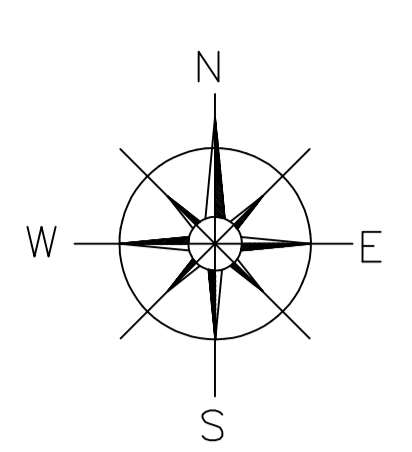
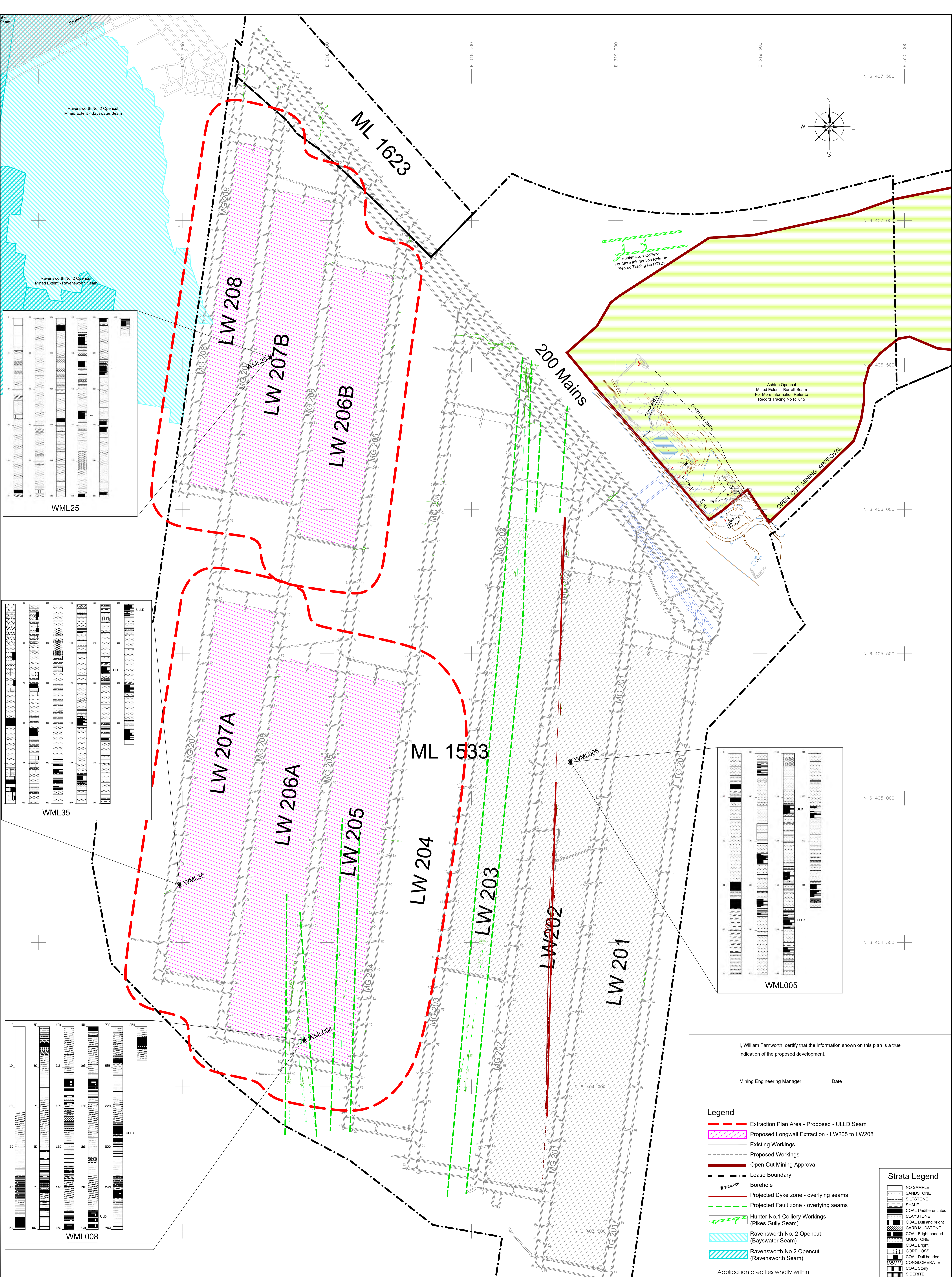
Application area lies wholly within Patrick Plains Mine Subsidence District



