



WAMBO COAL PTY LTD

NORTH WAMBO UNDERGROUND MINE EXTRACTION PLAN LONGWALLS 8 TO 10A

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WAMBO COAL MINE
NORTH WAMBO UNDERGROUND MINE

EXTRACTION PLAN
LONGWALLS 8 TO 10A



PREPARED BY
WAMBO COAL PTY LTD AND
RESOURCE STRATEGIES PTY LTD

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DOCUMENT CONTROL

Applicant	Wambo Coal Pty Limited
Mine	Wambo Coal Mine – North Wambo Underground Mine
Document No.	EP LW8-10A
Title	Extraction Plan for North Wambo Underground Mine Longwalls 8 to 10A
General Description	Management of potential subsidence effects, subsidence impacts and environmental consequences from mining of Longwalls 8 to 10A at the North Wambo 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	CCL743, ML1402, ML1594

Revisions

Rev No	Date	Description	By	Checked
A	December 2012	Original Draft	WCPL and Resource Strategies	-
B	December 2012	Final for Submission	WCPL and Resource Strategies	P. Fletcher
C	April 2013	Revised to Address DP&I Comments	WCPL and Resource Strategies	M. Alexander
D	February 2014	Revised to include Longwalls 9 and 10	WCPL and Resource Strategies	M. Alexander
E	June 2014	Revised to Address DRE-ESU Comments	WCPL and Resource Strategies	M. Alexander
F	April 2015	Revised to include Longwall 10A	WCPL and Resource Strategies	T. Britten

Approvals

	Name	Position	Signed	Date
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Checked	T. Britten	Technical Services Manager		10/04/2014
Confirmed	M. Wood	NWU Manager of Mining Engineering		10/04/2014

The nominated Coordinator for this document is	Director: Technical Services and Projects
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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 8 to 10A at the North Wambo Underground Mine.

The table on page ii summarises the key monitoring, management and reporting commitments in this Extraction Plan.

Wambo Coal Pty Limited (WCPL) commits to updating the following management plans to incorporate this revision of the Extraction Plan:

- Inrush Management Plan (as part of the notification under clause 33 of the *Work Health and Safety (Mines) Regulation, 2014*); and
- Mining Operations Plan (as required under the conditions of the Mining Lease).

The Trigger Action Response Plans (TARPs) provided in the component management plans will be developed further as this Extraction Plan is reviewed and revised. **Table 23** of this Extraction Plan is designed to support the TARPs in the component management plans and clearly outline actions, levels of responsibility within WCPL.

In accordance with of the Development Consent, WCPL must ensure that there is no exceedance of 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 impact. Controlled release of excess site water only in accordance with EPL requirements.
Wollemi National Park	Negligible subsidence impacts. Negligible environmental consequences.
Warkworth Sands Woodland Community	Minor cracking and ponding of the land surface or other impact. 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 impact. Negligible environmental consequences.
Other threatened species, populations or communities	Minor cracking and ponding of the land surface or other impact. 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	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	No additional risk.

Source: After Tables 14A and 14B 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.Monitoring in accordance with the Surface Water Monitoring Program.Monitoring in accordance with the North Wambo Creek Subsidence Response Strategy.	<ul style="list-style-type: none">If connective cracking to North Wambo Creek is identified, management measures will be employed in accordance with the North Wambo Creek Subsidence Response Strategy.Bulk fill of Homestead Mine Workings. Sections of historical workings of the Homestead Mine will be bulk filled with low strength grout primarily as a mitigation measure to minimise the potential for flooding due to chimney failure and pot hole development resulting from failure of remnant pillars within the Homestead Mine workings.Stabilisation of any areas of surface cracking using erosion protection measures (e.g. vegetation planting).	Section 3.1 and Appendix A
Wollombi Brook			
Stony Creek			
Wambo Creek	<ul style="list-style-type: none">Monitoring of subsidence in accordance with the Subsidence Monitoring Program.Monitoring of bores in the alluvium associated with Wambo Creek and comparison to the groundwater trigger values in the Groundwater Monitoring Program (P106, P109, P114, P116, P202 and P206).Surface water quality and flow monitoring on Wambo Creek downstream of Longwalls 8 to 10A and comparison to the surface water trigger values in the Surface Water Monitoring Program (SW07 and FM5).Bed and bank stability monitoring of Wambo Creek and Stony Creek in accordance with the Surface Water Monitoring Program.		
Alluvial Aquifers	<ul style="list-style-type: none">Monitoring of subsidence in accordance with the Subsidence Monitoring Program.Monitoring in accordance with the Groundwater Monitoring Program.Monitoring in accordance with the North Wambo Creek Subsidence Response Strategy.		
Permian Aquifers			

Summary of Monitoring and Management Commitments (Continued)

Component	Monitoring	Management	Reference
Land in General	<ul style="list-style-type: none"> Monitoring of subsidence in accordance with the Subsidence Monitoring Program. Visual observations of stock fences. Visual observations of the ground surface. 	<ul style="list-style-type: none"> Notification to agistees 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 cracks¹ 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. 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. Repair of stock fences prior to allowing access for agistment grazing. Management measures in accordance with the Erosion and Sediment Control Plan. 	Section 3.2 and Appendix B
Biodiversity	<ul style="list-style-type: none"> Monitoring of subsidence in accordance with the Subsidence Monitoring Program. Monitoring in accordance with the Flora and Fauna Management Plan. Annual plant cover abundance and Biometric monitoring at three sites above Longwalls 8 to 10A in accordance with the Biodiversity Management Plan. Monitoring of an <i>Acacia pendula</i> patch above Longwall 10A. Visual observations to record the Wollemi National Park escarpment cliff stability (including photographic record).² 	<ul style="list-style-type: none"> Vegetation Clearance Protocol, described in the Flora and Fauna Management Plan. Threatened Species Management Protocol, described in the Flora and Fauna Management Plan. Rehabilitation Program, described in the Flora and Fauna Management Plan. 	Section 3.3 and Appendix C

Summary of Monitoring and Management Commitments (Continued)

Component	Monitoring	Management	Reference
Wambo Homestead Complex (WHC)	<ul style="list-style-type: none"> Monitoring of subsidence in accordance with the Subsidence Monitoring Program. Monitoring in accordance with the WHC Mine Management Plan. <p>Visual and photographic inspection of the buildings within the WHC, especially Building No. 6, will be conducted after the mining of Longwall 8 has been completed.</p>	<ul style="list-style-type: none"> Bulk fill of Homestead Mine Workings. <p>Sections of historical workings of the Homestead Mine will be bulk filled in the vicinity of the Stud Master's Cottage. The grouting will reduce the risk of impacts to the heritage value of the WHC associated with the extraction of Longwall 8.</p> <ul style="list-style-type: none"> Management measures in accordance with the WHC Mine Management Plan including stabilisation, conservation works and expert assessment. 	Section 3.4 and Appendix D
Aboriginal Cultural Heritage	<ul style="list-style-type: none"> Monitoring of subsidence in accordance with the Subsidence Monitoring Program. 	<ul style="list-style-type: none"> Management measures in accordance with the approved Salvage and Management Programme including: <ul style="list-style-type: none"> the collection of surface artefacts; the collection of subsurface artefacts; and archaeological analysis and keeping of artefactual material. If subsidence monitoring identifies cracking or erosion proximal to a site, artefacts will be salvaged in accordance with the Salvage and Management Programme. 	Section 3.4 and Appendix D
WCPL Assets	<ul style="list-style-type: none"> Visual observations to record the general condition of WCPL assets including safety and serviceability. Monitoring of the location of the base and top of each power pole (if rollers not installed). Monitoring of the vertical distance from the ground to lowest point of the powerline between each power pole pair (i.e. conductor clearance) (if rollers not installed). Visual observations to record condition of roads and tracks, including surface cracks, buckling and general safety. Monitoring of pipeline integrity at fixed points. Monitoring to detect abnormal changes in flow. 	<ul style="list-style-type: none"> Assessment of WCPL assets to identify modifications potentially required prior to subsidence. 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 old haul roads and site access tracks and updating warning signs if a change to the WCPL asset is identified during monitoring. Following subsidence, fitting of WCPL powerlines with stays where affected by subsidence. Structural assessment of WCPL assets and subsidence assessment post-Longwalls 8 to 10A extraction. Repair of WCPL assets in accordance with associated standards and procedures. 	Section 3.5 and Appendix E

Summary of Monitoring and Management Commitments (Continued)

Component	Monitoring	Management	Reference
Prescribed Dams	<ul style="list-style-type: none"> Monitoring of subsidence in accordance with the Subsidence Monitoring Program. Water level in Wambo South Water Dam (transducer reading on CITECT and surveyed water level). Visual inspections of Wambo South Water Dam, including condition of: embankment; stormwater catchment drain on western side of dam; and dam level stake. Visual inspections of underground workings (including longwall progression and geological features encountered). Water level in Wambo South Water Dam (surveyed water level). Underground mine water monitoring. 	<ul style="list-style-type: none"> Lower watertable level of the Wambo South Water Dam to outside of the angle of draw of extraction prior to extraction of each longwall. CITECT email alarm to Underground Mine Manager and Technical Services Superintendent when Wambo South Water Dam level exceeds trigger level in the Prescribed Dam Management Plan. Implement TARP in the Prescribed Dam Management Plan. Structural assessment of Wambo South Water Dam following completion of active mining. Repair of any damage to the Prescribed Dam resulting from the extraction of Longwalls 8 to 10A (i.e. WCPL will restore the safety of any Prescribed Dam if compromised by mining). 	Section 3.5 and Appendix E
Right-of-way in Favour of Several Private Properties	<ul style="list-style-type: none"> Monitoring of subsidence in accordance with the Subsidence Monitoring Program. Visual observations to record condition of road, including surface cracks, buckling and general safety. Visual assessment of the effectiveness of warning signs. 	<ul style="list-style-type: none"> Post warning signs along the right-of-way across WCPL-owned land and update warning signs if a change is identified during monitoring. The signs will indicate that underground mining (with surface subsidence) is being undertaken on WCPL-owned land and that access is restricted to lawful entrants. Notify users of the right-of-way when there is active subsidence, by placement of a sign. Repair of right-of-way in accordance with associated standards and procedures. Alternatively, WCPL may vary the route of the right-of-way in accordance with the terms of the right-of-way. 	Section 3.5 and Appendix E

Summary of Monitoring and Management 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 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. Notification to agistees 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. Posting 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. Maintenance of warning signs. Management of surface cracking and areas of subsidence troughs in accordance with the Land Management Plan. All safety incidents will be handled in accordance with the Health and Safety Management System. Repair of fences in accordance with the Land Management Plan. Review of warning sign placement and removal if no longer required. 	Section 3.6 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 31 July). Annual Reviews (for the period 1 January to 31 December). 		Section 4.2

¹ Minor cracks that develop are not expected to require remediation as geomorphologic process will result in naturally filling of these cracks over time.

² Visual inspection will be conducted from areas accessible by vehicle for signs of freshly exposed rock face or debris, or areas of significant vegetation dieback.

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1 OVERVIEW OF THE EXTRACTION PLAN

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 (Peabody).

The North Wambo Underground Mine is a component of the approved Wambo Coal Mine. The North Wambo Underground Mine commenced in 2005 and involves extraction of coal by longwall mining methods from the Wambo Seam within Mining Lease (ML) 1402, ML 1594, Coal Lease (CL) 397 and Consolidated Coal Lease (CCL) 743 (**Figure 2**).

The potential environmental impacts of the existing Wambo Coal Mine were assessed in the *Wambo Development Project Environmental Impact Statement* (the 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* (EP&A Act).

An application to modify the Development Consent (DA 305-7-2003 MOD 2) was lodged in January 2005 to facilitate the re-orientation of the North Wambo Underground Mine longwall panels and allow access to the Wambo Seam via the open cut highwall and was approved on 4 May 2005. The application was accompanied by the *Wambo Development Project - Wambo Seam Underground Mine Modification Statement of Environmental Effects* (North Wambo SEE) (WCPL, 2005).

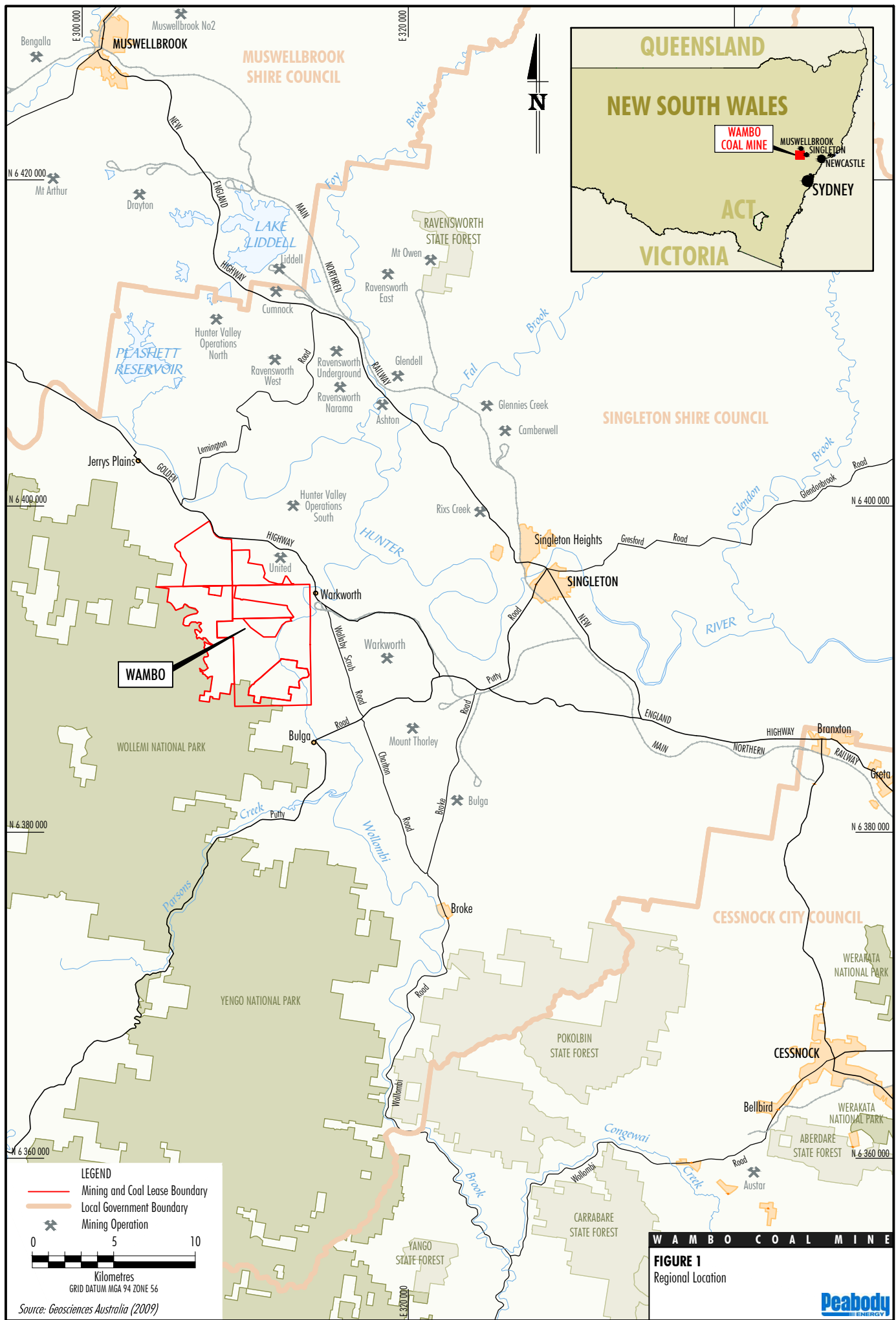
A subsequent application to modify the Development Consent (DA 305-7-2003 MOD 13) was lodged in December 2012 to allow an extension to the approved North Wambo Underground Mine to include two additional longwalls (Longwalls 9 and 10) and was approved on 8 July 2013. The application was accompanied by the *North Wambo Underground Mine Modification Environmental Assessment* (North Wambo Modification EA) (WCPL, 2012).

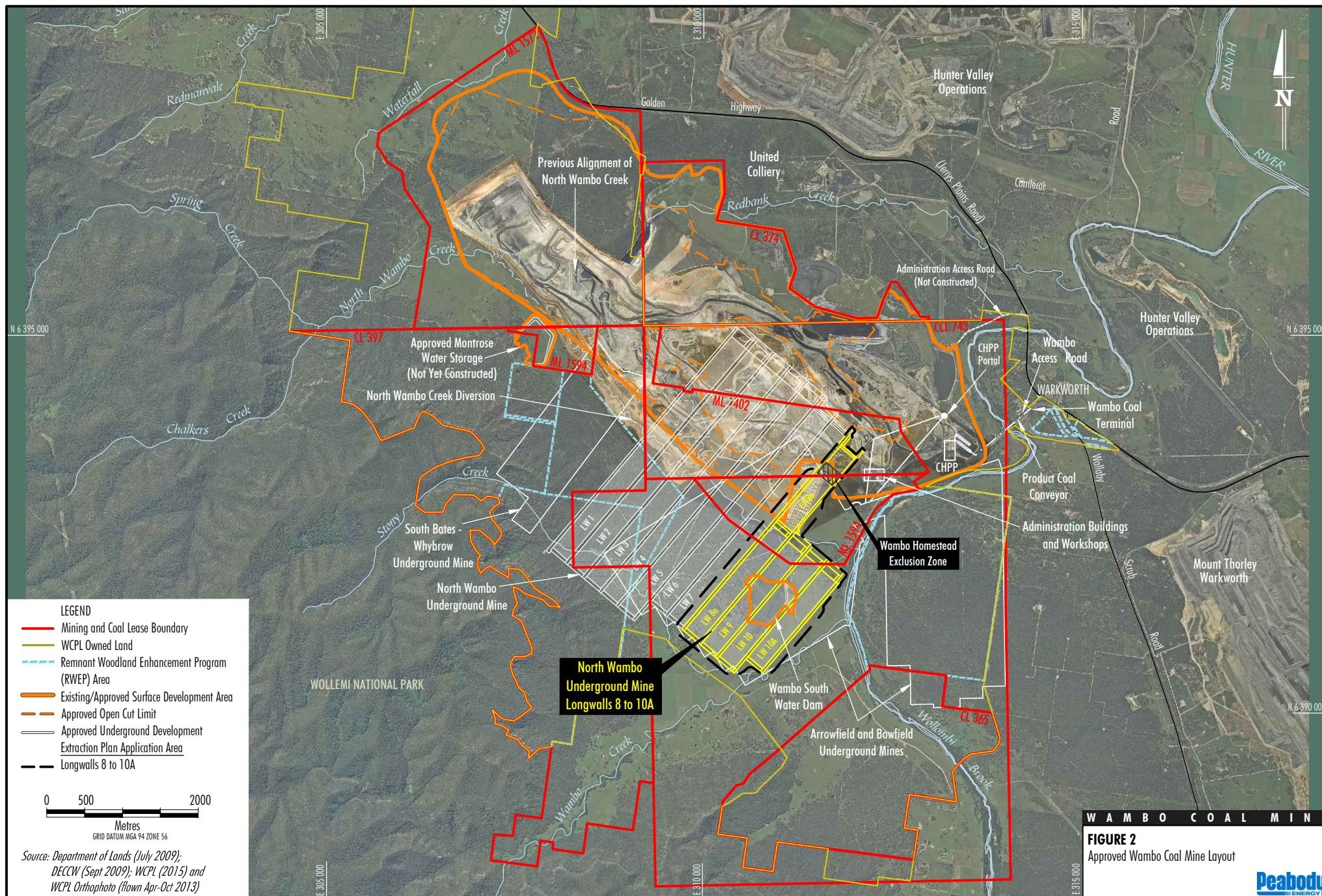
An application to modify the Development Consent (DA 305-7-2003 MOD 14) was lodged in September 2014 to allow an extension to the approved North Wambo Underground Mine to include an additional longwall (Longwall 10A). The application was accompanied by the *North Wambo Underground Mine Longwall 10A Modification Environmental Assessment* (North Wambo Longwall 10A Modification EA) (WCPL, 2014).

A Subsidence Management Plan for Longwalls 1 to 6 at the North Wambo Underground Mine (WCPL, 2006) was approved by the NSW Department of Primary Industries – Mineral Resources on 11 December 2006. A subsequent variation to the approved Subsidence Management Plan was lodged on 28 November 2007 and approved on 7 December 2007.

An Extraction Plan for Longwalls 7 and 8 was approved by the NSW Department of Planning and Infrastructure (DP&I) for Longwall 7 on 16 May 2013 and for Longwall 8 on 24 September 2013. Subsequently, a revised Extraction Plan for Longwalls 7 to 10 was approved by the Department of Planning and Environment (DP&E) on 4 July 2014.

The approved Extraction Plan for Longwalls 7 to 10 has been revised to include the remaining longwall within the North Wambo Underground Mine extent (Longwall 10A) for a consolidated Extraction Plan for Longwalls 8 to 10A (**Figure 3**).

