





Longwalls 205 to 208

AGL Macquarie Asset Management Plan

October 2020





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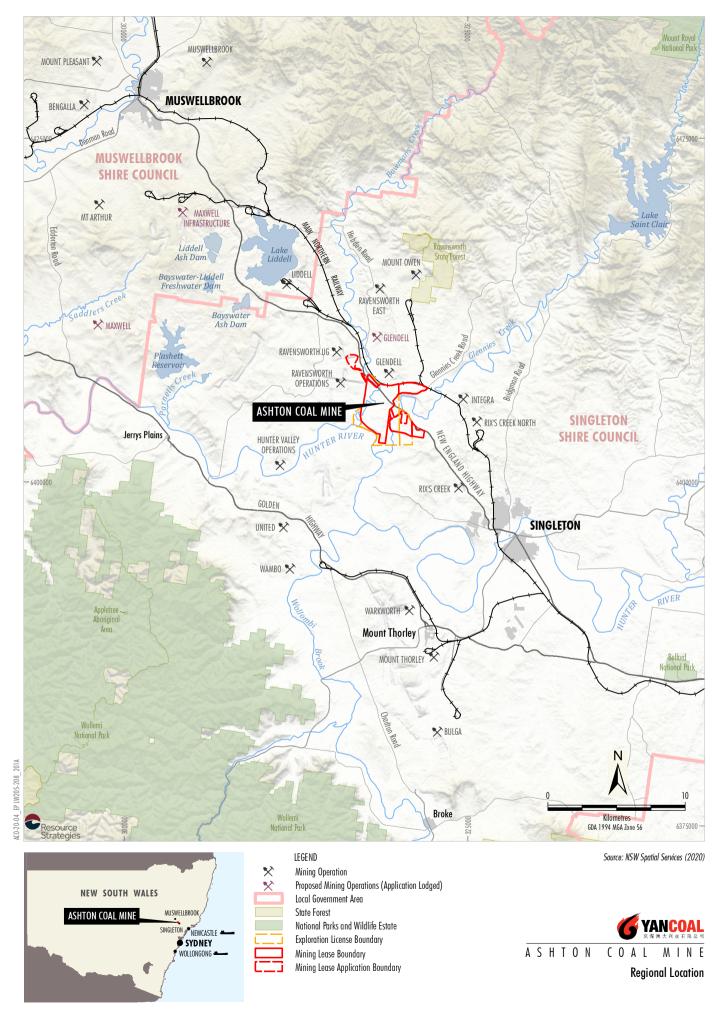
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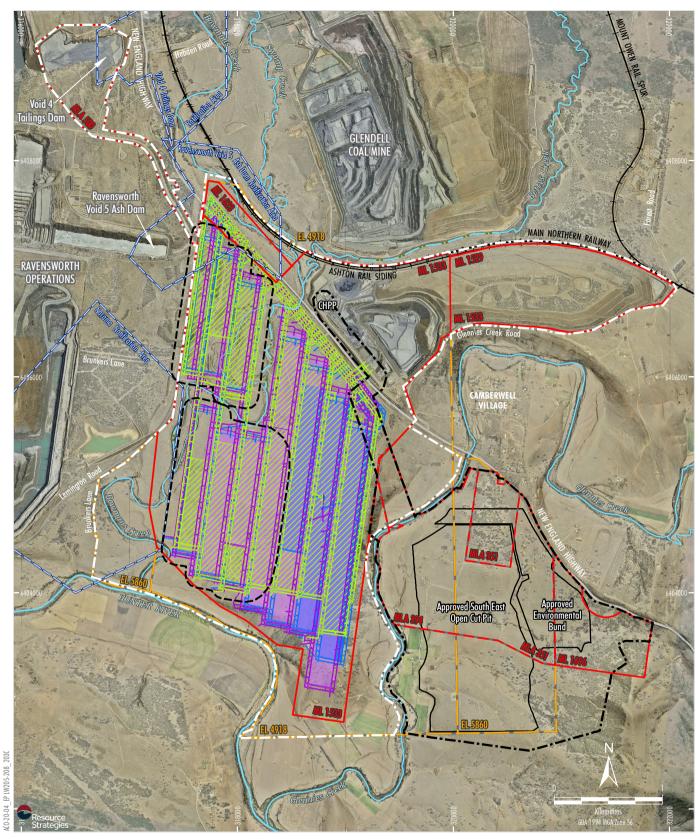
Ashton Coal Operations Pty Ltd (ACOL), a subsidiary of Yancoal Australia Limited (Yancoal), owns the Ashton Coal Project (ACP), an underground coal mine located approximately 14 kilometres north-west of Singleton in the Hunter Valley in New South Wales (NSW) (**Figure 1**).

