

WAMBO COAL PTY LIMITED



SOUTH BATES EXTENSION UNDERGROUND MINE

EXTRACTION PLAN LONGWALLS 24 TO 26

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WAMBO COAL PTY LIMITED



SOUTH BATES EXTENSION UNDERGROUND MINE

**EXTRACTION PLAN
LONGWALLS 24 TO 26**

MAIN DOCUMENT

Peabody

WAMBO COAL PTY LIMITED
SOUTH BATES EXTENSION UNDERGROUND MINE

EXTRACTION PLAN
LONGWALLS 24 - 26



PREPARED BY
WAMBO COAL PTY LIMITED AND
RESOURCE STRATEGIES PTY LTD

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DOCUMENT CONTROL

Applicant	Wambo Coal Pty Limited
Mine	Wambo Coal Mine – South Bates Extension Underground Mine
Document No.	EP 24-26
Title	Extraction Plan for South Bates Extension Underground Mine Longwalls 24 to 26
General Description	Management of potential subsidence effects, subsidence impacts and environmental consequences from mining of Longwalls 24 to 26 at the South Bates Extension Underground Mine
Key Support Documents	Wambo Coal Environmental Management System Wambo Coal Health and Safety Management System
Development Consent	DA 305-7-2003 (as modified)
Mining Leases	CL 397, ML 1594, ML 1572, ML 1806, MLA 632

Revisions

Rev No	Date	Description	By	Checked
A	June 2023	Original Draft for Consultation	WCPL and Resource Strategies	-
B	October 2023	Minor changes to incorporate agency consultation comments and DPE comments	WCPL and Resource Strategies	-
C	November 2023	Minor revisions to incorporate additional DPE comments	WCPL and Resource Strategies	-

Approvals

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The nominated Coordinator for this document is	Manager, Environment and Community
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OVERVIEW AND SUMMARY OF COMMITMENTS

This document is an Extraction Plan that outlines the proposed management, mitigation, monitoring and reporting of potential subsidence impacts and environmental consequences from the secondary extraction of Longwalls 24 to 26 at the South Bates Extension Underground Mine.

The table on pages iii to vii summarises the key monitoring, management and reporting commitments in this Extraction Plan.

Wambo Coal Pty Limited (WCPL) commits to updating the Inrush Management Plan (as part of the notification under clause 33 of the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014*) to incorporate this revision of the Extraction Plan.

The Trigger Action Response Plans (TARPs) provided in the component management plans will be further developed as this Extraction Plan is reviewed and revised. **Table 22** of this Extraction Plan is designed to support both the TARPs in the component management plans and clearly outline actions and levels of responsibility within WCPL.

In accordance with the Development Consent, WCPL must ensure that underground mining complies with the subsidence impact performance measures outlined below. This Extraction Plan has been developed to meet these subsidence impact performance measures.

Subsidence Impact Performance Measures

Feature	Performance Measure
Wollombi Brook	Negligible subsidence impacts and environmental consequences. Release of water from the site only in accordance with Environment Protection Licence requirements.
Low level cliffs within the South Bates Extension Area	Minor environmental consequences (that is occasional rockfalls, displacement or dislodgement of boulders or slabs, or fracturing that in total do not impact more than 5% of the total face area of such features).
Wollemi National Park	Negligible subsidence impacts and environmental consequences.
Warkworth Sands Woodland Community	Minor cracking and ponding of the land surface or other subsidence impacts. Negligible environmental consequences.
White Box, Yellow Box, Blakely's Red Gum Woodland/Grassy White Box Woodland Community	Minor cracking and ponding of the land surface or other subsidence impacts. Negligible environmental consequences.
Central Hunter Valley Eucalypt Forest and Woodland Ecological Community	Minor cracking and ponding of the land surface or other subsidence impacts. Negligible environmental consequences.
Conservation Areas (including the proposed Wambo offset area under SSD 7142)	Negligible reduction to previously identified biodiversity credits.
Threatened Species and Communities	Minor cracking and ponding of the land surface or other subsidence impacts. Negligible environmental consequences.
Wambo Homestead Complex (WHC)	Negligible impact on heritage values, unless approval has been granted by the Heritage Branch and/or the Minister.
All built features (including public infrastructure and all structures on privately-owned land)	Always safe. Serviceability should be maintained wherever practicable. Loss of serviceability must be fully compensated. Damage must be fully repairable, and must be fully repaired or else replaced or fully compensated.
Public Safety	Negligible additional risk.

Source: After Tables 1 and 2 of the Development Consent (DA 305-7-2003).

Summary of Monitoring, Management and Reporting Commitments

Component	Monitoring	Management	Reference
North Wambo Creek	<ul style="list-style-type: none"> Monitoring of subsidence in accordance with the Subsidence Monitoring Program (Appendix H). Monitoring in accordance with the Surface Water Management Plan, including the subsidence and diversion monitoring program. Monitoring in accordance with the Groundwater Management Plan. Weekly visual inspections when extraction is occurring within 100 metres (m) of North Wambo Creek. Visual inspection of surface areas which required remediation in accordance with the Land Management Plan (Appendix B). 	<ul style="list-style-type: none"> Stockpile sufficient materials and make equipment and necessary resources available for sealing any surface cracks (particularly in areas that are predicted to be ponded) and installation of scour protection works. Remediation of larger surface cracks² along North Wambo Creek and in other areas where practicable using conventional earthmoving equipment. Installation of scour protection works in areas that may be vulnerable to scour following completion of subsidence. Stabilisation of any areas of surface cracking or erosion if necessary, using erosion protection measures (e.g. vegetation planting). Review of remediation measures and implementation of additional measures if required. Review of areas that may be vulnerable to instabilities along North Wambo Creek and North Wambo Creek Diversion and implementation of vegetation management and channel stabilisation measures if necessary. Implementation of the Response Plans in the Surface Water and Groundwater Management Plans. 	<p>Section 4.2.1 and Appendix A</p>
Waterfall Creek	<ul style="list-style-type: none"> Monitoring of subsidence in accordance with the Subsidence Monitoring Program (Appendix H). Monitoring in accordance with the Surface Water Management Plan, including the subsidence monitoring program. Monitoring in accordance with the Groundwater Management Plan. Weekly visual inspections when extraction is occurring within 100 metres (m) of Waterfall Creek. Visual inspection of surface areas which required remediation in accordance with the Land Management Plan (Appendix B). 	<ul style="list-style-type: none"> Stockpile sufficient materials and make equipment and necessary resources available for sealing any surface cracks (particularly in areas that are predicted to be ponded) and installation of scour protection works. Remediation of larger surface cracks² along Waterfall Creek and in other areas where practicable using conventional earthmoving equipment. Installation of scour protection works in areas that may be vulnerable to scour following completion of subsidence. Stabilisation of any areas of surface cracking or erosion if necessary, using erosion protection measures (e.g. vegetation planting). Review of remediation measures and implementation of additional measures if required. Review of areas that may be vulnerable to instabilities along Waterfall Creek and implementation of vegetation management and channel stabilisation measures if necessary. Implementation of the Response Plans in the Surface Water and Groundwater Management Plans. 	

Summary of Monitoring, Management and Reporting Commitments (Continued)

Component	Monitoring	Management	Reference
Ephemeral Drainage Lines	<ul style="list-style-type: none"> Monitoring of subsidence in accordance with the Subsidence Monitoring Program (Appendix H). Visual inspection of drainage line flow paths for evidence of erosion or channelisation following significant rainfall events. Monitoring in accordance with the Surface Water Management Plan, including bed and bank stability monitoring and surface water quality and flow monitoring. Monitoring in accordance with the Groundwater Management Plan. 	<ul style="list-style-type: none"> Implementation of the Response Plans in the Surface Water and Groundwater Management Plans. Post-subsidence assessment of impacts to North Wambo Creek and Waterfall Creek and other ephemeral drainage lines and implementation of any minor remedial works where required. 	<p>Section 4.2.1 and Appendix A</p>
Permian Aquifers	<ul style="list-style-type: none"> Monitoring in accordance with the Groundwater Management Plan. 	<ul style="list-style-type: none"> Implementation of the Response Plans in the Surface Water and Groundwater Management Plans. 	
Cliffs	<ul style="list-style-type: none"> Monitoring of subsidence in accordance with the Subsidence Monitoring Program. Visual observations of cliffs¹ nearest to Longwalls 24 to 26 for signs of recent rock fall and/or instability (high definition video/photos recorded via an unmanned aerial vehicle). 	<ul style="list-style-type: none"> Measures to stabilise/mitigate impacts to rock faces/cliffs if considered beneficial and practicable in consultation with relevant regulatory agencies (e.g. artificial rock support, standing supports, dislodgement of remaining loose rock, etc.). 	<p>Section 4.2.2 and Appendix B</p>
Land in General	<ul style="list-style-type: none"> Monitoring of subsidence in accordance with the Subsidence Monitoring Program. Visual observation of steep slopes over Longwalls 25 and 26. Visual observations of fences. Visual observations of the ground surface. Visual observations of low lying areas. Visual observations of surface areas which required remediation. 	<ul style="list-style-type: none"> Notification to agisters of areas of longwall mining and active subsidence, and exclusion of agistment grazing from areas where surface cracking presents a reasonable risk to people and/or livestock. Remediation of larger surface cracks² where practicable using conventional earthmoving equipment (e.g. a backhoe), including: <ul style="list-style-type: none"> infilling of surface cracks with soil or other suitable materials; or locally regrading and re-compacting the surface. Repair of fences prior to allowing access for agistment grazing. Stabilisation of any areas of surface cracking using erosion protection measures (e.g. vegetation planting). Drainage works and rehabilitation of subsidence troughs (i.e. areas of induced ponding) as necessary. Management measures in accordance with the Erosion and Sediment Control Plan. 	

Summary of Monitoring, Management and Reporting Commitments (Continued)

Component	Monitoring	Management	Reference
Biodiversity	<ul style="list-style-type: none"> Monitoring of subsidence in accordance with the Subsidence Monitoring Program. Monitoring in accordance with the Biodiversity Management Plan. Visual observations after mining of each longwall panel to record Wollemi National Park escarpment cliff stability (including high definition video/photos recorded via an unmanned aerial vehicle). 	<ul style="list-style-type: none"> Vegetation Clearance Protocol, described in the Biodiversity Management Plan. Threatened Species Management Protocol, described in the Biodiversity Management Plan. Rehabilitation as described in the Rehabilitation Management Plan. 	Section 4.2.3 and Appendix C
Aboriginal Cultural Heritage	<ul style="list-style-type: none"> Monthly visual observations (during extraction of Longwalls 24 to 26) of artefact scatters and isolated finds to identify any significant surface cracks and/or erosion in the vicinity of a site during extraction of longwall panels in immediate proximity to a site. 	<ul style="list-style-type: none"> Based on the recommendations of Kuskie (2022), artefact scatters will be left <i>in situ</i>. If subsidence monitoring identifies any adverse changes the appropriate stabilisation works and/or salvage will be considered in accordance with the protocols in the Heritage Management Plan. WCPL will maintain a database of site locations and locate any surface activities to avoid impacts to Aboriginal sites where practicable. If a site is to be impacted by surface remediation activities and it is located within an Aboriginal Heritage Impact Permit area, that site will be salvaged in accordance with the WCPL complex-wide Heritage Management Plan. WCPL will lodge updated Aboriginal Site Recording Forms and/or Aboriginal Site Impact Recording Forms with Heritage NSW when required. 	Section 4.2.4 and Appendix D

Summary of Monitoring, Management and Reporting Commitments (Continued)

Component	Monitoring	Management	Reference
WCPL Assets	<ul style="list-style-type: none"> • Visual observations to record the general condition of WCPL assets (e.g. active service lines), including safety and serviceability. • Visual observations to record condition of roads and access tracks, including surface cracks, buckling and general safety. • Monitoring of pipeline integrity at fixed points. • Monitoring to detect abnormal changes in flow in pipelines. 	<ul style="list-style-type: none"> • Assessment of WCPL assets to identify modifications potentially required prior to subsidence. • Assessment of bores and decommissioning and sealing prior to extraction if required (dependent on condition). • Maintenance of safe access to WCPL assets. • Implementation of communication protocols to ensure internal WCPL stakeholders are aware of the longwall progression. • Posting of warning signs at suitable locations on roads and site access tracks and updating warning signs if a change to the WCPL asset is identified during monitoring. • Provision of a 15 metre separation barrier around the Montrose West Open Cut pit walls. • Structural assessment of WCPL assets and subsidence assessment post-Longwalls 24 to 26 extraction. • Repair of WCPL assets in accordance with associated standards and procedures. 	<p>Section 4.2.5 and Appendix E</p>

Summary of Monitoring, Management and Reporting Commitments (Continued)

Component	Monitoring	Management	Reference
Public Safety	<ul style="list-style-type: none"> • Monitoring of subsidence in accordance with the Subsidence Monitoring Program. • Visual observations of fences. • Visual observations of warning signs (e.g. legibility). • Visual observations of integrity of cliffs and steep slopes. • Visual inspections per standard measures in the Health and Safety Management System (e.g. security, site staff around site). 	<ul style="list-style-type: none"> • Restricted access (i.e. the general public are not allowed on WCPL-owned land used for mining purposes). Permanent signage located at the entrance to WCPL-owned land will be maintained. • All personnel and visitors accessing the Wambo site are subject to Health and Safety Management System requirements. • Posting and maintenance of warning signs at suitable locations on property boundaries, fences and access tracks. The signs will indicate that underground mining (with surface subsidence) is being undertaken on WCPL-owned land and will prohibit entry by unauthorised persons. • Notification to agisters of areas of longwall mining and active subsidence, and exclusion of agistment grazing from areas where surface cracking presents a reasonable risk to people and/or livestock. • Management of surface cracking, areas of subsidence troughs and potential cliff or steep slope instability in accordance with the Land Management Plan. • Repair of fences in accordance with the Land Management Plan. • All safety incidents will be handled in accordance with the Health and Safety Management System. • Following mining, review of warning sign placement and removal if no longer required. 	Section 4.2.6 and Appendix F
Reporting	<p>The following mechanisms will report the outcomes of the monitoring and management measures:</p> <ul style="list-style-type: none"> • Incident Reporting. • Subsidence Management Status Reports. • Six Monthly Report (for the period 1 January to 30 June). • Annual Reviews (for the period 1 January to 31 December). 		Section 5.2

¹ Cliffs include: the low level cliffs, intermediate level cliffs and cliffs associated with the Wollemi National Park escarpment. There are no cliffs identified above or adjacent to Longwalls 24 to 26, however there are cliffs located approximately 760 m west of Longwall 26 within the Wollemi National Park escarpment.

² Minor cracks that develop are not expected to require remediation as geomorphologic process will result in natural filling of these cracks over time.

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- Appendix F Public Safety Management Plan for Longwalls 24-26
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- Report 1 Subsidence Predictions and Impact Assessments
- Report 2 Groundwater Assessment Review
- Report 3 Surface Water Assessment Review
- Report 4 Subsidence Risk Assessment

1 INTRODUCTION

The Wambo Coal Mine is an open cut and underground coal mining operation located approximately 15 kilometres (km) west of Singleton, near the village of Warkworth, New South Wales (NSW) (**Figure 1**). The Wambo Coal Mine is owned and operated by Wambo Coal Pty Limited (WCPL), a subsidiary of Peabody Energy Australia Pty Limited.

The potential environmental impacts of the existing Wambo Coal Mine were assessed in the *Wambo Development Project Environmental Impact Statement* (the Wambo Development Project EIS) (WCPL, 2003). Development Consent (DA 305-7-2003) for the Wambo Coal Mine was granted on 4 February 2004 by the then NSW Minister for Urban Affairs and Planning under Part 4 of the NSW *Environmental Planning and Assessment Act 1979*.

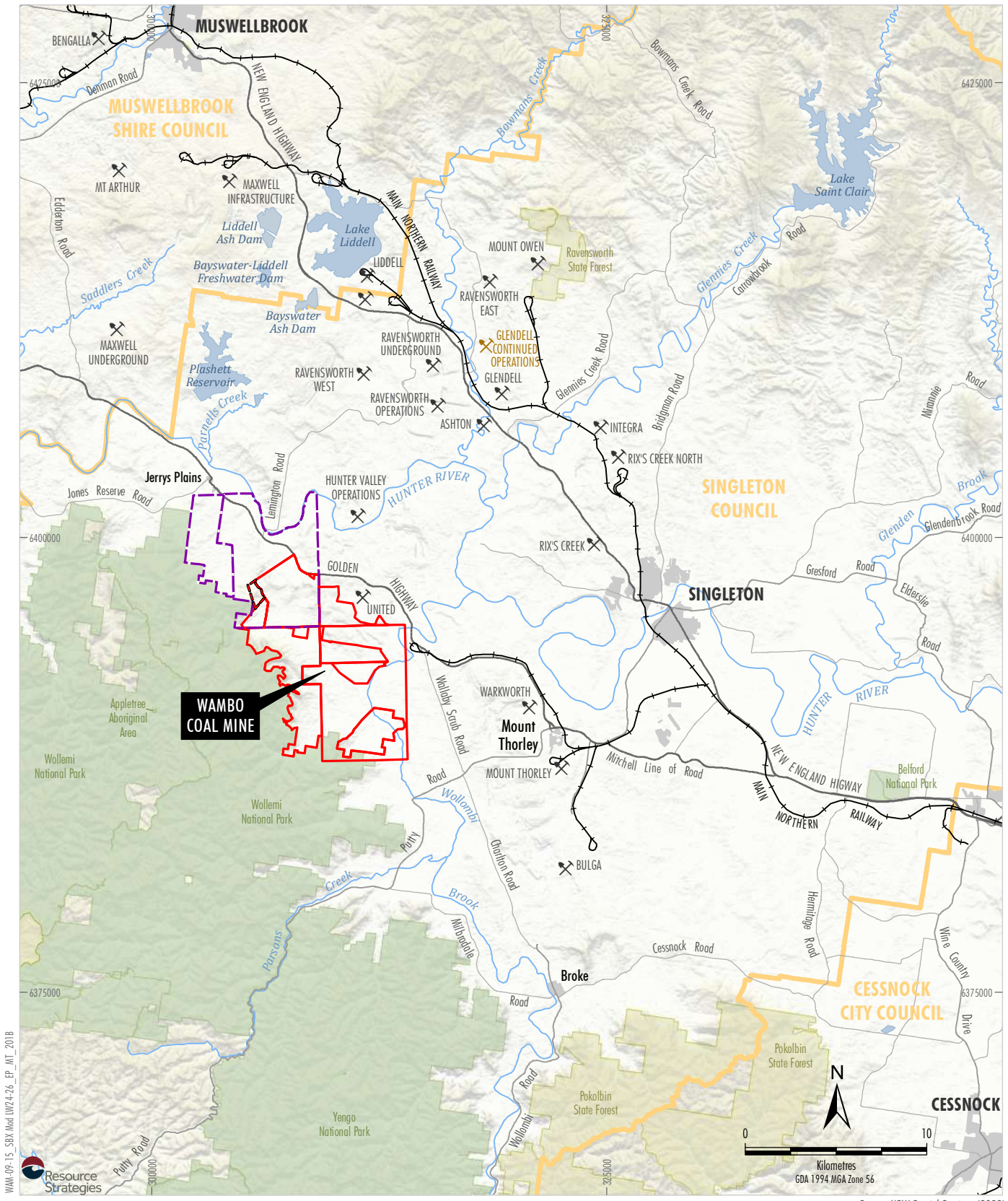
The South Bates Extension Underground Mine is a component of the approved Wambo Coal Mine. In August 2022, WCPL submitted an application to modify the Development Consent (DA 305-7-2003) to allow for the optimisation and continued operations of the South Bates Extension Underground Mine through the reorientation of Longwalls 24 and 25, and the addition of Longwall 26 (Modification 19) (WCPL, 2022). Modification 19 was approved on 25 January 2023.

The South Bates Extension Underground Mine commenced in Longwall 17 in December 2018 and involves extraction of coal by longwall mining methods from the Whybrow Seam within Coal Lease (CL) 397, Mining Lease (ML) 1594, ML 1572, ML 1806 and Mining Lease Application (MLA) 632 (**Figure 2**).

1.1 PURPOSE AND SCOPE

This document is an Extraction Plan that outlines the proposed management, mitigation, monitoring and reporting of potential subsidence impacts and environmental consequences from the secondary extraction of the second set of longwalls at the South Bates Extension Underground Mine (Longwalls 24 to 26).

This Extraction Plan has been prepared in consideration of the *Extraction Plan Guideline* (Department of Planning and Environment [DPE], 2022).



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GDA 1994 MGA Zone 56

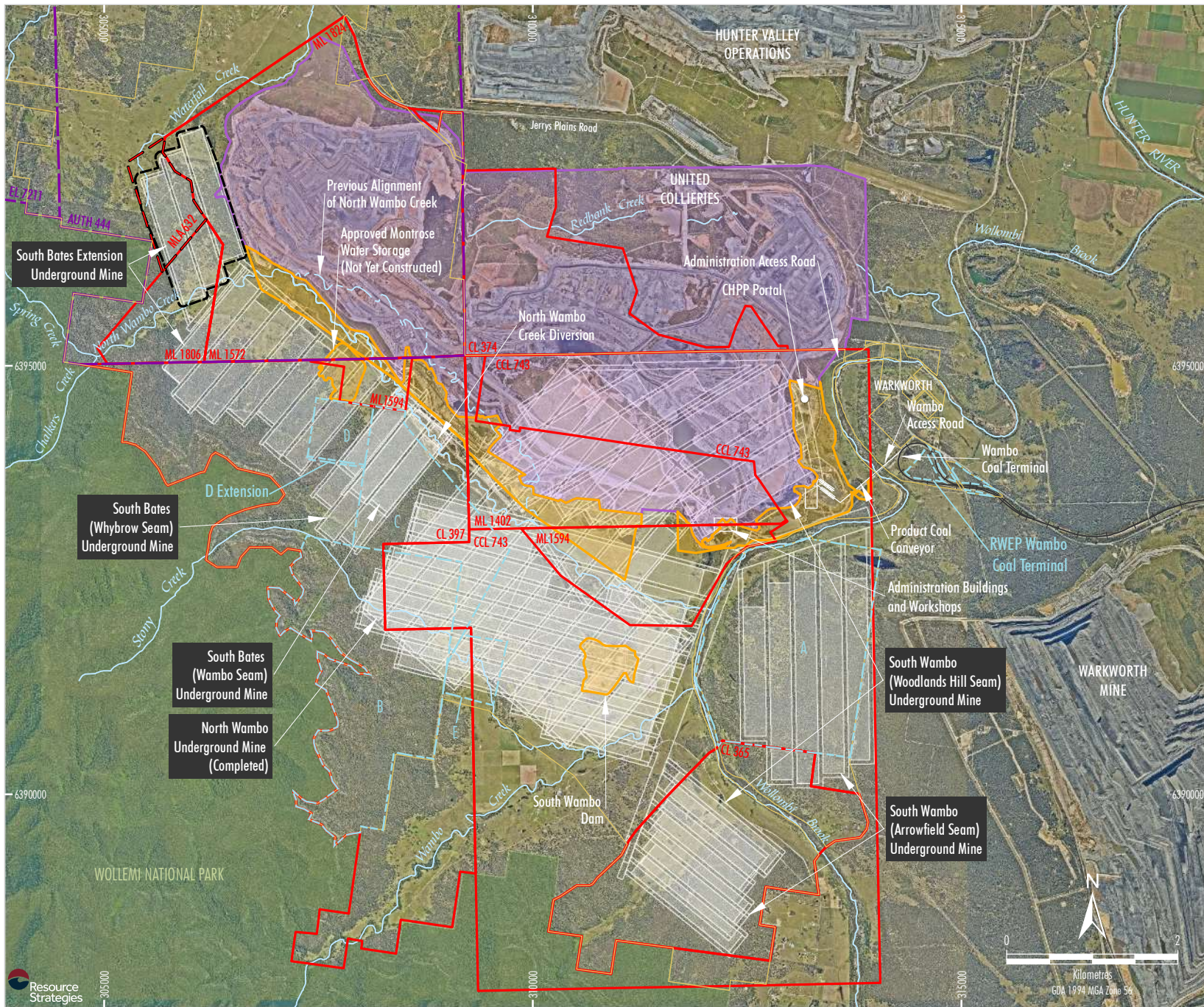
Source: NSW Spatial Services (2023)



- LEGEND**
- Exploration Licence Boundary (AUTH, EL)
 - Mining and Coal Lease Boundary (ML, CL, CCL)
 - Mining Lease Application Boundary (MLA)
 - Local Government Area
 - National Park
 - State Forest
 - ⚡ Mining Operation
 - ⚡ Proposed Mining Operation (Under Assessment)

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WAMBO COAL MINE
Regional Location

Figure 1



- LEGEND**
- National Park
 - SSD 7142 Operational Area #
 - WCPL Owned Land
 - Wambo Coal Mine
 - Exploration Licence Boundary (AUTH, EL)
 - Mining and Coal Lease Boundary (ML, CL, CCL)
 - Mining Lease Application Boundary (MLA)
 - Remnant Woodland Enhancement Program (RWEPM) Area
 - Existing/Approved Wambo Coal Mine Surface Development Area
 - Existing/Approved Underground Development
 - Extraction Plan Application Area

Under Phase 2 of mining at Wambo Coal Mine (commenced 1 December 2020), this area is operated by United Colliers Pty Ltd under the United Wambo Joint Venture Project.

Source: WCPL (2023); MSEC (2023); NSW Spatial Services (2023)
 Orthophoto: WCPL (Nov-May 2022)

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 WAMBO COAL MINE
 Existing/Approved Wambo Coal Mine Layout

Figure 2

The objectives of this Extraction Plan are to:

- provide detailed plans of Longwalls 24 to 26;
- outline potential subsidence effects, subsidence impacts and environmental consequences of Longwalls 24 to 26;
- describe the measures that will be implemented to ensure compliance with the subsidence impact performance measures and mitigate, manage and remediate potential subsidence impacts and environmental consequences; and
- detail a monitoring and contingency plan for potential subsidence impacts and environmental consequences, including detailed performance indicators for subsidence impact performance measures.

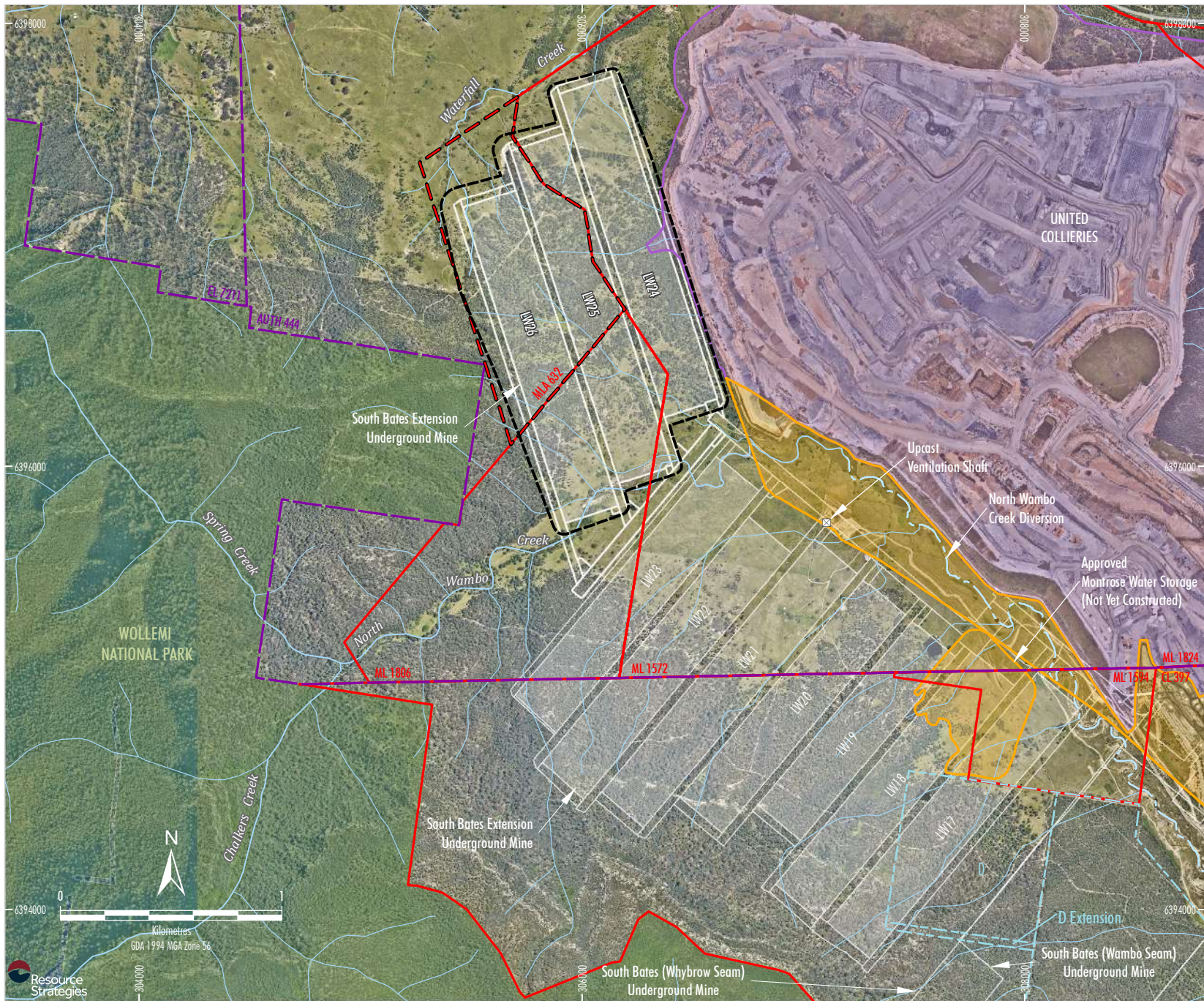
The South Bates Extension Underground Mine includes 10 longwalls in the Whybrow Seam (Longwalls 17 to 26). The Extraction Plan Application Area for Longwalls 24 to 26 (Longwalls 24 to 26 Application Area) is based on a 26.5 degree (°) angle of draw and is shown on **Figure 3**. Secondary extraction of Longwalls 24 to 26 is scheduled to commence in December 2023.

This Extraction Plan forms part of WCPL's Environmental Management System for the Wambo Coal Mine. The relationship of this Extraction Plan to the Wambo Coal Mine Environmental Management System is shown on **Figure 4**.

1.2 STRUCTURE OF THE EXTRACTION PLAN

This Extraction Plan comprises a main text component and supporting management plans and studies, which include **Appendices A through I** and **Technical Reports 1 through 4**. An overview of the main text sections of the Extraction Plan is presented below:

- | | |
|------------------|--|
| Section 1 | Provides an introduction to the Extraction Plan, including the purpose and scope of the Extraction Plan and a summary of the mine plan and design. |
| Section 2 | Describes the process undertaken to develop the Extraction Plan, including: the process of reviewing and updating the predictions of subsidence effects, subsidence impacts and environmental consequences; the risk assessment process for identifying key subsidence management issues; and consultation undertaken by the mine with affected agencies and other key stakeholders. |
| Section 3 | Provides a short overview of the subsidence impact assessment undertaken (Technical Report 1). |
| Section 4 | Details all of the monitoring methods proposed to support the assessment of subsidence effects, impacts and environmental consequences. |
| Section 5 | Describes the measures that will be implemented to manage, mitigate, remediate and report potential subsidence impacts and environmental consequences on natural and built features. |
| Section 6 | Addresses key elements of how the plan administration is going to be implemented, detailing the review protocol of the Extraction Plan and the associated management plans, alongside designating the key responsibilities of implementing the Extraction Plan. |
| Section 7 | Lists the documents referred to in Sections 1 to 4 of this Extraction Plan. |
| Section 8 | Defines abbreviations, acronyms and terms used in Sections 1 to 4 of this Extraction Plan. |



- LEGEND**
- National Park
 - SSD 7142 Operational Area #
 - Wambo Coal Mine
 - Exploration Licence Boundary (AUTH, EL)
 - Mining and Coal Lease Boundary (ML, CL, CCL)
 - Mining Lease Application Boundary (MLA)
 - Remnant Woodland Enhancement Program (RWEF) Area
 - Existing/Approved Wambo Coal Mine Surface Development Area
 - Ventilation Shaft
 - Existing/Approved Underground Development
 - Extraction Plan Application Area

Under Phase 2 of mining at Wambo Coal Mine (commenced 1 December 2020), this area is operated by United Collieries Pty Ltd under the United Wambo Joint Venture Project.

Source: WCPL (2023); MSEC (2023); NSW Spatial Services (2023)
 Orthophoto: WCPL (Nov 2022)



WAMBO COAL MINE
Aerial Photograph of Longwalls 24 - 26

Figure 3

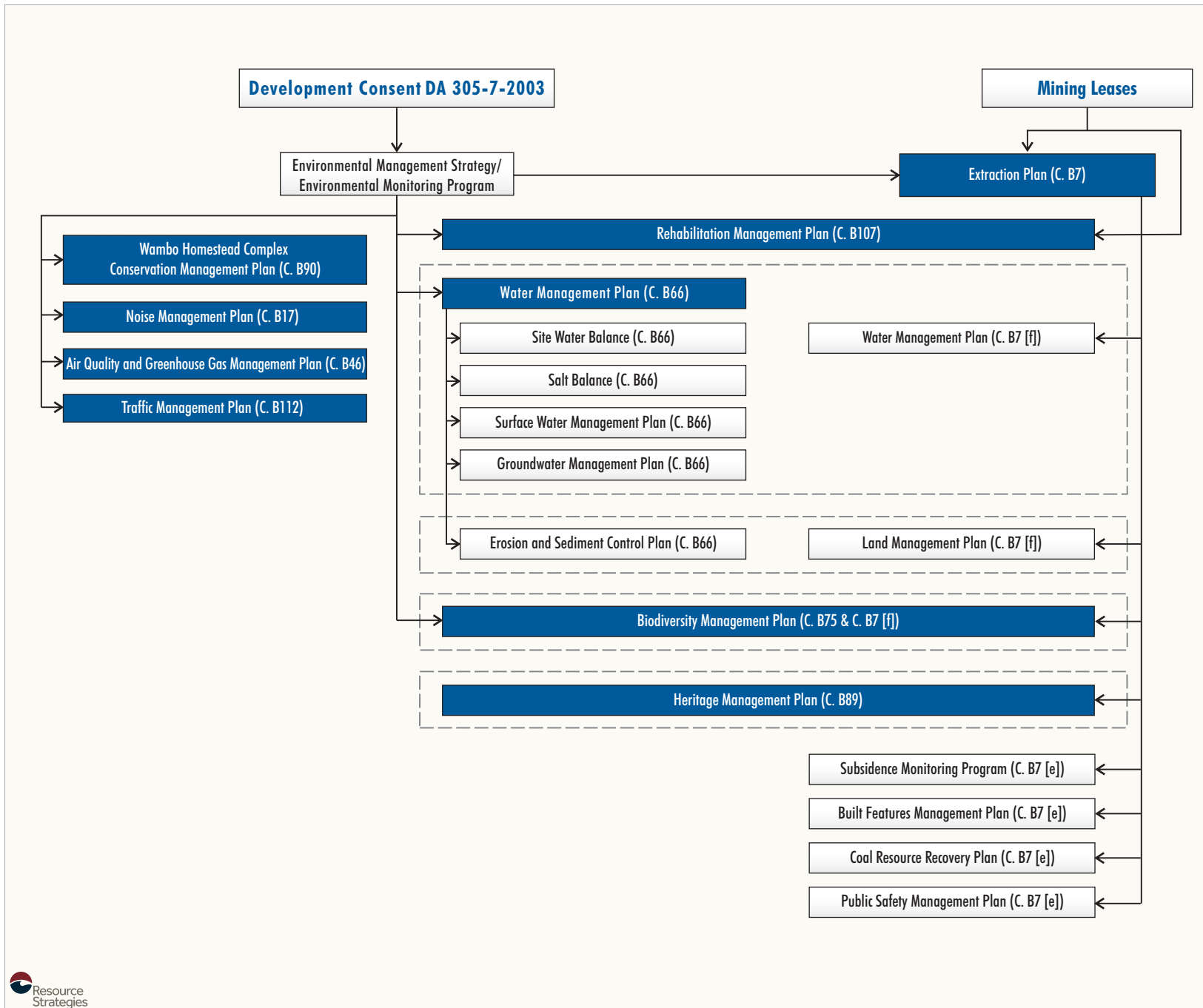


Figure 4

Attachment 1 Outlines the relevant requirements under the Development Consent (DA 305-7-2003), *Extraction Plan Guideline* (DPE , 2022) and mining leases, and provides the relevant section of this Extraction Plan where the requirements are addressed.

Attachment 2 Provides evidence of WCPL’s consultation process for the Extraction Plan.

Attachment 3 Provides details of a program to collect sufficient baseline data for future Extraction Plans.

Attachment 4 Provides a consolidated list of key stakeholder contact information.

Appendices A to I contain component management and monitoring plans of the Extraction Plan:

Appendix A Water Management Plan for Longwalls 24 to 26 (WMP).

Appendix B Land Management Plan for Longwalls 24 to 26 (LMP).

Appendix C WCPL complex-wide Biodiversity Management Plan (BMP) (addressing the requirement for a BMP for Longwalls 24 to 26).

Appendix D WCPL complex-wide Heritage Management Plan (HMP) (addressing the requirement for a HMP for Longwalls 24 to 26).

Appendix E Built Features Management Plan for Longwalls 24 to 26 (BFMP).

Appendix F Public Safety Management Plan for Longwalls 24 to 26 (PSMP).

Appendix G Coal Resource Recovery Plan for Longwalls 24 to 26 (CRRP).

Appendix H Subsidence Monitoring Program for Longwalls 24 to 26.

Appendix I Rehabilitation Management Plan (RMP).

This Extraction Plan is also supported by a series of technical reports, prepared by relevant specialists, which contain a review of predictions of subsidence effects, subsidence impacts and environmental consequences. A facilitated risk assessment workshop, incorporating the relevant technical specialists, was also conducted. These technical reports are contained in **Technical Reports 1 to 4**:

Technical Report 1 Subsidence Predictions and Impact Assessment.

Technical Report 2 Groundwater Assessment Review.

Technical Report 3 Surface Water Assessment Review.

Technical Report 4 Subsidence Risk Assessment.

1.3 MINE PLAN AND SCHEDULE

The approved orientation and footprint of the South Bates Extension Underground Mine was assessed by the Longwall 24 to 26 Modification (Modification 19) Modification Report (WCPL, 2022). Since Modification 19 was approved, no significant changes to the layout of Longwalls 24 to 26 have occurred. Only the finishing (i.e. southern) end of Longwall 24 has been reduced by approximately 39 metres (m).

Further detail on the mine plan and schedule is provided in the subsections below.

1.3.1 Mine Plan

Longwalls 24 to 26 will be extracted using retreating longwall mining methods for secondary extraction of panels with approximately 262 m void width (extraction face of approximately 251 m). Construction of development main headings, maingates and tailgates will be undertaken using continuous miners.

The Longwalls 24 to 26 Application Area and approved mine plan is shown in **Figure 3**, and key mining parameters are summarised in **Table 1**.

Table 1
Key Mining Parameters

Dimension	Longwall 24	Longwall 25	Longwall 26
Gate Road Width (m)	5.40		
Gate Road Height (m)	3.0		
Maingate Chain Pillar Width (m)	25	25	25
Tailgate Chain Pillar Width (m)	17	25	25
Longwall Void Width (m)	262		
Longwall Void Length (m)	1,540	1,585	1,505
Extraction Height (m)	1,545	1,586	1,507
Depth of Cover (m)	2.8 to 3.0	2.8 to 3.0	2.8 to 3.0

ROM = run-of-mine.

Mt = million tonnes.

m = metres (m).

Detailed mine layout drawings are provided in **Appendix G** (CRRP). **Appendix G** also provides justification of the mining layout, including a description of resource recovery and effects on future resource recovery.

Geology and Stratigraphy

The Wambo Coal Mine is situated within the Hunter Coalfield subdivision of the Sydney Basin, which forms the southern part of the Sydney-Gunnedah-Bowen Basin (WCPL, 2003). The coal-bearing rocks of the Sydney Basin are Permian in age and are typically associated with low-lying gentle topography (WCPL, 2003). The overlying rocks of Triassic age cover large parts of the Sydney Basin and tend to form prominent escarpments where they outcrop (WCPL, 2003).

Mining activities at the Wambo Coal Mine include both open cut and underground mining of several coal seams from the Wittingham Coal Measures, which combine with the Newcastle Coal Measures to form the Singleton Supergroup. A summary of the coal measure stratigraphy underlying the Wambo Coal Mine area is provided in **Figure 5**.

The Wittingham Coal Measures are divided into the Jerrys Plains Subgroup, Vane Subgroup, Denman Formation and Archerfield Sandstone (WCPL, 2003). The Jerrys Plains Subgroup contains eight formations with 15 named coal seams (WCPL, 2003). The Jerrys Plains Subgroup is up to 800 m thick and generally consists of relatively coarse clastic sediments (NSW Department of Mineral Resources [DMR], 1993). The sedimentary rock layers above and between coal seams are typically lithic sandstone, siltstone and conglomerate, while minor carbonaceous claystone and tuff occurs throughout the sequence (WCPL, 2003).

SUPERGROUP	GROUP	SUBGROUP	FORMATION	SEAM		
SINGLETON SUPERGROUP	NARRABEEN GROUP	WIDDEN BROOK CONGLOMERATE				
		GLEN GALLIC SUBGROUP	Greigs Creek Coal			
	Redmanvale Creek Formation					
	Dights Creek Coal					
	NEWCASTLE COAL MEASURES ¹	DOYLES CREEK SUBGROUP	Waterfall Gully Formation			
			Pinegrove Formation			
		HORSESHOE CREEK SUBGROUP	Lucernia Coal			
			Strathmore Formation			
			Alcheringa Coal			
			Clifford Formation			
		APPLETREE FLAT SUBGROUP	Charlton Formation			
			Abbey Green Coal			
		WATTS SANDSTONE				
		WITTINGHAM COAL MEASURES	DENMAN FORMATION			
	JERRYS PLAINS SUBGROUP		Mount Leonard Formation	<i>Whybrow Seam</i> ²		
			Althorpe Formation			
			Malabar Formation	<i>Redbank Creek Seam</i> ²		
				<i>Wambo Seam</i> ²		
				<i>Whynot Seam</i> ²		
				<i>Blakefield Seam</i>		
			Mount Ogilvie Formation	<i>Glen Munro Seam</i>		
				<i>Woodlands Hill Seam</i> ²		
			Milbrodale Formation			
			Mount Thorley Formation	<i>Arrowfield Seam</i> ²		
	<i>Bowfield Seam</i> ³					
	<i>Warkworth Seam</i> ³					
	Fairford Formation					
	Burnamwood Formation		<i>Mount Arthur Seam</i> ³			
			<i>Piercefield Seam</i> ³			
			<i>Vaux Seam</i> ³			
<i>Broonie Seam</i>						
<i>Boyswater Seam</i>						
ARCHERFIELD SANDSTONE						
VANE SUBGROUP	Bulga Formation					
	Foybrook Formation					
	Saltwater Creek Formation					

¹ Previously known as the Wollombi Coal Measures.

