WAMBO COAL PTY LIMITED

WAMBO COAL MINE
LONGWALL 24 TO 26 MODIFICATION

SUBMISSIONS REPORT

For the Modification of DA 305-7-2003 (MOD 19)
Optimisation and Continued Operation
of the Approved South Bates Extension Underground Mine

November 2022

Peabody

WAMBO COAL MINE
LONGWALL 24-26 MODIFICATION
SUBMISSIONS REPORT

Prepared by Wambo Coal Pty Ltd

PROJECT NO.	WAM-09-15
DOCUMENT NO.	01158306
DATE:	NOVEMBER 2022

EXECUTIVE SUMMARY

The Wambo Coal Mine is situated approximately 15 kilometres west of Singleton, near the village of Warkworth, New South Wales (NSW), and is operated in accordance with Development Consent (DA 305-7-2003).

The Wambo Coal Mine is owned and operated by Wambo Coal Pty Limited (WCPL), a subsidiary of Peabody Energy Australia Pty Limited.

In August 2022, WCPL submitted a modification to modify Development Consent (DA 305-7-2003) for the Wambo Coal Mine to allow for the continuation and improved efficiency of the South Bates Extension Underground Mine (hereafter referred to as the Modification), under section 4.55(2) of the NSW *Environmental Planning and Assessment Act 1979*.

The Modification Report was placed on public exhibition by the Department of Planning and Environment (DPE) from 20 September 2022 to 4 October 2022. During and following the public exhibition period, a total of nine submissions on the Modification Report were received from NSW Government agencies. Three submissions were also received from members of the public. Of these three public submissions, all three supported the Modification, no public submissions opposed the Modification or provided comments. No submissions were received from local councils.

On 7 October 2022, the DPE requested that WCPL prepare and submit a Submissions Report for the Modification (this report). Accordingly, this Submissions Report provides WCPL's responses to issues raised in submissions on the Modification.

The key issues raised in the submissions related to environmental matters, namely biodiversity and water resources issues.

In support of this Submissions Report, WCPL has commissioned Hunter Eco (2022) to prepare a Biodiversity Development Assessment Report to assist in responding to the DPE – Biodiversity and Conservation Division submission.

The Biodiversity Development Assessment Report has not materially altered the findings of any key environmental assessment matters. No amendments to the Modification have been required to address the submissions received.

Since lodgement of the Modification Report, WCPL has reviewed the submissions on the Modification and has continued to consult with members of the community, local councils and NSW Government agencies, and also sought additional advice from its technical specialists. Based on this further consideration and analysis, WCPL has concluded that the key potential impacts and benefits of the Modification and the justification for the Modification remain consistent with the conclusions presented in Section 7 of the Modification Report (WCPL, 2022).

In weighing up the main environmental impacts (costs and benefits) associated with the proposal as assessed and described in the Modification Report and this Submissions Report, the Modification remains, on balance, in the public interest of the State of NSW.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ATTACHMENTS

1 INTRODUCTION

The Wambo Coal Mine is situated approximately 15 kilometres (km) west of Singleton, near the village of Warkworth, New South Wales (NSW) (Figure 1), and is operated in accordance with Development Consent (DA 305-7-2003), issued under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

The Wambo Coal Mine is owned and operated by Wambo Coal Pty Limited (WCPL), a subsidiary of Peabody Energy Australia Pty Limited.

In August 2022, WCPL submitted a Modification Report (WCPL, 2022) to support a request to modify Development Consent (DA 305-7-2003) under section 4.55(2) of the EP&A Act to seek approval for the continuation and improved efficiency of the South Bates Extension Underground Mine (the Modification).

The Modification Report was placed on public exhibition by the Department of Planning and Environment (DPE) from 20 September 2022 to 4 October 2022. During and following the public exhibition period, submissions on the Modification Report were received from NSW Government agencies and members of the public.

On 7 October 2022, DPE requested that WCPL prepare and submit a Submissions Report for the Modification (this report). Accordingly, this Submissions Report provides WCPL's responses to issues raised in submissions on the Modification. It has been prepared in consideration of the *State significant development guidelines – preparing a submissions report* (Department of Planning, Industry and Environment [DPIE], 2021).

The remainder of this Submissions Report is structured as follows:

Section 1 Provides an introduction and overview of the approved and modified Wambo Coal Mine.

Section 2 Provides an analysis of the submissions received by DPE during the public exhibition period.

Section 3 Summarises the actions taken since lodgement of the Modification Report, including additional engagement activities and further refinements and assessment of the Modification.

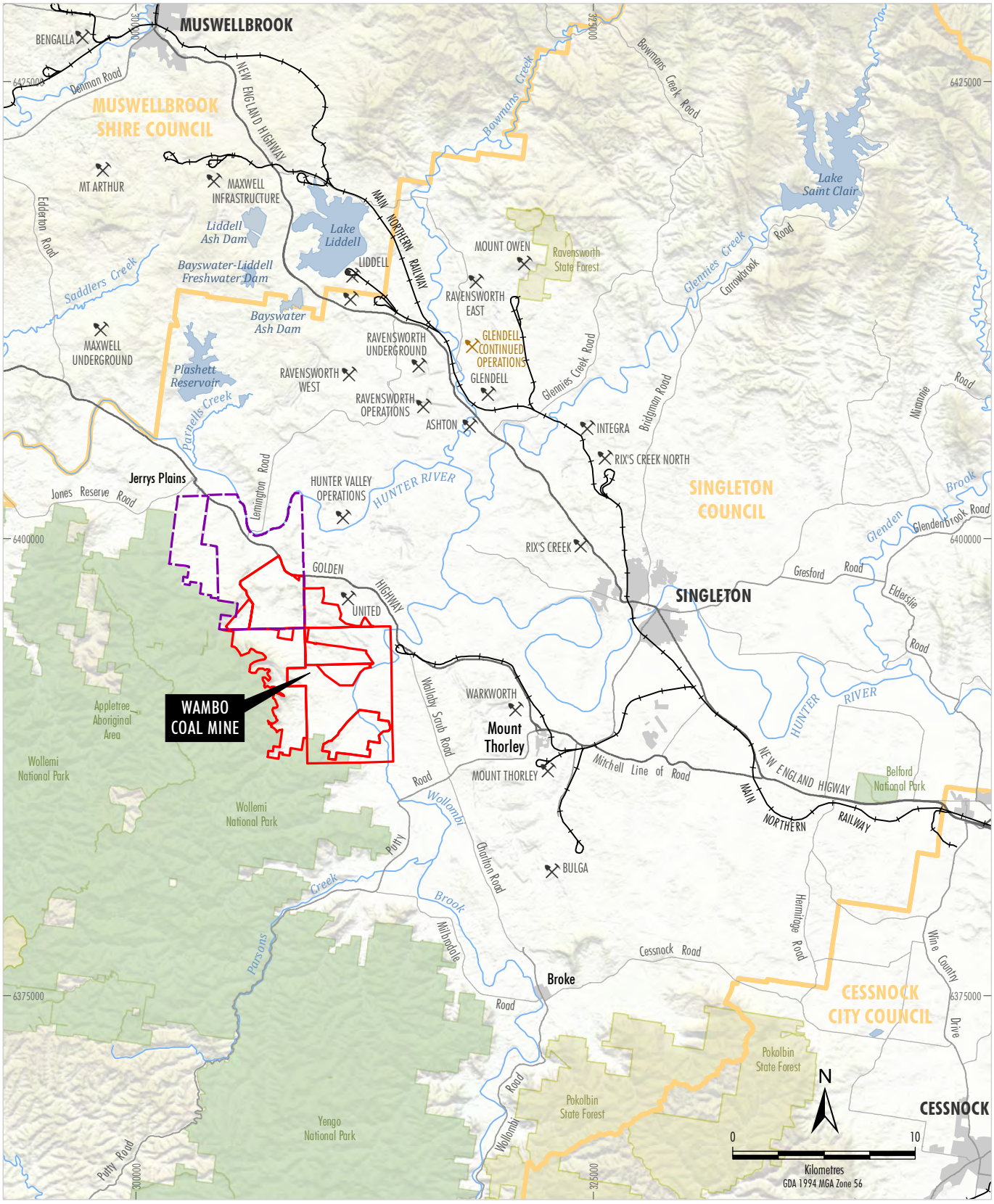
Section 4 Provides responses to aspects raised in submissions.

Section 5 Provides an updated evaluation of the Modification.

Section 6 Lists the documents referenced in the Submissions Report.

1.1 WAMBO COAL MINE OVERVIEW

A range of open cut and underground mine operations have been conducted at the Wambo Coal Mine since mining operations commenced in 1969. Mining under Development Consent (DA 305-7-2003) commenced in 2004, with both open cut and underground operations conducted until 2020. From 1 December 2020, the Wambo Coal Mine transitioned into underground mining and coal handling and processing operations.



WAH-09-15_SBX Mod LW24-26_RKS_201A

LEGEND

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

Source: NSW Spatial Services (2022)

Peabody

WAMBO COAL MINE

Regional Location

Figure 1

Development Consent (DA 305-7-2003) (as modified) allows for the following mining and coal handling and processing operations at the Wambo Coal Mine:

- Underground mining operations in the approved North Wambo Underground Mine (completed).
- Underground mining operations in the approved South Bates Underground Mine (completed).
- Underground mining operations in the approved South Bates Extension Underground Mine (in progress).
- Underground mining operations in the approved South Wambo Underground Mine (future operation).
- Ongoing operation of the Coal Handling and Processing Plant (CHPP) and processing of coal from the underground mining operation and the United Wambo Open Cut Coal Mine, with up to 14.7 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal processed at the CHPP in any calendar year.

Underground mining operations at the Wambo Coal Mine are approved until 31 August 2042.

Development Consent (DA 305-7-2003) has been modified 17 times since approval for the Wambo Coal Mine was granted.

1.2 MODIFICATION OVERVIEW

The Modification would allow for the continuation and improved efficiency of the South Bates Extension Underground Mine and would include:

- reorienting Longwalls 24 and 25 of the South Bates Extension Underground Mine;
- an additional longwall panel (i.e. Longwall 26);
- processing of ROM coal from Longwalls 24 to 26 at the existing on-site CHPP;
- an overall reduction in the approved area of overlying land predicted to experience potential subsidence impacts (relative to the layout assessed and approved by Modification 17); and
- an additional mining lease over a component of Authorisation (AUTH) 444.

The Modification would not extend the approved overall life of the Wambo Coal Mine, but would allow for continued operations at the South Bates Extension Underground Mine for a further three years (as the approved Longwalls 24 and 25 would not be mined in their current arrangement).

No other changes to the approved Wambo Coal Mine (including surface development area) would be required for the Modification.

Table 1 provides a comparative summary of the existing/approved and modified Wambo Coal Mine.

The approved and modified South Bates Extension Underground Mine general arrangement is shown in Figures 2 and 3.

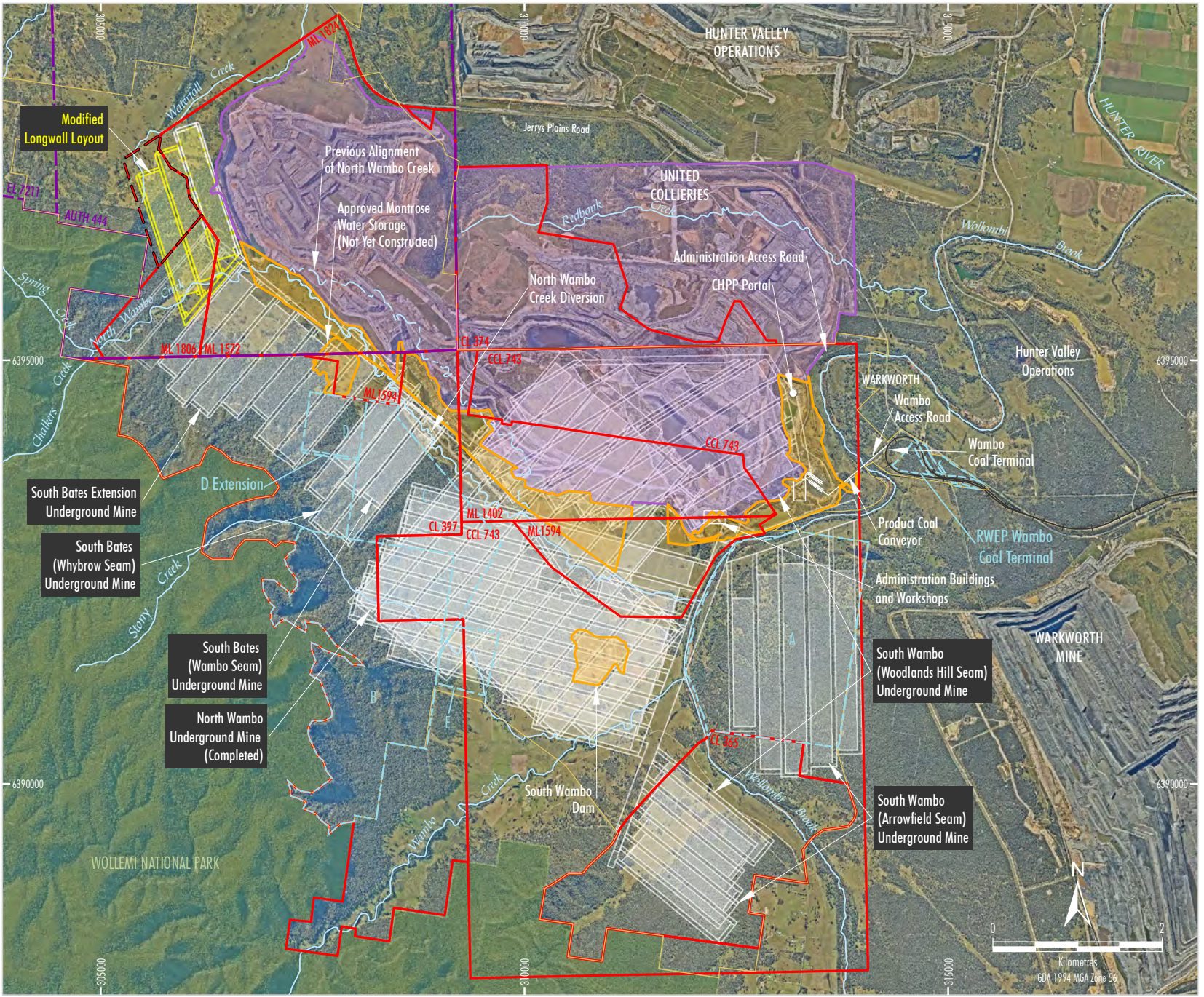
Based on a review of the proposed changes, WCPL considers that the modified Wambo Coal Mine would be substantially the same as the existing/approved Wambo Coal Mine.

A description of the Modification is provided in Section 3 of the Modification Report (WCPL, 2022).

Table 1
Summary Comparison of Approved and Modified Wambo Coal Mine

Project Component	Approved Wambo Coal Mine[1]	Modified Wambo Coal Mine
Life of Mine	Underground mining operations may be carried out until 31 August 2042.	No change.
Open Cut Mining	No open cut mining activities following commencement of Phase 2 operations.	No change.
Underground Mining Rate	Longwall mining of up to 9.75 Mtpa of ROM coal.	No change.
Underground Mine Target Seams	Extraction from the Whybrow, Wambo, Woodlands Hill and Arrowfield Seams.	No change.
Longwall Layout (South Bates Extension Underground Mine)	As per Figure 3 of Development Consent (DA 305-7-2003).	Reorientation of Longwalls 24 and 25, and the addition of Longwall 26 (Figures 2 and 3).
Total ROM Coal Mined	Underground ROM coal reserves estimated at 161.3 million tonnes (Mt).	No change.
Total CHPP Rejects	Approximately 40.3 Mt of coarse rejects and approximately 24.5 Mt of tailings.	No change.
Subsidence Commitments and Management	The subsidence impact performance measures listed in Conditions B1 and B4 of Development Consent (DA 305-7-2003).	No change.
Waste Rock Management	No open cut mining activities or associated waste rock management following commencement of Phase 2 operations.	No change.
Coal Washing	Up to 14.7 Mtpa of ROM coal from the Wambo Coal Mine and United Wambo Open Cut Coal Mine may be processed at the Wambo Coal Mine CHPP in any calendar year.	No change.
CHPP Reject Management	Coarse rejects and tailings would be incorporated, encapsulated and/or capped within open cut voids and emplacement areas associated with the United Wambo Open Cut Coal Mine.	No change.
Water Supply	Make-up water demand to be met from runoff recovered from tailings storage areas, operational areas, dewatering, licensed extraction from Wollombi Brook and Hunter River. Ongoing exchange of water between the United Wambo Open Cut Coal Mine and the Wambo Coal Mine to allow for integration of the water management systems.	No change.
Surface Facilities	Construction of surface facilities within the approved surface development area.	No change.
Mining Tenements	Coal Lease (CL) 365, CL 374, CL 397, Consolidated Coal Lease (CCL) 743, Mining Lease (ML) 1402, ML 1572, ML 1594, ML 1806, AUTH 444, Exploration Licence 7211.	An additional mining lease over a component of exploration tenement AUTH 444.

[1] Development Consent (DA 305-7-2003) (as modified).