AshtonCoal
 PO Box 699 Singleton NSW 2330
 Phone 61+ 02 6576 1111 Fax 61+ 02 6576 1122

ASHTON UNDERGROUND MINE				Drawing No.
PROPOSED LW205 to LW208 - UPPER LOWER LIDELL SEAM				C-4029
PLAN No.5 - Mining Titles and Land Ownership				Revision No.
Date	Scale:	Drawn	Checked	Approved
05/08/2020	1:4000	JJP	TS	AM
				Sheet Size
				A0

U:\MG-Survey\Drawings\4000-SMP Plans\C-4029 ULLD LW205-208 Extraction - Plan5.dwg



I, William Farnworth, certify that the information shown on this plan is a true indication of the proposed development.

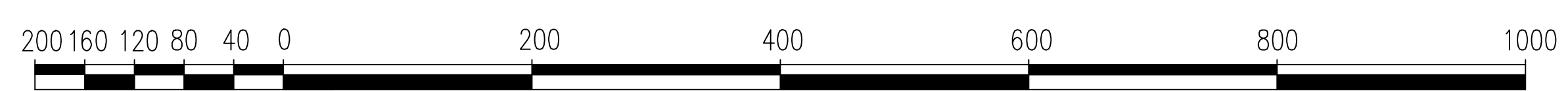
..... Date

Mining Engineering Manager

- Legend**
- Extraction Plan Area - Proposed - ULLD Seam
 - Proposed Longwall Extraction - LW205 to LW208
 - Existing Workings
 - Proposed Workings
 - Open Cut Mining Approval
 - Lease Boundary
 - Borehole
 - Projected Dyke zone - overlying seams
 - Projected Fault zone - overlying seams
 - Hunter No.1 Colliery Workings (Pikes Gully Seam)
 - Ravensworth No.2 Opencut (Bayswater Seam)
 - Ravensworth No.2 Opencut (Ravensworth Seam)
- Application area lies wholly within Patrick Plains Mine Subsidence District

Strata Legend

	NO SAMPLE SANDSTONE
	SILTY SANDSTONE
	SHALE
	COAL Undifferentiated CLAYSTONE
	COAL Dull and bright
	CARB MUDSTONE
	COAL Bright banded
	MUDSTONE
	COAL Bright
	CORE LOSS
	COAL Dull banded CONGLOMERATE
	COAL Story
	SIDERITE
	COAL Dull



All measurements are in metres

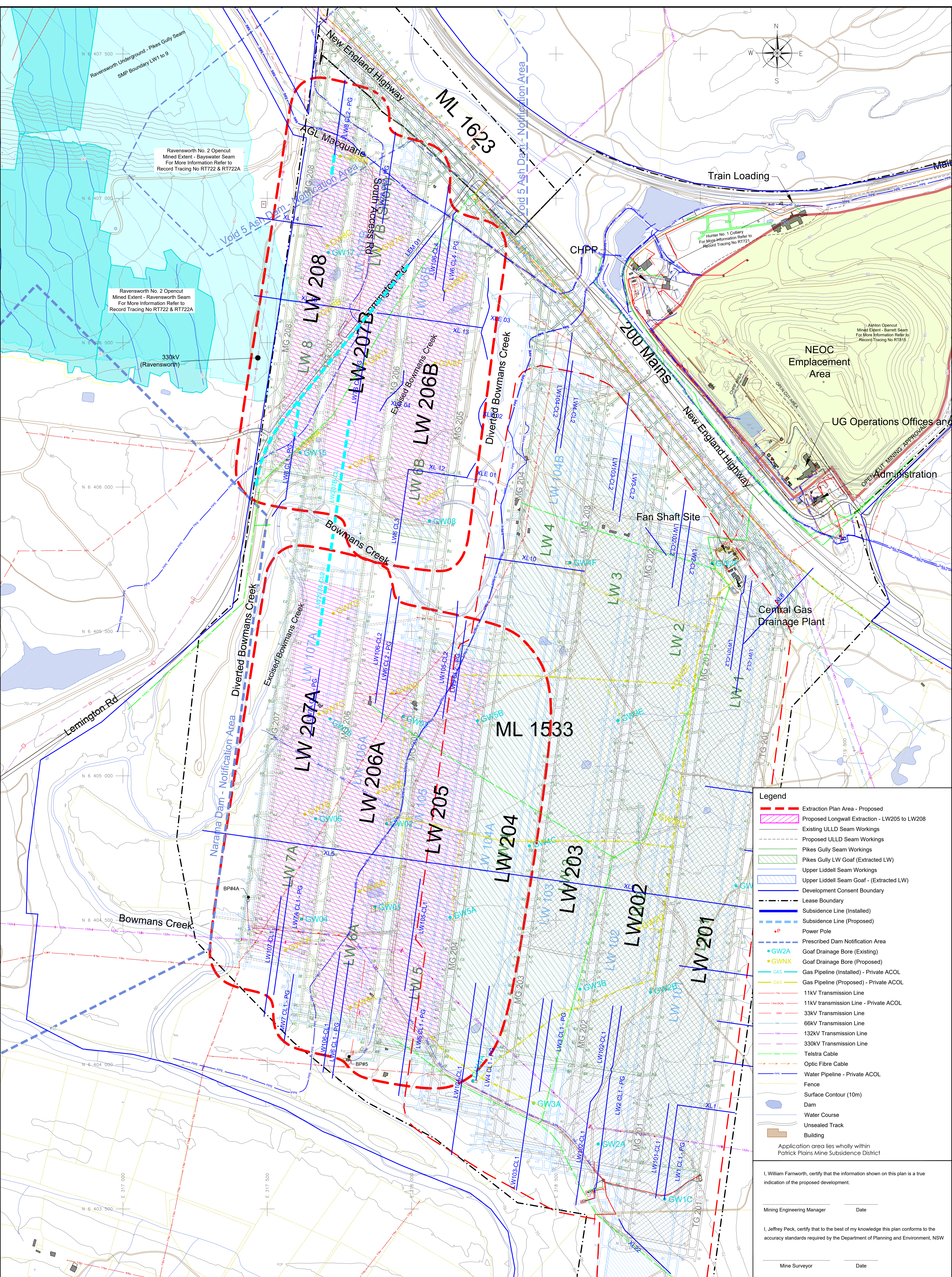
AshtonCoal
 PO Box 699 Singleton NSW 2330
 Phone 61+ 02 6576 1111 Fax 61+ 02 6576 1122