² Coal reserves currently approved to be mined at the Wambo Coal Mine.

³ Coal reserves proposed to be mined by the United Wambo Open Cut Coal Mine Project (SSD 7142).

WAM-09-15_SBX_Arcad LW24-26_EP_INT_001A



After: DMR (1993)



W A M B O C O A L M I N E

Stratigraphy of the
Wambo Coal Mine Area

Figure 5

Coal seams previously, currently and approved to be mined at the Wambo Coal Mine include (**Figure 5**):

- Whybrow Seam;
- Redbank Creek Seam;
- Wambo Seam;
- Whynot Seam;
- Woodlands Hill Seam; and
- Arrowfield Seam.

These seams dip gently to the south-west at approximately 2° to 3°, with minor local variations due to varying thicknesses of inter-seam sediments and fault zones (WCPL, 2003). Faulting usually trends north or north-east to south-west with normal throws of up to 10 m, with some low angle thrusts (i.e. reverse faults) of variable throw (MineConsult, 2001).

The South Bates Extension Underground Mine mines the Whybrow Seam, which produces a low ash thermal coal. ROM coal is crushed and washed at the Wambo coal handling and preparation plant. Product coal from the South Bates Extension Underground Mine will be considered suitable for export and domestic markets.

Regional geological structure in the Longwalls 24 to 26 Application Area consists of several faults. The largest structure in the area is the Redmanvale Fault which has a throw greater than 20 m and is located to the south-west of the longwalls.

The Redmanvale Fault is located more than 1 km from Longwall 26 at its closest point. At this distance, the Redmanvale Fault is not expected to affect the predicted subsidence effects or increased potential for adverse impacts (**Technical Report 1**).

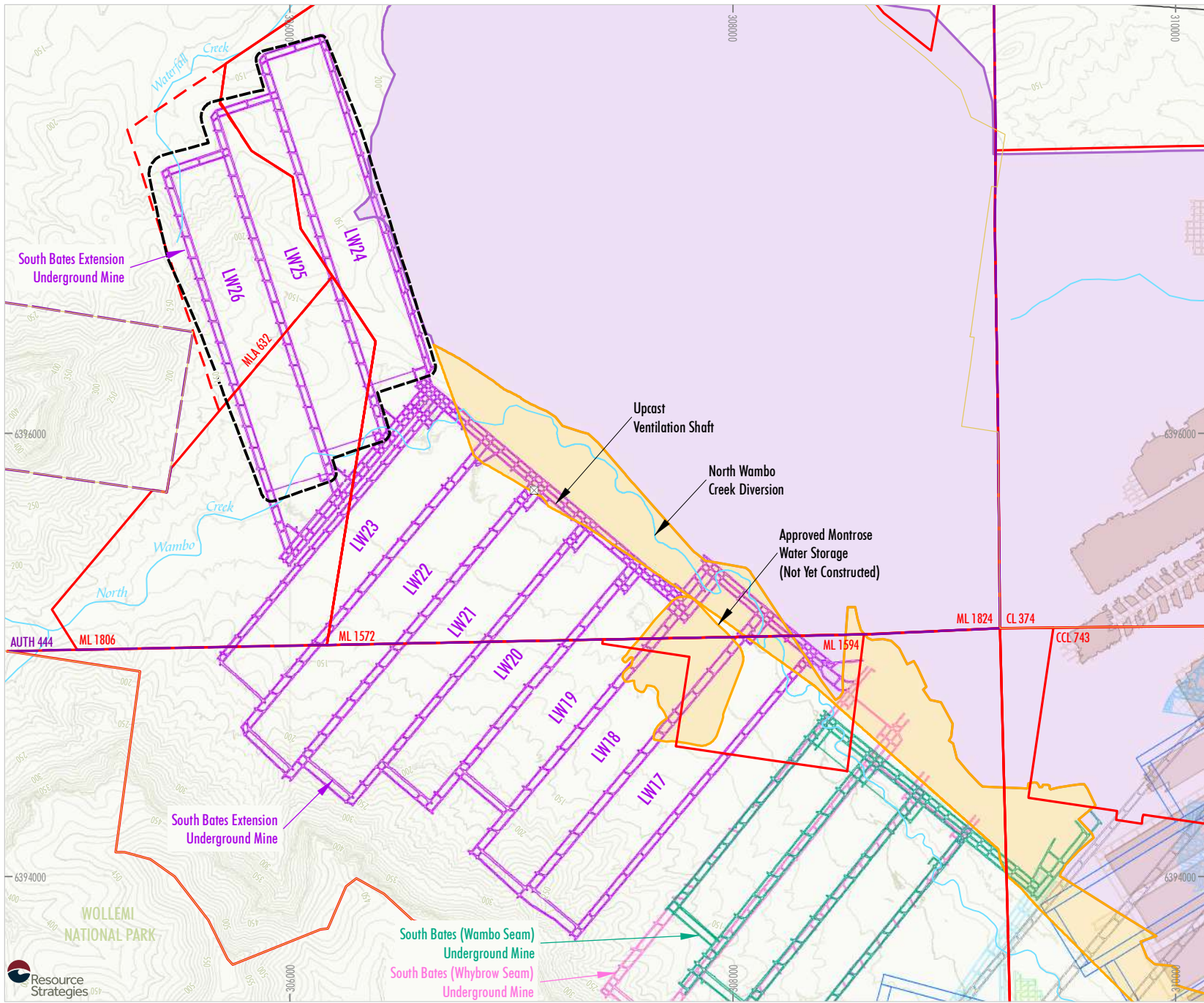
There are no major faults that have been identified within the extents of the proposed Longwall 24 to Longwall 26. Minor faults have been identified within the mining area with throws typically up to 1 m. A dyke crosses the mid-lengths of Longwalls 24 to 26. The faults and the dyke within the proposed mining area will be better defined through ongoing investigations and the development of first workings (**Technical Report 1**).

The overburden of the Longwalls 24 to 26 Application Area consists predominately of interbedded sandstone and siltstone layers, with minor claystone, mudstone, shale, tuffaceous and coal layers (**Technical Report 1**).

Previous and Future Mining

Previous and future workings in the vicinity of Longwalls 24 to 26 are shown on **Figure 6**.

In addition to the approved South Bates Extension Underground Mine, the Development Consent (DA 305-7-2003) provides consent for underground mining by longwall methods in the South Wambo Underground Mine Arrowfield and Woodlands Hill Seams (**Figure 6**). The future workings in the South Wambo Underground Mine are located to the south-east of the South Bates Extension Underground Mine (i.e. Longwalls 17 to 26) (**Figure 6**). The approved future underground longwall workings within the South Wambo Underground mine are described in the Wambo Development Project EIS (WCPL, 2003) and *South Wambo Underground Mine Modification Environmental Assessment* (WCPL, 2016) and will be the subject of a future Extraction Plan.



- LEGEND**
- SSD 7142 Operational Area #
 - WCPL Owned Land
 - Natural Surface Contour (50 m Interval)
 - Natural Surface Contour (10 m Interval)
 - Wambo Coal Mine
 - Exploration Licence Boundary (AUTH, EL)
 - Mining and Coal Lease Boundary (ML, CL, CCL)
 - Mining Lease Application Boundary (MLA)
 - Existing/Approved Wambo Coal Mine
 - Surface Development Area
 - Ventilation Shaft
 - Existing Homestead Mine Workings in Whybrow Seam
 - Existing Wollemi and Ridge Workings in Whybrow Seam
 - Existing United Mine Workings in Woodlands Hill/Arrowfield Seam
 - Existing North Wambo Underground Workings in Wambo Seam
 - Existing South Bates Underground Mine Workings in Whybrow Seam
 - Existing/Approved South Bates Underground Mine Workings in Wambo Seam
 - Approved Arrowfield and Woodlands Hill Seam Workings
 - South Bates Extension Underground Mine
 - Extraction Plan Application Area

Under Phase 2 of mining at Wambo Coal Mine (commenced 1 December 2020), this area is operated by United Collieries Pty Ltd under the United Wambo Joint Venture Project.

Source: WCPL (2023); MSEC (2023); NSW Spatial Services (2023)

Peabody
W A M B O C O A L M I N E
Longwalls 24 to 26 Layout

Figure 6

An application to modify the Development Consent (DA 305-7-2003 MOD 16) was lodged in November 2016 to support the proposed United Wambo Open Cut Coal Mine Project. The Modification was approved on 28 August 2019 and allows open cut mining at the United Wambo Open Cut Coal Mine, which is managed by Glencore Australia.

1.3.2 Mine Schedule

WCPL operates its mines seven days per week, 24 hours per day on a rotating shift basis. WCPL is currently mining Longwall 23 at the South Bates Extension Underground Mine.

The proposed sequence of mining for Longwalls 24 to 26 at the South Bates Extension Underground Mine under the Extraction Plan and anticipated/actual start and completion dates are summarised in **Table 2**.

**Table 2
Proposed Mining Schedule (Secondary Extraction)**

Longwall	Estimated Start Date	Estimated Duration	Estimated Completion Date
Longwall 24	December 2023	8 months	August 2024
Longwall 25	November 2024	8 months	July 2025
Longwall 26	October 2025	8 months	June 2026

2 PLAN DEVELOPMENT AND CONSULTATION

2.1 PLAN DEVELOPMENT

This Extraction Plan and its component plans have been prepared by WCPL, with assistance from Mine Subsidence Engineering Consultants (MSEC), SLR Consulting Pty Ltd (SLR), Alluvium Consulting (Alluvium), South East Archaeology, Eco Logical Australia (ELA) and Resource Strategies. The appointment of the team of suitably qualified and experienced persons has been endorsed by the Secretary of the DPE.

WCPL has engaged specialists to undertake technical reports to provide a review on the predicted subsidence effects, subsidence impacts and environmental consequences (**Technical Reports 1 to 4**) of mining Longwalls 24 to 26.

Subsidence predictions of mining Longwalls 24 to 26 was undertaken by MSEC within *South Bates Extension Underground Mine Longwalls 24-26 Modification Subsidence Assessment* (MSEC, 2022). These subsidence predictions have been reviewed alongside recent subsidence monitoring data with the technical report provided by MSEC (2023) (**Technical Report 1**).

A review of the Groundwater Assessment undertaken by SLR to evaluate the groundwater impacts predicted in the *Longwalls 24-26 Modification Groundwater Assessment* (SLR, 2022). A review of recent groundwater monitoring data and predicted groundwater drawdown have been undertaken within the technical report provided by SLR (2023) (**Technical Report 2**). SLR has further conducted a review of the WMP (**Appendix A**).

A review of the Surface Water Assessment undertaken by Alluvium to evaluate the surface water impacts that were predicted in the *Longwalls 24-26 Modification – Surface Water Assessment* (Alluvium, 2022). A review of the cumulative subsidence impacts and environmental consequences on the North Wambo Creek and Waterfall Creek, alongside recommendations on the monitoring and mitigation of these environmental impacts has been provided within the technical report provided by Alluvium (2023) (**Technical Report 3**). Alluvium has further conducted a review of the WMP (**Appendix A**).

A review of the WCPL complex-wide HMP (**Appendix D**) and WCPL complex-wide BMP (**Appendix C**) was undertaken by South East Archaeology and ELA, respectively, for its inclusion in this Extraction Plan.

2.1.1 Statutory Requirements

This Extraction Plan has been prepared in accordance with the conditions of the Development Consent (DA 305-7-2003), and in consideration of the *Extraction Plan Guideline* (DPE, 2022).

The statutory requirements relevant to this Extraction Plan are summarised below.

Development Consent (DA 305-7-2003)

This Extraction Plan has been prepared in accordance with Condition B7 of Schedule 2 of the Development Consent (DA 305-7-2003). The requirements of Condition B7 of Schedule 2 are summarised in **Table 3**, along with the relevant section of this Extraction Plan in which the requirements are addressed.

Further detail on the requirements of the Development Consent (DA 305-7-2003) is provided in **Attachment 1**.

Mining Lease Conditions

Longwalls 24 to 26 are located within ML 1572, ML 1806 and MLA 632 (**Figure 3**). Under the conditions of the mining leases, WCPL must not undertake underground mining operations that may cause subsidence other than in accordance with an approved Extraction Plan. The approved Extraction Plan must provide for the effective management of risks associated with any subsidence resulting from mining operations. The requirements of the conditions of the mining leases are summarised in **Attachment 1**, along with the relevant section of this Extraction Plan where the requirements are addressed.

Other Statutory Requirements

In addition to the Development Consent (DA 305-7-2003) and mining leases, all activities at or in association with the South Bates Extension Underground Mine will be undertaken in accordance with the following licences, permits and leases:

- *Wambo Coal Mine Rehabilitation Management Plan* required under the Mining Lease conditions.
- Environment Protection Licence (EPL) 529 issued under the NSW *Protection of the Environment Operations Act 1997*, and any subsequent variations.
- Consent #2222 and Aboriginal Heritage Impact Permits (AHIPs) #C0001474, #C0002000 and #C0003213 issued under section 90 of the NSW *National Parks and Wildlife Act 1974* (NPW Act) and any additional AHIPs issued under section 90 of the NPW Act.
- Water access licences and approvals issued under the NSW *Water Management Act 2000*.
Mining and occupational health and safety related approvals granted by the NSW Resources Regulator and WorkCover NSW.

Table 3
Extraction Plan Requirements

Development Consent (DA 305-7-2003) Condition	Extraction Plan Reference
Condition B7 of Schedule 2	
B7. The Applicant must prepare an Extraction Plan for all second workings on the site to the satisfaction of the Planning Secretary. Each Extraction Plan must:	This document
a) be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Planning Secretary;	Section 2.1 and Attachment 2
b) include detailed plans of existing and proposed first and second workings and any associated surface development;	Section 1.3 and Appendix G
c) provide updated predictions of the potential subsidence effects, subsidence impacts and environmental consequences of the proposed mining covered by the Extraction Plan, incorporating any relevant information obtained since this consent;	Section 3 and Technical Reports 1 to 4
d) describe in detail the performance criteria to be implemented to ensure compliance with the performance measures in Table 1 and Table 2, and manage or remediate any impacts and/or environmental consequences to meet the rehabilitation objectives in condition B104, including: <ul style="list-style-type: none"> (i) a trigger action response plan to identify risks and specific follow up actions to avoid exceedances of the performance measures; and (ii) a contingency plan that expressly provides for adaptive management where monitoring indicates that there has been an exceedance of the performance measures, or where any such exceedance appears likely; 	Section 4 and Appendices A, B, C, D, E, F, H and I Section 5.3 and Appendices A, B, C, D, E, F, G, H, and I Section 5.1.2
e) include the following to the satisfaction of the Resources Regulator (or DRG, as the case may require): <ul style="list-style-type: none"> (i) a coal resource recovery plan... (ii) a Subsidence Monitoring Program... (iii) a Built Features Management Plan... (iv) a Public Safety Management Plan... (v) appropriate revisions to the Rehabilitation Management Plan... 	Appendix G Appendix H Appendix E Appendix F Appendix I
f) include a: <ul style="list-style-type: none"> (i) Water Management Plan... (ii) Biodiversity Management Plan... (iii) Land Management Plan... (iv) Heritage Management Plan... 	Appendix A Appendix C Appendix B Appendix D
g) include a program to collect sufficient baseline data for future Extraction Plans.	Attachment 3

2.1.2 Risk Assessment

A Subsidence Risk Assessment (Risk Mentor, 2023) for Longwalls 24 to 26 was undertaken to identify subsidence impacts with high risk levels and/or potentially severe consequences, including a workshop conducted in March 2023. The workshop was facilitated by a risk assessment specialist and attended by relevant WCPL personnel and technical specialists. The Subsidence Risk Assessment is provided as **Technical Report 4** of the Extraction Plan.

With the implementation of the identified controls, the risk assessment team consensus was that subsidence related impacts over Longwalls 24 to 26 could be managed at a tolerable level of risk (**Technical Report 4**).

A summary of the key potential consequences/hazards associated with Longwalls 24 to 26, as identified in the risk assessment workshop, is provided in **Table 4**. The table also provides a cross-reference to where these key potential consequences/hazards have been addressed in the Extraction Plan.

Table 4
Key Potential Consequences/Hazards Identified by the Subsidence Risk Assessment

Subject Area	Potential Consequence/Hazard	Extraction Plan Reference
Natural Features	Impacts to downstream water quality.	Section 4.2.1 and WMP (Appendix A)
	Failure of the monitoring program to detect and respond to an impact on the groundwater system.	
	Induced leakage from North Wambo Creek (natural and diverted sections) due to subsidence resulting in adverse impact on environmental flow.	
	Environmental consequences associated with water flow and quality changes in unnamed minor drainage lines resulting from subsidence impacts associated with the extraction of Longwalls 24 to 26.	
	Reduced base flow to North Wambo Creek and North Wambo Creek Diversion resulting from a lowering of the water table associated with the extraction of Longwalls 24 to 26.	
	Presence of a geological structure mid-block for Longwalls 24 to 26. Change in orientation will move closer to the mapped fault – which might lead to differences between modelled and observed groundwater drawdown (possibly conservative at a distance, but inaccurate locally).	
	Licensing requirements for base flow water loss and confidence in modelled numbers to address licensing requirements for the whole complex.	
	Potential for cracking enlargement in dispersive subsoils (where there are steep slopes).	
	Reduced base flow to North Wambo Creek / diversion resulting from a lowering of the water table associated with the extraction of Longwalls 24 to 26.	
	Impacts to downstream water quality.	
	Unintended subsidence impacts resulting in rock instability of the Wollemi National Park escarpment and associated environmental consequences.	Section 4.2.3 and BMP (Appendix C)
	Subsidence impacts on United Wambo Joint Venture Offset areas reducing biodiversity values.	
	Creation of subsidence repairs, monitoring or other tracks affects the conservation values of the United Wambo Joint Venture Offset areas.	
	Subsidence impacts resulting in significant cracking and downslope movement of steep slopes and associated environmental consequences.	Section 4.2.2 and LMP (Appendix B)
	A change in land surface slope and preferential pathways for rainfall infiltration resulting from fracturing to the land surface caused by the extraction of Longwalls 24 to 26.	
Mine Infrastructure	Ingress of oxygen into mine workings as a result of subsidence cracking and subsequent spontaneous combustion events.	Section 4.2.5 and BFMP (Appendix E)
	Structural damage to wells and bores close to the mine footprint, in particular monitoring bores and other gas drainage infrastructure.	
	Impact on ventilation shaft MG21.	
	North Wambo Creek damaged by subsidence (surface cracking along diversion directly above Longwalls 25 and 26) resulting in inflow to workings and delay to operations.	Section 4.2.1 and WMP (Appendix A)
Other	Controls and/or remediation that were committed to be implemented were not executed to a standard that meets regulator expectations and significant later works are required.	Section 4.2.7 and RMP (Appendix I)
	Impacts on access for firefighting or fire management purposes over Longwalls 24 to 26.	Section 4.2.6 and PSMP (Appendix F)

Source: After Risk Mentor (**Technical Report 4**).

2.2 CONSULTATION

Consultation is being conducted for the Extraction Plan in accordance with the requirements of the Development Consent (DA 305-7-2003) and in consideration of the Extraction Plan Guideline (DPE, 2022). Consultation with relevant stakeholders is described further below.

Evidence of WCPL's consultation process for the Extraction Plan is provided in **Section 2.2** and **Attachment 2**.

The consultation approach for this Extraction Plan recognises the extensive consultation that has occurred recently in relation to Modification 19 to DA 305-7-2003. This consultation included:

- meetings and correspondence with State Government agencies to obtain input on the proposed management approaches;
- consultation with registered Aboriginal parties in accordance with the Office of Environment and Heritage (OEH) policy *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (NSW Department of Environment, Climate Change and Water [DECCW], 2010); and
- a public exhibition process for the Modification 19 Modification Report between 20 September 2022 to 4 October 2022.

The layout and timing of Longwalls 24 to 26 has not significantly changed compared to the layout and timing presented and assessed in the Modification 19 Modification Report.

2.2.1 Government Agencies

A summary of the consultation with government agencies and the key issues raised is provided in **Table 5**. Draft management plans were distributed for comment as summarised in **Table 6**. There are no 'affected public authorities' relevant to the Longwalls 24 to 26 Application Area, therefore the LMP was not distributed for comment.

Table 5
Summary of Consultation with Government Agencies

Agency	Consultation Conducted	Revision Extraction Plan Required
DPE	<ul style="list-style-type: none"> • 24 March 2023 – endorsement of Extraction Plan team for Longwalls 24 to 26 and review of proposed approach to management of Extraction Plan process in relation to Phase 2 of the United Wambo Joint Venture Project. • 10 July 2023 – provided with a copy of the Extraction Plan for Longwalls 24 to 26. • 10 November 2023 – DPE provided comments on WCPL’s response to recommendations received from DPE-Water on 19 July 2023. 	<ul style="list-style-type: none"> • N/A
NSW Resources Regulator	<ul style="list-style-type: none"> • 4 October 2022 – submission on the Modification 19 Modification Report raised no specific comments. • 5 June 2023 – provided with a copy of the Extraction Plan for Longwalls 24 to 26. • 3 July 2023 – NSW Resources Regulator provided comments on the draft LMP. No revision to the LMP was required. 	<ul style="list-style-type: none"> • N/A
NSW Environment Protection Authority (EPA)	<ul style="list-style-type: none"> • 23 September 2022 – submission on the Modification 19 Modification Report raised no subsidence-related issues. • 5 June 2023 – provided with a copy of the Extraction Plan for Longwalls 24 to 26. 	<ul style="list-style-type: none"> • N/A
NSW Biodiversity and Conservation Division (BCD)	<ul style="list-style-type: none"> • 5 October 2022 – submission on the Modification 19 Modification Report requested the following: <ul style="list-style-type: none"> – additional information on the Surface Water Management Plan; and – WCPL prepares a Biodiversity Development Assessment Report. • 5 June 2023 – provided with a copy of the complex-wide BMP. • 23 June 2023 – BCD notified WCPL that they had no comments on the complex-wide BMP. 	<ul style="list-style-type: none"> • N/A
Heritage Council of NSW	<ul style="list-style-type: none"> • 16 September 2022 – submission on the Modification 19 Modification Report raised no comments. 	<ul style="list-style-type: none"> • N/A
Heritage NSW	<ul style="list-style-type: none"> • 15 September 2022 – submission on the Modification 19 Modification Report raised no comments. • 5 June 2023 – provided with a copy of the complex-wide HMP. • 3 July 2023 – Heritage NSW notified WCPL that they had no comments on the complex-wide HMP. 	<ul style="list-style-type: none"> • N/A
DPE – Water	<ul style="list-style-type: none"> • 26 October 2022 – submission on the Modification 19 Modification Report raised the following: <ul style="list-style-type: none"> – subsidence impacts to watercourses should be remediated to ensure stability and natural ecological functioning; – mitigate any impact to associated GDEs; and – report direct and indirect groundwater take against WALs and Shares held. • 5 June 2023 – provided with a copy of the Extraction Plan for Longwalls 24 to 26. • 19 July 2023 – DPE-Water provided comments on the draft Extraction Plan and draft Water Management Plan. Specific updates have been made to the Water Management Plan and Groundwater Management Plan to address these recommendations. 	<ul style="list-style-type: none"> • N/A
Subsidence Advisory NSW	<ul style="list-style-type: none"> • 8 November 2022– submission on Modification 19 Modification Report raised no issues. 	<ul style="list-style-type: none"> • N/A

Table 6
Management Plans Distributed for Comment

Management Plan	Agencies	Date Distributed
Water Management Plan (WMP)	EPA, DPE-Water, NRAR	5 June 2023
Biodiversity Management Plan (BMP)	BCD, DCCEEW	5 June 2023
Heritage Management Plan (HMP)	Heritage NSW	5 June 2023
	Registered Aboriginal Parties	9 June 2023
Coal Resource Recovery Plan (CRRP)	NSW Resources Regulator	5 June 2023
Subsidence Monitoring Program (SMP)	NSW Resources Regulator	5 June 2023
Built Features Management Plan (BFMP)	NSW Resources Regulator	5 June 2023
Public Safety Management Plan (PSMP)	NSW Resources Regulator	5 June 2023

2.2.2 Infrastructure Owners

All infrastructure within the Longwalls 24 to 26 Application Area is owned by WCPL and there are no other relevant infrastructure owners.

2.2.3 Public Consultation

The consultation approach for the Extraction Plan reflects that the Application Area is wholly within WCPL-owned land and land owned by the State of NSW (i.e. Crown Land).

The Community Consultative Committee (CCC) was consulted during the preparation of the Modification 19 Modification Report (DA 305-7-2003 MOD 19) and receive regular updates on the current status of underground mining operations at the Wambo Coal Mine.

An electronic copy of the Extraction Plan will be distributed to the members of the CCC for consultation purposes and the final Extraction Plan will be placed on the WCPL website.

2.2.4 Consultation with Aboriginal Stakeholders

Aboriginal stakeholders were consulted on the management of Aboriginal sites associated with Longwalls 24 to 26 through the preparation of an Aboriginal Cultural Heritage Assessment (ACHA) that accompanied the Modification 19 Modification Report (DA 305-7-2003 MOD 19). Consultation for the ACHA was conducted in accordance with the OEH policy *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW, 2010) and Condition B87, Schedule 2 of the Development Consent (DA 305-7-2003).

A draft version of the complex-wide HMP (incorporating management associated with Longwalls 24 to 26) was provided to the Aboriginal parties registered at the Wambo Coal Mine on 9 June 2023 for their review and comment (**Appendix D**). No comments from Aboriginal parties were received.

3 SUBSIDENCE ASSESSMENT

3.1 SUBSIDENCE PREDICTIONS

Predictions of subsidence effects for Longwalls 24 to 26 are provided by MSEC (**Technical Report 1**). The process for the development of these predictions is described in **Section 3.1.1**.

Predicted Conventional Subsidence Movements

The maximum vertical subsidence predicted by MSEC (**Technical Report 1**) is 1,950 millimetres (mm), which is the same as the maximum presented in the Modification 19 Modification Report (1,950 mm) (WCPL, 2022). The maximum tilt predicted by MSEC (**Technical Report 1**) (75 millimetres per metre [mm/m]) is the same as the maximum presented in the Modification 19 Modification Report (WCPL, 2022) (75 mm/m).

The maximum subsidence, tilts and curvatures predicted by MSEC (2023) for Longwalls 24 to 26 are summarised in **Table 7**. **Figure 7** provides subsidence contours for Longwalls 24 to 26 at the South Bates Extension Underground Mine.

Table 7
Maximum Predicted Total Subsidence, Tilt and Curvatures for Longwalls 24 to 26

Longwalls ¹	Subsidence (mm)	Tilt (mm/m)	Hogging Curvature (km ⁻¹)	Sagging Curvature (km ⁻¹)
Longwall 24	1,850	70	> 3.0	> 3.0
Longwall 25	1,950	75	> 3.0	> 3.0
Longwall 26	1,950	75	> 3.0	> 3.0
Cumulative subsidence	1,950	75	> 3.0	> 3.0

After: MSEC (2023).

Note: mm = millimetres; mm/m = millimetres per metre; km⁻¹ = per kilometre.

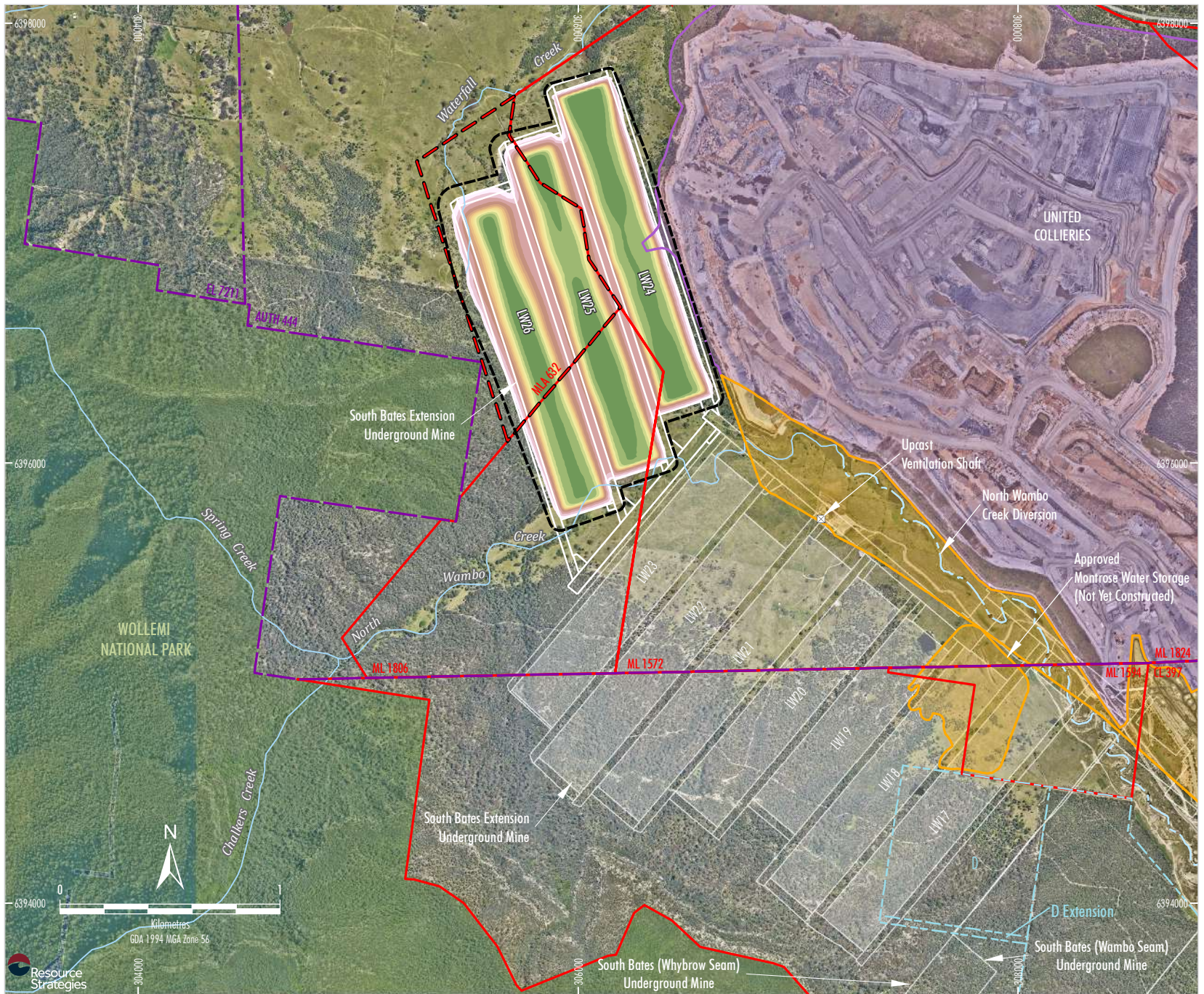
- Predictions for individual longwalls are incremental and do not take into account additional subsidence caused by adjacent longwall panels.

Non-Conventional Ground Movements

MSEC (**Technical Report 1**) considers it is likely non-conventional ground movements (i.e. localised irregularities) will occur due to near surface geological features, steep topography and shallow depths of cover. The non-conventional movements are often accompanied by elevated tilts, curvatures and strains which are likely to exceed the conventional predictions. The sections of drainage lines located directly above the longwalls have shallow incisions into the natural surface soils. The predicted valley related movements for the drainage lines, therefore, are not significant when compared with the predicted conventional movements (**Technical Report 1**).

In most cases, it is not possible to predict the exact locations or magnitudes of the non-conventional movements due to near surface geological conditions. For this reason, the strain predictions provided in **Technical Report 1** are based on a statistical analysis of measured strains, including both conventional and non-conventional anomalous strains.

For single-seam conditions, at the commencing ends of Longwalls 24 to 26 (i.e. north-western), the 95 percent (%) confidence levels for maximum strains above areas with similar mining geometry was 5 mm/m tensile and 4 mm/m compressive (**Technical Report 1**). At the finishing ends of Longwalls 24 to 26, the 95% confidence levels for maximum strains above areas with similar mining geometry was 12 mm/m tensile and 17 mm/m compressive (**Technical Report 1**).



- LEGEND**
- National Park
 - SSD 7142 Operational Area #
 - ▭ Wambo Coal Mine
 - ▭ Exploration Licence Boundary (AUTH, EL)
 - ▭ Mining and Coal Lease Boundary (ML, CL, CCL)
 - ▭ Mining Lease Application Boundary (MLA)
 - ▭ Remnant Woodland Enhancement Program (RWEF) Area
 - ▭ Existing/Approved Wambo Coal Mine Surface Development Area
 - ▭ Ventilation Shaft
 - ▭ Existing/Approved Underground Development
 - ▭ Extraction Plan Application Area
 - ▭ Subsidence Contour Colour Scale (mm)
- | |
|------|
| 20 |
| 50 |
| 100 |
| 200 |
| 400 |
| 600 |
| 800 |
| 1000 |
| 1200 |
| 1400 |
| 1600 |
| 1800 |

Under Phase 2 of mining at Wambo Coal Mine (commenced 1 December 2020), this area is operated by United Collieries Pty Ltd under the United Wambo Joint Venture Project.

Source: WCPL (2023); MSEC (2023); NSW Spatial Services (2023)
 Orthophoto: WCPL (Nov 2022)

Peabody
 WAMBO COAL MINE
 Predicted Subsidence from the
 South Bates Extension Underground Mine

Figure 7

Predicted Far-Field Displacement Movements

An empirical database of observed incremental far-field horizontal movements from monitoring data from the NSW Coalfields indicates that the 95% confidence level for measurable far-field movements (i.e. nominally greater than 80 mm) is within 1 km from the active longwall (**Technical Report 1**).

The Montrose West Open Cut Pit is located to the north-east of Longwalls 24 to 26 (**Figure 7**). The open cut pit has extracted the overburden material above the Whybrow Seam. The removal of this material would have relieved and redistributed much of the horizontal in-situ stress in the overburden strata adjacent to the open cut pit. The potential for far-field horizontal movements in the vicinity of the Montrose West Open Cut Pit, therefore, is reduced (**Technical Report 1**).

The far-field horizontal movements due to the mining of Longwalls 24 to 26 are expected to be bodily (i.e. en masse) movements towards the mining area. These movements are associated with very low levels of strain (i.e. differential horizontal movements) that are generally in the order of survey tolerance (i.e. less than 0.3 mm/m).

MSEC (**Technical Report 1**) predicts the potential impacts of far-field horizontal movements on the natural and built features within the vicinity of the longwalls are not expected to be significant. Therefore, MSEC (**Technical Report 1**) considers it is not necessary to establish monitoring to measure the far-field horizontal movements resulting from Longwalls 24 to 26.

Timing and Duration of Subsidence Impacts

Surface cracking has been typically observed to close up as the longwall face retreats, and natural filling of minor remnant cracking usually occurs within 6 to 12 months. Conditions at the South Bates Extension Underground Mine in areas of high depth of cover are expected to be similar.

3.1.1 Review of Predictions

The predicted subsidence effects, subsidence impacts and environmental consequences of the South Bates Extension Underground Mine have been assessed in the Modification 19 Modification Report (WCPL, 2022), and by MSEC (2023), SLR (2023) and Alluvium (2023) (**Technical Reports 1 to 3**). This section describes the process of reviewing these predictions.

As discussed in **Section 1.3**, no significant changes to the layout of Longwalls 24 to 26 have occurred since Modification 19 was approved.

3.1.1.1 Predicted Subsidence Effects and Subsidence Impacts

A detailed subsidence assessment for Longwalls 24 to 26 has been prepared in support of this Extraction Plan, with the outcomes of this assessment incorporated into the management plans in **Appendices A to F**.

3.1.1.2 Review of Subsidence Prediction Methodology

The predictions of subsidence effects were developed by MSEC using the Incremental Profile Method (**Technical Report 1**), calibrated using local monitoring data from Longwalls 11 to 13 at the South Bates Underground Mine, Longwalls 1 to 6 at the North Wambo Underground Mine and from other nearby collieries in the Hunter Coalfield.

Ground movements measured along the 7XL-Line and 8XL-Line above Longwalls 11 to 13 at the South Bates Underground Mine and Longwall 17 at the South Bates Extension Underground Mine were also considered by MSEC (**Technical Report 1**). The observed profiles of subsidence, tilt and curvature along the 7XL-Line and 8XL-Line, reasonably match those predicted using the standard Incremental Profile Method for the Hunter Coalfield.

Based on the comparisons, it was found that the standard Incremental Profile Method for the Hunter Coalfield provides reasonable predictions of subsidence, tilt and curvature, for the longwall mining conditions at the South Bates Extension Underground Mine (**Technical Report 1**). It was considered, therefore, that the Incremental Profile Method provides predictions that are consistent with the measurements and that it was not necessary to re-calibrate the model based on the monitoring data for the Whybrow Seam.

Comparison with Previous Predictions of Subsidence Effects

Predicted subsidence parameters for Longwalls 24 to 26 were provided in the subsidence assessment prepared by MSEC (2022) in the Modification 19 Modification Report (WCPL, 2022).

MSEC (2023) presents subsidence predictions based on Longwalls 24 to 26 (**Technical Report 1**). The maximum predicted vertical subsidence and tilt for Longwalls 24 to 26, based on the Extraction Plan layout, is the same as the maximum predicted values based on the Modification 19 layout (**Technical Report 1**). The predicted subsidence effects are the same as there have been no significant changes to the longwall layout between MSEC (2022) and MSEC (2023) (i.e. approximate 39 m reduction to the finishing end of Longwall 24) (**Technical Report 1**).

Predicted Subsidence Impacts

Subsidence impacts predicted by MSEC (2022) above Longwalls 24 to 26 include:

- ground cracking above the longwalls with the greatest extent of cracking expected over the shallowest sections;
- potential for localised erosion of the ground surface depending on ground conditions, with the effects more prevalent in steeper terrain and along drainage flow paths; and
- alteration of existing surface drainage patterns with isolated ponding potentially occurring in low-lying areas overlying the longwalls.

The revised subsidence impacts predicted by MSEC (2023) (**Technical Report 1**) are consistent with, or less than, the predictions presented in the Modification 19 Modification Report (WCPL, 2022). A summary of the changes to predictions and assessed levels of potential impact for environmental and built features is provided in **Table 8**.

Table 8
Changes to Predictions and Assessed Levels of Potential Impact

Issue/Feature	Summary of Changes to Predictions and Assessed Levels of Potential Impact	Extraction Plan Reference
Surface Water		
North Wambo Creek Diversion	<ul style="list-style-type: none"> No change. 	Refer to the WMP and Technical Report 3 for more detail.
Waterfall Creek	<ul style="list-style-type: none"> No change. 	
North Wambo Creek	<ul style="list-style-type: none"> No change. 	
Ephemeral Drainage Lines	<ul style="list-style-type: none"> No change. 	
Groundwater		
Permian Aquifers	<ul style="list-style-type: none"> No change. 	Refer to the WMP for more detail.
Land		
Land Use	<ul style="list-style-type: none"> No change. 	Refer to the LMP for more detail.
Land Capability	<ul style="list-style-type: none"> No change. 	
Steep Slopes	<ul style="list-style-type: none"> No change. 	
Wollemi National Park Escarpment and Intermediate Level Cliffs	<ul style="list-style-type: none"> No change. 	
Low Level Cliffs	<ul style="list-style-type: none"> No change. 	
Land in General	<ul style="list-style-type: none"> No change. 	
Biodiversity		
Flora	<ul style="list-style-type: none"> No change. 	Refer to the BMP for more detail.
Fauna	<ul style="list-style-type: none"> No change. 	
Aquatic Ecosystems	<ul style="list-style-type: none"> No change. 	
Wollemi National Park	<ul style="list-style-type: none"> No change. 	
Aboriginal Cultural Heritage		
Open Artefact Sites	<ul style="list-style-type: none"> No change. 	Refer to the HMP for more detail.
Built Features		
WCPL Assets	<ul style="list-style-type: none"> No change. 	Refer to the BFMP for more detail.
Public Safety		
Public Safety	<ul style="list-style-type: none"> No change. 	Refer to the PSMP for more detail.

3.2 SUBSIDENCE IMPACT PERFORMANCE MEASURES

The statutory requirements relevant to this Extraction Plan are summarised in **Section 2.1.1**. In accordance with the Development Consent (DA 305-7-2003) (Conditions B1 and B4, Schedule 2), WCPL must ensure that the underground mining operations comply with the subsidence impact performance measures outlined in **Table 9**. This Extraction Plan has been developed to meet these performance measures. The locations of key features are provided on **Figures 8a and 8b**.

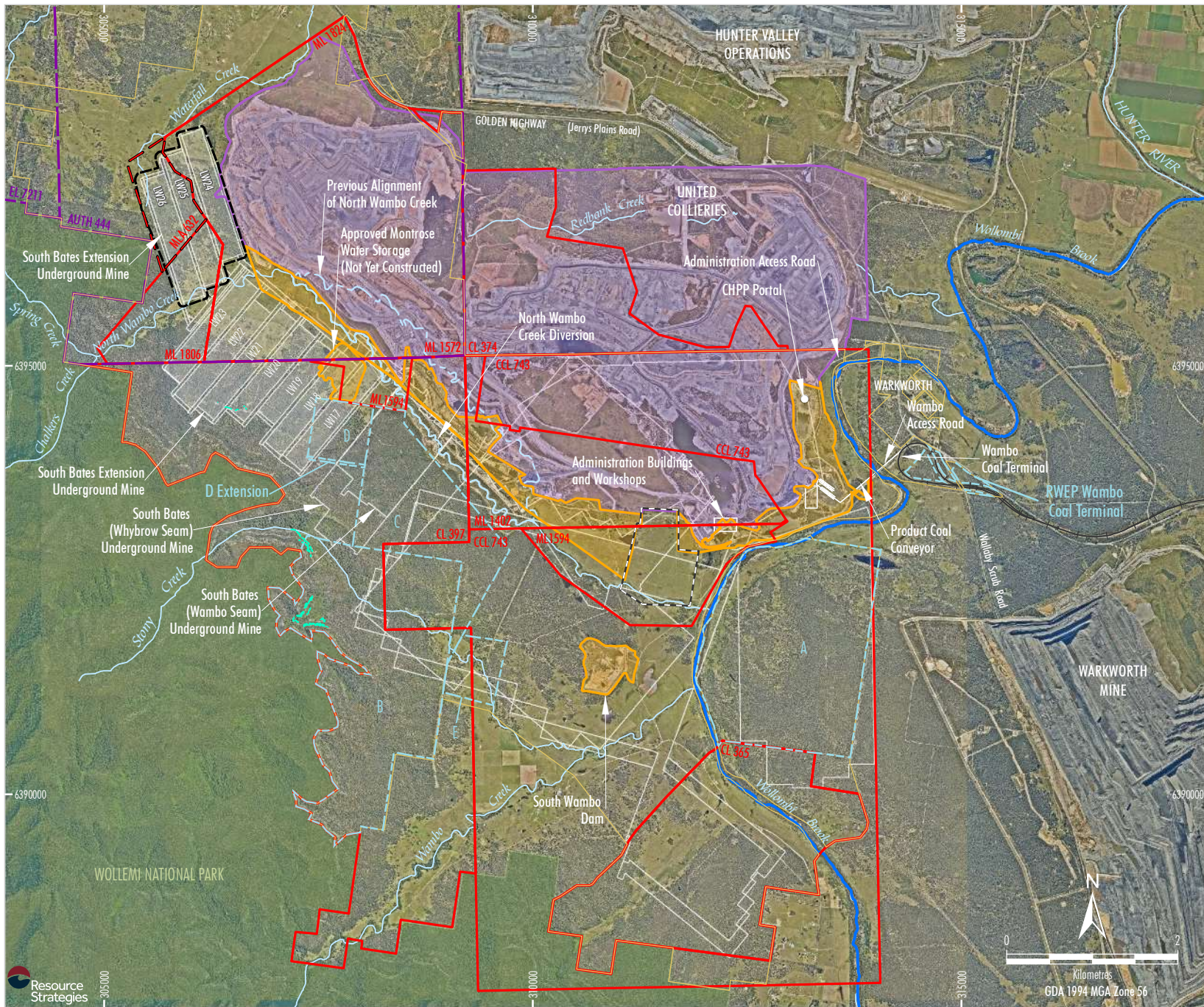
The Wambo Homestead Complex is located approximately 3.5 km south-east of Longwalls 17 to 26 (**Figures 8a and 8b**) and will experience no measurable subsidence from the South Bates Extension Underground Mine.