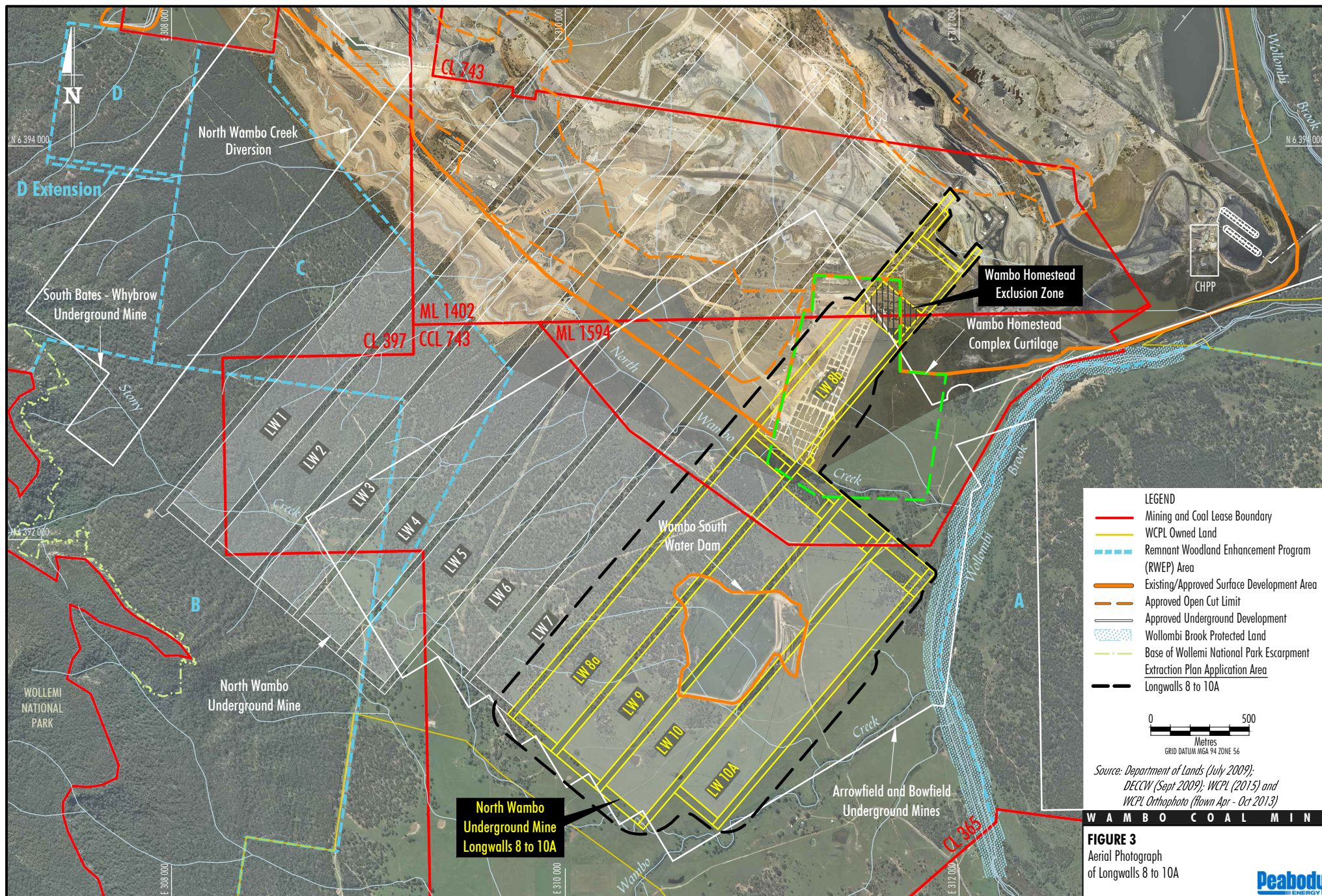




WAMBO COAL MINE

FIGURE 2
Approved Wambo Coal Mine Layout





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 Longwalls 8 to 10A at the North Wambo Underground Mine.

This Extraction Plan has been prepared in consideration of the Draft *Guidelines for the Preparation of Extraction Plans Required under Conditions of Development Consents, Project Approvals and Mining Lease Conditions for Underground Coal Mining* (Version 5) (Draft Extraction Plan Guidelines) (Department of Planning and Environment [DP&E] and NSW Trade & Investment – Division of Resources and Energy [DRE], 2015).

The objectives of this Extraction Plan are to:

- provide detailed plans of Longwalls 8 to 10A;
- outline potential subsidence effects, subsidence impacts and environmental consequences of Longwalls 8 to 10A;
- describe the measures that will be implemented to ensure compliance with the subsidence 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 performance measures.

Longwalls 8 to 10A are located adjacent to Longwalls 1 to 7 at the North Wambo Underground Mine. The Extraction Plan Application Area for Longwalls 8 to 10A based on a 26.5 degree (°) angle of draw is shown on **Figure 3**. Extraction in Longwall 8a and 9 is complete and extraction of Longwall 10 commenced in January 2015. Pending approval of this Extraction Plan, secondary extraction of Longwall 10A is scheduled to commence in June 2015.

This Extraction Plan has been prepared by WCPL, with assistance from Mine Subsidence Engineering Consultants (MSEC), HydroSimulations (formerly Heritage Computing Pty Ltd), Advisian (formerly Evans & Peck), RPS Australia Asia Pacific (RPS) and Resource Strategies. The appointment of the team of suitably qualified and experienced persons has been endorsed by the Secretary of the DP&E.

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**.

1.1.1 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 Draft Extraction Plan Guidelines (DP&E and DRE, 2015).

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 22C of Schedule 4 of the Development Consent (DA 305-7-2003). The requirements of Condition 22C of Schedule 4 are summarised in **Table 1**, along with the relevant section of this Extraction Plan in which the requirements are addressed.

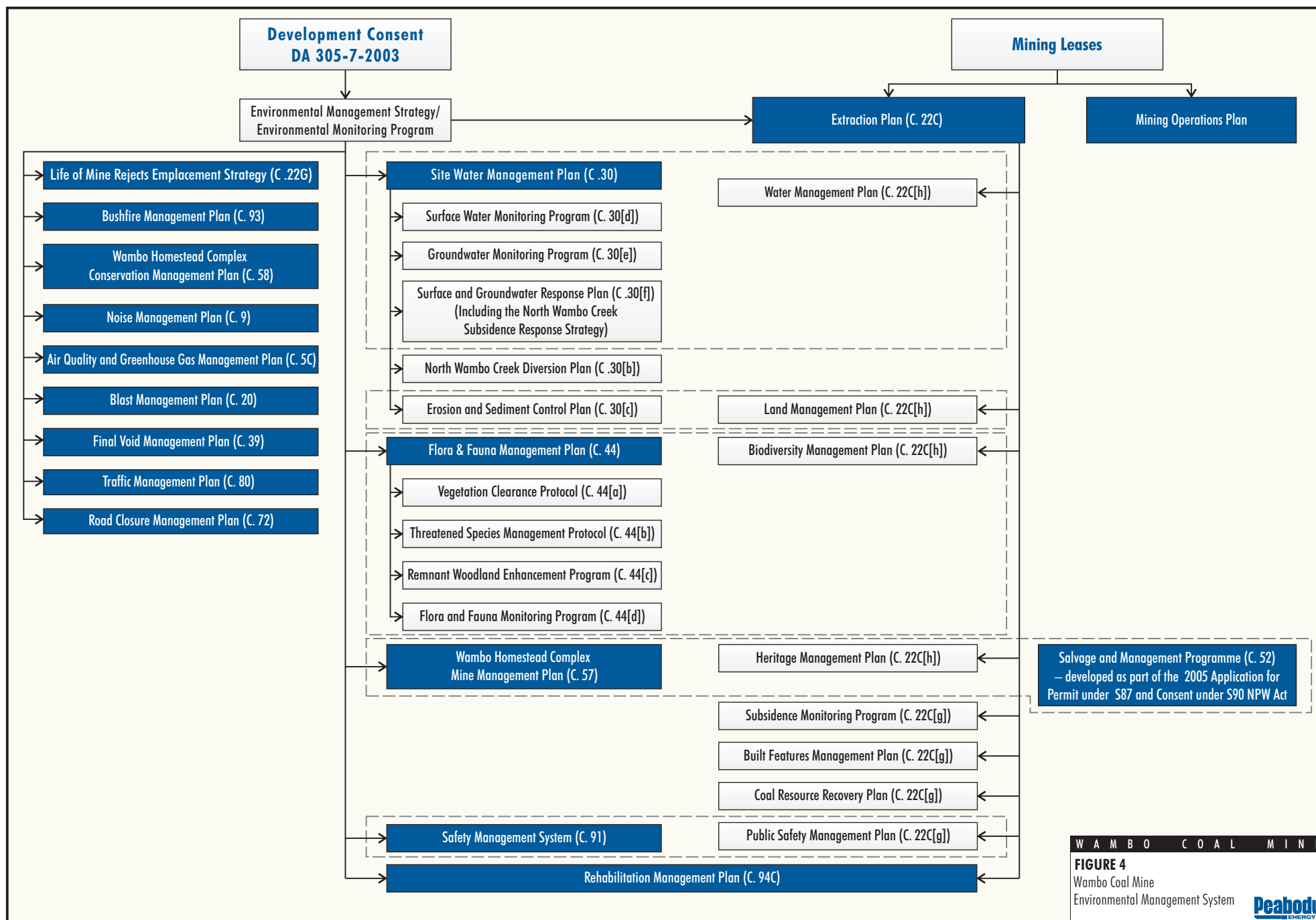


Table 1
Extraction Plan Requirements

Development Consent (DA 305-7-2003) Condition	Extraction Plan Reference
<p>Condition 22C of Schedule 4</p> <p>22C. The Applicant shall prepare and implement an Extraction Plan for the second workings within each seam to be mined to the satisfaction of the Secretary. Each Extraction Plan must:</p> <ul style="list-style-type: none"> a) be prepared by a team of suitably qualified persons whose appointment has been endorsed by the Secretary; b) be approved by the Secretary before the Applicant carries out any of the second workings covered by the plan; c) include detailed plans of the proposed first and second workings and any associated surface development; d) included detailed performance indicators for each of the performance measures in Tables 14A and 14B; e) provide revised predictions of potential subsidence effects, subsidence impacts and environmental consequences of the proposed second workings, incorporating any relevant information obtained since this consent; f) describe the measures that would be implemented to ensure compliance with the performance measures in Tables 14A and 14B, and manage or remediate any impacts and/or environmental consequences; g) include the following to the satisfaction of the DRE: <ul style="list-style-type: none"> • a coal resource recovery plan... • a subsidence monitoring program... • a Built Features Management Plan... • a Public Safety Management Plan... • appropriate revisions to the Rehabilitation Management Plan... h) include a: <ul style="list-style-type: none"> • Water Management Plan... • Biodiversity Management Plan... • Land Management Plan... • Heritage Management Plan... i) include a program to collect sufficient baseline data for future Extraction Plans. 	<p>This document</p> <p>Section 1.1 and Attachment 2</p> <p>Section 1.3 and Appendix G</p> <p>Section 3 and Appendices A, C, D, E and F</p> <p>Section 2.1 and Technical Reports 1 to 4</p> <p>Section 3 and Appendices A, B, C, D, E, F, H and I</p> <p>Appendix G</p> <p>Appendix H</p> <p>Appendix E</p> <p>Appendix F</p> <p>Section 3.7</p> <p>Appendix A</p> <p>Appendix C</p> <p>Appendix B</p> <p>Appendix D</p> <p>Attachment 3</p>

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

Mining Lease Conditions

Longwalls 8 to 10A are located within ML 1402, ML 1594 and CCL 743 (**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 North Wambo Underground Mine will be undertaken in accordance with the following licences, permits and leases:

- *Underground Mining Operations Plan March 2013 – September 2015 (MOP)* approved by under the conditions of the mining leases, and any approved amendment or replacement MOP.
- Environment Protection Licence (EPL) 529 issued under the *NSW Protection of the Environment Operations Act, 1997*, and any subsequent variations.
- Approval of the application under section 60 of the *NSW Heritage Act, 1977* for mining Longwalls 7 and 8 within the curtilage of the Wambo Homestead Complex (WHC) (2012/S60/30).
- Approval of the application under section 60 of the *NSW Heritage Act, 1977* for mining associated with Longwalls 9 and 10 within the curtilage of the WHC (2013/S60/30) and subsequent modification under section 65A of the *NSW Heritage Act, 1977* (2013/S65A/16).
- Consent #2222 issued under section 90 of the *NSW National Parks and Wildlife Act, 1974*.
- Water licences issued under the *NSW Water Act, 1912* and water access licences and approvals issued under the *NSW Water Management Act, 2000*.
- Mining and occupational health and safety related approvals granted by DRE and WorkCover NSW.

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, subsidence predictions, subsidence performance measures and subsidence management approach. |
| Section 2 | Describes the process of development of 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 | Describes the measures that will be implemented to mitigate, manage, remediate and monitor potential subsidence impacts and environmental consequences on natural and built features. |
| Section 4 | Addresses key elements of how the plan is going to be implemented, including an adaptive management approach, reporting, regular review and key responsibilities. |
| Section 5 | Lists the documents referred to in Sections 1 to 4 of this Extraction Plan. |
| Section 6 | Defines abbreviations, acronyms and terms used in Sections 1 to 4 of this Extraction Plan. |

- Attachment 1** Outlines the relevant requirements under the Development Consent (DA 305-7-2003), Draft Extraction Plan Guidelines (DP&E and DRE, 2015) 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.
- Attachment 5** Provides the Grouting Options Paper submitted as a condition of approval of the Extraction Plan for Longwall 7.

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

- Appendix A** Water Management Plan for Longwalls 8 to 10A (WMP).
- Appendix B** Land Management Plan for Longwalls 8 to 10A (LMP).
- Appendix C** Biodiversity Management Plan for Longwalls 8 to 10A (BMP).
- Appendix D** Heritage Management Plan for Longwalls 8 to 10A (HMP).
- Appendix E** Built Features Management Plan for Longwalls 8 to 10A (BFMP).
- Appendix F** Public Safety Management Plan for Longwalls 1 to 10A (PSMP).
- Appendix G** Coal Resource Recovery Plan (Including Plans 1 to 7) (CRRP).
- Appendix H** Subsidence Monitoring Program.
- Appendix I** Rehabilitation Management Plan.

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:

- Report 1** Subsidence Predictions and Impact Assessment.
- Report 2** Groundwater Impact Assessment Review.
- Report 3** Surface Water Impact Assessment Review.
- Report 4** Subsidence Risk Assessment.

1.3 MINE PLAN AND SCHEDULE

The currently approved orientation and footprint of the North Wambo Underground Mine was assessed as part of the North Wambo SEE (WCPL, 2005), the North Wambo Modification EA (WCPL, 2012) and the North Wambo Longwall 10A Modification EA (WCPL, 2014).

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

1.3.1 Mine Plan

Longwalls 8 to 10A will be extracted using retreating longwall mining methods for secondary extraction of panels with a 262.8 metre (m) void width. Construction of development main headings and gateroads are mined using continuous miners.

The Extraction Plan Application Area and proposed mine plan is shown in **Figure 3** and key dimensions summarised in **Table 2**.

Table 2
Key Mining Parameters

Dimension	Longwall 8	Longwall 9	Longwall 10	Longwall 10A
ROM Coal Extracted (Mt)	2.83	1.88	1.91	1.74
Gate Road Width (m)	5.4			
Gate Road Height (m)	2.5 – 2.8			
Maingate Chain Pillar Width (m)	16.8 (for single abutment loading) 26.2 (for double abutment loading) ¹	26.2	26.2	26.2
Tailgate Chain Pillar Width (m)	26.2			
Tailgate Chain Pillar Length (m)	94.6			
Longwall Void Width (m)	262.8			
Longwall Void Length (m)	Longwall 8a – 1,782 Longwall 8b – 812.5 ²	1,748.5	1,763.7	1,508.8
Extraction Height (m)	2.2 – 2.5	2.3 – 2.6	2.3 – 2.6	2.2 – 2.6
Depth of Cover (m)	60 – 240			

ROM = run-of-mine.

Mt = million tonnes.

¹ A portion of the Longwall 8 maingate pillar has been designed for double abutment loading for Longwall 9.

² Excludes the Wambo Homestead Exclusion Zone (WHEZ) as shown in **Figures 1 and 2** and discussed in **Section 3.7**.

Detailed mine layout drawings are provided in **Appendix G** (Coal Resource Recovery Plan), including the Plans 1 to 7 required under the Draft Extraction Plan Guideline. **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 (**Figure 5**). A summary of the coal measure stratigraphy underlying the Wambo Coal Mine area is provided in **Figure 5**.

SUPERGROUP	GROUP	SUBGROUP	FORMATION	SEAM	
SINGLETON SUPERGROUP	NARRABEEN GROUP	WIDDEN BROOK CONGLOMERATE			
	NEWCASTLE COAL MEASURES ¹	GLEN GALLIC SUBGROUP	Greigs Creek Coal		
			Redmanvale Creek Formation		
			Dights Creek Coal		
		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	Whybrow Seam ²	
			Althorpe Formation		
			Malabar Formation	Redbank Creek Seam ²	
				Wambo Seam ²	
				Whynot Seam ²	
				Blakefield Seam	
			Mount Ogilvie Formation	Glen Munro Seam	
				Woodlands Hill Seam	
			Milbrodale Formation		
			Mount Thorley Formation	Arrowfield Seam ²	
				Bowfield Seam ²	
				Warkworth Seam ³	
			Fairford Formation		
			Burnamwood Formation	Mount Arthur Seam	
				Piercefield Seam	
				Vaux Seam	
				Broonie Seam	
				Bayswater Seam	
		ARCHERFIELD SANDSTONE			
		VANE SUBGROUP	Bulga Formation		
			Foybrook Formation		
			Saltwater Creek Formation		

¹ Previously known as the Wollombi Coal Measures.

² Coal reserves currently, previously and proposed to be mined at the Wambo Coal Mine.

³ Coal reserves to be mined by the Wambo Coal Mine where the upper three plies of the Warkworth Seam combine with the two plies of the Bowfield Seam.

After: DMR (1993)

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

FIGURE 5
Stratigraphy of the
Wambo Coal Mine Area



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 (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).

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

- Whybrow Seam;
- Redbank Creek Seam;
- Wambo Seam;
- Whynot Seam;
- Arrowfield Seam; and
- Bowfield 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 North Wambo Underground Mine mines the Wambo Seam which produces a low ash thermal coal (WCPL, 2003). ROM coal is crushed and washed at the Wambo coal handling and preparation plant. Product coal from the North Wambo Underground Mine is considered suitable for export and domestic markets.

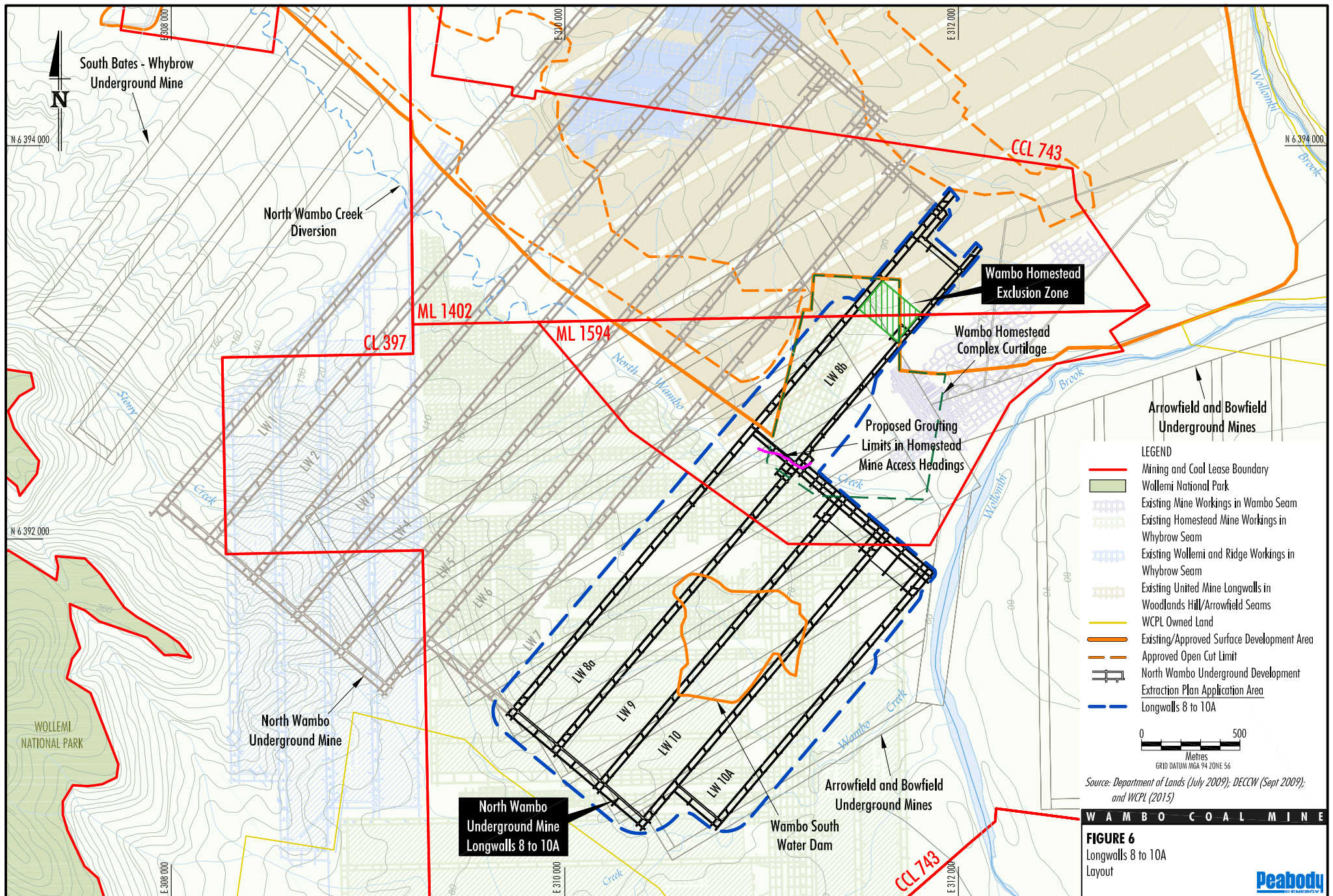
The North Wambo Underground Mine mines the Wambo Seam which produces a low ash thermal coal (WCPL, 2003). ROM coal is crushed and washed at the Wambo Coal Mine coal handling and preparation plant. Product coal from the North Wambo Underground Mine is considered suitable for export and domestic markets.