ASHTON UNDERGROUND MINE
PROPOSED LW205 to LW208 - UPPER LOWER LIDDELL SEAM
PLAN No.6 - Geological Strata Sections

Date	Scale:	Drawn	Checked	Approved
05/08/2020	1:4000	JJP	TS	AM

Drawing No.	C-4030
Revision No.	2
Sheet Size	A0

L:\MG-Survey\Drawings\4000-SMP Plans\C-4030 ULLD LW205-208 Extraction - Plan6.dwg

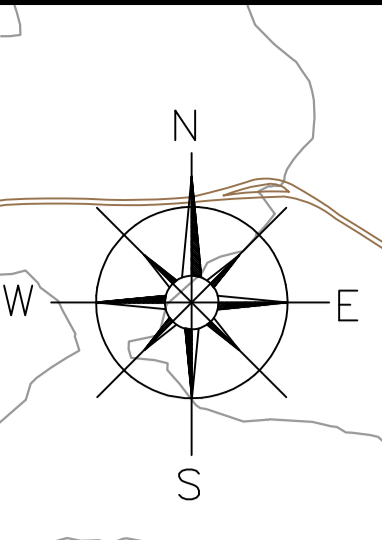


Ravensworth Underground - Pikes Gully Seam
SMP Boundary LW1 to 9

Ravensworth No. 2 Open-cut
Mined Extent - Ravensworth Seam
For More Information Refer to
Record Tracing No RT722 & RT722A

Ravensworth No. 2 Open-cut
Mined Extent - Ravensworth Seam
For More Information Refer to
Record Tracing No RT722 & RT722A

330kV
(Ravensworth)



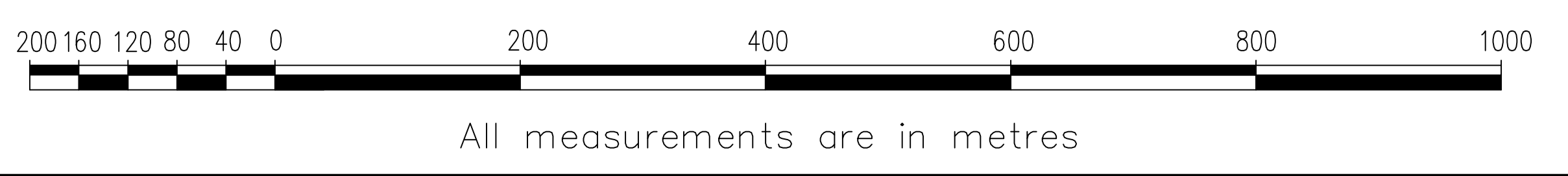
Legend	
	Extraction Plan Area - Proposed
	Proposed Longwall Extraction - LW205 to LW208
	Existing ULLD Seam Workings
	Proposed ULLD Seam Workings
	Pikes Gully Seam Workings
	Pikes Gully LW Goaf (Extracted LW)
	Upper Liddell Seam Workings
	Upper Liddell Seam Goaf - (Extracted LW)
	Development Consent Boundary
	Lease Boundary
	Subsidence Line (Installed)
	Subsidence Line (Proposed)
	Power Pole
	Prescribed Dam Notification Area
	Goaf Drainage Bore (Existing)
	Goaf Drainage Bore (Proposed)
	Gas Pipeline (Installed) - Private ACOL
	Gas Pipeline (Proposed) - Private ACOL
	11kV Transmission Line
	11kV Transmission Line - Private ACOL
	33kV Transmission Line
	66kV Transmission Line
	132kV Transmission Line
	330kV Transmission Line
	Telstra Cable
	Optic Fibre Cable
	Water Pipeline - Private ACOL
	Fence
	Surface Contour (10m)
	Dam
	Water Course
	Unsealed Track
	Building
Application area lies wholly within Patrick Plains Mine Subsidence District	