Monitoring of consequences against performance indicators and measures relating to the Wambo Homestead Complex is not considered necessary for Longwalls 24 to 26. Monitoring and management measures for the Wambo Homestead Complex were addressed in previous Extraction Plans for the North Wambo Underground Mine.

**Table 9
Subsidence Impact Performance Measures**

Feature	Performance Measure
Wollombi Brook	Negligible subsidence impacts and environmental consequences. Release of water from the site only in accordance with Environment Protection Licence requirements.
Low level cliffs within the South Bates Extension Area	Minor environmental consequences (that is occasional rockfalls, displacement or dislodgement of boulders or slabs, or fracturing that in total do not impact more than 5% of the total face area of such features).
Wollemi National Park	Negligible subsidence impacts and environmental consequences.
Warkworth Sands Woodland Community	Minor cracking and ponding of the land surface or other subsidence impacts. Negligible environmental consequences.
White Box, Yellow Box, Blakely's Red Gum Woodland/Grassy White Box Woodland Community	Minor cracking and ponding of the land surface or other subsidence impacts. Negligible environmental consequences.
Central Hunter Valley Eucalypt Forest and Woodland Ecological Community	Minor cracking and ponding of the land surface or other subsidence impacts. Negligible environmental consequences
Conservation Areas (including the proposed Wambo offset area under SSD 7142)	Negligible reduction to previously identified biodiversity credits.
Threatened Species and Communities	Minor cracking and ponding of the land surface or other subsidence impacts. Negligible environmental consequences.
Wambo Homestead Complex (WHC)	Negligible impact on heritage values, unless approval has been granted by Heritage NSW and/or the Minister.
All built features (including public infrastructure and all structures on privately-owned land)	Always safe. Serviceability should be maintained wherever practicable. Loss of serviceability must be fully compensated. Damage must be fully repairable, and must be fully repaired or else replaced or fully compensated.
Public Safety	Negligible additional risk.

Source: After Tables 1 and 2 of the Development Consent (DA 305-7-2003).



- LEGEND**
- National Park
 - SSD 7142 Operational Area #
 - WCPL Owned Land
 - Wambo Coal Mine
 - Exploration Licence Boundary (AUTH, EL)
 - Mining and Coal Lease Boundary (ML, CL, CCL)
 - Mining Lease Application Boundary (MLA)
 - Remnant Woodland Enhancement Program (RWEF) Area
 - Existing/Approved Wambo Coal Mine Surface Development Area
 - Existing/Approved Underground Development
 - Extraction Plan Application Area
 - Features with Subsidence Impact
 - Performance Measures
 - Wollumbi Brook
 - Low Level Cliffs
 - Wambo Homestead Complex Curtilage

Under Phase 2 of mining at Wambo Coal Mine (commenced 1 December 2020), this area is operated by United Collieries Pty Ltd under the United Wambo Joint Venture Project.

Source: WCPL (2023); MSEC (2020, 2023); NSW Spatial Services (2023)
 Orthophoto: WCPL (Nov-May 2022)

Peabody

WAMBO COAL MINE

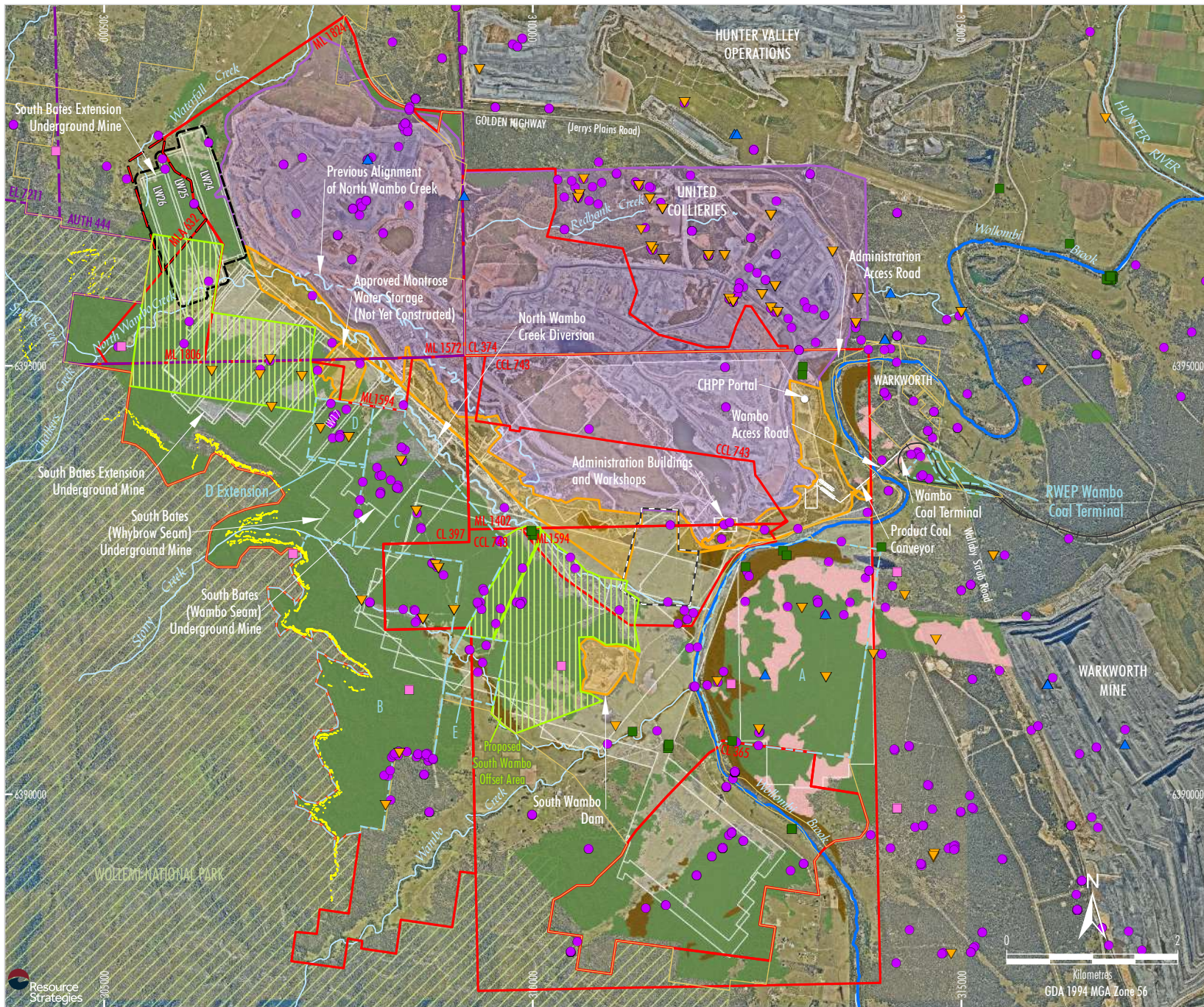
Features with Subsidence Impact

Performance Measures

- Water, Cliffs and Heritage



Figure 8a



- LEGEND**
- Wollemi National Park
 - SSD 7142 Operational Area #
 - WCPL Owned Land
 - Wambo Coal Mine
 - Exploration Licence Boundary (AUTH, EL)
 - Mining and Coal Lease Boundary (ML, CL, CCL)
 - Mining Lease Application Boundary (MLA)
 - Remnant Woodland Enhancement Program (RWEF) Area
 - Existing/Approved Wambo Coal Mine Surface Development Area
 - Existing/Approved Underground Development
 - Extraction Plan Application Area
 - Features with Subsidence Impact**
 - Performance Measures**
 - Wollemi National Park
 - Wollemi National Park Escarpment
 - Central Hunter Valley Eucalypt Forest and Woodland Community
 - Warkworth Sands Woodland
 - Other Threatened Ecological Community ¹
 - Threatened Flora Populations
 - Threatened Flora Species
 - Threatened Mammal Records
 - Threatened Bat Records
 - Threatened Bird Records

Under Phase 2 of mining at Wambo Coal Mine (commenced 1 December 2020), this area is operated by United Collieries Pty Ltd under the United Wambo Joint Venture Project.

¹ Listed as endangered or critically endangered under the Biodiversity Conservation Act, 2016.

Source: WCPL (2023); MSEC (2020, 2023); FloraSearch (2016, 2017, 2022 as modified by Hunter Eco); NSW Bioner Atlas (2023); NSW Spatial Services (2023)
 Orthophoto: WCPL (Nov-May 2022)

Peabody
 W A M B O C O A L M I N E
 Features with Subsidence Impact
 Performance Measures
 - Biodiversity

Figure 8b

3.3 SUBSIDENCE MANAGEMENT APPROACH

Potential environmental consequences from mining of Longwalls 24 to 26 will be managed in accordance with the relevant requirements of the Development Consent (DA 305-7-2003) and other approvals, through:

- **Mine Design** – Longwalls 24 to 26 have been designed to meet the subsidence impact performance measures for the Wollemi National Park (**Section 4.2.3**).
- **Subsidence Monitoring** – visual and survey monitoring and reporting will be conducted to confirm predictions of subsidence effects and detect subsidence impacts and environmental consequences (**Section 4.2.8**).
- **Remediation** – remediation of any subsidence impacts or environmental consequences detected by subsidence monitoring will be conducted where required in consideration of: the potential impacts of the unmitigated impact (including potential risks to safety and the potential for self-healing or long-term degradation); and the potential impacts of the remediation (**Sections 4.2.1 to 4.2.7**).
- **Contingency Response** – a contingency response will be implemented where a potential exceedance of a subsidence impact performance measure or an unexpected impact is detected (**Section 5.1.2**), including consideration of identified potential contingency measures (**Sections 4.2.1, 4.2.3 and 4.2.5**).
- **Adaptive Management and Review** – WCPL will implement an adaptive management approach by reviewing and evaluating the effectiveness of management strategies, and adjusting management strategies to improve performance, particularly following an exceedance of a subsidence impact performance measure or detection of an unexpected impact (**Sections 5.1, 6.1 and 6.3**).

3.3.1 Wollemi National Park Escarpment Offset

The cliffs associated with the Wollemi National Park escarpment were considered in the Modification 19 Modification Report (WCPL, 2022). WCPL (2022) states:

The Modification would not increase the predicted subsidence effects on the cliffs associated with the Wollemi National Park escarpment. MSEC (2022) concludes these cliffs are not predicted to experience measurable conventional tilts, curvatures or strains.

While the cliffs associated with the Wollemi National Park escarpment could experience low level far-field horizontal movements, it is unlikely that the cliffs would be adversely impacted (Appendix A).

There are no cliffs identified above or adjacent to Longwalls 24 to 26. Longwalls 24 to 26 are located approximately 760 m to the east of cliffs associated with the Wollemi National Park Escarpment (at its closest point). Longwalls 24 to 26 will meet the performance measures of negligible subsidence impacts to, and negligible environmental consequences for, the Wollemi National Park.

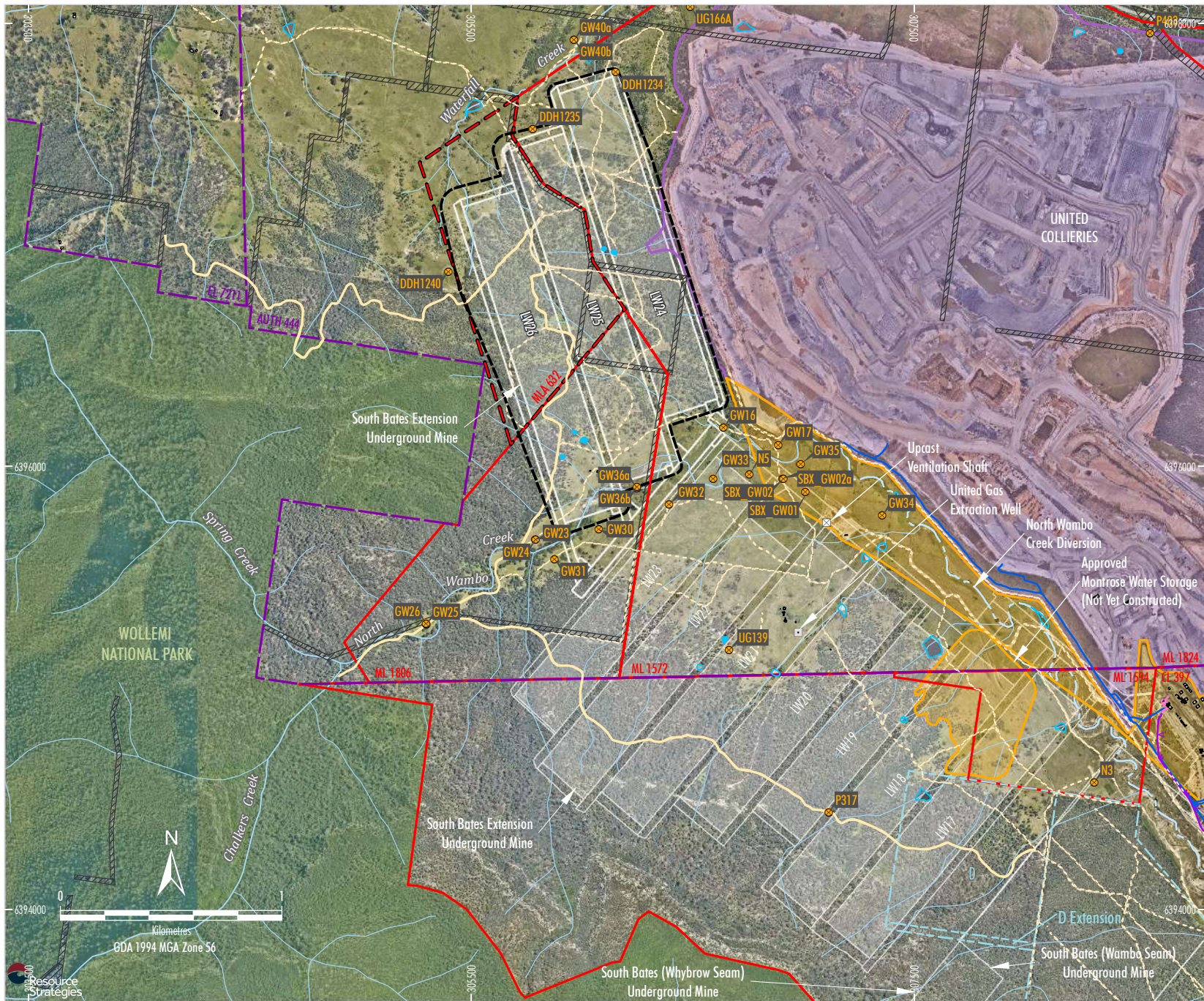
There is very low level predicted vertical subsidence for cliffs associated with the Wollemi National Park escarpment from Longwalls 24 to 26 (**Technical Report 1**). Any low level far-field horizontal movements are not expected to impact the cliffs associated with the Wollemi National Park escarpment (**Technical Report 1**).

4 MONITORING PROGRAMS

Surface and sub-surface features within, or in the vicinity of, the Longwalls 24 to 26 Application Area are listed in **Table 10**. These features may be potentially impacted by the secondary extraction of Longwalls 24 to 26. The locations of built features are shown in **Figure 9** and environmental features are shown in **Figures 3 and 10**. Descriptions of each of these features are contained within the relevant management plan referenced in **Table 10**.

Table 10
Surface and Sub-surface Features

Feature	Section/Management Plan Reference
Natural Features	
North Wambo Creek	Section 4.2.1 and WMP (Appendix A)
Waterfall Creek	
Permian aquifers	
Ephemeral drainage lines	
Threatened and protected species	Section 4.2.3 and BMP (Appendix C)
Natural vegetation	
Cliffs associated with the Wollemi National Park escarpment	Section 4.2.2 and LMP (Appendix B)
Steep slopes	
Farm Land and Facilities	
Use of WCPL-owned land for agistment	Section 4.2.2 and LMP (Appendix B)
Fences and gates	
Mine Infrastructure	
North Wambo Creek Diversion	Section 4.2.1 and WMP (Appendix A)
Groundwater monitoring bores	Section 4.2.5 and BFMP (Appendix E)
Montrose West Open Cut pit walls and emplacement areas	
Fences	
Exploration bores and gas wells	
Roads (all types)	
Wells or bores	
Farm dams	
Drainage culverts	
Farm buildings or sheds	
Tanks	
Areas of Archaeological and/or Heritage Significance	
Artefact scatters	Section 4.2.4 and HMP (Appendix D)

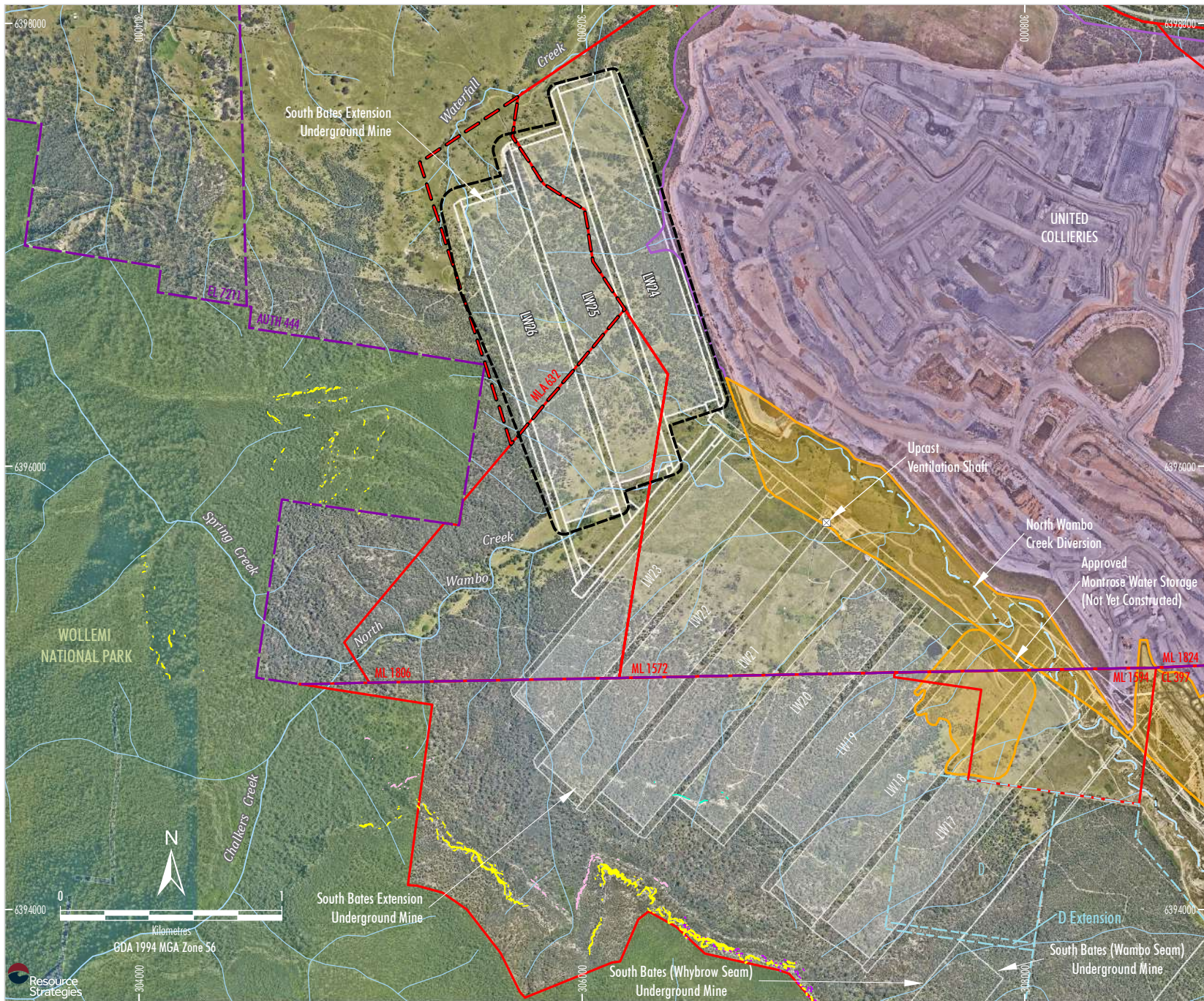


- LEGEND**
- National Park
 - Crown Road
 - SSD 7142 Operational Area #
 - Wambo Coal Mine
 - Exploration Licence Boundary (AUTH, EL)
 - Mining and Coal Lease Boundary (ML, CL, CCL)
 - Mining Lease Application Boundary (MLA)
 - Remnant Woodland Enhancement Program (RWEPP) Area
 - Existing/Approved Wambo Coal Mine Surface Development Area
 - Ventilation Shaft
 - Existing/Approved Underground Development
 - Extraction Plan Application Area
 - 11 kV Power Line
 - 11 kV Power Line Buried
 - Surface Water Supply/Dewatering Pipeline
 - Fire Trail
 - Access Track
 - Buildings
 - Groundwater Monitoring Sites

Under Phase 2 of mining at Wambo Coal Mine (commenced 1 December 2020), this area is operated by United Collieries Pty Ltd under the United Wambo Joint Venture Project.

Source: WCPL (2023); MSEC (2023); NSW Spatial Services (2023)
 Orthophoto: WCPL (Nov 2022)

Figure 9



- LEGEND**
- National Park
 - SSD 7142 Operational Area #
 - Wambo Coal Mine
 - Exploration Licence Boundary (AUTH, EL)
 - Mining and Coal Lease Boundary (ML, CL, CCL)
 - Mining Lease Application Boundary (MLA)
 - Remnant Woodland Enhancement Program (RWEF) Area
 - Existing/Approved Wambo Coal Mine Surface Development Area
 - Ventilation Shaft
 - Existing/Approved Underground Development
 - Extraction Plan Application Area
 - Cliffs
 - Associated with Wollemi National Park Escarpment
 - Intermediate Level Cliffs
 - Lower Level Cliffs
 - Spur
 - Minor Cliffs

Under Phase 2 of mining at Wambo Coal Mine (commenced 1 December 2020), this area is operated by United Colliers Pty Ltd under the United Wambo Joint Venture Project.

Source: WCPL (2023); MSEC (2020, 2023); NSW Spatial Services (2023)
 Orthophoto: WCPL (Nov 2022)

Peabody
 WAMBO COAL MINE
 Cliffs in the Vicinity of Longwalls 24 to 26

Figure 10

The Longwalls 24 to 26 Application Area is located wholly within the Patrick Plains Mine Subsidence District (proclaimed 2 July 1980 and revised on 7 July 2017). Fences, gates, and tracks are the only man-made structures in the Longwalls 24 to 26 Application Area known to have been constructed prior to the declaration of the Mine Subsidence District.

The Longwalls 24 to 26 Application Area is wholly within WCPL-owned land and land owned by the State of NSW (i.e. Crown Land) and there are no relevant proposed developments within the Application Area proposed by other parties.

Wollemi National Park (and its escarpment) may be considered an area of environmental sensitivity. Longwalls 24 to 26 would meet the performance measures of negligible subsidence impacts and negligible environmental consequences for the Wollemi National Park.

Subsidence predictions and impact assessments for surface and sub-surface features have been provided in **Technical Report 1**. Management and monitoring actions for each feature are included in management plans as indicated in **Table 10** and summarised in **Sections 4.2.1 to 4.2.8**.

The component management plans to this Extraction Plan form part of WCPL's Environmental Management System for the Wambo Coal Mine as shown on **Figure 4**. In order to avoid duplication of existing Environmental Management Plans, these management plans reference components of the following existing plans:

- WMP (Version 2), including:
 - Surface Water Management Plan (SWMP) (Version 2);
 - Groundwater Management Plan (GWMP) (Version 5); and
 - United Wambo and Wambo Water Monitoring Program (Version 5).
- BMP (complex-wide consolidated plan) (revisions to the plan proposed as part of this Extraction Plan revision) (Version 5), including:
 - Erosion and Sediment Control Plan (ESCP) (Version 2).
- HMP (complex-wide consolidated plan) (revisions to the plan proposed as part of this Extraction Plan revision) (Version 2).
- Health Safety Management System (HSMS) as summarised in the HSMS Overview.

A summary of the proposed monitoring for the Extraction Plan is provided in **Section 4.2.8**.

4.1 SUBSIDENCE MONITORING PROGRAM

4.1.1 Subsidence Monitoring Details

The Subsidence Monitoring Program is provided in **Appendix H**.

Subsidence monitoring lines are monitored until negligible change in subsidence is detected. Discontinuance of survey of these lines will be totally at the discretion of the Principal Subsidence Engineer (NSW Resources Regulator).

The monitoring lines for Longwalls 24 to 26 (Lines CL24A, CL26A, 9XL, 10XL) will be installed as star pickets driven to refusal with a mark then punched into the top and labelled. The marks will be capped with a protective cover that will be removed during survey.

Survey pegs shall generally be a minimum of 10 m and a maximum of 20 m apart.

Surveys shall be carried out using either differential levelling to class LC accuracy or Trig heightening methods to an accuracy of Class B as specified in the Inter-Governmental Committee on Surveying and Mapping Special Publication 1 (ICSM SP1).

Light Detection and Ranging (LiDAR) monitoring lines (Lines CL24A and CL26A) will be analysed by creating a surface profile along the line from 3 dimensional LiDAR data. The potential for survey error due to displacement of the data will be minimised through the use of fixed reference points outside the angle of draw. This data will be used to provide an estimate of the actual angle of draw to the limit of vertical subsidence data at the commencement ends. LiDAR analysis is considered the most suitable monitoring method given the terrain constraints the ability to use other survey methods.

4.1.2 Survey Accuracy and Frequency

The prescribed accuracy, as defined by the Inter-Governmental Committee on the Survey and Mapping Special Publication 1 and the required frequency of the surveys can be seen in **Table 11**.

4.1.3 Subsidence Effects Recording and Reporting

Subsidence survey data for the South Bates Extension Underground Mine will be stored by WCPL in a centralised database, with results from each survey clearly demarcated.

Subsidence survey data will be provided to the Principal Subsidence Engineer (NSW Resources Regulator) promptly following each survey. Subsidence effects will also be reported under the reporting framework of the Extraction Plan.

**Table 11
Subsidence Effects Monitoring Program Summary**

Survey Line	Data Type	Survey Accuracy Classification	Survey Frequency	Survey Status
Visual Inspections	As per the Subsidence Impact Register provided in Attachment 2 of the Subsidence Monitoring Program	N/A	<ul style="list-style-type: none"> • Within 1 month of longwall extraction that may cause surface movement. • 3 monthly or more frequent in areas of significance such as creeks, roads and buildings. 	<ul style="list-style-type: none"> • As per monitoring program.
Line 9XL	z (level and strain distances)	ICSM Class B or LC	<ul style="list-style-type: none"> • Twice prior to longwall extraction that will cause surface movement. • After completion of each longwall block. 	<ul style="list-style-type: none"> • Line to be installed and surveyed prior to commencement of mining.
Line 10XL	z (level and strain distances)	ICSM Class B or LC	<ul style="list-style-type: none"> • Twice prior to longwall extraction that will cause surface movement. • After completion of each longwall block. 	<ul style="list-style-type: none"> • Line to be installed and surveyed prior to commencement of mining.
Line CL24A	z (level and strain distances)	ICSM Class B or LC	<ul style="list-style-type: none"> • Twice prior to longwall extraction that will cause surface movement. • After completion of each longwall block. 	<ul style="list-style-type: none"> • Line to be installed and surveyed prior to commencement of mining.
Line CL26A	z (level and strain distances)	ICSM Class B or LC	<ul style="list-style-type: none"> • Twice prior to longwall extraction that will cause surface movement. • After completion of each longwall block. 	<ul style="list-style-type: none"> • Line to be installed and surveyed prior to commencement of mining.
Line CL24A	Random x, y, z (LiDAR)	<150mm Vert (1 sigma)	<ul style="list-style-type: none"> • Prior to longwall extraction that will cause surface movement. • After completion of each longwall block. 	<ul style="list-style-type: none"> • Baseline data to be collected prior to commencement of mining.
Line CL26A	Random x, y, z (LiDAR)	<150mm Vert (1 sigma)	<ul style="list-style-type: none"> • Prior to longwall extraction that will cause surface movement. • After completion of each longwall block. 	<ul style="list-style-type: none"> • Baseline data to be collected prior to commencement of mining.

4.2 ENVIRONMENTAL MONITORING PROGRAMS

4.2.1 Water Monitoring Program

4.2.1.1 Overview

The WMP is provided in **Appendix A**. The purpose and scope of the WMP are summarised below:

Purpose: Management of potential environmental consequences of the proposed secondary workings described in the Extraction Plan on water resources.

Scope: Surface water resources, groundwater resources and flooding within the Longwalls 24 to 26 Application Area (**Figure 3**).

The WMP references components of the SWMP and GWMP.

4.2.1.2 Key Water Issues, Monitoring and Management Measures

The key issues relating to subsidence impacts on surface water resources, groundwater resources and flooding described in the WMP and the relevant monitoring and management measures are summarised in **Table 12**.

The WMP addresses monitoring and management measures for ephemeral drainage lines in the Longwalls 24 to 26 Application Area.

The WMP also address monitoring and management measures for Waterfall Creek, North Wambo Creek and North Wambo Creek Diversion, a constructed water control structure for the Wambo Coal Mine. Potential impacts on Waterfall Creek, North Wambo Creek and North Wambo Creek Diversion is provided in **Technical Report 3**.

Alluvium (2022) reviewed the current subsidence and diversion monitoring program in the SWMP and recommended the installation of four additional subsidence and diversion monitoring points (U1A to U4A) along North Wambo Creek and three additional monitoring points (W1 to W3) along where headwater tributaries of Waterfall Creek cross the boundaries of Longwall panels 24 to 26 to monitor any major changes in gradient on the tributaries.

Based on the recommendations of SLR (2022, 2023) and feedback received from DPE-Water on 19 July 2023, WCPL installed four additional standpipe monitoring bores adjacent to Waterfall Creek at two paired locations upstream (GW40a and GW40b) and downstream (GW41a and GW41b) in October 2023. These bores are located along Waterfall Creek north-west of Longwalls 24 to 26 to monitor shallow unconsolidated and weathered strata to improve the understanding of the nature and saturation level of unconsolidated material. Additionally, WCPL has established a new surface water quality monitoring site (SW54) adjacent to groundwater monitoring bores GW40a and GW40b (an existing surface water quality monitoring bore [SW39] is located adjacent to groundwater monitoring bores GW41a and GW41b).

As required by Condition B65, Schedule 2 of the Development Consent (DA 305-7-2003), this Extraction Plan takes into account the findings of the Groundwater Dependent Ecosystem Study required under Condition B64, Schedule 2 of the Development Consent (DA 305-7-2003) and the monitoring results obtained to date from GW23, GW24, GW25, P317 and UG139.

4.2.1.3 *Assessment of Performance Indicators and Measures*

Performance indicators developed for the subsidence impact performance measures relating to water are presented in the WMP and are summarised in **Table 13**. Monitoring conducted to inform the assessment of the extraction of Longwalls 24 to 26 against these performance indicators is summarised in **Section 4.2.8** and **Appendix H**.

The procedure followed to assess the extraction of Longwalls 24 to 26 against the performance indicators and performance measures is outlined in **Figure 11** and described in detail in **Appendix A**.

Table 12
Water Management Issues Associated with the Extraction of Longwalls 24 to 26

Issue	Approved Impact	Revised Impact	Monitoring	Management
Surface Water				
North Wambo Creek	<ul style="list-style-type: none"> • Creation of ephemeral or semi-permanent pools.¹ • Potential for surface cracking above Longwalls 25 and 26 (similar to that observed above Longwall 11) and minor cracking along the section of the North Wambo Creek not located directly above the longwalls.¹ • Potential for changes in grade and increased scour (and associated suspended solids) prior to the implementation of scour protection works.¹ • Potential for increased leakage from the North Wambo Creek prior to crack remediation works.¹ 	<ul style="list-style-type: none"> • Impacts resulting from the extraction of Longwalls 24 to 26 will be consistent with those presented in the Modification 19 Modification Report.³ 	<ul style="list-style-type: none"> • Monitoring of subsidence in accordance with the Subsidence Monitoring Program (Appendix H). • Subsidence and diversion monitoring program in accordance with the SWMP, including: <ul style="list-style-type: none"> - surface water quality and flow monitoring; - monitoring of the Index of Diversion Condition (IDC); - Landscape Function Analysis (LFA) monitoring; - riparian vegetation assessment; - aerial photography analysis; - analysis of long and cross-section surveys; and - reviews of the geomorphic condition and assessment of efficacy of subsidence management or rehabilitation works. • Monitoring in accordance with the GWMP, including inflows to underground workings. • Weekly visual inspections when extraction is occurring within 100 m of North Wambo Creek. • Visual inspection of surface areas which required remediation in accordance with the LMP (Appendix B). 	<ul style="list-style-type: none"> • Stockpile sufficient materials and make equipment and necessary resources available for sealing any surface cracks (particularly in areas that are predicted to be ponded) and installation of scour protection works. • Remediation of larger surface cracks along North Wambo Creek and in other areas where practicable using conventional earthmoving equipment. • Installation of scour protection works in areas that may be vulnerable to scour following completion of subsidence. • Stabilisation of any areas of surface cracking or erosion, using erosion protection measures (e.g. vegetation planting). • Review of remediation measures and implementation of additional measures if required. • Review of areas that may be vulnerable to instabilities along North Wambo Creek, and North Wambo Creek Diversion and implementation of vegetation management and channel stabilisation measures if necessary. • Implementation of the response plans outlined in the SWMP.

Table 12 (Continued)
Water Management Issues Associated with the Extraction of Longwalls 24 to 26

Issue	Approved Impact	Revised Impact	Monitoring	Management
Surface Water (continued)				
Waterfall Creek	<ul style="list-style-type: none"> • Small changes in alignment and slight increase in ponding. • Increase in suspended sediments. 	<ul style="list-style-type: none"> • Impacts resulting from the extraction of Longwalls 24 to 26 will be consistent with those presented in the Modification 19 Modification Report.³ 	<ul style="list-style-type: none"> • Monitoring of subsidence in accordance with the Subsidence Monitoring Program (Appendix H). • Monitoring in accordance with the Surface Water Management Plan, including the subsidence monitoring program. • Monitoring in accordance with the Groundwater Management Plan. • Weekly visual inspections when extraction is occurring within 100 metres (m) of Waterfall Creek. • Visual inspection of surface areas which required remediation in accordance with the Land Management Plan (Appendix B). 	<ul style="list-style-type: none"> • Stockpile sufficient materials and make equipment and necessary resources available for sealing any surface cracks (particularly in areas that are predicted to be ponded) and installation of scour protection works. • Remediation of larger surface cracks along Waterfall Creek and in other areas where practicable using conventional earthmoving equipment. • Installation of scour protection works in areas that may be vulnerable to scour following completion of subsidence. • Stabilisation of any areas of surface cracking or erosion, using erosion protection measures (e.g. vegetation planting). • Review of remediation measures and implementation of additional measures if required. • Review of areas that may be vulnerable to instabilities along Waterfall Creek and implementation of vegetation management and channel stabilisation measures if necessary. • Implementation of the Response Plans in the Surface Water and Groundwater Management Plans.

Table 12 (Continued)
Water Management Issues Associated with the Extraction of Longwalls 24 to 26

Issue	Approved Impact	Revised Impact	Monitoring	Management
Surface Water (continued)				
Ephemeral Drainage Lines	<ul style="list-style-type: none"> Localised increased ponding and surface cracking.¹ 	<ul style="list-style-type: none"> Impacts resulting from the extraction of Longwalls 24 to 26 will be consistent with those presented in the Modification 19 Modification Report.³ 	<ul style="list-style-type: none"> Visual inspection of drainage line flow paths for evidence of erosion or channelisation following a rainfall event of greater than 40 mm in 24 hours.⁵ 	<ul style="list-style-type: none"> Implementation of the response plans outlined in the SWMP. Post-subsidence assessment of impacts to North Wambo Creek and Waterfall Creek and other ephemeral drainage lines and implementation of any minor remedial works.
Groundwater				
Permian Aquifers	<ul style="list-style-type: none"> Dewatering of the Permian aquifer and lowering of groundwater levels.¹ Impact on Permian water quality through mining will not be detrimental to the area.¹ 	<ul style="list-style-type: none"> Impacts resulting from the extraction of Longwalls 24 to 26 will be consistent with those presented in the Modification 19 Modification Report.⁴ 	<ul style="list-style-type: none"> Monitoring in accordance with the GWMP. 	<ul style="list-style-type: none"> Implementation of the response plans outlined in the GWMP.

¹ After the Modification 19 Modification Report (WCPL, 2022).

² After Alluvium (**Technical Report 3**).

³ After MSEC (**Technical Report 1**).

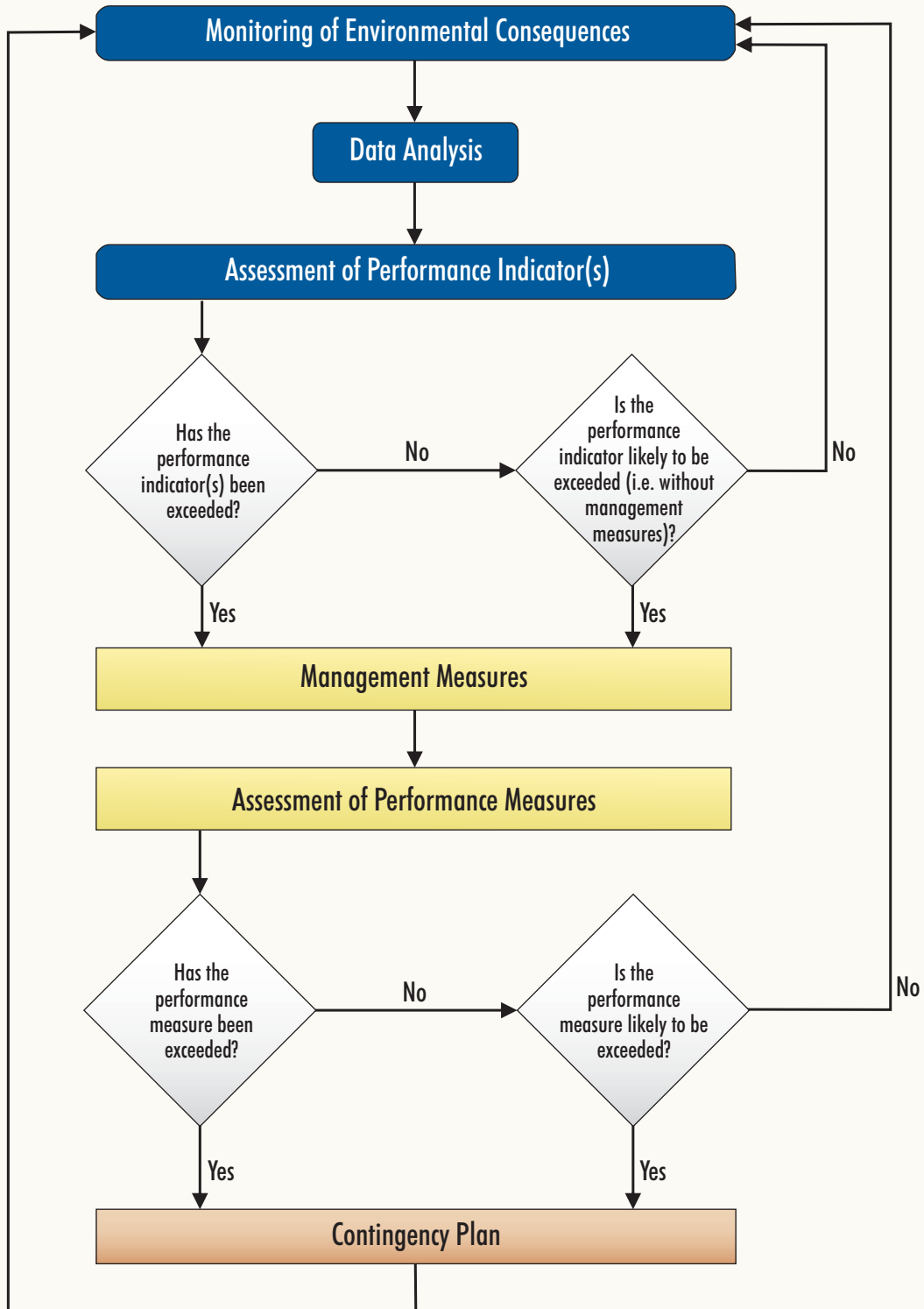
⁴ After SLR (**Technical Report 2**).

⁵ Inspection to occur once access is practicably available following the rainfall event. Inspections would not occur for subsequent rainfall events within 7 days of previous inspection.

**Table 13
Water Performance Measures, Performance Indicators and Contingency Measures for Longwalls 24 to 26**

Performance Measure	Performance Indicator(s)	Relevant Management and Contingency Measures
<p>Wollombi Brook Negligible subsidence impacts and environmental consequences.</p>	<ul style="list-style-type: none"> The performance indicators will be considered to have been exceeded if the surface water quality in Wollombi Brook exceeds the surface water quality criteria in the SWMP. The performance indicators will be considered to have been exceeded if the groundwater levels in alluvial bores exceed the groundwater level criteria in the GWMP. The performance indicators will be considered to have been exceeded if the groundwater quality in alluvial bores exceeds the groundwater quality criteria in the GWMP. 	<ul style="list-style-type: none"> Consider whether the performance measure has been exceeded based on subsidence, groundwater and surface water monitoring data and hydrological and/or hydrogeological analysis. If the performance measure has been exceeded, implement a Contingency Plan, which may include: <ul style="list-style-type: none"> Implementation of stream flow loss remediation techniques (e.g. injection grouting or installation of a geomembrane).
<p>Release of water from the site only in accordance with EPL requirements.</p>	<ul style="list-style-type: none"> The performance indicator will be considered to have been exceeded if water is released from the site, and it is not in accordance with the EPL requirements. 	<ul style="list-style-type: none"> Provision of offsets (i.e. retirement of an equivalent volume of water licence). Implementation of erosion and sediment control measures and stabilisation techniques. Additional monitoring (e.g. increase in monitoring frequency). Consideration of changes to longwall extraction geometry in consultation with relevant regulatory authorities.

