Ashton Coal Mine

Longwalls 201 to 204

Extraction Plan

November 2016

TITLE BLOCK

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APPENDICES

1 INTRODUCTION

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

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

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

ACOL has subsequently prepared an Extraction Plan for longwall mining of LW201 to 204 in the ULLD Seam of the Ashton Underground Coal Mine, varying between 105 metres and 230 metres below the surface. Proposed longwall mining in the Extraction Plan area of 201 to 204 (the **EP Area** – refer **Figure 1.1**) is due to commence in April 2017, and is planned to take place over a three year period.

The location of Ashton's mining areas, and previous mining is shown with the Ashton Mine Complex in **Figure 1.1**.

1.1 SCOPE & OBJECTIVE

The Extraction Plan for Longwalls 201 to 204 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 management strategies for subsidence induced impacts on natural and built features from secondary extraction of longwall panels LW201 to LW204 within the Upper Lower Liddell (ULLD) Seam at Ashton using traditional longwall mining techniques (the **Extraction Plan Area** shown as).

The objective of the Extraction Plan will be achieved by:

- Providing an overview of the planned coal resource recovery methods;
- Identifying the predicted subsidence impacts and/or environmental consequences within the Extraction Plan area associated with the planned coal recovery;
- Identifying the management activities (including monitoring and remediation) prepared to address the predicted subsidence impacts from secondary extraction of longwall panels LW201 to LW204 within the ULLD Seam at Ashton; and
- Identifying the review and reporting activities to allow for assessment of the performance of subsidence management measures by Ashton, and identification of areas where either

continual improvement may be achieved, or management of unpredicted subsidence impacts can be managed.

1.2 DOCUMENT STRUCTURE

The Extraction Plan has been prepared to address conditions of DA 309-11-2001-i (MOD 5), and structured in general 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:

Volume 1 - Extraction Plan	Asset Management Plans	Volume 2 - Specialist Assessments	Volume 3 - A0 Plans
•EP - Main Doc •Water Management Plan (Reference Addendum Report) •Land Management Plan (Reference Addendum Report) •Biodiversity Management Plan(Reference Addendum Report) •Heritage Management Plan (Reference Addendum Report) •Built Features Management Plan •Public Safety Management Plan •Subsidence Monitoring Program •Coal Resource Recovery Plan	•Property 130 BFMP •Ausgrid 132 kV BFMP •Ausgrid 11kV BFMP •RMS BFMP •Telstra BFMP •*Asset Management Plans currently being developed with stakeholders	•Subsidence Assessment (SCT) •Surface and Groundwater Report AGE) •Risk Assessment Workshop (SLR) •Archaeology (Insite) •Flora and Fauna (Umwelt)	•Prepared internally by ACOL Surveyors

It should be noted that Addendum documents have been prepared for the Biodiversity Management Plan, Archaeology and Cultural Heritage Management Plan, Land Management Plan and Water 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 and details 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; and

- **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 described in **Table 1.1**.

Table 1.1 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
Biodiversity 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.