I, William Farnworth, certify that the information shown on this plan is a true indication of the proposed development.

Mining Engineering Manager Date

I, Jeffrey Peck, certify that to the best of my knowledge this plan conforms to the accuracy standards required by the Department of Planning and Environment, NSW

Mine Surveyor Date



		ASHTON UNDERGROUND MINE PROPOSED LW205 to LW208 - UPPER LOWER LIDDELL SEAM PLAN No. 7 - Subsidence Monitoring		Drawing No. C-4031				
PO Box 699 Singleton NSW 2330 Phone 61+ 02 6576 1111 Fax 61+ 02 6576 1122		Date 05/08/2020	Scale: 1:4000	Drawn: JJP	Checked: TS	Approved: AM	Revision No. 2	Sheet Size A0

Appendices

Appendix A

Key Project Approval & Mining Lease Conditions

Table A1: Development Consent (DA 309-11-2001-i MOD 5) Conditions Extraction Plan Document Reference

Condition No.	Condition Requirement	Addressed in EP
Schedule 3, Condition 32	Extraction Plan The Applicant must prepare an Extraction Plan for all second workings on site. This plan must:	This document
	(a) be prepared by a team of suitably qualified and experienced experts whose appointment has been endorsed by the Secretary;	S3.1
	(b) be approved by the Secretary;	This application
	(c) include detailed plans of the proposed second workings and any associated surface development;	EP and Appendices
	(d) include detailed performance indicators for each of the performance measures in Table 10;	Specific management plans
	(e) provide revised predictions of the conventional and non-conventional subsidence effects, subsidence impacts and environmental consequences of the proposed second workings, incorporating any relevant information obtained since this consent, that specifically addresses the incremental and cumulative subsidence effects and impacts of multi-seam mining;	Volume 2 – Subsidence Assessment and Technical Reports
	(f) describe the measures that would be implemented to ensure compliance with the performance measures in Table 10, and remediate any predicted subsidence impacts and/or environmental consequences;	BFMPs and Site Environmental Management Plans
	(g) include the following, which have been prepared in consultation with RR:	
	<ul style="list-style-type: none"> a coal resource recovery plan that demonstrates effective recovery of the available resource; 	Appendix J
	<ul style="list-style-type: none"> a subsidence monitoring program to: <ul style="list-style-type: none"> provide data to assist in the management of the 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; 	Appendix I
	<ul style="list-style-type: none"> a Built Features Management Plan, which has been prepared in consultation with the owners of such features, to manage the potential impacts and consequences of subsidence on any built features; 	Appendix G
	<ul style="list-style-type: none"> a Public Safety Management Plan to ensure public safety in the underground mining area; and a revised Rehabilitation Management Plan; 	Appendix H
	<ul style="list-style-type: none"> a revised Rehabilitation Management Plan; 	Covered under the approved MOP
(h) include a: <ul style="list-style-type: none"> Water Management Plan, which has been prepared in consultation with EPA and DPI Water, to manage the potential impacts and consequences of subsidence on surface water and groundwater resources, flooding and existing and proposed creek diversions, and which includes: 	Appendix C	