CONTINGENCY MANAGEMENT



WAMCO-09-15_SBX/Mod/IMP24-26_EP_INT_003A



4.2.1.4 Contingency Plan

In the event that the subsidence impact performance measures relating to water, summarised in **Table 13**, are considered to have been exceeded or are likely to be exceeded, WCPL will implement a Contingency Plan as described in **Section 5.5**. Potential contingency measures for the performance measures relating to water are outlined in **Table 13**.

4.2.2 Land Monitoring Program

4.2.2.1 Overview

The LMP is provided in **Appendix B**. The purpose and scope of the LMP are summarised below:

Purpose: Management of potential environmental consequences of the proposed secondary workings described in the Extraction Plan on land in general (including cliffs).

Scope: Land in general within the Longwalls 24 to 26 Application Area and cliffs in the vicinity of the Longwalls 24 to 26 Application Area (**Figure 3**).

The LMP references components of the ESCP.

4.2.2.2 Key Land Issues, Monitoring and Management Measures

The Longwalls 24 to 26 Application Area is wholly located on WCPL-owned land and land owned by the State of NSW (i.e. Crown Land). Land uses include the North Wambo Creek Diversion, Remnant Woodland Enhancement Program (RWEP) areas and, occasionally, the agistment of stock.

MSEC (2022) identified cliffs near the Wollemi National Park escarpment and to the west of Longwalls 24 to 26 using LiDAR and separated them into three categories to assess the effects of subsidence on each separately: cliffs associated with the Wollemi National Park escarpment, intermediate level cliffs and low level cliffs. The locations of these cliffs are shown on **Figure 10**.

MSEC (**Technical Report 1**) notes that it is difficult to assess the likelihood of cliff instabilities based upon predicted subsidence effects, as the likelihood of a cliff being unstable is dependent on a number of factors which are difficult to fully quantify.

Therefore, MSEC based its assessment on case studies where longwalls have been extracted directly beneath cliffs having similar mine subsidence parameters (i.e. similar depths of cover, similar cliff sizes and proximities, etc.). It is expected that there would be no adverse impacts on the cliffs associated with the Wollemi National Park escarpment due to mining of Longwalls 24 to 26 (**Technical Report 1**).

MSEC did not prepare predictions for the intermediate and low level cliffs above and adjacent to the western ends of Longwalls 17 to 23, due to these cliffs being located significantly outside the Longwalls 24 to 26 Application Area.

Potential impacts on agricultural activities within the Longwalls 24 to 26 Application Area include:

- possible injury to persons undertaking agricultural activities;
- possible injury to livestock caused by surface cracking; and
- loss of integrity of stock fences.

The key issues relating to subsidence impacts on land in general described in the LMP and the relevant monitoring and management measures are summarised in **Table 14**.

Table 14
Land Management Issues Associated with the Extraction of Longwalls 24 to 26

Issue	Approved Impact	Revised Impact	Monitoring	Management
Land Use Land Capability Steep Slopes	<ul style="list-style-type: none"> • Surface cracking.¹ • Increased erosion.¹ • Ponding of surface water in areas where isolated depressions form.¹ • Increased depth and duration of inundation during flood events.¹ 	<ul style="list-style-type: none"> • Impacts resulting from the extraction of Longwalls 24 to 26 will be consistent with those presented in the Modification 19 Modification report.³ 	<ul style="list-style-type: none"> • Monitoring of subsidence in accordance with the Subsidence Monitoring Program (Appendix H). • Visual observations of fences. • Visual observations of the ground surface. 	<ul style="list-style-type: none"> • Notification to agisters of areas of longwall mining and active subsidence, and exclusion of agistment grazing from areas where surface cracking presents a reasonable risk to people and/or livestock. • Remediation of surface cracks² where practicable using conventional earthmoving equipment (e.g. a backhoe), including: <ul style="list-style-type: none"> - infilling of surface cracks with soil or other suitable materials; or - locally regrading and re-compacting the surface. • Repair of fences prior to allowing access for agistment grazing. • Stabilisation of any areas of surface cracking using erosion protection measures (e.g. vegetation planting). • Drainage works and rehabilitation of subsidence troughs (i.e. areas of induced ponding) as necessary. • Management measures in accordance with the ESCP.

Table 14 (Continued)
Land Management Issues Associated with the Extraction of Longwalls 24 to 26

Issue	Approved Impact	Revised Impact	Monitoring	Management
Wollemi National Park Escarpment and Intermediate Level Cliffs	<ul style="list-style-type: none"> The cliffs associated with the Wollemi National Park escarpment and the intermediate level cliffs will be unlikely to experience any adverse impacts.¹ The predicted subsidence effects for the cliffs associated with the Wollemi National Park escarpment are less than 5 mm (i.e. “no” vertical subsidence).¹ There are no predicted subsidence effects for the intermediate level cliffs.¹ 	<ul style="list-style-type: none"> Impacts resulting from the extraction of Longwalls 24 to 26 will be consistent with those presented in the Modification 19 Modification Report.³ 	<ul style="list-style-type: none"> Visual observations of cliffs for signs of recent rock fall and/or instability (high definition video/photos recorded via an unmanned aerial vehicle [UAV]). 	<ul style="list-style-type: none"> Relevant management and contingency measures if the performance measure has been exceeded are addressed in the BMP (Section 4.2.3).
Low Level Cliffs	<ul style="list-style-type: none"> Lower level cliffs are located above approved Longwalls 20 to 21 in the South Bates Extension Underground Mine, outside of the Longwalls 24 to 26 Application Area. It is considered unlikely the lower level cliffs would be adversely impacted due to the extraction of Longwalls 24 to 26. 	<ul style="list-style-type: none"> Extraction of Longwalls 24 to 26 will not change the predicted subsidence impacts.³ 	<ul style="list-style-type: none"> Visual observations of cliffs for signs of recent rock fall and/or instability (high definition video/photos recorded via an UAV). 	<ul style="list-style-type: none"> Measures to stabilise/mitigate impacts to rock faces/cliffs if considered beneficial and practicable in consultation with relevant regulatory agencies (e.g. artificial rock support, standing supports, dislodgement of remaining loose rock, etc.). Relevant management and contingency measures, if the performance measure has been exceeded, are addressed in the BMP (Section 4.2.3).
Surface Water	<ul style="list-style-type: none"> Addressed in Section 4.2.1. 	<ul style="list-style-type: none"> Addressed in Section 4.2.1. 	<ul style="list-style-type: none"> Addressed in Section 4.2.1. 	<ul style="list-style-type: none"> Addressed in Section 4.2.1.

¹ After the Modification 19 Modification Report (WCPL, 2022).

² Minor cracks that develop are not expected to require remediation as geomorphologic process will result in natural filling of these cracks over time.

³ After MSEC (**Technical Report 1**).

4.2.2.3 *Assessment of Performance Indicators and Measures*

The performance indicator for the performance measure relating to low level cliffs will be considered to have been exceeded if impacts to low level cliffs are identified (i.e. new rockfall, displacement or dislodgement of boulders or slabs or fracturing). Monitoring conducted to inform the assessment of the extraction of Longwalls 24 to 26 against these performance indicators is summarised in **Section 4.2.8** and **Appendix H**.

If data analysis indicates the performance indicator has been exceeded or is likely to be exceeded, an assessment will be made against the performance measure. This assessment will include relevant geotechnical and/or subsidence investigations to determine if:

- the impact(s) cumulatively affect more than 5% of the total face area; and
- the impact(s) can be attributed to the extraction of Longwalls 24 to 26 (or previous longwalls).

If the performance measure is considered to have been exceeded, the Contingency Plan will be implemented. If data analysis indicates that the performance measure has not been exceeded, WCPL will continue monitoring.

The performance measure relating to the Wollemi National Park and associated escarpment is addressed in the BMP (**Section 4.2.1**).

4.2.2.4 *Contingency Plan*

WCPL will implement a Contingency Plan as described in **Section 5.1.2**, in the event that:

- subsidence impacts to land in general have occurred and are not effectively mitigated by the management measures summarised in **Table 14**; and/or
- the subsidence impact performance measure related to low level cliffs (summarised in **Section 4.2.2.3**) is considered to have been exceeded or is likely to be exceeded.

4.2.3 **Biodiversity Monitoring Program**

4.2.3.1 *Overview*

The BMP is provided in **Appendix C**. The purpose and scope of the BMP are summarised below:

Purpose: Management strategies, procedures, controls and monitoring programs required to manage flora and fauna at the Wambo Coal Mine, including management of potential environmental consequences of the proposed secondary workings described in this Extraction Plan.

Scope: All activities undertaken within WCPL's mining authorisations and approved mining areas that may impact on biodiversity (including the Longwalls 24 to 26 Application Area) as well as biodiversity in WCPL's RWEPP areas and open cut revegetation areas.

4.2.3.2 *Key Biodiversity Issues, Monitoring and Management Measures*

The key issues relating to subsidence impacts on biodiversity are described in the BMP and the relevant monitoring and management measures are summarised in **Table 15**.

Hunter Eco (2022) recorded the following threatened communities above Longwalls 24 to 26:

- one critically endangered ecological community (CEEC) listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (*Central Hunter Valley Eucalypt Forest and Woodland*);
- one endangered ecological community (EEC) listed under the NSW *Biodiversity Conservation Act 2016* (*Central Hunter Grey Box in the New South Wales North Coast and Sydney Basin Bioregions*); and
- one vulnerable ecological community (VEC) listed under the NSW *Biodiversity Conservation Act 2016* (*Hunter Valley Foothills Slaty Gum Woodland in the Sydney Basin and New South Wales North Coast Bioregions*).

In the South Bates Extension Underground Mine area, the *Central Hunter Grey Box – Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions* EEC is equivalent to the *Central Hunter Valley Eucalypt Forest and Woodland* CEEC (listed under the EPBC Act) and is collectively referred to as the Central Hunter Grey Box – Ironbark Woodland EEC/CEEC.

No listed threatened flora species or populations have been found in targeted searches or other sampling conducted over Longwalls 24 to 26 (Hunter Eco, 2022).

4.2.3.3 Assessment of Performance Indicators and Measures

Performance indicators developed for the subsidence impact performance measures relating to biodiversity relevant to the extraction of Longwalls 24 to 26 are presented in the BMP and are summarised in **Table 16**. Monitoring conducted to inform the assessment of the extraction of Longwalls 24 to 26 against these performance indicators is summarised in **Section 4.2.8** and **Appendix H**.

The procedure followed to assess the extraction of Longwalls 24 to 26 against the performance indicators and performance measures is outlined in **Figure 11** and described in detail in **Appendix C**.

As described in **Appendix C**, monitoring of environmental consequences against performance indicators and measures relating to the Warkworth Sands Woodland Community and the White Box, Yellow Box, Blakely's Red Gum Woodland/Grassy White Box Woodland Community is not considered necessary for Longwalls 24 to 26. Monitoring relevant to these communities will be addressed in subsequent Extraction Plans.

4.2.3.4 Contingency Plan

In the event that the subsidence impact performance measures relating to biodiversity summarised in **Table 16** are considered to have been exceeded or are likely to be exceeded, WCPL will implement a Contingency Plan as described in **Section 5.1.2**. Potential contingency measures for the performance measures relating to biodiversity relevant to the extraction of Longwalls 24 to 26 are outlined in **Table 16**.

**Table 15
Biodiversity Management Issues Associated with the Extraction of Longwalls 24 to 26**

Issue	Approved Impact	Revised Impact	Monitoring	Management
Flora	<ul style="list-style-type: none"> Negligible impacts as a result of potential minor cracking and ponding of the land.¹ Impacts are unlikely to result in the loss of vegetation cover or alteration of flora community structure and species habitat.¹ 	<ul style="list-style-type: none"> Impacts resulting from the extraction of Longwalls 24 to 26 will be consistent with those presented in the Modification 19 Submissions Report.² 	<ul style="list-style-type: none"> Monitoring of subsidence in accordance with the Subsidence Monitoring Program (Appendix H). Monitoring in accordance with the BMP. This monitoring includes: <ul style="list-style-type: none"> monitoring of revegetation of disturbance areas (including areas subject to subsidence from underground mining); monitoring of the RWEF areas; and riparian zone monitoring transects. Visual inspections as described in Section 4.2.8, the BMP and the Subsidence Monitoring Program (Appendix H). 	<ul style="list-style-type: none"> The Vegetation Clearance Protocol (VCP), described in the BMP. The Threatened Species Management Protocol (TSMP), described in the BMP. Management measures for the RWEF areas, described in the BMP. Rehabilitation as described in the RMP.
Fauna	<ul style="list-style-type: none"> Impacts are unlikely to affect any threatened fauna species to the extent of undermining the viability of a local population of that species.¹ 	<ul style="list-style-type: none"> Impacts resulting from the extraction of Longwalls 24 to 26 will be consistent with those presented in the Modification 19 Submissions Report.² 	<ul style="list-style-type: none"> monitoring of revegetation of disturbance areas (including areas subject to subsidence from underground mining); monitoring of the RWEF areas; and riparian zone monitoring transects. Visual inspections as described in Section 4.2.8, the BMP and the Subsidence Monitoring Program (Appendix H). 	<ul style="list-style-type: none"> Rehabilitation as described in the RMP.

Table 15 (Continued)
Biodiversity Management Issues Associated with the Extraction of Longwalls 24 to 26

Issue	Approved Impact	Revised Impact	Monitoring	Management
<p>Conservation Areas (including the proposed Wambo offset area under SSD 7142)</p>	<ul style="list-style-type: none"> Negligible reduction to previously identified biodiversity credits. 	<ul style="list-style-type: none"> Impacts resulting from the extraction of Longwalls 24 to 26 will be consistent with those presented in the Modification 19 Modification Report.² 	<ul style="list-style-type: none"> Monitoring of subsidence in accordance with the Subsidence Monitoring Program (Appendix H). Monitoring in accordance with the BMP. This monitoring includes: <ul style="list-style-type: none"> monitoring of revegetation of disturbance areas (including areas subject to subsidence from underground mining); monitoring of the RWEPP areas; and riparian zone monitoring transects. Visual inspections as described in Section 4.2.8, the BMP and the Subsidence Monitoring Program (Appendix H). 	<ul style="list-style-type: none"> An assessment of the biodiversity credits provided by the proposed Wambo offset area under SSD 7142 will be undertaken by an accredited assessor within two years of the completion of subsidence at the South Bates Extension Underground Mine.
<p>Wollemi National Park</p>	<ul style="list-style-type: none"> No material subsidence to the Wollemi National Park.¹ 	<ul style="list-style-type: none"> Impacts resulting from the extraction of Longwalls 24 to 26 will be consistent with those presented in the Modification 19 Modification Report.² 	<ul style="list-style-type: none"> Visual observations of cliffs for signs of recent rock fall and/or instability (high definition video/photos recorded via an UAV). 	<ul style="list-style-type: none"> If monitoring detects impacts resulting from the extraction of Longwalls 24 to 26, relevant management and contingency measures presented in the BMP and summarised in Table 16 will be implemented.

¹ After the Modification 19 Modification Report (WCPL, 2022).

² After MSEC (**Technical Report 1**).

Table 16
Biodiversity Performance Measures, Performance Indicators and Contingency Measures for Longwalls 24 to 26

Performance Measure	Performance Indicator(s)	Relevant Management and Contingency Measures
<p>Wollemi National Park Negligible subsidence impacts and environmental consequences.</p>	<ul style="list-style-type: none"> The performance indicators will be considered to have been exceeded if conventional vertical subsidence exceeds 20 mm or the limit of survey accuracy (whichever is greater) at the base of the Wollemi National Park escarpment. The performance indicators will be considered to have been exceeded if visual inspections identify cliff or rock face instability at the Wollemi National Park escarpment. 	<ul style="list-style-type: none"> Consider whether the performance measure has been exceeded. If the performance measure has been exceeded, implement a Contingency Plan, which may include: <ul style="list-style-type: none"> Implementation of erosion and sediment control measures and stabilisation techniques. Scaling/dislodgement/removal of remaining loose rock. Measures to improve the aesthetic values if cliff instability occurs (e.g. planting of endemic native vegetation at the base of the escarpment). Additional monitoring (e.g. increase in monitoring frequency). Consideration of changes to longwall extraction geometry in consultation with relevant regulatory authorities. Offset in accordance with Condition B3 of the Development Consent (DA 305-7-2003).
<p>Warkworth Sands Woodland Community Minor cracking and ponding of the land surface or other subsidence impacts. Negligible environmental consequences.</p>	<ul style="list-style-type: none"> The Warkworth Sands Woodland Community is absent from the South Bates Underground Mine area and the South Bates Extension Underground Mine area. On this basis, monitoring of environmental consequences against performance indicators and measures relating to the Warkworth Sands Woodland Community are not considered necessary for the South Bates Underground Mine or the South Bates Extension Underground Mine. 	

Table 16 (Continued)
Biodiversity Performance Measures, Performance Indicators and Contingency Measures for Longwalls 24 to 26

Performance Measure	Performance Indicator(s)	Relevant Management and Contingency Measures
<p>Central Hunter Valley Eucalypt Forest and Woodland Ecological Community</p> <p>Minor cracking and ponding of the land surface or other impact.</p> <p>Negligible environmental consequences.</p>	<ul style="list-style-type: none"> The performance indicator will be considered to have been exceeded if annual monitoring at flora monitoring sites or bird monitoring sites above Longwalls 24 to 26 indicate a statistically significant downward trend or change between monitoring periods not observed at analogue/reference sites. 	<ul style="list-style-type: none"> Consider whether the performance measure has been exceeded. If the performance measure has been exceeded, implement a Contingency Plan, which may include: <ul style="list-style-type: none"> Filling of minor cracks with appropriate material (e.g. soil or mulch) to avoid the creation of drainage channels. Re-grading of isolated depressions or highpoints and revegetation. Re-grading of slopes to minimise the potential for erosion. Remediation of creek beds to minimise bank and headwater erosion. Revegetation with monitoring in accordance with the RMP. Additional monitoring (e.g. increase in monitoring frequency). Offset in accordance with Condition B3 of the Development Consent (DA 305-7-2003).
<p>White Box, Yellow Box, Blakely's Red Gum Woodland/Grassy White Box Woodland Community</p> <p>Minor cracking and ponding of the land surface or other subsidence impacts.</p> <p>Negligible environmental consequences.</p>	<ul style="list-style-type: none"> The White Box, Yellow Box, Blakely's Red Gum Woodland/Grassy White Box Woodland Community is absent from the South Bates Underground Mine area and the South Bates Extension Underground Mine area. On this basis, monitoring of environmental consequences against performance indicators and measures relating to the White Box, Yellow Box, Blakely's Red Gum Woodland/Grassy White Box Woodland Community are not considered necessary for the South Bates Underground Mine or the South Bates Extension Underground Mine. 	

Table 16 (Continued)
Biodiversity Performance Measures, Performance Indicators and Contingency Measures for Longwalls 24 to 26

Performance Measure	Performance Indicator(s)	Relevant Management and Contingency Measures
<p>Conservation Areas (including the proposed Wambo offset area under SSD 7142)</p> <p>Negligible reduction to previously identified biodiversity credits.</p>	<ul style="list-style-type: none"> The performance indicator will be considered to have been exceeded if annual monitoring at flora monitoring sites or bird monitoring sites within Remnant Woodland Enhancement Areas A, B, C, D, D Extension or E indicate a statistically significant downward trend or change between monitoring periods not observed at analogue/reference sites. 	<ul style="list-style-type: none"> Consider whether the performance measure has been exceeded. If the performance measure has been exceeded, implement a Contingency Plan, which may include: <ul style="list-style-type: none"> Filling of minor cracks with appropriate material (e.g. soil or mulch) to avoid the creation of drainage channels. Re-grading of isolated depressions or highpoints and revegetation. Re-grading of slopes to minimise the potential for erosion. Remediation of creek beds to minimise bank and headwater erosion. Revegetation with monitoring in accordance with the RMP. Additional monitoring (e.g. increase in monitoring frequency). Offset in accordance with Condition B3 of the Development Consent (DA 305-7-2003).
	<ul style="list-style-type: none"> The performance indicator will be considered to be exceeded if the assessment identifies a reduction to previously identified biodiversity credits. 	<ul style="list-style-type: none"> Consider whether the performance measure has been exceeded. If the performance measure has been exceeded, implement a Contingency Plan, which may include: <ul style="list-style-type: none"> Filling of minor cracks with appropriate material (e.g. soil or mulch) to avoid the creation of drainage channels. Re-grading of isolated depressions or highpoints and revegetation. Re-grading of slopes to minimise the potential for erosion. Remediation of creek beds to minimise bank and headwater erosion. Acquisition of sufficient additional biodiversity credits in accordance with the NSW <i>Biodiversity Conservation Act 2016</i>.

Table 16 (Continued)
Biodiversity Performance Measures, Performance Indicators and Contingency Measures for Longwalls 24 to 26

Performance Measure	Performance Indicator(s)	Relevant Management and Contingency Measures
<p>Threatened Species and Communities</p> <p>Minor cracking and ponding of the land surface or other subsidence impacts</p> <p>Negligible environmental consequences</p>	<ul style="list-style-type: none"> The performance indicator will be considered to have been exceeded if the walk-through inspection identifies subsidence that is causing notable environmental consequence. 	<ul style="list-style-type: none"> Consider whether the performance measure has been exceeded. If the performance measure has been exceeded, implement a Contingency Plan, which may include: <ul style="list-style-type: none"> Filling of minor cracks with appropriate material (e.g. soil or mulch) to avoid the creation of drainage channels. Re-grading of isolated depressions or highpoints and revegetation. Re-grading of slopes to minimise the potential for erosion. Remediation of creek beds to minimise bank and headwater erosion. Revegetation with monitoring in accordance with the RMP. Acquisition of sufficient additional biodiversity credits in accordance with the NSW <i>Biodiversity Conservation Act 2016</i>.

4.2.4 Heritage Monitoring Program

4.2.4.1 Overview

The HMP is provided in **Appendix D**. The purpose and scope of the HMP are summarised below:

Purpose: Consolidated description of the management of Aboriginal heritage and historic heritage at the Wambo Coal Mine, incorporating the requirements of the existing AHIPs #2222, #C0001474, #C0002000 and #C0003213 and Development Consent (DA 305-7-2003), including management of potential environmental consequences of the proposed secondary workings described in the Extraction Plan on heritage sites or values.

Scope: The extent of the Development Application area of the Development Consent (DA 305-7-2003).

4.2.4.2 Key Heritage Issues, Monitoring and Management Measures

No historical heritage sites are located in the Longwalls 24 to 26 Application Area (EJE Heritage, 2022).

The Whynot property granted to Noah Long in 1906 and now owned by WCPL is located above the approved Longwall 21 to the south-east of Longwalls 24 to 26. There is a homestead, other outbuildings and fenced yards on the Whynot property that appear to date from the Federation Period (EJE Heritage, 2017). The buildings are in a degraded state, and show signs of termite activity. An assessment of heritage significance (EJE Heritage, 2017) concluded that the Whynot property has little significance under any and all criteria within a local context.

The homestead and outbuildings on the Whynot property are located above Longwall 21 and are not predicted to experience any further vertical subsidence due to the extraction of Longwalls 24 to 26.

Aboriginal sites located by surveys are identified in WCPL's Aboriginal heritage site database and shown in the HMP.

The key issues relating to subsidence impacts on heritage sites and values described in the HMP and the relevant monitoring and management measures are summarised in **Table 17**.

4.2.4.3 Assessment of Performance Indicators and Measures

The Wambo Homestead Complex is located approximately 3.5 km south-east of Longwalls 17 to 26 and will experience no measurable subsidence from the South Bates Extension Underground Mine. Monitoring of consequences against performance indicators and measures relating to the Wambo Homestead Complex is not considered necessary for Longwalls 24 to 26. Monitoring and management measures for the Wambo Homestead Complex were addressed in previous Extraction Plans for the North Wambo Underground Mine.

Performance indicators developed for heritage sites and values relevant to the extraction of Longwalls 24 to 26 are presented in the HMP and are summarised in **Table 17**. Monitoring conducted to inform the assessment of the extraction of Longwalls 24 to 26 against the performance indicators is summarised in **Section 4.2.8** and **Appendix H**. The procedure followed to assess the extraction of Longwalls 24 to 26 against the performance indicators and performance measures is outlined in **Figure 11** and described in detail in **Appendix D**.

Table 17
Heritage Management Issues Associated with the Extraction of Longwalls 24 to 26

Issue	Approved Impact	Revised Impact	Monitoring	Management
Aboriginal cultural heritage (Open artefact sites)	<ul style="list-style-type: none"> • No Aboriginal site types have been identified in the Longwalls 24 to 26 Application Area that may be susceptible to subsidence impacts.¹ • Potential subsidence impacts would have a very low to negligible potential to occur.¹ • Potential for surface cracking and/or erosion in the vicinity of surface artefacts, although unlikely that the artefact scatters or isolated finds themselves would be adversely impacted.¹ • Consent to damage or destroy all Aboriginal cultural heritage sites within the extent of AHIP #2222 and #C0003213. 	<ul style="list-style-type: none"> • Impacts resulting from the extraction of Longwalls 24 to 26 will be consistent with those presented in the Modification 19 Modification Report.² 	<ul style="list-style-type: none"> • Monthly visual observations of artefact scatters and isolated finds to identify any significant surface cracks and/or erosion in the vicinity of a site during extraction of longwall panels in immediate proximity to a site. 	<ul style="list-style-type: none"> • Based on the recommendations of Kuskie (2022), artefact scatters will be left <i>in situ</i>. • If subsidence monitoring identifies cracking or erosion proximal to a site, artefacts will be salvaged in accordance with the protocols in the HMP. • WCPL will maintain a database of site locations and locate any surface activities to avoid impacts to Aboriginal sites where practicable. • If a site is to be impacted by surface remediation activities and it is located within an AHIP area, that site will be salvaged in accordance with the HMP. • WCPL will lodge updated Aboriginal Site Recording Forms and/or Aboriginal Site Impact Recording Forms with the Heritage NSW when required.

¹ After the Modification 19 Modification Report (WCPL, 2022).

² After MSEC (**Technical Report 1**).

4.2.4.4 Contingency Plan

In the event that the impacts relating to Aboriginal cultural heritage summarised in **Table 17** are considered to have been exceeded or are likely to be exceeded, WCPL will implement a Contingency Plan as described in **Section 5.1.2**.

4.2.5 Built Features Management

4.2.5.1 Overview

The BFMP is provided in **Appendix E**. The purpose and scope of the BFMP are summarised below:

Purpose: Management of all public infrastructure and all classes of other built features for the proposed secondary workings described in the Extraction Plan.

Scope: All public infrastructure and all other classes of built features within the Longwalls 24 to 26 Application Area (**Figure 9**).

The BFMP comprises one component plan, the WCPL Asset Management Plan (WAMP), which provides further detail on the management of WCPL assets.

4.2.5.2 Key Built Features Issues, Monitoring and Management Measures

Built features within the Longwalls 24 to 26 Application Area consist of a number of WCPL-owned assets (as described in **Table 10** and the WAMP) (**Figure 9**). The key issues relating to management of these built features in regard to subsidence impacts are described in the WAMP. A summary of the relevant monitoring and management measures for these built features is provided in **Table 18**.

The Longwalls 24 to 26 Application Area does not intersect the Notification Area of any Prescribed Dam gazetted under the *Dams Safety Act 1978*.

There are no State survey control marks in the vicinity of the Longwalls 24 to 26 Application Area (MSEC, 2022). There are three State survey control marks located within the vicinity of Longwalls 21 to 23, with an additional three located within the Montrose Open Cut Pit (MSEC, 2022). Under the *Surveying and Spatial Information Act 2002*, survey marks cannot be displaced or damaged without a relevant authorisation. WCPL will manage the impacts of mine subsidence on these survey marks in consultation with NSW Spatial Services, including lodging a relevant application under the NSW *Surveying and Spatial Information Regulation 2017* as required by the *Surveyor-General's Direction No. 11 Preservation of Survey Infrastructure*.

4.2.5.3 Assessment of Performance Indicators and Measures

Performance indicators developed for the subsidence impact performance measures relating to built features relevant to the extraction of Longwalls 24 to 26 are presented in the WAMP and summarised in **Table 19**. Monitoring conducted to inform the assessment of the extraction of Longwalls 24 to 26 against these performance indicators is summarised in **Section 4.2.8** and **Appendix H**. The procedure followed to assess the extraction of Longwalls 24 to 26 against the performance indicators and performance measures is outlined in **Figure 11** and described in detail in **Appendix E**.

4.2.5.4 Contingency Plan

In the event that the subsidence impact performance measures relating to built features summarised in **Table 19** are considered to have been exceeded or are likely to be exceeded, WCPL will implement a Contingency Plan as described in **Section 5.1.2**.

**Table 18
Built Feature Management Issues Associated with the Extraction of Longwalls 24 to 26**

Issue	Monitoring	Management
WCPL assets	<ul style="list-style-type: none"> Monitoring of subsidence in accordance with the Subsidence Monitoring Program (Appendix H). Visual inspections as described in Section 4.2.8 and the Subsidence Monitoring Program (Appendix H). 	<ul style="list-style-type: none"> Assessment of WCPL assets to identify modifications potentially required prior to subsidence. Assessment of bores and decommissioning and sealing prior to extraction if required (dependent on condition). Maintenance of safe access to WCPL assets such that WCPL personnel are able to undertake routine maintenance and remediation works as required. Implementation of communication protocols, including the provision of WCPL internal longwall panel status reports, to ensure internal WCPL stakeholders are aware of the longwall progression and are able to provide sufficient notification to relevant WCPL personnel regarding potential subsidence to WCPL assets. Posting of warning signs at suitable locations on roads and site access tracks and updating warning signs if a change to the WCPL asset is identified during monitoring. Provision of a 15 m separation barrier around the Montrose West Open Cut pit walls. Structural assessment of WCPL assets post-Longwalls 24 to 26 extraction. Repair of WCPL assets in accordance with associated standards and procedures.

**Table 19
Built Feature Performance Measures, Performance Indicators and Contingency Measures for Longwalls 24 to 26**

Performance Measure	Performance Indicator(s)	Relevant Management and Contingency Measures
<p>For all built features:</p> <ul style="list-style-type: none"> Ensure built features are always safe. Serviceability should be maintained wherever practicable. Loss of serviceability must be fully compensated. Damage must be fully repairable, and must be fully repaired or else replaced or fully compensated. 	<p>The performance indicators developed for WCPL assets will be considered to have been exceeded if:</p> <ul style="list-style-type: none"> the structural integrity of any WCPL assets is assessed to have been compromised; the functionality of any WCPL powerlines, cables or pipelines is compromised; or the integrity of access roads required for the serviceability of WCPL assets is not maintained. 	<p>Contingency measures will be developed as required on a case-by-case basis in consultation with the relevant WCPL stakeholders and government agencies.</p>

4.2.6 Public Safety Management

4.2.6.1 Overview

The PSMP is provided in **Appendix F**. The purpose and scope of the PSMP and the primary hazards and risks addressed by the PSMP are summarised below:

Purpose: Management of potential risks to public safety resulting from the proposed secondary workings described in the Extraction Plan for Longwalls 24 to 26

Scope: Risks to public safety associated with extraction of Longwalls 24 to 26 at the South Bates Extension Underground Mine (**Figure 3**).

Hazards: The primary hazards associated with the extraction of Longwalls 24 to 26 include:

- surface cracking;
- cliff instability;
- ground deformations; and
- damaged infrastructure (e.g. powerlines, roads and access tracks).

Risks: Members of the general public potentially at risk due to the extraction of Longwalls 24 to 26 are limited to those accessing WCPL-owned land.

The PSMP references components of the existing HSMS as summarised in the HSMS Overview.

4.2.6.2 Key Public Safety Issues, Monitoring and Management Measures

The key issues relating to potential risks to public safety resulting from the extraction of Longwalls 24 to 26 described in the PSMP, and the relevant monitoring and management measures are summarised in **Table 20**. The location of predicted subsidence is presented in **Figure 7**.

A subsidence risk assessment was undertaken as part of the Extraction Plan process for Longwalls 24 to 26 (**Technical Report 4**).

The subsidence risk assessment did not identify any public safety issues in addition to those summarised in **Table 20**.

4.2.6.3 Assessment of Performance Indicators and Measures

The performance indicator for the subsidence impact performance measures relating to public safety (**Table 9**) will be considered to have been exceeded if a hazard to the general public arising from subsidence effects, not previously identified and mitigated accordingly, becomes evident.

Monitoring conducted to inform the assessment of the extraction of Longwalls 24 to 26 against this performance indicator is summarised in **Section 4.2.8** and **Appendix H**.

The procedure followed to assess the extraction of Longwalls 24 to 26 against the performance indicators and performance measures is outlined in **Figure 11** and described in detail in **Appendix F**.

4.2.6.4 Contingency Plan

In the event that the subsidence impact performance measure relating to public safety summarised in **Section 4.2.6.3** is considered to have been exceeded or is likely to be exceeded, WCPL will implement a Contingency Plan as described in **Section 5.1.2**.

Table 20
Public Safety Management Issues Associated with the Extraction of Longwalls 24 to 26

Issue	Approved Impact	Revised Impact	Monitoring	Management
<p>Agisters accessing the Longwalls 24 to 26 Application Area to manage stock.</p> <p>Unauthorised access to the Longwalls 24 to 26 Application Area (e.g. looking for firewood, hunting or horse riding).</p> <p>Members of the Rural Fire Service accessing the Longwalls 24 to 26 Application Area.</p>	<p>Subsidence impacts, which may be considered to pose a safety hazard, currently approved include:</p> <ul style="list-style-type: none"> • surface cracking;¹ • erosion;¹ and • ponding.¹ 	<p>Impacts resulting from the extraction of Longwalls 24 to 26 will be consistent with those presented in the Modification 19 Modification Report.²</p>	<ul style="list-style-type: none"> • Monitoring of subsidence in accordance with the Subsidence Monitoring Program (Appendix H). • Visual inspection of the integrity of fences. • Visual assessment of the effectiveness of warning signs (e.g. legibility). • Visual inspection of integrity of cliffs and steep slopes. • Visual inspections per standard measures in the Health and Safety Management System (e.g. security, site staff around site). 	<ul style="list-style-type: none"> • Restricted access (i.e. the general public are not allowed on WCPL-owned land used for mining purposes). Permanent signage located at the entrance to WCPL-owned land will be maintained. • All personnel and visitors accessing the Wambo site are subject to the requirements of: <ul style="list-style-type: none"> - WA-TRG-MP-302 Wambo Training and Competency Management Plan; and - WA-SAH-PRO-315.7 Site Introduction of Personnel Procedure. • Posting and maintenance of warning signs at suitable locations on property boundaries, fences and access tracks. The signs will indicate that underground mining (with surface subsidence) is being undertaken on WCPL-owned land and will prohibit entry by unauthorised persons. • Notification to agisters of areas of longwall mining and active subsidence, and exclusion of agistment grazing from areas where surface cracking presents a reasonable risk to people and/or livestock. • Management of surface cracking, areas of subsidence troughs and potential cliff or steep slope instability in accordance with the LMP (Table 14). • Repair of fences in accordance with the LMP (Table 14). • All safety incidents will be handled in accordance with the HSMS. • Following mining, review of warning sign placement and removal if no longer required.

¹After the Modification 19 Modification Report (WCPL, 2022).

²After MSEC (**Technical Report 1**).

4.2.7 Rehabilitation Management

The current complex-wide RMP is provided in **Appendix I**.

Rehabilitation associated with subsidence impacts from the extraction of Longwalls 24 to 26 will be undertaken in accordance with the Rehabilitation Management Plan and the management and mitigation measures outlined in this Extraction Plan and the relevant component plans.

A Subsidence Risk Assessment has been undertaken, which included consideration of subsidence impacts to public safety, livestock and wildlife. The Subsidence Risk Assessment is provided in **Technical Report 4** and summarised in **Section 2.1.2**. Observed subsidence features and potential risks to public safety, livestock and wildlife will be reported through incident reports, subsidence management status reports and Annual Reviews described in **Section 5.2**.

A number of potential management measures are available to mitigate/remediate subsidence impacts on land in general resulting from the extraction of Longwalls 24 to 26. The requirement and methodology for any subsidence remediation techniques will be determined in consideration of:

- potential impacts of the unmitigated impact, including potential risks to public safety and the potential for self-healing or long-term degradation; and
- potential impacts of the remediation technique, including site accessibility.

Minor cracks that develop are not expected to require remediation as geomorphologic process will result in the natural filling of these cracks over time.

Remediation of typical surface cracks (generally in the order of 25 mm to 50 mm, but up to approximately 150 mm) will use conventional earthmoving equipment (e.g. a backhoe) and will include:

- infilling of surface cracks with soil or other suitable materials; or
- locally regrading and re-compacting the surface.

Areas of surface cracking will be stabilised using erosion protection measures (e.g. vegetation planting). Drainage works and rehabilitation of subsidence troughs (i.e. areas of induced ponding) will be conducted as necessary and may include stabilisation of banks subject to soil slumping.

If surface crack remediation works are required in remnant vegetation areas, compact mobile equipment will be utilised, where practicable, to minimise damage to surrounding vegetation. If the remediation work requires clearing of remnant vegetation to an extent that would exceed the benefit of the remediation, the requirement for remediation will be revised. Vegetation that requires clearance will be subject to the VCP (Vegetation Clearance Protocol, in the BMP in **Appendix C**).

A summary of subsidence monitoring is provided in **Section 4.2.8**, including cross references to components of the Extraction Plan with further detail.

Visual monitoring of remediated subsidence areas will be conducted monthly to identify any requirement for maintenance measures and/or remedial works in accordance with the RMP (**Appendix I**).

Any installed sediment control structures will be inspected on a monthly basis, or following rainfall events of equal to or greater than 20 mm per day (midnight to midnight) as recorded by the Wambo Meteorological Station. The sediment control structures will be inspected for capacity, structural integrity and effectiveness in accordance with the ESCP.

4.2.8 Monitoring Program Summary

The various monitoring programs presented in each of the management plans described in **Section 4.2** are summarised in **Table 21**, and the location of environmental monitoring sites included in WCPL's various environmental monitoring programs are presented in **Figures 12 to 14**.

Figure 12 presents the locations of air quality, noise and dust monitoring sites. **Figure 13** presents the location of surface water and groundwater monitoring sites. **Figure 14** presents the location of biodiversity monitoring sites. As described in **Table 21**, visual observation of cliffs and the Wollemi National Park escarpment will be undertaken as part of the LMP monitoring program.

Details of any subsidence impacts observed will be recorded in the Subsidence Impact Register with visual observations documented in the Subsidence Impact Register Assessment Form as provided in Attachment 2 of the Subsidence Monitoring Program (**Appendix H**). Visual inspections will be undertaken in accordance with the inspection checklist provided in Attachment 2 of the Subsidence Monitoring Program (**Appendix H**). The Subsidence Impact Register will be maintained as an electronic spreadsheet on-site, with hard copies of assessment forms filed in a folder.

**Table 21
Longwalls 24 to 26 Monitoring Program Summary**

Management Plan	Monitoring Component	Parameter	Frequency
Water Management Plan	Monitoring of surface water quality and flow monitoring sites (SW04, SW27a, SW39, US FM1, FM1, FM2, FM3), including at additional surface water quality monitoring site SW54.	<ul style="list-style-type: none"> Monitoring of surface water flow and quality along Waterfall Creek, North Wambo Creek, North Wambo Creek Diversion, Stony Creek and Wollombi Brook in accordance with the SWMP. 	<ul style="list-style-type: none"> In accordance with the SWMP.
	Monitoring of groundwater sites (GW16, GW17, N3, N5, P317, UG139, GW23 to GW26, GW30 to GW36 [a, b], SBX_GW02a).	<ul style="list-style-type: none"> In accordance with the GWMP and WMonP. 	<ul style="list-style-type: none"> In accordance with the GWMP and WMonP.
	Monitoring at additional groundwater VWP sites along the northern and western ends of LW24-26 (DDH1240, DDH1235, DDH1234), and four new standpipe monitoring bores adjacent to Waterfall Creek (monitoring sites GW40 [a, b] and GW41 [a, b]) were installed in October 2023.	<ul style="list-style-type: none"> Groundwater pressure at VWP sites In accordance with the GWMP and WMonP at the four new standpipe monitoring bores adjacent to Waterfall Creek. 	<ul style="list-style-type: none"> VWP sites downloaded quarterly Standpipe monitoring site in accordance with the GWMP and WMonP.
	Inflows to underground workings.	<ul style="list-style-type: none"> Dewatering volumes and underground water levels in accordance with the GWMP. 	<ul style="list-style-type: none"> In accordance with the GWMP.
	Diversion and subsidence monitoring program, including seven additional sites (U1A, U2A, U3A, U4A, W1, W2 and W3).	<ul style="list-style-type: none"> As outlined in the SWMP, including: monitoring of Index of Diversion Condition; LFA; riparian vegetation; aerial photography; long and cross-section surveys (extracted from LiDAR); and geomorphic condition and efficacy of subsidence management or rehabilitation works. 	<ul style="list-style-type: none"> In accordance with the SWMP.
	Visual inspection of the North Wambo Creek and Waterfall Creek.	<ul style="list-style-type: none"> Inspections for surface cracking and/or surface ponding. 	<ul style="list-style-type: none"> Weekly inspections when extraction is occurring within 100 m of North Wambo Creek and Waterfall Creek.
	Visual inspection of drainage line flow paths.	<ul style="list-style-type: none"> Evidence of erosion or channelisation. 	<ul style="list-style-type: none"> Following a rainfall event of greater than 40 mm in 24 hours.¹

Table 21 (Continued)
Longwalls 24 to 26 Monitoring Program Summary

Management Plan	Monitoring Component	Parameter	Frequency
Land Management Plan	Fences.	<ul style="list-style-type: none"> Visual observation to record the condition of fences. 	<ul style="list-style-type: none"> Prior to secondary extraction of Longwalls 24 to 26. Prior to secondary extraction within 100 m of any active WCPL fences (i.e. fences being used to hold stock or prevent public access) and undertaken at 50 m intervals until the active mining face is 100 m past the WCPL fence. Following completion of secondary extraction of Longwalls 24 to 26.
	Ground surface.	<ul style="list-style-type: none"> Visual observations to record the initial condition of the ground surface. Visual observations of the ground surface behind the longwall face to identify potential surface cracks. 	<ul style="list-style-type: none"> Prior to secondary extraction of Longwalls 24 to 26. Monthly inspections during secondary extraction of Longwalls 24 to 26, increased to weekly inspections when extraction is within 100 m of the North Wambo Creek and Waterfall Creek.
	Cliffs ² .	<ul style="list-style-type: none"> Visual observations of cliffs² for signs of recent rock fall and/or instability (high definition video/photos recorded via an unmanned aerial vehicle [UAV]). 	<ul style="list-style-type: none"> Prior to, and following completion of, secondary extraction of each of Longwalls 24 to 26.
	Low lying areas.	<ul style="list-style-type: none"> Visual observations of low lying areas to identify potential surface ponding. 	<ul style="list-style-type: none"> Following a significant rainfall event (i.e. 40 mm within 24 hours).¹
	Surface areas which required remediation.	<ul style="list-style-type: none"> Visual observations of the ground surface to identify stabilisation of erosion and groundcover. 	<ul style="list-style-type: none"> Monthly inspections until stabilisation of erosion and groundcover is >60%.
	Steep slopes.	<ul style="list-style-type: none"> Visual observations of steep slopes for signs of instability (high definition video/photos recorded via UAV). 	<ul style="list-style-type: none"> Monthly during secondary extraction of Longwalls 25 and 26. Following completion of secondary extraction of Longwalls 25 and 26.