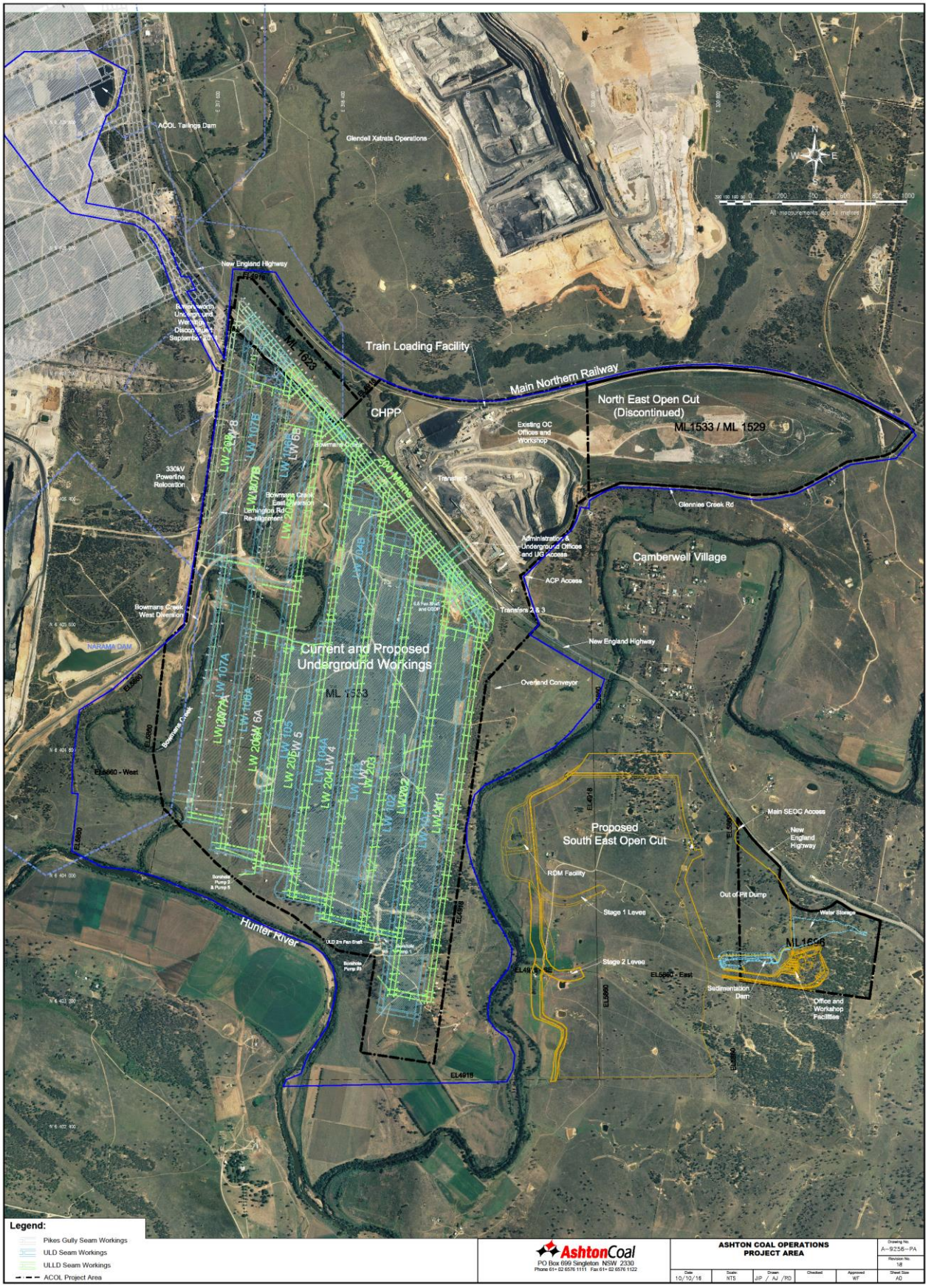


Figure 1.1 Ashton Mine Complex

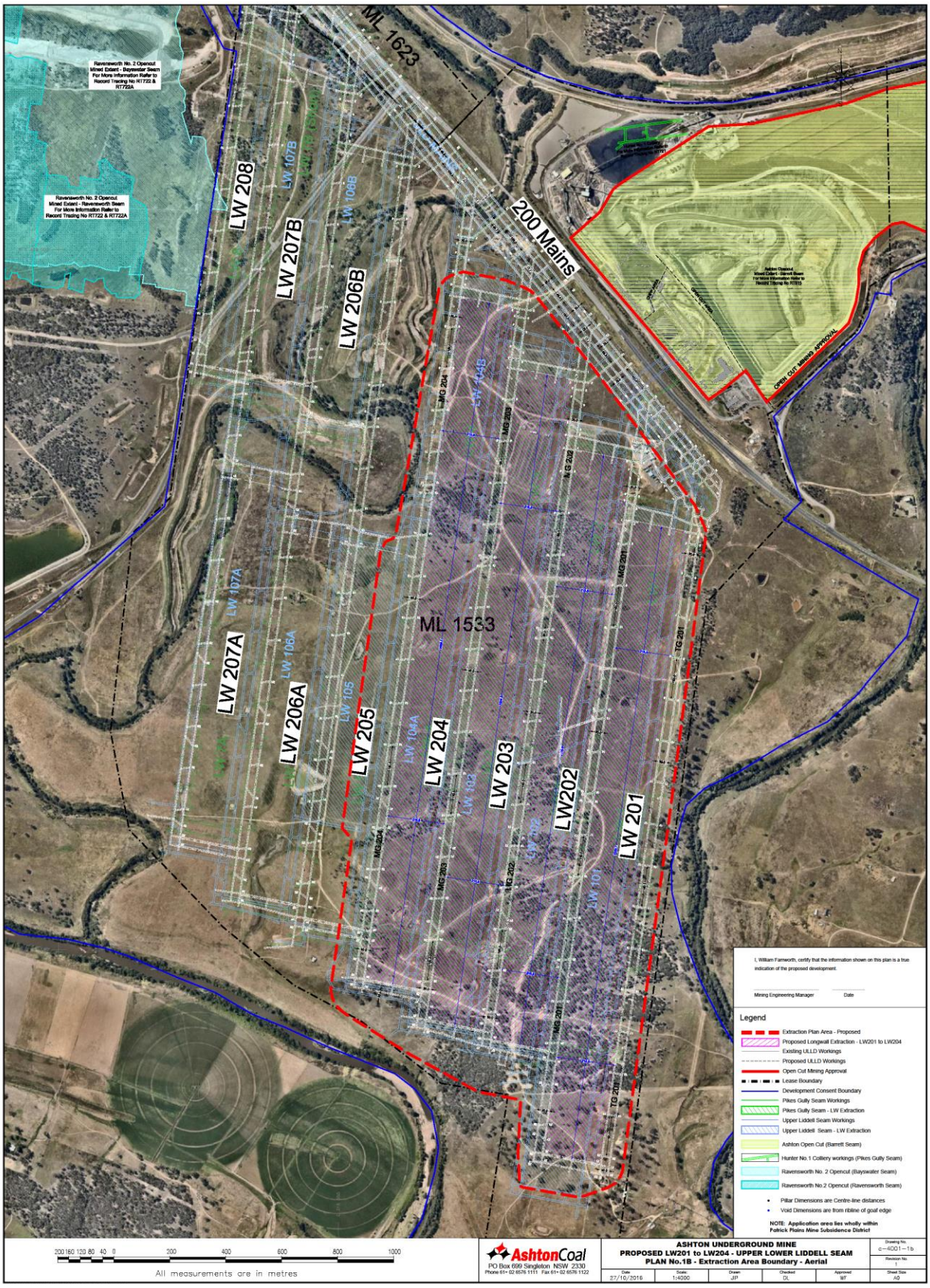


Figure 1.2 Extraction Plan Area

2 OVERVIEW

2.1 ENVIRONMENTAL CONTEXT

2.1.1 Environmental Setting

The Extraction Plan Area surface expression is approximately 230 ha and is located in Camberwell, approximately 14 kilometres north-west of Singleton in the Hunter Valley of NSW.

The surface topography within the Extraction Plan Area is dominated by a steeply rising ridgeline adjacent to Glennies Creek above Longwall 201 from which the ground slopes west toward Bowmans Creek (Foy Brook) floodplain and the broader Hunter River floodplain to the south. There are 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 line.

On the western edge of the Extraction Plan Area, Bowmans Creek flows down a channel incised into a broad floodplain and the adjacent slopes. This watercourse was previously diverted by ACOL in two locations to allow for more efficient recovery of the coal resource. A portion of both the original creek alignment and the eastern diversion channel are within the Extraction Plan Area adjacent to the northern part of Longwall 204.

The Hunter River, as defined by the edge of the Hunter River Alluvium is located outside the southern edge of the Extraction Plan Area and comes within approximately 160 metres and 150 metres respectively of the corners of Longwalls 203 and 204.

Glennies Creek meanders along the eastern side of the proposed mining but is outside the 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 however Longwalls 201-204 are not located directly below any alluvium.

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

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 millimetres 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 2.1**.**

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 also includes rural residential and vegetated land. The village of Camberwell is located approximately 1 km north-east of the Extraction Plan Area.

The Extraction Plan Area is predominately cattle grazing land owned by ACOL other than a small part in the far south-east known as Property 130. Property 130 is a privately owned dairy farm which is serviced on a daily basis with access across ACOL land located above the underground mining area via a 'right of way' agreement. The access road in an unsealed road that traverse the Extraction Plan Area from north to south. An alternative access road is available across the central part of the mining area.

The Extraction Plan Area is located to the south of the New England Highway which is a Road and Maritime Services controlled road.

The Extraction Plan Area is located within Mining Lease 1533 (refer to **Figure 1.1** and **Graphical Plan 5**).