Condition No.	Condition Requirement	Addressed in EP
	<ul style="list-style-type: none"> - surface and groundwater impact assessment criteria, including trigger levels for investigating any potentially adverse impacts on water resources or water quality; - a program to monitor and report groundwater inflows to underground workings; - a program to manage and monitor impacts on groundwater bores on privately-owned land; 	
	<ul style="list-style-type: none"> • Biodiversity Management Plan, which has been prepared in consultation with OEH, to manage the potential impacts and consequences of subsidence on biodiversity, and which includes: <ul style="list-style-type: none"> - a program of works to ensure that overall terrestrial and aquatic biodiversity values are the same or better than existing in Bowmans Creek prior to longwall mining; - measures to manage potential impacts and/or environmental consequences of the proposed second workings on aquatic and terrestrial flora and fauna; 	Appendix E
	<ul style="list-style-type: none"> • Land Management Plan, which has been prepared in consultation with relevant landowners, to manage the potential impacts and consequences of subsidence on land in general; 	Covered under the approved <i>Flora and Fauna (Biodiversity) Management Plan</i> and MOP. A cross reference table has been prepared (Appendix D)
	<ul style="list-style-type: none"> • Heritage Management Plan, which has been prepared in consultation with OEH and relevant stakeholders for Aboriginal heritage, to manage the potential impacts and consequences of subsidence on heritage sites or values; 	Appendix F
	(i) include Trigger Action Response Plans, or equivalent, to address potential subsidence impacts and environmental consequences that may result from mining subsidence;	Appendix B
	(j) include a contingency plan that expressly provides for adaptive management where monitoring indicates that there has been an exceedance of any performance measures in Table 10, or where any such exceedance appears likely; and	Appendix B
	(k) include a program to collect sufficient baseline data for future Extraction Plans.	Appendix I

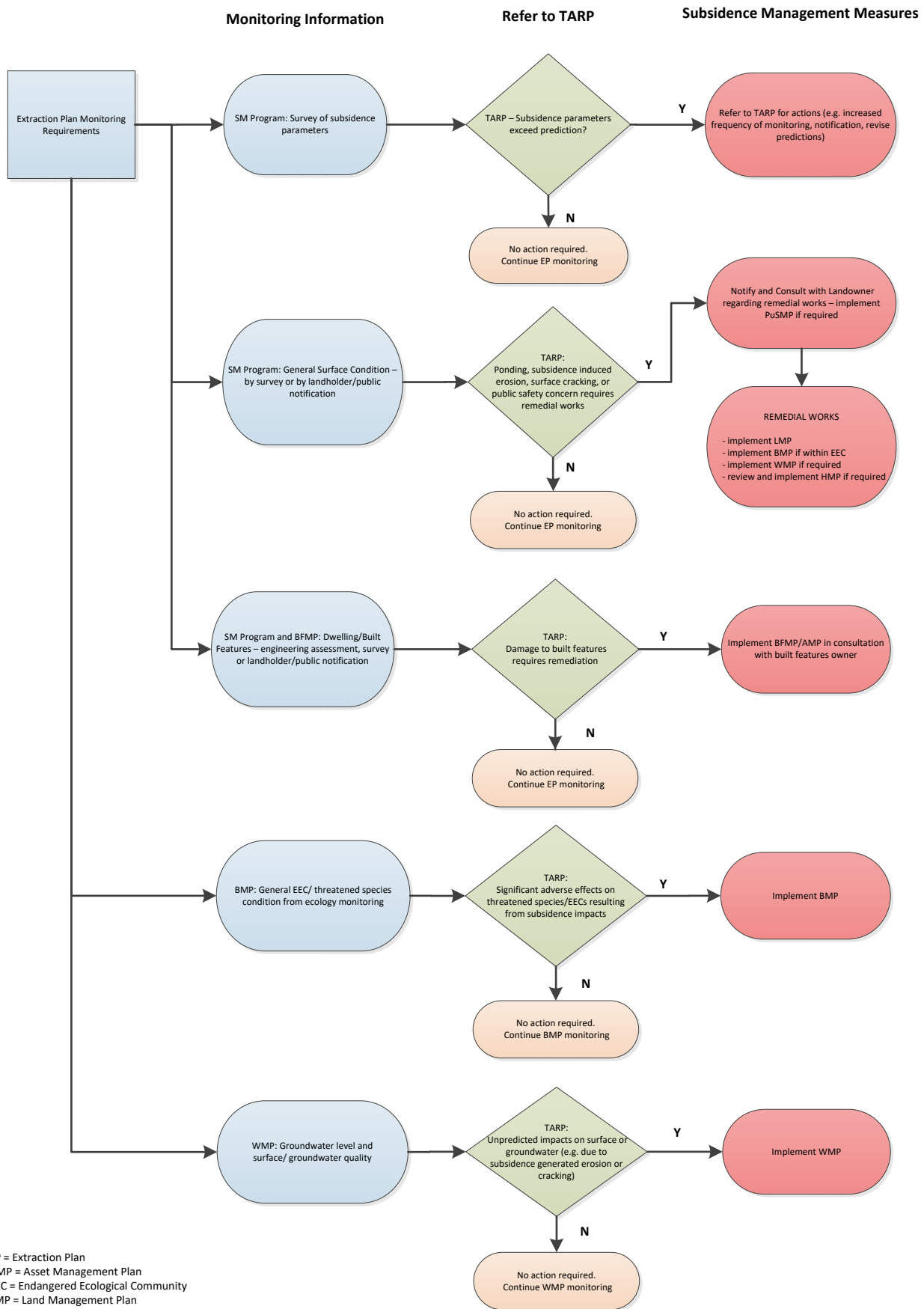
Table A2: Key Mining Lease ML1533 Conditions relating to Subsidence