The overburden of the Longwalls 8 to 10A Application Area consists of gently, south-west dipping sedimentary strata comprising medium strength thin to medium interbedded sandstone and siltstone with some thickly bedded sandstone units (Ditton Geotechnical Services [DgS], 2012a; Mine Subsidence Engineering Consultants [MSEC], 2014a; MSEC, 2014b). Low strength carbonaceous mudstone, mudstone and coal immediately overly and underlie the coal seams present in the overburden in the Wambo Coal Mine area (DgS, 2012a).

Previous and Future Mining

There are a number of previous workings in the vicinity of Longwalls 8 to 10A including **(Figure 6)**:

- Bord and pillar workings in the Wambo Seam to the south-east of Longwall 8.
- Bord and pillar workings and extracted longwall panels associated with the Homestead Mine and the Wollemi Mine in the Whybrow Seam, located approximately 45 to 95 m above the Wambo Seam.
- Extracted longwall panels associated with the United Mine in the Woodlands Hill/Arrowfield Seam (under a lease swap arrangement), located approximately 170 to 220 m below the Wambo Seam.



Longwall 8 is located within the inrush control zone associated with the historic bord and pillar workings in the Wambo Seam. Relevant monitoring and management measures are detailed in the Inrush Management Plan. Management measures include maintaining a geotechnically-stable barrier between Longwall 8 and the previous workings, drilling to define the integrity of the barrier and dewatering of the historic workings.

Longwalls 8 to 10A underlie previous workings of the Homestead Mine in the Whybrow Seam. Water has accumulated in these overlying workings and therefore, the inrush of water to Longwalls 8 to 10A resulting from hydraulic connection with the previous workings is considered to be a potential hazard. For this reason dewatering of the previous workings in the Whybrow Seam is undertaken in advance of active mining as a safety measure.

The extraction of Longwalls 8 to 10A is expected to result in goaf reactivation of the previous workings of the Homestead Mine in the overlying Whybrow Seam. Multi-seam interaction potential associated with the extraction of longwalls in the Wambo Seam has been assessed by DgS (2012a). The assessment found that it is unlikely that multi-seam interaction effects will cause instability of the existing standing pillars (DgS, 2012a).

Notwithstanding, sections of the previous workings of the Homestead Mine in the Whybrow Seam will be bulk filled with low strength grout. Further detail regarding the bulk filling is provided in **Section 1.6.2**.

1.3.2 Mine Schedule

The North Wambo Underground Mine operates seven days a week, 24 hours a day on a rotating shift basis. At the date of this document, extraction of Longwalls 1 to 7, 8a and 9 is complete, with extraction of Longwall 10 underway.

The proposed sequence of mining under this Extraction Plan and anticipated start and completion dates are summarised in **Table 3**.

Table 3
Proposed Mining Schedule (Secondary Extraction)

Longwall	Estimated Start Date	Estimated Duration	Estimated Completion Date
Longwall 8a	February 2014 (actual)	5 months	July 2014 (actual)
Longwall 9	August 2014 (actual)	5 months	January 2015 (actual)
Longwall 10	January 2015 (actual)	4 months	June 2015
Longwall 10A	June 2015	5 months	October 2015
Longwall 8b	November 2015	3 months	January 2016

1.4 SUBSIDENCE PREDICTIONS

Predictions of subsidence effects for Longwalls 8 and 10A are provided by MSEC (**Technical Report 1**). The process for the development of these predictions is described in **Section 2.1.1**.

Predicted Conventional Subsidence Movements

The maximum incremental and cumulative subsidence, tilts and strains predicted for Longwalls 8 to 10A are summarised in **Table 4**. **Figure 7** provides incremental subsidence contours for Longwalls 8 to 10A at the North Wambo Underground Mine.

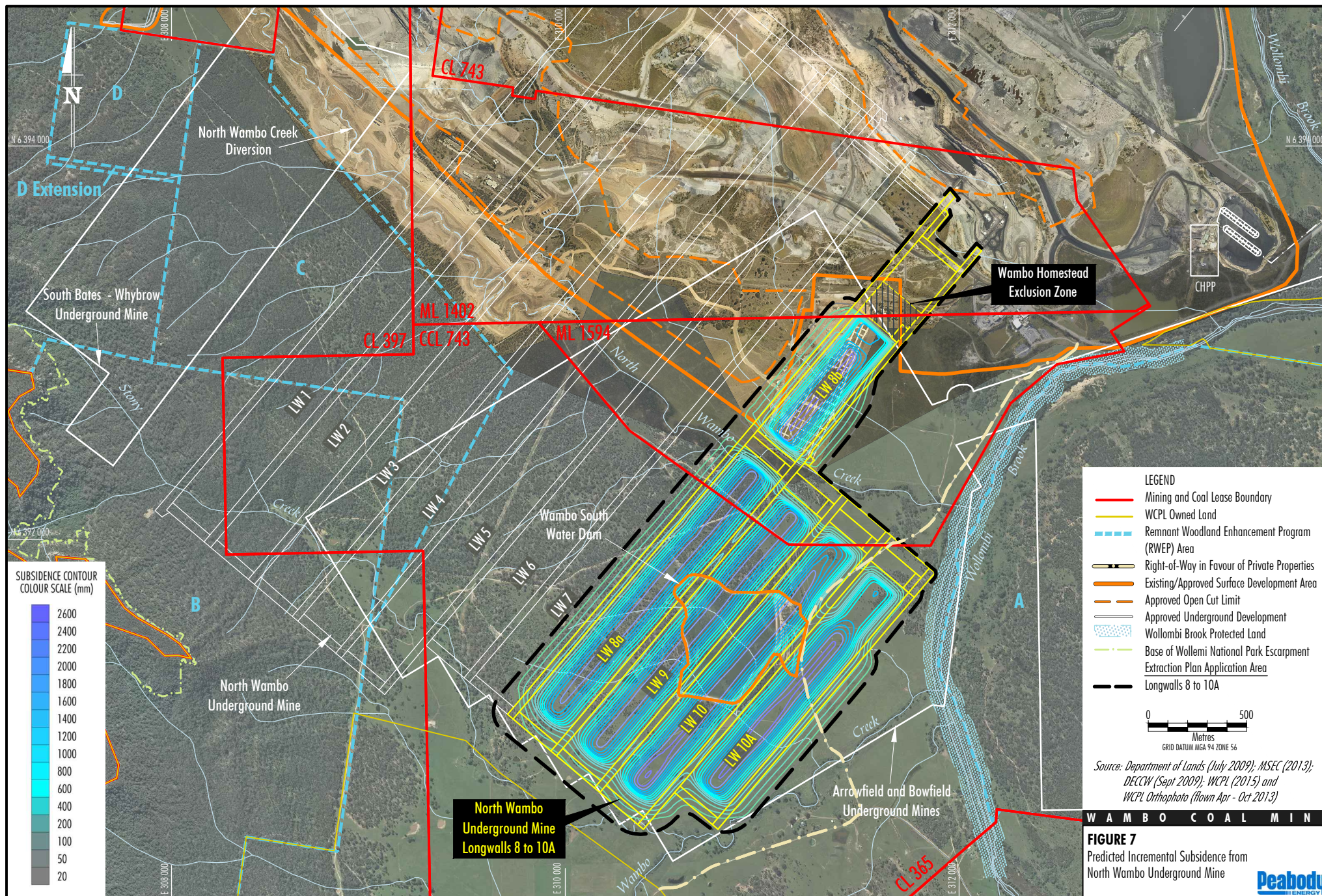


Table 4
Maximum Predicted Incremental Subsidence, Tilts and Curvatures for Longwalls 8 to 10A

Subsidence Parameter	Longwall 8	Longwall 9	Longwall 10	Longwall 10A
Maximum Subsidence (m)	2.4	2.3	2.6	2.55
Maximum Tilt (mm/m)	75	50	50	50
Maximum Hogging Curvature (km ⁻¹)	> 3.0	2	2	2
Maximum Sagging Curvature (km ⁻¹)	> 3.0	2	2	2

Source: After MSEC (2014a, 2014b).

mm/m = millimetres per metre.

km⁻¹ = per kilometre.

Non-Conventional Ground Movements

MSEC (**Technical Report 1**) considers it is likely non-conventional ground movements will occur due to near surface geological features and multi-seam mining conditions, which are often accompanied by elevated tilts, curvatures and strains.

In most cases, it is not possible to predict the exact locations or magnitudes of the non-conventional anomalous movements due to near surface geological conditions. However, MSEC (**Technical Report 1**) considers non-conventional ground movements are expected to be similar to those previously observed due to the extraction of the existing longwalls in the Wambo Seam at the North Wambo Underground Mine. 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.

Predicted Far-Field Displacement Movements

Based on an empirical model for the Newcastle Coalfield, DgS (2012a) concluded that measurable far-field displacement movements (i.e. greater than 20 millimetres [mm]) may occur for distances up to 3 to 4 times the cover depth (i.e. 150 m to 720 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 proposed 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 8 to 10A.

Timing and Duration of Subsidence Impacts

Based on subsidence monitoring data at the North Wambo Underground Mine to date, the requirement for remediation has been generally confined to gravel roads. 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.

1.5 SUBSIDENCE IMPACT PERFORMANCE MEASURES

The statutory requirements relevant to this Extraction Plan are summarised in **Section 1.1.1**. In accordance with of the Development Consent (DA 305-7-2003) (Condition 22 and 22A, Schedule 4), WCPL must ensure that there is no exceedance of the subsidence impact performance measures outlined in **Table 5**. This Extraction Plan has been developed to meet these performance measures.

Table 5
Subsidence Impact Performance Measures

Feature	Performance Measure
Wollombi Brook	Negligible impact. Controlled release of excess site water only in accordance with EPL requirements.
Wollemi National Park	Negligible subsidence impacts. Negligible environmental consequences.
Warkworth Sands Woodland Community	Minor cracking and ponding of the land surface or other impact. 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 impact. Negligible environmental consequences.
Other threatened species, populations or communities	Minor cracking and ponding of the land surface or other impact. 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	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	No additional risk.

Source: After Tables 14A and 14B of the Development Consent (DA 305-7-2003).

Applications for mining within the curtilage of the WHC have been submitted under section 60 of the NSW *Heritage Act, 1977* and approved by the NSW Heritage Council, as required by Condition 57 of Schedule 4 of the Development Consent (DA 305-7-2003) (2012/S60/30 and 2013/S60/30). Based on the assessment of the potential impacts and mitigation measures in relation to the proposed underground mining, Godden Mackay Logan (2012, 2013) concluded that there will be **no adverse effects on the State heritage values** of the WHC.

1.6 SUBSIDENCE MANAGEMENT APPROACH

Potential environmental consequences from mining of Longwalls 8 to 10A will be managed in accordance with the relevant requirements of the Development Consent (DA 305-7-2003) and other approvals, through:

- **Mine Design** – Longwall 8 will include a WHEZ (Wambo Homestead Exclusion Zone) to avoid/mitigate potential impacts on the WHC (**Section 1.6.1**).
- **Subsidence Mitigation** – sections of previous Homestead Mine workings located in the Whybrow Seam will be bulk filled to increase the stability of these workings (**Section 1.6.2**).
- **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 3.8**).
- **Remediation** – remediation will be conducted of any subsidence impacts or environmental consequences detected by subsidence monitoring, 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 3.1 to 3.7**).

- **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 4.1**), including consideration of identified potential contingency measures (**Sections 3.1, 3.3, 3.4 and 3.5**).
- **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 4.1 to 4.5**).

1.6.1 Wambo Homestead Exclusion Zone

Longwall 8 has been designed with a WHEZ to avoid/mitigate potential impacts on the WHC (**Figure 8**). This layout was also approved through the application for mining within the curtilage of the WHC under section 60 of the NSW *Heritage Act, 1977* (2012/S60/30).

The WHEZ was developed based on selecting an appropriate angle of draw to limit key subsidence effects (tilt, curvature and horizontal strain) to within tolerable limits. Due to the range of building sizes, structure type (i.e. masonry or timber frame), measured subsidence effects to date and existing condition, the WHEZ is based on the minimum set back distances from Longwall 8 presented in **Table 6** and the resulting predicted levels of impact risk.

Table 6
Wambo Homestead Exclusion Zone Dimensions and Impact Risk to Buildings

Building No. (See Figure 8)	Minimum Angle of Draw (for 67 m of cover)	Minimum Setback Distance (m)	Impact Risk to Buildings ¹
	Longwall 8	Longwall 8	
1, 2, 3, 4, 5, 7	35°	47	Negligible
6, 9	35°	47	Slight
8	35°	47	Slight

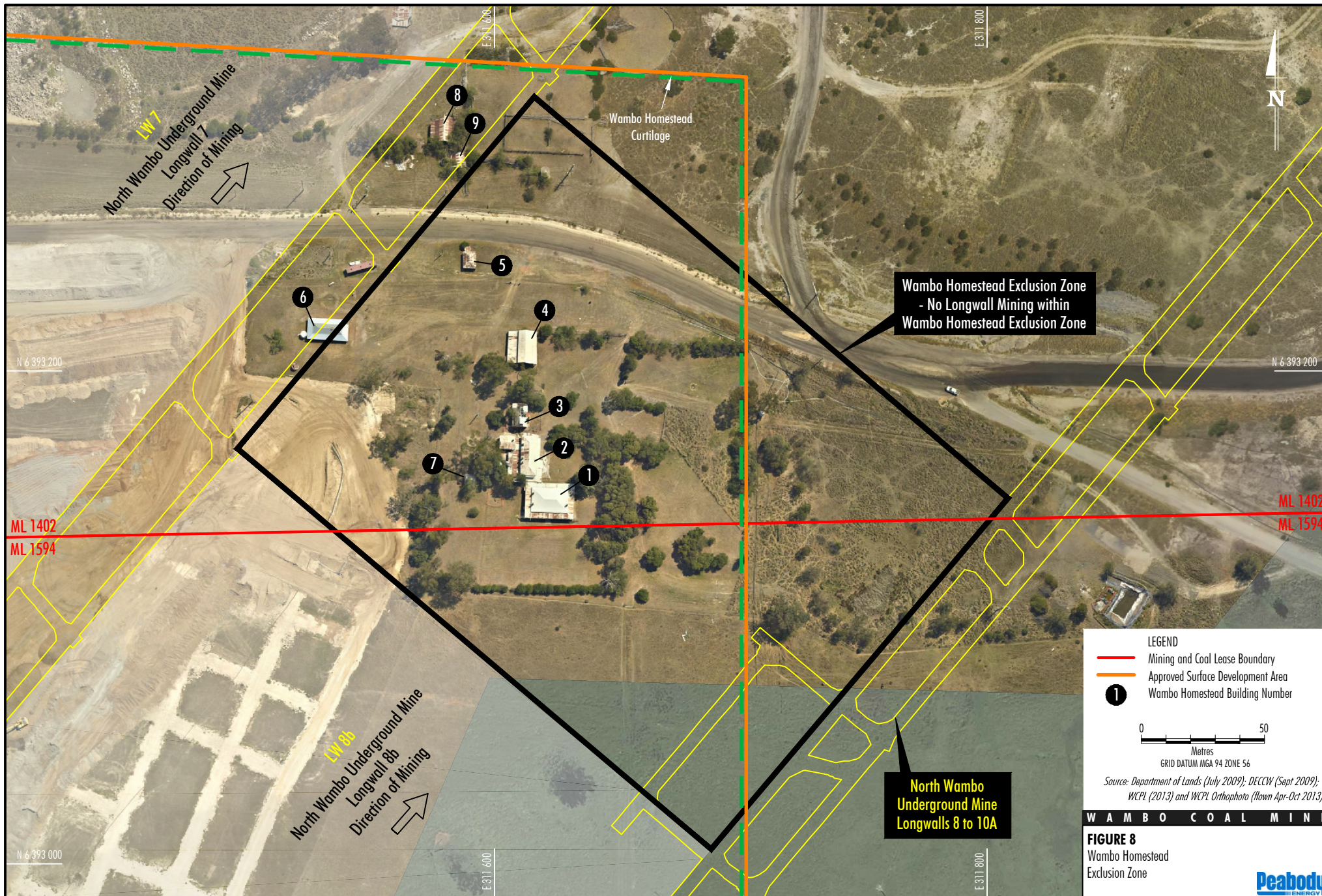
Source: After DgS (2012a).

¹ Impact risk is based on bulk fill (low strength grout) placed to full roadway height around two pillars in the Whybrow Seam that are directly below Building No. 6 (Stud Master's Cottage) (**Section 1.6.2**).

1.6.2 Bulk Fill of the Previous Homestead Mine Workings

Subsidence management measures will include bulk fill of sections of the previous Homestead Mine workings located in the Whybrow Seam to increase the stability of these workings. The bulk filling will be undertaken within historical workings of the Homestead Mine which underlie alluvium above Longwalls 7 and 8 (**Figure 6**). The bulk filling will be completed prior to secondary extraction of Longwall 8 within these areas. WCPL has implemented an internal monitoring process so that bulk filling will be completed on schedule.

Bulk filling is being undertaken primarily as a mitigation measure to minimise the potential for flooding due to chimney failure and pot hole development resulting from failure of remnant pillars within the Homestead Mine workings. In addition, bulk fill of some of the previous Homestead Mine workings is a requirement of WCPL's approval to mine within the curtilage of the WHC.



The method being undertaken is outlined below:

- Boreholes are drilled from the surface into the Homestead Mine voids.
- Boreholes are cased and capped for the duration of the project to reduce potential water inflow to the Homestead Mine voids.
- The seal and backfill material is mixed and prepared at the surface.
- To ensure containment of the backfill a sealer material is pumped into the Homestead Mine voids through the boreholes.
- After the mine is sealed, a low strength grout backfill mixture is injected via the boreholes into the Homestead Mine voids.
- The backfill mixture disperses within the Homestead Mine voids to a designated level.
- On completion the boreholes are surveyed and assessed to ensure the relevant Homestead Mine voids are adequately filled and stabilised.

In accordance with the Extraction Plan approval for Longwall 7 (dated 16 May 2013), WCPL completed a Grouting Options Paper that explored the costs and benefits of extending the current proposed bulk filling program and submitted the document to the DP&I and the DRE on 28 August 2013.

Based on the Grouting Options Paper, WCPL and the DP&I (now DP&E) agreed to extend the bulk fill of the Homestead workings compared to the area described in the Extraction Plan for Longwalls 7 and 8. The agreed limit of bulk fill in the Homestead Mine workings is shown on **Figure 6**.

The Grouting Options Paper is presented in **Attachment 5**.

2 DEVELOPMENT OF THE EXTRACTION PLAN

The potential subsidence impacts of Longwall 10A was assessed in the North Wambo Longwall 10A Modification EA. Subsequent to the North Wambo Longwall 10A Modification EA, the layout of Longwall 10A has been revised to shorten the commencing end by 245 metres. The shortened length of Longwall 10A has been considered in **Technical Reports 1 to 4**. The “Extraction Plan layout” refers to Longwall 10A with the shortened commencing end as presented in this Application.

2.1 REVIEW OF PREDICTIONS

The predicted subsidence effects, subsidence impacts and environmental consequences of the North Wambo Underground Mine have been assessed in the EIS (WCPL, 2003), the North Wambo SEE (WCPL, 2005), the North Wambo Modification EA (WCPL, 2012) and North Wambo Longwall 10A Modification EA (WCPL, 2014) (**Section 1.1**). This section describes the process of reviewing and updating these predictions to consider the Extraction Plan layout.