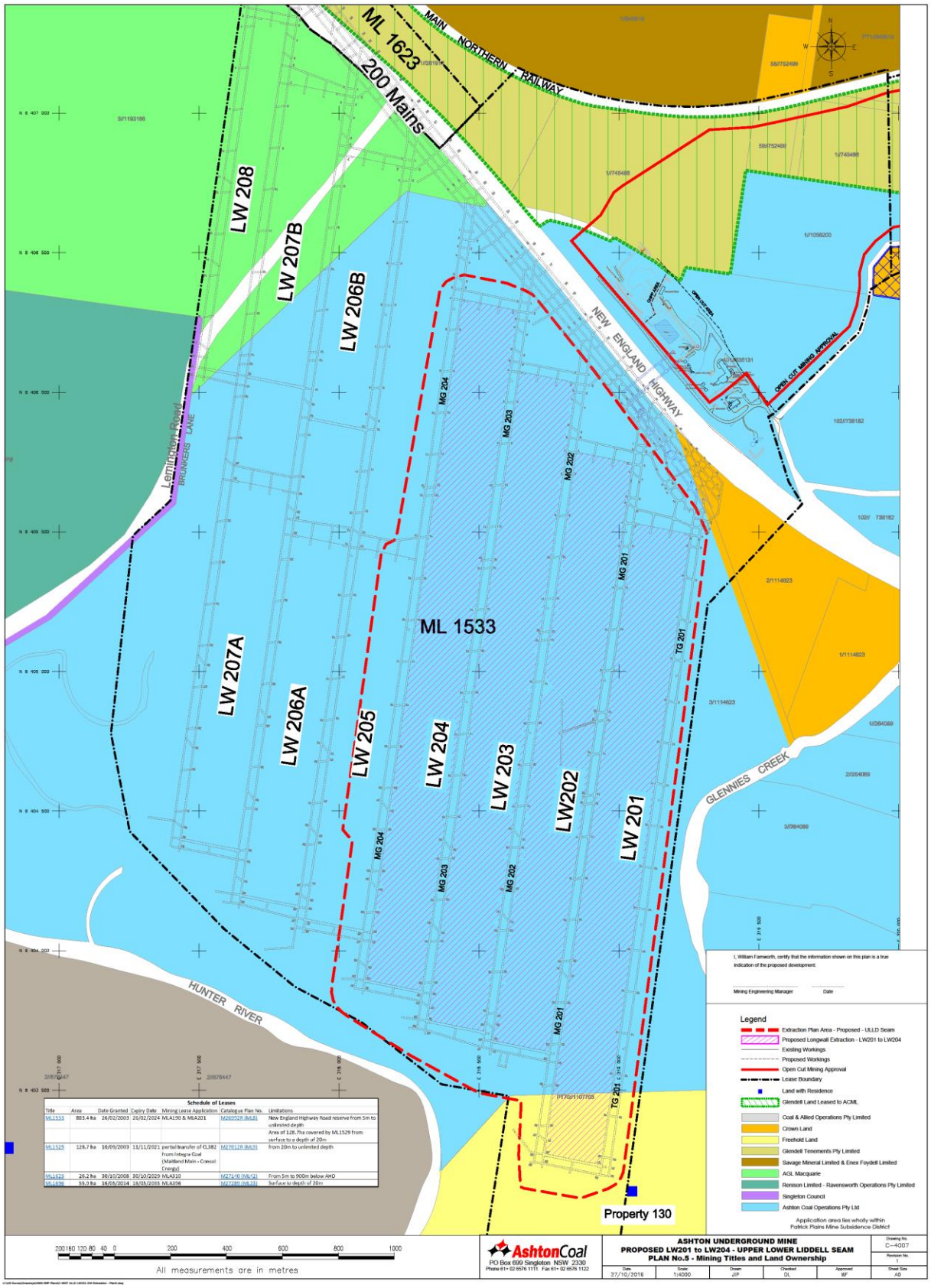


Figure 2.1 Extraction Plan Area Land Ownership

2.1.3 Natural and Built Features within Extraction Plan Area

A summary of natural features within the Extraction Plan Area include:

- Vegetation communities within the Extraction Plan Area includes Central Hunter Box-Ironbark Woodland EEC and Derived Grassland (Umwelt, 2016);
- No groundwater dependent ecosystems within the Extraction Plan Area (Umwelt, 2016) ;
- No threatened flora species have been recorded in the Extraction Plan Area during previous ecological surveys. A total of 20 threatened fauna species have been recorded, or are considered likely to occur within the Extraction Plan Area (Umwelt, 2016);
- A number of minor drainage lines reporting to the surrounding creeks and rivers (SCT, 2016); and
- A number of extant Archaeological heritage sites are located within the Extraction Plan area, with these outlined within the specialist Heritage Assessment (Insite Heritage).

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

- Communications infrastructure (local copper cables);
- Ausgrid above ground 132kV and 11kVpowerlines; and
- Rural property infrastructure (private access tracks, sheds, tanks, farm dams, fences).

2.2 MINE PLANNING, DESIGN AND RESOURCE RECOVERY

2.2.1 Extraction Plan Area

The Extraction Plan Area under consideration is that area likely to be affected by the mining of Longwalls 201 to 204 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 the proposed Longwalls 201 to 204.

2.2.2 Mining Domains

Longwalls 201 to 204 are located within ULLD seam mining area. This is Ashton's third seam of Longwall mining, following on from the Pikes Gulley Seam (Panels 1 - 8) and Upper Liddell Seam (Panels 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

Ashton intends to mine the ULLD seam by conventional retreating longwall mining methods. Seam thickness varies between 1.7 metres to 2.8 metres within the extraction area. Extraction height will typically be 2.5 metres.

Development roadways are generally driven at 2.7 metres high x 5.4 metres 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. Therefore following mining in the ULLD seam, mining will progressively access the reserves within the Lower Barrett (LB) Seam as approved under the Development Consent. ACOL intends to extract the remainder of the ULD Seam prior to completing mining of the ULLD Seam.

It should be noted that there remains some uncertainty regarding the interburden thickness between the ULD and ULLD seams at the southernmost end of LW201. A minimum interburden of 15m is required to ensure geotechnical integrity. Further drilling is planned to define the interburden between the two seams in this area. As a result LW201 may be shortened to accommodate the minimum interburden requirement.

The estimated recovery of the resource within the Extraction Plan Area is provided in **Table 2.1**.

Table 2.1 Extraction Plan Area Estimated Resource Recovery

Total tonnes of coal (Resource within Extraction Plan area)	11.27Mt
Total tonnes extracted through development	1.01Mt
Tonnes extracted by Longwall	8.83Mt
Percentage recovery	87%

Particulars relating to each longwall panel is given in **Table 2.2**.

Table 2.2 Individual Longwall Tonnages

Panel	Panel Length (m)	Panel Width (void m)	Average Extraction Height (m)	Panel Extraction Tonnes (Mt)
LW201	2,290	215.8	2.5	1.97
LW202	2,137	215.8	2.5	2.07
LW203	2,355	215.8	2.5	2.38
LW204	2,470	215.8	2.5	2.41

Table 2.3 Longwall Mining Rate and Sequence

Panel	Start Date	End Date	Estimate Duration (Days)
LW201	April 2017	Dec 2017	240
LW202	Jan 2018	Sept 2018	240
LW203	Oct 2018	June 2019	255
LW204	July 2019	March 2020	255

Table 2.4 Longwall Geological Attributes

Panel	Depth of Cover (m)	Seam Thickness (m)	Roof and Floor Conditions	Geological Anomalies
LW201	105 - 175	1.7 – 2.8	Distal from geological anomalies the roof is expected to be competent with some zones of potentially soft floor.	Fault zone associated with dyke expected within MG201 chain pillar including in the installation face and back road
LW202	125 - 190	1.7 – 2.8	Distal from geological anomalies the roof is expected to be competent with some zones of potentially soft floor.	Igneous Dolerite Dyke is expected trending north-south through the Panel
LW203	145 - 210	1.9 – 2.8	Distal from geological anomalies the roof is expected to be competent with some zones of potentially soft floor.	Graben Fault Zone is expected trending north-south through the Panel
LW204	150 - 230	2.3 – 2.8	Distal from geological anomalies the roof is expected to be competent with some zones of potentially soft floor.	Fault zone expected within MG204 chain pillar outbye from installation face and back road

2.2.5 Mine Design In Relation to Subsidence Management

At Ashton underground mine, Longwalls 1 – 8 were mined in the PG seam, the uppermost of the four mining horizons proposed to be mine. The ULD Seam is located approximately 35 – 40 metres below the PG Seam. To date, longwalls 101 – 105 have been mined in the ULD Seam. Longwall 106 is currently in progress. These ULD Seam longwalls are located in substantially the same area as Longwalls 1 – 4 in the PG Seam except that the geometry of the ULD Seam longwalls is offset 60 metres to the west and the start and finish lines for the longwalls are different. Longwalls 201 -204 in the ULLD Seam are positioned directly below the PG Seam layout and are therefore offset 60 metres to the east of the ULD Seam Longwalls 101 – 104.