Condition	Mining Lease Requirement	Comment / Reference
18	The lease holder shall not interfere in any way with fences on or adjacent to the subject area unless the prior written approval of the owner thereof or the Minister and subject to such conditions as the Minister may stipulate.	Built Features MP
19	The lease holder shall observe any instruction given or which may be given by the Minister with a view to minimising or preventing public inconvenience or damage to public or private property.	Public Safety MP
20	If required to do so by the Minister and within such time as may be stipulated by the Minister the lease holder shall carry out to the satisfaction of the Minister surveys of structures, buildings and pipelines on adjacent landholdings to determine the effect of operations on any such structures, buildings and pipelines.	Subsidence Assessment (ASH4552, 2016) undertaken. Specific BFMP's prepared.
21	If so directed by the Minister the lease holder shall rehabilitate to the satisfaction of the Minister any lands within the subject area which may have been disturbed by the lease holder.	Covered under the MOP.
30	The lease holder shall conduct operations in such a manner as not to cause or aggravate soil erosion and the lease holder shall observe and perform any instructions given or which may be given by the Minister with a view to minimising or preventing soil erosion.	Covered under the MOP and Water Management Plan.
31	<p>The lease holder shall pay to Singleton Council, Department of Land and Water Conservation or the Chief Executive, Roads and Traffic Authority the cost incurred by such Council or Department or Chief Executive of making good any damage caused by operations carried on by or under the authority of the lease holder to any road adjoining or traversing the surface or the excepted surface, as the case may be of the subject area.</p> <p>Provided however that the amount to be paid by the lease holder as aforesaid shall be reduced by such sum of money if any as may be paid to the said Council, the Department of Land and Water Conservation or the Chief Executive, Roads and Traffic Authority as the case may be from the Mine subsidence Compensation Fund constituted under the Mine Subsidence Compensation Act 1961, in settlement of a claim for compensation for the same damage.</p>	All management of built features covered under specific BFMPs.
32	In the event of operations being conducted on the surface of any road, track or firetrail traversing the subject area or in the event of the operations causing damage to or interference with any such road, track or firetrail the lease holder, at his own expense, shall if directed to do so by the Minister provide to the satisfaction of the Minister an alternate road, track or firetrail in a position as required by the Minister and shall allow free and uninterrupted access along such alternate road, track or firetrail and, where required to do so by the Minister, the lease holder shall upon completion of operations rehabilitate the surface of the original road, track or firetrail to a condition satisfactory to the Minister.	All management of built features covered under specific BFMPs

Appendix B

Extraction Plan Flowchart & TARP

EXTRACTION PLAN SUBSIDENCE MONITORING AND MANAGEMENT FLOWCHART – LONGWALLS 205 TO 208



EP = Extraction Plan
 AMP = Asset Management Plan
 EEC = Endangered Ecological Community
 LMP = Land Management Plan
 BMP = Biodiversity Management Plan
 PuSMP = Public Safety Management Plan
 BFMP = Built Features Management Plan
 HMP = Heritage Management Plan
 WMP = Water Management Plan
 SM Program = Subsidence Monitoring Program