LEGEND

- National Park
- SSD 7142 Operational Area #
- WCPL Owned Land

Wambo Coal Mine

- Exploration Licence Boundary (AUTH, EL)
- Mining and Coal Lease Boundary (ML, CL, CCL)
- Proposed Mining Lease Application Area
- Remnant Woodland Enhancement Program (RWEP) Area
- Existing/Approved Wambo Coal Mine Surface Development Area
- Existing/Approved Underground Development
- Approved Orientation of Longwalls 24 and 25
- Existing/Approved Underground Development (First Workings only)

Modification 19

- Modified Longwall Layout

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

Source: WCPL (2022); NSW Spatial Services (2022)
Orthophoto: WCPL (May 2022)

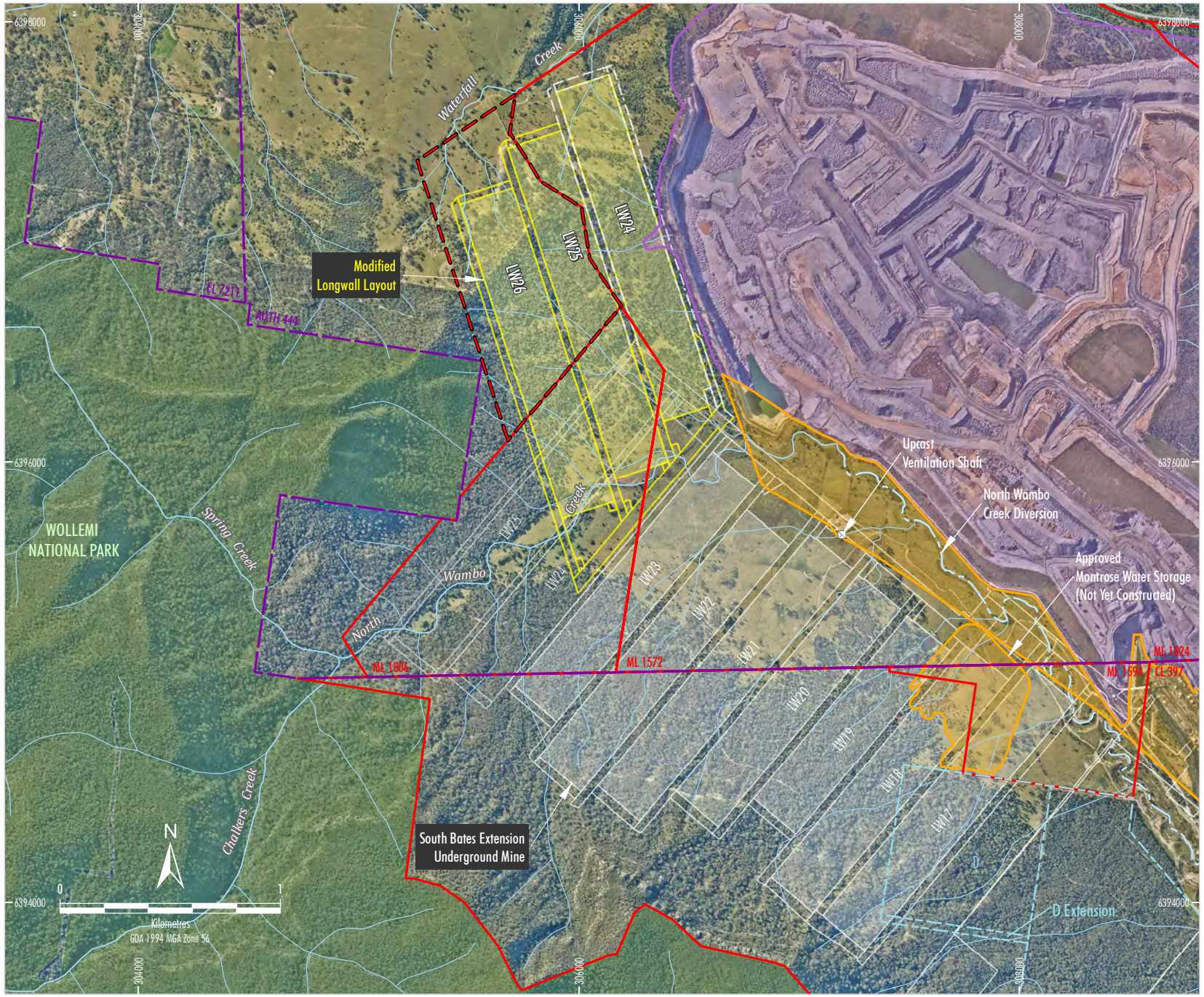
Peabody

WAMBO COAL MINE

Approved and Modified Wambo Coal Mine General Arrangement

Figure 2

WAM-09-15_SBX Mod LW24-26_RtS_202A



LEGEND

- National Park
- SSD 7142 Operational Area #

Wambo Coal Mine

- Exploration Licence Boundary (AUTH, EL)
- Mining and Coal Lease Boundary (ML, CL, CCL)
- Proposed Mining Lease Application Area
- Remnant Woodland Enhancement Program (RWEP) Area
- Existing/Approved Wambo Coal Mine Surface Development Area
- Ventilation Shaft
- Existing/Approved Underground Development
- Approved Orientation of Longwalls 24 and 25
- Existing/Approved Underground Development (First Workings only)

Modification 19

- Modified Longwall Layout

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

Source: WCPL (2022); NSW Spatial Services (2022)
Orthophoto: WCPL (May 2022)

Peabody

WAMBO COAL MINE

Approved and Modified South Bates Extension Underground Mine General Arrangement

Figure 3

WAM-09-15_SBX Mod LW24-26_RtS_203A

2 ANALYSIS OF SUBMISSIONS

2.1 BREAKDOWN OF SUBMISSIONS

A total of nine submissions on the Modification Report were received from NSW Government agencies.

The following NSW Government agencies had little or no comment on the Modification, and hence no formal response from WCPL is required:

- Resources Regulator;
- Subsidence Advisory;
- Department of Regional NSW – Mining, Exploration and Geoscience;
- Environmental Protection Authority;
- Heritage NSW;
- Heritage Council of NSW; and
- DPE – Crown Lands.

The following NSW Government agencies requested additional information, or had more comprehensive comments/concerns regarding the Modification:

- DPE – Water; and
- DPE – Biodiversity and Conservation Division (BCD).

There were three submissions received from members of the public in support of the Modification. No submissions on the Modification Report were received from members of the public objecting to the Modification.

A register of submitters is provided in Attachment 1.

The key aspects raised in submissions are summarised in Section 2.2.

2.2 Categorising Issues

Consistent with the *State significant development guidelines – preparing a submissions report* (DPIE, 2021), WCPL has reviewed the issues raised in submissions to categorise them into broad categories (e.g. submissions relating to the modified Wambo Coal Mine layout, design or activities; submissions relating to procedural matters; submissions relating to environmental matters). Based on this review, WCPL considers that all issues raised were related to environmental matters, including biodiversity and water resources.

3 ACTIONS TAKEN SINCE EXHIBITION

3.1 REFINEMENT OF THE MODIFICATION

No refinements of the Modification have been required to address the submissions received.

3.2 ENGAGEMENT ACTIVITIES

Since the lodgement of the Modification Report, WCPL has continued to consult with key NSW Government agencies and the community regarding the Wambo Coal Mine and the Modification. An overview of key recent consultation is provided below.

NSW Department of Planning and Environment

WCPL consulted with the DPE regarding the approach to addressing the key issues raised in submissions on 14 October 2022. During this consultation it was agreed that WCPL would prepare a Biodiversity Development Assessment Report (BDAR) to address the BCD's submission (Section 3.3).

Furthermore, WCLP has committed to undertaking additional targeted biodiversity surveys prior to commencing longwall mining of the modified Longwalls 24 to 26 as a result of the consultation with DPE (Section 4.2).

Community Consultative Committee

WCPL notified Community Consultative Committee members on 19 September 2022 that the Modification Report was on public exhibition.

An update on the Modification was provided at the Community Consultative Committee meeting held on 8 November 2022. WCPL provided a recap of the Modification, an overview of the Modification assessment process (including the public exhibition process) and a summary of feedback provided by NSW Government agencies. WCPL advised the Community Consultative Committee members that comments and feedback would be addressed within the Submissions Report (this document). An opportunity for Community Consultative Committee members to ask questions in relation to the Modification was also provided during the meeting.

3.3 FUTHER ENVIRONMENTAL ASSESSMENT

In support of this Submissions Report, WCPL has commissioned Hunter Eco (2022) to prepare a BDAR to assist in responding to the DPE – BCD submission (Attachment 2).

The BDAR has not materially altered the findings of any key environmental assessment matters.

4 RESPONSE TO SUBMISSIONS

The matters raised in the submissions were related to the environmental impacts associated with the modified Wambo Coal Mine (Section 2.2). Responses to these issues are provided below.

4.1 WATER RESOURCES

Surface Water Flow Monitoring

Issue

The DPE – BCD requested additional information on stream flow monitoring proposed to monitor potential surface water losses due to cracking in North Wambo Creek.

Response

The length of North Wambo Creek located above the Modified Layout will be approximately 2.1 km shorter than the Approved Layout of the South Bates Extension Underground Mine (Figure 3).

Mine Subsidence Engineering Consultants (MSEC) (2022) assessed the potential stream bed cracking impacts of the Modification in the Subsidence Assessment (Appendix A of the Modification Report) and concluded that no long-term adverse impacts are expected after the completion of the relevant surface remediation measures previously implemented at the Wambo Coal Mine.

In accordance with the approved Surface Water Management Plan, prepared in accordance with Condition B66(d)(iv) of Development Consent (DA 305_7_2003), WCPL monitors flow in North Wambo Creek, the North Wambo Creek Diversion, Wambo Creek and Stony Creek using continuous flow monitoring stations (Figure 4). The Surface Water Management Plan would be reviewed and revised to incorporate for the Modification, subject to the conditions of any modified Consent (DA 305-7-2003).

Any measured loss of surface water flow would be licensed using WCPL's existing Water Access Licence 18437 (350 shares) in the Lower Wollombi Brook Water Source under the *Hunter Unregulated and Alluvial Water Sources Water Sharing Plan 2009*. WCPL would make any necessary adjustments to its pumping from Wollombi Brook and/or the scale of mining operations so that there would be sufficient entitlement to licence any observed surface water flow losses.

Watercourse Remediation

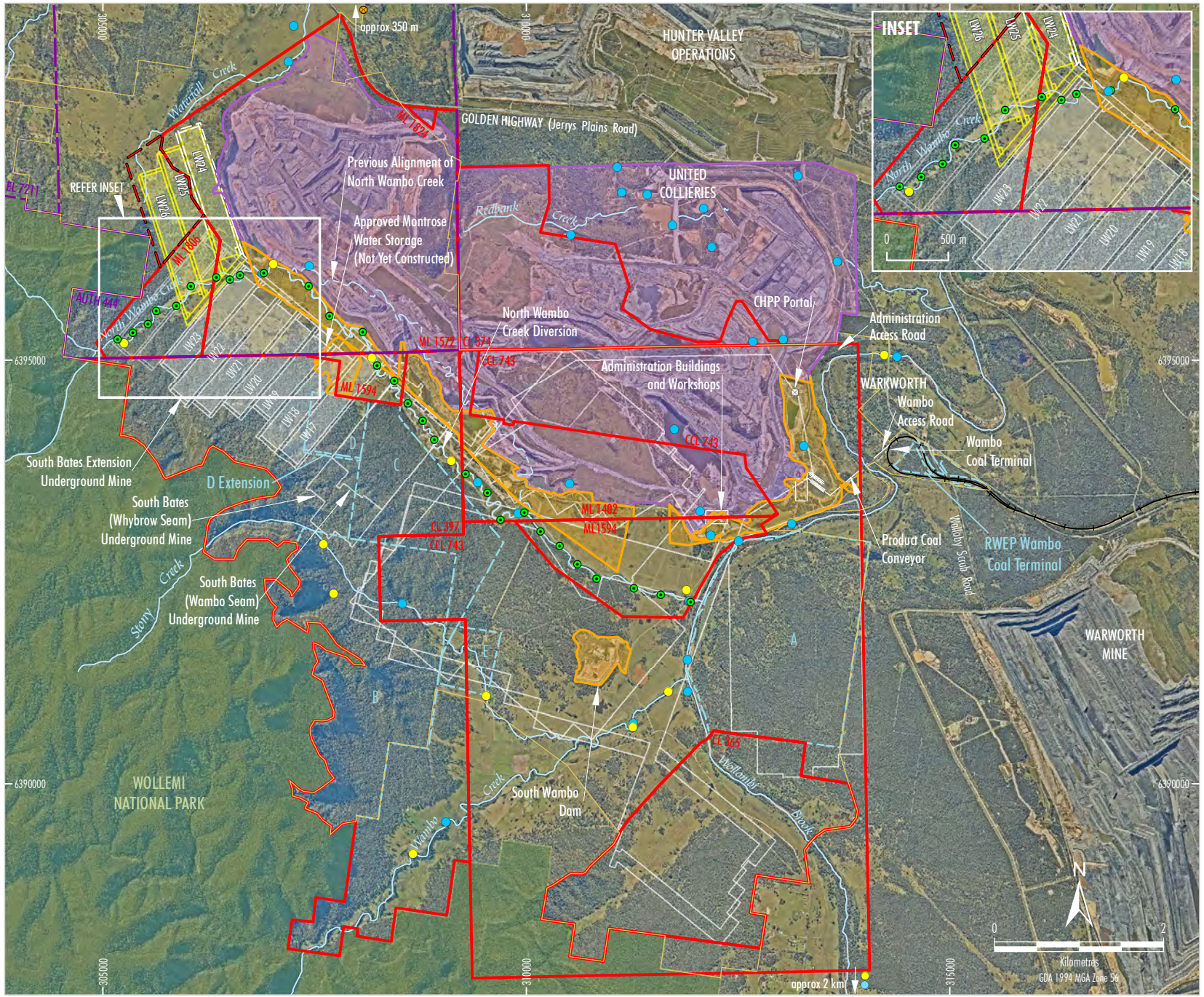
Issue

DPE-Water recommended that remediation of watercourses post-mining should be undertaken in consideration of the guidance series for *Controlled Activities on Waterfront Land* (NSW Department of Primary Industries Office of Water, 2012).

Response

In accordance with Condition B7(d) of Development Consent (DA 305-7-2003), WCPL is required to remediate or manage any impacts and/or environmental consequences to meet the rehabilitation objectives listed within Condition B105 of Development Consent (DA 307-7-2003).

WCPL will remediate watercourses in consideration of the guidance series for *Controlled Activities on Waterfront Land* (NSW Department of Primary Industries Office of Water, 2012).



LEGEND

- National Park
- SSD 7142 Operational Area #
- WCPL Owned Land

Wambo Coal Mine

- Exploration Licence Boundary (AUTH, EL)
- Mining and Coal Lease Boundary (ML, CL, CCL)
- Proposed Mining Lease Application Area
- Remnant Woodland Enhancement Program (RWEP) Area
- Existing/Approved Wambo Coal Mine Surface Development Area
- Existing/Approved Underground Development
- Approved Orientation of Longwalls 24 and 25
- Existing/Approved Underground Development (First Workings only)

Modification 19

- Modified Longwall Layout

Monitoring Sites

- Surface Water Flow Monitoring Site
- Surface Water Quality Monitoring Site
- Diversion and Subsidence Monitoring Site

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

Source: WCPL (2022); NSW Spatial Services (2022)
Orthophoto: WCPL (May 2022)

Peabody

WAMBO COAL MINE

Locations of Surface Water Monitoring Sites

Figure 4

Groundwater Licencing

Issue

DPE – Water recommended that WCPL holds sufficient Water Access Licences (WALs) to cover both direct and indirect groundwater take at the Wambo Coal Mine and that groundwater take and licensing is reported in the Annual Review.

Response

The Groundwater Assessment (Appendix B of the Modification Report) concluded that WCPL holds sufficient licences to account for the expected groundwater take for the modified Wambo Coal Mine.

In accordance with Condition B53 of Development Consent (DA 305-7-2003), WCPL will report on water take (both direct and indirect) from the Wambo Coal Mine in the Annual Review.

Groundwater Dependent Ecosystems

Issue

DPE – Water recommended that WCPL commits to mitigating potential impacts on groundwater dependent ecosystems (GDEs) associated with North Wambo Creek.

Response

The Groundwater Assessment (Appendix B of the Modification Report) concluded that the Modification is not expected to result in impacts to the GDEs identified on North Wambo Creek, Waterfall Creek, Redmanvale Creek and Hunter River. The modified South Bates Extension Underground Mine would reduce the area of high potential GDEs associated with the North Wambo Creek that would be undermined (Appendix F of the Modification Report).

The water management performance measures outlined in Condition B62 of Development Consent (DA 305-7-2003) require the Wambo Coal Mine to have negligible environmental consequences on GDEs.

The management of potential impacts on GDEs associated with the second workings of the South Bates Extension Underground Mine would be undertaken in accordance with the Biodiversity Management Plan prepared as part of the Extraction Plan for the modified South Bates Extension Underground Mine in accordance with Condition B7 of Development Consent (DA 305-7-2003).

4.2 BIODIVERSITY

Assessment Methodology

Issue

The DPE – BCD recommended that a BDAR be prepared for the Modification.

Response

The Biodiversity Review prepared for the Modification (Appendix F of the Modification Report) assessed the potential impacts of the Modification and concluded that the Modification would not result in a net increase to impacts on biodiversity values. A BDAR was therefore not considered to be required with reference to clause 30A, sections 1(a) and 2(c) of the *Biodiversity Conservation (Savings and Transitional) Regulation 2017)*.