2.1.1 Predicted Subsidence Effects and Subsidence Impacts

Detailed subsidence assessments for Longwalls 8, 9 and 10 have been provided in support of previous revisions of this Extraction Plan, with the outcomes of these assessments incorporated into the management plans in **Appendices A to F**.

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 the North Wambo Underground Mine, as well as from other nearby collieries in the Hunter Coalfield.

As part of the North Wambo Longwall 10A Modification EA, MSEC (2014b) reviewed subsidence monitoring data along a number of monitoring lines above the North Wambo Underground Mine, including monitoring data up to the completion of Longwall 7. These longwalls have been extracted beneath the Homestead/Wollemi workings in the Whybrow Seam and above the United Mine in the Woodlands Hill/Arrowfield Seam.

Based on the review, MSEC (2014b) concluded:

- The standard Incremental Profile Method for the Hunter Coalfield provides reasonable predictions of subsidence, tilt and curvature for single-seam mining conditions at the North Wambo Underground Mine (panel width-to-depth ratios of 2.0 or greater).
- The observed profiles of subsidence, tilt and curvature along the monitoring lines reasonably matched those predicted using the calibrated Incremental Profile Method for multi-seam conditions and the calibrated Incremental Profile Method for multi-seam conditions provides reasonable predictions of subsidence, tilt and curvature.

Comparison with Previous Predictions of Subsidence Effects

Predicted subsidence parameters for Longwall 10A were provided in support of the North Wambo Longwall 10A Modification EA. MSEC has prepared revised subsidence predictions for the Extraction Plan layout as described in **Technical Report 1** and shown on **Figure 7**.

The maximum predicted incremental and cumulative subsidence effects predicted by MSEC (**Technical Report 1**) are the same as those previously provided in the North Wambo Longwall 10A Modification EA. The extent of predicted subsidence has reduced with the reduction in the surface area above the longwall by 6.1 hectares.

Predicted Subsidence Impacts

MSEC (**Technical Report 1**) provides a revised assessment of subsidence impacts based on the Extraction Plan layout for Longwall 10A. **Table 7** presents a summary of the predicted subsidence impacts on key features in the vicinity of Longwall 10A.

Table 7
Comparison of Previously Described Impacts and Revised Impacts for Longwall 10A

Feature/Environmental Aspect	Impacts of Longwall 10A Described in the North Wambo Modification EA	Potential Impacts Associated with Extraction Plan Layout
Wollombi Brook	Wollombi Brook is located outside the extent of subsidence from Longwall 10A. Wollombi Brook is not expected to experience any measurable tilts, curvatures or strains.	No change. The mining of longwall panels will continue to be constrained by the subsidence exclusion zone limited to an angle of 26.5° from the vertical to a 40 meter buffer from the Wollombi Brook high bank.
Wambo Creek and Stony Creek	Sections of Wambo and Stony Creeks in the Modification area may be vulnerable to scour and erosion as a result of subsidence from approved mining and the proposed Longwall 10A.	The revised maximum predicted total subsidence on Wambo Creek and Stony Creek due to the extraction of Longwalls 8 to 10A is 50 mm. Wambo Creek and Stony Creek are not expected to experience any significant tilts, curvatures or strains due to the extraction of Longwalls 8 to 10A. The predicted changes in grade are very small (i.e. 0.1 % or less) and it is unlikely that any significant surface cracking will occur along the alignments of Wambo Creek or Stony Creek due to the Longwalls 8 to 10A.
Wambo South Water Dam	The potential subsidence impacts on Wambo South Water Dam will be managed in accordance with the requirements of the Dams Safety Committee to maintain safety.	No change.
Aboriginal Cultural Heritage	Incremental subsidence from the Modification will result in a negligible to low additional risk to Aboriginal cultural heritage sites.	The predicted subsidence parameters for Sites 40 and 363 reduce as a result of the change the longwall commencing end of Longwall 10A.

Source: After MSEC (**Technical Report 1**).

2.1.2 Potential Environmental Consequences

Detailed discussion of potential environmental consequences is provided in the component management plans in **Appendices A to F** and summarised in **Section 3**.

A review of recent monitoring data was conducted as part of the recent North Wambo Longwall 10A Modification EA.

HydroSimulations (2015) (**Technical Report 2**) and Advisian (2015) (**Technical Report 3**) conducted a review of the potential environmental consequences to groundwater and surface water based on the Extraction Plan layout.

HydroSimulations (2015) concluded all predicted groundwater impacts would be less than, or similar to, the potential impacts to groundwater identified in the North Wambo Longwall 10A Modification EA.

The potential impacts on Wambo Creek and Stony Creek will be materially less than described in the North Wambo Longwall 10A Modification EA. Advisian (2015) concluded it is unlikely that extraction of Longwalls 8 to 10A will result in adverse impacts on Wambo Creek and Stony Creek. Therefore, mitigation works are unlikely to be required for the Extraction Plan layout to manage the risk of any change in sediment movement along the creek or upstream migration of head-cuts along both creeks (Advisian, 2015).

2.2 RISK ASSESSMENT

A Subsidence Risk Assessment has been undertaken to identify subsidence impacts with high risk levels and/or potentially severe consequences.

A risk assessment workshop was conducted in October 2012 for Longwalls 7 and 8, and was facilitated by a risk assessment specialist and attended by relevant WCPL personnel and technical specialists (Safe Productions Solutions, 2012). A second risk assessment workshop was conducted in October 2013 to review the potential aspects and impacts of including Longwalls 9 and 10 (Safe Productions Solutions, 2014).

A further risk assessment workshop was conducted on 30 October 2014 to identify issues relating to Longwall 10A, identify issues that were no longer relevant (e.g. related to the completed extraction in Longwall 7) and review the risk mitigation measures based on the latest available information (Operational Risk Mentoring, 2015).

With the implementation of the proposed risk treatment measures, all of the potential loss scenarios were ranked “Medium – As Low As Reasonably Practicable” or “Low” by the risk assessment team (**Technical Report 4**).

A summary of the key potential consequences/hazards associated with Longwalls 8 to 10A, as identified in the risk assessment workshops is provided in **Table 8**. The table also provides a cross-reference to where these key potential consequences/hazards have been addressed in the Extraction Plan.

Table 8
Key Potential Consequences/Hazards Identified by the Subsidence Risk Assessment

Subject Area	Potential Consequence Hazard	Extraction Plan Reference
Natural Features	Environmental/subsidence impacts on Wambo Creek (in particular the confluence area with Stony Creek) and potential for erosion. ¹	Section 3.1 and WMP (Appendix A)
	Potential for increased erosion in Wambo and Stony Creeks resulting in potential changes in downstream water quality. ¹	
	Potential for changes in alignment of Wambo and Stony Creeks above Longwall 10A. ¹	
	Environmental consequences associated with water flow and quality changes in Stony Creek (including changes to channel stability) resulting from subsidence impacts associated with the extraction of Longwalls 8 to 10A.	
	Reduced base flow to Wambo Creek resulting from a lowering of the water table associated with the extraction of Longwalls 8 to 10A.	
	A change in flood regimes or extent of potential inundation due to subsidence resulting from the extraction of Longwalls 8 to 10A.	
	Failure of the monitoring program to detect and respond to an impact on the groundwater system.	
	Mine subsidence impacts due to the extraction of Longwalls 8 to 10A on riparian vegetation of Stony Creek resulting in environmental consequences.	
	Reduced groundwater user access to hard rock groundwater supply due to a lowering of the water table associated with the extraction of Longwalls 8 to 10A.	
	Erosion and geomorphological impacts on North Wambo Creek above predicted impacts.	
	Potential for Longwall 10A to reactivate subsidence cracking which required historic repairs to Wambo Creek over Panels 9 and 9A in the Homestead Mine (Whybrow Seam). ²	
	Potential for impacts on groundwater users or baseflow as a result of drawdown effects from dewatering in the Whybrow Seam.	
Farm Land and Facilities	Potential subsidence effects on the right-of-way (road) in favour of several private properties.	Section 3.5 and BFMP (Appendix E)
Heritage	Potential fracturing in sandstone outcrops adjacent to Wollombi Brook.	Section 3.4 and HMP (Appendix D)
	Mine subsidence impacts on items of known Aboriginal heritage.	
Mine Infrastructure	Potential impact on the integrity of the Wambo South Water Dam wall.	Section 3.5 and BFMP (Appendix E)
	Temporary loss of capacity of water storage in the Wambo South Water Dam due to fracturing to the water storage floors resulting from extraction of Longwalls 8 to 10A.	
	Subsidence impacts to WCPL powerlines resulting from the extraction of Longwalls 8 to 10A.	
	Structural damage to wells and bores close to the mine footprint (including old United Mine gas bores).	

Table 8 (Continued)
Key Potential Consequences/Hazards Identified by the Subsidence Risk Assessment

Subject Area	Potential Consequence Hazard	Extraction Plan Reference
Other	Failure of timing or effectiveness of Homestead backfill project (grouting of historic Homestead Mine workings in the Whybrow Seam).	Section 1.6.2
	Interaction of Wambo Seam fractured zone with overlying Whybrow Seam fractured zone result in increased water make in the underground workings.	Coal Resource Recovery Plan (Appendix G)

Source: After Operational Risk Mentoring (**Technical Report 4**).

¹ The risk assessment workshop was completed prior to the shortening of the commencing end of Longwall 10A. As noted in **Technical Report 4**, it is considered that no changes to the risk rankings are required as the change in longwall layout will result in a reduction in environmental impact. Although the subsidence risks to Wambo Creek and Stony Creek are reduced, these issues have been maintained in the list of key potential consequences/hazards for completeness.

² Subsequent to the risk assessment workshop, records of remediation works on Wambo Creek were reviewed. Previous remediation grouting works on Wambo Creek are located outside the angle of draw of Longwall 10A.

2.3 CONSULTATION

Consultation has been conducted for the Extraction Plan in accordance with the requirements of the Development Consent (DA 305-7-2003) and in consideration of the Draft Extraction Plan Guidelines. Consultation with relevant stakeholders is described further below.

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

2.3.1 Government Agencies

A summary of the consultation with government agencies and the key issues raised is provided in **Table 9**. Draft management plans were distributed for comment as required under Condition 22C of the Development Consent (DA 305-7-2003), as summarised in **Table 10**. There are no 'affected public authorities' relevant to the Longwalls 8 to 10A Application Area, therefore the LMP was not distributed for comment.

Table 9
Summary of Consultation with Government Agencies

Agency	Consultation Conducted	Key Issues Raised
DP&E	<ul style="list-style-type: none"> 14 September 2012 – briefing email and invitation to risk assessment workshop. 19 September 2012 – Endorsement of Extraction Plan team. 1-6 November 2012 – draft BMP, WMP and HMP provided. 18 December 2012 – Extraction Plan for Longwalls 7 and 8 lodged. 28 August 2013 – Grouting Options Paper lodged. 25 October 2013 – Endorsement of Extraction Plan team. 18 December 2013 – revised draft BMP and HMP provided. 18 December 2013 – letter describing proposed changes to Longwalls 9 and 10. 10 January 2014 – revised draft WMP provided. 	<ul style="list-style-type: none"> Extent of bulk fill in the Homestead Mine workings (Attachment 5).

Table 9 (Continued)
Summary of Consultation with Government Agencies

Agency	Consultation Conducted	Key Issues Raised
DP&E (cont.)	<ul style="list-style-type: none"> 22 February 2014 – Extraction Plan for Longwalls 7 to 10 lodged. September 2014 – April 2015 – consultation on the North Wambo Longwall 10A Modification EA. 12 March 2015 – revised draft BMP and HMP provided. 13 April 2015 – Endorsement of Extraction Plan team. 	
DRE	<ul style="list-style-type: none"> 14 September 2012 – briefing email and invitation to risk assessment workshop. 9 October 2012 – briefing provided. 25 October 2012 – site inspection and summary of subsidence predictions. 1 November 2012 – draft BMP provided. 8 November 2012 – draft Subsidence Monitoring Program provided. 23 November 2012 – meeting to discuss the draft BMP. 26 November 2012 – letter advising that the DRE has assessed the BMP and has no objection to the performance and contingency measures. 18 December 2012 – Extraction Plan for Longwalls 7 and 8 lodged. 28 August 2013 – Grouting Options Paper lodged. 30 December 2013 – draft Subsidence Monitoring Program provided. 22 February 2014 – Extraction Plan for Longwalls 7 to 10 lodged. 26 February 2014 – site inspection for the Extraction Plan. May 2014 – consultation on first workings for Longwall 10A. September – December 2014 – consultation on the North Wambo Longwall 10A Modification EA. 2 April 2015 – draft Subsidence Monitoring Program provided. 	<ul style="list-style-type: none"> Multi-seam subsidence monitoring data (Technical Report 1). South Wambo Dam NSW Dams Safety Committee (DSC) approval and interaction with Chief Inspector of Mines approval (Appendix E). Interaction of the WHC with the BFMP (Appendix E). Interaction of subsurface fracturing and alluvium (Appendix A and Technical Reports 1 and 2). Reporting timing and framework (Section 4.2).
NSW Environment Protection Authority (EPA)	<ul style="list-style-type: none"> 14 September 2012 – briefing email and invitation to risk assessment workshop. 6 November 2012 – draft WMP provided. 9 November 2012 – letter advising that the EPA will not comment on the WMP. 18 December 2012 – Extraction Plan for Longwalls 7 and 8 provided to EPA. 10 January 2014 – revised draft WMP provided. 22 February 2014 – Extraction Plan for Longwalls 7 to 10 provided to EPA. 	<ul style="list-style-type: none"> No issues raised.

Table 9 (Continued)
Summary of Consultation with Government Agencies

Agency	Consultation Conducted	Key Issues Raised
NSW Office of Environment and Heritage (OEH)	<ul style="list-style-type: none"> 14 September 2012 – briefing email and invitation to risk assessment workshop. 1 November 2012 – draft BMP provided. 6 November 2012 – draft HMP provided. 30 November 2012 – comments on HMP provided. 18 December 2012 – Extraction Plan for Longwalls 7 and 8 provided to OEH. 18 December 2013 – revised draft BMP and HMP provided. 17 January 2014 – comments on BMP provided. 20 January 2014 – letter advising that the OEH has reviewed the HMP and is satisfied that the management measures proposed are adequate and appropriate. 22 February 2014 – Extraction Plan for Longwalls 7 to 10 provided to OEH. September – December 2014 – consultation on the North Wambo Longwall 10A Modification EA. 12 March 2015 – revised draft BMP and HMP provided. 	<ul style="list-style-type: none"> No comments on revised HMP. Monitoring of vegetation structure and composition above longwall mining areas (Appendix C and Section 3.3). Monitoring of impacts on the Wollemi National Park (Appendix C and Section 3.3).
NSW Office of Water (NOW)	<ul style="list-style-type: none"> 14 September 2012 – briefing email and invitation to risk assessment workshop. 17 October 2012 – on-site briefing. 18 December 2012 – Extraction Plan for Longwalls 7 and 8 provided to NOW. 10 January 2014 – revised draft WMP provided. 22 February 2014 – Extraction Plan for Longwalls 7 to 10 provided to NOW. September 2014 – March 2015 – consultation on the North Wambo Longwall 10A Modification EA. 	<ul style="list-style-type: none"> Subsidence predictions where longwall panels are not parallel with Whybrow workings (Technical Report 1). Source and quantity of water in old underground workings (Appendix A). Drawdown impacts on alluvium (Appendix A and Technical Report 2). Subsidence impacts on Wambo and Stony Creeks (Appendix A and Technical Report 3).
Department of Primary Industries – Fisheries (DPI-Fisheries)	<ul style="list-style-type: none"> 14 September 2012 – briefing email and invitation to risk assessment workshop. 1 November 2012 – draft BMP provided. 7 November 2012 – letter advising that DPI-Fisheries has no objections to the BMP and the proposed management and contingency measures proposed are adequate. 18 December 2012 – Extraction Plan for Longwalls 7 and 8 provided to DPI-Fisheries. 22 February 2014 – Extraction Plan for Longwalls 7 to 10 provided to DPI-Fisheries. September – December 2014 – consultation on the North Wambo Longwall 10A Modification EA. 	<ul style="list-style-type: none"> No issues raised.

Table 9 (Continued)
Summary of Consultation with Government Agencies

Agency	Consultation Conducted	Key Issues Raised
NSW Mine Subsidence Board (MSB)	<ul style="list-style-type: none"> 14 September 2012 – briefing email and invitation to risk assessment workshop. 10 October 2012 – attendance at morning session of risk assessment workshop. 18 December 2012 – Extraction Plan for Longwalls 7 and 8 provided to MSB. 22 February 2014 – Extraction Plan for Longwalls 7 to 10 provided to MSB. 	<ul style="list-style-type: none"> Consideration of impacts on Ausgrid-owned infrastructure (now decommissioned and removed).
NSW Dams Safety Committee (DSC)	<ul style="list-style-type: none"> 14 September 2012 – briefing email and invitation to risk assessment workshop. 23 November 2012 – briefing provided. 18 December 2012 – Extraction Plan for Longwalls 7 and 8 provided to DSC. 5 November 2013 – DSC provides endorsement for the extraction of Longwall 8 and first workings for Longwalls 9 and 10. 22 February 2014 – Extraction Plan for Longwalls 7 to 10 provided to DSC. 1 August 2014 – DSC provides endorsement for the extraction of Longwalls 9 and 10 and first workings for Longwall 10A. 10 February 2014 – draft Prescribed Dam Management Plan (PDMP) provided to DSC. 9 April 2015 – draft PDMP provided to DSC. 	<ul style="list-style-type: none"> An application to extract Longwall 10A within the notification area needs to be approved by the Chief Inspector of Mines prior to mining within notification area (Appendix E).

Table 10
Draft Management Plans Distributed for Comment

Management Plan	Agencies	Date Distributed
Water Management Plan (WMP)	DP&I, NOW, EPA DP&I, NOW, EPA DP&I, NOW, EPA	6 November 2012 (Longwall 7 and 8) 18 December 2012 (Longwall 7 and 8) 10 January 2014 (Longwall 7 to 10)
Biodiversity Management Plan (BMP)	DP&I, OEH, DRE, DPI-Fisheries DP&I, OEH, DRE, DPI-Fisheries DP&I, OEH DP&E, OEH	1 November 2012 (Longwall 7 and 8) 18 December 2012 (Longwall 7 and 8) 18 December 2013 (Longwall 7 to 10) 12 March 2015 (Longwall 8 to 10A)
Heritage Management Plan (HMP)	DP&I, OEH, Heritage Branch (OEH) DP&I, OEH, Heritage Branch (OEH) DP&I, OEH, Heritage Branch (OEH) DP&E, OEH, Heritage Branch (OEH)	6 November 2012 (Longwall 7 and 8) 18 December 2012 (Longwall 7 and 8) 18 December 2013 (Longwall 7 to 10) 12 March 2015 (Longwall 8 to 10A)
Subsidence Monitoring Program	DRE DRE DRE DRE	8 November 2012 (Longwall 7 and 8) 18 December 2012 (Longwall 7 and 8) 30 December 2013 (Longwall 7 to 10) 2 April 2015 (Longwalls 8 to 10A)
Prescribed Dam Management Plan (PDMP)	DSC DSC DSC	19 December 2012 (Longwall 7 and 8) 10 February 2014 (Longwall 7 to 10) 9 April 2015 (Longwall 8 to 10A)

2.3.2 Infrastructure Owners

All infrastructure within the Longwalls 8 to 10A Application Area is owned by WCPL.

WCPL consulted with Ausgrid in 2012 and 2013 to decommission and remove an 11 kilovolt (kV) powerline owned by Ausgrid that was within the Longwalls 8 to 10A Application Area.

2.3.3 Public Consultation

Previous Consultation for Longwalls 7 to 10

A public notice providing notice of WCPL's intent to lodge an Extraction Plan for Longwalls 7 and 8 was placed in the Singleton Argus and Sydney Morning Herald on 2 and 3 October 2012, respectively (**Attachment 2**). One local landholder (and member of the Community Consultative Committee [CCC]) registered his interest in being consulted as part of the Extraction Plan process.

A briefing letter was sent to the members of the CCC in October 2012 providing information on the Extraction Plan for Longwalls 7 and 8.

An electronic copy of the draft Extraction Plan for Longwall 7 and 8 was distributed to the members of the CCC for consultation purposes and the final Extraction Plan was placed on the WCPL website.

A public notice providing notice of WCPL's intent to revise the Extraction Plan to include Longwalls 7 to 10 was placed in the Singleton Argus and Sydney Morning Herald on 11 October 2013 (**Attachment 2**).

One local landholder (and member of the CCC) requested to be consulted as part of the Extraction Plan process. A member of the Aboriginal community also requested to be consulted as part of the Extraction Plan process. These parties received an electronic copy of the draft Extraction Plan for Longwalls 7 to 10.