The subsidence monitoring above Longwalls 101 – 105 indicates that for an offset geometry the maximum subsidence can be estimated with reasonable confidence and the subsidence profile is also relatively predictable although the specific mechanic of the interaction of the two seams needs to be recognised.

Where panels in the two seams overlap in an offset geometry, maximum cumulative subsidence from mining both seams is in the order of 62% – 72% of the combined mining thickness of both seams (compared to 50% - 60% for the first seam mined) and incremental subsidence is in the order of 72% - 83% of the height of the second seam mined.

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 200 millimetres and insignificant for all practical purposes; and
- The influence of latent subsidence from mining in the PG Seam causes subsidence movements to extend over the next panel because the PG chain pillar is located on this side of the ULD panel.

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 proposed layout in Longwalls 201 – 204 in the ULLD Seam is consistent with keeping all secondary extraction at least 40 metres (in a horizontal direction) from the high bank of Bowmans Creek in its diverted function form as per Schedule 3 Section 23 of DA 309-11-2001-i.

A triple stacked permanent goaf edge is formed along the northern section of Longwall 204. The triple stacked edge is designed to protect Bowmans Creek. Subsidence monitoring to date confirms that the solid barrier pillars left in each seam is controlling subsidence over the coal barriers to less than 120 millimetres at the goaf edge and less than 20 millimetres at half depth. Horizontal movements are also limited and only extending about 40 metres over the solid coal to the west of the goaf edge.

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 LW201 to LW204 are:

- Panel width (void) = 215.8m
- Minimum Chain Pillar width (solid) = 24.6m.

Chain pillar lengths are nominally 150m, 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 Longwall 201 – 204 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 features within the mining area is an igneous dyke that was intersected with PG Seam LW2, ULD Seam LW102 and has been intersected in a pre-extraction development drive in Longwall 202 to the west off MG201 (refer to **Graphical Plan 3**). 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. A step change was observed at the location of the geological dyke structure above Longwalls 2 and 102. This step change occurred in an area of bushland remote from any surface infrastructure. It is possible that similar behaviour may occur again during mining on Longwall 202, but he surface impacts are not considered to be significant.

2.3 SUBSIDENCE PREDICTIONS

2.3.1 Prediction Method and Reliability

Subsidence predictions for the Extraction Plan Area have been provided by Strata Control Technology (SCT) using previous multi seam subsidence monitoring results from Longwalls 101 – 104 in the ULD Seam to estimate the subsidence behaviour and seam interaction effects that may be expected over Longwalls 201-204 in the ULLD Seam. Detailed description of the prediction technique used, factors that may affect the development of subsidence, and the relevance of input data are provided in Report No. ASH4552_REV3 (2016).

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. These approaches appear to be still valid based on the comparison of past predictions with subsequent measurements, but there is clearly room for refinements now that multi-seam subsidence monitoring data is available.

Li et al. (2010) present a summary of experiences of multi seam mining in NSW and elsewhere that indicates maximum subsidence associated with supercritical width mining in two seams reaches a maximum of 83% off the combined seam thickness mined. To date Ashton has adopted a more conservative approach by using a maximum subsidence of 85% of combined mining thickness for the previous ULD Seam predictions.

The monitoring data from Longwalls 101 – 104 indicates that the maximum cumulative vertical subsidence was less than 75% of the combined seams extraction heights. This indicates that the use of 85% of the combined seam mining heights is a reasonably conservative approach to estimating maximum cumulative subsidence. A refinement to this estimating method is used to predict the total subsidence profile for the proposed ULLD Seam mining. This method estimates the incremental subsidence i.e. the subsidence associated with mining in the ULLD Seam, additional to subsidence that previously occurred due to mining in the PG and ULD Seams.

The monitoring data from Longwalls 101 – 104 also indicates that strains and tilts for general background conditions in an offset geometry are quite different to and much less than the strains and tilts observed at stacked edge goaf edges. Maximum strains and tilts may therefore need to be estimated for four different conditions, incremental and cumulative and general background and stacked goaf edges. To estimate maximum strains and tilts the Holla approach captures the key drivers and allows the differences between background offset geometries and stacked edge geometries to be accommodated by varying the K value (K = a constant of proportionality).

K values have been indicated from analysis of the subsidence database from Longwalls 101 – 104 that appear suitable to use with the Holla approach to provide a reasonable and conservative estimate of the measured strains and tilts for the four combinations of incremental and cumulative subsidence and general background and stacked goaf edges. From this, estimates for the maximum values for tilts and strains expected for the proposed ULLD Seam mining at the stacked goaf edge can be calculated.

It is considered that the abovementioned methods for predicting subsidence has provided reasonable, if not, conservative predictions for the monitoring lines above the Longwalls extracted in

the ULD seam at the Mine and with further refinement from subsidence monitoring in the ULD Seam it is expected that the subsidence predictions for mining in the ULLD Seam would provide reasonable, if not, slightly conservative predictions for the proposed Longwalls 201 to 204.

2.3.2 Extraction Plan Area Subsidence Predictions

Longwalls 201 to 204 are the first panels to be extracted in the ULLD Seam. The following sections provide the estimates of the subsidence and subsidence parameters expected over the proposed longwall panels resulting from the extraction of the proposed Longwalls 201 to 204. The predicted subsidence parameters and the impact assessments for the natural and built features are provided in ASH4522_REV3 in **Volume 2**.

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 are expected to remain within the Subsidence Performance Measures of development consent DA309-11-2001-i.

2.3.2.1 Incremental and Cumulative Subsidence Parameters Predicted for Longwalls 201 – 204

A summary of the subsidence parameters expected from mining Longwalls 201 – 204 in the ULLD Seam is provided in **Table 2.5**. It is proposed that the Longwalls would be extracted in order of LW201, LW202, LW203 and then LW204.

The predicted incremental subsidence contours, after the completion of each of the proposed Longwalls 201 - 204 are shown in Figure 7 in ASH4522_REV3 in **Volume 2**. The incremental subsidence predictions for Longwalls 201 – 204 along the subsidence line XL5 are shown in Figure 6 in ASH4522_REV3 in **Volume 2**. The location of the stacked goaf edges for Longwalls 201 – 204 are shown in Figure 8 in ASH4522_REV3 in **Volume 2**.

At the completion of mining Longwalls 201 – 204, almost all the footprint of the ULLD Seam mining area is expected to have been subsided by more than 1 metre and greater than 90% by more than 2 metres. The proportion of the total area subsided by more than 3 metres, 4 metres and 5 metres is estimated to be 57%, 38% and 26% respectively.