Notwithstanding the above, consistent with DPE – BCD's recommendation, WCPL has commissioned Hunter Eco (2022) to prepare a BDAR for the Modification (Attachment 2). The BDAR addresses any proposed changes that would result in impacts (direct, indirect or prescribed) on biodiversity values.

The BDAR concludes:

> *The Modification would not result in any direct impacts on native vegetation or habitat as no land clearance is proposed. In regard to indirect impacts, the Modification would result in an overall reduction in the area of native vegetation predicted to experience potential subsidence impacts (22.7 ha reduction). The Modification is likely to result in minor cracking and ponding of the land surface with negligible environmental consequences, consistent with the approved mine.*

Biodiversity Management Measures

Issue

The DPE – BCD recommended that an adaptive management plan be prepared based on the guidance in Section 8.5 of the *Biodiversity Assessment Method* (BAM) (DPIE, 2020a).

Response

The BAM (DPIE, 2020a) states:

> *The proponent must develop an adaptive management plan to address any remaining impacts where mitigation measures in Section 8.4 have not been proposed in the BDAR or BCAR.*

WCPL has proposed mitigation measures to address remaining impacts. Section 8 of the BDAR states:

> *Biodiversity management and monitoring at the Wambo Coal Mine is conducted in accordance with the approved Biodiversity Management Plan prepared in accordance with Condition B75, Schedule 2 of the Development Consent (DA 305-7-2003). Furthermore, the management of potential biodiversity impacts associated with the second workings of the South Bates Extension Underground Mine is undertaken in accordance the Extraction Plan in accordance with Condition B7, Schedule 2 of the Development Consent (DA 305-7-2003). The monitoring programme is extensive and includes biometric sites, riparian vegetation monitoring, groundwater dependent vegetation monitoring and a visual subsidence inspection.*
>
> *…*
>
> *An adaptive management plan (as per the BAM) is not proposed as WCPL has proposed mitigation measures to address remaining impacts and an adaptive management approach is already proposed through the standard conditions of development consents for underground coal mines in NSW.*

Issue

The DPE – BCD recommended that targeted surveys be undertaken for a list of threatened species.

Response

The BAM (DPIE, 2020a) does not require threatened species surveys. Section 4.3.4 of the BDAR states:

> *For a development proposal, the BAM (DPIE 2020a) describes that a proponent may elect to assume a species is present in replace of a targeted survey or expert report.*

Potential subsidence impacts on all potentially occurring threatened flora and fauna species were assessed in the BDAR. Section 7.2.1 of the BDAR states:

> *As described above, there is no likelihood of significant change to habitat structure and content as a consequence of subsidence. Consequently, there would be no loss of any of the threatened species listed in Table 9 were they to occur in the Subject Land.*

Notwithstanding to the above, based on consultation with DPE (Section 3.2), WCPL will undertake targeted surveys in accordance with *Surveying Threatened Plants and Their Habitats: NSW Survey Guide for the Biodiversity Assessment Method* (DPIE, 2020b) for the *Tiger Orchid Population in the Hunter Catchment* and *Slaty Red Gum* ('count' species) within the assumed species polygon from the BDAR prior to the commencement of Longwall mining in the modified Longwalls 24 to 26.

5 PROJECT EVALUATION

This Submissions Report provides responses to issues raised by submissions from NSW Government agencies and local councils during the public exhibition period for the Modification Report and has been prepared in consideration of the *State significant development guidelines – preparing a submissions report* (DPIE, 2021).

The Modification Report provides an evaluation of the Modification in Section 7 (WCPL, 2022). This evaluation concluded that in weighing up the main environmental impacts (costs and benefits) associated with the proposal as assessed and described in the Modification Report, the Modification is, on balance, considered to have merit.

Since lodgement of the Modification Report, WCPL has reviewed the submissions on the Modification and has continued to consult with members of the community and key NSW Government agencies, and also sought additional advice from its technical specialists. Based on this further consideration and analysis, WCPL has concluded that the key potential impacts and benefits of the Modification and the justification for the Modification remain consistent with the conclusions presented in Section 7 of the Modification Report.

In weighing up the main environmental impacts (costs and benefits) associated with the proposal as assessed and described in the Modification Report and this Submissions Report, the Modification remains, on balance, in the public interest of the State of NSW.

6 REFERENCES

Department of Planning, Industry and Environment (2020a) *Biodiversity Assessment Method*

Department of Planning, Industry and Environment (2020b) *Surveying Threatened Plants and Their Habitats: NSW Survey Guide for the Biodiversity Assessment Method.*

Department of Planning, Industry and Environment (2021) *State Significant Development Guidelines – preparing a submissions report*

Hunter Eco (2022) *Longwall 24 To 26 Biodiversity Development Assessment Report*

Mine Subsidence Engineering Consultants (2022) *South Bates Extension Underground Mine Longwalls 24 to 26 Modification Subsidence Assessment*

New South Wales Department of Primary Industries Office of Water (2012) *Controlled Activities on Waterfront Land*

Wambo Coal Pty Ltd (2022) *Wambo Coal Mine Longwall 24 to 26 Modification – Modification Report*

ATTACHMENT 1

SUBMISSIONS REGISTER

Table A1-1
Register of Submissions

Group	Name	Section where issues addressed in Submissions Report
Agencies	Department of Planning and Environment – Water	Section 4.1
	Department of Planning and Environment – Biodiversity and Conservation Division	Section 4.2
	Department of Planning and Environment – Crown Lands	Section 2.1
	New South Wales Resources Regulator	Section 2.1
	Subsidence Advisory New South Wales	Section 2.1
	New South Wales Environmental Protection Agency	Section 2.1
	Department of Regional NSW – Mining, Exploration and Geoscience	Section 2.1
	Heritage New South Wales	Section 2.1
	Heritage Council of New South Wales	Section 2.1
Public	Dave Malone	Section 2.1
	Custom Fluidpower	Section 2.1
	Brenton Lewis	Section 2.1

ATTACHMENT 2

BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

WAMBO COAL MINE

LONGWALLS 24 TO 26 MODIFICATION

BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

Prepared by
Dr Colin Driscoll
BAAS17004

November 2022

Certification under clause 6.15 Biodiversity Conservation Act 2016

I certify that this report has been prepared based on the requirements of, and information provided under, the Biodiversity Assessment Method and clause 6.15 of the *Biodiversity Conservation Act 2016* (BC Act).

Signature: _____

Date: 29 November 2022

BAM Assessor Accreditation no: BAAS17004

This BDAR has been prepared to meet the requirements of BAM 2020. Appendix A provides an assessment of compliance with the minimum information requirements outlined in BAM Appendix K.

TABLE OF CONTENTS

TABLES

FIGURES

PLATES

ATTACHMENTS

DEFINITIONS

BAM: *the Biodiversity Assessment Method.*

BC Act: *the NSW Biodiversity Conservation Act 2016.*

BC Regulation: *the NSW Biodiversity Conservation Regulation 2017.*

Biodiversity Assessment Method Calculator: *the online computer program that provides decision support to assessors and proponents by applying the BAM and referred to as the BAM-C. The BAM-C contains biodiversity data from the BioNet Vegetation Classification and the Threatened Biodiversity Data Collection that the assessor is required to use in a BAM assessment. The BAM-C applies the equations used in the BAM, including those to determine the number and class of biodiversity credits required to offset the impacts of a development, or created at a biodiversity stewardship site. It is published by the Department.*

Biodiversity Development Assessment Report (BDAR): *a report prepared by an accredited person in relation to proposed development or activity that would be authorised by a planning approval, or proposed clearing that would be authorised by a vegetation clearing approval, that:*

- *(a) assesses in accordance with the BAM the biodiversity values of the land subject to the proposed development, activity or clearing;*
- *(b) assesses in accordance with the BAM the impact of proposed development, activity or clearing on the biodiversity values of that land;*
- *(c) sets out the measures that the proponent of the proposed development, activity or clearing proposes to take to avoid or minimise the impact of the proposed development, activity or clearing; and*
- *(d) specifies in accordance with the BAM the number and class of biodiversity credits that are required to be retired to offset the residual impacts on biodiversity values of the actions to which the biodiversity offsets scheme applies.*

Biodiversity Offsets: *the gain in biodiversity values achieved from the implementation of management actions on areas of land, to compensate for losses to biodiversity values from the impacts of development.*

Biodiversity Stewardship Site: *means the land that is designated by a biodiversity stewardship agreement to be a biodiversity stewardship site for the purposes of the BC Act.*

Broad Condition State: *areas of the same Plant Community Type that are in relatively homogenous condition. Broad condition is used for stratifying areas of the same Plant Community Type into a vegetation zone for the purpose of determining the vegetation integrity score.*

Class of biodiversity credit: *biodiversity credits that share the same attributes (refer to Subsection 10.2 of the BAM 2020).*

Development Footprint: *the area of land that is directly impacted on by a proposed development, including access roads and areas used to store construction materials. The term development footprint is also taken to include clearing footprint, except where the reference is to a small area development or a major project development.*

Ecosystem credits: *a measurement of the value of threatened ecological communities, threatened species habitat for species that can be reliably predicted to occur with a PCT, and PCTs generally. Ecosystem credits measure the loss in biodiversity values at a development, activity, clearing or biodiversity certification site and the gain in biodiversity values at a biodiversity stewardship site.*

EPBC Act: *the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.*

High threat weed cover: *plant cover composed of vascular plants that, if not controlled, will invade and outcompete native plant species. Also referred to as high threat weeds or high threat exotic vegetation. Plants considered to be high threat weeds are listed on the high threat weeds list published in the BAM-C.*

Mapped Important Areas: *for a small number of species for which we have extensive, long-term datasets that indicate the importance of parts of the landscape, the species credit components of*

their habitat will be mapped as 'important areas'. Mapping these areas seeks to address the criticism that survey rarely detects these highly mobile species, resulting in the ongoing loss of core habitat. Mapping means that if impacted by development, these important areas required for the species to persist in the wild will be offset within a mapped important area.

Native Vegetation Cover: *the percentage of native vegetation cover on the subject land and the surrounding buffer area. Cover estimates are based on the cover of native woody and non-woody vegetation. Native vegetation cover includes regrowth, derived native grasslands and plantations that are comprised of plants native to New South Wales.*

Plant Community Type (PCT): *a NSW plant community type identified using the Plant Community Type classification system.*

Serious and Irreversible Impacts (SAII): *impacts likely to contribute significantly to the risk of extinction of a threatened species or ecological community in NSW.*

Species Credit Species: *threatened species or components of species habitat that are identified in the Threatened Species Data Collection as requiring assessment for species credits.*

Species Credits: *the class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection.*

Subject Land: *is land subject to a development, activity, clearing, biodiversity certification or a biodiversity stewardship proposal. It excludes the assessment area which surrounds the subject land (i.e. the area of land in the 1500 m buffer zone around the subject land or 500 m buffer zone for linear proposals). In the case of a biodiversity certification proposal, subject land includes the biodiversity certification assessment area.*

Vegetation Class: *a level of classification of vegetation communities, as defined in Keith (2004).*

Vegetation Formation: *a broad level of vegetation classification as defined in Keith (2004). There are 16 vegetation formations and sub-formations in NSW.*

Vegetation Integrity (VI): *the condition of native vegetation assessed for each vegetation zone against the benchmark for the Plant Community Type.*

Vegetation Integrity (VI) Score: *the quantitative measure of vegetation condition calculated in accordance with Equation 23 or Equation 24.*

Vegetation Zone: *a relatively homogenous area of native vegetation on a development site, land to be biodiversity certified or a biodiversity stewardship site that is the same Plant Community Type and broad condition state.*

EXECUTIVE SUMMARY

Wambo Coal Pty Limited (WCPL), a subsidiary of Peabody Energy Australia Pty Limited, is proposing to modify Development Consent (DA 305-7-2003) for the Wambo Coal Mine to allow for optimisation and continued operations of the South Bates Extension Underground Mine (hereafter referred to as the Modification). The Modification is being sought under section 4.55(2) of the New South Wales (NSW) *Environmental Planning and Assessment Act 1979*.

This Biodiversity Development Assessment Report (BDAR) was prepared by Dr Colin Driscoll (Hunter Eco) to assess the likely biodiversity impacts from an additional Modification to the approved South Bates Extension Underground Mine. The Modification includes the following changes to the approved Wambo Coal Mine:

- reorienting Longwalls 24 and 25 of the South Bates Extension Underground Mine;
- an additional longwall panel (i.e. Longwall 26);
- processing of run of mine (ROM) coal from Longwalls 24 to 26 at the existing on-site Coal Handling and Preparation Plant;
- an overall reduction in the approved area of overlying land predicted to experience potential subsidence impacts (relative to the layout assessed and approved by Modification 17); and
- an additional mining lease over a component of Authorisation 444.

No other changes to the approved Wambo Coal Mine (including surface development area) would be required for the Modification.

Landscape Features, Native Vegetation and Threatened Species

The Wambo Coal Mine is situated approximately 15 kilometres (km) west of Singleton, near the village of Warkworth, NSW. The additional area of land subject to subsidence outside of the approved extent of subsidence is the Subject Land for the purpose of this assessment.

The Subject Land consists entirely of native vegetation, comprising 95 hectares (ha) of woodland/forest and 10 ha of derived native grassland, totalling 105 ha. No named watercourses, aside from Waterfall Creek, occur in the Subject Land, but there are unnamed ephemeral drainage lines that drain to the north and south. No karst, caves, cliffs, or other geological features occur in the Subject Land.

The native vegetation present in the Subject Land is predominantly *Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter* (Plant Community Type [PCT] 1603) with some areas of *Slaty Box - Grey Gum Shrubby Woodland on Footslopes of the Upper Hunter Valley Sydney Basin Bioregion* (PCT 1176). PCT 1603 equates to *Central Hunter Grey Box—Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions* listed as Endangered under the NSW *Biodiversity Conservation Act 2016* (BC Act). PCT 1176 equates to *Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion* listed as Vulnerable under the BC Act. Both PCT equate to *Central Hunter Valley Eucalypt Forest and Woodland* listed as Critically Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Eco Logical Australia undertook opportunistic searches for threatened species. In lieu of targeted surveys, this assessment has conservatively assumed that a number of threatened species may use habitat in the Subject Land in accordance with the NSW Biodiversity Assessment Method, informed by habitat assessments by experienced ecologists. The results of previous targeted surveys at the Wambo Coal Mine were considered.

Assessment Summary

The Modification would not result in any direct impacts on native vegetation or habitat as no land clearance is proposed. As such, no biodiversity credits are required to be calculated in accordance with the NSW Biodiversity Assessment Method.

In regard to indirect impacts, the Modification would result in an overall reduction from the originally approved mine plan in the area of native vegetation predicted to experience potential subsidence impacts (22.7 ha reduction)[1]. Monitoring in the South Bates Extension Underground Mine area has recorded no evidence of mine subsidence impacting native vegetation condition, despite observed subsidence surface effects.

No additional prescribed impacts on biodiversity values not assessed in the original approval are likely to occur. This is mainly because:

- no karst, caves, cliffs, or other geological features occur in the Subject Land;
- the Modification would not result in any direct impacts on native vegetation or habitat as no land clearance is proposed;
- minor occurrences of surface rock are likely to persist despite subsidence;
- the Modification would decrease the impact to named waterbodies because approximately 2 km of North Wambo Creek would no longer be undermined or subject to subsidence; and
- the Modification would materially reduce subsidence to vegetation that may use groundwater as approximately 91% (4.2 ha) of PCT 485 along North Wambo Creek would no longer be undermined or subject to subsidence.

Measures to Avoid, Minimise, Mitigate and Manage Impacts

The Modification would avoid and minimise potential impacts from the approved South Bates Extension Underground Mine because the Modification would:

- result in an overall reduction in the area of native vegetation predicted to experience potential subsidence impacts (22.7 ha reduction);
- decrease the impact to named waterbodies because approximately 2 km of North Wambo Creek would no longer be undermined or subject to subsidence; and
- materially reduce subsidence to vegetation that may use groundwater.

The approved South Bates Extension Underground Mine operates within an approved management framework. Biodiversity management and monitoring at the Wambo Coal Mine is conducted in accordance with the approved Biodiversity Management Plan prepared in accordance with Condition B75, Schedule 2 of the Development Consent (DA 305-7-2003) as well as the Extraction Plan in accordance with Condition B7, Schedule 2 of the Development Consent (DA 305-7-2003). Subsidence impacts are mitigated through standard subsidence remediation measures.

No specific or additional mitigation measures, management or monitoring of biodiversity are required for the Modification. Consistent with the existing approved South Bates Extension Underground Mine, if subsidence remediation measures are not considered to be reasonable or feasible, or have not been successful in remediating the impact, WCPL is required to provide an offset to compensate for the impact or environmental consequence in accordance with Development Consent (DA 305-7-2003).

[1] ELA (2022) undertook the biodiversity review on the subsidence 'angle of draw' (MSEC 2022) however this BDAR assesses the impact of the predicted 20 mm conventional subsidence extent (MSEC 2022) as this is the relevant area that would be subsided.

The Modification would not result in any direct impacts on native vegetation or habitat as no land clearance is proposed. In regard to indirect impacts, the Modification would result in an overall reduction from the originally approved mine plan in the area of native vegetation predicted to experience potential subsidence impacts (22.7 ha reduction). The Modification is likely to result in minor cracking and ponding of the land surface with negligible environmental consequences, consistent with the approved mine.