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 and 255 metres 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.





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

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



General Arrangement





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)





2 SCOPE & OBJECTIVE

This Asset Management Plan has been developed to manage risks associated with the potential subsidence impacts on AGL Macquarie infrastructure in the vicinity of the Longwalls 205-208 Extraction Plan area as a result of the secondary extraction of Longwalls 205-208 within the ULLD Seam.

This management plan provides a mechanism through which the potential subsidence impacts from longwall mining can be managed to maintain the safety and serviceability of AGL Macquarie infrastructure whilst mining is in progress.

Infrastructure of relevance to the Extraction Plan area includes the AGL Macquarie South Access Road and disused sediment ponds and other minor infrastructure (i.e. farm dams, fences and gates) (Figure 4).

This Asset Management Plan forms part of the Ashton Longwalls 205 to 208 Extraction plan and should not be read in isolation.



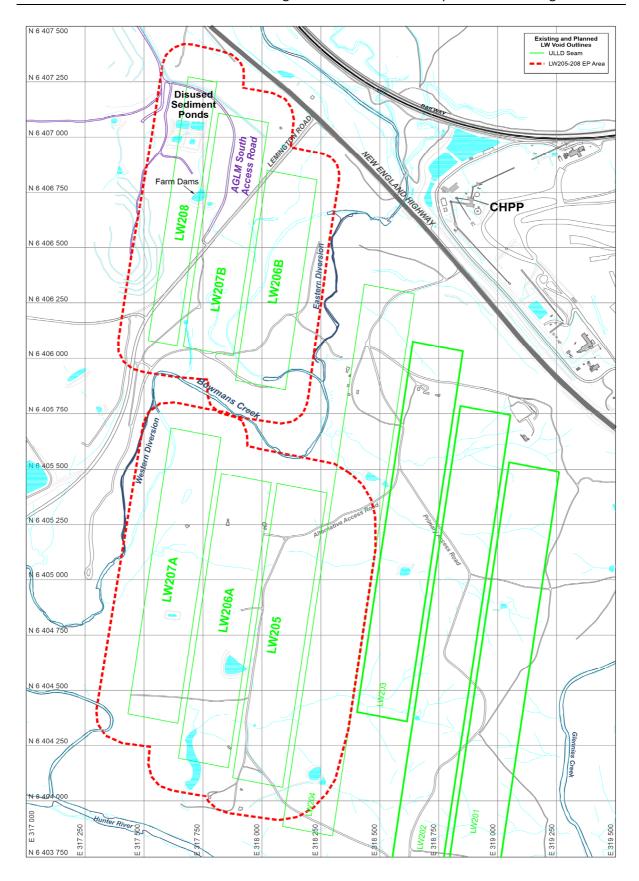


Figure 4: Plan Showing Location of AGL Macquarie Infrastructure in the Vicinity of Longwalls 205 to 208



3 ASSETS AND IMPACTS

The AGL Macquarie South Access Road extends from the intersection with Lemington Road (overlying Longwall 207B) to the north-western boundary of the Extraction Plan area (with a small section overlying Longwall 208) (**Figure 4**). The road is sealed in the vicinity of the Lemington Road intersection and unsealed for the remainder of its length (**Plate 1**).



Plate 1: AGL Macquarie South Access Road Looking North from Lemington Road Intersection

Four disused sedimentation ponds are located over and on the edge of Longwall 208 (Plate 2). SCT understands that AGL Macquarie do not intend to use these ponds again.