Very high tilts and strains are expected above stacked goaf edges including the start of Longwalls 202, 203 and 204 and to a lesser extent, due to the ULD Seam mining, the finishing lines of Longwalls 201 – 204. These high tilts and strains could lead to perceptible changes in elevation, large cracks and local steep grades.

Table 2.5 Incremental and Cumulative Subsidence Parameters Predicted due to the Extraction of Each of the Proposed Longwalls

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

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 structure.

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, particularly by comparison with subsidence movements associated with stacked goaf edges in multiple seams.

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

Strata dilution effects are generally observed as valley closures. At Ashton there has been no direct evidence of valley closure, but there has been a consistent pattern of horizontal movement in an upslope direction over each of the mined panels. This pattern is considered to be associated with the same mechanism that causes valley closure. However at Ashton the general dip of the strata is to the west at a rate greater than the topography. This general dip has the effect of causing the dilating strata to move upslope towards the free surface in a similar way that diluting strata moves toward the free surface of a valley in horizontally bedded strata. The magnitude of this upslope horizontal movement has been about 200 millimetres over each panel and similar movement is expected above proposed panels mined in the ULLD Seam.

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 500 millimetres 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 300 millimetres were 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.

A step change was observed at the location of a geological dyke structure above Longwalls 2 and 102. This step change occurred in area of bushland remote from any surface infrastructure. It is possible that similar behaviour may occur again during mining of Longwall 202, but the surface impacts are not considered likely to be significant.

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. The most significant stacked edge cracking to date has occurred along LW104B. Photographs of the impacts of subsidence along the stacked goaf edge as well as impacts after remediation is shown 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

2.3.2.3 Summary of Subsidence Impacts

A summary of subsidence impacts associated with mining LW 201-204 is outlined within **Table 2.6** and **Table 2.7** below.

Table 2.6 Summary of Impacts and Management of Infrastructure

Feature	Owner/Manager	Brief Description	Impact
Property 130	Property 130	Privately owned property in the south-eastern corner of the EP area.	Minor impacts to access road, potential strains of fences and some surface cracking. Overall similar in nature to previous impacts requiring remediation measures.
Access Roads (including Right of Way)	ACOL and Property 130	Unsealed access roads that cross the EP area.	Additional incremental subsidence of up to 2.7m with high strains and tilts expected at the stacked goaf edges with ponding likely to occur at several places requiring mitigation and remediation measures to maintain accesses. Possible step change due to known geological feature through LW201 and LW202.
New England Highway	RMS	Located approximately 140m north of the EP area.	No perceptible subsidence impacts.
132kV line	Ausgrid	Powerline traversing east-west in the southern part of the EP area.	Minor impacts expected. Subsidence greater than that for the PG and ULD seams expected, however specific assessment and monitoring of upgraded structures expected to be successful in managing any impacts. Minor ponding expected.
11kV line	Ausgrid	Powerline traversing north-south in the southern part of the EP area.	Impacts greater but similar to those previously experienced for the PG and ULD seams. Some additional works such as sheaving conductors recommended at stack goaf edges and changes of direction. Minor ponding expected.

Feature	Owner/Manager	Brief Description	Impact
132kV and combined 66/11 kV lines	Ausgrid	Combined powerlines running parallel to New England Highway	No perceptible subsidence impacts.
Farm Dams	Property 130	Farm dams on Property 130.	Minor impacts expected requiring remediation.
Telstra Cables	Telstra	Buried copper line servicing Property 130 and ACOL properties.	Any impacts expected to be manageable
Fibre Optic Cable	AAPT	Sydney to Brisbane fibre optic cable located parallel to the New England Highway.	No perceptible subsidence impacts.
Fibre Optic	Ravensworth Operations	Fibre optic cable alongside Lemington Road.	No perceptible subsidence impacts.
Fences and Farm Infrastructure	Property 130	Farm infrastructure on Property 130.	Minor impacts requiring visual inspection and regular maintenance.

Table 2.7 Summary of Impacts of Natural Features and Heritage

Feature	Brief Description	Impact
Bowmans Creek and Alluvium	Main channel of Bowmans Creek located to the west of the Extraction Plan area.	No perceptible impacts. The main channel of Bowmans Creek, including the two diversions is fully protected from subsidence effects by solid coal barriers in the PG, ULD and ULLD seams. The alluvium does extend into the EP area at the northern end of LW204 however it is located on solid coal beyond the edge of the panels.
Hunter River and Alluvium	River located to the south of the Extraction Plan area	No additional impacts expected. Located over 150m from the corners of LW 203 and 204.
Glennies Creek and Alluvium	Creek located to the east of the Extraction Plan area	No significant additional subsidence impacts. The channel and alluvium are outside of the Extraction Plan area.
Groundwater - inflows	Groundwater system within the 201 – 204 Extraction Plan area outlined within the Groundwater Impact Assessment (AGE, 2016).	Minor increase in groundwater inflow, with total mine inflows increasing from approximately 402 ML/yr (1,101 m^3/day) to 420 ML/yr (1,151 m^3/day). See Section 5.5.3 of the Groundwater Impact Assessment 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 for details.
Groundwater Baseflow Impacts		The overall impact of the mine is a general decrease in baseflow gain rate 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 for details.
Landform Drainage	-	General lowering of the landform by up to an additional 2.7m (5.8m in total) in some areas expected to cause ponding on drainage lines within the EP area. Steep grades and tensile cracking are possible at stacked goaf

Feature	Brief Description	Impact
		edges.
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 TSC Act (Umwelt, 2016).
Aboriginal Heritage	Aboriginal Heritage Assessment completed by Insite Heritage (2016) to accompany the EP. Several sites within EP area including artefact scatters and grinding grooves.	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, 2016). However it is noted that ACOL holds AHIPs which authorise these impacts.
Ecology	Ecology Assessment completed by Umwelt (2016) to accompany the EP.	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 TSC Act based on the subsidence predictions provided by SCT (2016).

2.4 PERFORMANCE OBJECTIVES

Performance objectives in relation to subsidence impacts at Ashton are presented in **Table 2.8**. These objectives have been used when developing management strategies of this Extraction Plan.

Table 2.8 Performance Objectives from DA 309-11-2001-i

<table>
<tr><th>Condition No.</th><th>Condition Requirement</th></tr>
<tr><td>Schedule 3, Condition 29</td><td>
Performance Measures
The Applicant must ensure that underground mining does not cause any exceedance of the performance measures in Table 10.