Table 21 (Continued)
Longwalls 24 to 26 Monitoring Program Summary

Management Plan	Monitoring Component	Parameter	Frequency
Biodiversity Management Plan	General monitoring of flora, fauna and aquatic ecosystems (including groundwater dependent ecosystems).	<ul style="list-style-type: none"> Monitoring in accordance with the BMP. 	<ul style="list-style-type: none"> In accordance with the BMP.
	Subsidence impacts to Wollemi National Park escarpment.	<ul style="list-style-type: none"> Visual observations of the Wollemi National Park escarpment for signs of recent rock fall and/or instability (high definition video/photos recorded via an UAV). 	<ul style="list-style-type: none"> Prior to secondary extraction of Longwalls 24 to 26 and following completion of each longwall in accordance with the LMP.
Heritage Management Plan	Artefact scatters.	<ul style="list-style-type: none"> Significant surface cracks and/or erosion in the vicinity of artefact scatters or isolated finds. 	<ul style="list-style-type: none"> In accordance with the HMP (prior to secondary extraction of Longwalls 24 to 26 and monthly during extraction of longwall panels in immediate proximity to a site).
Built Features Management Plan – WCPL Asset Management Plan	All built features.	<ul style="list-style-type: none"> Visual observations to record the general condition of WCPL assets including safety and serviceability. 	<ul style="list-style-type: none"> Prior to secondary extraction within 1,000 m of WCPL assets. Monthly inspection during secondary extraction of Longwalls 24 to 26 when 100 m from to 100 m past each asset and at end of each longwall.
	Active service lines. ⁵	<ul style="list-style-type: none"> Visual observations to record the general condition of WCPL active service lines including safety and serviceability. 	<ul style="list-style-type: none"> Weekly inspections.
		<ul style="list-style-type: none"> Monitoring of pipeline integrity at fixed points. 	<ul style="list-style-type: none"> Daily inspections commencing when secondary extraction is within 100 m of WCPL pipelines and undertaken until the active mining face is 100 m past the pipeline.
		<ul style="list-style-type: none"> Monitoring to detect abnormal changes in flow. 	<ul style="list-style-type: none"> Continuous (SCADA) monitoring of pump and pipeline conditions.

**Table 21 (Continued)
Longwalls 24 to 26 Monitoring Program Summary**

Management Plan	Monitoring Component	Parameter	Frequency
Built Features Management Plan – WCPL Asset Management Plan (Cont.)	Groundwater monitoring bores.	<ul style="list-style-type: none"> Integrity of groundwater monitoring bores by reviewing groundwater monitoring data. 	<ul style="list-style-type: none"> Once the active mining face is 100 m past the bore.
	Culverts.	<ul style="list-style-type: none"> Visual observations to record cracking of concrete culverts or grade reversal. 	<ul style="list-style-type: none"> Prior to secondary extraction within 100 m of culverts and undertaken at 50 m intervals until the active mining face is 100 m past the culverts.
	Roads and tracks.	<ul style="list-style-type: none"> Visual observations to record condition of roads and tracks, including surface cracks, buckling and general safety. 	<ul style="list-style-type: none"> Prior to secondary extraction within 100 m of any WCPL asset and undertaken at 50 m intervals until the active mining face is 100 m past the WCPL asset.
	Farm buildings, sheds, tanks.	<ul style="list-style-type: none"> Structural assessment. 	<ul style="list-style-type: none"> Following completion of active mining.
Public Safety Management Plan	Fences.	<ul style="list-style-type: none"> Visual observation to record the condition of fences. 	<ul style="list-style-type: none"> Prior to secondary extraction of each longwall. Prior to secondary extraction within 100 m of any active WCPL fences (i.e. fences being used to hold stock or prevent public access) and undertaken at 50 m intervals until the active mining face is 100 m past the WCPL fence. Following completion of secondary extraction of Longwalls 24 to 26.
	Warning signs.	<ul style="list-style-type: none"> Visual observation to record the initial condition of existing warning signs (e.g. legibility). Visual observations to record the condition of warning signs (e.g. legibility) during extraction of Longwalls 24 to 26. 	<ul style="list-style-type: none"> Prior to secondary extraction of each longwall. Monthly inspections during secondary extraction of Longwalls 24 to 26.

**Table 21 (Continued)
Longwalls 24 to 26 Monitoring Program Summary**

Management Plan	Monitoring Component	Parameter	Frequency
Rehabilitation Management Plan (RMP)	Remediated subsidence areas.	<ul style="list-style-type: none"> Visual monitoring to identify any requirement for maintenance measures and/or remedial works. 	<ul style="list-style-type: none"> Monthly inspections until monitoring confirms stabilisations of erosion and groundcover is >60%.
	Installed sediment control structures.	<ul style="list-style-type: none"> Inspection of capacity, structural integrity and effectiveness in accordance with the ESCP. 	<ul style="list-style-type: none"> Monthly and/or following a significant rainfall event (i.e. 20 mm within 24 hours, midnight to midnight).

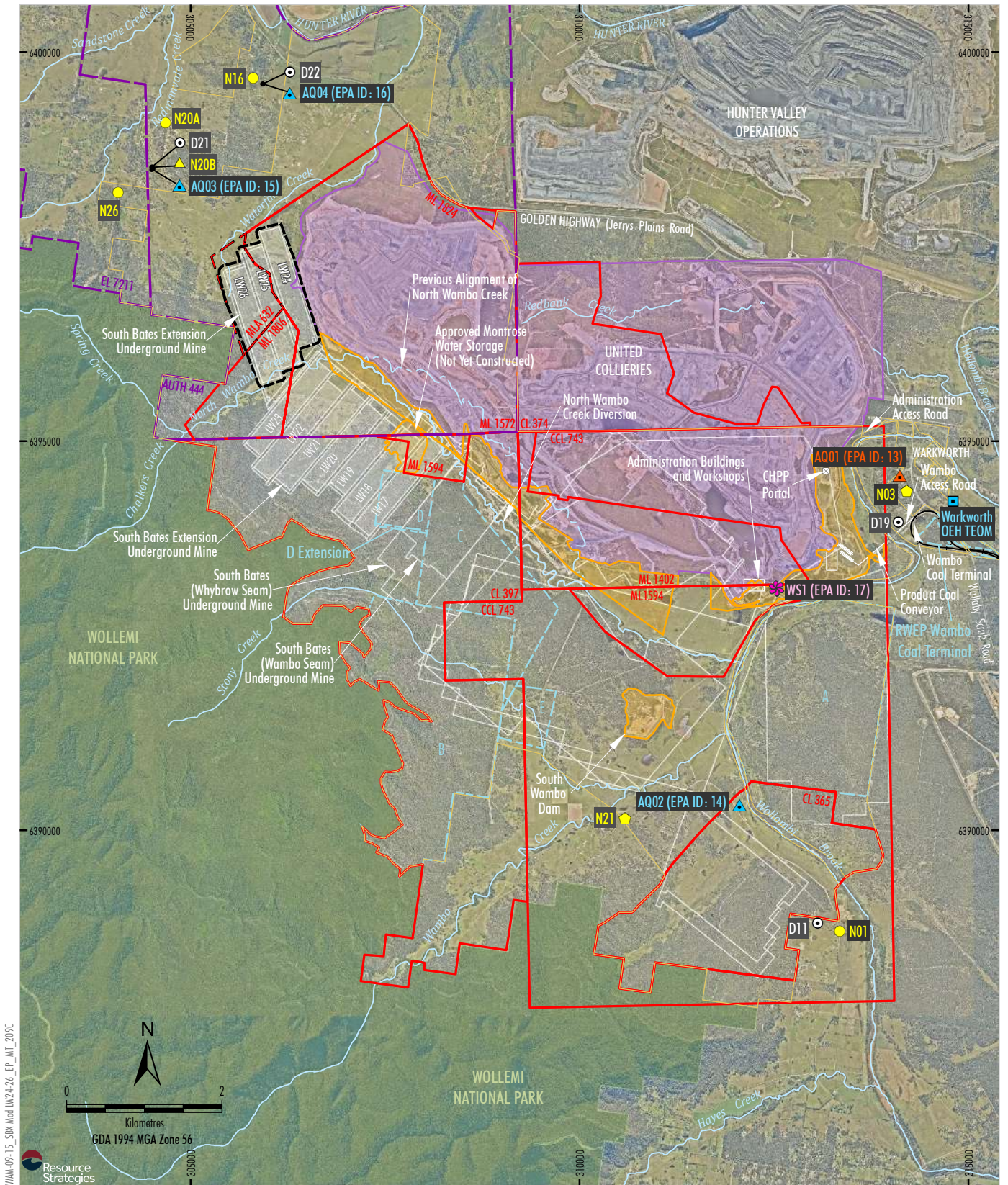
¹ Inspection to occur once access is practicably available following the rainfall event. Inspections will not occur for subsequent rainfall events within 7 days of previous inspection.

² Cliffs include: the low level cliffs, intermediate level cliffs and cliffs associated with the Wollemi National Park escarpment. There are no cliffs identified above or adjacent to Longwalls 24 to 26, however there are cliffs located approximately 760 m west of Longwall 26 within the Wollemi National Park escarpment.

³ Where sufficient data for a baseline record has not already been obtained by WCPL.

⁴ If no change is detected then this will be documented. If any adverse changes that threaten the stability of the tree are identified, then appropriate stabilisation works and/or salvage will be considered and undertaken as required.

⁵ Active service lines include all services required for mining at the Wambo Coal Mine (electricity supply, telecommunications, water supply and mine dewatering).



WAM-09-15_SBK Mod U24-26_EP_INT_2019C

Source: WCPL (2023); MSEC (2023); NSW Spatial Services (2023)
 Orthophoto Mosaic: WCPL (May, Nov 2022)

- LEGEND**
- National Park
 - SSD 7142 Operational Area #
 - WCPL Owned Land
 - Wambo Coal Mine
 - Exploration Licence Boundary (AUTH, EL)
 - Mining and Coal Lease Boundary (ML, CL, CCL)
 - Mining Lease Application Boundary (MLA)
 - Remnant Woodland Enhancement Program (RWEP) Area
 - Existing/Approved Wambo Coal Mine Surface Development Area
 - Existing/Approved Underground Development
 - Extraction Plan Application Area

- Monitoring Types**
- Meteorological Station
 - Noise Monitoring Site (Attended and Real-time)
 - Noise Monitoring Site (Attended)
 - Noise Monitoring Site (Real-time)
 - OEH PM₁₀ Monitor
 - WCPL TEOM (PM₁₀)
 - WCPL TEOM (PM₁₀ and PM_{2.5})
 - Dust Deposition Gauge

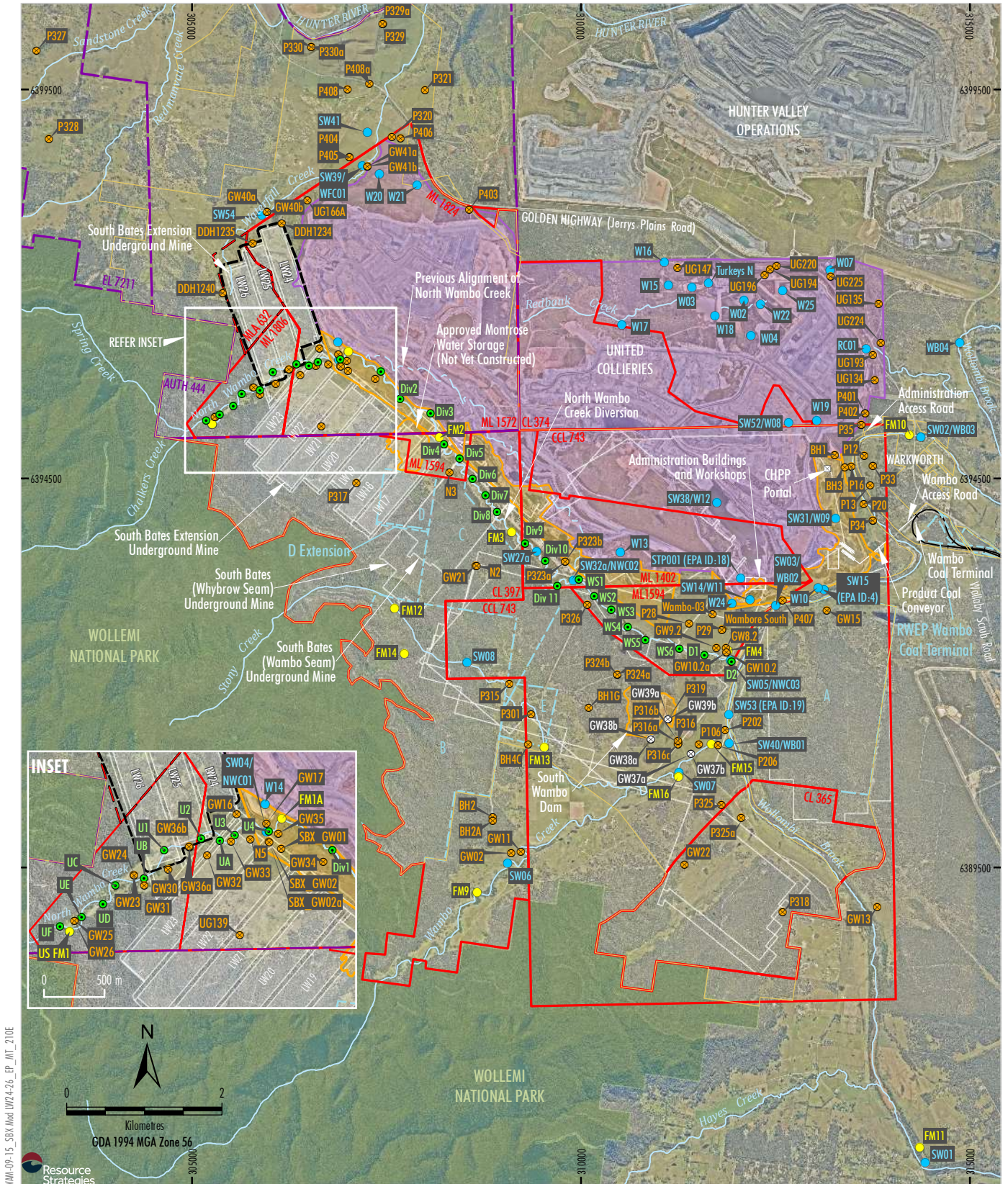
Under Phase 2 of mining at Wambo Coal Mine (commenced 1 December 2020), this area is operated by United Collieries Pty Ltd under the United Wambo Joint Venture Project.

Peabody

W A M B O C O A L M I N E

Location of Air Quality and Noise Monitoring Sites

Figure 12



WAM-09-15_SBX_Moat_UW24-26_EP_INT_210C

Source: WCPL (2023); MSEC (0223); NSW Spatial Services (2023)
 Orthophoto Mosaic: WCPL (May, Nov 2022)

- | | |
|--|--|
| LEGEND | Monitoring Sites |
| National Park | Groundwater Monitoring Sites |
| SSD 7142 Operational Area # | Proposed Groundwater Monitoring Sites |
| WCPL Owned Land | Surface Water Flow Monitoring Site |
| Wambo Coal Mine | Surface Water Quality Monitoring Site |
| Exploration Licence Boundary (AUTH, EL) | Diversion and Subsidence Monitoring Site |
| Mining and Coal Lease Boundary (ML, CL, CCL) | |
| Mining Lease Application Boundary (MLA) | |
| Remnant Woodland Enhancement Program (RWEPP) Area | |
| Existing/Approved Wambo Coal Mine Surface Development Area | |
| Existing/Approved Underground Development | |
| Extraction Plan Application Area | |

Under Phase 2 of mining at Wambo Coal Mine (commenced 1 December 2020), this area is operated by United Collieries Pty Ltd under the United Wambo Joint Venture Project.



W A M B O C O A L M I N E

Location of Surface Water and Groundwater Monitoring Sites

Figure 13

5 MANAGEMENT, MITIGATION, REMEDIATION AND REPORTING MEASURES

5.1 ADAPTIVE MANAGEMENT AND CONTINGENCY PLANNING

5.1.1 Adaptive Management

WCPL will implement an adaptive management approach to ensure subsidence impact performance measures (**Table 9**) are achieved at the South Bates Extension Underground Mine. Adaptive management will involve:

- **Planning** – developing management strategies to meet performance measures; identifying performance indicators to assess performance; and establishing monitoring programs to monitor against the performance measures.
- **Implementation** – implementing management strategies and monitoring impacts against performance indicators.
- **Review** – reviewing and evaluating the effectiveness of management strategies by analysis of monitoring data against predicted impacts, performance indicators and performance measures in accordance with the schematic presented in **Figure 11**.
- **Contingency Response** – implementing contingency plans where a potential exceedance of a subsidence impact performance measures or an unexpected impact is detected (**Section 5.1.2**).
- **Adjustment** – adjusting management strategies to improve performance, particularly following an exceedance of a subsidence impact performance measure or detection of an unexpected impact.

5.1.2 Contingency Response

In the event the performance measures in **Table 9** are considered to have been exceeded or are likely to be exceeded, WCPL will implement the Contingency Plan outlined further below.

Responsibilities during contingency response are outlined in **Table 22**, which is designed to clearly outline actions, levels of responsibility within WCPL and reporting requirements where monitoring results indicate that impacts are exceeding (or likely to exceed) predicted or approved limits. This table is designed to support the Trigger Action Response Plans (TARPs) provided in the component management plans (**Appendices A to F**). These TARPs will be developed further as this Extraction Plan is reviewed and revised.

Relevant management and contingency measures are summarised in **Section 4.2** and outlined in the component management plans (**Appendices A to F**). WCPL will consider changes to longwall extraction geometry (in consultation with relevant regulatory authorities) if greater than negligible subsidence impacts or environmental consequences occur to the Wollemi National Park.

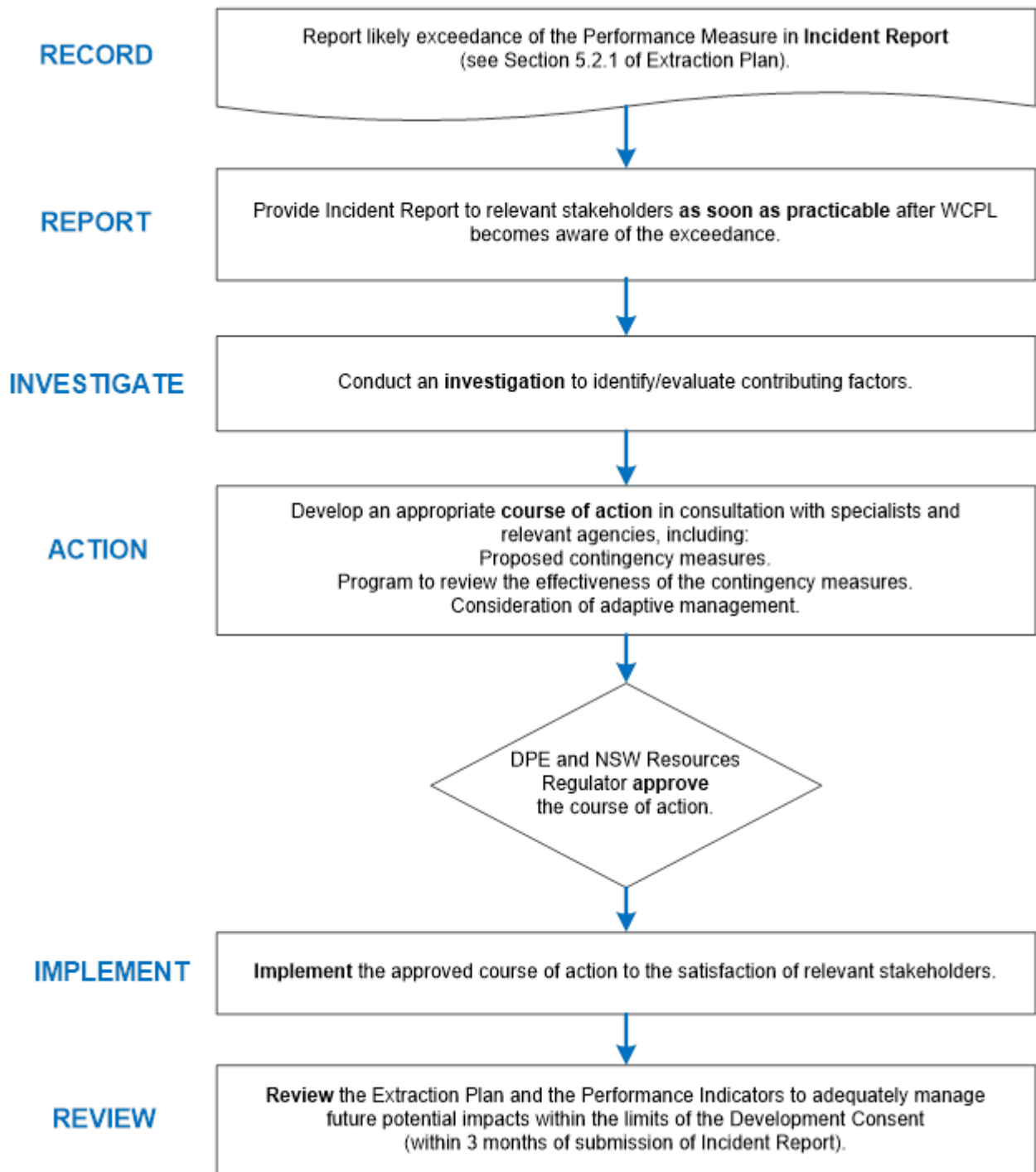
Changes to longwall geometry would be implemented through WCPL's internal Mine Plan Design Alteration procedure (SWP 9004) administered by the Mine Surveyor.

Table 22
Contingency Plan Responsibilities

	Normal	Level 1	Level 2
	Predicted Impacts	Implement Management Measures	Contingency Phase
Mine Surveyor	Work to continue as normal in accordance with: <ul style="list-style-type: none"> Extraction Plan and component plans; Development Consent; and Mining Lease conditions. 	<ul style="list-style-type: none"> Complete Subsidence Impact Register. Report to TSS and MEC. Additional survey of area to confirm subsidence impacts and effects, where required. 	<ul style="list-style-type: none"> As per Level 1, but respond immediately.
Manager, Environment and Community (MEC)		<ul style="list-style-type: none"> Where related to environmental impact, investigate area and advise of additional works or remediation, where required. Increase monitoring frequency in immediate vicinity, where required. Consult with external expert(s) for advice where appropriate. Review information and approve and instruct implementation of remediation/corrective action/compensation, if necessary. Report findings/recommendations to TSS, MME and/or GM where required. Report impact and response in Annual Review, where required. 	<ul style="list-style-type: none"> As per Level 1, but respond immediately. As soon as practical, lodge Incident Report, with DPE and relevant agencies (e.g. BCD, NSW Resources Regulator, DPE-Water) and report on corrective actions. Within 3 months, review this Extraction Plan.
Technical Services Superintendent (TSS)		<ul style="list-style-type: none"> Review investigation(s). Review information and approve and instruct implementation of remediation/corrective action/compensation, if necessary. Report findings/recommendations to MEC, MME and/or GM where required. Report impact/response in Subsidence Management Status Report. 	<ul style="list-style-type: none"> As per Level 1, but respond immediately. In making recommendations, review need to stop mining (including safety implications). Consult with external expert(s) for advice where appropriate. As soon as practical, notify NSW Resources Regulator and Subsidence Advisory NSW on corrective actions. As soon as practical, notify relevant infrastructure owners of impacts.
Mining Engineering Manager (Underground Mine Manager) (MME)		<ul style="list-style-type: none"> Ensure adequate resources are available for implementation of remediation/corrective actions. Report to GM, where required. 	<ul style="list-style-type: none"> As per Level 1, but respond immediately. If recommended, direct operations to stop in a safe manner.
General Manager (GM)		<ul style="list-style-type: none"> Review information and approve and instruct implementation of remediation/corrective action/compensation, if necessary. 	<ul style="list-style-type: none"> As per Level 1, but respond immediately.

As noted in the Contingency Plan, within 3 months of submission of an Incident Report, the relevant components of the Extraction Plan will be review and revised, where necessary. The process of review is outlined in **Section 6.2**.

Contingency Plan



5.2 INCIDENTS, COMPLAINTS, EXCEEDANCES AND NON-COMPLIANCES

Table 23 provides a summary of the reporting framework, including which stakeholders will receive copies of each report and the distribution method. The subsections below provide further detail on the contents of each reporting mechanism.

The proposed reporting framework for the South Bates Extension Underground Mine is considered adequate as the Application Area is wholly within WCPL-owned land and Longwalls 24 to 26 are not predicted to have greater than negligible impact on items of environmental sensitivity.

5.2.1 Incident Report

WCPL will notify the relevant agencies (**Table 23**) of a subsidence incident as soon as practicable after WCPL becomes aware of the incident. Within **7 days** of the date of the incident, WCPL will provide the relevant agencies with a detailed Incident Report.

A subsidence incident includes any of the following:

- a potential exceedance of a subsidence impact performance measure or an unexpected impact is detected, including impacts to the natural environment or impacts that may be adverse to the serviceability and/or safety of built features;
- detection of any significant unpredicted and/or higher-than-predicted subsidence and/or abnormalities in subsidence development in any surface areas that may be affected by longwall mining;
- detection of an incident caused by subsidence which has a potential to expose any person to health and safety risks;
- detection of significant deviation from the predicted nature, magnitude, distribution, timing and duration of subsidence effects, and of the potential impacts and consequences of those deviations on built features and the health and safety of any person;
- significant failure or malfunction of a monitoring device or risk control measure set out in the Extraction Plan addressing built features, public safety or subsidence monitoring;
- reports of any adverse subsidence impacts by any relevant stakeholder; or
- any other subsidence related incident requiring prompt notification.

An Incident Report will include the following:

- details on the nature of the incident (including survey results, photographs and date of the incident);
- results of investigation(s) to identify/evaluate the contributing factors to the incident;
- proposed course of action to remedy the incident, including proposed contingency measures and a program to review the effectiveness of the contingency measures; and
- relevant WCPL contact details to obtain further information on the incident.

Table 23
Summary of Reporting Framework

Report	Frequency	Distribution ¹	Distribution Method ¹	Responsibility for Data Collation and Preparation	Responsibility for Submission
Incident Report	As required – see Section 5.2.1	DPE (Manager, Mining Projects) NSW Resources Regulator (Subsidence Executive Officer) Subsidence Advisory NSW (District Manager) Other regulators as specified in management plans	Email	Manager, Environment and Community	General Manager
Subsidence Management Status Report	To be updated fortnightly. Must be submitted if impacts greater than predicted are identified or upon request.	DPE (Manager, Mining Projects) NSW Resources Regulator (Subsidence Executive Officer)	Email	Technical Services Superintendent Manager, Environment and Community	Technical Services Superintendent (in consultation Mining Engineering Manager and Environment and Community Manager)
Six Monthly Report	Annual (for the period 1 January to 30 June)	DPE (Manager, Mining Projects) NSW Resources Regulator (Subsidence Executive Officer)	NSW DPE Planning Portal and/or Email	Manager, Environment and Community	General Manager
Annual Review	Annual (for the period 1 January to 31 December)	DPE (Manager, Mining Projects) NSW Resources Regulator (Subsidence Executive Officer) NSW Resources Regulator (Manager Environmental Sustainability) Subsidence Advisory NSW (District Manager) BCD/EPA (General Contact) DPE-Water (Water Regulation) Singleton Shire Council (General Manager) CCC Members	NSW DPE Planning Portal, Email and/or Post	Manager, Environment and Community	General Manager

¹ See **Attachment 4** for distribution details.

5.2.2 Subsidence Management Status Report

The Subsidence Management Status Report will include the following:

- Current face position of the longwall panel being extracted and a note on the current location of development.
- Summary of any comments, advice and feedback from consultation with stakeholders in relation to subsidence management undertaken in the month and a summary of WCPL's responses.
- Summary of observed and/or reported subsidence impacts, including a full description and good photos of the impact.
- Summary of any observed and/or reported incidents, service difficulties, asset owner complaints or community complaints related to subsidence and a summary of WCPL's response to these issues.
- Report on any unusual subsidence development (to facilitate early detection of potential subsidence impacts).

The Subsidence Management Status Report will be updated regularly on site and submitted if impacts greater than predicted are identified or upon request from DPE or NSW Resources Regulator.

5.2.3 Six Monthly Report

A Six Monthly Report will be prepared to summarise monitoring results for the period 1 January to 30 June. The Six Monthly Report will include:

- Current face position of the longwall panel being extracted and a note on the current location of development.
- Summary of any comments, advice and feedback from consultation with stakeholders in relation to subsidence management undertaken in the reporting period and a summary of WCPL's responses.
- Summary of all observed and/or reported impacts (where monitoring has been undertaken within the six month period).
- Any management measures or contingency responses proposed or implemented.
- Update on the effectiveness of the contingency measures outlined in any Incident Report submitted (**Section 5.2.1**).
- Summary of all quantitative and qualitative environmental monitoring results (summarised in **Section 4.2.8**) (noting that monitoring conducted on an annual basis will be summarised in the Annual Review).
- Assessment of compliance against performance indicators and performance measures.
- Summary of subsidence development based on monitoring information compared with any defined triggers and/or the predicted subsidence (to facilitate early detection of potential subsidence impacts).
- Statement regarding any additional and/or outstanding management actions to be undertaken or the need for early responses or emergency procedures to ensure adequate management of any potential subsidence impacts due to longwall mining.

5.2.4 Annual Review

The Annual Review will be prepared and submitted in accordance with Condition D10 of Schedule 2 of the Development Consent (DA 305-7-2003).

Annual Reviews will include:

- summary of subsidence effects monitoring results and a comparison to predicted subsidence effects; and
- summary of all environmental and subsidence monitoring results and a comparison of actual impacts with predicted subsidence impacts and the subsidence impact performance measures.

6 PLAN ADMINISTRATION AND RESPONSIBILITIES

6.1 REVIEW OF OTHER MANAGEMENT PLANS

WCPL commits to updating the Inrush Management Plan (as part of the notification under clause 33 of the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014*) to incorporate this revision of the Extraction Plan.

This Extraction Plan references the following management plans with revisions proposed as part of this Extraction Plan revision:

- BMP (Version 5); and
- HMP (Version 2).

As per Condition D6 of Development Consent (DA 305-7-2003) other management plans that are not associated with this extraction plan will be reviewed in detail within three months of:

- the submission of an incident report;
- the submission of an Annual Review;
- the submission of an audit report; or
- any modification to the conditions of the Development Consent (DA 305-7-2003).

6.2 REVIEW OF THE EXTRACTION PLAN

This Extraction Plan and its component management plans will be reviewed in detail, and revised if necessary, in the following circumstances:

- during WCPL preparing subsequent Extraction Plans for Longwalls 24 to 26, or for other Longwalls being mined within the Wambo Coal Mine;
- within 3 months of the submission of an **Incident Report** relating to a subsidence impact (**Section 5.2.1**) taking into consideration any contingency response implemented following submission of the Incident Report (**Section 5.1.2**); and/or
- where there is a significant change in operation that may affect the environment or the community.

In addition to the above, this Extraction Plan will also be reviewed within 3 months of:

- the submission of an Annual Review;
- the submission of an audit report; or
- any modification to the conditions of the Development Consent (DA 305-7-2003).

The component management plans of this Extraction Plan reference components of a number of existing Environmental Management Plans to avoid duplication (**Section 4**). If these Environmental Management Plans are revised separately in accordance with the Development Consent (DA 305-7-2003) the management plans will be updated accordingly.

6.3 KEY RESPONSIBILITIES

Key responsibilities under this Extraction Plan are summarised in **Table 24**. The component management plans provide additional responsibilities under the plans. A summary WCPL organisation structure is provided in **Figure 15**.

Table 24
Key Extraction Plan Responsibilities

Responsibility	Task
General Manager	<ul style="list-style-type: none"> • Ensure resources are available to WCPL personnel to facilitate the completion of responsibilities under this Extraction Plan. • Ensure the safety of WCPL employees and the public in relation to WCPL operations. • Approve and instruct implementation of remediation/corrective action/compensation, if necessary.
Mining Engineering Manager (Underground Mine Manager)	<ul style="list-style-type: none"> • Ensure the safety of WCPL employees and the public in relation to WCPL operations. • Ensure adequate resources are available for implementation of remediation/corrective actions.
Technical Services Superintendent	<ul style="list-style-type: none"> • Liaise with relevant stakeholders regarding subsidence impact management and related public safety hazards.
Manager, Environment and Community	<ul style="list-style-type: none"> • Liaise with relevant stakeholders regarding environmental management. • Ensure monitoring and reporting required in accordance with this Extraction Plan are carried out within specified timeframes, are adequately checked and processed and are prepared to the required standard. • Ensure that any Incident Reports are lodged in accordance with regulatory requirements with all available information. • Ensure that reviews of this Extraction Plan and other plans are conducted as described in Sections 6.1 and 6.2.
Mine Surveyor	<ul style="list-style-type: none"> • Undertake all subsidence monitoring to the required standard within the specified timeframes and ensure data are adequately checked, processed and recorded. • Record and maintain observations of subsidence impacts in the Subsidence Impact Register.

LEGEND
 Key personnel responsible for implementation of the Extraction Plan

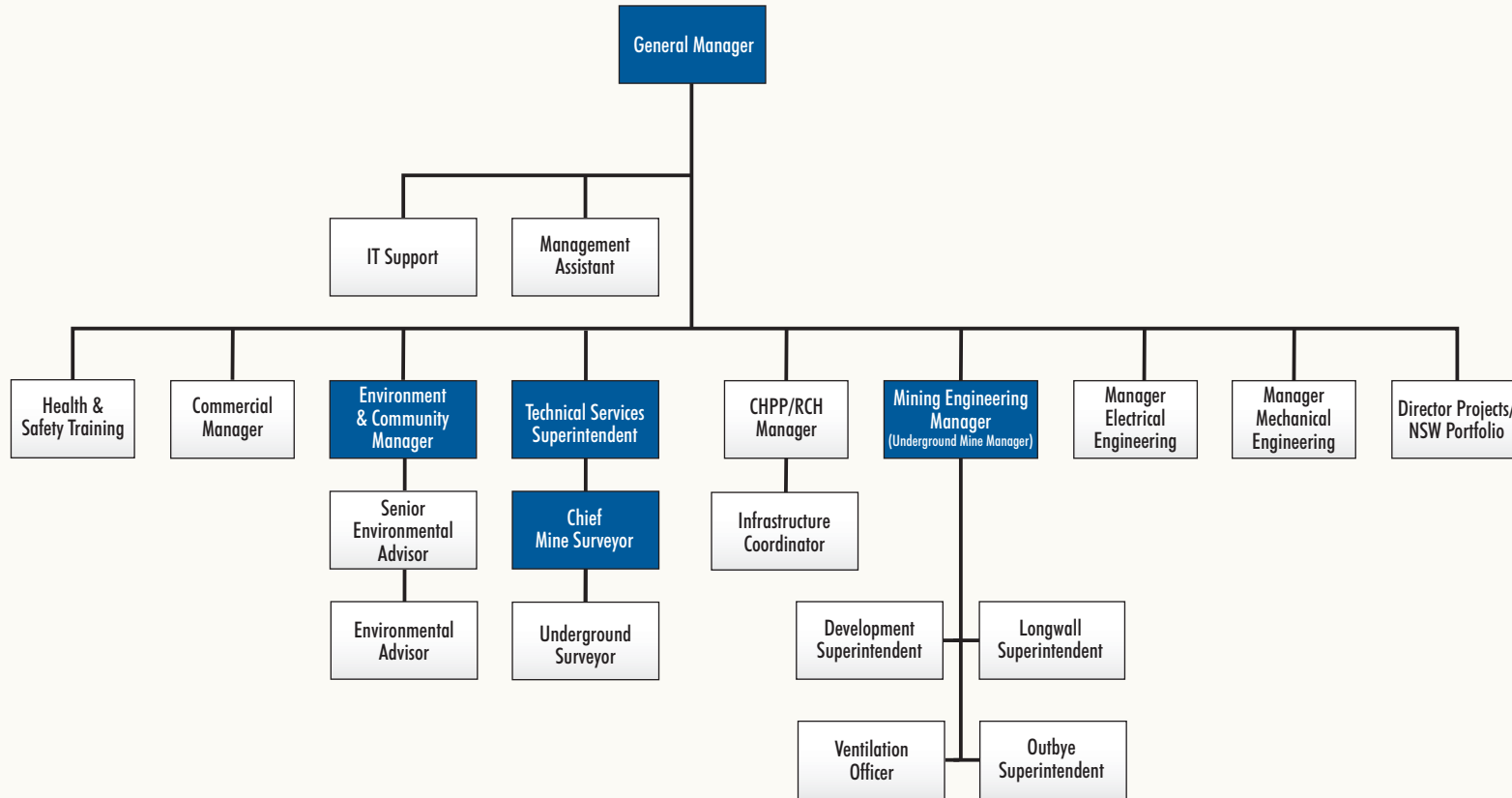


Figure 15

7 REFERENCES

- Alluvium Consulting (2022). *Wambo Longwalls 24-26 Modification – Surface Water Assessment (Longwalls 24-26)*. Report prepared for Wambo Coal Pty Limited.
- Alluvium Consulting (2023) *Longwalls 24-26 – Extraction Plan – Surface Water*. Report prepared for Wambo Coal Pty Limited.
- Department of Environment, Climate Change and Water (2010) *Aboriginal Cultural Heritage Consultation Requirements for Proponents*.
- Department of Mineral Resources (1993) *Hunter Coalfield Regional Geology 1:100 000 Sheet*. New South Wales.
- Department of Planning and Environment (2022) *Extraction Plan Guideline*.
- EJE Heritage (2017) *Statement of Heritage Impact, Wambo Coal Mine, South Bates Extension Modification, Near Warkworth NSW*.
- EJE Heritage (2022) *Wambo Coal Mine Longwalls 24-26 Modification. Historic Heritage Assessment*. Report Prepared for Wambo Coal Pty Limited.
- FloraSearch (2017) *South Bates Extension Modification – Flora Assessment*. Report prepared for Wambo Coal Pty Limited.
- Hunter Eco (2022) *Longwalls 24 to 26 Biodiversity Development Assessment Report*
- Kuskie, P. (2022) *Wambo Coal Mine Longwalls 24-26 Modification. Aboriginal Cultural Heritage Assessment*. Report prepared for Wambo Coal Pty Limited.
- MineConsult (2001) *Wambo Strategic Mine Plan Vol 1*. Report prepared for Wambo Mining Corporation Ltd.
- Mine Subsidence Engineering Consultants (2022) *South Bates Extension Underground Mining Longwalls 24 to 26 Modification Subsidence Assessment*. Report MSEC1224 prepared for Wambo Coal Pty Limited.
- Mine Subsidence Engineering Consultants (2023) *South Bates Extension Underground Mining Longwalls 24 to 26 Extraction Plan Subsidence Assessment*. Report MSEC1317 prepared for Wambo Coal Pty Limited.
- Risk Mentor (2023) *Wambo U/G South Bates Extension – Longwalls 24-26 – Extraction Plan Risk Assessment Report*. Report prepared for Wambo Coal Pty Limited.
- SLR Consulting Pty Ltd (2022) *Longwalls 24-26 Modification Groundwater Assessment*.
- SLR Consulting Pty Ltd (2023) *Longwalls 24-26 Extraction Plan Groundwater Technical Report*.
- Wambo Coal Pty Limited (2003) *Wambo Development Project Environmental Impact Statement*.
- Wambo Coal Pty Limited (2016) *South Wambo Underground Mine Modification Environmental Assessment*.
- Wambo Coal Pty Limited (2017) *South Bates Extension Underground Mine Modification – Environmental Assessment*.
- Wambo Coal Pty Limited (2022) *Longwalls 24 to 26 Modification Report*.

8 ABBREVIATIONS, ACRONYMS AND GLOSSARY

8.1 ABBREVIATIONS AND ACRONYMS

ACHA	Aboriginal Cultural Heritage Assessment	HSMS	Health Safety Management System
AHIP	Aboriginal Heritage Impact Permit	HMP	Heritage Management Plan
BCD	Biodiversity and Conservation Division	IDC	Index of Diversion Condition
BFMP	Built Features Management Plan	km	kilometre
BMP	Biodiversity Management Plan	km ⁻¹	per kilometre
CCC	Community Consultative Committee	kV	kilovolt
CEEC	critically endangered ecological community	LiDAR	Light Detection and Ranging
CL	Coal Lease	LFA	Landscape Function Analysis
CRRP	Coal Resource Recovery Plan	LMP	Land Management Plan
DA	Development Approval	m	metre
DECCW	NSW Department of Environment, Climate Change and Water	MEG	Mining, Exploration and Geosciences
DPIE-Water	NSW Department of Planning, Industry and Environment – Water	ML	Mining Lease
DPE	NSW Department of Planning and Environment	ML/day	megalitre per day
DPIE	NSW Department of Planning, Industry and Environment (now DPE)	mm	millimetre
DRG	Division of Resources and Geoscience (now MEG)	mm/m	millimetre per metre
EEC	endangered ecological community	Modification 19 Report	<i>Longwalls 24 to 26 Modification Report (WCPL, 2022)</i>
EPA	NSW Environment Protection Authority	MSEC	Mine Subsidence Engineering Consultants
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>	Mt	million tonnes
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>	NPW Act	NSW <i>National Parks and Wildlife Act 1974</i>
EPL	Environment Protection Licence	NSW	New South Wales
ESCP	Erosion and Sediment Control Plan	NSW Trade & Investment	NSW Department of Trade and Investment, Regional Infrastructure and Services
GWMP	Groundwater Management Plan	OEH	NSW Office of Environment and Heritage
		PAD	potential archaeological deposit
		PSMP	Public Safety Management Plan
		RMP	Rehabilitation Management Plan
		ROM	Run-of-mine
		RWEP	Remnant Woodland Enhancement Program
		SMP	Subsidence Monitoring Program

South Bates Extension Modification EA	<i>South Bates Extension Modification Environmental Assessment</i> (WCPL, 2017)	VWP the Wambo Development Project EIS	vibrating wire piezometer <i>Wambo Development Project Environmental Impact Statement</i> (WCPL, 2003)
SWMP	Surface Water Management Plan	WAMP	WCPL Asset Management Plan
TARP	Trigger Action Response Plan	WHC	Wambo Homestead Complex
TSMP	Threatened Species Management Plan	WMP	Water Management Plan
UAV	unmanned aerial vehicle	°	degree
VCP	Vegetation Clearance Protocol	%	percent

8.2 GLOSSARY

Note: Terms in bold are defined in the Development Consent (DA 305-7-2003).