An electronic copy of the draft revised Extraction Plan was also distributed to the members of the CCC for consultation purposes and the final Extraction Plan was placed on the WCPL website.

Consultation for Revised Extraction Plan

The North Wambo Longwall 10A Modification EA was placed on public exhibition in October 2014. One submission from a local landholder (and member of the CCC) was received on the North Wambo Longwall 10A Modification EA.

An electronic copy of the revised 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.

3 SUBSIDENCE MANAGEMENT AND MONITORING

Surface and sub-surface features within the Application Area are listed in **Table 11**. These features may be potentially impacted by the secondary extraction of Longwalls 8 to 10A. The location of built features is shown in **Figure 9** and environmental features are shown in **Figure 3**. Descriptions of each of these features are contained within the relevant management plan referenced in **Table 11**.

The Application Area is located wholly within the Patrick Plains Mine Subsidence District (proclaimed 2 July 1980). The WHC, wells, fences, gates, possibly some farm dams and farm tracks are the only man-made structures in the Application Area known to have been constructed prior to declaration of the Mine Subsidence District (L. Latter, Technical Site Services Coordinator, pers. comm., 11 December 2012).

Table 11
Surface and Sub-surface Features

Feature	Section/Management Plan Reference
Natural Features	
North Wambo Creek and associated alluvial aquifers	Section 3.1 and WMP (Appendix A)
Wambo and Stony Creek and associated alluvial aquifers	
Permian aquifers	
Threatened and protected species	Section 3.3 and BMP (Appendix C)
Natural vegetation	
Farm Land and Facilities	
Use of WCPL land for agistment	Section 3.2 and LMP (Appendix B)
Fences and gates ¹	
Farm dams ¹	Section 3.5 and WCPL Asset Management Plan (WAMP) in BFMP (Appendix E)
Right-of-way in favour of several private properties (the route of which may be varied on reasonable notice) across WCPL-owned land	Section 3.5 and Right-of-Way Management Plan (ROWMP) in BFMP (Appendix E)
Mine Infrastructure	
66 kV overhead powerline and fibre optic cable	Section 3.5 and WAMP in BFMP (Appendix E)
11 kV overhead powerline	
Buried inactive 11 kV powerline (used to services a personal emergency device system)	
Water supply pipelines and associated pumps and ancillary infrastructure	
Dewatering pipelines, dewatering boreholes and associated pumps and ancillary infrastructure	
Boreholes and wells ¹	
Fences ¹	
All-weather site access track, old haul roads and other unsealed tracks ¹	
Exploration plant that may be located in the Application Area	Section 3.5 and PDMP in BFMP (Appendix E)
Wambo South Water Dam	

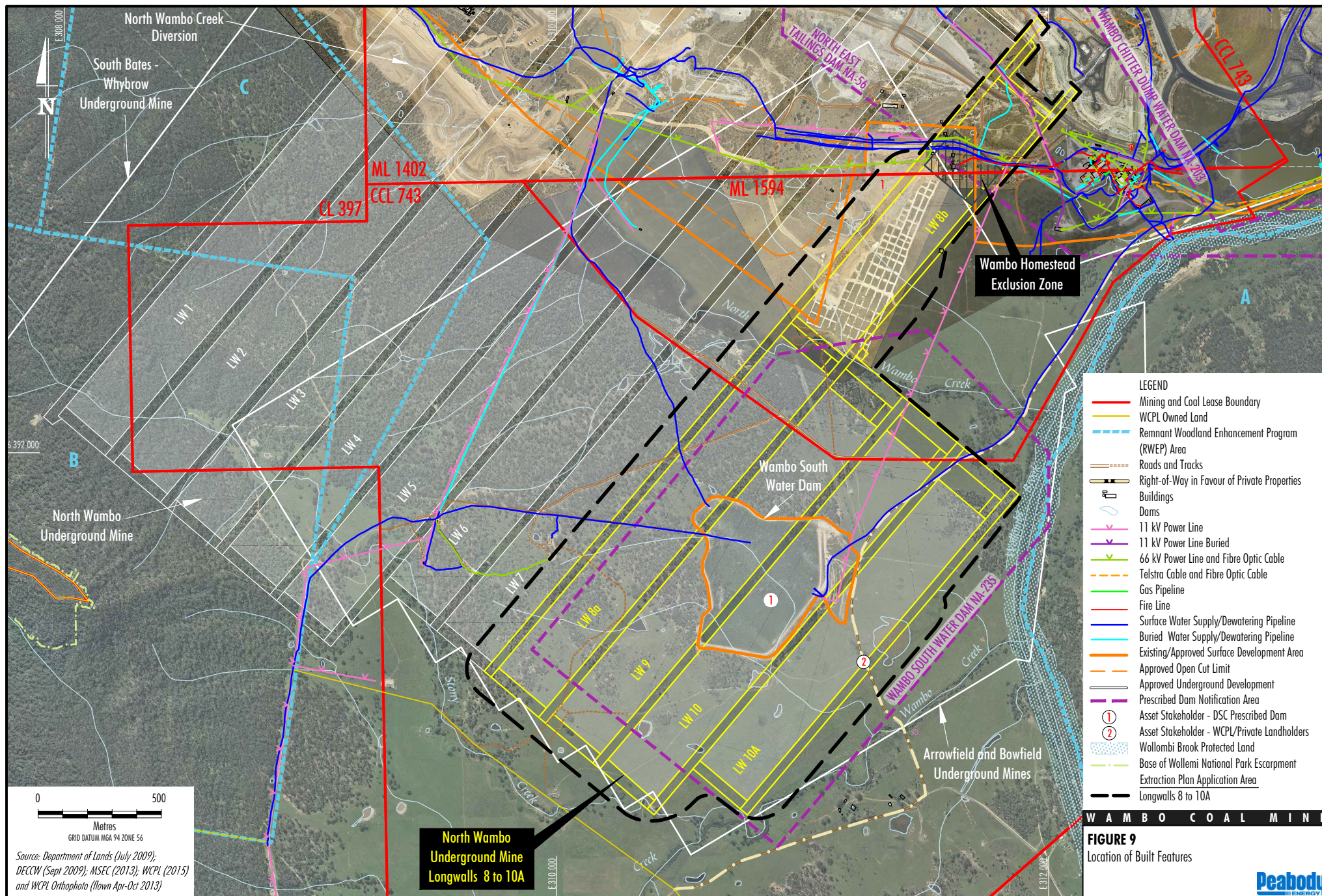


Table 11 (Continued)
Surface and Sub-surface Features

Feature	Section/Management Plan Reference
Areas of Archaeological and/or Heritage Significance	
Wambo Homestead Complex ^{1, 2}	Section 3.4 and HMP (Appendix D)
Aboriginal cultural heritage sites	
Items of Architectural Significance	
Wambo Homestead Complex ^{1, 2}	Section 3.4 and HMP (Appendix D)

¹ Man-made structures known to have been constructed prior to declaration of the Mine Subsidence District (L. Latter, Technical Site Services Coordinator, pers. comm., 11 December 2012).

² Identified as an area of environmental sensitivity. Longwall 8 has been designed with a WHEZ to avoid/mitigate potential impacts on the WHC (**Section 1.6.1**).

The Application Area is wholly within WCPL-owned land and there are no relevant proposed developments within the Application Area proposed by other parties.

In addition to the WHC, Wollombi Brook and Wollemi National Park (and its escarpment) may be considered areas of environmental sensitivity. Wollombi Brook and Wollemi National Park are located outside of the Application Area, and have been considered in **Section 3.1** and **Section 3.3**, respectively.

Revised subsidence predictions and impacts to these surface and sub-surface features have been provided in **Technical Report 1**. Management and monitoring actions for each feature are included in each of the management plans as indicated in **Table 11** and summarised in **Sections 3.1 to 3.6**.

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:

- Site Water Management Plan, including:
 - Surface Water Monitoring Program (SWMP);
 - Groundwater Monitoring Program (GWMP);
 - Surface and Groundwater Response Plan (SGWRP); and
 - North Wambo Creek Subsidence Response Strategy (NWCSRS) (the NWCSRS is a component of the SGWRP).
- Erosion and Sediment Control Plan (ESCP).
- Flora and Fauna Management Plan (FFMP).
- Wambo Homestead Complex Mine Management Plan (WHCMMP) (Godden Mackay Logan, 2012).
- Salvage and Management Programme (S&MP) (Navin Officer Heritage Consultants, 2005).
- Health and Safety Management System (H&SMS) as summarised in the H&SMS Overview.

A summary of the proposed monitoring for the Extraction Plan is provided in **Section 3.8**.

3.1 WATER MANAGEMENT

3.1.1 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 8 to 10A Application Area (**Figure 3**).

The WMP references components of the SWMP, GWMP, SGWRP and NWCSRS.

3.1.2 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**.

A review of the potential environmental consequences to groundwater due to the extraction of longwalls at North Wambo Underground Mine was undertaken by HydroSimulations (2015) and is provided as **Technical Report 2**. HydroSimulations (2015) concluded that predicted impacts on alluvial water levels and third party bores would be consistent with the North Wambo Longwall 10A Modification EA.

The potential impacts on Wambo Creek and Stony Creek will be materially less than described in the North Wambo Longwall 10A Modification EA. Advisian (2015) concluded it is unlikely that extraction of Longwalls 8 to 10A will result in adverse impacts on Wambo Creek and Stony Creek. Therefore, mitigation works are unlikely to be required for the Extraction Plan layout to manage the risk of any change in sediment movement along the creek or upstream migration of head-cuts along both creeks (Advisian, 2015).

3.1.3 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 8 to 10A against these performance indicators is summarised in **Section 3.8** and **Appendix H**.

The procedure followed to assess the extraction of Longwalls 8 to 10A against the performance indicators and performance measures is outlined in **Figure 10** and described in detail in **Appendix A**.

3.1.4 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 4.1**. Potential contingency measures for the performance measures relating to water are outlined in **Table 13**.

Table 12
Water Management Issues Associated with the Extraction of Longwalls 8 to 10A

Issue	Approved Impact	Revised Impact	Monitoring	Management
Surface Water				
North Wambo Creek	<ul style="list-style-type: none"> Additional area of the North Wambo catchment inundated during floods due to subsidence.¹ 	<ul style="list-style-type: none"> Potential environmental consequences are reduced by the change in layout of Longwall 8 (i.e. separation of Longwall 8a and 8b).² 	<ul style="list-style-type: none"> Monitoring of subsidence in accordance with the Subsidence Monitoring Program (Appendix H). Monitoring in accordance with the SWMP. Monitoring in accordance with the GWMP. Monitoring in accordance with the NWCSRS. 	<ul style="list-style-type: none"> If connective cracking to North Wambo Creek is identified, management measures will be employed in accordance with the NWCSRS. Bulk fill of Homestead Mine Workings. As discussed in Section 1.6.2, sections of historical workings of the Homestead Mine will be bulk filled with low strength grout primarily as a mitigation measure to minimise the potential for flooding due to chimney failure and pot hole development resulting from failure of remnant pillars within the Homestead Mine workings. Stabilisation of any areas of surface cracking using erosion protection measures (e.g. vegetation planting).
Wollombi Brook	<ul style="list-style-type: none"> No subsidence or associated cracking.¹ Groundwater levels and/or surface water flow generally unchanged due to underground mining.¹ 	<ul style="list-style-type: none"> Subsidence impacts on Wollombi Brook are expected to be negligible.³ No revision of the potential environmental consequences is required.⁴ 		
Stony Creek	<ul style="list-style-type: none"> Subsidence induced erosion and ponding in the reaches of Stony Creek above the Wambo, Arrowfield and Bowfield Seam workings.¹ Cracking along Stony Creek over the ends of the North Wambo Underground Mine longwall panels.¹ 	<ul style="list-style-type: none"> The potential impacts on Stony Creek will be materially less than described in the North Wambo Longwall 10A Modification EA.⁵ Stony Creek could experience subsidence up to 50 mm near the end of Longwall 10.³ Advisian (2015) concluded it is unlikely that extraction of Longwalls 8 to 10A will result in adverse impacts on Stony Creek.⁵ 		
Wambo Creek	<ul style="list-style-type: none"> Subsidence induced erosion and ponding in the reaches of Wambo Creek above the Arrowfield and Bowfield Seam workings.¹ 	<ul style="list-style-type: none"> The potential impacts on Wambo Creek will be materially less than described in the North Wambo Longwall 10A Modification EA.⁵ Wambo Creek could experience subsidence up to 50 mm near the end of Longwall 10A.³ Advisian (2015) concluded it is unlikely that extraction of Longwalls 8 to 10A will result in adverse impacts on Wambo Creek.⁵ 		

Table 12 (Continued)
Water Management Issues Associated with the Extraction of Longwalls 8 to 10A

Issue	Approved Impact	Revised Impact	Monitoring	Management
Groundwater				
Alluvial Aquifers	<ul style="list-style-type: none"> Potential for connection between underground mine workings and the alluvium where geological structures exist.¹ Potential cracking of the alluvium along North Wambo Creek.¹ Lowering of the base of the North Wambo Creek alluvium affecting groundwater leakage rates.¹ Short-term drainage of groundwater out of the alluvium.¹ No water quality impact on the local alluvial groundwater system.¹ 	<ul style="list-style-type: none"> No revision of the potential environmental consequences is required.⁴ 	<ul style="list-style-type: none"> Monitoring of subsidence in accordance with the Subsidence Monitoring Program (Appendix H). Monitoring in accordance with the GWMP. Monitoring in accordance with the NWCSRS. 	<ul style="list-style-type: none"> If connective cracking to North Wambo Creek is identified, management measures will be employed in accordance with the NWCSRS. Bulk fill of Homestead Mine Workings. As discussed in Section 1.6.2, sections of historical workings of the Homestead Mine will be bulk filled with low strength grout primarily as a mitigation measure to minimise the potential for flooding due to chimney failure and pot hole development resulting from failure of remnant pillars within the Homestead Mine workings.
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"> No revision of the potential environmental consequences is required.⁴ 		

¹ After the EIS (WCPL, 2003).

² After MSEC (2014a).

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

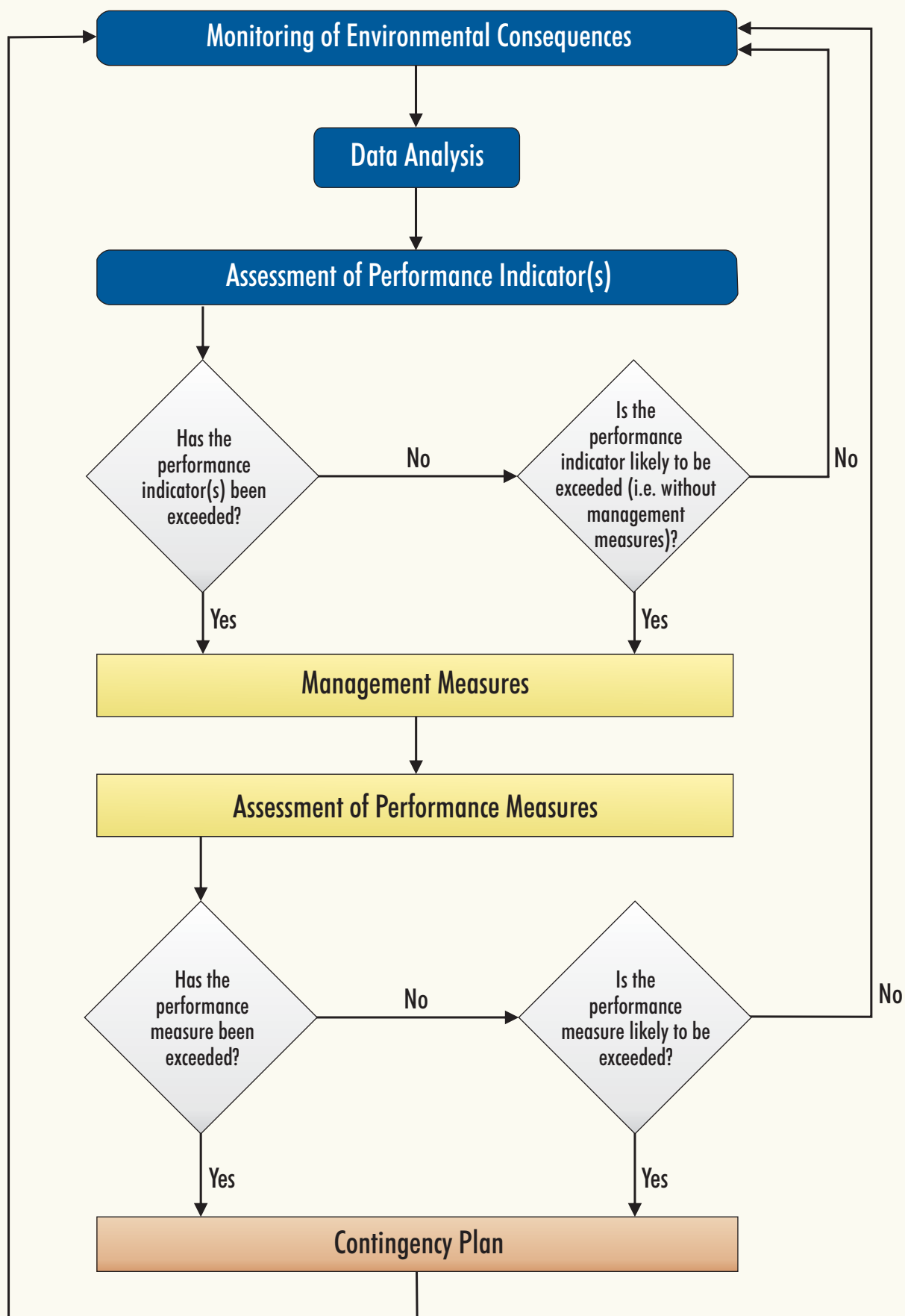
⁴ After HydroSimulations (**Technical Report 2**).

⁵ After Advisian (**Technical Report 3**).

Table 13
Water Performance Measures, Performance Indicators and Contingency Measures for Longwalls 8 to 10A

Performance Measure	Performance Indicator(s)	Relevant Management and Contingency Measures
Negligible impact to Wollombi Brook.	<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 listed in Table 12 of the SWMP. The performance indicators will be considered to have been exceeded if pumping of water from the North Wambo Underground Mine roadways requires regular pumping at rates higher than normal. The performance indicators will be considered to have been exceeded if the groundwater levels in alluvial bores exceed the groundwater level criteria listed in Table 11 of the GWMP. The performance indicators will be considered to have been exceeded if the groundwater quality in alluvial bores exceeds the groundwater quality criteria listed in Table 11 of 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). 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



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

FIGURE 10

Monitoring of Environmental Consequences
against Performance Indicators
and Measures

Peabody
ENERGY

3.2 LAND MANAGEMENT

3.2.1 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.

Scope: Land in general within the Longwalls 8 to 10A Application Area (**Figure 3**).

The LMP references components of the ESCP.

3.2.2 Key Land Issues, Monitoring and Management Measures

The Longwalls 8 to 10A Application Area is wholly located on WCPL-owned land and land use includes cleared grazing land (rain-fed unimproved pasture), patches of remnant native woodland and the Wambo South Water Dam.

Potential impacts on agricultural activities within the Longwalls 8 to 10A Application Area include:

- possible injury to persons undertaking agricultural activities;
- possible injury to livestock caused by surface cracking;
- loss of integrity of stock fences; and
- loss of water storage of small farm dams through tilting or surface cracking.

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**.

3.2.3 Assessment of Performance Indicators and Measures

No subsidence impact performance measures specifically relate to land in general. Subsidence impact performance measures relating to the Wollemi National Park and associated escarpment are addressed in the BMP (**Section 3.3**).

3.2.4 Contingency Plan

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**, WCPL will implement a Contingency Plan as described in **Section 4.1**.

Table 14
Management Issues for Land in General Associated with the Extraction of Longwalls 8 to 10A

Issue	Approved Impact	Revised Impact	Monitoring	Management
Land Use	<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 8 to 10A will be consistent with those presented in the EIS, the North Wambo SEE, the North Wambo Modification EA and the North Wambo Longwall 10A Modification EA. 	<ul style="list-style-type: none"> • Monitoring of subsidence in accordance with the Subsidence Monitoring Program (Appendix H). • Visual observations of stock fences. • Visual observations of the ground surface. • Visual observations of low lying areas. • Visual observations of farm dams (condition of embankment, freeboard, evidence of erosion, general safety) (also addressed in BFMP [Appendix E]). 	<ul style="list-style-type: none"> • Notification to agistees 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 cracks³ 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. • 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. • Repair of stock fences prior to allowing access for agistment grazing. • Remediation of farm dams where it presents a risk to people, livestock and/or the environment. • Management measures in accordance with the ESCP.
Land Capability				
Steep Slopes	<ul style="list-style-type: none"> • Surface cracking.¹ 	<ul style="list-style-type: none"> • No natural steep slopes occur within the Longwalls 8 to 10A Application Area.² 		
Surface Water	<ul style="list-style-type: none"> • Addressed in the WMP (Section 3.1). 	<ul style="list-style-type: none"> • Addressed in the WMP (Section 3.1). 	<ul style="list-style-type: none"> • Addressed in the WMP (Section 3.1). 	<ul style="list-style-type: none"> • Addressed in the WMP (Section 3.1).