1 INTRODUCTION

The Wambo Coal Mine is situated approximately 15 kilometres (km) west of Singleton, near the village of Warkworth, New South Wales (NSW) (Figure 1) and is operated in accordance with Development Consent (DA 305-7-2003). The Wambo Coal Mine is owned and operated by Wambo Coal Pty Limited (WCPL), a subsidiary of Peabody Energy Australia Pty Limited.

WCPL is proposing to modify Development Consent (DA 305-7-2003) for the Wambo Coal Mine to allow for optimisation and continued operations of the South Bates Extension Underground Mine (hereafter referred to as the Modification). The Modification is being sought under section 4.55(2) of the NSW *Environmental Planning and Assessment Act 1979*. WCPL is the applicant for the Modification.

1.1 WAMBO MINE OVERVIEW

A range of open cut and underground mining operations have been conducted at the Wambo Coal Mine since mining operations commenced in 1969. Mining under Development Consent (DA 305-7-2003) commenced in 2004, with both open cut and underground operations conducted until 2020.

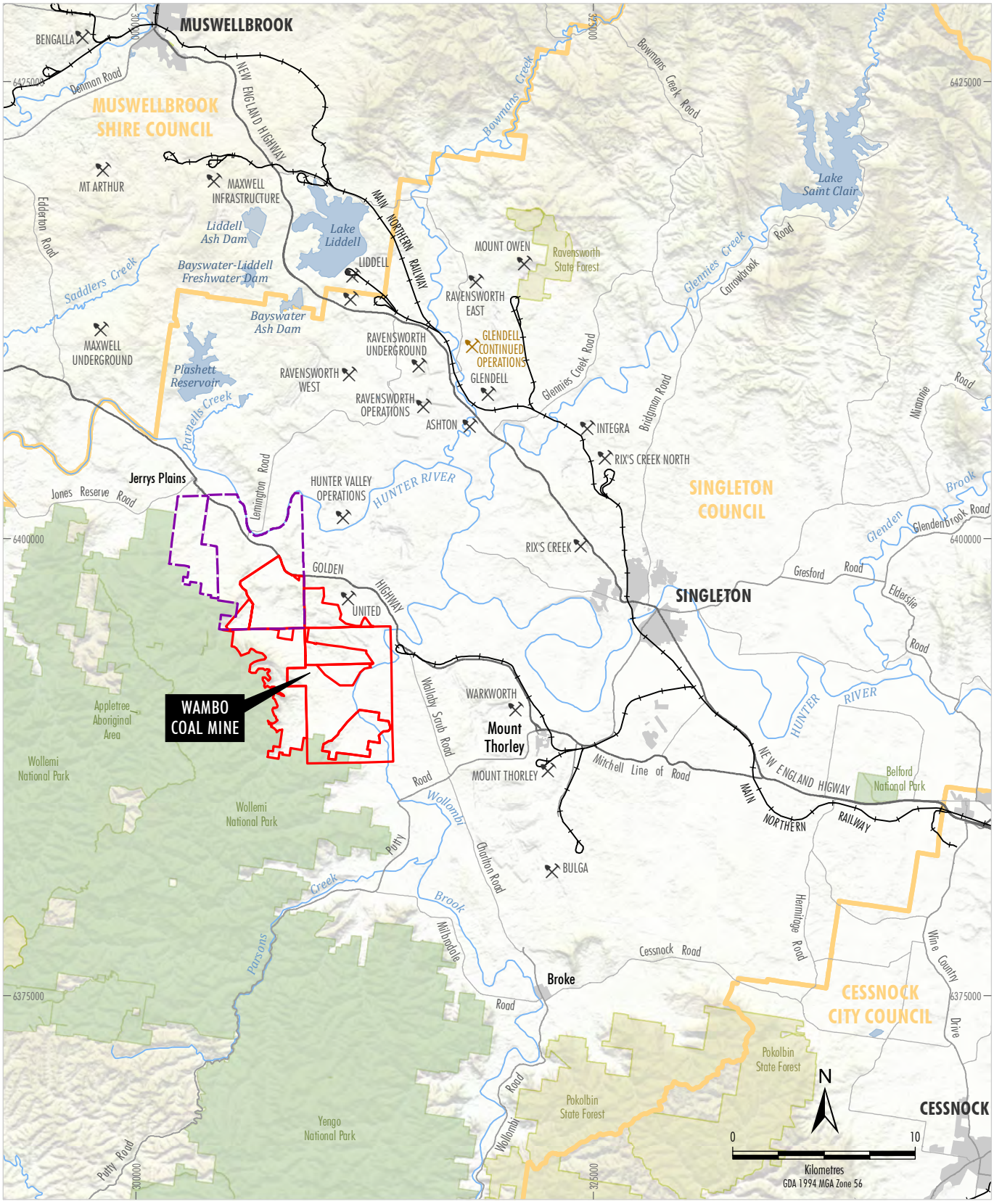
From 1 December 2020, the Wambo Coal Mine transitioned into Phase 2 operations which includes underground mining and coal handling and processing, as described in Development Consent (DA 305-7-2003):

> *The phase of the development that comprises undergrounding mining operations at Wambo underground mine, the operation of Wambo infrastructure within the green operational area identified in Figure 2 of Appendix 2 and associated surface development. An aerial photograph of Wambo, illustrating the existing/approved extent of the underground mine operations and locations of key infrastructure is provided on Figures 2a and 2b.*

Development Consent (DA 305-7-2003) (as modified) allows for the following mining and processing operations at the Wambo Coal Mine (Figure 2):

- Underground mining operations in the approved North Wambo Underground Mine (completed).
- Underground mining operations in the approved South Bates Underground Mine (completed).
- Underground mining operations in the approved South Bates Extension Underground Mine (in progress).
- Underground mining operations in the approved South Wambo Underground Mine (future operation).

Ongoing operation of the Coal Handling and Processing Plant (CHPP) and processing of coal from the underground mining operation and the United Wambo Open Cut Coal Mine, with up to 14.7 million tonnes per annum of run-of-mine (ROM) coal processed at the CHPP in any calendar year. Underground mining operations at the Wambo Coal Mine are approved until 31 August 2042.



WAH-09-15_SBX Mod LW24-26_BDAR_205A

LEGEND

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

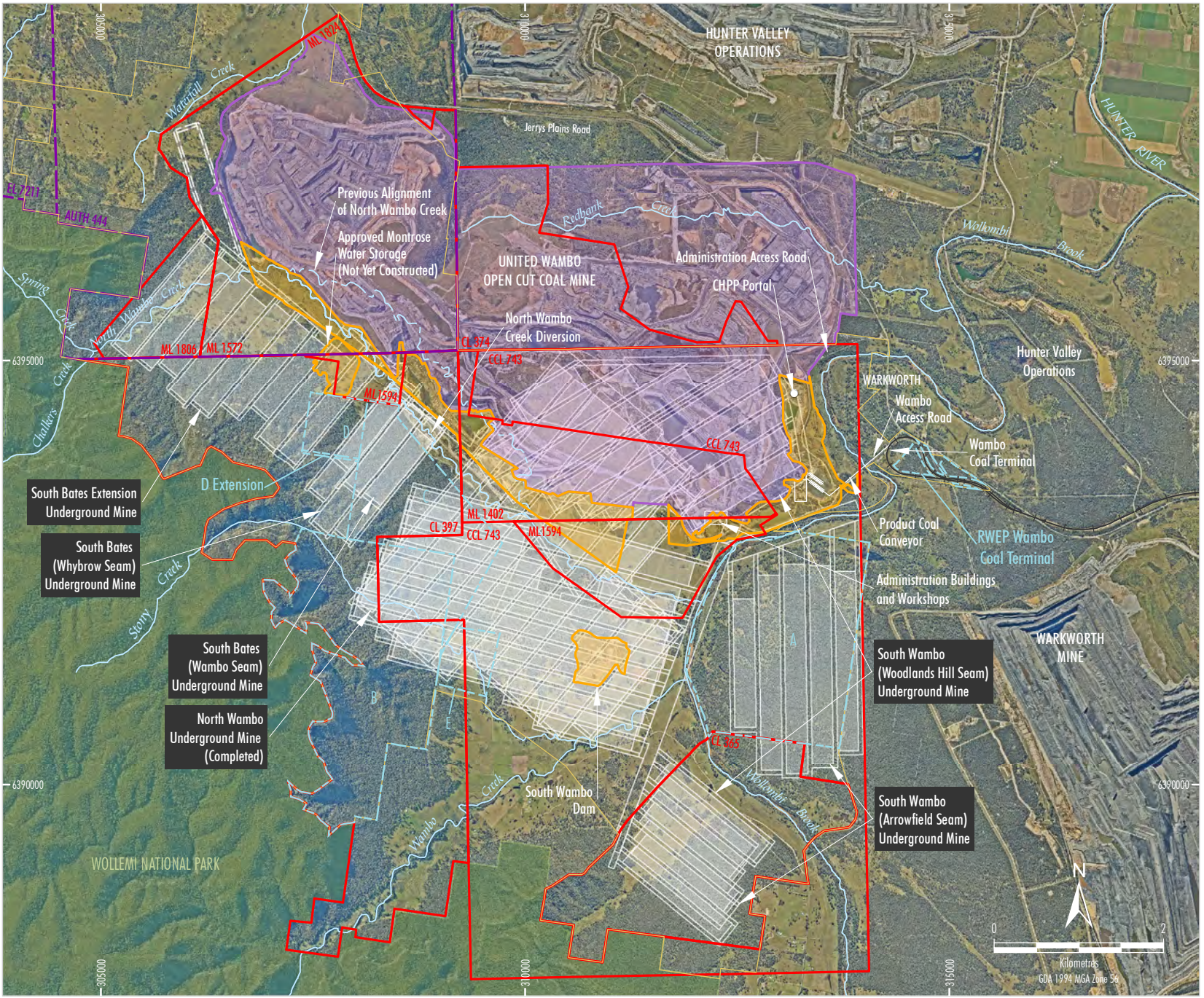
Source: NSW Spatial Services (2022)

Peabody

WAMBO COAL MINE

Regional Location

Figure 1



LEGEND

- National Park
- SSD 7142 Operational Area #
- WCPL Owned Land

Wambo Coal Mine

- Exploration Licence Boundary (AUTH, EL)
- Mining and Coal Lease Boundary (ML, CL, CCL)
- Remnant Woodland Enhancement Program (RWEP) Area
- Existing/Approved Wambo Coal Mine Surface Development Area
- Existing/Approved Underground Development
- Existing/Approved Underground Development (First Workings only)

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

Source: WCPL (2022); NSW Spatial Services (2022)
Orthophoto: WCPL (May 2022)

Peabody

WAMBO COAL MINE

Existing/Approved Wambo Coal Mine Longwall Layout

Figure 2

WAM-09-15_SBX Mod LW24-26_BDAR_206A

1.2 MODIFICATION DESCRIPTION

The Modification includes reorienting Longwalls 24 and 25 of the South Bates Extension Underground Mine to maximise ROM coal recovery in consideration of identified geological structures and adverse geotechnical conditions within the approved mining layout. The Modification includes the following changes to the approved Wambo Coal Mine:

- reorienting Longwalls 24 and 25 of the South Bates Extension Underground Mine;
- an additional longwall panel (i.e. Longwall 26);
- processing of ROM coal from Longwalls 24 to 26 at the existing on-site CHPP;
- an overall reduction in the approved area of overlying land predicted to experience potential subsidence impacts (relative to the layout assessed and approved by Modification 17); and
- an additional mining lease over a component of Authorisation 444.

No other changes to the approved Wambo Coal Mine (including surface development area) would be required for the Modification.

The proposed layout of the Modification is shown on Figure 3. No Secretary's Environmental Assessment Requirements have been issued for the Modification.

1.3 GENERAL DESCRIPTION OF THE SUBJECT LAND

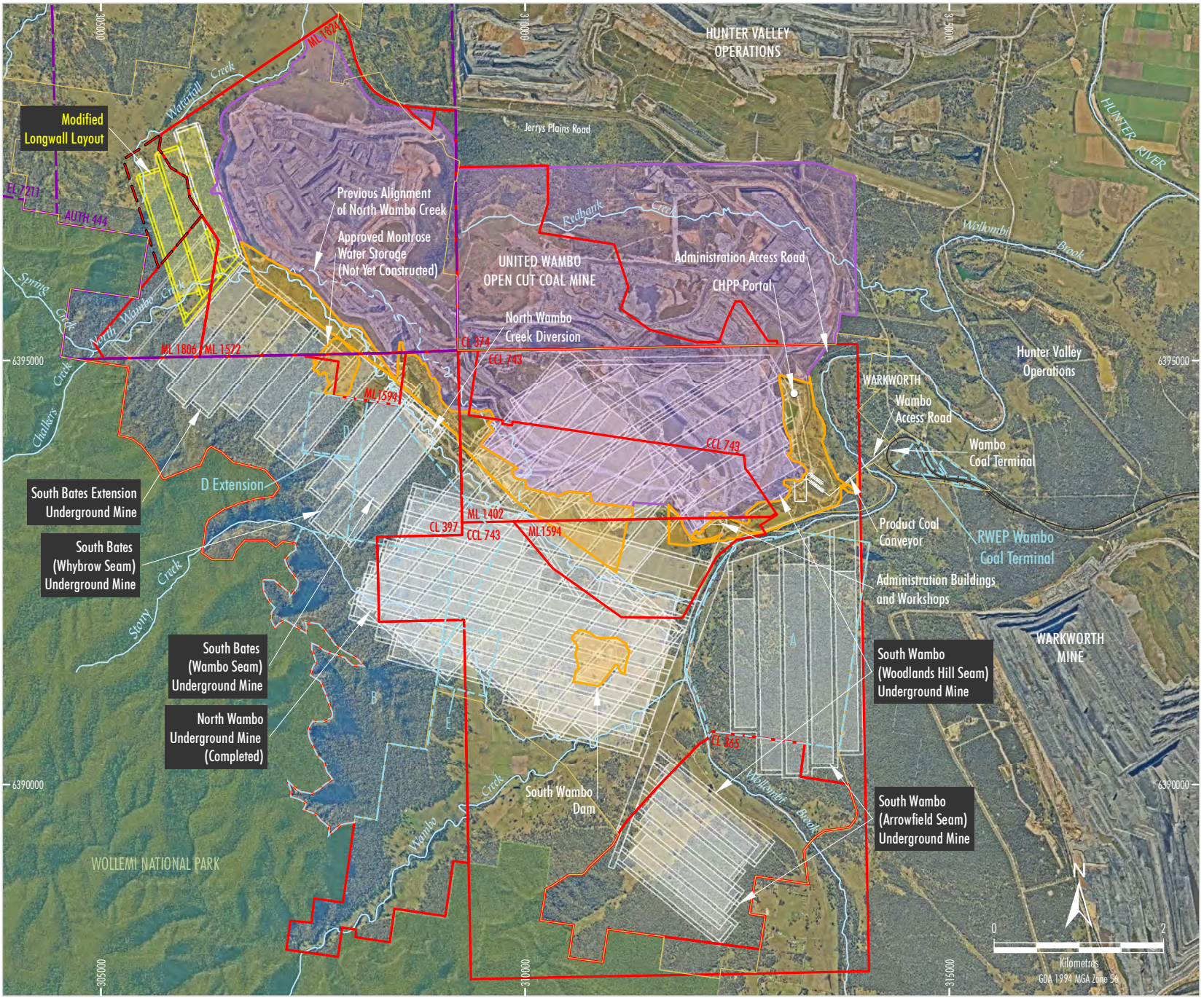
The Modification is to modify underground components only and the Modification does not require any additional native vegetation or habitat clearance. There is no Development Footprint. The additional area of land subject to 20 millimetres (mm) conventional subsidence outside of the approved extent of subsidence is the Subject Land for the purpose of this assessment (Figure 4). The Subject Land is approximately 105 hectares (ha).

Eco Logical Australia (ELA) (2022) undertook the biodiversity review on the subsidence 'angle of draw' (Mine Subsidence Engineering Consultants [MSEC] 2022) however this Biodiversity Development Assessment Report (BDAR) assesses the impact of the predicted 20 mm conventional subsidence extent (MSEC 2022) as this is the relevant area that would be subsided.

1.4 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

South Bates Extension Underground Mine, Warkworth, NSW (EPBC 2016/7816) was approved under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in May 2018. The controlling provisions for the approved South Bates Extension Underground Mine were "listed threatened species and communities" (sections 18 and 18A of the EPBC Act) and "a water resource, in relation to coal seam gas development and large coal mining development" (sections 24D and 24E of the EPBC Act).

ELA (2022) assessed the impacts of the Modification on EPBC Act listed threatened species and communities and concluded that it is unlikely that the Modification would have a significant impact because no direct impacts (such as surface clearing) are proposed and potential indirect impacts associated with subsidence and surface cracking are considered negligible.