Adaptive management	Adaptive management includes monitoring subsidence impacts and subsidence effects and, based on the results, modifying the mining plan as mining proceeds to ensure that the effects, impacts and/or associated environmental consequences remain within predicted and designated ranges and in compliance with the conditions of the Development Consent.
Alluvial	A general term for clay, silt, sand and gravel transported by water and deposited, on the bed of a floodplain, river or stream.
Angle of draw	The angle between the vertical and the line joining the edge of the mining void with the limit of vertical subsidence, usually taken as 20 millimetres.
Aquifer	A sub-surface rock formation containing water in recoverable quantities.
Baseflow	The discharge of sub-surface water into a stream (i.e. groundwater seepages).
Built features	Includes any building or work erected or constructed on land, and includes dwellings and infrastructure such as any formed road, street, path, walk, or driveway; any pipeline, water, sewer, telephone, gas or other service main.
Development Consent	Development Consent (DA 305-7-2003) for the Wambo Coal Mine was granted on 4 February 2004 by the then NSW Minister for Urban Affairs and Planning under Part 4 of the NSW <i>Environmental Planning and Assessment Act 1974</i> .
Environmental consequences	The environmental consequences of subsidence impacts, including: damage to infrastructure, buildings and residential dwellings; loss of surface flows to the subsurface; loss of standing pools; adverse water quality impacts; development of iron bacterial mats; cliff falls; rock falls; damage to heritage items; impacts on aquatic ecology; ponding.
Fault	Major fracture of the Earth's crust caused by the relative movement of the rock masses on either side.
First workings	Development of main headings, longwall gate roads, related cut throughs and other workings for mine access and ventilation.
Geological structures	Geological structures are faults, igneous intrusions, joints or any other significant type of discontinuity or disturbances within the rock strata.
Goaf	The mined-out area into which the immediate roof strata break.

Low level cliffs	Low level cliffs as defined in the Subsidence Assessment (Appendix A) of the South Bates Extension Modification Environmental Assessment (WCPL, 2017).
Mitigation	Activities associated with reducing the impacts of the development.
Remediation	Activities associated with partially or fully repairing or rehabilitating the impacts of the development or controlling the environmental consequences of this impact.
Risk	The chance of something happening that will have an impact upon objectives. It is measured in terms of consequence and likelihood.
Safe, serviceable and repairable	Safe means no danger to users who are present, serviceable means available for its intended use, and repairable means damaged components can be repaired economically.
Second workings	Extraction of coal from longwall panels, mini-wall panels or pillar extraction.
Strain	The change in the horizontal distance between two points at the surface and is typically expressed in units of mm/m. <i>Tensile strain</i> is an increase in the distance between two points (i.e. stretching) and <i>compressive strain</i> is a decrease in distance (i.e. squeezing).
Subsidence	The totality of subsidence effects, subsidence impacts and environmental consequences of subsidence impacts.
Subsidence effects	Deformation of the ground mass due to mining, including all mining-induced ground movements, such as vertical and horizontal displacement, tilt, strain and curvature.
Subsidence impacts	Physical changes to the ground and its surface caused by subsidence effects, including tensile and shear cracking of the rock mass, localised buckling of strata caused by valley closure and subsidence and surface depressions or troughs.
Tilt	The change in the slope of a land surface as a result of differential subsidence and is expressed in units of millimetres per metre (mm/m) or a change in grade where 1 mm/m = 0.1%.
Upsidence	Relative vertical upward movements of the ground surface associated with subsidence.
Vertical subsidence	Vertical downward movements of the ground surface caused by underground coal mining.

WAMBO COAL PTY LIMITED



SOUTH BATES EXTENSION UNDERGROUND MINE

EXTRACTION PLAN LONGWALLS 24 TO 26

ATTACHMENT 1 STATUTORY REQUIREMENTS

Peabody

Attachment 1
Statutory Requirements

This Attachment outlines relevant statutory and guideline requirements and provides the relevant section of the Extraction Plan where the requirements are addressed. This Attachment considers the statutory instruments and guidelines in **Table A1-1**.

Table A1-1
Relevant Statutory Instruments and Guidelines

Statutory Instrument or Guideline	Attachment 1 Reference
Development Consent (DA 305-7-2003)	Table A1-2
<i>Extraction Plan Guideline</i> (Department of Planning and Environment, 2022)	Table A1-3
Mining Lease Conditions	Table A1-4

**Table A1-2
Development Consent DA 305-7-2003 Requirements**

Condition Number	Condition	Document Reference/Comment																		
Performance Measures – Natural and Heritage Features, etc																				
B1.	<p>The Applicant must ensure that underground mining operations undertaken following the approval of Modification 9 comply with the performance measures in Table 1.</p> <p>Table 1: Subsidence Impact Performance Measures – Natural and Heritage Features etc</p> <table border="1" data-bbox="371 507 1357 1241"> <thead> <tr> <th data-bbox="371 507 869 547">Feature</th> <th data-bbox="869 507 1357 547">Performance Measures</th> </tr> </thead> <tbody> <tr> <td colspan="2" data-bbox="371 547 1357 587">Water</td> </tr> <tr> <td data-bbox="371 587 869 715">Wollombi Brook</td> <td data-bbox="869 587 1357 715"> <ul style="list-style-type: none"> Negligible subsidence impacts and environmental consequences Release of water from the site only in accordance with EPL requirements </td> </tr> <tr> <td colspan="2" data-bbox="371 715 1357 754">Land</td> </tr> <tr> <td data-bbox="371 754 869 930">Low level cliffs within the South Bates Extension Area</td> <td data-bbox="869 754 1357 930"> <ul style="list-style-type: none"> Minor environmental consequences (that is occasional rockfalls, displacement or dislodgement of boulders or slabs, or fracturing that in total do not impact more than 5% of the total face area of such features) </td> </tr> <tr> <td colspan="2" data-bbox="371 930 1357 970">Biodiversity</td> </tr> <tr> <td data-bbox="371 970 869 1042">Wollemi National Park</td> <td data-bbox="869 970 1357 1042"> <ul style="list-style-type: none"> Negligible subsidence impacts and environmental consequences </td> </tr> <tr> <td data-bbox="371 1042 869 1145">Warkworth Sands Woodland Community</td> <td data-bbox="869 1042 1357 1145"> <ul style="list-style-type: none"> Minor cracking and ponding of the land surface or other subsidence impacts Negligible environmental consequences </td> </tr> <tr> <td data-bbox="371 1145 869 1241">White Box, Yellow Box, Blakely's Red Gum Woodland/Grassy White Box Woodland Community</td> <td data-bbox="869 1145 1357 1241"> <ul style="list-style-type: none"> Minor cracking and ponding of the land surface or other subsidence impacts Negligible environmental consequences </td> </tr> </tbody> </table>	Feature	Performance Measures	Water		Wollombi Brook	<ul style="list-style-type: none"> Negligible subsidence impacts and environmental consequences Release of water from the site only in accordance with EPL requirements 	Land		Low level cliffs within the South Bates Extension Area	<ul style="list-style-type: none"> Minor environmental consequences (that is occasional rockfalls, displacement or dislodgement of boulders or slabs, or fracturing that in total do not impact more than 5% of the total face area of such features) 	Biodiversity		Wollemi National Park	<ul style="list-style-type: none"> Negligible subsidence impacts and environmental consequences 	Warkworth Sands Woodland Community	<ul style="list-style-type: none"> Minor cracking and ponding of the land surface or other subsidence impacts Negligible environmental consequences 	White Box, Yellow Box, Blakely's Red Gum Woodland/Grassy White Box Woodland Community	<ul style="list-style-type: none"> Minor cracking and ponding of the land surface or other subsidence impacts Negligible environmental consequences 	<p>This Extraction Plan has been developed to meet the subsidence impact performance measures.</p> <p>Section 4.2.1 and Appendix A (Water Management Plan).</p> <p>Section 4.2.2 and Appendix B (Land Management Plan).</p> <p>Section 4.2.3 and Appendix C (Biodiversity Management Plan).</p> <p>Given the absence of the Warkworth Sands Woodland Community and the White Box, Yellow Box, Blakely's Red Gum Woodland/Grassy White Box Woodland Community from the South Bates Extension Underground Mine area, these communities are not expected to experience impacts resulting from the extraction of Longwalls 24 to 26.</p>
Feature	Performance Measures																			
Water																				
Wollombi Brook	<ul style="list-style-type: none"> Negligible subsidence impacts and environmental consequences Release of water from the site only in accordance with EPL requirements 																			
Land																				
Low level cliffs within the South Bates Extension Area	<ul style="list-style-type: none"> Minor environmental consequences (that is occasional rockfalls, displacement or dislodgement of boulders or slabs, or fracturing that in total do not impact more than 5% of the total face area of such features) 																			
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Wollemi National Park	<ul style="list-style-type: none"> Negligible subsidence impacts and environmental consequences 																			
Warkworth Sands Woodland Community	<ul style="list-style-type: none"> Minor cracking and ponding of the land surface or other subsidence impacts Negligible environmental consequences 																			
White Box, Yellow Box, Blakely's Red Gum Woodland/Grassy White Box Woodland Community	<ul style="list-style-type: none"> Minor cracking and ponding of the land surface or other subsidence impacts Negligible environmental consequences 																			

Table A1-2 (Continued)
Development Consent DA 305-7-2003 Requirements

Condition Number	Condition	Document Reference/Comment														
B1. (Cont.)	<table border="1"> <tr> <td colspan="2" data-bbox="369 370 1355 402">Table 1: Subsidence Impact Performance Measures (Continued)</td> </tr> <tr> <td colspan="2" data-bbox="369 406 1355 438">Biodiversity (Continued)</td> </tr> <tr> <td data-bbox="369 443 788 539">Central Hunter Valley Eucalypt Forest and Woodland Ecological Community</td> <td data-bbox="795 443 1355 539"> <ul style="list-style-type: none"> • Minor cracking and ponding of the land surface or other subsidence impacts • Negligible environmental consequences </td> </tr> <tr> <td data-bbox="369 544 788 635">Conservation Areas (including the proposed Wambo offset area under SSD 7142)</td> <td data-bbox="795 544 1355 635"> <ul style="list-style-type: none"> • Negligible reduction to previously identified biodiversity credits </td> </tr> <tr> <td data-bbox="369 639 788 730">Threatened Species and Communities</td> <td data-bbox="795 639 1355 730"> <ul style="list-style-type: none"> • Minor cracking and ponding of the land surface or other subsidence impacts • Negligible environmental consequences </td> </tr> <tr> <td colspan="2" data-bbox="369 735 1355 767">Heritage</td> </tr> <tr> <td data-bbox="369 772 788 868">Wambo Homestead Complex</td> <td data-bbox="795 772 1355 868"> <ul style="list-style-type: none"> • Negligible impact on heritage values, unless approval has been granted by Heritage NSW and/or the Minister </td> </tr> </table>	Table 1: Subsidence Impact Performance Measures (Continued)		Biodiversity (Continued)		Central Hunter Valley Eucalypt Forest and Woodland Ecological Community	<ul style="list-style-type: none"> • Minor cracking and ponding of the land surface or other subsidence impacts • Negligible environmental consequences 	Conservation Areas (including the proposed Wambo offset area under SSD 7142)	<ul style="list-style-type: none"> • Negligible reduction to previously identified biodiversity credits 	Threatened Species and Communities	<ul style="list-style-type: none"> • Minor cracking and ponding of the land surface or other subsidence impacts • Negligible environmental consequences 	Heritage		Wambo Homestead Complex	<ul style="list-style-type: none"> • Negligible impact on heritage values, unless approval has been granted by Heritage NSW and/or the Minister 	<p>Section 4.2.3 and Appendix C (Biodiversity Management Plan).</p> <p>Section 4.2.3 and Appendix C (Biodiversity Management Plan).</p> <p>Section 4.2.3 and Appendix C (Biodiversity Management Plan).</p> <p>Section 4.2.4 and Appendix D (Heritage Management Plan).</p>
Table 1: Subsidence Impact Performance Measures (Continued)																
Biodiversity (Continued)																
Central Hunter Valley Eucalypt Forest and Woodland Ecological Community	<ul style="list-style-type: none"> • Minor cracking and ponding of the land surface or other subsidence impacts • Negligible environmental consequences 															
Conservation Areas (including the proposed Wambo offset area under SSD 7142)	<ul style="list-style-type: none"> • Negligible reduction to previously identified biodiversity credits 															
Threatened Species and Communities	<ul style="list-style-type: none"> • Minor cracking and ponding of the land surface or other subsidence impacts • Negligible environmental consequences 															
Heritage																
Wambo Homestead Complex	<ul style="list-style-type: none"> • Negligible impact on heritage values, unless approval has been granted by Heritage NSW and/or the Minister 															

**Table A1-2 (Continued)
Development Consent DA 305-7-2003 Requirements**

Condition Number	Condition	Document Reference/Comment										
Performance Measures – Built Features												
B4.	<p>The Applicant must ensure that underground mining operations undertaken following the approval of Modification 9 comply with the performance measures in Table 2.</p> <p>Table 2: Subsidence Impact Performance Measures – Built Features</p> <table border="1" data-bbox="369 502 1339 853"> <thead> <tr> <th data-bbox="369 502 660 550"><i>Feature</i></th> <th data-bbox="660 502 1339 550"><i>Performance Measures</i></th> </tr> </thead> <tbody> <tr> <td colspan="2" data-bbox="369 550 1339 582">Built Features</td> </tr> <tr> <td data-bbox="369 582 660 774">All built features (including public infrastructure and all structures on privately-owned land)</td> <td data-bbox="660 582 1339 774"> <ul style="list-style-type: none"> • Always safe. • Serviceability should be maintained wherever practicable. • Loss of serviceability must be fully compensated. • Damage must be fully repairable, and must be fully repaired or else replaced or fully compensated. </td> </tr> <tr> <td colspan="2" data-bbox="369 774 1339 805">Public Safety</td> </tr> <tr> <td data-bbox="369 805 660 853">Public Safety</td> <td data-bbox="660 805 1339 853"> <ul style="list-style-type: none"> • Negligible additional risk </td> </tr> </tbody> </table>	<i>Feature</i>	<i>Performance Measures</i>	Built Features		All built features (including public infrastructure and all structures on privately-owned land)	<ul style="list-style-type: none"> • Always safe. • Serviceability should be maintained wherever practicable. • Loss of serviceability must be fully compensated. • Damage must be fully repairable, and must be fully repaired or else replaced or fully compensated. 	Public Safety		Public Safety	<ul style="list-style-type: none"> • Negligible additional risk 	<p>This Extraction Plan has been developed to meet the subsidence impact performance measures.</p> <p>Section 4.2.5 and Appendix E (Built Features Management Plan).</p> <p>Section 4.2.6 and Appendix F (Public Safety Management Plan).</p>
<i>Feature</i>	<i>Performance Measures</i>											
Built Features												
All built features (including public infrastructure and all structures on privately-owned land)	<ul style="list-style-type: none"> • Always safe. • Serviceability should be maintained wherever practicable. • Loss of serviceability must be fully compensated. • Damage must be fully repairable, and must be fully repaired or else replaced or fully compensated. 											
Public Safety												
Public Safety	<ul style="list-style-type: none"> • Negligible additional risk 											
B5.	<p>Any dispute between the Applicant and the owner of any built feature over the interpretation, application or implementation of the performance measures in Table 2 is to be settled by the Planning Secretary, following consultation with the Resources Regulator. Any decision by the Planning Secretary shall be final.</p>	<p>The Longwalls 24 to 26 Application Area is located entirely within WCPL-owned land.</p> <p>All built features are to be managed in accordance with Section 4.2.5 and the Built Features Management Plan (Appendix E).</p>										

**Table A1-2 (Continued)
Development Consent DA 305-7-2003 Requirements**

Condition Number	Condition	Document Reference/Comment
First Workings		
B6.	<p>The applicant may carry out first workings within the underground mining area, other than in accordance with an approved Extraction Plan, provided that the Resources Regulator is satisfied that the first workings are designed to remain stable and non-subsiding in the long term, except insofar as they may be impacted by approved second workings.</p> <p><i>Note: The intent of this condition is to ensure that first workings are built to geotechnical and engineering standards sufficient to ensure long term stability, with negligible direct subsidence impacts.</i></p>	Section 2.5 of Appendix G (Coal Resource Recovery Plan).
Extraction Plan		
B7.	<p>The Applicant must prepare an Extraction Plan for all second workings on the site to the satisfaction of the Planning Secretary. Each Extraction Plan must:</p> <p>(a) be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Planning Secretary;</p> <p>(b) include detailed plans of existing and proposed first and second workings and any associated surface development;</p> <p>(c) provide updated predictions of the potential subsidence effects, subsidence impacts and environmental consequences of the proposed mining covered by the Extraction Plan, incorporating any relevant information obtained since this consent;</p>	<p>Section 1.1 and Attachment 2.</p> <p>This application. Section 1.3 and Appendix G (Coal Resource Recovery Plan).</p> <p>Section 3.1 and Technical Reports 1 to 3.</p>

**Table A1-2 (Continued)
Development Consent DA 305-7-2003 Requirements**

Condition Number	Condition	Document Reference/Comment
B7. (Cont.)	(d) describe in detail the performance criteria to be implemented to ensure compliance with the performance measures in Table 1 and Table 2, and manage or remediate any impacts and/or environmental consequences to meet the rehabilitation objectives in condition B104, including: <ul style="list-style-type: none"> (i) a trigger action response plan to identify risks and specific follow up actions to avoid exceedances of the performance measures; and (ii) a contingency plan that expressly provides for adaptive management where monitoring indicates that there has been an exceedance of the performance measures, or where any such exceedance appears likely; 	Sections 3 and 4 and Appendices A, B, C, E and F.
	(e) include the following to the satisfaction of the Resources Regulator (or MEG, as the case may require):	Section 3 and Technical Reports 1 to 3.
	(i) a coal resource recovery plant that demonstrates effective recovery of the available resource;	Appendix G (Coal Resource Recovery Plan).
	(ii) a Subsidence Monitoring Program to: <ul style="list-style-type: none"> • provide data to assist with the management of the risks associated with subsidence (conventional and non-conventional); • validate the subsidence predictions; and • analyse the relationship between the subsidence effects and impacts under the plan against those predicted and any ensuing environmental consequences; 	Section 4.1 and Appendix H (Subsidence Monitoring Program).
	(iii) a Built Features Management Plan to manage the potential subsidence impacts and/or environmental consequences of the proposed second workings on built features, and which: <ul style="list-style-type: none"> • addresses, in appropriate detail, all items of public infrastructure and all classes of other built features; and • has been prepared following appropriate consultation with the owner/s of potentially affected feature/s; 	Section 4.2.5 and Appendix E (Built Features Management Plan). There is no public infrastructure in the Longwalls 21 to 24 Application Area.
	(iv) a Public Safety Management Plan to ensure public safety in the mining area; and	Section 4.2.6 and Appendix F (Public Safety Management Plan).

Table A1-2 (Continued)
Development Consent DA 305-7-2003 Requirements

Condition Number	Condition	Document Reference/Comment
B7. (Cont.)	(v) appropriate revisions to the Rehabilitation Management Plan required under condition B107; and	Section 4.2.7 and Appendix I (Rehabilitation Management Plan).
	(f) include a: <ul style="list-style-type: none"> <li data-bbox="421 480 1413 884">(i) Water Management Plan, which has been prepared in consultation with EPA, DPE Water and NRAR, which provides for the management of the potential impacts and/or environmental consequences of the proposed second working on surface water resources, groundwater resources and flooding, and which includes: <ul style="list-style-type: none"> <li data-bbox="488 608 1413 695">• surface and groundwater impact assessment criteria, including trigger levels for investigating any potentially adverse impacts on water resources (level, yield and quality); <li data-bbox="488 711 1413 767">• a program to monitor and report on compliance with the surface and groundwater impact assessment criteria; <li data-bbox="488 783 1413 839">• a program to monitor and report on groundwater inflows to underground workings; and <li data-bbox="488 855 1413 884">• a program to manage and monitor impacts on privately-owned licensed bores; 	Section 4.2.1 and Appendix A (Water Management Plan).
	(ii) Biodiversity Management Plan , which has been prepared in consultation with BCD, which provides for the management of the potential impacts and/or environmental consequences of the proposed second workings on flora and fauna, with a specific focus on threatened species, populations and their habitats, EECs and groundwater dependent ecosystems;	Section 4.2.3 and Appendix C (Biodiversity Management Plan).

Table A1-2 (Continued)
Development Consent DA 305-7-2003 Requirements

Condition Number	Condition	Document Reference/Comment
B7. (Cont.)	(iii) Land Management Plan , which has been prepared in consultation with any affected public authorities, which provides for the management of the potential impacts and/or environmental consequences of the proposed second workings on land in general, with a specific focus on cliffs, minor cliffs, rock face features, steep slopes and agricultural enterprises;	Section 4.2.2 and Appendix B (Land Management Plan).
	(iv) Heritage Management Plan , which has been prepared in consultation with BCD and relevant stakeholders for Aboriginal and non-Aboriginal heritage, to manage the potential impacts and/or environmental consequences of the proposed second workings on heritage items; and	Section 4.2.4 and Appendix D (Heritage Management Plan).
	(g) include a program to collect sufficient baseline data for future Extraction Plans.	Attachment 3.
B9.	<p>The Applicant must implement the Extraction Plan as approved by the Planning Secretary.</p> <p>Notes:</p> <ul style="list-style-type: none"> • <i>Management plans prepared under condition B7(e)&(f) should address all potential impacts of proposed underground coal extraction on the relevant features. Other site-wide management plans required under this consent are not required to duplicate these plans or re-address the specific impacts associated with underground coal extraction.</i> 	Appendices A to D.

**Table A1-3
Requirements of the Extraction Plan Guideline**

Guideline Section	Requirement	Document Reference/Comment
Structure		
-	<p>The high-level structure for the required elements of an Extraction Plan should be as follows:</p> <ul style="list-style-type: none"> • Introduction; • Plan Development and Consultation; • Subsidence Assessment; • Monitoring Programs: <ul style="list-style-type: none"> - Subsidence Monitoring Program; - Environmental Monitoring Program; - Ongoing Baseline Data Collection Program. • Management, Mitigation, Remediation and Reporting Measures; • Plan Administration and Responsibilities; • References; • Appendices; and • Attachments. 	<p>The Extraction Plan has been structured as follows:</p> <ul style="list-style-type: none"> • Overview and Summary of Commitments. • Section 1 – Introduction. • Section 2 – Plan Development and Consultation. • Section 3 – Subsidence Assessment. • Section 4 – Monitoring Programs. • Section 5 – Management, Mitigation, Remediation and Reporting Measures. • Section 6 – Plan Administration and Responsibilities. • Section 7 – References. • Section 8 – Abbreviations, Acronyms and Glossary. • Attachments 1 to 4. • Appendices A to I (component management plans). <p>Graphical plans are provided in Appendix G (Coal Resource Recovery Plan).</p> <ul style="list-style-type: none"> • Technical Reports 1 to 4.

Table A1-3 (Continued)
Requirements of the Extraction Plan Guideline

Guideline Section	Requirement	Document Reference/Comment
Introduction		
1	<ul style="list-style-type: none"> Title Page, executive summary and table of contents 	Document Control page and Overview and Summary of Commitments
	<ul style="list-style-type: none"> Background 	Section 1
	<ul style="list-style-type: none"> Plans of the approved development 	Section 1.3
	<ul style="list-style-type: none"> Scope of the plan 	Section 1.1
	<ul style="list-style-type: none"> Plan structure 	Section 1.2
Plan development and consultation		
2	<ul style="list-style-type: none"> Statutory requirements 	Section 2.1.1
	<ul style="list-style-type: none"> Specialist assessments 	Section 2.1
	<ul style="list-style-type: none"> Review of previous subsidence predictions 	Section 3.1.1
	<ul style="list-style-type: none"> Risk assessment 	Section 2.1.2
	<ul style="list-style-type: none"> Avoidance and minimisation strategies (if applicable) 	Not Applicable
<ul style="list-style-type: none"> Specialist assessments 	Section 2.2	
Subsidence Assessment		
3	<ul style="list-style-type: none"> Overview Only 	Section 3 and Technical Report 1

**Table A1-3 (Continued)
Requirements of the Extraction Plan Guideline**

Guideline Section	Requirement	Document Reference/Comment
Monitoring Programs		
4	<ul style="list-style-type: none"> • Subsidence monitoring program 	Section 4.1
	<ul style="list-style-type: none"> • Environmental monitoring program 	Section 4.2
	<ul style="list-style-type: none"> - baseline data 	Attachment 3
	<ul style="list-style-type: none"> - surface water flows and quality 	Section 4.2.1, Technical Report 3 and Water Management Plan (Appendix A)
	<ul style="list-style-type: none"> - swamps (if applicable) 	Not Applicable
	<ul style="list-style-type: none"> - groundwater flows and quality 	Section 4.2.1, Technical Report 2 and Water Management Plan (Appendix A)
	<ul style="list-style-type: none"> - landforms 	Section 4.2.2, Technical Report 1 and Land Management Plan (Appendix B)
	<ul style="list-style-type: none"> - biodiversity 	Section 4.2.3 and Biodiversity Management Plan (Appendix C)
	<ul style="list-style-type: none"> - heritage features 	Section 4.2.4 and Heritage Management Plan (Appendix D)
	<ul style="list-style-type: none"> - infrastructure and other built features 	Section 4.2.5, Technical Report 1, Built Features Management Plan (Appendix E)
<ul style="list-style-type: none"> • Ongoing baseline data collection program 	Attachment 3	

Table A1-3 (Continued)
Requirements of the Extraction Plan Guideline

Guideline Section	Requirement	Document Reference/Comment
Management, mitigation, remediation and reporting measures		
5	<ul style="list-style-type: none"> • Performance measures and indicators 	Section 4.2.1.3, Section 4.2.2.3, Section 4.2.4.3, Section 4.2.5.3 and Section 4.2.6.3.
	<ul style="list-style-type: none"> • Management and mitigation measures 	Section 5
	<ul style="list-style-type: none"> • Remediation and rehabilitation measures 	Section 4.2.7
	<ul style="list-style-type: none"> • Master TARP 	Appendices A, B, C, E and F.
	<ul style="list-style-type: none"> • Adaptive management and contingency planning 	Section 5.1
	<ul style="list-style-type: none"> • Incidents, complaints, exceedances and non-compliances 	Section 5.2
	<ul style="list-style-type: none"> • Reporting, review and auditing 	Section 5.2
6	<ul style="list-style-type: none"> • Review of other management plans 	Section 6.1
	<ul style="list-style-type: none"> • Review of the extraction plan 	Section 6.2
	<ul style="list-style-type: none"> • Key responsibilities 	Section 6.3
References		
7	Any relevant references to other documents	Section 7

**Table A1-3 (Continued)
Requirements of the Extraction Plan Guideline**

Guideline Section	Requirement	Document Reference/Comment
Appendices		
8	<ul style="list-style-type: none"> • Key sub-plans 	Key component management plans are provided in Appendices A to F: <ul style="list-style-type: none"> • Appendix A – Water Management Plan; • Appendix B – Land Management Plan; • Appendix C – Biodiversity Management Plan; • Appendix D – Heritage Management Plan; • Appendix E – Built Features Management Plan; and • Appendix F – Public Safety Management Plan.
	<ul style="list-style-type: none"> • Required mine plans 	Mine Plans 1 – 7 are attached to the Coal Resource and Recovery Plan (Appendix G)
9	<ul style="list-style-type: none"> • Specialist assessment reports 	Specialist assessment reports are provided in Technical Reports 1 to 4: <ul style="list-style-type: none"> • Technical Report 1 – Subsidence Predictions and Impact Assessments; • Technical Report 2 – Groundwater Assessment Review; • Technical Report 3 – Surface Water Assessment Review; and • Technical Report 4 – Subsidence Risk Assessment;
	<ul style="list-style-type: none"> • Coal resource recovery plan (if required) 	Coal Resource Recovery Plan (Appendix G)

**Table A1-4
Mining Lease Requirements**

Condition Number	Condition	Document Reference/Comment
Mining Lease 1594 and Mining Lease 1572		
4	<p>(b) The lease holder must not undertake any underground mining operations that may cause subsidence except in accordance with an approved Extraction Plan.</p> <p>(c) The lease holder must ensure that the approved Extraction Plan provides for the effective management of risks associated with any subsidence resulting from mining operations carried out under this lease.</p> <p>(d) The lease holder must notify the Secretary within 48 hours of any:</p> <ul style="list-style-type: none"> (i) incident caused by subsidence which has a potential to expose any person to health and safety risks; (ii) significant deviation from the predicted nature, magnitude, distribution, timing and duration of subsidence effects, and of the potential impacts and consequences of those deviations on built features and the health and safety of any person; or (iii) significant failure or malfunction of a monitoring device or risk control measure set out in the approved Extraction Plan addressing: <ul style="list-style-type: none"> A. built features; B. public safety; or C. subsidence monitoring. 	<p>This application.</p> <p>Technical Report 4 and Appendices A to F.</p> <p>Section 5.2</p>
12	<p>Operations must be carried out in a manner that ensures the safety of persons or stock in the vicinity of the operations. All drill holes shafts and excavations must be appropriately protected, to the satisfaction of the Director General, to ensure that access to them by persons and stock is restricted. Abandoned shafts and excavations opened up or used by the lease holder must be filled in or otherwise rendered safe to a standard acceptable to the Director-General.</p>	<p>Appendix F (Public Safety Management Plan).</p>
13	<p>(a) Land disturbed must be rehabilitated to a stable and permanent form suitable for a subsequent land use acceptable to the Director-General and in accordance with the Mining Operations Plan so that:-</p> <ul style="list-style-type: none"> • there is no adverse environmental effect outside the disturbed area and that the land is properly drained and protected from soil erosion. • the state of the land is compatible with the surrounding land and land-use requirements. • the landforms, soils, hydrology and flora require no greater maintenance than that in the surrounding land. 	<p>Appendix I (Rehabilitation Management Plan).</p>

Table A1-4 (Continued)
Mining Lease Requirements

Condition Number	Condition	Document Reference/Comment
13 (cont.)	<ul style="list-style-type: none"> in cases where revegetation is required and native vegetation has been removed or damaged, the original species must be re-established with close reference to the flora survey included in the Mining Operations Plan. If the original vegetation was not native, any re-established vegetation must be appropriate to the area and at an acceptable density. the land does not pose a threat to public safety. 	Appendix I (Rehabilitation Management Plan). Appendix F (Public Safety Management Plan).
	(b) Any topsoil that is removed must be stored and maintained in a manner acceptable to the Director-General.	Appendix I (Rehabilitation Management Plan).
16	Operations must be carried out in a manner that does not cause or aggravate air pollution, water pollution (including sedimentation) or soil contamination or erosion, unless otherwise authorised by a relevant approval, and in accordance with an accepted Mining Operations Plan. For the purpose of this condition, water shall be taken to include any watercourse, waterbody or groundwaters. The lease holder must observe and perform any instructions given by the Director-General in this regard.	Appendix A (Water Management Plan) and Appendix B (Land Management Plan).
17	Operations must not interfere with or impair the stability or efficiency of any transmission line, communication line, pipeline or any other utility on the lease area without prior written approval of the Director-General and subject to any conditions he may stipulate.	Appendix E (Built Features Management Plan) All assets within the Longwalls 24 to 26 Application Area are WCPL-owned.
18	(a) Activities on the lease must not interfere with or damage fences without the prior written approval of the owner thereof or the Minister and subject to any conditions the Minister may stipulate.	Appendix B (Land Management Plan) All fences within the Longwalls 24 to 26 Application Area are WCPL-owned.
19	(a) Operations must not affect any road unless in accordance with an accepted Mining Operations Plan or with the prior written approval of the Director-General and subject to any conditions he may stipulate.	Appendix B (Land Management Plan) and Appendix E (Built Features Management Plan) All roads and tracks within the Longwalls 24 to 26 Application Area are WCPL-owned.
27	(A) Notwithstanding any Mining Operations Plan, the lease holder must not mine within any part of the lease area which is within the notification area of the Wambo Tailings Dam without the prior written approval of the Minister and subject to any conditions that he may stipulate.	The Longwalls 24 to 26 Application Area does not intersect the Notification Area of any Prescribed Dams (Appendix E [Built Features Management Plan]).
Annexure A (12/11/2013)	(a) Notwithstanding any Mining Operations Plan, the leaseholder must not mine within any part of the lease area which is within the notification area of the Wambo South Water Dam without the prior written approval of the Minister and subject to any conditions that he may stipulate.	The Longwalls 24 to 26 Application Area does not intersect the Notification Area of any Prescribed Dams (Appendix E [Built Features Management Plan]).

**Table A1-4 (Continued)
Mining Lease Requirements**

Condition Number	Condition	Document Reference/Comment
Coal Lease 397		
1	(d) Where the registered holder desires to commence and to carry out underground mining operations within the subject area or where the Minister notifies the registered holder that he proposes to issue a direction pursuant to paragraph (c) of this condition the registered holder shall furnish to the Minister a plan showing the proposed workings in the section of land to be so mined together with such other details as the Minister may require.	Workings which are the subject of this application are shown on Plan 7 of Appendix G (Coal Resource Recovery Plan).
26	The registered holder shall not interfere in any way with any fences on or adjacent to the subject area unless with the prior written approval of the owner thereof of the Minister and subject to such conditions as the Minister may stipulate.	Appendix B (Land Management Plan) and Appendix E (Built Features Management Plan). All fences within the Longwalls 24 to 26 Application Area are WCPL-owned.
27	The registered holder shall observe any instruction given or which may be given by the Minister with a view to minimising or preventing public inconvenience or damage to public or private property.	Appendix E (Built Features Management Plan). All assets within the Longwalls 24 to 26 Application Area are WCPL-owned.
30	Subject to any specific condition of this lease providing for rehabilitation of any particular part of the subject area affected by mining or activities associated therewith, the registered holder shall; (a) reinstate, level, regrass, reforest and contour to the satisfaction of the Minister, any part of the subject area that may in the opinion of the Minister have been damaged or deleteriously affected by mining operations; and (b) fill in, seal or fence, to the satisfaction of the Minister, any excavation within the subject area.	Appendix I (Rehabilitation Management Plan).
31	If requested so to do by the Minister and within such time as may be stipulated by the Minister the registered holder shall carry out to the satisfaction of the Minister surveys of structures, buildings and pipelines on adjacent landholdings to determine the effect of operations on any such structures, buildings and pipelines.	Pre-mining inspections are outlined in Appendix E (Built Features Management Plan). All assets within the Longwalls 24 to 26 Application Area are WCPL-owned.
33	If so directed by the Minister the registered holder shall rehabilitate to the satisfaction of the Minister and within such time as may be allowed by the Minister any lands within the subject area which may have been disturbed by the operations hereby authorised.	Appendix I (Rehabilitation Management Plan).
36	If so directed by the Minister the lease holder shall rehabilitate to the satisfaction of the Minister and within such time as may be allowed by the Minister any lands within the subject area which may have been disturbed by mining or prospecting operations whether such operations were or were not carried out by the lease holder.	Appendix I (Rehabilitation Management Plan).

**Table A1-4 (Continued)
Mining Lease Requirements**

Condition Number	Condition	Document Reference/Comment
40	The lease holder shall provide and maintain to the satisfaction of the Minister efficient means to prevent contamination, pollution, erosion or siltation of any river, stream, creek, tributary, lake, dam, reservoir, watercourse or catchment area or any undue interference to fish or their environment and shall observe any instruction given or which may be given by the Minister with a view to preventing or minimising the contamination, pollution, erosion or siltation of any river stream, creek, tributary, lake, dam, reservoir, watercourse or catchment area or any undue interference to fish or their environment.	Appendix A (Water Management Plan), Appendix B (Land Management Plan) and Appendix C (Biodiversity Management Plan).
46	Operations shall be carried out in such a manner as to interfere as little as possible with natural flora and fauna and the registered holder shall comply with any direction given or which may be given in this regard by the Minister or the Director-General.	Appendix B (Land Management Plan) and Appendix C (Biodiversity Management Plan).
52	The lease holder shall conduct operations in such a manner as to not cause or aggravate soil erosion and the lease holder shall observe and perform any instructions given or which may be given by the Minister with a view to minimising or preventing soil erosion.	Appendix B (Land Management Plan) and Appendix I (Rehabilitation Management Plan).
59	In the event of operations being conducted on the surface of any road, track or firetrail traversing the subject area or in the event of such operations causing damage to or interference with any such road, track or firetrail the lease holder, at his own expense, shall if directed to do so by the Minister provide to the satisfaction of the Minister an alternate road, track or firetrail in a position as required by the Minister and shall allow free and uninterrupted access along such alternate road, track or firetrail and, if required to do so by the Minister, the lease holder shall upon completion of operations rehabilitate the surface of the original road, track or firetrail to a condition satisfactory to the Minister.	Appendix B (Land Management Plan) and Appendix D (Built Features Management Plan) All roads and tracks within the Longwalls 24 to 26 Application Area are WCPL-owned.
68	(a) The marks in connection with any trigonometrical station erected on or near the subject area shall not be interfered with and the unrestricted right of access to such station by authorised persons and also the right to clear sight lines to surrounding stations is reserved at all times.	There are state survey control marks located within the Longwalls 24 to 26 Application Area. Any movements to survey control marks would be managed in accordance with this condition.
73	(a) The registered holder shall as far as is practicable so conduct operations as not to interfere with or impair the stability of any:- (i) telephone line; (ii) power transmission line; (iii) pipeline traversing the subject area.	Appendix E (Built Features Management Plan). All assets within the Longwalls 24 to 26 Application Area are WCPL-owned.

**Table A1-4 (Continued)
Mining Lease Requirements**

Condition Number	Condition	Document Reference/Comment
Schedule A	(b) The lease holder must not undertake any underground mining operations that may cause subsidence except in accordance with an approved Extraction Plan.	This application.
	(c) The lease holder must ensure that the approved Extraction Plan provides for the effective management of risks associated with any subsidence resulting from mining operations carried out under this lease.	Technical Report 4 and Appendices A to F.
	(d) The lease holder must notify the Secretary within 48 hours of any: <ul style="list-style-type: none"> (i) incident caused by subsidence which has a potential to expose any person to health and safety risks; (ii) significant deviation from the predicted nature, magnitude, distribution, timing and duration of subsidence effects, and of the potential impacts and consequences of those deviations on built features and the health and safety of any person; or (iii) significant failure or malfunction of a monitoring device or risk control measure set out in the approved Extraction Plan addressing: <ul style="list-style-type: none"> A. built features; B. public safety; or C. subsidence monitoring. 	Section 4.2.
Mining Lease 1806		
2	Any disturbance resulting from the activities carried out under this mining lease must be rehabilitated to the satisfaction of the Minister.	Appendix I (Rehabilitation Management Plan).
3	(a) The lease holder must comply with an approved Mining Operations Plan (MOP) in carrying out any significant surface disturbing activities, including mining operations, ancillary mining activities and prospecting. The lease holder must apply to the Minister for approval of a MOP. An approved MOP must be in place prior to commencing any significant surface disturbing activities, including mining operations, ancillary mining activities and prospecting.	Appendix I (Rehabilitation Management Plan).

Table A1-4 (Continued)
Mining Lease Requirements

Condition Number	Condition	Document Reference/Comment
3 (cont.)	(b) The MOP must identify the post mining land use and set out a detailed rehabilitation strategy which: <ul style="list-style-type: none"> (i) identifies areas that will be disturbed; (ii) details the staging of specific mining operations, ancillary mining activities and prospecting; (iii) identifies how the mine will be managed and rehabilitated to achieve the post mining land use; (iv) identifies how mining operations, ancillary mining activities and prospecting will be carried out in order to prevent and or minimise harm to the environment; and (v) reflects the conditions of approval under: <ul style="list-style-type: none"> • the <i>Environmental Planning and Assessment Act 1979</i>; • the <i>Protection of the Environment Operations Act 1997</i>; and • any other approvals relevant to the development including the conditions of this mining lease. 	Appendix I (Rehabilitation Management Plan).
	(c) The MOP must be prepared in accordance with the <i>ESG3: Mining Operations Plan (MOP) Guidelines September 2013</i> published on the Department's website	Appendix I (Rehabilitation Management Plan).
	(d) The lease holder may apply to the Minister to amend an approved MOP at any time.	Appendix I (Rehabilitation Management Plan).
	(e) It is not a breach of this condition if: <ul style="list-style-type: none"> (i) the operations which, but for this condition 3(e) would be a breach of condition 3(a), were necessary to comply with a lawful order or direction given under the <i>Environmental Planning and Assessment Act 1979</i>, the <i>Protection of the Environment Operations Act 1997</i>, the <i>Work Health and Safety (Mines and Petroleum Sites) Act 2013</i> and <i>Work Health and Safety (Mines and Petroleum Sites) Regulation 2014</i> or the <i>Work Health and Safety Act 2011</i>; and <i>Work Health and Safety Regulation 2017</i> (ii) the Minister had been notified in writing of the terms of the order or direction prior to the operations constituting the breach being carried out. 	Appendix I (Rehabilitation Management Plan).

**Table A1-4 (Continued)
Mining Lease Requirements**

Condition Number	Condition	Document Reference/Comment
3 (cont.)	(f) The lease holder must prepare a Rehabilitation Report to the satisfaction of the Minister. The report must: <ul style="list-style-type: none"> (i) provide a detailed review of the progress of rehabilitation against the performance measures and criteria established in the approved MOP; (ii) be submitted annually on the grant anniversary date (or at such other times as agreed by the Minister); and (iii) be prepared in accordance with any relevant annual reporting guidelines published on the Department’s website. Note: The Rehabilitation Report replaces the Annual Environmental Management Report.	Appendix I (Rehabilitation Management Plan).
4	(a) The lease holder must notify the Department upon becoming aware of any breaches of the conditions of this mining lease or breaches of the Act or Mining Regulations 2016;	Section 5.2
	(b) Notifications under condition 4(a) must be provided in the form specified on the Department’s website within seven (7) days of the mining lease holder becoming aware of the breach.	Section 5.2
5	The lease holder must provide environmental incident notifications and reports to the Secretary no later than seven (7) days after those environmental incident notifications and reports are provided to the relevant authorities under the Protection of the Environment Operations Act 1997.	Section 5.2
6	(b) The lease holder must not undertake any underground mining operations that may cause subsidence except in accordance with an approved Extraction Plan.	This application.
	(c) The lease holder must ensure that the approved Extraction Plan provides for the effective management of risks associated with any subsidence resulting from mining operations carried out under this lease.	Technical Report 4 and Appendices A to F.