Plate 2: AGL Macquarie Disused Sediment Ponds

Other minor infrastructure on land owned by AGL Macquarie includes access tracks/roads, two farm dams, fences and gates.



3.1 SUBSIDENCE PARAMETER DEFINITIONS

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

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

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

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

3.2 MAXIMUM PREDICTED SUBSIDENCE

Table 1 below 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).



Table 1. Maximum Predicted Subsidence Parameters for ULLD Seam Longwall Panels

ULLD Seam Longwall Panels (depth range in brackets [m])		Longwalls 205-208 Forecast						
		ULLD ULLD Strain (mm/m)		ULLD Tilt (mm/m)				
		Subs (m)	General	Stacked Edges	Undercut Edges	General	Stacked Edges	Undercut Edges
Incremental	Subsidence Paramo	eters						
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

3.3 PREDICTED SUBSIDENCE IMPACTS

The following sections describe predicted subsidence impacts to AGL Macquarie infrastructure as a result of underground mining of Longwalls 205-208 (SCT, 2020).

3.3.1 South Access Road

Subsidence impacts to the unsealed section of the South Access Road are expected to be similar to those experienced on unsealed roads above the current underground mining areas. Impacts to the sealed section of the South Access Road adjacent to Lemington Road are expected to be similar to the impacts to Lemington Road.

Maximum incremental subsidence of 2.5 m and 2.2 m and maximum cumulative subsidence of 4.2 m and 3.1 m are expected over the centres of Longwalls 207B and 208, respectively. A maximum incremental strain of 26 mm/m is expected along the centre of Longwall 207B with strains over the western edges of Longwalls 207B and 208 of up to 46 mm/m and 37 mm/m, respectively. Maximum incremental tilts of 52 mm/m are expected over the centre of Longwall 207B with incremental tilts over the western edges of Longwalls 207B and 208 of 92 mm/m and 73 mm/m, respectively.

These strains and tilts are expected to cause surface cracking up to 200-300 mm wide and compression humps greater than 100 mm high as well as localised steep gradients along and across the road. Most of the surface cracks and compression humps are expected to occur at the same locations as those that formed when Longwalls 7B and 8 were mined.



3.3.2 Disused Sediment Ponds

Impacts are expected to include cracking of the dam walls and tilting with potential loss of water from the ponds. The sedimentation ponds are positioned where incremental subsidence of up to 2.2 m is expected with maximum cumulative subsidence of up to 3.1 m. Maximum incremental strains of 37 mm/m and maximum tilts of 73 mm/m are expected over the stacked edge of Longwall 208. Large permanent cracks and significant changes in grade are expected, particularly along the eastern side of the ponds.

3.3.3 Other Minor Infrastructure

Impacts to access tracks/roads are expected to include cracking, steps or humps and tilting resulting in change of grades.

Impacts to a farm dam located over the chain pillar between Longwalls 207B and 208 are expected to be minor but may involve loss of storage capacity. Any loss of water during the mining of Longwalls 207B and 208 is not expected to pose an operational risk to mining underground and is not an inrush hazard.

Impacts to fences are expected to be greater in areas of high strain. Impacts could include broken or loosened wires to the extent that fences become ineffective.

3.4 PROPOSED MONITORING/MANAGEMENT MEASURES

The following sections describe the proposed monitoring/management measures for the AGL Macquarie infrastructure within close proximity of the extraction plan area as detailed in the Longwall 205-208 Subsidence Assessment (SCT, 2020).

3.4.1 South Access Road

The nature of the road and the limited traffic flow suggests that impacts to the access road are likely to be manageable. Regular regrading of the road during the period of active subsidence is expected to be an effective approach to maintaining access. Measures to control traffic volume, the use of warning signs, speed restrictions, regular inspections, and timely remediation of any impacts during the period of active subsidence are considered appropriate measures to manage potential impacts.

There may also be a need to raise the level of approximately 100 m of the road by approximately 0.5 m to reduce the impacts of ponding that is expected to occur if drainage works to reduce these impacts are not undertaken.