LEGEND

- National Park
- SSD 7142 Operational Area #
- WCPL Owned Land

Wambo Coal Mine

- Exploration Licence Boundary (AUTH, EL)
- Mining and Coal Lease Boundary (ML, CL, CCL)
- Proposed Mining Lease Application Area
- Remnant Woodland Enhancement Program (RWEP) Area
- Existing/Approved Wambo Coal Mine Surface Development Area
- Existing/Approved Underground Development
- Approved Orientation of Longwalls 24 and 25
- Existing/Approved Underground Development (First Workings only)

Modification 19

- Modified Longwall Layout

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

Source: WCPL (2022); NSW Spatial Services (2022)
Orthophoto: WCPL (May 2022)

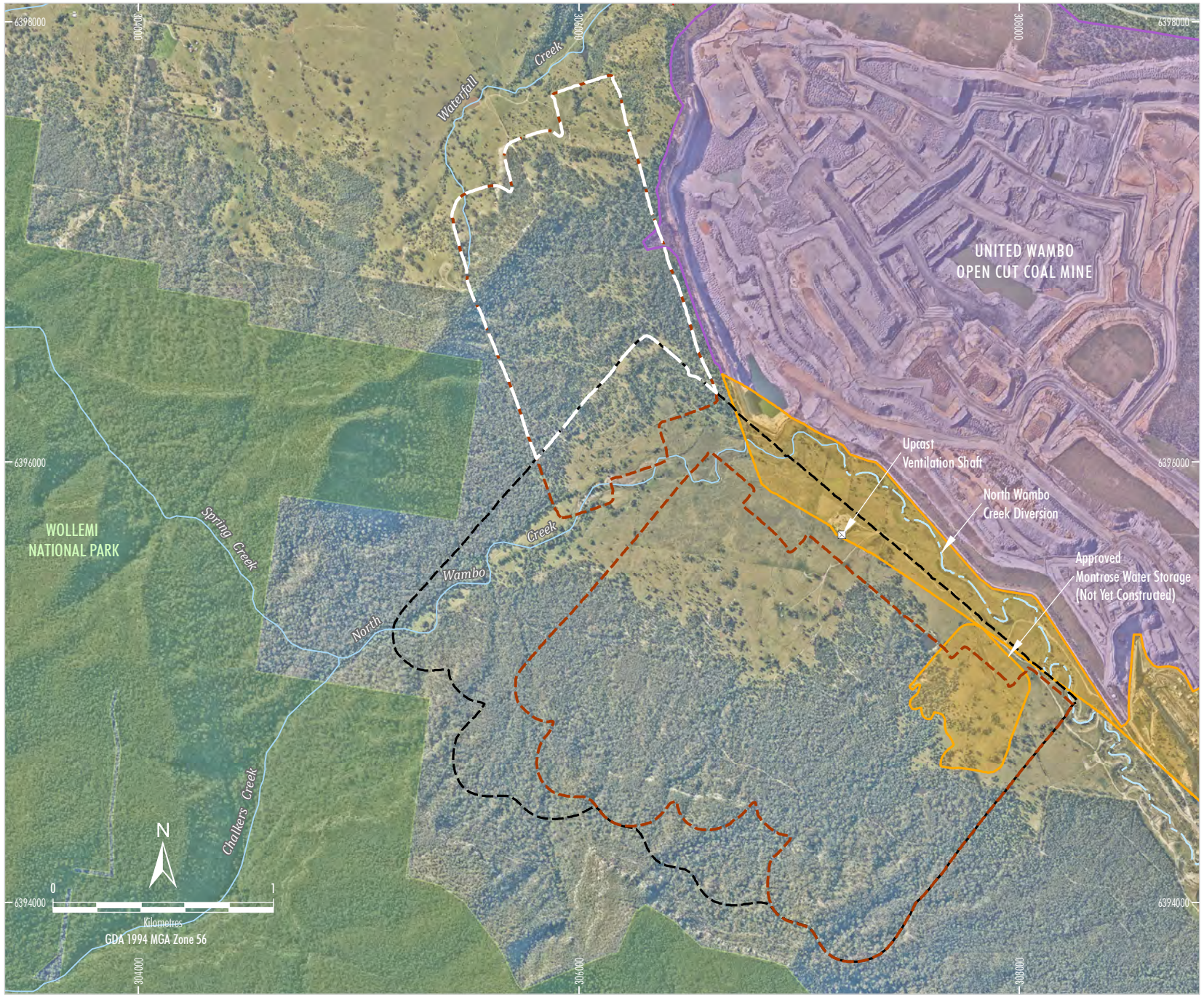
Peabody

WAMBO COAL MINE

Approved and Modified Wambo Coal Mine General Arrangement

Figure 3

WAM-09-15_SBX Mod LW24-26_BDAR_207A



LEGEND

- National Park
- SSD 7142 Operational Area
- Existing/Approved Wambo Coal Mine Surface Development Area
- Ventilation Shaft
- Approved Extent of Conventional Subsidence (20 mm subsidence contour)
- Modified Extent of Conventional Subsidence (20 mm subsidence contour)
- Subject Land

Source: MSEC (2022, 2021); WCPL (2022); NSW Spatial Services (2022)
Orthophoto: WCPL (May 2022)

Peabody

WAMBO COAL MINE

Subject Land

Figure 4

WAM-09-15_SBX Mod LW24-26_BDAR_208A

1.5 INFORMATION SOURCES USED IN THIS ASSESSMENT

This BDAR was prepared by Dr Colin Driscoll (Hunter Eco), who is an accredited assessor under the NSW *Biodiversity Conservation Act 2016* (BC Act) (assessor accreditation BAAS17004). This BDAR was prepared in accordance with the Biodiversity Assessment Method (BAM) (Department of Planning, Industry and Environment [DPIE] 2020a) and in consideration of the submission from the Biodiversity and Conservation Division on the Modification Report (5 October 2022).

The Subject Land and surrounds has been surveyed extensively as part of previous ecological surveys for the Wambo Coal Mine, including the South Bates Extension Underground Mine (FloraSearch 2017; ELA 2017). Most recently, ELA (2022) prepared a Biodiversity Review for the Modification that included additional ecological surveys in March and April 2022. The surveys involved vegetation assessments in accordance with the BAM (DPIE 2020a), habitat assessments and mapping of Plant Community Types (PCTs).

Other key technical reports used in this assessment include:

- *Wambo Coal Mine - South Bates Extension Modification – Fauna Assessment* (ELA 2017).
- *South Bates Extension Modification Environmental Assessment – Flora Assessment* (FloraSearch 2017).
- *Wambo Coal Mine South Bates Extension Underground - Groundwater Dependent Ecosystems Vegetative Assessment* (Hunter Eco 2019).
- *South Bates Extension Underground Mine Longwalls 24 to 26 Modification Subsidence Assessment* (MSEC 2022).

Published databases used in this assessment include:

- *Threatened Biodiversity Data Collection* (TBDC) (Department of Planning and Environment [DPE] 2022a)[2];
- *BioNet Vegetation Classification* (DPE 2022b);
- *BioNet Atlas* (DPE 2022c)[3]; and
- *Directory of Important Wetlands of Australia* (Department of Climate Change, Energy, the Environment and Water [DCCEEW] 2022a).

A full reference list of all information sources used in this BDAR is provided in Section 12.

Dr Colin Driscoll undertook an inspection of the Subject Land and surrounds on the 4 November 2022 to ground-truth landscape features, vegetation, threatened ecological communities (TECs) and habitat. Potential ponding areas were also inspected for any potentially occurring threatened trees and shrubs.

The BAM Calculator (BAM-C) (App last updated: 09/12/2021 11:00 [Version: 1.4.0.00] BAM data last updated: 4/10/2022 [Version: 55]) was used in this assessment to inform the assessment of the Subject Land.

The Modification does not involve a Development Footprint, no biodiversity credits are required to be calculated and no BAM-C application was submitted in the Biodiversity Offsets and Agreement Management System (DPE 2022d).

[2] This website is titled 'Profiles'.

[3] This website is titled 'Species Sightings Search'.

2 LANDSCAPE FEATURES

This section provides a description of the landscape features relevant to the Subject Land in accordance with the BAM (DPIE 2020a). The Subject Land is mostly undulating lower slopes, with higher landforms to the west and lower floodplain areas north and south outside of the Subject Land. Regional soil landscape units mapped in the vicinity of the Modification area include Bulga, Lees Pinch, Jerrys Plains and Benjang soils (Kovac and Lawrie 1991).

2.1 IBRA BIOREGIONS AND SUB-REGIONS

In accordance with the BAM (DPIE 2020a), the Site Map is shown on Figure 5 and the Location Map for the Subject Land is shown on Figure 6.

The Subject Land lies within the Sydney Basin Interim Biogeographic Regionalisation for Australia (IBRA) Bioregion, Hunter IBRA sub-region. The IBRA regional boundaries (DCCEEW 2020) do not occur near the Subject Land and hence are not shown on Figures 5 and 6.

2.2 RIVERS, STREAMS, ESTUARIES AND WETLANDS

The Subject Land is located within the North Wambo Creek and Waterfall Creek catchments. Rivers and streams (and riparian buffer distances based on Strahler stream ordering [Department of Primary Industries – Water 2017]) are shown on Figure 5.

First and second order unnamed ephemeral drainage lines occur in the Subject Land. The ephemeral unnamed tributaries of North Wambo Creek typically transition from steep deeply incised gullies to broader gullies before flowing into North Wambo Creek (Alluvium Consulting 2022). The ephemeral unnamed tributaries of Waterfall Creek have steep and relatively incised gullies (Alluvium Consulting 2022).

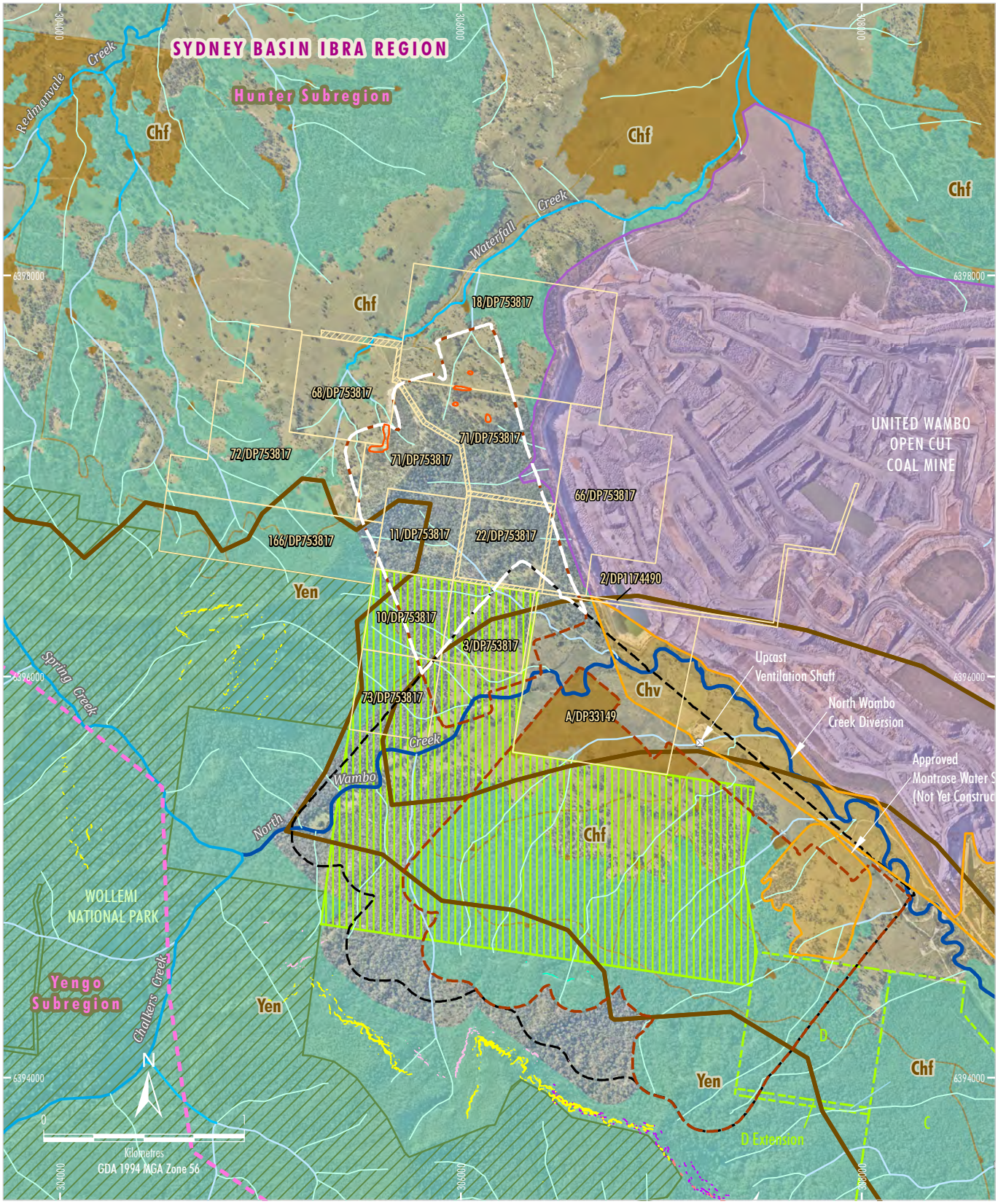
There are no important or local wetlands on or adjacent to the Subject Land. The closest important wetland is too far away to be shown on Figure 6. Some farm dams occur outside of the Subject Land.

2.3 HABITAT CONNECTIVITY

The woodland/forest habitat in the Subject Land is on the edge of the existing mining area and is therefore not part of a corridor linking two areas of existing woodland/forest habitat. The woodland/forest habitat is linked to the extensive area of existing woodland/forest habitat associated with Wollemi National Park.

2.4 KARST, CAVES, CREVICES, CLIFFS, ROCKS AND OTHER GEOLOGICAL FEATURES

No karst, caves, cliffs, or other geological features occur in the Subject Land (ELA 2022; MSEC 2017). Cliffs in the surrounds are shown on Figure 5, and are mostly within Wollemi National Park. There are some small localised areas of surface rock in the northern end of the Subject Land (Figure 5).



LEGEND

- National Park
- SSD 7142 Operational Area
- Existing/Approved Wambo Coal Mine Surface Development Area
- Ventilation Shaft
- Approved Extent of Conventional Subsidence (20 mm subsidence contour)
- Modified Extent of Conventional Subsidence (20 mm subsidence contour)
- Subject Land
- Subject Land Cadastral Boundary *
- Subject Land Road Reserve *
- Proposed Biodiversity Offset Area under SSD 7142
- Remnant Woodland Enhancement Program (RWEP) Area
- Habitat Connectivity Area
- Non-native Vegetation
- Rocky Area
- Cliff Associated with Wollemi National Park Escarpment
- Intermediate Level Cliff
- Lower Level Cliff
- Spur
- Minor Cliff
- IBRA Subregion Boundary

Mitchell Landscapes

- Chf Central Hunter Alluvial Plains
- Chv Central Hunter Foothills
- Yen Yengo Plateau

Strahler Stream Order

- 1st Order
- 2nd Order
- 3rd Order
- 4th Order
- 5th Order

* Note the Subject Land cadastral boundaries have not been surveyed and are based on the NSW Digital Cadastral Database, 2022.

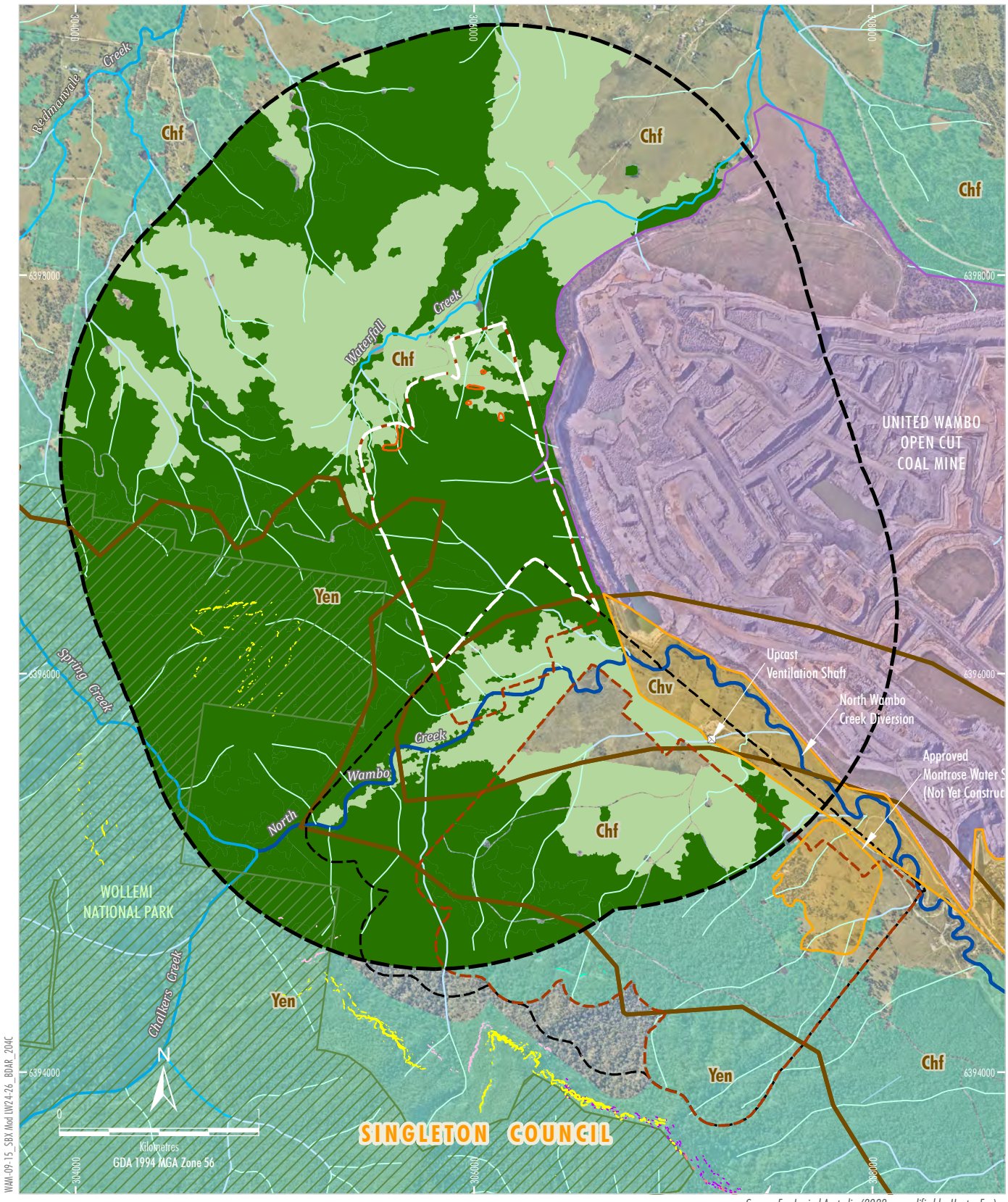
Source: Eco Logical Australia (2022 as modified by Hunter Eco); Hunter Eco (2022); MSEC (2022, 2021, 2016); NSW Spatial Services (2022); Crown Lands and Water - a Division of the NSW Department of Industry (2013); Orthophoto: WCPL (May 2022)