¹ After the EIS (WCPL, 2003).

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

³ Minor cracks that develop are not expected to require remediation as geomorphologic process will result in naturally filling of these cracks over time.

3.3 BIODIVERSITY MANAGEMENT

3.3.1 Overview

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

Purpose: Management of potential environmental consequences of the proposed secondary workings described in this Extraction Plan on flora and fauna.

Scope: Flora and fauna within the Longwalls 8 to 10A Application Area (**Figure 3**).

The BMP references components of the existing FFMP.

3.3.2 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**.

3.3.3 Assessment of Performance Indicators and Measures

Performance indicators developed for the subsidence impact performance measures relating to biodiversity relevant to the extraction of Longwalls 8 to 10A are presented in the BMP and are summarised in **Table 16**. Monitoring conducted to inform the assessment of the extraction of Longwalls 8 to 10A against these performance indicators is summarised in **Section 3.8** and **Appendix H**.

The procedure followed to assess the extraction of Longwalls 8 to 10A against the performance indicators and performance measures is outlined in **Figure 10** 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 EEC and the White Box, Yellow Box, Blakely's Red Gum Woodland/Grassy White Box Woodland EEC/CEEC is not considered necessary for Longwalls 8 to 10A. Monitoring relevant to these communities will be addressed in subsequent Extraction Plans.

3.3.4 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 4.1**. Potential contingency measures for the performance measures relating to biodiversity relevant to the extraction of Longwalls 8 to 10A are outlined in **Table 16**.

Table 15
Biodiversity Management Issues Associated with the Extraction of Longwalls 8 to 10A

Issue	Approved Impact	Revised Impact	Monitoring	Management
Flora	<ul style="list-style-type: none"> Ponding of surface water in areas where isolated depressions form.¹ A change in flora species composition and structure expected to occur as a result of increased ponding, which is likely to occur along and adjacent to lower reaches of North Wambo Creek and Wambo Creek.¹ Impacts are unlikely to place any threatened flora species, populations, ecological communities, or their habitats at risk of extinction.¹ 	<ul style="list-style-type: none"> Impacts resulting from the extraction of Longwalls 8 to 10A will be consistent with those presented in the EIS, the North Wambo SEE, the North Wambo Modification EA and the North Wambo Longwall 10A Modification EA. 	<ul style="list-style-type: none"> Monitoring of subsidence in accordance with the Subsidence Monitoring Program (Appendix H). Monitoring in accordance with the FFMP. This monitoring includes two main components: <ul style="list-style-type: none"> monitoring of revegetation of disturbance areas (including areas subject to subsidence from underground mining); and monitoring of the Remnant Woodland Enhancement Program (RWEPP) areas. Annual plant cover abundance and Biometric monitoring at three sites above Longwalls 8 to 10A. Monitoring of an <i>Acacia pendula</i> patch above Longwall 10A. Visual inspections as described in Section 3.8 and the Subsidence Monitoring Program (Appendix H). 	<ul style="list-style-type: none"> The Vegetation Clearance Protocol (VCP), described in the FFMP. The VCP has been developed to minimise impacts on threatened flora and fauna and is applicable across all WCPL managed land, including the Longwalls 8 to 10A Application Area. The Threatened Species Management Protocol (TSMP), described in the FFMP. The TSMP has been developed to minimise impacts on threatened flora and fauna and is applicable across all WCPL managed land, including the Longwalls 8 to 10A Application Area. The RWEPP, described in the FFMP. There are no RWEPP areas located within the Longwalls 8 to 10A Application Area. The RWEPP includes a monitoring program to assess potential impacts due to subsidence. The Rehabilitation Program, described in the FFMP. <p>The Rehabilitation Program will apply to the Longwalls 8 to 10A Application Area where applicable.</p>
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 8 to 10A will be consistent with those presented in the EIS, the North Wambo SEE, the North Wambo Modification EA and the North Wambo Longwall 10A Modification EA. 		
Aquatic Ecosystems	<ul style="list-style-type: none"> Alterations to aquatic habitat due to the approved operations are unlikely to significantly alter the macroinvertebrate or fish community composition, or the conservation values of North Wambo Creek, Wambo Creek and Stony Creek.¹ 	<ul style="list-style-type: none"> Impacts resulting from the extraction of Longwalls 8 to 10A will be consistent with those presented in the EIS, the North Wambo SEE, the North Wambo Modification EA and the North Wambo Longwall 10A Modification EA.² 		

¹ After the EIS (WCPL, 2003).

² The potential impacts on Wambo Creek and Stony Creek will be materially less than described in the North Wambo Longwall 10A Modification EA (**Section 3.1**).

Table 16
Biodiversity Performance Measures, Performance Indicators and Contingency Measures for Longwalls 8 to 10A

Performance Measure	Performance Indicator(s)	Relevant Management and Contingency Measures
Wollemi National Park Negligible subsidence impacts. Negligible environmental consequences.	<ul style="list-style-type: none"> The performance indicators will be considered to have been exceeded if the actual angle of draw is greater than the predicted 'worst case'* angle of draw. The performance indicators will be considered to have been exceeded if visual inspections identify cliff instability experienced by 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, for example planting of endemic native vegetation at the base of the escarpment. Consideration of changes to longwall extraction geometry in consultation with relevant regulatory authorities.
Other threatened species, populations or communities Minor cracking and ponding of the land surface or other impact. Negligible environmental consequences.	<ul style="list-style-type: none"> The performance indicator will be considered to have been exceeded if annual monitoring at sites S1 and S2 or riparian vegetation monitoring on Wambo Creek indicates a declining trend in the condition of the vegetation community or statistically significant changes in vegetation between monitoring periods. The performance indicator will be considered to have been exceeded if visual observations of <i>Acacia pendula</i> indicate deterioration in the condition of the population. 	<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 Section 4.1 of the FFMP. Additional monitoring (e.g. increase in monitoring frequency). Offset in accordance with Condition 22, Schedule 4 of the Development Consent (DA 305-7-2003).

* Based on an upper 95% confidence limit.

3.4 HERITAGE MANAGEMENT

3.4.1 Overview

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

Purpose: Management of potential environmental consequences of the proposed secondary workings described in the Extraction Plan on heritage sites or values.

Scope: Heritage sites and values within the Longwalls 8 to 10A Application Area (**Figure 3**).

The HMP references components of the WHCMMP and the S&MP.

3.4.2 Key Heritage Issues, Monitoring and Management Measures

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**.

3.4.3 Assessment of Performance Indicators and Measures

Performance indicators developed for the subsidence impact performance measure relating to the heritage sites and values relevant to the extraction of Longwalls 8 to 10A (i.e. the WHC) are presented in the HMP and are summarised in **Table 18**. Monitoring conducted to inform the assessment of the extraction of Longwalls 8 to 10A against the performance indicators is summarised in **Section 3.8** and **Appendix H**.

The procedure followed to assess the extraction of Longwalls 8 to 10A against the performance indicators and performance measures is outlined in **Figure 10** and described in detail in **Appendix D**.

Table 18
Heritage Performance Measures, Performance Indicators and Contingency Measures for Longwalls 8 to 10A

Performance Measure	Performance Indicator(s)	Relevant Management and Contingency Measures
Negligible impact on heritage values at WHC, unless approval has been granted by the Heritage Branch and/or the Minister.	<ul style="list-style-type: none"> The performance indicators will be considered to have been exceeded if subsidence monitoring identifies an exceedance (or a trend to exceedance) of predicted values in Table 4 of the HMP. The performance indicators will be considered to have been exceeded if visual inspections identify an impact to the condition or structural integrity of a WHC building. 	<ul style="list-style-type: none"> Consider whether the performance measure has been exceeded based on structural and heritage review and analysis. If the performance measure has been exceeded, implement a Contingency Plan, which may include: <ul style="list-style-type: none"> - Additional monitoring (e.g. increase in monitoring frequency). - Management measures identified in Section 5 of the WHCMMP in consideration of the WHC Conservation Management Plan. - Consideration of changes to longwall extraction geometry in consultation with relevant regulatory authorities.

Table 17
Heritage Management Issues Associated with the Extraction of Longwalls 8 to 10A

Issue	Approved Impact	Revised Impact	Monitoring	Management
WHC	<ul style="list-style-type: none"> Impacts such that mining will not have adverse heritage impacts on the WHC due to subsidence or other impacts in accordance with the WHCMMP.¹ 	<ul style="list-style-type: none"> Impacts resulting from the extraction of Longwalls 8 to 10A will be consistent with those presented in the WHCMMP.² 	<ul style="list-style-type: none"> Monitoring of subsidence in accordance with the Subsidence Monitoring Program (Appendix H). Monitoring in accordance with the WHCMMP. 	<ul style="list-style-type: none"> Bulk fill of Homestead Mine Workings. As discussed in Section 1.6.2, sections of historical workings of the Homestead Mine will be bulk filled in the vicinity of the Stud Master's Cottage. The grouting will reduce the risk of impacts to the heritage value of the WHC associated with the extraction of Longwall 8. Management measures in accordance with the WHCMMP including stabilisation and conservation works.
Aboriginal Cultural Heritage	<ul style="list-style-type: none"> Consent to damage or destroy all Aboriginal cultural heritage sites with the extent of Aboriginal Heritage Impact Permit #2222.³ Development consent to damage Aboriginal cultural heritage sites within the extent of subsidence from Longwall 10A with a variation to Aboriginal Heritage Impact Permit #2222 pending. 	<ul style="list-style-type: none"> Impacts resulting from the extraction of Longwalls 8 to 10A will be consistent with those presented in the EIS, the North Wambo SEE, the North Wambo Modification EA and the North Wambo Longwall 10A Modification EA. 	<ul style="list-style-type: none"> Monitoring of subsidence in accordance with the Subsidence Monitoring Program (Appendix H). 	<ul style="list-style-type: none"> Management measures in accordance with the S&MP including: <ul style="list-style-type: none"> the collection of surface artefacts; the collection of subsurface artefacts; and archaeological analysis and keeping of artefactual material. If subsidence monitoring identifies cracking or erosion proximal to a site artefacts will be salvaged in accordance with the S&MP.

¹ After the WHCMMP (Godden Mackay Logan, 2012).

² After DgS (2012a); MSEC (2014a, **Technical Report 1**).

³ Aboriginal Heritage Impact Permit #2222 (as varied on 2 August 2013).

3.4.4 Contingency Plan

In the event that the subsidence impact performance measure relating to the WHC summarised in **Table 18** is considered to have been exceeded or is likely to be exceeded, WCPL will implement a Contingency Plan as described in **Section 4.1**. Potential contingency measures for the performance measure relating to the WHC are outlined in **Table 18**.

3.5 BUILT FEATURES MANAGEMENT

3.5.1 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 8 to 10A Application Area (**Figure 9**).

The BFMP comprises three component plans, the WAMP, PDMP and ROWMP.

3.5.2 Key Built Features Issues, Monitoring and Management Measures

Built features within the Longwalls 8 to 10A Application Area consist of (**Figure 9**):

- a number of WCPL-owned assets (as described in **Table 11** and the WAMP);
- Wambo South Water Dam (constructed 2010) (a Prescribed Dam) owned by WCPL (as described in the PDMP); and
- a right-of-way in favour of several private properties (the route of which may be varied on reasonable notice) across WCPL-owned land (as described in the ROWMP).

The key issues relating to management of these built features in regard to subsidence impacts are described in the relevant component plans of the BFMP. The relevant monitoring and management measures for these built features are summarised in **Table 19**.

The Longwalls 8 to 10A Application Area is located within the Notification Area of the following Prescribed Dams (**Figure 9**):

- South Wambo Dam Notification Area (Plan Number NA-231).
- North East Tailings Dam Notification Area (Plan Number NA-56).

The Wambo South Water Dam Notification Area overlies Longwalls 8 to 10A, while the North East Tailings Dam Notification Area overlies Longwall 8 only.

WCPL's application to extract Longwall 8 and develop gate roads for Longwalls 9 and 10 within the Wambo South Water Dam Notification Area (Application WAMBO-04) was endorsed at the DSC meeting in October 2013. WCPL's application to extract Longwalls 9 and 10 and develop gate roads for Longwall 10A within the Wambo South Water Dam Notification Area (Application WAMBO-05) was endorsed at the DSC meeting in August 2014. The PDMP addresses the recommendations of the DSC in relation to the application.

Table 19
Built Feature Management Associated with the Extraction of Longwalls 8 to 10A

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 3.8 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. 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 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 old haul roads and site access tracks and updating warning signs if a change to the WCPL asset is identified during monitoring. Following subsidence, fitting of WCPL powerlines with stays where affected by subsidence. Structural assessment of WCPL assets and subsidence assessment post-Longwalls 8 to 10A extraction. Repair of WCPL assets in accordance with associated standards and procedures. Assessment of water pipelines and provision of sufficient slack in pipelines for subsidence. Assessment of wells and bores and decommission and seal prior to extraction if required (dependent on condition).
Right-of-way in favour of several private properties		<ul style="list-style-type: none"> Post warning signs along the right-of-way across WCPL-owned land and update warning signs if a change is identified during monitoring. The signs will indicate that underground mining (with surface subsidence) is being undertaken on WCPL-owned land and that access is restricted to lawful entrants. Notify users of the right-of-way when there is active subsidence, by placement of a sign. Repair of right-of-way in accordance with associated standards and procedures. Alternatively, WCPL may vary the route of the right-of-way in accordance with the terms of the right-of-way.
Prescribed Dams	<ul style="list-style-type: none"> Monitoring of subsidence in accordance with the Subsidence Monitoring Program (Appendix H). Visual inspections as described in Section 3.8 and the Subsidence Monitoring Program (Appendix H). Water level in Wambo South Water Dam as described in Section 3.8. Underground mine water monitoring as described in Section 3.8. 	<ul style="list-style-type: none"> Lower watertable level of the Wambo South Water Dam to outside of the angle of draw of extraction prior to extraction of each longwall. CITECT email alarm to Underground Mine Manager and Technical Services Superintendent when Wambo South Water Dam level exceeds trigger level in the PDMP (Appendix E). Implement TARP in the PDMP. Structural assessment of Wambo South Water Dam following completion of active mining. Repair of any damage to the Prescribed Dam resulting from the extraction of Longwalls 8 to 10A (i.e. WCPL will restore the safety of any Prescribed Dam if compromised by mining).

WCPL will require the approval of the Chief Inspector of Mines prior to longwall extraction of Longwall 10A within the Wambo South Water Dam Notification Area.

3.5.3 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 8 to 10A are presented in the component plans of the BFMP and are summarised in **Table 20**. Monitoring conducted to inform the assessment of the extraction of Longwalls 8 to 10A against these performance indicators is summarised in **Section 3.8** and **Appendix H**.

The procedure followed to assess the extraction of Longwalls 8 to 10A against the performance indicators and performance measures is outlined in **Figure 10** and described in detail in **Appendix E**.

3.5.4 Contingency Plan

In the event that the subsidence impact performance measures relating to built features summarised in **Table 20** are considered to have been exceeded or are likely to be exceeded, WCPL will implement a Contingency Plan as described in **Section 4.1**.

3.6 PUBLIC SAFETY MANAGEMENT

3.6.1 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 8 to 10A, the previous Extraction Plan for Longwalls 7 to 10 and the Subsidence Management Plan (SMP) for Longwalls 1 to 6.

Scope: Risks to public safety associated with extraction of Longwalls 1 to 10A at the North Wambo Underground Mine (**Figure 3**).

Hazards: The primary hazards associated with the extraction of Longwalls 1 to 10A include:

- surface cracking;
- ground deformations; and
- damaged infrastructure (e.g. powerlines, roads and access tracks [including the right-of-way¹]).

Risks: Members of the general public potentially at risk due to the extraction Longwalls 1 to 10A are limited to those accessing WCPL-owned land.

The PSMP references components of the existing H&SMS as summarised in the H&SMS Overview.

3.6.2 Key Public Safety Issues, Monitoring and Management Measures

The key issues relating to potential risks to public safety resulting from the extraction of Longwalls 1 to 10A described in the PSMP and the relevant monitoring and management measures are summarised in **Table 21**. The location of predicted subsidence is presented in **Figure 7**.

¹ A right of way in favour of several private properties (the route of which may be varied on reasonable notice) across WCPL-owned land is situated in the Application Area for Longwalls 8 to 10A.

Table 20
Built Feature Performance Measures, Performance Indicators and Contingency Measures for Longwalls 8 to 10A

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-owned 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; • the powerline clearance from vegetation/access tracks identified during monitoring has reduced following secondary extraction within 100 m of any above ground powerlines; 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>
	<p>The performance indicators developed for Wambo South Water Dam will be considered to have been exceeded if:</p> <ul style="list-style-type: none"> • the Level 4 water level trigger in the PDMP is exceeded; • continuous pumping from the underground workings is in place; or • the increase in water make causes water to flow from the sump. 	<p>Exceedance of a performance indicator would result in immediate cessation of mining and a risk assessment to determine a further action plan.</p> <p>Contingency measures will be developed as required on a case-by-case basis in consultation with the relevant WCPL stakeholders and the DSC.</p>
	<p>The proposed performance indicators for the built features and public safety performance measures will be considered to have been exceeded if, in the reasonable opinion of WCPL:</p> <ul style="list-style-type: none"> • the serviceability of the right-of-way is not maintained as a result of subsidence effects; or • subsidence effects present a hazard to lawful users of the right-of-way that cannot be managed or mitigated by using standard risk management controls for the type of hazard presented. 	<p>Contingency measures may include varying the current route of the right-of-way, in accordance with the terms of the right-of-way.</p>

Table 21
Public Safety Management Issues Associated with the Extraction of Longwalls 8 to 10A

Issue	Approved Impact	Revised Impact	Monitoring	Management
Agistees accessing the Longwalls 1 to 10A Application Areas to manage stock.	Subsidence impacts, which may be considered to pose a safety hazard, currently approved include: <ul style="list-style-type: none"> • surface cracking;¹ • erosion;¹ and • ponding.¹ 	<ul style="list-style-type: none"> • Impacts resulting from the extraction of Longwalls 1 to 10A will be consistent with those presented in the EIS, the North Wambo SEE, the North Wambo Modification EA and the North Wambo Longwall 10A Modification EA. 	<ul style="list-style-type: none"> • Monitoring of subsidence in accordance with the Subsidence Monitoring Program (Appendix H). • Visual observations of fences. • Visual assessment of the effectiveness of warning signs (e.g. legibility). • Visual inspection of the integrity of right-of-way across WCPL land. 	<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 (including the Wambo Homestead Complex) are subject to the requirements of: <ul style="list-style-type: none"> - WA-TRG-MP-302 Wambo Training and Competency Management Plan; and - WA-S&H-PRO 315.6 Site Introduction of Personnel. • Notification to agistees 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. • Posting of warning signs at suitable locations on property boundaries, fences and access tracks, including the right of way across WCPL-owned land. The signs will indicate that underground mining (with surface subsidence) is being undertaken on WCPL-owned land and will prohibit entry by unauthorised persons. • Maintenance of warning signs. • Management of surface cracking and areas of subsidence troughs in accordance with the LMP (Table 14). • Management of the right-of-way across WCPL-owned land in accordance with the BFMP (Table 19). • All safety incidents will be handled in accordance with the H&SMS. • Repair of fences in accordance with the LMP. • Following mining, review of warning sign placement and removal if no longer required.
Authorised access of private properties via the right-of-way across WCPL-owned land.				
Unauthorised access to the Longwalls 1 to 10A Application Areas (e.g. looking for firewood or hunting).				
Members of the public visiting the WHC (inducted visitors of WCPL).				
Members of the Rural Fire Service accessing the Longwalls 1 to 10A Application Areas.				

¹ After the EIS (WCPL, 2003).

Subsidence risk assessments were undertaken as part of:

- the Extraction Plan process for Longwalls 8 to 10A;
- the Extraction Plan process for Longwalls 7 to 10;
- the Extraction Plan process for Longwalls 7 and 8; and
- the SMP process for Longwalls 1 to 6.

These subsidence risk assessments did not identify any public safety issues in addition to those summarised in **Table 21**.

3.6.3 Assessment of Performance Indicators and Measures

The performance indicator for the subsidence impact performance measures relating to public safety (**Table 5**) 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 8 to 10A against this performance indicator is summarised in **Section 3.8** and **Appendix H**.

The procedure followed to assess the extraction of Longwalls 8 to 10A against the performance indicators and performance measures is outlined in **Figure 10** and described in detail in **Appendix F**.

3.6.4 Contingency Plan

In the event that the subsidence impact performance measure relating to public safety summarised in **Section 3.6.3** is considered to have been exceeded or is likely to be exceeded, WCPL will implement a Contingency Plan as described in **Section 4.1**.