Table 10: Subsidence Performance Measures
<table>
<tr><td colspan="2">Water</td></tr>
<tr><td>Bowmans Creek</td><td>No greater subsidence impact or environmental consequences than predicted in the EA and the previous EIAs</td></tr>
<tr><td>Bowmans Creek – Eastern and Western Diversions</td><td>Hydraulically and geomorphologically stable</td></tr>
<tr><td>Bowmans Creek alluvial aquifer</td><td>No greater subsidence impact or environmental consequences than predicted in the EA and the previous EIAs</td></tr>
<tr><td colspan="2">Biodiversity</td></tr>
<tr><td>Threatened species, populations, habitat or ecological communities</td><td>Negligible impact</td></tr>
<tr><td colspan="2">Aboriginal Heritage Features</td></tr>
<tr><td>Waterhole Site</td><td>Negligible impact</td></tr>
<tr><td>Other Aboriginal heritage sites</td><td>No greater subsidence impact or environmental consequences than approved under a permit issued under section 90 of the National Parks and Wildlife Act 1974</td></tr>
<tr><td colspan="2">Built Features</td></tr>
<tr><td>New England Highway, including the bridge over Bowmans Creek</td><td>Always safe and serviceable.
Damage that does not affect safety or serviceability must be fully repairable, and must be fully repaired.</td></tr>
<tr><td>Lemington Road and Brunkers Lane</td><td>In accordance with recommendations of the report prepared under condition 36</td></tr>
<tr><td>Other built features, including other public infrastructure</td><td>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.</td></tr>
<tr><td colspan="2">Public Safety</td></tr>
<tr><td>Public safety</td><td>No additional risk due to mining</td></tr>
</table>
• 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.
</td></tr>
<tr><td>Schedule 3, Condition 41</td><td>
Rehabilitation Objectives
The Applicant must rehabilitate the site in a manner that is consistenet with the rehabilitation objectives in the EA and Table 11, to the satisfaction of DRE.

Table 11: Rehabilitation Objectives
<table>
<tr><td>Feature</td><td>Objective</td></tr>
<tr><td>Sections of Bowmans Creek within the underground mining area (except those sections of channel made redundant by diversion)</td><td>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.</td></tr>
</table>
</td></tr>
</table>

Condition No.	Condition Requirement	
	Bowmans Creek – Eastern and Western Diversions	*Hydraulically and geomorphologically stable, with riparian vegetation that is the same or better than existing in the adjacent channel prior to mining.*
	Other land affected by development	*Restire ecosystem function, including maintain or establishing self-sustaining ecosystems comprised of:* • *Local native plant species (unless DRE agrees otherwise); and* • *A landform consistent with the surrounding environment.*
	Built features affected by subsidence	*Repair to pre-mining condition or equivalent unless:* • *The owner agrees otherwise; or* • *The damage is fully restored, repaired or compensated under the Mine Subsidence Compensation Act 1961.*
	Community	*Ensure public safety* *Minimise the adverse socio-economic effects associated with mine closure*

2.4.1 Performance Measures and Indicators

Table 2.9 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 2.9 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. Section 3.5 (Bowmans Creek Diversion Management Plan) outlines performance and completion criteria. Surface Water Impact Assessment Criteria – Section 5.2 of the Water Management Plan. Table 16 of Water Management Plan outlines trigger levels for surface water. Indicators include water quality and streamflow.
Bowmans Creek – Eastern and Western Diversions	Hydraulically and geomorphologically stable	Water Management Plan. Section 3.5 (Bowmans Creek Diversion Management Plan) outlines completion criteria (indicators), including geomorphology and channel stability and stream health. This includes: • 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 6.2 of the Water Management Plan. Table 21 in Water Management Plan outlines trigger levels for groundwater. Indicators include water level, pressure, field parameters and comprehensive

Aspect	Performance Measure	Indicator
		analysis.
Biodiversity		
Threatened species, populations, habitat or ecological communities	Negligible impact	ACOL Flora and Fauna Management Plan Section 2.2. Commitment for 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. Umwelt Flora and Fauna Assessment for LW201 to 204.
Aboriginal Heritage Features		
Waterhole Site	Negligible impact.	
Other Aboriginal heritage sites	No great subsidence impact or environmental consequences than approved under a permit issued under section 90 of the *National Parks and Wildlife Act 1974.*	ACOL ACHMP Section 3.2 Section 2.2 of the Heritage Assessment (Insite 2016) refers to no disturbance to waterhole site. Also Section 3.2.1 outlines predicted subsidence impacts. Subsidence monitoring and inspections. See Subsidence Monitoring Program.
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. See Subsidence Monitoring Program.
Lemington Road and Brunkers Lane	In accordance with recommendations of the report prepared under condition 36.	Not relevant to this Extraction Plan area.
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 Built Features Management Plan. See Subsidence Monitoring Program.
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 and Environment (DPE) on 26 May 2016. The Extraction Plan Team is presented in **Table 3.1**.

Table 3.1 Extraction Plan Team

Extraction Plan Component	Team Members
Extraction Plan coordination and preparation	Ashton/Yancoal: • Digby Short – Environment & Community Manger • James Barben – Environment & Community Coordinator • Daniel Lee – Regional Registered Surveyor NSW • Tony Sutherland – Regional Technical Services Manager NSW • Chris Jones – SLR Consulting
Built Features Management Plan	Ashton/Yancoal – James Barben, Daniel Lee, Tony Sutherland
Public Safety Management Plan	Ashton/Yancoal – James Barben, Daniel Lee, Tony Sutherland
Land Management Plan	Ashton – James Barben
Coal Resource Recovery Plan	Yancoal – Daniel Lee, Tony Sutherland
Biodiversity Management Plan Flora and Fauna Assessment	Existing Ashton Coal approved management plan Umwelt – Alison Riley
Water Management Plan Groundwater Assessment for LW 201-204	Existing Ashton Coal approved management plan Australasian Groundwater and Environmental Consultants Pty Ltd (AGE) – Costante Conte
Heritage Management Plan Heritage Assessment for LW 201-204	Insite Heritage Pty Ltd – Angela Besant
Subsidence Predictions	Strata Control Technology (SCT) – Ken Mills

3.2 AGENCY CONSULTATION

3.2.1 Department of Planning and Environment

The Extraction Plan is required to be completed to the satisfaction of and approved by the Secretary of the DPE. Extensive consultation has taken place with DPE including a meeting held at the DPE office in Sydney with Howard Reed and Jessie Evans on the 11 October 2016 to discuss the proposed Extraction Plan. Topics discussed include:

- Subsidence predictions and impacts to date;
- Subsidence repair of stacked goaf edges;
- Subsidence profile;
- Water management; and
- Location of key infrastructure.

3.2.2 Division of Resources and Energy

There are several components of the Extraction Plan that are required to be completed in consultation with and to the satisfaction of the DRE. These components include:

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

A meeting was held at the DRE's Maitland office on the 1 September 2016 with attendees outlined in **Table 3.2** below.

Table 3.2 Extraction Plan Meeting Attendees at DRE

Attendees	Organisation
Ray Ramage	Resources Regulator
Zane West	DRE
Alex Love	DRE
Tully Mathew	DRE
Spencer Hopcroft	DRE
Kate Walsh	DRE
Tony Sutherland	Yancoal
Daniel Lee	Yancoal
James Barben	ACOL
Chris Jones	SLR

3.2.3 Office of Environment & Heritage

OEH has received a letter outlining the proposed EP and area via email dated 24 October 2016. OEH will receive a copy of the draft Extraction Plan as part of the consultation process for this project.