Peabody

WAMBO COAL MINE

Site Map

Figure 5



WAH-09-15_SBX Mod LW24-26_BDAR_204C

LEGEND

- National Park
- SSD 7142 Operational Area
- Existing/Approved Wambo Coal Mine
- Surface Development Area
- Ventilation Shaft
- Approved Extent of Conventional Subsidence (20 mm subsidence contour)
- Modified Extent of Conventional Subsidence (20 mm subsidence contour)
- Subject Land
- Assessment Area (Subject Land 1500 m Buffer)
- Woodland within the Buffer
- Derived Native Grassland within the Buffer
- Rocky Area
- Cliff Associated with Wollemi National Park Escarpment
- Intermediate Level Cliff
- Lower Level Cliff
- Spur
- Minor Cliff

Mitchell Landscapes

- Chf — Central Hunter Alluvial Plains
- Chv — Central Hunter Foothills
- Yen — Yengo Plateau

Strahler Stream Order

- 1st Order
- 2nd Order
- 3rd Order
- 4th Order
- 5th Order

Source: Eco Logical Australia (2022 as modified by Hunter Eco); Hunter Eco (2022); MSEC (2022, 2021, 2016); NSW Spatial Services (2022); Crown Lands and Water - a Division of the NSW Department of Industry (2013); Orthophoto: WCPL (May 2022)

Peabody

WAMBO COAL MINE

Location Map

Figure 6

2.5 AREAS OF OUTSTANDING BIODIVERSITY VALUE

There are no Areas of Outstanding Biodiversity Value listed under the NSW *Biodiversity Conservation Regulation 2017* (BC Regulation) associated with the Subject Land or assessment area.

2.6 NSW MITCHELL LANDSCAPE

The Subject Land is mostly within the Central Hunter Foothills Mitchell landscape (Mitchell 2002) (Figure 6).

2.7 NATIVE VEGETATION COVER

The Subject Land consists entirely of native vegetation, comprising 95 ha of woodland/forest and 10 ha of derived native grassland, totalling 105 ha. The extent of native vegetation cover within the assessment area is approximately 71% and patch size is >100 ha (Figure 6).

Areas not shown as native vegetation on the Location Map (Figure 6) are cleared of native vegetation. There were no notable differences between mapped vegetation extent and aerial imagery.

2.8 OTHER

The proposed Wambo Stewardship Site (Umwelt (Australia) Pty Limited 2021) is located partly within the Subject Land (Figure 5).

3 NATIVE VEGETATION

3.1 EXISTING INFORMATION ON NATIVE VEGETATION

FloraSearch (2017) prepared the original South Bates Extension Modification Environmental Assessment – Flora Assessment. The surveys involved quadrat sampling, rapid assessment spot sampling and random meanders for threatened flora species.

More recently, ELA (2022) prepared a Biodiversity Review for the Modification that included additional ecological surveys in March and April 2022. The systematic field-based surveys involved vegetation assessments in accordance with the BAM (DPIE 2020a), habitat assessments and mapping of PCTs.

Dr Colin Driscoll (Hunter Eco) undertook an inspection of the Subject Land and surrounds on the 4 November 2022 to ground-truth landscape features, vegetation, TECs and habitat. As a result of the site inspection, the following amendments were made to the vegetation mapping prepared by ELA (2022):

- PCT 116 *Weeping Myall - Coobah - Scrub Wilga Shrubland of the Hunter Valley* was remapped as PCT 1603 *Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter* (regenerating). *Acacia pendula* was not recorded in vegetation integrity plots within the areas sampled and mapped by ELA (2022) as PCT 116 and its absence was confirmed during the recent site visit. Historic aerial photography shows these mapped areas to have been almost completely cleared and are now regenerating. Being surrounded by PCT 1603, these areas are most likely to have been cleared from the same community.
- PCT 1598 *Forest Red Gum Grassy Open Forest on Floodplains of the Lower Hunter* was remapped as PCT 485 *River Oak Riparian Grassy Tall Woodland of the western Hunter Valley, Brigalow Belt South Bioregion and Sydney Basin Bioregion* as the vegetation is dominated by River Oak (Hunter Eco 2019). Umwelt (Australia) Pty Limited (2021) also mapped this vegetation unit as PCT 485.

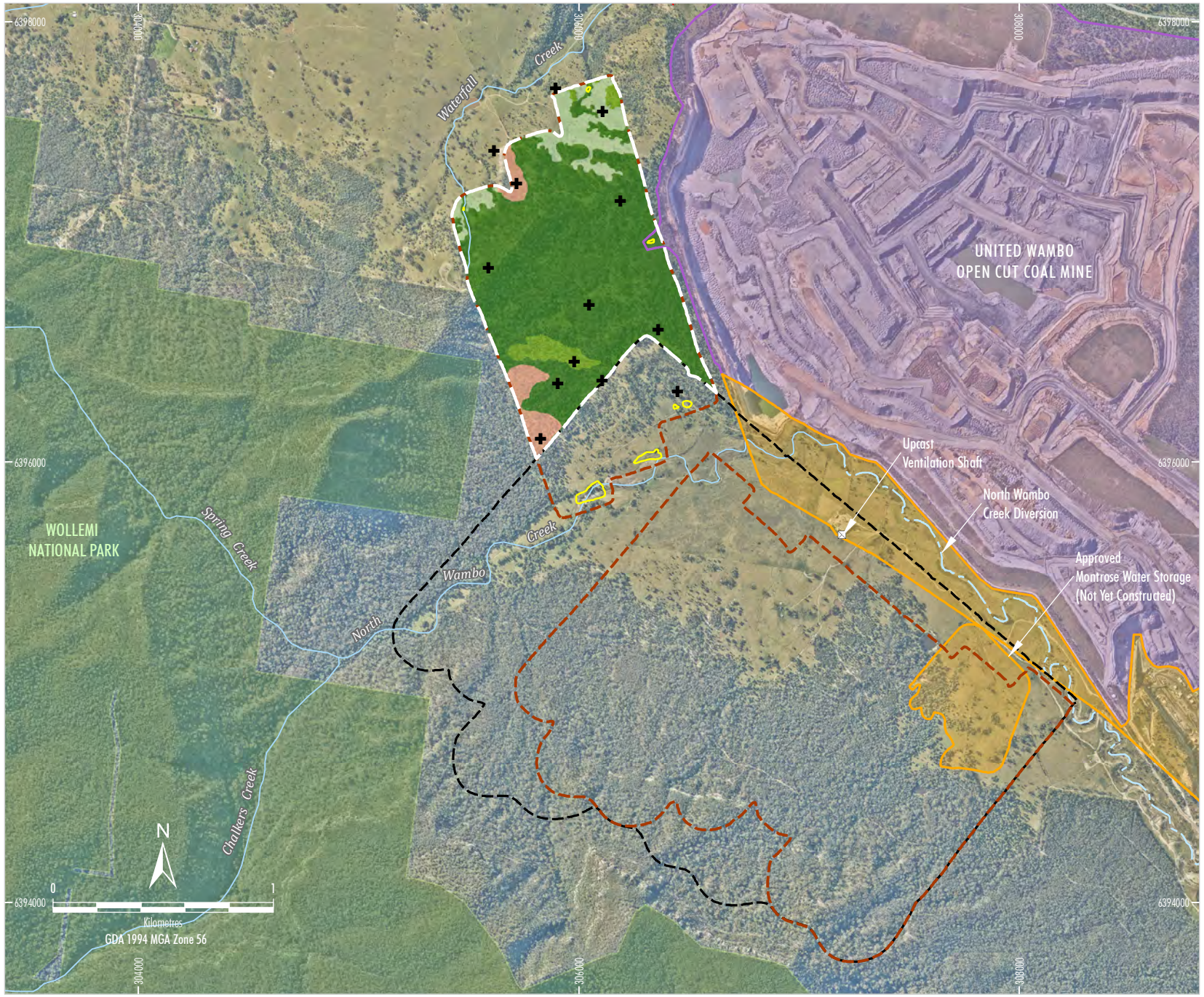
3.2 NATIVE VEGETATION EXTENT

The Subject Land consists entirely of native vegetation, comprising 95 ha of woodland/forest and 10 ha of derived native grassland, totalling 105 ha. As described in Section 2.7, the patch size is >100 ha.

3.3 PLANT COMMUNITY TYPES

3.3.1 Plant Community Types and Classes

PCTs within the Subject Land and surrounding area have been identified by ELA (2022) and Dr Colin Driscoll (Hunter Eco) in accordance with the BAM (DPIE 2020a) and *BioNet Vegetation Classification* (DPE 2022b) (Figure 7) (Table 1). The PCTs are assigned to a vegetation condition in Table 1. Table 1 also includes the Percent Cleared Values from the *BioNet Vegetation Classification* (DPE 2022b) and the Vegetation Integrity (VI) Scores. The vegetation descriptions by ELA (2022) are included in Attachment A.



LEGEND

- National Park
- SSD 7142 Operational Area
- Existing/Approved Wambo Coal Mine Surface Development Area
- Ventilation Shaft
- Approved Extent of Conventional Subsidence (20 mm subsidence contour)
- Modified Extent of Conventional Subsidence (20 mm subsidence contour)
- Subject Land
- Potential Ponding Area
- Vegetation Integrity Plot

Vegetation Communities

- Slaty Box - Grey Gum Shrubby Woodland on Footslopes of the Upper Hunter Valley Sydney Basin Bioregion (PCT 1176)
- Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter (Good) (PCT 1603)
- Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter (Regenerating) (PCT 1603)
- Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter (DNG) (PCT 1603)

Source: Eco Logical Australia (2022 as modified by Hunter Eco); MSEC (2022, 2021); WCPL (2022); NSW Spatial Services (2022)
Orthophoto: WCPL (May 2022)

Peabody

WAMBO COAL MINE

Vegetation Communities

Figure 7

WAM-09-15_SBX Mod LW24-26_BDAR_202C

3.3.2 Justification of PCT Selection

ELA (2022) and Dr Colin Driscoll (Hunter Eco) considered various attributes to assign vegetation to the best fit PCT. Attributes included dominant species in each stratum and relative abundance, community composition, soils and landscape position. ELA (2022) and Hunter Eco reviewed PCT descriptions in the *BioNet Vegetation Classification* (DPE 2022b). However, the BioNet description of PCT 116 indicates that the only upper stratum species would be *Acacia pendula*, which is absent from the PCT 116 areas mapped by ELA (2022); one reason why these areas were reassigned as described in Section 3.1.

Table 1
Plant Community Type Data

Vegetation Zone	PCT	PCT Name	Condition	Area (ha)	Percent Cleared^	Sensitivity Class^	VI Score~
Grassy Woodlands Formation – Coastal Valley Grassy Woodlands Class							
1 (A, C)	1603	Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter	Woodland	84.5	77% (+/- 70%)	High	73
1a	1603	Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter	DNG	10	77% (+/- 70%)	High	32
1b (A, C)	1603	Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter	Regenerating	4.5	77% (+/- 70%)	High	70.9
Dry Sclerophyll Forests Formation (Shrubby sub-formation) Western Slopes Dry Sclerophyll Forests Class							
2 (B, C)	1176	Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley Sydney Basin Bioregion	Woodland	6	40%	Low	59.8
			Total Woodland/Forest	**95**			
			Total Derived Native Grassland	**10**			
			Total	**105**			

A Central Hunter Grey Box—Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions (Central Hunter Grey Box–Ironbark Woodland) Endangered Ecological Community (EEC) listed under the BC Act

B Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion (Hunter Valley Footslopes Slaty Gum Woodland) Vulnerable Ecological Community (VEC) listed under the BC Act

C Central Hunter Valley Eucalypt Forest and Woodland Critically Endangered Ecological Community (CEEC) listed under the EPBC Act

^ DPE (2022b).

~ BAM Calculator.

3.3.3 Plant Community Types Percent Cleared Value

The BAM (DPIE 2020a) defines 'Percent Cleared Value' as the percentage of a PCT that has been cleared as a proportion of its pre-1750 extent, as identified in the *BioNet Vegetation Classification* (DPE 2022b). Percent cleared values for each PCT are shown in Table 1.

3.3.4 Threatened Ecological Communities

TECs and associated PCTs within the Subject Land are listed in Table 2 (ELA [2022] as modified by Dr Colin Driscoll [Hunter Eco]). TECs listed under the BC Act and EPBC Act are shown on Figure 8. As a result of the site inspection, the following amendments were made to the TEC mapping prepared by ELA (2022):

- PCT 1603 *Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter* (regenerating) is also attributed to the *Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions* listed under the BC Act for the reasons in Section 3.1 and in consideration of NSW Scientific Committee (2010a);
- the *Hunter Valley Weeping Myall Woodland in the Sydney Basin Bioregion* listed under the BC Act is not present for the reasons in Section 3.1; and
- *Central Hunter Valley Eucalypt Forest and Woodland* listed under the EPBC Act excludes the derived native grassland (after Department of the Environment 2015).

Table 2
Threatened Ecological Communities

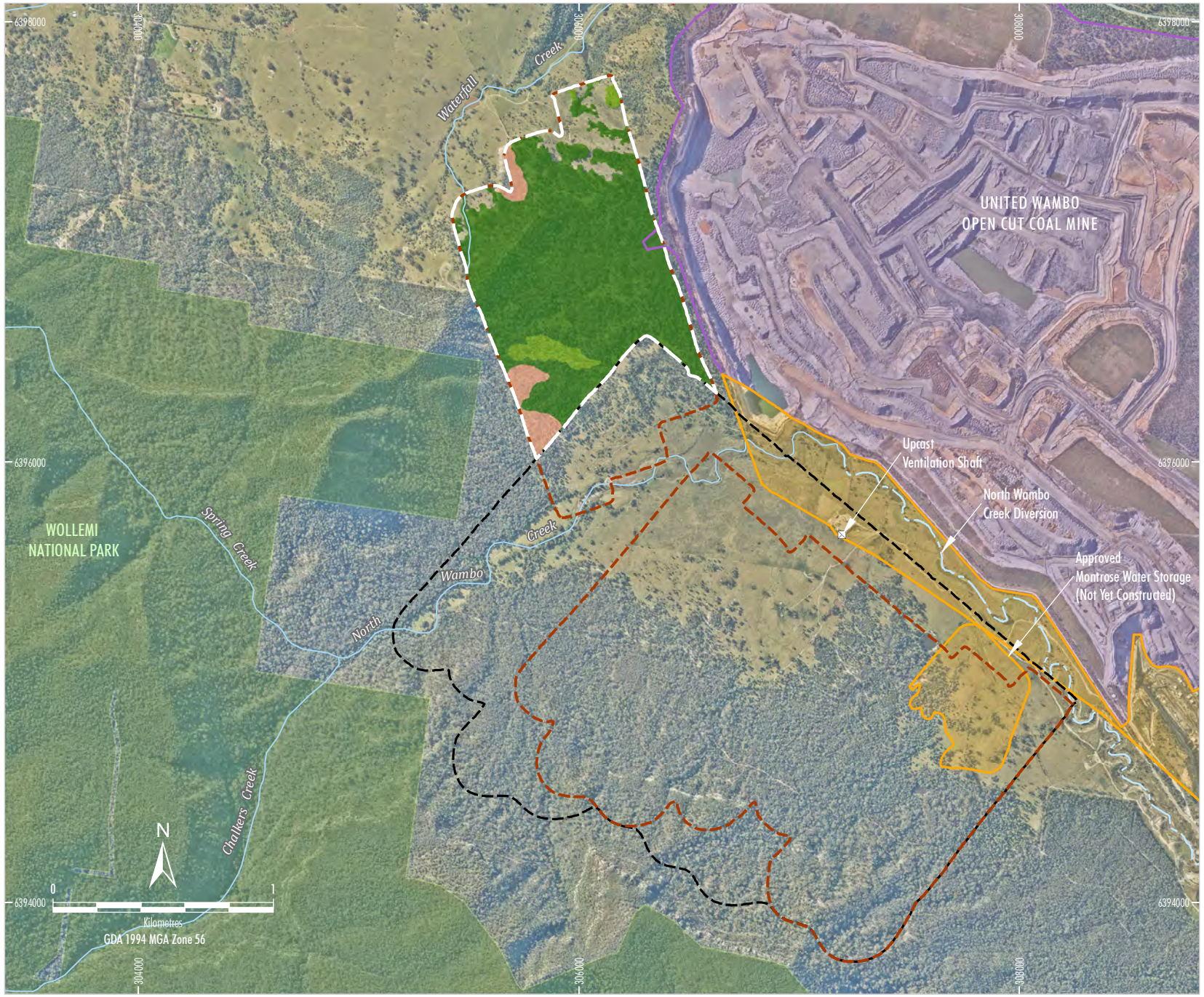
Threatened Ecological Community	Conservation Status*	Associated vegetation zones within the Subject Land	Area within Subject Land (ha)
Threatened Ecological Communities listed under the BC Act			
Central Hunter Grey Box–Ironbark Woodland listed under the BC Act	E	1603 (Woodland and Regeneration)	89
Hunter Valley Footslopes Slaty Gum Woodland listed under the BC Act	V	1176	6
Threatened Ecological Communities listed under the EPBC Act			
Central Hunter Valley Eucalypt Forest and Woodland	CE	1603 (Woodland and Regeneration), 1176	95

* Threatened ecological community status under the BC Act and EPBC Act (current as at November 2022).
V = Vulnerable; E = Endangered; CE = Critically Endangered.