**Table A1-4 (Continued)
Mining Lease Requirements**

Condition Number	Condition	Document Reference/Comment
6 (cont.)	(d) The lease holder must notify the Secretary within 48 hours of any: <ul style="list-style-type: none"> (i) incident caused by subsidence which has a potential to expose any person to health and safety risks; (ii) significant deviation from the predicted nature, magnitude, distribution, timing and duration of subsidence effects, and of the potential impacts and consequences of those deviations on built features and the health and safety of any person; or (iii) significant failure or malfunction of a monitoring device or risk control measure set out in the approved Extraction Plan addressing: <ul style="list-style-type: none"> • built features; • public safety; or • subsidence monitoring 	Section 5.2

WAMBO COAL PTY LIMITED



SOUTH BATES EXTENSION UNDERGROUND MINE

EXTRACTION PLAN LONGWALLS 24 TO 26

ATTACHMENT 2 RELEVANT CONSULTATION RECORDS

Peabody

Monday 3 July 2023

Peabody Energy
Via: Major Projects Portal

To whom it may concern,

I refer to your request of 5th June 2023 for advice regarding Wambo Mine Extraction Plan LW24-LW26 (DA305-7-2003-i-PA-72). The Resources Regulator has reviewed the request.

Based on the review of the documents, the Resources Regulator provides the following comments:

The proposed Extraction Plan (Wambo Mine Extraction Plan LW24-26) satisfies the requirements of the Wambo Mine Extraction Plan LW24-26 (DA305-7-2003-i-PA-72 condition B7 (e) of schedule 2). Note the proposed mining will be regulated under relevant WHS law, as a High-Risk Activity notification under Clause 35 and Schedule 3 Section 17(3)(e) of the Work Health and Safety (Mines and Petroleum Sites) Regulation 2022.

The expectation would be that the operator submits a relevant High Risk Activity notification at the appropriate time. As part of this submission, it is expected that a further review of the Land Management Plan will be required to detail the proposed subsidence monitoring program to assess the potential impacts from far-fielded subsidence movement of the remote cliffs in Wollombi National Park, located 760m away from LW26.

Regarding mine rehabilitation matters, the Resources Regulator advises that it has no specific comments regarding mine rehabilitation matters in relation to the proposals.

LIMITATIONS

The Extraction Plan is assessed and determined by Department of Planning and Environment (DPE) under the conditions of the development consent. The Resources Regulator provides advice to DPE to assist in the determination.

REGULATORY REQUIREMENTS IF APPROVED

The authorisation holder is required to ensure that the rehabilitation commitments outlined in any approved Extraction Plan are regulated by the Resources Regulator under the conditions of the mining lease and the *Mining Act 1992*.

The Resources Regulator may undertake assessments of the mine operators' proposed mining activities under the *Work Health and Safety (Mines and Petroleum Sites) Act 2013* and Regulation as well as other WHS regulatory obligations.

Subsidence associated with the proposed Extraction Plan will be regulated by under relevant provisions of WHS laws in particular Clause 35 and Clause 70 of the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014* relating to High-Risk Activities and Subsidence.

BACKGROUND

The NSW Resources Regulator is responsible for compliance and enforcement of the Extraction Plan is so far as it relates to requirements under the *Mining Act 1992* and Work Health and Safety legislation. This role principally relates to rehabilitation, workplace safety and public safety.

The Mining Act Inspectorate within the Resources Regulator undertake risk-based compliance and enforcement activities in relation to obligations under the *Mining Act 1992*. This includes undertaking assessment and compliance activities in relation to mine rehabilitation activities and determination of security deposits.

The Mine Safety Inspectorate within the Resources Regulator is responsible for ensuring the mine operators' compliance with the Work Health and Safety (WHS) legislation, in particular the effective management of risks associated with the principal hazards as specified in the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2022*.

CONTACT

Should you require any further information or clarification, please contact the Regulator on 1300 814 609 (Press Option 2 Press Option 5) or email nswresourcesregulator@service-now.com.

Yours sincerely,



Anthony Margetts

Acting Chief Inspector of Mines
Resources Regulator

Mr Peter Jaeger
Manager – Environment and Community
Wambo Coal Pty Limited
100 Melbourne Street
South Brisbane QLD 4101

24/03/2023

Subject: Appointment of Suitably Qualified and Experienced Persons to Prepare Revised Extraction Plan for Wambo Coal Mine

Dear Mr Jaeger,

I refer to your request dated 9 March 2023 seeking the Planning Secretary's endorsement of suitably qualified and experienced persons to prepare the revised Extraction Plan required by condition B7 of Schedule 2 of DA305-7-2003-i.

The Department has reviewed the nominations and information you have provided and is satisfied that following persons are suitably qualified and experienced to prepare the relevant sections of the Extraction Plan as outlined in your request.

- Mr James Barbato;
- Mr Adam Skorulis;
- Mr Brian Rask;
- Mr Roha Lucas;
- Mr Peter Kuskie;
- Mr Liam Scanlan; and
- Mrs Joanna Hinks.

Accordingly, I can advise that the Planning Secretary endorses the appointment of the above experts in accordance with condition B7 of Schedule 2 of DA305-7-2003-i.

If you wish to discuss the matter further, please contact me on (02) 4908 6896.

Yours sincerely



Joe Fittell
Team Leader
Resource Assessments

As nominee of the Planning Secretary



9 March 2023

Department of Planning and Environment
Locked Bag 5022
Parramatta NSW 2124

Attention: Steve O'Donoghue, Director Resource Assessments – Energy,
Resources and Industry

**RE: WAMBO COAL MINE DEVELOPMENT CONSENT (DA 305-7-2003) –
APPOINTMENT OF SUITABLY QUALIFIED AND EXPERIENCED
PERSONS AND INTERACTION WITH COMPLEX-WIDE
MANAGEMENT PLANS**

***Interaction between Longwalls 24 to 26 Extraction Plan and Complex-wide
Management Plans***

Wambo Coal Pty Ltd (WCPL) is currently preparing an Extraction Plan for the next set of longwall panels at the South Bates Extension Underground Mine (i.e. Longwalls 24 to 26). Longwall 24 is scheduled for commencement in November 2023. The Longwalls 24 to 26 Extraction Plan is anticipated to be submitted by the end of March 2023.

A summary table of the plans that will be updated and included in the Longwalls 24-26 Extraction Plan is provided below.

Plan	Updated for LW24-26 Extraction Plan
Longwalls 24-26 Water Management Plan	✓
Surface Water Monitoring Program*	✗
Groundwater Monitoring Program*	✗
Site Water Balance*	✗
Longwalls 24-26 Land Management Plan	✓
Erosion and Sediment Control Plan*	✗
Biodiversity Management Plan	✓
Heritage Management Plan	✓
Longwalls 24-26 Built Features Management Plan	✓
Longwalls 24-26 Public Safety Management Plan	✓
Longwalls 24-26 Coal Resource Recovery Plan	✓
Longwalls 24-26 Subsidence Monitoring Program	✓
Rehabilitation Management Plan*	✗

* Currently approved version will be included in the LW24-26 Extraction Plan.

The Longwalls 24 to 26 Extraction Plan requires endorsement by the Secretary of suitably qualified and experienced person/s. The below sections describe the teams that WCPL propose to prepare these documents.

Extraction Plan for Longwalls 24 to 26 – Suitably Qualified and Experienced Persons

WCPL is currently preparing an Extraction Plan for Longwalls 24 to 26 at the South Bates Extension Underground Mine.

We refer to Condition B7, Schedule 2 of the Development Consent (DA 305-7-2003) for the Wambo Development Project:

B7. The Applicant must prepare an Extraction Plan for all second workings on the site to the satisfaction of the Planning Secretary. Each Extraction Plan must:

(a) be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Planning Secretary;

...

In accordance with Condition B7 (a), Schedule 2 of the Development Consent (DA 305-7-2003), WCPL kindly requests the endorsement of the Secretary of the team outlined in this letter and listed below, as suitably qualified and experienced persons for the review and preparation of the Longwalls 24 to 26 Extraction Plan.

Background of Suitably Qualified and Experienced Persons

WCPL considers that the proposed team is suitable for preparation of the Extraction Plan, Water Management Plan, Biodiversity Management Plan and/or Heritage Management Plan. The curriculum vitae of the primary contributing suitably qualified and experienced persons are attached with a summary provided below.

Team Member	Role
Dr James Barbato (Mine Subsidence Engineering Consultants)	Preparation of relevant subsidence components, including prediction of subsidence effects and assessment of potential impacts.
Mr Adam Skorulis (SLR Consulting Pty Ltd)	Preparation of relevant groundwater components.
Mr Brian Rask (SLR Consulting Pty Ltd)	Preparation of relevant groundwater components.
Mr Rohan Lucas (Alluvium)	Preparation of relevant surface water components.
Mr Peter Kuskie (South East Archaeology)	Provision of advice on monitoring and management of Aboriginal Cultural Heritage sites.
Mr Liam Scanlan (Eco Logical Australia)	Provision of advice on biodiversity monitoring and management measures.
Mrs Joanna Hinks (Resource Strategies)	Preparation of management plans and overall Extraction Plan documentation.

The following experienced WCPL employees would also be involved in preparation of the Extraction Plan, Water Management Plan and/or Biodiversity Management Plan.

Team Member	Role
Mr Peter Jaeger (Manager: Environment & Community)	Responsible for review, sign-off and implementation of the Extraction Plan.
Mrs Nicole Dobbins (Senior Environmental Advisor)	Review of management plans and overall Extraction Plan documentation.
Mr Timothy Chisholm (Technical Services Superintendent)	Review of management plans and overall Extraction Plan documentation.
Mr Malcolm Walker (Registered Mine Surveyor)	Preparation of survey plans.

Dr Barbato

Mine Subsidence Engineering Consultants Pty Ltd (MSEC) is a private engineering consultancy company specialising in the fields of mine subsidence prediction and mine subsidence impact assessment. Dr Barbato is an Associate Director at MSEC and has written or co-written more than 350 subsidence prediction and assessment reports. Dr Barbato has significant experience at Wambo, having undertaken subsidence assessments in support of several Extraction Plan and Modification applications.

Dr Barbato has been involved in recent subsidence studies for the Wambo Coal Mine, including development of the subsidence components of the approved South Bates Extension Underground Mine Extraction Plan for Longwalls 17 to 20, and Longwalls 21 to 24. Dr Barbato also prepared the Subsidence Assessment for the recently approved Longwalls 24 to 26 Modification (i.e. Modification 19).

Mr Skorulis

Mr Skorulis is an associate hydrogeologist and groundwater modeller at SLR Consulting Pty Ltd with experience in hydrogeological studies involving data analysis, groundwater and surface water modelling and groundwater-surface water interactions. Mr Skorulis has further experience in field planning, analysis of data and interpretation of geological and geophysical data, compliance reporting, hydrogeological mapping and groundwater dependent ecosystem assessments.

Mr Skorulis has been involved in groundwater analysis and groundwater modelling projects for regional water resources studies, Environmental Impact Statements, site-scale and excavation and mine inflow and dewatering jobs. Mr Skorulis has expertise within hydrogeological analysis, groundwater modelling and the MODFLOW software and associated packages. Mr Skorulis also prepared the Groundwater Assessment for the recently approved Longwalls 24 to 26 Modification (i.e. Modification 19).

Mr Rask

Mr Rask is a technical director at SLR Consulting Pty Ltd with extensive experience in hydrogeology in the US and Australia. Mr Rask's project experience includes surface and groundwater assessments, Environmental Impact Statements, mine site water supply management, water supply, storage and operational management programs, contaminates site/surface and groundwater transport assessments/modelling.

Mr Rask is a leader in his field and has been recognised as winner of the 2008 NSW AWA Water Research Merit Award for his work. Mr Rask has expertise in Mine closure assessments, conceptual hydrogeology, groundwater modelling, surface and groundwater interactions, groundwater impact assessments, mine inflow risk assessments and hydrogeologic risk assessments. Mr Rask prepared the Groundwater Assessment for the recently approved Longwalls 24 to 26 Modification (i.e. Modification 19).

Mr Lucas

Mr Lucas has over 25 years of experience in environmental and natural resource management with a focus on waterways. This experience has been gained in a consulting role to government and industry in Australia and Asia-Pacific. Mr Lucas is a Registered Professional Engineer Queensland (RPEQ).

Mr Lucas has significant experience in designing and managing diversions. In addition, he has experience in modelling, assessment, design and documentation of subsidence impact management on waterways and diversions. Alluvium staff (principally Rohan Lucas and Ross Hardie) were the authors of the ACARP diversion projects (C8030 and C9068) in 1999-2002 that have been adopted by the Queensland government as a guideline against which diversions have been assessed and licensed since. This body of work has recently been updated to provide current leading practice guidance on constructed diversions through ACARP projects C20017 and C23030.

Mr Lucas was also principal author of the *Isaac River cumulative impacts assessment of mine developments* (2008). This project developed the hierarchy for assessing subsidence impacts on waterways which has been adopted by Queensland Government as their guidance and is now routinely utilized in subsidence impact assessments, including the extraction plans at Wambo Coal Mine.

Mr Lucas has been involved in recent surface water studies for the Wambo Coal Mine, including development of the surface water components of the approved South Bates Extension Underground Mine Extraction Plan for Longwalls 17 to 20, and Longwalls 21 to 24. Mr Lucas also prepared the Surface Water Assessment for the recently approved Longwalls 24 to 26 Modification (i.e. Modification 19).

Mr Kuskie

Mr Kuskie is the director of South East Archaeology with 33 years experience in Aboriginal cultural heritage issues, Aboriginal community consultation, and legislative requirements. Mr Kuskie's experience includes conducting surface surveys, salvage collections and excavations. He has prepared Indigenous and non-Indigenous components of Environmental Impact Statements, Aboriginal Heritage Impact Permit applications, Aboriginal Heritage Management Plans and Aboriginal Heritage Impact Assessments compliant with Office of Environment and Heritage, Department of Planning and Environment and other Government requirements. Mr Kuskie has strong familiarity with the area, having completed surveys at the Wambo Coal Mine.

Any updates to the Heritage Management Plan based on the advice of Mr Kuskie will be implemented by WCPL and subject to consultation with the Aboriginal community and the Department of Planning and Environment - Biodiversity and Conservation Division.

Mr Scanlan

Mr Scanlan is an Ecologist specialising in botany and restoration ecology for Eco Logical Australia with more than 5 years of experience in biodiversity related issues. Mr Scanlan has been involved in the preparation of multiple biodiversity assessments of plant communities and threatened flora for major developments in New South Wales. Eco Logical Australia have been involved at the Wambo Coal Mine for a number of years and has a comprehensive understanding of the site.

Updates to the Biodiversity Management Plan will be based on the advice of Mr Sullivan and subject to consultation with Department of Planning and Environment – Biodiversity and Conservation Division.

Mrs Hinks

Mrs Hinks has extensive experience in the project management of complex environmental approvals, environmental engineering, environmental impact assessment, environmental management, subsidence assessment and management, surface water management and planning legislation. Mrs Hinks has been involved at the Wambo Coal Mine for a number of years, managing the preparation of the Environmental Impact Statement, Environmental Assessments, and Environmental Management Plans for the Wambo Coal Mine.

Summary

It would be greatly appreciated if the Department would consider the above details regarding the qualifications and experience of the persons proposed to review and prepare the Extraction Plan, Water Management Plan and/or Biodiversity Management Plan and provide the Secretary's endorsement in accordance with Conditions B7(a), B66(a) and B74(a), Schedule 2 of the Development Consent (DA 305-7-2003).

It would also be appreciated if the Department could confirm if the interaction between the Longwalls 24 to 26 Extraction Plan and complex-wide management plans (and associated timing) outlined above is suitable.

If you have any queries or would prefer to organise a meeting to discuss, please do not hesitate to contact Nicole Dobbins, Senior Environmental Advisor on 0408 969 988.

Yours faithfully



Peter Jaeger
Manager: Environment & Community
WAMBO COAL PTY LIMITED

- Enclosure 1. Dr James Barbato's Curriculum Vitae.
- Enclosure 2. Mr Adam Skorulis' Curriculum Vitae.
- Enclosure 3. Mr Brian Rask's Curriculum Vitae.
- Enclosure 4. Mr Rohan Lucas' Curriculum Vitae.
- Enclosure 5. Mr Peter Kuskie's Curriculum Vitae.
- Enclosure 6. Mr Liam Scanlan's Curriculum Vitae.
- Enclosure 7. Mrs Joanna Hinks' Curriculum Vitae.

ENCLOSURE 1

DR JAMES BARBATO'S CIRRICULUM VITAE

Dr James Barbato, Associate Director

Company: Mine Subsidence Engineering Consultants Pty Ltd

Profile: James Barbato has had 8 years' experience as a structural engineer and 18 years' experience as a specialist in mine subsidence engineering. His roles include the prediction, assessment and management of mine subsidence due to underground mining. Specialist advice is provided to manage potential impacts to surface infrastructure and natural features and to minimise risk to public safety.

Education: Bachelor of Engineering (Civil, Hons.), 1995
UNSW – School of Civil Engineering
Doctor of Philosophy (PhD), 2017
UNSW – School of Mining Engineering

Affiliations: MIEAust, CPEng, NER

James joined Mine Subsidence Engineering Consultants (MSEC) in July 2004 and has worked on many subsidence studies and reports, some of which are listed below. He has extensive experience in the prediction of mine subsidence effects, the assessment of mine subsidence impacts on natural features and built features and the development of strategies to manage the potential impacts from mine subsidence.

He has been deeply involved in developing the analytical methods to improve the speed and reliability of subsidence predictions. Software has been developed using C#, Java and SQL for the subsidence prediction models, survey database and libraries. The survey database is now one of the largest collections of ground monitoring data for underground longwall mining in Australia.

James has completed post graduate research at the University of New South Wales in 2017. The title of the thesis is *Development of improved methods for the prediction of horizontal movement and strain at the surface due to longwall coal mining*.

He has written or co-written more than 350 subsidence prediction and assessment reports and has been involved in a number of Technical Committees to manage the potential subsidence impacts on natural and built features.

Some recent projects in which James has been involved include the following:

- Appin Longwalls 709 to 711 and 905 – subsidence report to support the Extraction Plan Application, including mining beneath houses, services and steep slopes;
- Chain Valley Miniwalls S2 and S3 – subsidence report to support the Extraction Plan Application for mining beneath Lake Macquarie;
- Integra Underground Longwalls 17 to 20 – subsidence predictions and the Management Plans for mining beneath the Mt. Owen Railway and Bridges;
- Maxwell Project – subsidence report to support the Environmental Impact Statement;
- Springvale Longwalls 428 to 432 – subsidence report to support the Extraction Plan Application; and
- Tahmoor Longwalls 26 to 30 – co-author of the subsidence report to support the SMP Application including mining beneath houses, services and other built infrastructure; and
- Wambo Coal Mine – subsidence reports to support the Modification and Extraction Plan Applications for the North Wambo Underground Mine, South Bates Underground Mine and South Bates Extension Underground Mine.

James is a current member of the Mine Subsidence Technological Society (MSTS) and has been involved in the preparation of the previous four conferences (2007, 2011, 2014, 2017 and 2022), which included the review of technical papers, compilation of the conference proceedings and organisation of the presentations.

He has also assisted in two ACARP Research projects and have presented or co-authored a number of technical papers including:

1. Waddington, A.A. and Barbato, J.P. *The Undermining of Railways*. Mine Subsidence Technological Society, Sixth Triennial Conference – Subsidence Management Issues. Maitland, October-November 2004, pp. 173-182.
2. Barbato, J.P., Kay, D.J., Pinkster, H. & de Somer, B. *Monitoring of subsidence movements at major infrastructure*. Seventh AusIMM Australasian Institute of Mining and Metallurgy Underground Coal Operators Conference on Sustainable Coal Mine Development. University of Wollongong, 2006, pp. 305-312.
3. Kay, D.J., Barbato, J.P., Brassington, G. & de Somer, B. *Impacts of Longwall Mining to Rivers and Cliffs in the Southern Coalfield*. Seventh AusIMM Australasian Institute of Mining and Metallurgy Underground Coal Operators Conference on Sustainable Coal Mine Development. University of Wollongong, 2006, pp. 327-336.
4. Kay, D.R., Barbato, J.P. & Mills, K.W. *Review of Mechanisms resulting in Observed Upsidence and Closure Movements*. Mine Subsidence Technological Society, Seventh Triennial Conference, University of Wollongong, Nov. 2007, pp. 197-205.
5. Barbato, J.P. & Sisson, S.A. *Analysis of Mining Induced Strains*. Mine Subsidence Technological Society, Eighth Triennial Conference, Management of Subsidence: State of the Art, Pokolbin, 15 to 17 May 2011, pp. 15-24.
6. Barbato, J.P. & Garlinge, S. *Continuous Monitoring of Longwall Undermining – Blakefield South LW1*. Mine Subsidence Technological Society, Eighth Triennial Conference, Management of Subsidence: State of the Art, Pokolbin, 15 to 17 May 2011, pp. 131-136.
7. Waddington, A.A., Barbato, J.P., Bullock, D.W. & Kay, D.J. *The Assessment of Subsidence Impacts on Building Structures*. Mine Subsidence Technological Society, Eighth Triennial Conference, Management of Subsidence: State of the Art, Pokolbin, 15 to 17 May 2011, pp. 155-166.
8. Barbato, J.P., Brassington, G. and Walsh, R. *Valley Closure Impact Model for Rockbar Controlled Streams in the Southern Coalfield*. Mine Subsidence Technological Society, Ninth Triennial Conference, Mine Subsidence: Risk Management in Action, Pokolbin, NSW, 11 to 13 May 2014.
9. Barbato, J., B. Hebblewhite, R. Mitra, and K. Mills (2016). *Review of horizontal surface movements due to longwall coal mining using numerical modelling*. In: Proceedings of the Coal Operators Conference. University of Wollongong, 10-12 February 2016, pp. 213-223.
10. Barbato, J., B. Hebblewhite, R. Mitra, and K. Mills (2016). *Prediction of horizontal movement and strain at the surface due to longwall coal mining*. In: International Journal of Rock Mechanics and Mining Sciences, Volume 84, April 2016, pp. 105-118. <https://doi.org/10.1016/j.ijrmms.2016.02.006>.
11. Barbato, J., B. Hebblewhite, R. Mitra, K. Mills, and A. Waddington (2017). *Development of predictive methods for strain at the surface due to longwall coal mining*. In: Mining Technology, October 2017. <http://dx.doi.org/10.1080/14749009.2017.1386815>.
12. Barbato, J., et al. (2017). *Development of Predictive Methods for Horizontal Movement and Strain at the Surface due to Longwall Mining*. Proceedings of the tenth triennial Mine Subsidence Technological Society Conference, Pokolbin, Hunter Valley, NSW, 5-7 November 2017. pp. 207-222.

ENCLOSURE 2

MR ADAM SKORULIS' CURRICULUM VITAE

CURRICULUM VITAE



ADAM SKORULIS

ASSOCIATE HYDROGEOLOGIST

Hydrology and Hydrogeology, Asia-Pacific

QUALIFICATIONS

International
BSc (Hons) 2014

International Bachelor of Science (Hons), Geosciences, University of Wollongong, NSW, Australia

EXPERTISE

- Hydrogeological Analysis
- Groundwater Modelling
- MODFLOW
- GIS

Adam is an associate hydrogeologist and groundwater modeller with experience in hydrogeological studies involving data analysis, groundwater and surface water modelling and groundwater-surface water interactions.

During his career Adam has been involved in groundwater analysis and groundwater modelling projects for regional water resources studies, EIS, site-scale and excavation and mine inflow and dewatering jobs. This includes development of conceptual groundwater models and numerical groundwater models to address State and Commonwealth requirements. As well as experience working with MODFLOW-SURFACT, MODFLOW-USG model code and associated packages. Adam has also led external modelling training courses in the MODFLOW-USG using Groundwater Vistas software.

Further to this, Adam has experience in field planning, analysis of data and interpretation of geological and geophysical data, compliance reporting, hydrogeological mapping and groundwater dependent ecosystem (GDE) assessments.

PROJECTS

Project Experience

Groundwater Modelling – Mining EIS, Modifications and Other Assessments

Wambo Coal Mine –
MOD19 Groundwater
Assessment (2021/22)

Lead hydrogeologist and groundwater modelling support for the Groundwater Impact Assessment completed for Wambo Coal's MOD19, which involved the re-orientation of LW24 and 25 and the addition of LW26.

Wambo Coal Mine –
North Wambo Creek GDE
Study NSW, Australia
(2019)

Lead groundwater modeller for a study focussing on the interaction between vegetation and an alluvial aquifer, and determining the likelihood and magnitude of impacts to the alluvium aquifer following nearby longwall mining. The study was conducted in an iterative approach that involved collaboration between the client, consultants from multiple disciplines, and a government agency. The outcomes and process of the study was presented at the 2019 Australasian Groundwater Conference – Multidisciplinary and adaptive approach to assessing groundwater dependence of a River Oak community in NSW Hunter Coalfields.

<p>Groundwater modelling (MODFLOW) training and construction of Pale Sub-basin groundwater model, Australian Water Partnership, NSW Australia (2019-20)</p>	<p>Instructor and primary contact during a two-week intensive groundwater modelling course for two Myanmar Hydrogeologists from the Irrigation Water Utilisation Management Department (IWUMD). The modelling training was in the use of Groundwater Vistas, a graphic user interface (GUI) for MODFLOW groundwater modelling code, and to assist in conceptualisation, model planning and construction for a numerical groundwater model of the Pale Sub-Basin</p>
<p>Galilee Basin Hydrogeological Model NSW, Australia (2015)</p>	<p>Geoscience Australia assessment of the cumulative impacts of new coal mining developments on water dependant assets and receptors, utilised as part of the Bioregional Assessment Program being undertaken by the Commonwealth Department of the Environment for the Galilee Subregion of the Lake Eyre Basin bioregion.</p>
<p>Hume Coal Project, NSW, Australia (2017-2020)</p>	<p>Lead groundwater modeller for additional work undertaken on the Hume Coal Project groundwater model developed for the EIS, following HydroSimulations' inheritance of the project from Coffey Consulting. The modelling work was aimed at responding to public and agency submissions against the project, and addressing issues identified in the peer review process. Developed methods of visualising key model outputs from an uncertainty analysis conducted on the revised groundwater model. Visualisation was consistent with IESC (Independent Expert Scientific Committee) Draft Guidelines on Uncertainty Analysis in Groundwater Modelling.</p>
<p>Mt Pleasant Operations, NSW, Australia (2017-2018)</p>	<p>Construction and local calibration of regional groundwater model containing the Hunter River and its associated alluvium as well as historic and ongoing open cut and underground longwall coal mining.</p>
<p>Compliance and Data Analysis</p>	
<p>Annual Compliance Reporting</p> <ul style="list-style-type: none"> • Wambo Coal Mine (Peabody) (2015-22) • United Wambo Joint Venture (Glencore/Peabody) (2020-22) • Wilpinjong Coal Mine (Peabody) (2015-22) • Moolarben Coal Operations (Yancoal) (2020-2021) 	<p>Carried out annual compliance reporting at various New South Wales coal mining operations since 2015. This involves the assessment of environmental performance with respect to groundwater, including the determination of whether groundwater level and quality trends are due to the operation being assessed, or are within the limits of normal pre-operational observations. Groundwater inflow and incidental take is also assessed against hard-rock and alluvial licences held by each site. The compliance reporting determines whether the site is compliant with consent conditions or performance measures defined in groundwater management and monitoring plans.</p>
<p>Water Management Plan and Trigger Development</p> <ul style="list-style-type: none"> • Wambo Coal Mine (Peabody) (2020-2023) • United Wambo Joint Venture (Glencore/Peabody) (2020) • Wilpinjong Coal Mine (Peabody) (2020-2023) 	<p>Assist clients to review and update water management documentation. This documentation provides the groundwater related consent conditions for each operation and details the operations approach to complying with these conditions including, the groundwater monitoring network, performance indicators and trigger levels, responses to exceedances or non-compliance. Recent reviews and updates of groundwater management documentation have focused on the rationalisation of monitoring networks, the development and revision of trigger levels, and revision of response requirements to exceedances.</p>

<p>Water and Tailings Storage Seepage Investigations</p> <ul style="list-style-type: none"> • Wambo Coal Mine (Peabody) (2020-22) 	<p>Lead hydrogeologist investigating the potential for seepage from water and tailings storage facilities at Wambo Coal Mine, both within the mine footprint and to external environment receptors. This involved detailed review of site geology, groundwater monitoring data, stored water elevations, and historical and planned future mining operations. The investigations determined potential seepage pathways and receptors as well as recommended groundwater monitoring and geological investigation holes where required.</p>
	<p>Mine Closure</p>
<p>Dendrobium Mine – Closure Modelling, NSW, Australia (2021)</p>	<p>Undertake and support sensitivity and uncertainty analysis groundwater modelling in support of the Illawarra Metallurgical Coal (IMC) Dendrobium Mine Closure Plan. This included the development of modelling scenarios and hydraulic parameters appropriate to test model uncertainty, as well as the presentation of model results in a format suitable to demonstrate model sensitivity/ uncertainty in relation to key modelling objectives.</p>
<p>Dendrobium Mine Extension Project– Closure Water Management Objectives, NSW, Australia (2021-22)</p>	<p>Work within a multidisciplinary team (Geotechnical, Civil/ Environmental Engineering, Hydrogeology) to address water related mine closure concerns raised by the IAPUM and IPC. This involved the development of mine closure strategies for Dendrobium Mine that consider groundwater recovery, the location and volume of long-term seepage from the mine, and post closure strategies for managing this seepage.</p>
<p>Final Void Modelling, NSW Australia (2021-22)</p>	<p>Technical and conceptual assistance to undertake final void groundwater modelling for a revised final landform at coal mine within the NSW Western Coalfield. The modelling focused on understanding likely differential fluxes and final void water levels between an approved and modified final landform, with a focus on identifying any additional impacts to nearby groundwater receptors.</p>
<p>Wallerawang Closure Groundwater Assessment, NSW, Australia (2017-2018)</p>	<p>Construction and technical assistance on the groundwater model developed for the Wallerawang Closure Groundwater Assessment. The modelling aimed to assist the development of closure strategies that would limit the potential migration of poor - quality groundwater toward the Cox’s River in the Central Tablelands of NSW.</p>

GIS/Hydrogeological Mapping

Adam has conducted hydrogeological mapping, using bore databases, existing literature, geophysics and published geological outcrop mapping, for use in groundwater assessments and is a competent user of GIS and databases.

memberships

<p>Member</p>	<p>NSW International Association of Hydrogeologists</p>

ENCLOSURE 3

MR BRIAN RASK'S CURRICULUM VITAE

CURRICULUM VITAE



BRIAN RASK

TECHNICAL DIRECTOR

Hydrogeology and Numerical Modelling

QUALIFICATIONS

BSc	1999	Bachelor of Science, (Watershed Science) Colorado State University, Fort Collins, Colorado USA
MBA	2003	Master of Technology Management, University of Phoenix, Lone Tree, Colorado USA

EXPERTISE

- Mine Closure Assessments
- Conceptual Hydrogeology
- Groundwater Modelling
- Surface and Groundwater Interaction
- Groundwater Impact Assessments
- Mine Inflow Risk Assessments
- Hydrogeologic Risk Assessments

Brian has extensive experience in hydrogeology, providing management and technical services throughout his career.

Brian is a leader in his field and has been recognised as winner of the 2008 NSW AWA Water Research Merit Award for his work as lead researcher on a project which evaluated and quantified the surface and groundwater interaction within a fractured rock system.

Brian has extensive experience in hydrogeology in the US and Australia. His project experience includes surface and groundwater assessments; environmental impact statements; mine site water supply management; water supply, storage and operational management programs; contaminated site/surface and groundwater transport assessments/modelling; remedial action plans; project and financial management; drilling and well design/construction management.

Brian is also experienced in the use of numerous surface and groundwater modelling programs including, but not limited to, MODFLOW (Visual and Groundwater Vistas), MODFLOW-SURFACT, FEFLOW, HEC-RAS, Quickflow, WinFlow, WinTrans, and GoldSim.

PROJECTS

Environmental Assessment and Approvals

BMA – Caval Ridge Mine Horse Pit Extension Project, Bowen Basin, QLD, Australia	Technical Director for the production of the Groundwater Impact Assessment supporting the environmental approvals for a coal mine extension development including post-mining assessment. Technical Lead for the groundwater modelling component.
BMA – Caval Ridge Mine 2021 Water License Reporting, Bowen Basin, QLD, Australia	Technical Lead (groundwater modelling) for groundwater modelling supporting Water License reporting obligations for the 2021 water year.

<p>Buck Reef West In-Pit Tailings - Feasibility Design and Risk Assessment, Carpentaria Gold Pty Ltd</p>	<p>Brian conducted a feasibility design and hydrogeologic risk assessment for the placement of tailings from the Sarsfield Pit into the proposed Buck Reef West Pit. Based upon the feasibility design\plan, Brian then developed a risk assessment and gap analysis associated with the requirements for environmental approvals.</p> <p>Brian developed a GoldSim model to assess the risk of water within the final void above the proposed tailings interacting with groundwater. The model incorporated analytical methods for groundwater inflow estimates along with AWBM surface runoff estimation methods. The model was developed to assess effects the uncertainties of the input parameters have on the final design, which were then used to guide the data gap analysis and recommendations for future work.</p>
<p>BMA – Daunia Mine 2021 Water License Reporting, Bowen Basin, QLD, Australia</p>	<p>Project Director for groundwater modelling supporting Water License reporting obligations for the 2021 water year. Technical Lead for the groundwater modelling component.</p>
<p>Oceanic Coal Australia Limited (Glencore) – OCAL Complex Closure Plan of Underground Water Management, Newcastle, Coalfields, NSW, Australia</p>	<p>Technical Director for the development of a Plan of Underground Water Management related to the planning of closure works and lease relinquishment at a large integrated open cut and multi-level underground mining complex. Technical Lead for the groundwater modelling component (lead modeler).</p>
<p>Glencore Coal Australia, Newlands Mine Complex Closure, Bowen Basin, QLD, Australia</p>	<p>Technical Lead (groundwater modelling) for the groundwater assessment associated with closure planning and PRCP development at a large integrated open cut and underground mining complex.</p>
<p>Whitehaven Coal Ltd, Winchester South EIS, Bowen Basin, QLD, Australia</p>	<p>Project Director for the production of the Groundwater Impact Assessment supporting the EIS for a new coal mine development including detailed final void modelling and post-mining assessment. Technical Lead for the groundwater modelling component.</p>
<p>BHP Mitsui Coal Pty Ltd – Poitrel Coal Mine, Bowen Basin, QLD, Australia</p>	<p>Project Director for the 2015 to 2020 reviews of groundwater monitoring at the Poitrel mine in accordance with EA conditions.</p>
<p>BHP Coal Pty Ltd – GCOS Project, Bowen Basin, QLD, Australia</p>	<p>Project Director for a groundwater gap analysis and forward work plan development to assist in environmental regulatory approvals studies for a brownfields underground coal mine development.</p>

	Groundwater Modelling
Synergy Kwinana Power Station (360 Environmental)	Project Director for the development of a 3D density dependent flow and transport model using FEFLOW. The transient model was calibrated to historical data. The model was used to assess sustainable yield and abstraction bore design to limit saltwater intrusion.
Laminex Groundwater Modelling (360 Environmental)	Project Director for the development of a 3D groundwater model using MODFLOW_USG. The model was calibrated to historical data. The model was used to design a borefield for the capture and retention of contaminants on-site.
G2Kconnect Consortium Inland Rail G2K Section Tender Design (2020-2021)	Brian was the lead design Hydrogeologist and Numerical Modeller for the hydrogeologic components of the tender design package submitted on behalf of G2Kconnect Consortium. The hydrogeologic design works included but was not limited to the assessment of potential inflows and associated environmental and design impacts associated with the proposed design and construction of 3 tunnels and over 42 hillside cuts. An assessment of risk to the project and recommendations for modifications to design and construction were provided.
Jellinbah Resources Ltd, Lake Vermont North Project, Bowen Basin, QLD, Australia	Project Director for the development of a groundwater model for a proposed coal mine expansion including post-mining assessment. Technical Lead for the groundwater modelling component.
New Hope Coal Pty Ltd - New Acland Stage 3 Project EIS, Clarence-Moreton Basin, Southeast Queensland, Australia	A groundwater model was created using the Groundwater Vistas MODFLOW pre-processor in conjunction with MODFLOW SURFACT. The model was calibrated with extensive calibration sensitivity assessments performed using a Monte Carlo approach. One operational scenario was simulated with multiple predictive sensitivity simulations performed. Results were provided for the groundwater impact assessment technical report.
Santos– Fairview Springs - Modelling in support of Extractive Approval Application, QLD, Australia (2015)	As Senior Hydrogeologist and Modeller, Brian provided modelling using industry standard groundwater software in support of regulatory approvals sought by Santos to extract groundwater from GAB aquifers located within the vicinity of GAB springs. Conducted an assessment of the potential impact of numerous extraction scenarios on adjacent springs.
Glencore – Mt Owen Expansion – Groundwater Impact Assessment, NSW, Australia (2013-2015)	A groundwater model was created using the Groundwater Vistas MODFLOW pre-processor in conjunction with MODFLOW SURFACT. The model was calibrated with extensive calibration sensitivity assessments performed using a Monte Carlo approach. One operational scenario was simulated with multiple predictive sensitivity simulations performed. Results were provided for the groundwater impact assessment technical report.
Glencore– Liddell Modification EA – Groundwater Impact Assessment, NSW, Australia (2013-2014)	A groundwater model was created using the Groundwater Vistas MODFLOW pre-processor in conjunction with MODFLOW SURFACT. The model was calibrated with extensive calibration sensitivity assessments performed using a Monte Carlo approach. One operational scenario was simulated with multiple predictive sensitivity simulations performed. Results were provided for the groundwater impact assessment technical report.