Impacts to the sealed section of the South Access Road can be managed using temporary filling and regular regrading during the period of active mining. Resealing is likely to be required once the road formation has been regraded and cracks have been filled.



3.4.2 Disused Sediment Ponds

The impacts are likely to be repairable to a state in keeping with their current and planned usage with some relatively significant earthworks. Loss of water from these ponds is not expected to pose an operational risk to mining underground and is not considered to be an inrush hazard.

3.4.3 Other Minor Infrastructure

Measures similar to those recommended for the South Access Road are expected to be effective in minimising risk from subsidence impacts, maintaining serviceability and repairing roads to an acceptable standard. 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.

A program of control measures, monitoring and appropriate remediation as required is considered an effective way to manage the expected impacts to minor infrastructure from the mining of Longwalls 205-208.



4 PERFORMANCE MEASURES

ACOL will aim to ensure that all built features owned by AGL Macquarie within the Extraction Plan area are always maintained as safe and serviceable. Any subsidence damage from ACOL's mining activities will be repaired as necessary, or else replaced and/or fully compensated or dealt with under the terms of an access or compensation agreement.

The subsidence impact performance measures relevant to AGL Macquarie assets under Schedule 3, Condition 29 of DA 309-11-2001-i are summarised in **Table 2**, while more specific objectives and performance measures developed by ACOL are listed in **Table 3**.

Table 2. Subsidence Impact Performance Measures

Built Features	
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.
Public Safety	runy compensaceu.
Public safety.	No additional risk due to mining.

Table 3. AGL Macquarie Asset Management Objectives

Objective	Performance Measure			
Private Roads				
To ensure access to the South Access Road (AGL Macquarie owned) is not disrupted as a result of subsidence.	 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. 			
Surface Water Storages (Sediment Dams)				
 To prevent dam wall failures. To ensure that after mining, dams are similar in function, condition and storage capacity to that which existed prior to mining. 	 Dams are monitored for damage and repairs. Sedimentation basins are remediated following subsidence movements. 			



5 MONITORING AND MANAGEMENT STRATEGIES

The management actions that ACOL undertakes to satisfy the performance measures outlined in Section 4 are outlined in Table 4. These actions include monitoring, management and incident reporting.

Table 4. AGL Macquarie Asset Monitoring and Management

Item	Feature	Action/Response	Trigger/Timing
1.0	Monitoring		
1.01	South Access Road	 Pre mining condition assessment. During and post subsidence monitoring inspections. 	 Prior to Longwall 207B; and During and following undermining.
1.02	Sediment Dams	Visual observation of dams.	 Monthly inspection during active subsidence to dams. Post-longwall extraction.
1.03	Other Minor Infrastructure	 Pre mining condition assessment. During and post subsidence monitoring inspections. 	During active subsidence; andFinal inspection and survey following completion of mining.
2.0	Management		
2.01	South Access Road	Erection of signage property gates warning of potential subsidence impacts and providing ACOL contact number. Repair damaged roads.	Prior to commencement of longwall mining beneath affected property. Post-subsidence.
2.02	Surface Cracking (all surfaces)	Repair permanent surface cracking on AGL Macquarie land (by filling or ripping) and revegetate in accordance with the MOP.	Post-subsidence.
3.0	Incident Respon	se	
3.01	South Access Road	Repair road in accordance with the Road Management Response Table (see Section 5.2) during subsidence. Filling of subsidence cracks and regrading.	As required due to subsidence impact (i.e. if identified during daily visual inspections).
3.02	Sediment Dams	Repair / remediation to dams, basins and contour banks.	Damage observed during monthly inspections.
3.03	Fences	Repair of damaged fences and gates.	If any damage to fencing/gates is reported.
4.0	Reporting		
4.01	Items 1.01 to 1.03	Provide a copy of pre-mining condition assessments to AGL Macquarie. Notify AGL Macquarie and provide copies of monitoring results.	Once completed. If subsidence monitoring results are greater than predicted or if potential impacts are identified.
4.02	Items 2.01 and 2.02	Notify and undertake management measures in consultation with AGL Macquarie.	If required.
4.03	Items 3.01 to 3.03	Notify stakeholders. Notify Resources Regulator if deemed a reportable incident.	Reporting as per Extraction Plan requirements.