Central Hunter Grey Box–Ironbark Woodland listed under the BC Act was identified in accordance with NSW Scientific Committee (2010a) and *Hunter Valley Footslopes Slaty Gum Woodland* was identified in accordance with NSW Scientific Committee (2010b).

3.4 VEGETATION ZONES

Four vegetation zones (i.e. areas of native vegetation that are the same PCT and similar broad condition states) are listed in Table 1 and mapped on Figure 7. The vegetation has been recognised as being in woodland, regenerating, or derived native grassland condition states.



LEGEND

- National Park
- SSD 7142 Operational Area
- Existing/Approved Wambo Coal Mine Surface Development Area
- ⊠ Ventilation Shaft
- Approved Extent of Conventional Subsidence (20 mm subsidence contour)
- Modified Extent of Conventional Subsidence (20 mm subsidence contour)
- Subject Land

Threatened Ecological Communities

- Slaty Box - Grey Gum Shrubby Woodland on Footslopes of the Upper Hunter Valley Sydney Basin Bioregion (PCT 1176) [1, 3]
- Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter (Good) (PCT 1603) [2, 3]
- Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter (Regenerating) (PCT 1603) [2, 3]

1 Listed BC Act, Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion (Vulnerable)

2 Listed BC Act, Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions (Endangered)

3 Listed EPBC Act, Central Hunter Valley Eucalypt Forest and Woodland (Critically Endangered)

Source: Eco Logical Australia (2022 as modified by Hunter Eco); MSEC (2022, 2021); WCPL (2022); NSW Spatial Services (2022)
Orthophoto: WCPL (May 2022)

Peabody

WAMBO COAL MINE

Threatened Ecological Communities

Figure 8

WAM-09-15_SBX Mod LW24-26_BDAR_201D

3.5 VEGETATION INTEGRITY (VEGETATION CONDITION)

3.5.1 Vegetation Integrity Plots

The location of vegetation integrity (site condition) plots sampled by ELA (2022) and used in this assessment are shown on Figure 7. The data is included in Attachment B.

There are 14 plots on Figure 7 which meet the minimum plots required for each vegetation zone as per the BAM (DPIE 2020a). ELA (2022) sampled an additional 18 plots in the wider area (a total of 32 plots).

3.5.2 Vegetation Integrity Score

The BAM-C was used to determine the VI Scores for each vegetation zone (Table 3).

Table 3
Vegetation Integrity Score Detail

Vegetation Zone	PCT	Condition	Composition Condition Score	Structure Condition Score	Function Condition Score	Trees with Hollows	VI Score
1	1603	Woodland	83.6	90.4	51.6	Yes	73
1a	1603	DNG	36.7	46.6	19.1	No	32
1b	1603	Regenerating	78.4	94.1	51.6	Yes	70.9
2	1176	Woodland	72.9	55.2	53	Yes	59.8

4 HABITAT SUITABILITY FOR THREATENED SPECIES

Threatened species that are 'ecosystem credit species' and/or 'species credit species' are predetermined by DPE in the BAM-C and TBDC (DPE 2022a). The BAM (DPIE 2020a) states:

'Ecosystem credit species' are threatened species whose occurrence can generally be predicted by vegetation surrogates and/or landscape features, or that have a low probability of detection using targeted surveys. The TBDC identifies the threatened species assessed for ecosystem credits.

'Species credit species' are threatened species for which vegetation surrogates and/or landscape features cannot reliably predict the likelihood of their occurrence or components of their habitat. These species are identified in the TBDC.

In some circumstances the TBDC (DPE 2022a) may identify a threatened species that requires assessment for ecosystem credits and species credits (referred to as dual credit species).

For dual credit species, part of the habitat is assessed as a species credit (e.g. breeding habitat or land mapped on an important habitat map for a species). The remaining habitat components for the species are assessed as an ecosystem credit (e.g. foraging habitat).

Dual credit species are generally:

- highly mobile species that rely on particular habitat components for breeding, such as maternity caves for bats, tree hollows for some large forest owls or cockatoos, or
- species for which particular areas in the landscape are important for their survival, such as selected beaches for migratory shorebirds.

4.1 ECOSYSTEM CREDIT SPECIES - HABITAT SUITABILITY ASSESSMENT

A total of 33 ecosystem credit species for assessment are listed in Table 4 from the BAM-C. For a conservative approach, no ecosystem species were excluded from the assessment even though not all species are expected to occur within the Subject Land.

Ecosystem credit species recorded in the wider area of the Subject Land are highlighted in Table 4 and shown on Figure 9. ELA (2022) recorded Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*) in the Subject Land. There is a Spotted Harrier record on Figure 9 and even though the species was not identified by the BAM-C it is considered an additional ecosystem credit species for assessment and has been included in Table 4.

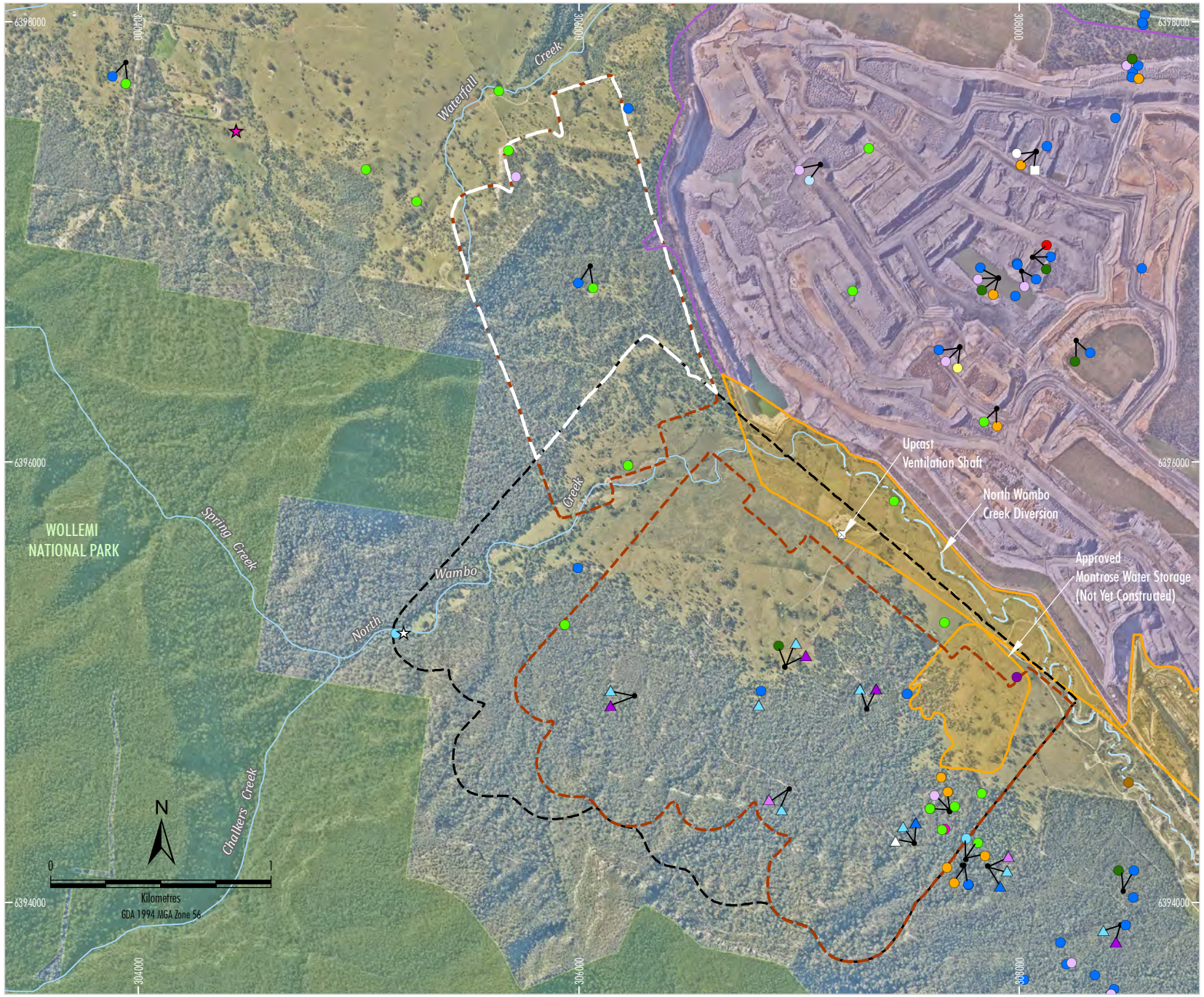
Table 4
Ecosystem Species from the BAM-C

Scientific Name	Common Name	Conservation Status[1]		Class of Credit[2]	Sensitivity to Gain Class
		BC Act	EPBC Act		
Birds					
Falco subniger	Black Falcon	V	-	E	Moderate
Lophoictinia isura	Square-tailed Kite	V	-	S/E	Moderate
Circus assimilis	Spotted Harrier	V	-	E	Moderate
Hieraaetus morphnoides	Little Eagle	V	-	S/E	Moderate

Scientific Name	Common Name	Conservation Status[1]		Class of Credit[2]	Sensitivity to Gain Class
		BC Act	EPBC Act		
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	V	S/E	High
Callocephalon fimbriatum	Gang-gang Cockatoo	V	E	S/E	Breeding: High Foraging: Moderate
Glossopsitta pusilla	Little Lorikeet	V	-	E	High
Neophema pulchella	Turquoise Parrot	V	-	E	High
Lathamus discolor	Swift Parrot	E	CE	S/E	Moderate
Tyto novaehollandiae	Masked Owl	V	-	S/E	High
Ninox strenua	Powerful Owl	V	-	S/E	High
Ninox connivens	Barking Owl	V	-	S/E	High
Hirundapus caudacutus	White-throated Needletail	-	V	E	High
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V	-	E	High
Chthonicola sagittata	Speckled Warbler	V	-	E	High
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V	-	E	Moderate
Anthochaera phrygia	Regent Honeyeater	CE	CE	S/E	High
Grantiella picta	Painted Honeyeater	V	V	E	Moderate
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	V	-	E	Moderate
Petroica phoenicea	Flame Robin	V	-	E	Moderate
Petroica boodang	Scarlet Robin	V	-	E	Moderate
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V	-	E	Moderate
Daphoenositta chrysoptera	Varied Sittella	V	-	E	Moderate
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	-	E	Moderate
Stagonopleura guttata	Diamond Firetail	V	-	E	Moderate
Mammals					
Dasyurus maculatus	Spotted-tailed Quoll	V	E	E	High
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	S/E	High
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-	E	High
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V	-	E	High
Miniopterus orianae oceanensis	Large Bent-winged Bat	V	-	S/E	Breeding: Very High Foraging: High
Miniopterus australis	Little Bent-winged Bat	V	-	S/E	
Nyctophilus corbeni	Corben's Long-eared Bat	V	V	E	High
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-	E	High
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-	E	High

[1] Threatened fauna species status under the BC Act and/or EPBC Act (current as at November 2022) (DPE 2022a). V = Vulnerable; E = Endangered; CE = Critically Endangered.

[2] Biodiversity credit class under the TBDC (DPE 2022a) (current as at November 2022). E = Ecosystem; S = Species.



LEGEND

- National Park
- SSD 7142 Operational Area
- Existing/Approved Wambo Coal Mine
- Surface Development Area
- Ventilation Shaft
- Approved Extent of Conventional Subsidence (20 mm subsidence contour)
- Modified Extent of Conventional Subsidence (20 mm subsidence contour)
- Subject Land

Threatened Species Records

- Brown Treecreeper (eastern subspecies)
- Diamond Firetail
- Dusky Woodswallow
- Gang-gang Cockatoo
- Glossy Black-Cockatoo
- Grey-crowned Babbler (eastern subspecies)
- Hooded Robin (south-eastern form)
- Little Eagle
- Little Lorikeet
- Speckled Warbler
- Spotted Harrier
- Turquoise Parrot
- Varied Sittella
- Squirrel Glider
- Eastern Coastal Free-tailed Bat
- Large-eared Pied Bat
- Little Bent-winged Bat
- Large Bent-winged Bat
- Yellow-bellied Sheathtail-bat
- Cotoneaster Pomaderris *
- *Cymbidium canaliculatum* - endangered population

* The record is listed as Scant Pomaderris in BioNet, however, ELA (pers comm) recently collected samples and the samples were identified by Gavin Phillips and Neville Walsh as Cotoneaster Pomaderris.

Source: Eco Logical Australia (2022); MSEC (2022, 2021); DPE (2022); NSW Spatial Services (2022)
Orthophoto: WCPL (May 2022)

Peabody

WAMBO COAL MINE

Threatened Species Records

Figure 9

WAM-09-15_SBX Mod LW24-26_BDAR_209C

4.2 SPECIES CREDIT SPECIES - HABITAT SUITABILITY ASSESSMENT

Assessing the habitat suitability for a species credit species involves the following steps:

Step 1: Identify species credit species for assessment.

Step 2: Assessment of the habitat constraints for species credit species on the Subject Land.

Step 3: Identify candidate species credit species for further assessment.

Step 4: Determine presence or absence of a candidate species credit species.

Step 5: Determine the area or count, and location of suitable habitat for a species credit species.

Step 6: Determine the habitat condition within the Habitat (Species Polygon) for species assessed by area.

4.2.1 Species Credit Species from the BAM-C

A total of 48 species credit species (and populations) from the BAM-C are listed in Table 5 for assessment. No records of species credit species occur in the Subject Land. Species credit species recorded in the wider area of the Subject Land are highlighted in Table 5 and shown on Figure 9.

A record of Pomaderris occurs in the area that would no longer be undermined or subject to subsidence (Figure 9). The record is listed as *Pomaderris queenslandica* in *BioNet Atlas* (DPE 2022c), however, ELA (pers comm) recently collected samples that were identified by Gavin Phillips and Neville Walsh as *Pomaderris cotoneaster*. Umwelt (Australia) Pty Limited (2021) also recorded *Pomaderris cotoneaster* in the Wambo Biodiversity Stewardship Site. For this reason, *Pomaderris cotoneaster* has been added to Table 5, despite not appearing in the BAM-C.