3.7 REHABILITATION MANAGEMENT

The existing Rehabilitation Management Plan was developed in December 2011 and reviewed by the DRE in May 2012. The Rehabilitation Management Plan is provided in **Appendix I**.

WCPL met with representatives of the DRE on 30 March 2015. At this meeting, it was agreed that WCPL will prepare a revised MOP for the Wambo Coal Mine that will address the requirements of a Rehabilitation Management Plan. The revised MOP will be prepared in consultation with the DRE and submitted prior to September 2015.

Rehabilitation associated with the extraction of Longwalls 8 to 10A will be undertaken in accordance with the existing Rehabilitation Management Plan (or the revised MOP when approved) and the management and mitigation measures outlined in this Extraction Plan and the relevant component plans (e.g. the LMP).

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 2.2**. 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 4.2**.

A number of potential management measures are available to mitigate/remediate subsidence impacts on land in general resulting from the extraction of Longwalls 8 to 10A. 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.
- 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 natural filling of these cracks over time.

Remediation of surface cracks 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.

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 Vegetation Clearance Protocol (refer to the Biodiversity Management Plan in **Appendix C**).

A summary of subsidence monitoring is provided in **Section 3.8**, 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 Rehabilitation Management Plan (**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/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.

3.8 MONITORING PROGRAM SUMMARY

The various monitoring programs presented in each of the management plans described in **Sections 3.1 to 3.6** are summarised in **Table 22** and the location of environmental monitoring sites included in Wambo's various environmental monitoring programs are presented in **Figures 11 to 13**.

Figure 11 presents the locations of air quality, noise and dust monitoring sites. **Figure 12** presents the location of surface water and groundwater monitoring sites. **Figure 13** presents the location of biodiversity monitoring sites. As described in **Table 22** visual observation of the Wollemi National Park escarpment will be undertaken as part of the BMP 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 22
Longwalls 8 to 10A Monitoring Program Summary

Management Plan	Monitoring Component	Parameter	Frequency
Water Management Plan	General surface water monitoring.	<ul style="list-style-type: none"> Monitoring of surface water flow and quality along North Wambo Creek, Wambo Creek, Stony Creek and Wollombi Brook in accordance with the SWMP. 	<ul style="list-style-type: none"> In accordance with the SWMP.
	General mine water quality.	<ul style="list-style-type: none"> Monitoring of water quality in mine water storage dams in accordance with the SWMP. 	<ul style="list-style-type: none"> In accordance with the SWMP.
	Bed and bank stability.	<ul style="list-style-type: none"> Monitoring to distinguish between natural erosion and erosion from mine subsidence instability in North Wambo Creek, Wambo Creek and Stony Creek. 	<ul style="list-style-type: none"> In accordance with the SWMP.
	General groundwater monitoring.	<ul style="list-style-type: none"> Monitoring of groundwater level and quality within the vicinity of the Wambo Coal Mine. 	<ul style="list-style-type: none"> In accordance with the GWMP.
	Subsidence impacts to the North Wambo Creek alluvium.	<ul style="list-style-type: none"> Monitoring of groundwater levels in the North Wambo Creek alluvium. 	<ul style="list-style-type: none"> In accordance with the NWCSRS.
	Subsidence impacts to Wollombi Brook.	<ul style="list-style-type: none"> Rate of water pumped from North Wambo Underground Mine roadways. 	<ul style="list-style-type: none"> When pumping is required.
Land Management Plan	Stock fences.	<ul style="list-style-type: none"> Visual observation to record the initial condition of stock fences. Visual observations to record the condition of stock fences following extraction of Longwalls 8 to 10A. 	<ul style="list-style-type: none"> Prior to secondary extraction of Longwalls 8 to 10A. Following completion of secondary extraction of Longwalls 8 to 10A.
	Ground surface.	<ul style="list-style-type: none"> Visual observation to record the initial condition of the ground surface. Visual observations of the ground surface behind the longwall face to identify potential surface cracks and/or potholes. Visual observations of low lying areas to identify potential surface ponding. 	<ul style="list-style-type: none"> Prior to secondary extraction of Longwalls 8 to 10A. Monthly inspections during secondary extraction of Longwalls 8 to 10A, increased to weekly inspections during extraction of Longwall 8b. Monthly inspections during secondary extraction of Longwalls 8 to 10A and/or following a significant rainfall event (i.e. 20 mm within 24 hours, midnight to midnight).

Table 22 (Continued)
Longwalls 8 to 10A Monitoring Program Summary

Management Plan	Monitoring Component	Parameter	Frequency
Biodiversity Management Plan	General monitoring of flora, fauna and aquatic ecosystems.	<ul style="list-style-type: none"> Monitoring in accordance with the FFMP. Annual plant cover abundance and Biometric monitoring at three sites in the vicinity of Longwalls 8 to 10A. Monitoring of an <i>Acacia pendula</i> patch above Longwall 10A. 	<ul style="list-style-type: none"> In accordance with the FFMP. Annually. Annually.
	Subsidence impacts to Wollemi National Park escarpment.	<ul style="list-style-type: none"> Visual observations to record the Wollemi National Park escarpment cliff stability (including photographic record).¹ 	<ul style="list-style-type: none"> On a quarterly basis while the active longwall face is within 2 km of the Wollemi National Park escarpment.
Heritage Management Plan	Subsidence impacts to the WHC.	<ul style="list-style-type: none"> Monitoring in accordance with the WHCMMP. Photographic records of the condition of WHC Buildings No. 1 to 8. Observations of cracking of masonry. Observations of loss of structural integrity. 	<ul style="list-style-type: none"> In accordance with the WHCMMP. After the mining of each longwall has been completed. Monthly during active subsidence. Following completion of Longwall 8.
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"> Monthly inspection during secondary extraction of Longwalls 8 to 10A.
	Above ground powerlines.	<ul style="list-style-type: none"> Monitoring of the location of the base and top of each power pole (if rollers not installed). Monitoring of the vertical distance from the ground to lowest point of the powerline between each power pole pair (i.e. conductor clearance) (if rollers not installed). 	<ul style="list-style-type: none"> Prior to secondary extraction within 100 m of WCPL powerline and undertaken at 50 m intervals until the active mining face is 100 m past the powerline.
	Active service lines.	<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"> Daily inspections commencing when secondary extraction is within 100 m of WCPL active service lines and undertaken until the active mining face is 100 m past the line.

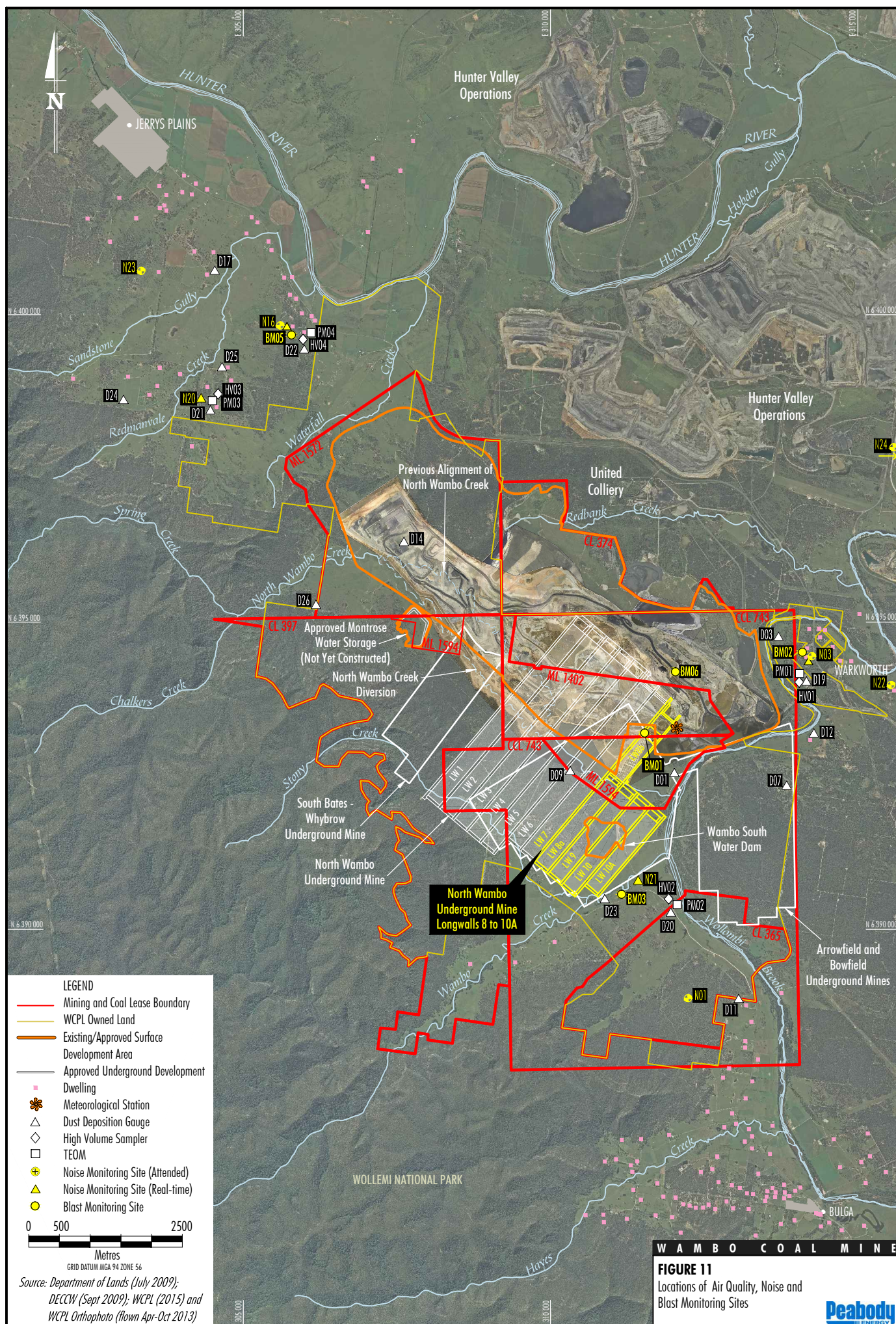
Table 22 (Continued)
Longwalls 8 to 10A Monitoring Program Summary

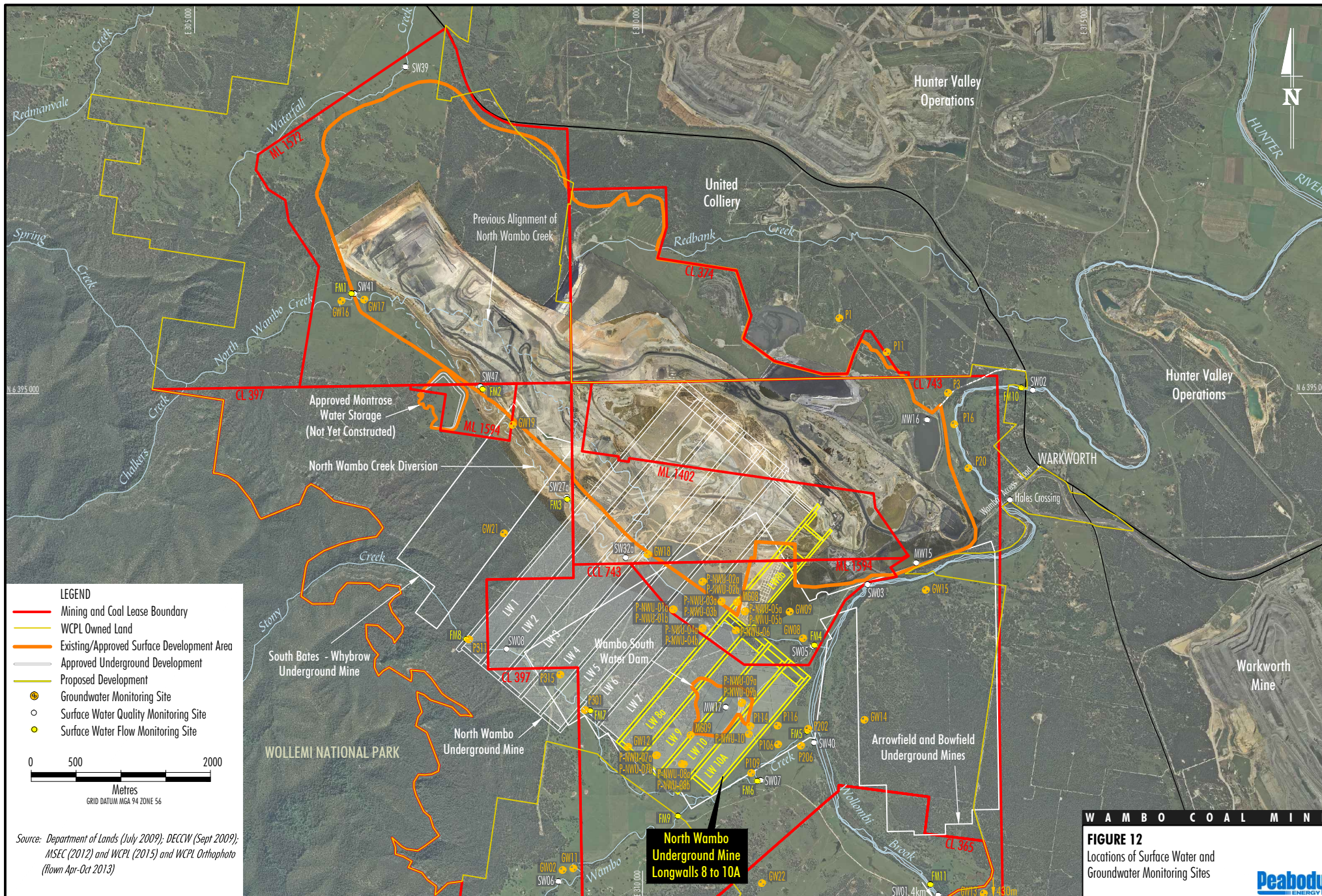
Management Plan	Monitoring Component	Parameter	Frequency
Built Features Management Plan – WCPL Asset Management Plan (Cont.)	Roads and tracks.	<ul style="list-style-type: none"> Visual observations to record condition of roads and tracks, including surface cracks, buckling and general safety. 	<ul style="list-style-type: 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.
	Mine dewatering and water supply pipelines.	<ul style="list-style-type: none"> Monitoring of pipeline integrity at fixed points. Monitoring to detect abnormal changes in flow. 	<ul style="list-style-type: none"> Daily inspections commencing when secondary extraction is within 100 m of WCPL active service lines and undertaken until the active mining face is 100 m past the pipeline. Continuous (SCADA) monitoring of pump and pipeline conditions.
	Farm dams.	<ul style="list-style-type: none"> Visual observations to record condition of embankment, freeboard, evidence of erosion 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.
Built Features Management Plan – Prescribed Dam Management Plan	Wambo South Water Dam.	<ul style="list-style-type: none"> Water level in Wambo South Water Dam (transducer reading on CITECT). Water level in Wambo South Water Dam (surveyed water level). Visual inspections of Wambo South Water Dam, including condition of: embankment; stormwater catchment drain on western side of dam; and dam level stake. 	<ul style="list-style-type: none"> Manual check weekly and following significant rainfall event. Monthly. Weekly inspections commencing when secondary extraction is within the Notification Area and undertaken until the active mining face is 100 m past the Notification Area and following significant rainfall event.

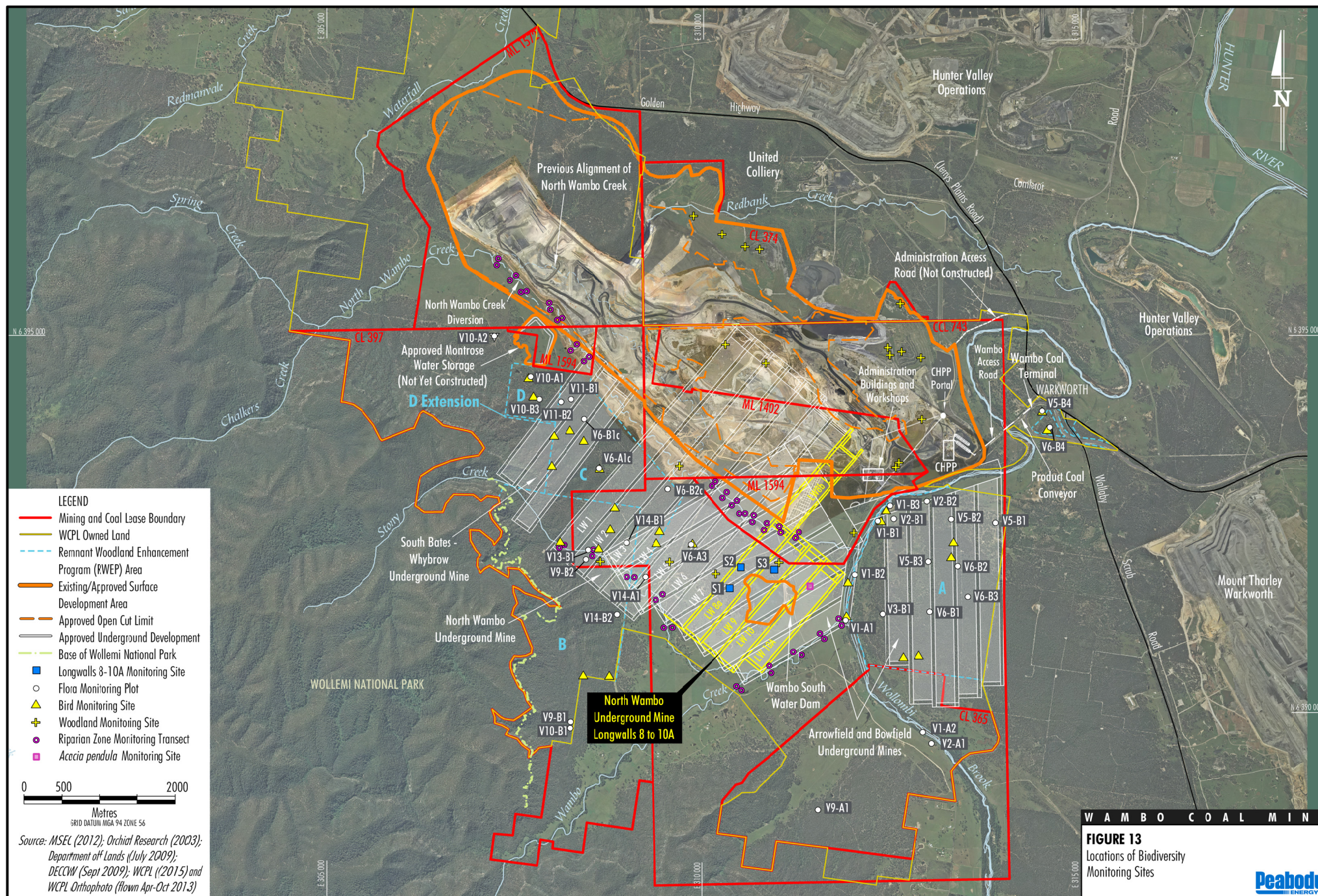
Table 22 (Continued)
Longwalls 8 to 10A Monitoring Program Summary

Management Plan	Monitoring Component	Parameter	Frequency
Built Features Management Plan – Prescribed Dam Management Plan (Cont.)	Underground workings.	<ul style="list-style-type: none"> Visual inspections of underground workings (including longwall progression and geological features encountered). Rate of water pumped from North Wambo Underground Mine roadways and Whybrow Seam. 	<ul style="list-style-type: none"> Daily inspections during extraction of Longwalls 8 to 10A. When pumping is required.
Built Features Management Plan – Right-of-Way Management Plan	Right-of-way in favour of several private properties.	<ul style="list-style-type: none"> Visual observations to record condition of road, including surface cracks, buckling and general safety. Visual assessment of the effectiveness of warning signs. 	<ul style="list-style-type: none"> Prior to secondary extraction within 100 m of the right-of-way and undertaken at 50 m intervals until the active mining face is 100 m past the right-of-way. Monthly inspections during secondary extraction.
Public Safety Management Plan	Fences.	<ul style="list-style-type: none"> Visual observation to record the initial condition of fences. Visual observations to record the condition of fences during extraction of Longwalls 8 to 10A. Visual observations to record the condition of fences following extraction of Longwalls 8 to 10A. 	<ul style="list-style-type: none"> Prior to secondary extraction of Longwalls 8 to 10A. Monthly inspections during secondary extraction of Longwalls 8 to 10A. Following completion of secondary extraction of Longwalls 8 to 10A.
	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 8 to 10A. 	<ul style="list-style-type: none"> Prior to secondary extraction of Longwalls 8 to 10A. Monthly inspections during secondary extraction of Longwalls 8 to 10A.

¹ Visual inspection will be conducted from areas accessible by vehicle for signs of freshly exposed rock face or debris, or areas of significant vegetation dieback.