5.1 SUBSIDENCE INSPECTIONS

Subsidence inspections will be carried out by mine staff pre mining and daily when the longwall face is within 50 m of the South Access Road, until the completion of subsidence.

The inspections will be carried out to identify any impacts on the ground surface directly above the undermined areas particularly in the vicinity of any AGL Macquarie infrastructure. The inspection checklist used for this task is shown in **Appendix B**.

5.1.1 Scope of Inspections

Regular surface inspections will cover a zone defined as being 200 m behind and 100 m in front of the current face position. The inspections will cover the full subsidence bowl out to the 45 degree angle of draw. Inspections will be carried out by trained persons and will follow the inspection checklist. Inspections will identify the following subsidence impacts:

- surface cracking edges of extraction void and start and travelling abutments particularly in rock outcrop areas;
- surface humps (compression) near centre of extracted panels and travelling abutment;
- step change in land surface associated with cracking;
- damage to towers, conductors, powerlines;
- reduced ground clearances of conductors;
- tilting of towers, increased/decreased tension in conductors; and
- bent crossarms or insulators.

5.1.2 Public Safety Issues Identified During Inspections

If any public safety issue is identified during inspections the person conducting the inspection shall:

- immediately notify the Technical Services Manager and/or Environment & Community Superintendent;
- erect "NO ROAD" or barrier tape and warning signs if immediate remediation is not possible; and
- the Operations Manager shall immediately notify the NSW Resources Regulator, Landholder and the infrastructure owner (contact details in Appendix A).



5.1.3 Remediation of AGL Macquarie Infrastructure Safety Issues

If any public safety issue is identified during inspections or other public safety issue is identified during assessment of monitoring or inspection results that person shall:

- immediately contact AGL Macquarie and advise the identified impact;
- arrange for AGL Macquarie to implement immediate repairs if necessary; and
- liaise with Mine Management and Subsidence Advisory NSW to arrange long term repairs.

5.2 CONTINGENCY PLANS

Should vehicle movements be interrupted on South Access Road as a result of subsidence impacts, ACOL will implement appropriate road management actions to ensure the road remains safe and functioning.

5.2.1 Road Management Response – TARP

The following table has been developed to assist in implementing appropriate levels or response for a range of potential subsidence impacts to the private access roads within the Extraction Plan area. This table acts as a Trigger Action Response Plan (TARP) for subsidence impacts to the AGL Macquarie owned South Access Road.

Full Road Width Impact Half Road Width Road Edge Cracking > 200 mm wide HIGH HIGH Cracking 50 – 200 mm wide LOW Cracking < 50 mm wide LOW LOW Water ponding HIGH LOW **Compression Humps** HIGH LOW Other LOW LOW

Table 5. Road Management Response TARP

Actions to be taken in accordance with the following risk levels:

High:

- o Barricade affected area and notify landowner, affected occupants/road users.
- o Provide alternative access around hazard until remediation works are complete.
- o Proceed with remediation works as soon as practical and document all actions.

Moderate:

- o Erect warning signs on both sides of hazard.
- o Notify landowner, occupants/road users.



o Proceed with remediation works immediately and document all actions.

Low:

o Proceed with remediation works promptly and document all actions.

ACOL has access to experienced road maintenance and earth moving contractors. Should subsidence effects require a rapid response then:

- the Contractor Supervisors would be contacted by the Underground Mining Engineer and instructions provided as to repairs required;
- machinery to be used onsite or contract machinery will be utilised; and
- material a supply of road gravel or similar will be maintained onsite for incidental repairs.

5.3 REPORTING

The results of inspections will be recorded and filed. Monitoring results will be reported annually in the Annual Review (AR) where relevant. Other communications will be as detailed in the Public Safety Management Plan.