**ASHTON COAL MINE – TRIGGER ACTION RESPONSE PLAN (TARP)
SUBSIDENCE MANAGEMENT LW205 TO LW208**

		ASHTON COAL MINE – TRIGGER ACTION RESPONSE PLAN (TARP) SUBSIDENCE MANAGEMENT LW205 TO LW208		
			CONTAINMENT / REMEDIATION MEASURES	ADAPTIVE MANAGEMENT MEASURES & CONTINGENCY PLANS
TRIGGERS	SUBSIDENCE PARAMETERS	NORMAL Less than predicted	Monitoring as per SM Program	
		TRIGGER LEVEL 1 Exceeds Max Predicted Total Subsidence Parameters for Each Panel (by less than 20%)	Monitoring as per SM Program Notify OM, TSM and ECS	Review subsidence predictions based on monitoring data
		TRIGGER LEVEL 2 Exceeds Max Predicted Total Subsidence Parameters for Each Panel (by more than 20%)	Notify DPIE and RR Notify affected landholders and/or infrastructure owners	Increase frequency of subsidence parameter monitoring Update subsidence predictions based on monitoring data Update impact assessment on natural and built features Review and update Extraction Plan
	BUILT FEATURES (PRIVATE PROPERTY)	NORMAL No damage requiring remediation	Monitoring as per Individual AMP	
		TRIGGER LEVEL 1 Built Feature experience damage below Safe Serviceable Repairable (SSR) criteria	Notify landholder Monitoring as per Individual AMPs Implement measures as per the relevant AMP	Review impact assessment based on observed damage Review landholder AMP
		TRIGGER LEVEL 2 Built Feature experiences damage above Safe Serviceable Repairable (SSR) criteria	Notify landholder Notify DPIE and RR Implement measures as per the relevant AMP	Update impact assessment based on observed damage Review landholder AMP
	BUILT FEATURES (INFRASTRUCTURE) (POWERLINES, TELECOMMUNICATIONS & PUBLIC ROADS)	NORMAL No damage requiring remediation	Monitoring as per Individual AMPs	
		TRIGGER LEVEL 1 Built Feature experience damage below Safe Serviceable Repairable (SSR) criteria	Notify infrastructure owner Monitoring as per Individual AMPs Implement measures as per the relevant AMP	Review impact assessment based on observed damage Review individual AMP for services in conjunction with Infrastructure owner to ensure these remain safe and serviceable
		TRIGGER LEVEL 2 Built Feature experience damage above Safe Serviceable Repairable (SSR) criteria	Notify infrastructure owner Notify RR Monitoring as per Individual AMPs Implement measures as per the relevant AMP	Update impact assessment based on observed damage Review individual AMP for services in conjunction with Infrastructure owner to ensure these remain safe and serviceable
	SURFACE IMPACTS THAT RESULTS IN PUBLIC SAFETY ISSUES	NORMAL Minor cracking (<100mm)	Monitoring as per SM Program, LMP and Public Safety MP	
TRIGGER LEVEL 1 Moderate cracking (>100 - <300mm), surface irregularities (i.e. humps), unstable trees		Notify landowner in accordance with Public Safety MP Rehabilitate landform, land use and ecosystem function in accordance with LMP in consultation with landowner	Review impact assessment based on observed damage	
TRIGGER LEVEL 2 Major cracking (>300mm), surface irregularities (i.e. humps), erosion Mass movement of steep slope		Notify landowner in accordance with Public Safety MP Rehabilitate landform, land use and ecosystem function in accordance with LMP in consultation with landowner Notify RR Implement public safety risk mitigation in accordance with Public Safety MP (notification, warning signs, traffic control)	Update impact assessment based on observed damage Provide ongoing resources to prevent access to the affected area until remediation plan can be enacted Remediate in accordance with LMP, BMP and WMP	
SURFACE WATERCOURSES (WATER QUALITY, CHANNEL/BANK STABILITY)	NORMAL No change to water quality or channel/bank stability from mining related impacts identified through routine water quality monitoring or BCD geomorphic assessments	Monitoring as per SM Program and WMP		
	TRIGGER LEVEL 1 Deterioration trend in stream water quality or impacts to channel stability outside of predictions identified through routine water quality monitoring or BCD geomorphic assessments	Follow the Surface and Groundwater Response Plan as per the WMP Establish whether water quality / channel stability is being impacted by underground mining impacts or environmental consequences Remediate in accordance with LMP where works are not on "Waterfront Land"	Consult with DPIE-Water - where works are required on "Waterfront Land" Remediate in accordance with LMP and any requirements of DPIE-Water	
	TRIGGER LEVEL 2 Subsidence remediation works required in watercourse	Consult with DPIE-Water - where works are required on "Waterfront Land" Remediate in accordance with LMP (MOP) and any requirements of DPIE-Water	Review subsidence assessment	
GROUNDWATER RESOURCES	NORMAL No adverse impact on groundwater	Monitoring as per WMP		
	TRIGGER LEVEL 1 Impacts outside predictions but significantly benign to cause no immediate adverse impact	Follow the Surface and Groundwater Response Plan as per the WMP		
	TRIGGER LEVEL 2 Continual exceedance outside the range of impact predictions and/or immediate adverse impact	Conduct investigation to determine the extent of the impacts and identify contributing factors as per the WMP	Review monitoring program and the WMP Review groundwater or subsidence assessment and update monitoring and management plans	