4 IMPLEMENTATION

4.1 ADAPTIVE MANAGEMENT AND CONTINGENCY RESPONSE

4.1.1 Adaptive Management

WCPL will implement an adaptive management approach to ensure subsidence impact performance measures (**Table 5**) are achieved at the North Wambo 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 10**.
- **Contingency Response** – implementing contingency plans where a potential exceedance of a subsidence impact performance measures or an unexpected impact is detected (**Section 4.1.2**).
- **Adjustment** – adjusting management strategies to improve performance, particularly following an exceedance of a subsidence impact performance measure or detection of an unexpected impact.

4.1.2 Contingency Response

In the event the performance measures in **Table 5** 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 23**, 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 3** 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 the following is confirmed to have occurred:

- Greater than negligible impact on the heritage values of the WHC (in addition to those impacts identified in the WHCMMP).
- Greater than negligible impact to Wollombi Brook (other than the controlled release of excess site water in accordance with EPL requirements).
- Greater than negligible subsidence impact or environmental consequences to Wollemi National Park.

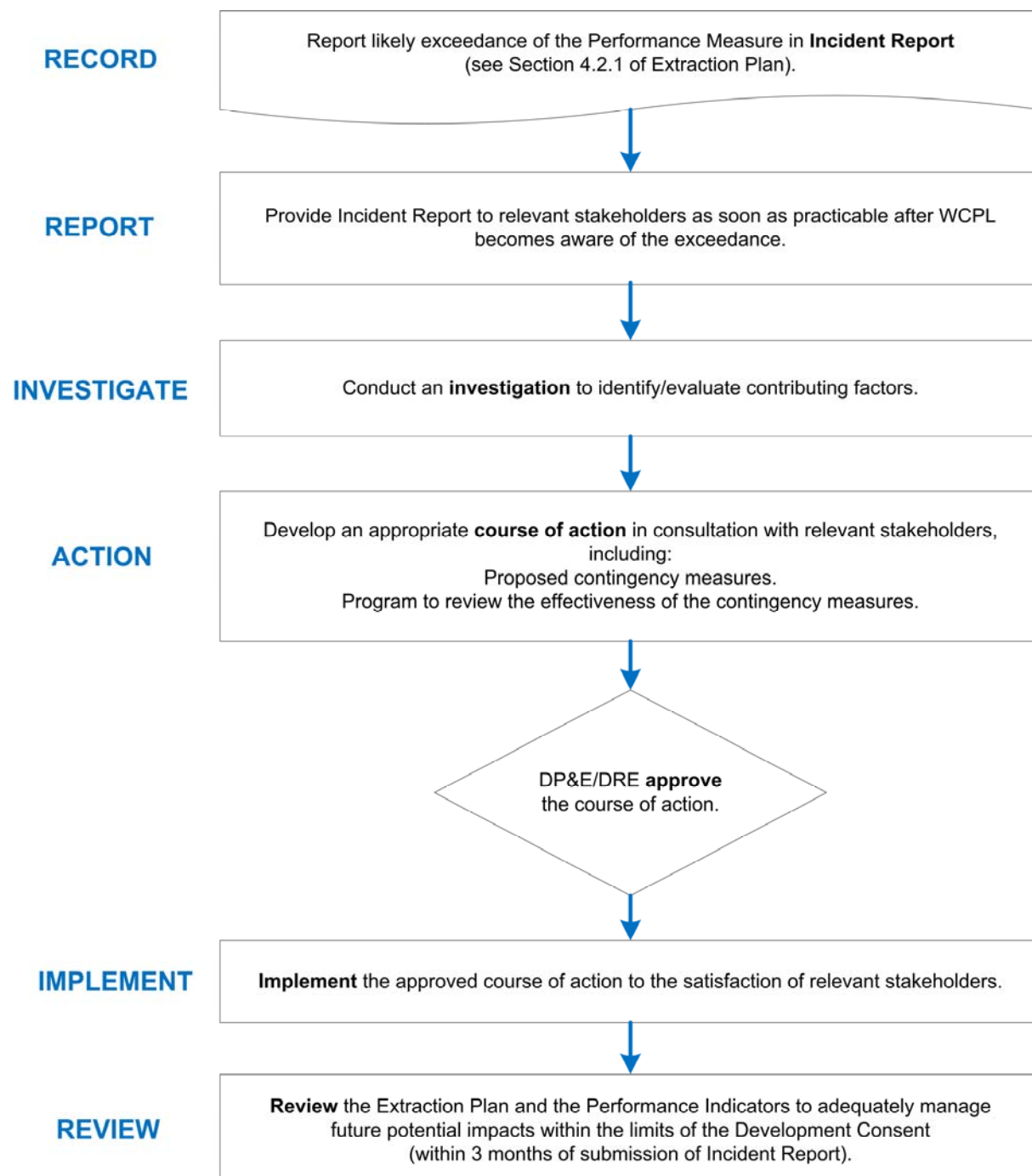
Changes to longwall geometry would be implemented through WCPL's internal Mine Plan Design Alteration procedure (SWP 9004) administered by the Mine Surveyor.

Table 23
Contingency Plan Responsibilities

Condition	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 TSM, UME and ECM. 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.
Underground Mining Engineer (UME)		<ul style="list-style-type: none"> Where related to built features or public safety, 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. Report findings and recommendations to TSM. 	<ul style="list-style-type: none"> As per Level 1, and immediately report findings to TSM (may include recommendation to stop mining).
Environment and Community Manager (ECM)		<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 TSM, UMM 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 DP&E and relevant agencies (e.g. OEH, DRE, NOW) and report on corrective actions. Within 3 months, review this Extraction Plan.
Technical Services and Projects Manager and/or Director: Technical Services and Projects (TSM)		<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 ECM, UMM 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 DRE, MSB and Principal Subsidence Engineer (PSE) on corrective actions. As soon as practical notify relevant infrastructure owners of impacts.
Underground Manager of Mining Engineering (UMM)		<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 4.3**.

Contingency Plan



4.2 REPORTING FRAMEWORK

WCPL has developed a reporting framework for the Extraction Plan based on the Draft Extraction Plan Guidelines (DP&E and DRE, 2015).

Table 24 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 North Wambo Underground Mine is considered adequate as the Application Area is wholly within WCPL-owned land and Longwalls 8 to 10A are not predicted to have greater than negligible impact on items of environmental sensitivity.

4.2.1 Incident Report

WCPL will notify the relevant agencies (**Table 24**) of a subsidence incident as soon as practicable after the 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 measures 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 24
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 4.2.1	DP&E (Manager – Mining Projects) DRE (Subsidence Executive Officer) MSB (District Manager) DSC (Executive Engineer) ² Other regulators as specified in management plans.	Email	Environment and Community Manager	General Manager
Subsidence Management Status Report	To be updated fortnightly. Must be submitted if new impacts are identified or upon request.	DP&E (Manager, Mining Projects) DRE (Subsidence Executive Officer) DSC (Executive Engineer) ²	Email	Technical Services Superintendent Environment and Community Manager	Technical Services Superintendent (in consultation with Underground Manager of Mining Engineering, Environment and Community Manager and Director: Technical Services and Projects)
Six Monthly Report	Annual (for the period 1 January to 31 July)	DP&E (Manager, Mining Projects) DRE (Subsidence Executive Officer) MSB (District Manager) OEH/EPA (General Contact) NOW (Manager Strategic Stakeholder Liaison)	Email	Environment and Community Manager	General Manager
Annual Review	Annual (for the period 1 January to 31 December)	DP&E (Manager, Mining Projects) DRE (Subsidence Executive Officer) DRE (Director – Environmental Sustainability) MSB (District Manager) OEH/EPA (General Contact) NOW (Manager Strategic Stakeholder Liaison) Singleton Shire Council (General Manager) CCC Members	Email and Post	Environment and Community Manager	General Manager

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

² Where the longwall face is within the DSC Notification Area of the Wambo South Water Dam or the North East Tailings Dam.

4.2.2 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 and preliminary characterisation of the impact (i.e. Normal – Predicted Impact; Level 1 – Implement Management Measures; or Level 2 – Contingency Phase).
- 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 new impacts are identified or upon request from DP&E or DRE.

4.2.3 Six Monthly Report

A Six Monthly Report will be prepared to summarise monitoring results for the period 1 January to 1 July. 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 subsidence management actions undertaken by WCPL in the period subsequent to the last regular submission of the Subsidence Management Status Report.
- 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.
- Comprehensive summary of all observed and/or reported impacts, including a revised characterisation of the impact (i.e. Normal – Predicted Impact; Level 1 – Implement Management Measures; or Level 2 – Contingency Phase).
- Any proposed actions resulting from observations of Level 1 (Implement Management Measures) or Level 2 (Contingency Phase) impacts.
- Update on the effectiveness of the contingency measures outlined in any Incident Report submitted (**Section 4.2.1**).
- Summary of the adequacy, quality and effectiveness of the implemented management processes based on the monitoring and consultation information summarised above.
- Assessment of compliance against performance indicators and performance measures.
- Comprehensive summary of all quantitative and qualitative environmental monitoring results, summarised in **Section 3.8**.
- 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.

4.2.4 Annual Review

The Annual Review will be prepared and submitted in accordance with Condition 5 of Schedule 6 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.

4.3 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:

- within 3 months of the submission of an **Incident Report** relating to a subsidence impact (**Section 4.2.1**) taking into consideration any contingency response implemented following submission of the Incident Report (**Section 4.1.2**); 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 3**). 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.

4.4 REVIEW OF OTHER MANAGEMENT PLANS

As part of the notification under clause 33 of the *Work Health and Safety (Mines) Regulation, 2014* for longwall mining of Longwall 10A, WCPL will review and where necessary revise the **Inrush Management Plan** to incorporate Longwalls 8 to 10A.

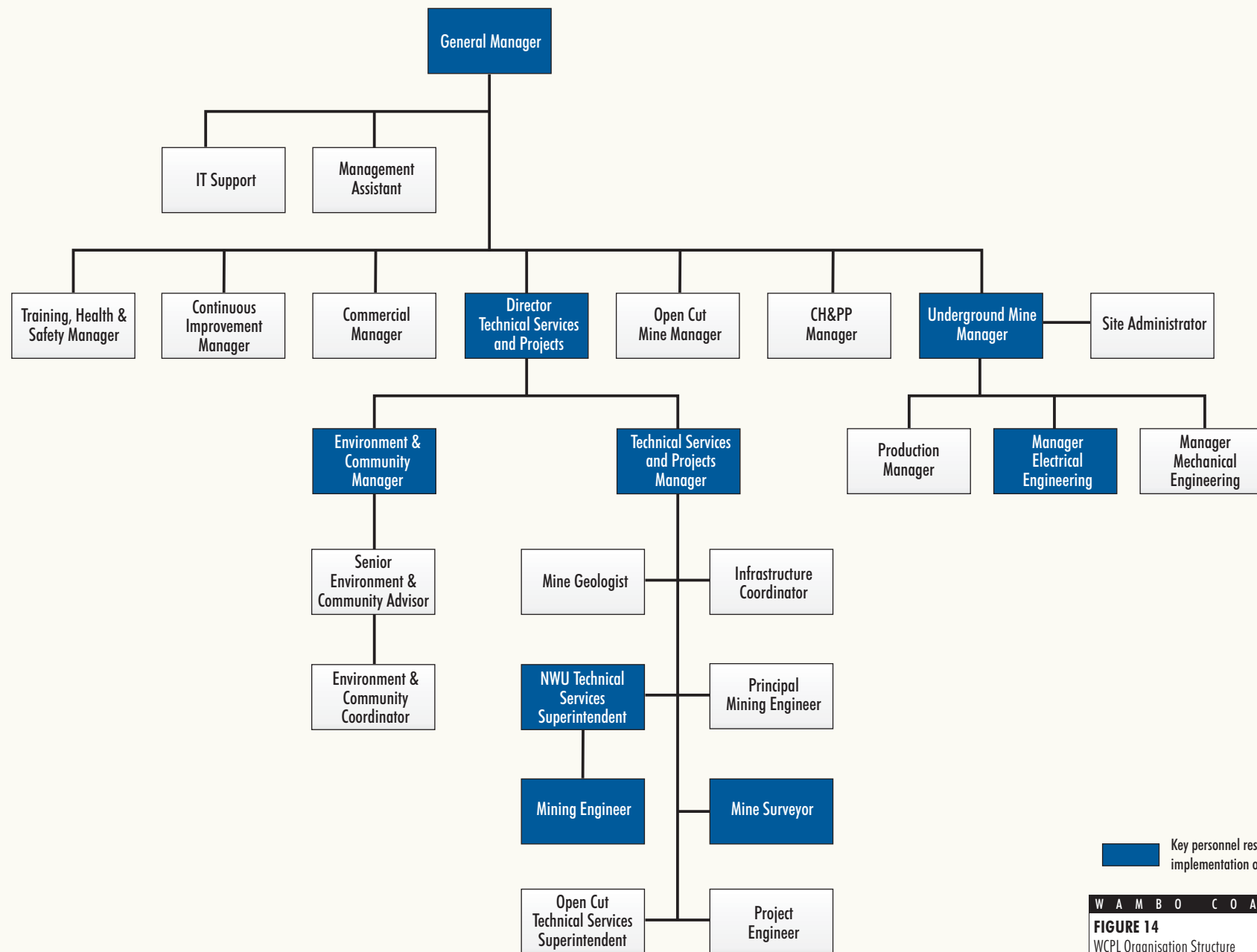
WCPL will also revise or amend the Underground Mining Operations Plan (as required under the conditions of the Mining Lease) to include Longwall 10A.

4.5 KEY RESPONSIBILITIES

Key responsibilities under this Extraction Plan are summarised in **Table 25**. The component management plans provide additional responsibilities under the plans. A summary WCPL organisation structure is provided in **Figure 14**.

Table 25
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.
Underground Manager of Mining Engineering	<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.
Director: Technical Services and Projects	<ul style="list-style-type: none"> 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. Liaise with relevant stakeholders regarding subsidence impact management and related public safety hazards.
Environment and Community Manager	<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 4.3 and 4.4.
Underground Mining Engineer	<ul style="list-style-type: none"> Undertake relevant monitoring and implementation of management measures summarised in Section 3.
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.



Key personnel responsible for implementation of the Extraction Plan

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

FIGURE 14

WCPL Organisation Structure

5 REFERENCES

- Advisian (2015) *Surface Water Impact Assessment Review – Revised Subsidence Impacts on Wambo Creek and Stony Creek*. Prepared for Wambo Coal Pty Limited.
- Department of Mineral Resources (1993) *Hunter Coalfield Regional Geology 1:100 000 Sheet*. New South Wales.
- Department of Planning and Environment and NSW Trade & Investment – Division of Resources and Energy (2015) *Guidelines for the Preparation of Extraction Plans Required under Conditions of Development Consents, Project Approvals and Mining Lease Conditions for Underground Coal Mining*. Version 5. Draft.
- Ditton Geotechnical Services (2012a) *Revised Predictions of Subsidence Effects and Subsidence Impacts for Longwalls 7 and 8 at North Wambo Underground Mine, Warkworth*.
- Ditton Geotechnical Services (2012b) *Subsidence Data Review and Validation of Prediction Methodology for North Wambo Underground Mine, Warkworth*.
- Godden Mackay Logan (2012) *Mine Management Plan - Underground Mining in the Vicinity of Wambo Homestead Complex*. Prepared for Wambo Coal Pty Limited.
- Godden Mackay Logan (2013) *Main Access to Longwalls 9 and 10 in the Vicinity of Wambo Homestead Complex Heritage Impact Statement*. Prepared for Wambo Coal Pty Limited.
- HydroSimulations (2015) *North Wambo Extraction Plan Longwalls 8 to 10A – Groundwater Impact Assessment Review*. 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 (2014a) *North Wambo Underground Subsidence Assessment*.
- Mine Subsidence Engineering Consultants (2014b) *North Wambo Underground Longwall 10A Subsidence Assessment*.
- Mine Subsidence Engineering Consultants (2015) *North Wambo Underground Mine Revised Subsidence Assessment. The Effects of the Modified Commencing End of WMLW10A on the Subsidence Predictions and Impact Assessments in Support of the Extraction Plan for WMLW8 to WMLW10A in the Wambo Seam*.
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Wambo Coal Pty Limited (2005) *Wambo Development Project – Wambo Seam Underground Mine Modification Statement of Environmental Effects*.

Wambo Coal Pty Limited (2006) *Wambo Development Project – North Wambo Underground Mine Subsidence Management Plan*.

Wambo Coal Pty Limited (2012) *North Wambo Underground Mine Modification Environmental Assessment*.

Wambo Coal Pty Limited (2014) *North Wambo Underground Mine Longwall 10A Modification Environmental Assessment*.

6 ABBREVIATIONS, ACRONYMS AND GLOSSARY

6.1 ABBREVIATIONS AND ACRONYMS

BFMP	Built Features Management Plan	HMP	Heritage Management Plan
BMP	Biodiversity Management Plan	km	kilometre
CCC	Community Consultative Committee	kV	kilovolt
CCL	Consolidated Coal Lease	LMP	Land Management Plan
CL	Coal Lease	m	metre
CRRP	Coal Resource Recovery Plan	MG	maingate
DgS	Ditton Geotechnical Services	ML	Mining Lease
DMR	NSW Department of Mineral Resources (now DRE)	mm	millimetre
DP&E	NSW Department of Planning and Environment	mm/m	millimetres per metre
DP&I	NSW Department of Planning and Infrastructure (now DP&E)	MOP	Mining Operations Plan
DPI	NSW Department of Primary Industries	MSB	Mine Subsidence Board
Draft Extraction Plan Guideline	<i>Guidelines for the Preparation of Extraction Plans Required under Conditions of Development Consents, Project Approvals and Mining Lease Conditions for Underground Coal Mining</i> (Department of Planning and Environment and NSW Trade & Investment – Division of Resources and Energy, 2015).	MSEC	Mine Subsidence Engineering Consultants
DRE	Division of Resources and Energy	Mt	million tonne
DSC	NSW Dams Safety Committee	North Wambo Modification EA	<i>North Wambo Underground Mine Modification Environmental Assessment</i>
EEC	endangered ecological community	North Wambo SEE	<i>Wambo Development Project - Wambo Seam Underground Mine Modification Statement of Environmental Effects</i>
the EIS	<i>Wambo Development Project Environmental Impact Statement</i>	NOW	NSW Office of Water
EPA	NSW Environment Protection Authority	NSW	New South Wales
EP&A Act	<i>NSW Environmental Planning and Assessment Act, 1979</i>	NSW Trade & Investment	NSW Department of Trade and Investment, Regional Infrastructure and Services
EPL	Environment Protection Licence	NWCSRS	North Wambo Creek Subsidence Response Strategy
ESCP	Erosion and Sediment Control Plan	OEH	NSW Office of Environment and Heritage
FFMP	Flora and Fauna Management Plan	PDMP	Prescribed Dam Management Plan
GWMP	Groundwater Monitoring Program	Peabody	Peabody Energy Australia Pty Limited
H&SMS	Health and Safety Management System	PSE	Principal Subsidence Engineer
		PSMP	Public Safety Management Plan
		ROM	Run-of-mine
		ROWMP	Right-of-way Management Plan
		RWEP	Remnant Woodland Enhancement Program

RPS	RPS Australia Asia Pacific	VCP	Vegetation Clearance Protocol
SGWRP	Surface and Groundwater Response Plan	WAMP	WCPL Asset Management Plan
SMP	Subsidence Management Plan	WCPL	Wambo Coal Pty Limited
SWMP	Surface Water Monitoring Program	WHC	Wambo Homestead Complex
S&MP	Salvage and Management Programme	WHCMMP	Wambo Homestead Complex Mine Management Plan
TARP	Trigger Action Response Plan	WHEZ	Wambo Homestead Exclusion Zone
TG	tailgate	WMP	Water Management Plan
TSMP	Threatened Species Management Plan	°	degree
		%	percent

6.2 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 mm.
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.
Cumulative Subsidence	The total subsidence effects resulting from all seams mined up to and including the Wambo Seam (i.e. future workings not included in this Extraction Plan are not included in the cumulative subsidence prediction).
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 Consequence	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 Aboriginal heritage sites; 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	Underground workings which establish access to the coal resource area.
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.
Incremental Subsidence	The subsidence effects resulting from mining in the Wambo Seam only, including goaf reactivation of the previous workings in the Whybrow Seam (i.e. not including any subsidence already completed as a result of mining in the Whybrow Seam and/or Woodlands Hill/Arrowfield Seam).
Mitigation	Activities associated with reducing the impacts of the development prior to or during those impacts occurring.
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 by longwall mining or pillar extraction that may result in surface subsidence.
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 Effect	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 Impact	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 upsidence 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.
WHC Curtilage	The boundary of the listing of the Wambo Homestead Complex under the State Heritage Register of NSW.
Wollombi Brook Protected Land (as shown on figures in this Extraction Plan)	Within 40 metres of Wollombi Brook as defined by the <i>Rivers and Foreshore Improvement Act, 1948</i> . Mining of longwall panels in the vicinity of Wollombi Brook would be constrained to an angle of 26.5 degrees from the vertical to “Protected Land”.