<p>Glencore– Ravensworth East TP2 – Groundwater Impact Assessment, NSW, Australia (2013-2014)</p>	<p>A groundwater model was created using the Groundwater Vistas MODFLOW pre-processor in conjunction with MODFLOW SURFACT. The model was calibrated with extensive calibration sensitivity assessments performed using a Monte Carlo approach. One operational scenario was simulated with multiple predictive sensitivity simulations performed. Results were provided for the groundwater impact assessment technical report.</p>
<p>Santos– Brine Injection Modelling in support of Environmental Approval Studies, QLD, Australia (2013)</p>	<p>Brian provided stochastic and solute transport modelling using industry standard groundwater software in support of regulatory approvals sought by Santos to inject RO brine concentrate into deep basement rocks. SKM conducted an assessment of the potential impact of saline effluent injection on adjacent aquifers including those supporting urban community drinking water supplies in the vicinity of the target injection site.</p>
<p>Cockatoo Coal– North Surat – Collingwood Coal Project – Groundwater Impact Assessment, QLD, Australia (2011-2012)</p>	<p>A groundwater model was created using the Groundwater Vistas MODFLOW pre-processor in conjunction with MODFLOW SURFACT. The model was calibrated with extensive calibration sensitivity assessments performed using the PEST Null Space Monte Carlo package. One operational scenario was simulated with multiple predictive sensitivity simulations performed. Results were provided for the groundwater impact assessment technical report.</p>
<p>Cockatoo Coal– North Surat – Taroomb Coal Project – Groundwater Impact Assessment, QLD, Australia (2011-2012)</p>	<p>A groundwater model was created using the Groundwater Vistas MODFLOW pre-processor in conjunction with MODFLOW SURFACT. The model was calibrated with extensive calibration sensitivity assessments performed using the PEST Null Space Monte Carlo package. One operational scenario was simulated with multiple predictive sensitivity simulations performed. Results were provided for the groundwater impact assessment technical report.</p>
<p>Cockatoo Coal– North Surat – Woori Coal Project – Groundwater Impact Assessment, QLD, Australia (2011-2012)</p>	<p>A groundwater model was created using the Groundwater Vistas MODFLOW pre-processor in conjunction with MODFLOW SURFACT. The model was calibrated with extensive calibration sensitivity assessments performed using the PEST Null Space Monte Carlo package. One operational scenario was simulated with multiple predictive sensitivity simulations performed. Results were provided for the groundwater impact assessment technical report.</p>
<p>BHP– Mine Development project in Central Queensland, QLD, Australia (2011-2012)</p>	<p>Brian developed an analytic groundwater flow modelling module within GoldSim that could provide direct input into the site water balance model. The end results provided the client with a stochastic risk-based assessment of potential inflows to the workings and a site water balance assessment that included the uncertainties associated with the unknown hydrogeologic characterisation.</p> <p>A numeric groundwater model was developed that utilised the time-varying parameter package (TMP1) of MODFLOW:SURFACT to allow for the changing material properties resulting from mining induced subsidence. In addition to the time varying properties, Brian utilised the PEST Null Space Monte Carlo package, which aids in the running of stochastic simulations with numeric models. The results of the numeric modelling provided the client with a risk-based assessment of inflows (peaks, timing and spatially (panels) during the initial feasibility studies of the project. These stochastic results were then used in the stochastic based GoldSim water balance and water management models providing a complete stochastic approach to the water balance assessment.</p>

<p>Department of Transport and Main Roads – Cross River Rail North-South Rail Track, Groundwater Impact Assessment, QLD, Australia (2011)</p>	<p>The proposed project is approximately 19 km in length and extending from Salisbury to Woolloowin. It is anticipated that the Project will consist of a new tunnel (or tunnels) under the Brisbane River and four new underground train stations. Brian conducted a recalibration of the groundwater model late in the project based upon field data gathered during the overall work program. The recalibration and subsequent simulation provided a greater confidence in groundwater modelling results for the submission of the EIS because it was based upon more site-specific field testing</p>
<p>Sagittarius Mines– Tampakan Power Station, Port and Filter Plant ESIA - Groundwater Impact Assessment, Philippines (2011)</p>	<p>Brian conducted numerous simulation runs to evaluate the potential groundwater available for construction and operations of the power station, port and filter plant. Final operational and construction scenarios were simulated for the impact assessment to neighbouring groundwater users. A final report was edited to reflect final construction and operational water supply planning and associated estimated impacts.</p>
<p>Middlemount Coal – Groundwater Impact Assessment, QLD, Australia (2010)</p>	<p>A groundwater model was created using the Groundwater Vistas MODFLOW pre-processor in conjunction with MODFLOW SURFACT. The model was calibrated with extensive calibration sensitivity assessments performed. One operational scenario was simulated with multiple predictive sensitivity simulations performed. Results of all modelling and a final report were provided within the aggressive 4-week project delivery schedule.</p>
<p>Cobbora Management Company – Cobbora Coal Mine Project - Groundwater Impact Assessment, NSW (2019-2010)</p>	<p>A groundwater model was created using the Visual MODFLOW pre-processor in conjunction with MODFLOW SURFACT. The model was suitably calibrated for the project requirements. Two operational scenarios were simulated with respect to how the pit is dewatered, as well as numerous recovery simulations. An additional water balance model was developed to estimate the filling duration and long-term water level fluctuations within the final voids (2). Results of all modelling provided the quantitative basis for the groundwater impact assessment.</p>
<p>Thiess-John Holland – Airport Link, Brisbane QLD, Australia (2008-2009)</p>	<p>A three-dimension numerical model was developed in MODFLOW to simulate the inflow rates, drawdown and potential contaminant transport associated with the construction of the project. The results of the model were used for water management, treatment and disposal planning.</p>
<p>Groundwater Technical Review</p>	
<p>Tomingley Gold Operations Pty Ltd - Peer Review of In Pit Tailing Assessment – Modification 4 Groundwater Impact Assessment Report, QLD, Australia (2016)</p>	<p>Brian was commissioned to conduct an independent peer review of the hydrogeologic and hydrogeochemical impact assessment. The peer review consisted of reviewing previous hydrogeologic and hydrogeochemical investigations, conceptualisation, modelling and reporting with a view of assessing if the impact assessment and modelling were fit for purpose.</p>
<p>Eagleton Rock Syndicate Pty Ltd - Eagleton Quarry Hydrogeological Investigation Report, QLD, Australia (2016)</p>	<p>Brian was commissioned to conduct an independent peer review of the hydrogeologic impact assessment. The peer review consisted of reviewing previous hydrogeologic investigations, conceptualisation, modelling and reporting with a view of assessing if the impact assessment and modelling were fit for purpose.</p>

<p>Queensland Department of Natural Resources and Mines– Tamborine Mountain Groundwater Investigation, QLD, Australia (2015)</p>	<p>Brian was commissioned to provide a peer review of the Tamborine Mountain groundwater investigation report prepared by Andrew Todd from QUT in 2011. The objective of the review was to provide an independent assessment of the appropriateness of the assumptions made to support the assessment made in the investigation. The review also assessed the suitability of the 2011 QUT report for providing suitable information to Department Natural Resources and Mines (DNRM) and the public about the groundwater resources of Tamborine Mountain.</p>
<p>Bandanna Energy - Springsure Creek Coal Mine Environmental Impact Assessment– Hydrogeologic Impact Assessment, QLD, Australia (2012)</p>	<p>Brian was commissioned to conduct an independent peer review of the hydrogeologic impact assessment. The peer review consisted of reviewing previous hydrogeologic investigations, conceptualisation, modelling and reporting with a view of assessing if the impact assessment and modelling were fit for purpose.</p>
<p>Victoria Department of Sustainability and Environment– Ecomarkets, Melbourne, VIC, Australia (2009-2010)</p>	<p>Brian was the lead peer reviewer for the North Central and North East catchment models. Through a series of meetings at strategic model development stages (steady state and transient calibration) Brian was able to provide comments and recommendations throughout the process to assist DSE and their modelling contractor to deliver a groundwater model that met all project specifications. A final model review report was prepared by Brian that documented the model development, key assumptions, limitations and recommendations for model use and improvements.</p>
<p>MCC Australia Sanjin Mining Pty Ltd – Cape Lambert Magnetite Project: Hydrogeological Assessment, WA, Australia (2010)</p>	<p>Brian was commissioned to undertake hydrogeologic assessment for the Cape Lambert Magnetite Project. The hydrogeologic assessment included the development, calibration, and sensitivity assessment of a groundwater numeric model. The model was then used to assess the potential impacts associated with assumed mining conditions. Modelling was undertaken using the pre-processor Visual MODFLOW Pro in conjunction with MODFLOW: SURFACT software. Brian provided technical peer review of the groundwater modelling and associated report.</p>
<p>Department of Defence, Garden Island - Groundwater Fate and Transport Model, Stage 3 Remediation Powerhouse Fuel Spill Plume, WA, Australia (2010)</p>	<p>As part of a previous role, Brian was commissioned to undertake Stage 3 works for environmental remedial works associated with the Powerhouse diesel fuel spill Part of the Stage 3 works includes undertaking groundwater modelling to simulate observed groundwater contamination; and scenario modelling to simulate options for aquifer remediation. Modelling undertaken included both flow and solute transport. Groundwater flow and transport modelling was undertaken using Visual MODFLOW Pro and MT3DMS software respectively. Brian provided technical peer review of the groundwater modelling and associated report.</p>
<p>Department of Defence– Groundwater Fate and Transport Model, Stage 3 Remediation Powerhouse Fuel Spill Plume, Garden Island, WA, Australia (2010)</p>	<p>PB was commissioned to undertake Stage 3 works for environmental remedial works associated with the Powerhouse diesel fuel spill Part of the Stage 3 works includes undertaking groundwater modelling to simulate observed groundwater contamination; and scenario modelling to simulate options for aquifer remediation. Modelling undertaken included both flow and solute transport. Groundwater flow and transport modelling was undertaken using Visual MODFLOW Pro and MT3DMS software respectively. Brian provided technical peer review of the groundwater modelling and associated report.</p>

<p>AquaSure Joint Venture– Melbourne Desalination Treatment Plant, VIC, Australia (2009-2010)</p>	<p>As one of the Joint Venture’s associates, Brian was commissioned to provide hydrogeologic assessments associated with the design and construction of a desalination plant in Victoria. These technical studies include the assessment of impacts during and after construction. Numerous models (3D MODFLOW and analytical models) were developed at various stages as part of the assessment. The assessments include estimated inflows to tunnels and excavations as well as the short and long-term drawdown associated with the project. These results are then provided as part of an overall assessment of follow-on impacts such as acid-sulphate soils, subsidence, and ecological impacts. Brian was commissioned to provide technical peer review of the groundwater models being prepared as well as ongoing modelling/technical support.</p>
<p>Thiess-John Holland – Airport Link, Brisbane, QLD, Australia (2008-2009)</p>	<p>A three-dimension numerical model was developed in MODFLOW to simulate the inflow rates, drawdown and potential mitigation measures for the entire project area (global model). Numerous sensitivity runs and adjustments to model and structural designs were done in order to provide a best for project, client, and environmental outcome.</p> <p>Brian provided technical reviews of various versions as well as providing some strategic advice throughout the review and internal and external commenting processes.</p>
<p>Queensland Department of Infrastructure and Planning– Abbot Point State Development Area Infrastructure Corridor Study, QLD, Australia (2008)</p>	<p>Brian conducted a review of the groundwater conditions in the area(s) proposed and provided a hydrogeologic constraints analysis and recommendations for work to be performed in order to further develop the preferred option(s) for the infrastructure corridor. Significant constraints were identified as the proposed area is a wetland and as such require significant risk mitigation.</p>
<p>Rio Tinto Hunter Valley– Groundwater Due Diligence, NSW, Australia (2008)</p>	<p>A due diligence assessment was conducted for all operations in the Hunter Valley as it pertains to commitments made regarding groundwater investigations, monitoring, licensing, etc. The results of the investigation provided Rio Tinto with a roadmap of what further works need to be completed as well as a general prioritisation of tasks.</p>
<p>Iluka Resources Limited– Jacinth Ambrosia Project, SA, Australia (2008)</p>	<p>Brian was responsible for the technical and fit-for-purpose peer review of all groundwater borefield construction design and tendering documents. Brian worked closely with the team to ensure that he understood the key demands and drivers to ensure the design and tender packages were appropriate for the intended purpose.</p>
<p>Delta Electricity – Old State Mine, Lithgow, NSW, Australia (2007-2008)</p>	<p>Brian was commissioned to conduct a groundwater model using FEFLOW to estimate potential water supply from the old State Mine at Lithgow. Brian provided peer review of the model and reporting through two rounds of model calibration and predictive simulations. The nature of the old workings for the longwall mining operation, known discharge points from the mine workings, outcropping and local groundwater users provided many challenges for the modelling and thus a significant modelling effort was required.</p>
<p>Groundwater-Surface Water Interaction</p>	

<p>Sydney Catchment Authority – Collaborative Research Program: Conceptualisation and Modelling of Surface Water – Groundwater Interaction in the Upper Nepean Fractured Aquifer System, NSW, Australia (2007-2008)</p>	<p>A Collaborative Research project to investigate the surface water and groundwater interaction in Doudles Folley Creek was undertaken near Bowral, NSW. The investigation comprised a comprehensive suite of hydrogeologic and hydrogeochemical tools, and tracers (environmental and applied) to quantify the natural interaction of the two systems and how it changes under a trial borefield simulation.</p> <p>Brian was the project manager and lead hydrogeologist for the project. The results of the eight-month field program and later desk top analyses has provided the Sydney Catchment Authority with clear and quantifiable evidence of the background interaction and changes associated with localised pumping. The innovative approach, application of tools, and results on the project were recognised by Brian, his team, and the SCA being awarded the 2008 NSW AWA Water Research Merit Award.</p>
<p>Sydney Catchment Authority– Collaborative Research Program: Impacts of Longwall Mining in the Waratah Rivulet, NSW, Australia (2007-2008)</p>	<p>A Collaborative Research project to investigate the changes to surface water and groundwater interaction in Waratah Rivulet as a result of longwall mining was undertaken near Helensburgh NSW. The investigation comprised a comprehensive suite of hydrogeologic and hydrogeochemical tools, and tracers (environmental and applied) to quantify the post-mining interaction of the two systems and how it might have changed as a result of longwall mining. Brian was only involved as the project manager and lead hydrogeologist for the project for the initial stages of the project.</p> <p>This project was a three year long project and as project manager Brian was responsible for the initial project reviews, such as literature review of longwall mining impacts and baseline dataset, and the development of the methodology for the field studies.</p>
<p>Groundwater Development / Management</p>	
<p>Delta Electricity – Emergency Drought Supply Evaluation: Pinedale Mine, Lithgow, NSW, Australia (2009)</p>	<p>Provided technical guidance and oversight of a desktop investigation into the feasibility of extracting water for the mine void. The feasibility investigation included estimating volumes potentially available within the mine void, identification of permitting requirements, a conceptual model, and the conceptual design and placement of potential extraction bores.</p>
<p>Sydney Gas – Hydrogeological Assessment of Broke Gas Prospect, Broke, NSW, Australia (2006-2009)</p>	<p>Desktop assessment(s) of groundwater and surface water resources, groundwater quality and potential impacts from extraction of coal seam methane from Wittingham and Wollombi Coal Measures. Brian also provided strategic planning advice for throughout his 4 years of project involvement.</p>
<p>Sydney Catchment Authority– Supervision and Hydrogeological Analysis of Drilling and Testing Program – Warragamba and Wallacia Investigation Sites, Wallacia, NSW, Australia (2006-2007)</p>	<p>Brian was project manager of the Drilling and Supervision project at the Warragamba and Wallacia Investigation Sites, which included the supervision of drilling two bores at the Warragamba site and three bores at the Wallacia site and the supervision of geophysical logging and pump testing of these test bores.</p> <p>Four bores were installed in the Hawkesbury Sandstone, with one bore (3A) drilled to 450 m into the underlying Narrabeen Group sediments. 7-day pumping and recovery tests were conducted at each site with water levels monitored in all bores. A final report documenting all field work, water quality, pumping test results and estimated safe yields were provided at the completion of the project.</p>

<p>Sydney Catchment Authority – Supervision and Hydrogeological Analysis of Drilling and Testing Program – Illawarra Investigation Sites, Wollongong, NSW, Australia (2006-2007)</p>	<p>Brian was project manager of the Drilling and Supervision project at the Illawarra site. The primary objective of the investigation was to establish the potential groundwater yield and water quality, and to determine the potential for borefield construction. One bore was drilling on site, which had below average yields and water quality not ideal for borefield development. Further drilling and exploration was consequently cancelled. A final report documenting all field work, water quality and yield measurements was provided at the completion of the project.</p>
<p>Delta Electricity – Emergency Drought Supply Evaluation: Lithgow Mine, Lithgow, NSW, Australia (2006-2007)</p>	<p>Evaluated and managed the project to identify potential water sources for drought supply. One site identified was the Lithgow Mine. Conducted numerous desktop and field investigations into the feasibility of extracting water for the mine void. Feasibility investigations have ranged from estimating volumes potentially available within the mine void, identification of permitting requirements, a conceptual model, and the conceptual design and placement of potential extraction bores.</p>
<p>Boral Resources– Greystanes Estate - Southern Employment Lands Groundwater Drainage Concept Design, Sydney, NSW, Australia (2006)</p>	<p>Brian was coordinator for the groundwater design team; organising a team of hydrogeologists, geochemists, civil engineers, waste water treatment engineers and draftsmen to provide a comprehensive concept design of the groundwater drainage network. The network was designed to maintain water levels below ground surface to a sufficient level to prevent, salinity and negative impacts to shallow piping networks, utilities, and other features associated with the 160-hectare development. Groundwater was then designed to be treated to a sufficient level for discharge to Prospect Creek.</p>
<p>MEMBERSHIPS</p>	
<p>Member</p>	<p>International Association of Hydrogeologists</p>
<p>AWARDS</p>	
<p>NSW AWA Merit Award (2008)</p>	<p>NSW AWA Water Research Merit Award</p>

ENCLOSURE 4

MR ROHAN LUCAS' CURRICULUM VITAE

Rohan Lucas

Education and training:

Bachelor of Engineering (Honours) (Environmental)
University of Melbourne, 1996
Bachelor of Science (Earth Sciences)
University of Melbourne, 1994
Other ongoing training in river sciences and engineering

Industry affiliations:

Registered Professional Engineer Queensland (RPEQ)
Engineers Australia
Professionals Australia
Institute of Engineers in Papua New Guinea



Rohan is a Principal Consultant – Environmental Engineering and Geomorphology and Director of Alluvium Consulting. He has over 25 years’ experience in environmental and natural resource management with a focus on waterways. This experience has been gained in a consulting role to government and industry in Australia and Asia-Pacific for the assessment, design, review and implementation of waterway management and rehabilitation programs and of the interactions of resource and infrastructure projects with surface water systems and the risks posed to each other.

Rohan has had extensive involvement in the planning and implementation of catchment and watercourse management programs for Catchment Management Authorities or equivalents in Queensland, Victoria, South Australia and New South Wales. Rohan also has extensive experience with private industry clients including mining and gas companies and infrastructure developers and associated regulator engagement across Australia and parts of the Asia-Pacific.

Key skill areas:

- Fluvial geomorphology, hydrology and hydraulics
- Design, rehabilitation and monitoring of waterway diversions for mining companies
- Watercourse rehabilitation program priority setting, design and implementation of works
- Waterway crossing assessments for large linear infrastructure projects
- Mining related subsidence impact assessment and management measures for waterways
- Development impact assessment on waterways
- Programs – RORB, HECRAS, 12d Model, Chute, RipRap

Relevant projects:

Project	Description	Role	Client	Year
Lakeland Irrigation Project	Environmental assessment of surface water quality, geomorphology and sediment transport.	Geomorph lead	SMEC	2022
Blackwater Mine	Back Access Road and levee assessment and design	Geomorph lead	SMEC/BMA	Current
Raising The Burdekin Falls Dam EIS	Environmental assessment of surface water quality, geomorphology and sediment transport.	Geomorph lead	SLR / Sunwater	2021
Hells Gate Irrigation Project EIS	Environmental assessment of surface water quality, geomorphology and sediment transport.	Geomorph lead	SMEC / TEL	2021
Major Watercourse Diversion Monitoring	Geomorphic monitoring of major waterways at BMA Mines including Blackwater	Geomorph lead	BMA	2020-21

Quarry Management Plan for the Lower Burdekin River	This project required a review of catchment sediment source rates as well as sediment transport rates to determine if continued sand mining from the riverbed is sustainable.	Geomorph lead	DNRME	2019
Gully Erosion Control	Multiple designs and oversight of construction works for gully erosion in the Bowen, Broken and Bogie catchments.	Principal Engineer /Geomorphologist	NQ Dry Tropics	2018-current
Surface Water Technical Report for South Bates Underground Extraction Plan	Geomorphology and surface water existing conditions and impact assessment of longwalls LW11-16 at Wambo Coal Mine.	Project Director, Geomorphologist	Wambo Coal	2016-17
North Wambo Creek Diversion review of condition	Development and implementation of a monitoring program to understand diversion condition and condition trajectory.	Principal Engineer /Geomorphologist	Wambo Coal	2016-18
Wilpinjong Mine final landform waterway requirements	Regional assessment of geomorphology of valley and waterway character and behaviour to inform design of final landforms and their hydrologic and geomorphologic characteristics.	Principal Engineer /Geomorphologist	Wilpinjong Coal	2016-18
Murrumbidgee and Eastern Creek diversion designs	Concept designs of diversions at Moolarben Coal Mine that optimise environmental outcomes associated with the mine plan and final landforms	Principal Engineer /Geomorphologist	Moolarben Coal	2017
Sydney Basin Bioregional Assessment	Workshop to determine impacts of underground coal mining on water resources of the Sydney Basin Bioregion	Technical expert	Australian Government	2017
Sydney drinking water catchment audit	As required by legislation an audit of Sydney's drinking water supply catchments is required every three years.	Mining impacts chapter	NSW Government	2017
Western Slopes Pipeline EIS	Geomorphologic and flood behaviour assessments to inform the EIS of the Western Slopes Pipeline EIS from Narrabri to central southern NSW.	Geomorphologist	APA	2017-18
MRA diversion of Walker Creek	To allow continuation of the South Walker Creek mine in central Queensland a significant diversion of Walker Creek was required. This was undertaken from concept design, detail design, approvals and construction. Capital cost ~\$25M.	Technical Director and principal Owners Engineer	BHP	2014-2017
Diversions at Roy Hill Mine	Review of designs, development and implementation of monitoring programs for diversions	Project Director, Engineer, Geomorphologist	Roy Hill	2016
Marillana Creek diversion	Expert review of proposed diversions of Marillana Creek at Yandi Mine	Project Director, Engineer, Geomorphologist	BHP Billiton	2016
Design and rehabilitation criteria for Bowen Basin River Diversions	Undertaken for the Australian Coal Association Research Program (ACARP) this project (C9068) developed design and rehabilitation criteria for diversions in mining in Australia. The criteria developed in the project have been adopted and utilised by the Queensland Government since as their guidelines.	Geomorphologist	ACARP	2001-2
Criteria for functioning river landscape units in mining and post mining landscapes	ACARP (http://acarp.com.au/abstracts.aspx?repld=C20017). This project reviewed the performance of diversions implemented since the C9068 project a decade earlier and incorporated best practice improvements internationally into a revised set of criteria for diversions in the mining industry. The project clearly demonstrated those implemented to the C9068 standard are performing much better than those which don't meet the standard.	Project director, geomorphologist	ACARP	2012-14
Collaborative performance trajectories for diversion approvals relinquishment	ACARP (http://acarp.com.au/abstracts.aspx?repld=C23030). This project developed a stakeholder assessment tool for assessing diversion condition and suitability for relinquishment of approvals by mining companies. The project also developed a vegetation condition trajectory tool to assist in the relinquishment process.	Project director	ACARP	2014-16
Subsidence Management Plans	Modelling, assessment, design and documentation of subsidence management plans for 4 major underground coal mines in central Queensland. These focus on the management of impacts to the waterways impacted by subsidence.	Project Director, Engineer, Geomorphologist	AAMC, Peabody, BMA	2011-2016

ENCLOSURE 5

MR PETER KUSKIE'S CURRICULUM VITAE

CURRICULUM VITAE

NAME: (Mr) KUSKIE, PETER JAMES

Position: Director, South East Archaeology Pty Limited

Address: 24 Bamford Street
Hughes ACT 2605

Mobile: 0417 691 231
Email: *peter@southeastarchaeology.com.au*

Relevant Employment Experience:

Consultant Archaeologist, South East Archaeology, 1989 - present.

Key projects as principal consultant include:

- ❑ Part 3A assessment of Ulan Coal Mine's Continued Operations Project near Mudgee, involving extensive survey of a 50 square kilometre area over 21 weeks, with in excess of 900 Aboriginal sites recorded, including open artefact sites, rock shelters, grinding grooves, scarred trees, stone arrangements and art sites (UCML/Glencore);
- ❑ Survey over a five week period, with over 1,000 Aboriginal sites recorded, and salvage excavations over a 27 week period at the 37 square kilometre Mount Arthur North Coal Mine (URS Australia, BHP Billiton);
- ❑ Part 3A and Part 4.1 State Significant Development assessments of major coal mining Projects, Extensions and Modifications including at Spur Hill (Spur Hill Management / Resource Strategies), Tasman (Donaldson Coal), Abel Mine (Ellembey Resources / Donaldson Coal), Bloomfield (Bloomfield Colliery), Wilpinjong (Peabody) and Moolarben (Yancoal);
- ❑ Part 3A assessment of the Australian Rail Track Corporation's 32 kilometre Maitland to Minimbah and 11 kilometre Minimbah to Wittingham rail upgrades in the Hunter Valley, involving surveys and mitigation measures (Hunter 8 Alliance);
- ❑ Pacific Highway Upgrades, including extensive survey and test excavations of the 37 kilometre Oxley Highway to Kempsey route near Port Macquarie and survey of the 27 kilometre Woolgoolga to Wells Crossing route near Coffs Harbour (GHD/RTA);
- ❑ Surveys, test excavations and salvage excavations for large residential developments at Thornton North in the Hunter Valley (Investa Property Group, County Property Group and Defence Housing Australia);
- ❑ Surveys and mitigation projects for numerous water and sewerage pipeline routes in the Hunter Valley and Central Coast (GHD, Hunter Water Corporation, Department of Commerce, Wyong Shire Council);
- ❑ Surveys and mitigation projects for The Vintage residential golf course (Stevens Group);
- ❑ Salvage and test excavations over an 18 week period for 'The Dairy' ('The Lakes') residential development near Ulladulla (Elderslie Property Investments) and over a 10 week period for Australian Property Growth Fund;
- ❑ Salvage excavations over a 12 week period at Lemington Mine, near Singleton (Lemington Coal Mines);
- ❑ Salvage excavations over a 14 week period of two Aboriginal sites along the F3 Freeway (M1) at Black Hill, near Maitland (RTA);

- ❑ Survey of BHP Petroleum and Westcoast Energy Australia's 740 kilometre long Eastern Gas Pipeline, from Longford, Victoria, to Wilton, NSW;
- ❑ Surveys of Optus Communications' mobile telecommunications network throughout NSW and Queensland and fibre optic cable network from Sydney to Brisbane and Cootamundra to Canberra (Optus Communications, Landscan);
- ❑ Survey for Dorrigo Three Year Environmental Impact Study (State Forests of NSW);
- ❑ Heritage studies at Coffs Harbour (Coffs Harbour and District Local Aboriginal Land Council), Bingie Bingie Point (Cobowra LALC) and the Hunter Valley (Mindaribba LALC);
- ❑ Excavations in Guam, Micronesia, USA (Dames and Moore, National Heritage Studies);
- ❑ Acting Senior Conservation Officer, Australian Heritage Commission (1993);
- ❑ Additional sub-surface investigations and salvage projects in NSW at numerous locations, including Rothbury (RTA), Thornton (GHD, Beechwood Homes, CPG, UrbisJHD), St. Georges Basin (Shoalhaven City Council), Cudmirrah National Park (DECCW), Bewong (Cowman Stoddart), Wollongong (Wollongong City Council), Merimbula (Ridge Consolidated, Bega Valley Shire Council, RTA and Bega Traditional Aboriginal Elders Council), Old Erawal Bay (Matrix Planning), Fishermans Paradise (Matrix Planning) and various locations (Optus Communications).
- ❑ Additional surveys throughout NSW, including:
 - Hunter Valley - numerous locations, such as Anna Bay, Bayswater, Beresfield, Cessnock, Fishermans Bay, Jerrys Plains, Lemington, Maitland, Rothbury, Singleton, Thornton, Tomago, Wambo and Wyong - for clients including Egis, Devine Erby Mazlin, GHD, HWC, Lemington Mine, MPE, Newcastle City Council, Rail Access Corporation and Umwelt;
 - Central Coast - numerous locations, including Wyong, Warnervale, Mardi, Wamberal, Ourimbah, Dora Creek, Toronto, Fennell Bay, Boolaroo, West Wallsend and Woy Woy - for clients including GHD, Department of Commerce, Wyong Shire Council and Connell Wagner;
 - South Coast - numerous locations, including Batemans Bay, Bendalong, Berry, Bewong, Broulee, Callala Beach, Cobargo, Congo, Conjola, Cudmirrah, Dapto, East Nowra, Eurobodalla NP, Fishermans Paradise, Jervis Bay NP, Kangaroo Valley, Lake Conjola, Milton, Moruya, Nowra, Potato Point, St. Georges Basin, West Dapto, Wollongong - for clients including Bullock Walters & Associates, Cowman Stoddart, Crescent Home Plan & Design Service, Eurobodalla Shire Council, Forbes Rigby, Glenshaw Holdings, Grenon-Walker, Horseshoe Pastoral Company, Matrix Planning, Maunsell, Miltonbrook, Niche Environmental Information, DECCW, P.W. Rygate & West, Shoalhaven City Council, State Forests of NSW, Town & Country Real Estate and Travers Morgan;
 - Far South Coast - numerous locations, including Bournda NP, Dalmeny, Bega, Merimbula, Tuross Falls - for clients including Bega Valley Shire Council, Great Southern Energy, GHD, Caddey Searl and Jarman, DECCW and RTA;
 - Southern and Central Tablelands - numerous locations, including Goulburn, Marulan, Yass, Snowy Mountains, Tallaganda, Gundagai, Cowra and Ulan - for clients including Ulan Coal Mine, Cowra Shire Council, Matrix Planning, Cowman Stoddart, SMEC, State Forests of NSW, DECCW and Gundagai Shire Council;
- ❑ Surveys in the ACT at Mitchell, Hume, Conder, Banks, Gungahlin and West Belconnen (ACT Government) and ACT site mapping project (Canberra Archaeological Society).

Professional Skills:

- ❑ Managing and conducting large-scale and small-scale Aboriginal heritage projects;
- ❑ Planning and conducting archaeological surveys of Aboriginal heritage sites;
- ❑ Planning and conducting archaeological excavations of Aboriginal sites, including artefact scatters, shell middens and rock shelters;
- ❑ Preparation of Aboriginal Heritage Impact Permit applications and the conduct of sub-surface investigations and other mitigation measures;
- ❑ Preparing Aboriginal heritage management plans and Aboriginal heritage impact assessment reports compliant with Heritage NSW, Department of Planning and other Government requirements;
- ❑ Liaising with Aboriginal communities, clients and government agencies;
- ❑ Assessing heritage site significance; and
- ❑ Analysing shell midden deposits and stone artefacts.

Academic Qualifications:

Tertiary degree: Bachelor of Arts (Honours) Australian National University
Result, 1989 Prehistory IV Honours: H2A

ENCLOSURE 6

MR LIAM SCANLAN'S CURRICULUM VITAE



Liam Scanlan ECOLOGIST

Liam Scanlan is an Ecologist based in the Newcastle office, specialising in botany and restoration ecology. Liam completed his Honours degree researching the phylogenetic diversity and conservation of rainforests on the Sunshine Coast. He is now undertaking biodiversity assessments of plant communities and threatened flora for major developments in New South Wales. Liam has also managed the propagation of threatened subtropical rainforest plants in South-East Queensland and supported bushfire management.

QUALIFICATIONS

- Bachelor of Science (Honours), University of the Sunshine Coast 2016
- Thesis title "Phylogenetic diversity and conservation of rainforests in the Sunshine Coast region, Queensland, Australia"
- Bachelor of Science (Environmental Studies and Plant Science), University of Tasmania 2015
- Certificate III Conservation and Land Management, 2018

ADDITIONAL CERTIFICATION AND TRAINING

- Certificate III Conservation and Land Management
- Agricultural chemical distribution control training, QLD commercial operator's license
- Level II Chainsaw operation
- Firefighter crew member accreditation
- Provide First Aid and provide CPR
- Occupational Health and Safety Construction Induction (White Card)
- Operate and maintain and four-wheel drive vehicle

PROJECT EXPERIENCE

2022

Flora surveying and monitoring

- Targeted threatened flora surveys for major renewable and extractive projects (Muswellbrook, Coolah, Walcha, Euston and Narrabri, NSW)
- Vegetation condition monitoring and weed management planning for biodiversity offsets and rehabilitated areas (Warkwork, Narrabri and Swan Bay NSW)
- Broad-scale vegetation ground-truthing and BioCondition assessments (Upper Burdekin region, North Queensland)
- Vegetation mapping and vegetation integrity assessments of private native forestry areas (Northern NSW)

Assessment and strategic planning

- Threatened Flora Seed Collection Procedures (Santos, NSW)

2021

Flora surveying and monitoring

- Broad-scale vegetation ground-truthing and mapping in high priority conservation areas (MidCoast, NSW)
- 'Saving our Species' Littoral rainforest monitoring (North Coast, NSW Parks and Wildlife Service)
- Monitoring of vegetation restoration sites and threatened rainforest flora (Ballina, NSW)
- Saltwater Creek vegetation validation and mapping (Southwest Rocks, NSW)
- Broad-scale vegetation ground-truthing (Yass region, NSW)
- Vegetation integrity plots and vegetation mapping for major renewable energy development (Coolah, NSW)
- Threatened flora targeted surveys (Coolah, NSW)

Assessment and strategic planning

- Threatened Allocasuarina translocation management plan (Port Macquarie, NSW)
- Weed management plan for Wambo Colliery (Warkworth, NSW)

Fauna surveying

- Targeted surveys for threatened amphibians (Uki, NSW)
- Pre-clearing surveys for threatened amphibians (Kooragang, NSW)

2020

Flora surveying and monitoring

- Threatened flora targeted surveys for rainforest flora for state significant project (Uki, NSW)
- Vegetation integrity plots and vegetation mapping (Uki, NSW)
- Vegetation integrity plots and vegetation mapping of a Biodiversity Stewardship site (sites including Narrabri NSW, Stroud NSW and Putty Valley NSW)
- Post-fire rainforest monitoring (North Coast, NSW Parks and Wildlife Service)
- 'Saving our Species' Littoral rainforest monitoring (North Coast, NSW Parks and Wildlife Service)
- 'Saving our Species' Endangered Ecological Community monitoring (Coffs Harbour City Council)
- Vegetation validation and identification of ecological values (Central Coast, NSW Parks and Wildlife Service)
- Threatened flora targeted surveys and vegetation integrity plots (Somersby region, NSW)
- Threatened flora targeted surveys (Pilliga Forest, NSW)
- Vegetation rapid sampling and vegetation mapping (MidCoast Council, NSW)
- Biodiversity Offset monitoring and weed survey (Warkworth, NSW)

Assessment and Strategic Planning

- Field assessment for bushland reserve Site Management Plans (Central Coast, NSW)
- Leumeah Vegetation Management Plan (Leumeah, NSW)

Fauna surveying

- Targeted surveys and clearing supervision for Green and Golden Bell Frog (Newcastle, NSW)
- Targeted surveys for Eastern Cave Bat (Central Coast, NSW)
- Targeted surveys for threatened microbats (Uki, NSW)
- Targeted surveys for threatened birds (Narrabri, NSW)

2019

Flora surveying and monitoring

- 'Saving our Species' Littoral rainforest monitoring (NSW Parks and Wildlife Service)
- Coolah Tops vegetation surveys for mapping (NSW Parks and Wildlife Service)
- Manning River Wetlands vegetation surveys for mapping (MidCoast Council)
- Burwood and Belmont Water Treatment Plants Biodiversity Assessment (Veolia)
- Biodiversity Offset and Rehabilitation monitoring (Gunnedah, NSW)
- Biodiversity Offset monitoring and weed survey (Singleton, NSW)
- Threatened flora targeted surveys (Central Coast, NSW)
- Threatened flora targeted surveys and rehabilitation monitoring (Pilliga Forest, NSW)
- *Grevillia parviflora* subsp. *parviflora* translocation (Newcastle, NSW)

Assessment and Strategic Planning

- Hunter Regional Strategy for Chinese Violet Eradication and Containment (Port Stephens Council)
- Flora and Fauna Assessment and Management Plan templates (Port Stephens Council)
- Coastal Integrated Forestry Operations Approval Threatened Flora Management Plans (Natural Resources Commission)
- Pilliga Forest Rehabilitation and Significant Species Management Plans (Santos, NSW)
- Wambo Coal Mine Weed Treatment Plan (Singleton, NSW)

Fauna surveying

- Targeted survey for threatened fauna (Somersby, NSW)
- Preclearing surveys and clearing supervision (Bennetts Green, NSW)

2017-2019

- Threatened rainforest flora mapping and propagation (Noosa Shire Council)
- Bushfire management plans for bushland reserves (Noosa Shire Council)
- Supervisor of conservation and land management trainees (Noosa Landcare)
- Fire spotting and planned burn assistance (HQ Plantations)
- Bush regeneration and native plant nursery assistance (Noosa Landcare)

ENCLOSURE 7

MRS JOANNA HINKS' CURRICULUM VITAE

JOANNA HINKS

project and portfolio management
environmental impact assessment
environmental engineering
stakeholder engagement
planning legislation and planning strategy

Certified Environmental Practitioner No. 1500/IA11065
NSW Registered Environmental Assessment Practitioner (REAP) R80005

EDUCATION

Bachelor of Engineering (Environmental) (Hons I), University of Queensland, Brisbane.

Master of Science (Project Management) (Distinction), Curtin University, Perth (external).

PROFESSIONAL HISTORY

- Resource Strategies Pty Ltd, Environmental Project Manager, 2008 – 2015
- Resource Strategies Pty Ltd, Senior Environmental Manager, 2015 – 2019
- Resource Strategies Pty Ltd, General Manager / Principal, 2020 – current

EXPERIENCE

Joanna has specific experience in the project management of complex environmental approvals, environmental engineering, environmental impact assessment, environmental management, subsidence assessment and management, surface water management and planning legislation.

Joanna has directed Resource Strategies' involvement for a number of approval processes, including project oversight, cost and schedule control, risk management and government and community consultation. Joanna is also skilled in the resolution of key technical issues and the development of approval strategies.

Joanna was responsible for coordinating and preparing the EIS for the Tasman Extension Project in 2012, which was the first SSD mining project EIS to go on exhibition and be approved in NSW following the repeal of Part 3A. Since then, Joanna has directed Resource Strategies' involvement with the approval processes for another SSD coal mining project (the Maxwell Project), two Gateway Certificate Applications (the Spur Hill Underground Project and Maxwell Project) and numerous modifications for mining projects (including business-critical and urgent applications).

Joanna has gained experience in the preparation of a range of regulatory approval documents. She has been a key team member in delivering the following approval documents:

- Environmental Impact Statements/Environmental Assessments (Maxwell Project, Tasman Extension Project, Vickery Extension Project, Caroon Coal Project, Wilpinjong Extension Project, Cadia East Project, Bulli Seam Operations, Duralie Extension Project, and Tarrawonga Coal Project).
- Approval Condition Negotiation, Response to Submissions and Public Hearings (Tasman Extension Project, United Wambo Open Cut Coal Mine Project, Bulli Seam Operations, Millennium Expansion Project and Eaglefield Expansion Project).
- EPBC Act Documentation (Bulli Seam Operations Environmental Impact Statement, Maxwell Project Referral, Tasman Extension Project Referral, Spur Hill Underground Coking Coal Project Referral).
- Project/Environmental Approval Modifications (Wambo Coal Mine, Metropolitan Mine and Abel Underground Mine).
- Environmental Management Plans (Wambo Coal Mine, Moolarben Coal Complex, Cowal Gold Mine, Ulan Mine, Duralie Coal Mine and Stratford Coal Mine). A wide range of plans have been prepared addressing overall environmental management strategies, subsidence management and water management.

Joanna also has a thorough understanding of planning legislation and regularly provides advice to operational sites and the NSW Minerals Council on existing planning legislation and proposed. Joanna also provides direct advice to DPIE regarding draft DPIE environmental assessment policy and guideline documents, and has assisted with a non-mining related preliminary regional impact assessment.

WAMBO COAL PTY LIMITED



SOUTH BATES EXTENSION UNDERGROUND MINE

EXTRACTION PLAN LONGWALLS 24 TO 26

ATTACHMENT 3 PROGRAM TO COLLECT BASELINE DATA FOR FUTURE EXTRACTION PLANS

Peabody

Attachment 3
Program to Collect Baseline Data for Future Extraction Plans

The following underground mines at the Wambo Coal Mine are approved:

- North Wambo Underground Mine (Wambo Seam) (now completed);
- South Bates Underground Mine (Whybrow and Wambo Seams) (now completed);
- South Bates Extension Underground Mine (Whybrow Seam) (current mining area); and
- South Wambo Underground Mine (Woodlands Hill and Arrowfield Seams) (not yet commenced).

This Extraction Plan covers Longwalls 24 to 26 at the South Bates Extension Underground Mine.

Future Extraction Plans at the Wambo Coal Mine will include Extraction Plan(s) for the South Wambo Underground Mine.

The monitoring proposed to be undertaken to collect baseline data for future Extraction Plans is summarised in **Table A3-1**. WCPL considers that the current monitoring with the augmentations described below is adequate to collect sufficient baseline data for use in future Extraction Plans.

**Table A3-1
Program to Collect Baseline Data for Future Extraction Plans**

Aspect of Future Extraction Plan	Proposed Monitoring
Subsidence	<ul style="list-style-type: none"> • Subsidence monitoring undertaken in accordance with the Subsidence Monitoring Program. • The subsidence monitoring data collected during extraction of Longwalls 17 to 26 will be used to validate revised single-seam subsidence predictions for future Extraction Plans. • It is considered that the proposed subsidence monitoring is adequate to collect sufficient subsidence data for use in future Extraction Plans.
Groundwater	<ul style="list-style-type: none"> • Groundwater monitoring (groundwater level and quality) undertaken in accordance with the GWMP (Figure 13 of the Extraction Plan), including additional groundwater sites along the northern and western ends of Longwalls 24 to 26 (DDH1240, DDH1235, DDH1234) and new standpipe monitoring bores adjacent to Waterfall Creek (GW40a, GW40b, GW41a and GW41b). • The groundwater monitoring data collected will be used to validate predicted environmental consequences on groundwater resources for future Extraction Plans. If this validation finds environmental consequences have exceeded those predicted, the groundwater monitoring data will be used to provide revised predictions of environmental consequences. • The Groundwater Management Plan will adequately capture and incorporate the above commitments.
Surface Water	<ul style="list-style-type: none"> • Surface water monitoring (flow, quality and bed and bank stability) undertaken in accordance with the SWMP (Figure 13 of the Extraction Plan) along North Wambo Creek, Wambo Creek, Waterfall Creek and Stony Creek, including additional surface water quality monitoring site SW54, established adjacent to groundwater monitoring bores GW40a and GW40b. • The surface water monitoring data collected will be used to validate predicted environmental consequences on surface water resources for future Extraction Plans. If this validation finds environmental consequences have exceeded those predicted, the surface water monitoring data will be used to provide revised predictions of environmental consequences. • It is considered that the proposed surface water monitoring is adequate to collect sufficient baseline surface water data for use in future Extraction Plans. • The Surface Water Management Plan in preparation will adequately capture and incorporate the above commitments.

Table A3-1 (Continued)
Program to Collect Baseline Data for Future Extraction Plans

Aspect of Future Extraction Plan	Proposed Monitoring
Land	<ul style="list-style-type: none"> • Monitoring of impacts to land in general in accordance with the Longwalls 24 to 26 Land Management Plan, including high resolution photographic recording of cliffs. • The monitoring conducted in accordance with the Longwalls 24 to 26 Land Management Plan will be used in the review of observed subsidence impacts for future Extraction Plans.
Biodiversity	<ul style="list-style-type: none"> • Monitoring of biodiversity in accordance with the Biodiversity Management Plan (Figure 14 of the Extraction Plan), including: <ul style="list-style-type: none"> – annual vegetation monitoring in the Remnant Woodland Enhancement Program areas; – annual riparian monitoring (including transects along the North Wambo Creek Diversion, North Wambo Creek, Wambo Creek and Stony Creek); and – annual bird surveys including specific surveys for Swift Parrot and Regent Honeyeater. • Biodiversity monitoring data collected will be used to validate predicted environmental consequences on biodiversity for future Extraction Plans. If this validation finds environmental consequences have exceeded those predicted, the monitoring data would be used to provide revised predictions of environmental consequences.
Aboriginal Heritage	<ul style="list-style-type: none"> • Maintenance of an Aboriginal heritage sites database.
Non-Aboriginal Heritage	<ul style="list-style-type: none"> • In accordance with Condition 62A, Schedule 4 of the Development Consent (now removed from the Development Consent as it has been addressed), an Archival Recording has been completed of the Whynot Homestead and outbuildings. • Structural assessment of the Whynot Homestead will be undertaken post-mining to assess if demolition is required. • Monitoring data associated with subsidence near the Wambo Homestead Complex has been collected in accordance with previous Extraction Plans. This monitoring data would be used to predict impacts to the Wambo Homestead Complex for future Extraction Plans.

Note: GWMP refers to the Wambo Coal Pty Limited Groundwater Monitoring Program.
SWMP refers to the Wambo Coal Pty Limited Surface Water Monitoring Program.

WAMBO COAL PTY LIMITED



SOUTH BATES EXTENSION UNDERGROUND MINE

EXTRACTION PLAN LONGWALLS 24 TO 26

ATTACHMENT 4 KEY CONTACT REGISTER

**Attachment 4
Key Contact Register**

Contact Details to be Reviewed Annually by the Environment and Community Manager

**Table A4-1
Emergency Contacts**

Organisation	Phone Number
Emergency Services (Police, Fire, Ambulance)	000
Environment Protection Authority	131 555
State Emergency Services	132 500
SafeWork NSW	13 10 50
Subsidence Advisory NSW (24 Hour Emergency Hotline)	1800 248 083
Singleton Shire Council	(02) 6578 7290

**Table A4-2
Internal WCPL Contact Details**

Position	Contact Name	Phone Number
Manager: Environment and Community	Peter Jaeger	(02) 6570 2206
Community Hotline	-	(02) 6570 2245
Control Room (24 hours)	-	(02) 6570 2240
Manager: Health Safety and Training	Victoria Hellyer	(02) 6570 2309
General Manager	Kenneth Rigsby	(02) 6570 2216
Technical Services Superintendent	Timothy Chisholm	
Mining Engineering Manager (Underground Mine Manager)	Peter Jandzio	

**Table A4-3
Stakeholder Contact Details**

Organisation	Name/Position	Contact Phone Number/Email	Postal Address
NSW Department of Planning, Industry and Environment	Steve O'Donoghue Director Resource Assessments, Energy, Resources and Industry	Lodge via Planning Portal	Locked Bag 5022 Parramatta NSW 2124
NSW Mining, Exploration and Geosciences	-	minres.environment@planning.nsw.gov.au	PO Box 344 Hunter Region MC NSW 2310
NSW Resources Regulator	-	nswresourcesregulator@service-now.com 1300 814 609	PO Box 344 Hunter Region MC NSW 2310
Subsidence Advisory NSW	Newcastle District Office	subsidenceadvisory@customerservice.nsw.gov.au District Office – (02) 4908 4300	PO Box 488G Newcastle NSW 2300
NSW Natural Resources Access Regulator	-	nrar.enquiries@nrar.nsw.gov.au 1800 633 362	Locked Bag 5022 Parramatta 2124
Biodiversity and Conservation Division (BCD)	-	info@environment.nsw.gov.au 1300 361 967	Locked Bag 5022 Parramatta 2124
Environment Protection Authority	Hunter Region	hunter.region@epa.nsw.gov.au	PO Box 488G Newcastle NSW 2300
Heritage NSW, Department of Premier and Cabinet	Hunter Region	heritagemailbox@environment.nsw.gov.au	Locked Bag 5020 Parramatta NSW 2124
Singleton Shire Council	-	council@singleton.nsw.gov.au (02) 6578 7290	PO Box 314 Singleton NSW 2330