6 RESPONSIBILITIES

6.1 ASHTON OPERATIONS MANAGER

The Operations Manager must:

- promptly notify the Resources Regulator of any identified public safety issue via telephone to the central reporting number 1300 814 609; and
- complete a written notification using the online incident notification form via the Regulator Portal at https://www.resourcesregulator.nsw.gov.au/safety-and-health/notifications/incidentor-injury.

6.2 TECHNICAL SERVICES MANAGER

The Technical Services Manager must:

- authorise the Plan and any amendments;
- ensure that the required personnel and equipment are provided to enable this Plan to be implemented effectively;
- inform the Operations Manager of impacts requiring notification to the NSW Resources Regulator and/or AGL Macquarie; and
- liaise with officers of AGL Macquarie and remediation consultants and contractors as required.

6.3 ASHTON ENVIRONMENT & COMMUNITY SUPERINTENDENT

The Environment & Community Superintendent must:

- inform the landholders of impacts requiring remediation; and
- report monitoring results in the AR.

6.4 ASHTON REGISTERED MINING SURVEYOR

The Registered Mining Surveyor must:

- ensure that subsidence inspections are conducted to the required schedule and that the persons conducting the inspection are trained in the requirements of this plan and understand their obligations;
- review and assess subsidence monitoring results and inspection checklists; and
- promptly notify Technical Services Manager and/or the Environment and Community Superintendent of any identified public safety issue.



6.5 ASHTON TECHNICAL SERVICES TEAM

The Ashton Technical Services Team members must:

- conduct the subsidence inspection within the applicable subsidence zone to the standard required and using the subsidence inspection checklist;
- take actions to remediate any public safety issue identified during inspections; and
- where actions are beyond their capabilities immediately attempt to notify the landowner or infrastructure owner and Technical Services Manager.

6.6 AGL MACQUARIE

AGL Macquarie must arrange repairs as necessary through consultation between AGL Macquarie and ACOL.

6.7 PAYMENT OF COSTS IN RELATION TO REPAIRS

ACOL will liaise with Subsidence Advisory NSW in relation to payment for any necessary repairs such that no cost will be borne by AGL Macquarie.



7 TRAINING

All personnel who conduct inspections will be trained in the requirements of the Ashton Longwalls 205-208 Built Features Management Plan, Longwalls 205-208 Subsidence Monitoring Program and Longwalls 205-208 AGL Macquarie Asset Management Plan.

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



8 AUDIT AND REVIEW

8.1 AUDIT

The requirements of the Longwalls 205-208 AGL Macquarie Asset Management Plan are to be audited as required.

8.2 REVIEW

A review of this plan will be undertaken:

- if the mine design criteria are changed;
- if subsidence impacts are greater than predicted;
- if required by AGL Macquarie; and
- following each audit.



9 REFERENCES

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



Appendices



Appendix A Stakeholder Contact Details



Longwalls 205 - 208 Extraction Plan Stakeholder List

Position	Name	Phone			
ASHTON					
Operations Manager	Aaron McGuigan	6570 9104			
Technical Services Manager	Tony Sutherland	6570 9110			
Environment and Community Superintendent	Phillip Brown	6570 9219			
Mine Surveyor	Jeff Peck	6570 9125			
Senior Mining Engineer	Ben Tockuss	6570 9124			
After Hours	Ashton Control Room	6570 9166			
GOVERNMENT					
Subsidence Advisory NSW	Newcastle Office	4908 4300			
Resources Regulator		1300 814 609			
AGL MACQUARIE					
AGL Macquarie – Environment Business Partner	Summer Steward	6542 1508			
LANDHOLDERS					
Refer to Ashton internal contact re	egister.				



Appendix B Subsidence Inspection Checklist



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



SUBSIDENCE INSPECTION CHECKLIST

Where to Inspect

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

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

What to look for

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

Actions if there is damage to non ACOL infrastructure:

Immediately notify the:

- Operations Manager;
- Technical Services Manager and/or Environment & Community Superintendent; and
- relevant infrastructure owner/operator.

If repairs or remediation work are required these will be undertaken by ACOL.