3.2.4 DPI Water

DPI Water has received a letter outlining the proposed EP and area via email dated 27 October 2016. DPI Water requested a hard copy of the EP which will be forwarded directly upon lodgement with DPE.

3.2.5 Mine Subsidence Board

MSB has received a letter outlining the proposed EP and area via email dated 26 October 2016. The MSB will continue to be consulted during preparation of individual Built Features Management Plans in conjunction with the Built Feature owners.

3.3 LANDHOLDER CONSULTATION

As indicated previously, the Extraction Plan area includes land owned by a private landholder.

The land above the Extraction Plan area is predominately cattle grazing land owned by ACOL other than a small part in the far south-east known as Property 130.

3.3.1 Community

Ashton Coal holds regular Community Consultative Committee (CCC's) meetings with a number of community representatives. ACOL provided updates on the progress of the EP201-204 application at the March and July 2016 CCC meetings.

3.3.2 Private Landholders

ACOL continues to liaise with the Property 130 landholders through the Extraction Plan process. Property 130 have been advised that a Built Features Management Plan will be prepared in consultation with the landholder prior to subsidence impacts occurring. The BFMP also will include details of remediation strategies to land (should they be required). An access agreement with Property 130 is currently being prepared. The benefit of the access arrangements ahead of mining is to streamline any land remediation works to be undertaken by ACOL (that are not covered by the Mine Subsidence Board).

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 Community Consultative Committee (CCC), with minutes of these meetings uploaded to the Ashton website (www.ashtoncoal.com.au).

3.4 INFRASTRUCTURE OWNER CONSULTATION

In accordance with the Built Features Management Plan development, Ashton has consulted with infrastructure owners, and will continue to consult with these stakeholders during the development individual Built Features Management Plans to manage potential subsidence effects. Owners include:

- Roads (RMS);
- Telstra; and
- Ausgrid.

Each of the infrastructure owners are consulted with during updates to the Extraction Plan and preparation of the individual Built Features Management Plans.

3.5 RISK ASSESSMENT

A risk assessment was conducted on 19 April 2016 to review and identify the subsidence-related hazards that may affect the environment and community as a result of the secondary extraction of the Extraction Plan Area. A copy of the risk assessment is included in **Volume 2**.

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.

The risk assessment was facilitated by Brad Radloff from SLR Consulting who is an experienced facilitator and has qualifications in risk management and involved a team consisting of members of Ashton staff, Yancoal, AGE and SLR Consulting.

- Brad Radloff (SLR Consulting);
- Jessica Coffey (SLR Consulting);
- Thomas Kaltschmidt (Yancoal);
- Costante Conte (AGE);
- Jeff Peck (ACOL);
- Daniel Lee (Yancoal);
- James Barben (ACOL);
- Bill Farnworth (ACOL); and
- Ryan Davidson (ACOL).

The risk assessment identified a total of 27 risks, which were ranked as follows:

- 15 low risks;
- 10 moderate risks;
- 2 high risks; and
- 0 extreme risks.

The two 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). Controls to manage the impact of subsidence on surface water features are outlined in the Water Management Plan (**Appendix C**). The Surface and Groundwater Assessment (AGE, 2016) has been prepared to address these risks.

The second high risk related to alluvial groundwater level and quality changes due to mine subsidence being greater than predicted. A Hydrogeological Assessment was undertaken following

the risk assessment, and groundwater management controls for the site are outlined in the Water Management Plan (**Appendix C)** which covers the entire ACOL operations. The Surface and Groundwater Assessment (AGE, 2016) has been prepared to address these risks.

The full risk assessment report including a full list of risks in assessment order, risk rank order and consequence order respectively are shown in **Volume 2**.

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:

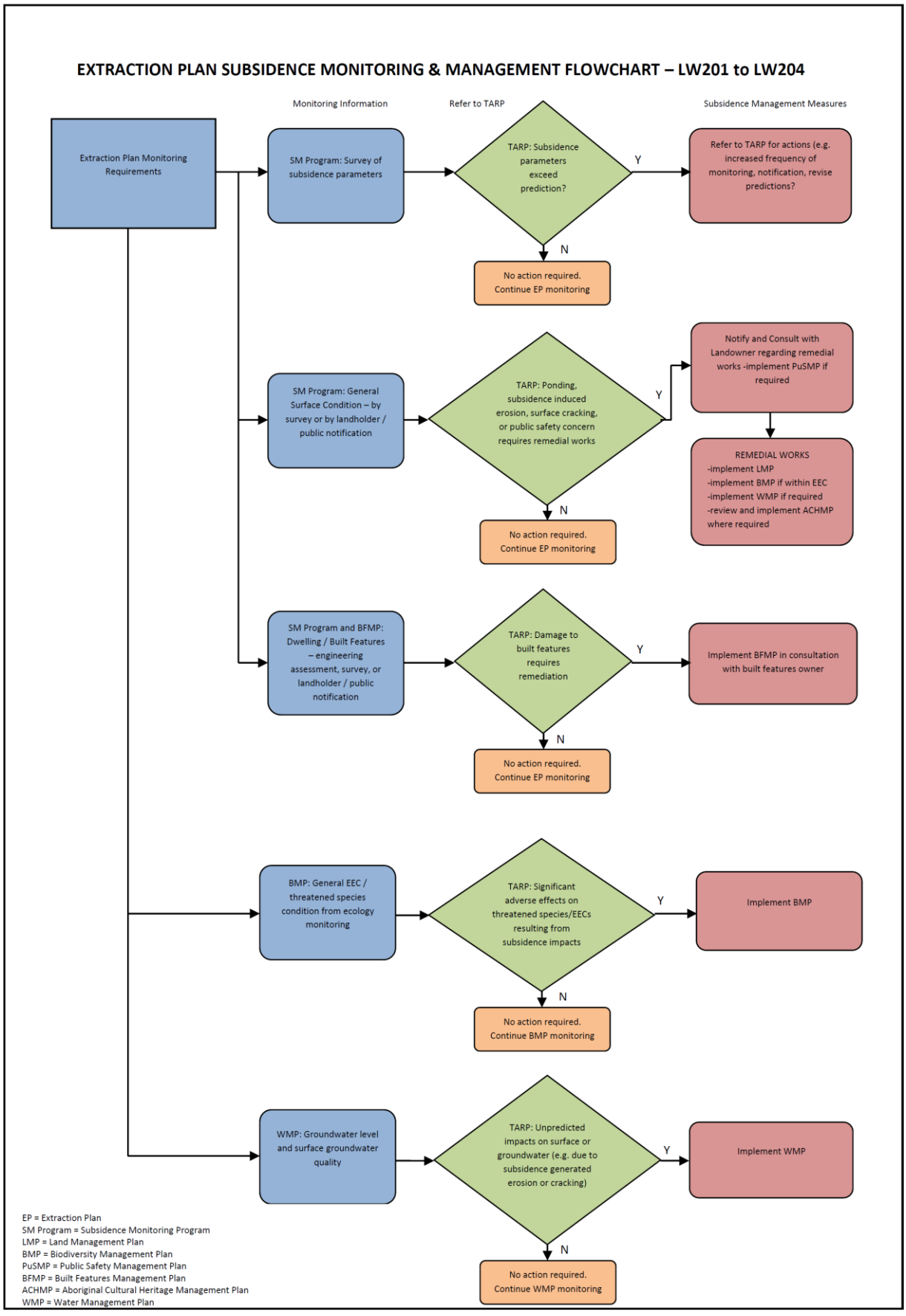
- **Water Management Plan** – to manage the potential environmental consequences of second workings on surface and groundwater;
- **Land Management Plan** – to manage the potential environmental consequences of second workings on steep slopes and land in general;
- **Biodiversity Management Plan** – 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

Ashton has developed an overall subsidence management **LW201 to LW204 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 the Subsidence Monitoring (SM) Program and specific management plans.