FLOOD AND PONDING	NORMAL No significant change in drainage or ponding as shown in WMP	Monitoring as per SM Program and LMP (MOP)		
	TRIGGER LEVEL 1 Drainage or ponding impacts outside of predictions	Remediate in accordance with LMP (MOP) in consultation with relevant land owner	Remediate in accordance with LMP (MOP)	
	TRIGGER LEVEL 2 Ponding prevents access to private property	Correct drainage to allow temporary access	Correct drainage flow to prevent future access issues	
CULTURAL HERITAGE	NORMAL No impact to identified sites	Monitoring as per HMP		
	TRIGGER LEVEL 1 Impacts identified outside of predictions	Follow protocols in the HMP and approved Aboriginal Heritage Impact Permit (AHIP)	Review subsidence assessment	
	TRIGGER LEVEL 2 Remediation encounters new Cultural Heritage site	Cease work immediately, notify Registered Aboriginal Parties and Heritage NSW, follow protocol in HMP and AHIP to assess the extent, nature and significance of the Aboriginal object(s)	Follow outcomes of the AHIP process and the HMP including (where agreed)	
ECOLOGICAL VALUES	NORMAL No significant adverse impact to threatened species, populations, habitats and/or ecological communities	Monitoring as per BMP		
	TRIGGER LEVEL 1 Subsidence induced impact outside of predictions on terrestrial flora and fauna identified by Ecologist or SM Program	Continue monitoring as per BMP Assess whether significant adverse impact to threatened species, populations, habitats and/or ecological communities has occurred	Develop remediation plan as appropriate in consultation with relevant land owner Remediate in accordance with the LMP (MOP)	
	TRIGGER LEVEL 2 Remediation works to threatened species, populations, habitats and/or ecological communities have failed to successfully remediate the impact in accordance with LMP (MOP)	Continue monitoring as per BMP Review rehabilitation process and procedure and implement alternative method if feasible	Review BMP and subsidence assessment	
RESPONSIBILITIES	OPERATIONS MANAGER (OM)	Ensure adequate resources are available to implement the Extraction Plan		
	TECHNICAL SERVICES MANAGER (TSM)	Arrange monitoring as per Public Safety MP Owner of the Public Safety MP Owner of the Coal Resources Recovery Plan Owner of the SM Program	Notify RR and PSE of identified public safety issues Notify PSE and RR of subsidence exceedance	Update subsidence prediction and impact assessment as required Increase frequency of subsidence monitoring in consultation with PSE Stabilise unstable structures Reduce safety hazards to that of pre mining Update subsidence predictions based on monitoring data Participate in review and update of Extraction Plan
	ENVIRONMENT & COMMUNITY SUPERINTENDENT (ECS)	Arrange monitoring as per BMP Arrange monitoring as per the BFMP and AMPs Arrange monitoring as per LMP Arrange monitoring as per HMP Arrange monitoring as per the WMP Owner of the BMP, BFMP, AMPs, LMP, HMP & WMP Seek access for monitoring programs	Conduct further assessments investigations where required by BMP, HMP, WMP Rehabilitate land in accordance with LMP, WMP, BMP and HMP Develop remediation plan in consultation with land owner and Heritage NSW (where required) Notify landholder of exceedances of performance criteria Arrange pre mining subsidence building inspections as per AMP Arrange temporary water replacement as required	Provide ongoing resources to prevent access to the affected area until remediation plan can be enacted Develop remediation strategy with landowner and Heritage NSW Correct drainage to prevent future access issues Signage and access restriction as per Public Safety MP Consult with DPIE-Water - where remediation works are required on "Waterfront Land" Consult with and seek endorsement from Secretary of DPIE for biodiversity offsets required by BMP Review and update Extraction Plan
	REGISTERED MINE SURVEYOR	Arrange monitoring as per SM Program Undertake subsidence monitoring as per SM Program, LMP, BFMP and Public Safety MP		

EP = Extraction Plan, SM Program = Subsidence Monitoring Program, LMP = Land Management Plan, BMP = Biodiversity Management Plan, Public Safety MP = Public Safety Management Plan, BFMP = Built Features Management Plan, AMP = Asset Management Plan HMP = Heritage Management Plan, WMP = Water Management Plan, DPIE = Department of Planning, Industry and Environment, RR = NSW Resources Regulator, DPIE-Water = Department of Planning, Industry and Environment – Water, PSE = Principal Subsidence Engineer of RR.

Appendices C – K

(Provided Separately)

Appendix C	Water Management Plan Addendum
Appendix D	Land Management Plan Addendum
Appendix E	Biodiversity Management Plan Addendum
Appendix F	Heritage Management Plan Addendum
Appendix G	Built Features Management Plan (including Asset Management Plans)
Appendix H	Public Safety Management Plan
Appendix I	Coal Resource Recovery Plan
Appendix J	Subsidence Monitoring Program
Appendix K	Mining Operations Plan