4.3 EXTRACTION PLAN SUBSIDENCE MONITORING AND MANAGEMENT FLOWCHART

Ashton 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 & MANAGEMENT FLOWCHART – LW201 to LW204
Monitoring Information
Refer to TARP
Subsidence Management Measures
Extraction Plan Monitoring Requirements
SM Program: Survey of subsidence parameters
TARP: Subsidence parameters exceed prediction?
Y
Refer to TARP for actions (e.g. increased frequency of monitoring, notification, revise predictions?
N
No action required. Continue EP monitoring
SM Program: General Surface Condition – by survey or by landholder / public notification
TARP: Ponding, subsidence induced erosion, surface cracking, or public safety concern requires remedial works
Y
Notify and Consult with Landowner regarding remedial works -implement PuSMP if required
REMEDIAL WORKS
-implement LMP
-implement BMP if within EEC
-implement WMP if required
-review and implement ACHMP where required
N
No action required. Continue EP monitoring
SM Program and BFMP: Dwelling / Built Features – engineering assessment, survey, or landholder / public notification
TARP: Damage to built features requires remediation
Y
Implement BFMP in consultation with built features owner
N
No action required. Continue EP monitoring
BMP: General EEC / threatened species condition from ecology monitoring
TARP: Significant adverse effects on threatened species/EECs resulting from subsidence impacts
Y
Implement BMP
N
No action required. Continue BMP monitoring
WMP: Groundwater level and surface groundwater quality
TARP: Unpredicted impacts on surface or groundwater (e.g. due to subsidence generated erosion or cracking)
Y
Implement WMP
N
No action required. Continue WMP monitoring
EP = Extraction Plan
SM Program = Subsidence Monitoring Program
LMP = Land Management Plan
BMP = Biodiversity Management Plan
PuSMP = Public Safety Management Plan
BFMP = Built Features Management Plan
ACHMP = Aboriginal Cultural Heritage Management Plan
WMP = Water Management Plan

5 PLAN IMPLEMENTATION

5.1 REPORTING FRAMEWORK

5.1.1 Annual Review / Annual Environmental Management Report (AEMR)

The Annual Review / AEMR is prepared to summarise Ashton'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.

By the end of March each year (or other such timing as agreed by the Secretary), the Applicant, must review the environmental performance of the development to the satisfaction of the Secretary. This review must:

(a) Describes the works (including and rehabilitation) that were carried during the previous calendar year, and the works that are proposed to be carried out over the current calendar year;

(b) Include a comprehensive review of the monitoring results and complaints records of the development over the previous calendar year, which includes a comparison of these results against:

- the relevant statutory requirements, limits or performance measures/criteria;
- the monitoring results of previous years; and
- the relevant predictions in the EA and previous EIAs;

(c) Identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;

(d) Identify any trends in the monitoring data over the life of the development;

(e) Identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and

(f) Describe what measure will be implemented over the next year to improve the environmental performance of the development.

The Annual Review / AEMR will be published on the Ashton website upon completion and submission to DPE and DRE.

5.1.2 Regular Stakeholder Extraction Plan Update Reporting

The Ashton Coal Mine Community Consultative Committee 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, Ashton will notify the DPE 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, Ashton will notify DPE and any other relevant agencies as soon as practicable after Ashton becomes aware of the incident. Within 7 days of the date of the incident Ashton will provide DPE and any 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 DPE.

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

5.3 COMPLAINTS HANDLING

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

5.4 EXTRACTION PLAN ROLES AND ACCOUNTABILITIES

Detailed below in **Table 5.1** are key personnel involved with implementing this Extraction Plan to manage subsidence, their roles and responsibilities.

Table 5.1 Roles and Responsibilities

Role	Responsibilities
Operations Manager (OM)	• Make appropriate resources available for the implementation of this Extraction Plan • Conduct underground mining activities in accordance with the Extraction Plan Coal Resource Recovery Plan. • Notify and liaise with DRE Inspectors (if required)
Environment and Community Manager (ECM)	• Owner of the Extraction Plan • Ensure that all environmental monitoring and reporting 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 landform • Liaise with Mine Subsidence Board in relation to Built Features impacts • Liaise with Government Agencies in relation to environmental consequences of subsidence and proposed management strategies • 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 • Notify and liaise with neighbours and community in relation to mining timing and monitoring performance • Review and update the Extraction Plan and sub plans as required

Role	Responsibilities
Technical Services Manager (TSM)	• Liaise with Government Agencies and Community members in relation to subsidence matters and the Extraction Plan subsidence predictions and monitoring program • Coordinate Mine Surveyor to ensure subsidence monitoring is undertaken in accordance with the Extraction Plan • Provide training for subsidence impact measurements and observations in accordance with SM program • Review subsidence monitoring data against predictions and TARPs in order to trigger any actions required on the basis of subsidence results • Manage / implement subsidence management actions required by the Extraction Plan in relation to Infrastructure • Review subsidence predictions based on monitoring information and the TARPs • Provide support and guidance in relation to subsidence effects to Environment & Community Manager
Mine Surveyor	• Ensure that all subsidence monitoring is completed to the requirements of the Subsidence Monitoring Program and provided to the TSM for review • Liaise with the Environment & Community Manager to gain required access for subsidence monitoring • Provide training for subsidence impact measurements and observations in accordance with SM program

6 REFERENCES

Australasian Groundwater and Environmental Consultants Pty Ltd (AGE, 2016), Report on: *Yancoal – Ashton Coal Longwalls LW201 to LW204, Groundwater Impact Assessment,* Project number G1758N

Insite Heritage Pty Ltd (Insight, 2016) *Aboriginal Heritage Assessment, Longwalls 201 – 204 Extraction Plan, Ashton Coal Project, Camberwell NSW*, September 2016, Reference ACOL_ULLDLW201-204

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

Unwelt (Unwelt, 2016), Ashton Coal: *Flora and Fauna Assessment for Longwalls 201 – 204 Extraction Plan*, Report Number 3776/R01/V5.

Graphical Plans

Appendices

Appendix A

Key Project Approval & Mining Lease Conditions

Appendix B

Extraction Plan Flowchart & TARP

Appendix C

Water Management Plan

Appendix D

Land Management Plan

Appendix E

Biodiversity Management Plan

Appendix F

Heritage Management Plan

Appendix G

Built Features Management Plan

Appendix H

Public Safety Management Plan

Appendix I

Subsidence Monitoring Program

Appendix J

Coal Resource Recovery Plan