Table 5
Species Credit Species for Assessment

Scientific Name	Common Name	Conservation Status[1]		Class of Credit[2]	Associated Vegetation Zone/s
		BC Act	EPBC Act		
Flora					
Acacia pendula – *endangered population*	Weeping Myall population in the Hunter catchment	E	-	S	1176, 1603
Angophora inopina	Charmhaven Apple	V	V	S	1603
Asperula asthenes	Trailing Woodruff	V	V	S	1603
Cryptostylis hunteriana	Leafless Tongue Orchid	V	V	S	1176
Cymbidium canaliculatum – endangered population	Tiger Orchid population in the Hunter Catchment	E	-	S	1176, 1603
Cynanchum elegans	White-flowered Wax Plant	E	E	S	1603 (woodland only)
Diuris tricolor – endangered population	Pine Donkey Orchid population in the Muswellbrook local government area	EP	-	S	1176, 1603
Diuris tricolor	Pine Donkey Orchid	V	-	S	1176, 1603
Eucalyptus glaucina	Slaty Red Gum	V	V	S	1603
Eucalyptus pumila	Pokolbin Mallee	V	V	S	1176

Scientific Name	Common Name	Conservation Status[1]		Class of Credit[2]	Associated Vegetation Zone/s
		BC Act	EPBC Act		
Grevillea parviflora subsp. *parviflora*	Small-flower Grevillea	V	V	S	1603 (woodland only)
Monotaxis macrophylla	Large-leafed Monotaxis	E	-	S	1176, 1603 (woodland only)
Ozothamnus tesselatus	*Ozothamnus tesselatus*	V	V	S	1176
Pomaderris queenslandica	Scant Pomaderris	E	-	S	1176, 1603
Pomaderris reperta	Denman Pomaderris	CE	CE	S	1176
Pomaderris cotoneaster	Cotoneaster Pomaderris	E	E	S	-
Prostanthera cineolifera	Singleton Mint Bush	V	V	S	1176
Prostanthera cryptandroides subsp. cryptandroides	Wollemi Mint-bush	V	V	S	1176
Pterostylis chaetophora	Rusty Greenhood	V	-	S	1603 (woodland only)
Pterostylis gibbosa	Illawarra Greenhood	E	E	S	1603
Rutidosis heterogama	Heath Wrinklewort	V	V	S	1176
Thesium australe	Austral Toadflax	V	V	S	1176, 1603
Amphibians					
Litoria aurea	Green and Golden Bell Frog	E	V	S	1603
Litoria brevipalmata	Green-thighed Frog	V	-	S	1603
Reptiles					
Aprasia parapulchella	Pink-tailed Legless Lizard	V	V	S	1176, 1603
Delma impar	Striped Legless Lizard	V	V	S	1176, 1603
Hoplocephalus bitorquatus	Pale-headed Snake	V	-	S	1176, 1603
Birds					
Lophoictinia isura	Square-tailed Kite	V	-	S/E	1176, 1603
Hieraaetus morphnoides	Little Eagle	V	-	S/E	1176, 1603
Burhinus grallarius	Bush Stone-curlew	E	-	S	1176, 1603
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	V	S/E	1176, 1603
Callocephalon fimbriatum	Gang-gang Cockatoo	V	E	S/E	1176, 1603
Lathamus discolour	Swift Parrot	E	CE	S/E	1176, 1603
Tyto novaehollandiae	Masked Owl	V	-	S/E	1176, 1603
Ninox strenua	Powerful Owl	V	-	S/E	1176, 1603
Ninox connivens	Barking Owl	V	-	S/E	1176, 1603
Anthochaera phrygia	Regent Honeyeater	CE	CE	S/E	1176, 1603
Mammals					
Phascogale tapoatafa	Brush-tailed Phascogale	V	-	S	1603
Planigale maculata	Common Planigale	V	-	S	1176, 1603
Phascolarctos cinereus	Koala	E	E	S	1176, 1603
Cercartetus nanus	Eastern Pygmy-possum	V	-	S	1176, 1603
Petaurus norfolcensis	Squirrel Glider	V	-	S	1176

Scientific Name	Common Name	Conservation Status[1]		Class of Credit[2]	Associated Vegetation Zone/s
		BC Act	EPBC Act		
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V	S	1176, 1603
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	S/E	1176, 1603
Miniopterus orianae oceanensis	Large Bent-winged Bat	V	-	S/E	1176, 1603
Miniopterus australis	Little Bent-winged Bat	V	-	S/E	1176
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	S	1176, 1603
Myotis macropus	Southern Myotis	V	-	S	1603
Vespadelus troughtoni	Eastern Cave Bat	V	-	S	1176

[1] Threatened flora species status under the BC Act and/or EPBC Act (current as at November 2022) (DPE 2022a).
V = Vulnerable; E = Endangered; CE = Critically Endangered; EP = Endangered Population.

[2] Biodiversity credit class under the TBDC (DPE 2022a) (current as at November 2022).
E = Ecosystem; S = Species.

4.2.2 Exclusion of Species Credit Species

4.2.2.1 Geographical Constraints

Geographic constraints are identified in the TBDC (DPE 2022a) for some species credit species (and populations) (Table 6). The Pine Donkey Orchid population in the Muswellbrook Local Government Area (LGA) is not likely to occur as it is constrained to the Muswellbrook LGA.

Table 6
Species Credit Species – Geographic Constraints

Scientific Name	Common Name	Geographic Constraint within the Hunter Sub-zone in the BAM-C	Assessment
Acacia pendula – endangered population	Weeping Myall population in the Hunter catchment	Within Hunter River catchment	Not a relevant constraint.
Angophora inopina	Charmhaven Apple	Within Singleton and Cessnock LGAs	Not a relevant constraint.
Cymbidium canaliculatum – endangered population	Tiger Orchid population in the Hunter Catchment	Must be within Hunter catchment as defined by Australia's River Basins (Geoscience Australia 1997)	Not a relevant constraint.
Diuris tricolor – endangered population	Pine Donkey Orchid population in the Muswellbrook LGA	Muswellbrook LGA	The Wambo Coal Mine is located within the Singleton LGA

Shaded species/populations are species that have geographical constraints within the Hunter sub-zone.

4.2.2.2 Habitat Constraints and Vagrancy

Habitat constraints are identified in the TBDC (DPE 2022a) for some species credit species (and populations), and the absence of identified habitat precludes the species from further assessment (Table 7).

Table 7
Species Credit Species - Habitat Constraints

Common Name	Credit Class (Unit of Measure)	Habitat Constraints identified in the TBDC (DPE 2022a)	Assessment	Species Assumed Present and Vegetation Zones associated with the Species Polygon (Attachment C)	Species Polygon Area (ha)	Biodiversity Risk Weighting (DPE 2022a)
Flora						
Acacia pendula – endangered population	Species (Area)	*None.*	-	1176, 1603	105	3.00
Charmhaven Apple	Species (Area)	*None.*	-	1603	99	2.00
Trailing Woodruff	Species (Area)	*None.*	-	1603	99	2.00
Leafless Tongue Orchid	Species (Area)	*None.*	-	1176	6	1.50
Tiger Orchid population in the Hunter Catchment	Species (Count)	*Epiphytic in a range of eucalypts, Acacia and Angophora; Cut stumps or logs on ground.*	Habitat constraint present.	1176, 1603	120.8	2.00
White-flowered Wax Plant	Species (Area)	*None.*	-	1603 (woodland only)	84.5	2.00
Pine Donkey Orchid	Species (Area)	*None.*	-	1176, 1603	105	1.50
Slaty Red Gum	Species (Count)	*None.*	-	1603	115.9	2.00
Pokolbin Mallee	Species (Area)	*None.*	-	1176	6	3.00
Small-flower Grevillea	Species (Area)	*None.*	-	1603 (woodland only)	84.5	2.00
Large-leafed Monotaxis	Species (Area)	*Species is a short-lived annual, and will not be present unless a recent disturbance/fire event has occurred and triggered germination.*	A portion of the Subject Land was subject to a burn in 2018-2019 (National Parks and Wildlife Service 2022).	1176, 1603 (woodland only)	90.5	2.00

Common Name	Credit Class (Unit of Measure)	Habitat Constraints identified in the TBDC (DPE 2022a)	Assessment	Species Assumed Present and Vegetation Zones associated with the Species Polygon (Attachment C)	Species Polygon Area (ha)	Biodiversity Risk Weighting (DPE 2022a)
Ozothamnus tesselatus	Species (Area)	*None.*	-	1176	6	1.50
Scant Pomaderris	Species (Area)	*None.*	-	1176, 1603 (woodland only)	6	2.00
Denman Pomaderris	Species (Area)	*None.*	-	1176	6	3.00
Cotoneaster Pomaderris	Species (Area)	*None.*	-	No species polygon. Not associated with PCTs in the Subject Land.	N/A	N/A
Singleton Mint Bush	Species (Area)	*None.*	-	1176	6	2.00
Wollemi Mint-bush	Species (Area)	*None.*	-	1176	6	2.00
Rusty Greenhood	Species (Area)	*None.*	-	1603 (woodland only)	84.5	2.00
Illawarra Greenhood	Species (Area)	*None.*	-	1603	99	2.00
Heath Wrinklewort	Species (Area)	*None.*	-	1176	6	2.00
Austral Toadflax	Species (Area)	*None.*	-	1176, 1603	105	1.50
Amphibians						
Green and Golden Bell Frog	Species (Area)	*Semi-permanent/ephemeral wet areas (within 1km of wet areas).* *Swamps (within 1km of swamp).* *Waterbodies (within 1km of waterbody).*	Habitat constraint absent.	No species polygon	N/A	N/A
Green-thighed Frog	Species (Area)	*Swamps* *Waterbodies*	Habitat constraint absent.	No species polygon	N/A	N/A

Common Name	Credit Class (Unit of Measure)	Habitat Constraints identified in the TBDC (DPE 2022a)	Assessment	Species Assumed Present and Vegetation Zones associated with the Species Polygon (Attachment C)	Species Polygon Area (ha)	Biodiversity Risk Weighting (DPE 2022a)
Reptiles						
Pink-tailed Legless Lizard	Species (Area)	*Rocky areas or within 50 m of rocky areas.*	Habitat constraint present. There are some small localised areas of surface rock in the northern end of the Subject Land.	50 m buffer from rocky areas.	7.8	2.00
Striped Legless Lizard	Species (Area)	*None.*	-	No species polygon. This species does not occur in the Hunter Region (Mahony *et. al.* 2022).	N/A	N/A
Pale-headed Snake	Species (Area)	*None.*	-	1176, 1603	105	2.00
Birds						
Square-tailed Kite	Species/Ecosystem (Area)	*Breeding constraint: Other (Nest trees).*	Habitat constraint present.	1176, 1603	105	1.50
Little Eagle	Species/Ecosystem (Area)	*Breeding constraint: Other (Nest trees - live (occasionally dead) large old trees within vegetation).*	Habitat constraint present.	1176, 1603	105	1.50
Bush Stone-curlew	Species (Area)	*Fallen/standing dead timber including logs.*	Habitat constraint present.	1176, 1603	105	2.00
Glossy Black-Cockatoo	Species/Ecosystem (Area)	*Breeding constraint: Hollow-bearing trees (Living or dead tree with hollows greater than 15 cm diameter and greater than 5 m above ground).*	Habitat constraint present.	1176, 1603	105	2.00
Gang-gang Cockatoo	Species/Ecosystem (Area)	*Breeding constraint: Hollow-bearing trees (Eucalypt tree species with hollows greater than 9 cm diameter).*	Habitat constraint present.	1176, 1603	105	2.00
Swift Parrot	Species/Ecosystem (Area)	*Breeding constraint: Other (As per mapped important areas).*	Habitat constraint absent. Not a mapped important area (DPE 2022d).	No species polygon	N/A	N/A

Common Name	Credit Class (Unit of Measure)	Habitat Constraints identified in the TBDC (DPE 2022a)	Assessment	Species Assumed Present and Vegetation Zones associated with the Species Polygon (Attachment C)	Species Polygon Area (ha)	Biodiversity Risk Weighting (DPE 2022a)
Masked Owl	Species/Ecosystem (Area)	*Breeding constraint: Hollow-bearing tree (Living or dead trees with hollows greater than 20 cm diameter).*	Habitat constraint present.	1176, 1603	105	2.00
Powerful Owl	Species/Ecosystem (Area)	*Breeding constraint: Hollow-bearing tree (Living or dead trees with hollows greater than 20 cm diameter).*	Habitat constraint present.	1176, 1603	105	2.00
Barking Owl	Species/Ecosystem (Area)	*Breeding constraint: Hollow-bearing tree (Living or dead trees with hollows greater than 20 cm diameter and greater than 4m above the ground).*	Habitat constraint present.	1176, 1603	105	2.00
Regent Honeyeater	Species/Ecosystem (Area)	*Breeding constraint: Other (As per mapped areas).*	Habitat constraint absent. Not a mapped important area (DPE 2022a).	No species polygon	N/A	N/A
Mammals						
Brush-tailed Phascogale	Species (Area)	*Hollow-bearing trees.*	Habitat constraint present.	1603	99	2.00
Common Planigale	Species (Area)	*None.*	-	1176, 1603	105	2.00
Koala	Species (Area)	*Presence of koala use trees. Refer to the Koala (Phascolarctos cinereus): Biodiversity Assessment Method Survey Guide for information on targeted survey requirements and mapping species polygons.*	Habitat constraint present.	1176, 1603	105	2.00
Eastern Pygmy-possum	Species (Area)	*None.*	-	1176, 1603	105	2.00
Squirrel Glider	Species (Area)	*None*	-	1176	6	2.00
Brush-tailed Rock-wallaby	Species (Area)	*Other (Land within 1 km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or clifflines).*	Habitat constraint absent (ELA 2022).	No species polygon	N/A	N/A

Common Name	Credit Class (Unit of Measure)	Habitat Constraints identified in the TBDC (DPE 2022a)	Assessment	Species Assumed Present and Vegetation Zones associated with the Species Polygon (Attachment C)	Species Polygon Area (ha)	Biodiversity Risk Weighting (DPE 2022a)
Grey-headed Flying-fox	Species/Ecosystem (Area)	*Breeding constraint: Other (Breeding camps).*	Habitat constraint absent. The nearest camp is at Singleton (DCCEEW 2022b).	No species polygon	N/A	N/A
Large Bent-winged Bat	Species/Ecosystem (Area)	*Breeding constraint: Caves (Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding).*	Habitat constraint absent from Subject Land but present within 2 km.	1176, 1603	105	3.00
Little Bent-winged Bat	Species/Ecosystem (Area)	*Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records in BioNet with microhabitat code 'IC – in cave'; observation type code 'E nest-roost'; with numbers of individuals >500; or from the scientific literature.*	Habitat constraint absent from Subject Land but present within 2 km.	1176	6	3.00
Large-eared Pied Bat	Species (Area)	*Cliffs (Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels).*	Habitat constraint absent from Subject Land but present within 2 km.	1176, 1603	105	3.00
Southern Myotis	Species (Area)	*Hollow-bearing trees (Within 200 m of riparian zone).* *Other (Bridges, caves or artificial structures within 200 m of riparian zone).*	Habitat constraint absent from Subject Land but present within 200 m.	1603 within 200 m buffer of artificial dams.	7	2.00
Eastern Cave Bat	Species (Area)	*Caves (Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, crevices or boulder piles, or within two kilometres of old mines, tunnels, old buildings or sheds).*	Habitat constraint absent from Subject Land but present within 2 km.	1176	6	3.00

Shaded species are species that have habitat constraints as identified in the TBDC (DPE 2022a) such that these species are not likely to occur and are therefore excluded from further assessment.

* Habitat Constraints not in the BAM-C.

4.2.2.3 Degraded Habitat

A candidate species credit species is considered unlikely to occur if after carrying out a field assessment of the habitat constraints or microhabitats, the assessor determines that the habitat is substantially degraded to the point that the species is unlikely to utilise the vegetation zone (DPIE 2020a). The derived native grassland areas within the Subject Land are considered too degraded for some species in Table 5 that are only likely to occur in the woodland form of the PCT.

4.3 SPECIES CREDIT SPECIES – ASSESSMENT METHOD

4.3.1 Species Important Habitat Mapping

No DPE Important Habitat Mapping is relevant to the Subject Land (DPE 2022d).

4.3.2 Expert Reports

No expert reports have been obtained.

4.3.3 Targeted Surveys

FloraSearch (2017) prepared the original South Bates Extension Modification Environmental Assessment – Flora Assessment. The surveys involved random meanders for threatened flora species. No threatened flora species were recorded.

Fauna surveys were undertaken by ELA (2017) for the South Bates Extension Modification in September and October 2016. The surveys included habitat assessment, diurnal bird surveys, microbat detection devices, remote camera surveys, amphibian survey, nocturnal mammal and reptile surveys, terrestrial and arboreal mammal trapping, and opportunistic fauna sightings. No species credit species were recorded during the surveys by ELA (2017).

ELA (2022) undertook opportunistic searches for threatened species, but no targeted surveys for species credit species in accordance with the relevant guidelines (e.g. DPIE (2020b) *Surveying Threatened Plants and Their Habitats: NSW Survey Guide for the Biodiversity Assessment Method*) were undertaken specifically for the Modification during these surveys.

Dr Colin Driscoll undertook an inspection of the Subject Land and surrounds on the 4 November 2022, which included inspecting potential ponding areas for any potentially occurring threatened trees and shrubs. No threatened trees or shrubs were found.

4.3.4 Species Assumed to be Present

For a development proposal, the BAM (DPIE 2020a) describes that a proponent may elect to assume a species is present in replace of a targeted survey or expert report.

Flora Species Credit Species

Two flora species credit species, the *Tiger Orchid population in the Hunter Catchment* and Cotoneaster Pomaderris, are known to occur in the wider area of the Subject Land (Table 5 and Figure 9). It is possible that the Tiger Orchid occurs in the Subject Land and this assessment has been prepared on the basis that that this species is 'assumed present' in accordance with the BAM (DPIE 2020a). The Cotoneaster Pomaderris occurs along North Wambo Creek, and is not known to be associated with the PCTs in the Subject Land (DPE 2022a) so no species polygon has been prepared for this species.

There are an additional 19 flora species credit species that are also 'assumed present' for the purpose of this assessment (Table 7). Species polygons are provided in Attachment C based on the entire associated vegetation zone (Table 7).

It is noted that *Tiger Orchid Population in the Hunter Catchment* and Slaty Red Gum are 'count' species (the other flora are 'area' species). For the purpose of this assessment, the entire associated vegetation zone has been included in the species polygon for these species as well as a 30 m buffer of this suitable habitat (Table 7). This approach was undertaken because the Modification does not involve a Development Footprint, no biodiversity credits are required to be calculated and no BAM-C application was submitted in the Biodiversity Offsets and Agreement Management System (DPE 2022d).

Potential subsidence impacts on all potentially occurring threatened flora species are assessed in Section 7.2.1.

Fauna Species Credit Species

A total of 20 fauna species credit species are also 'assumed present' for the purpose of this assessment (Table 7). Species polygons are provided in Attachment C based on the entire associated vegetation zone (Table 7).

Three bird species which are dual credit species have been recorded in the wider area of the Subject Land (i.e. Little Eagle, Glossy Black-Cockatoo and Gang-gang Cockatoo) (Figure 9).

Four mammal species credit species have been recorded in the wider area of the Subject Land (i.e. Squirrel Glider, Large Bent-winged Bat, Little Bent-winged Bat and Large-eared Pied Bat) (Figure 9). Two bat species are dual credit species, and one is a species credit species. Although only foraging habitat for the bats occurs in the Subject Land, the Subject Land is within 2 km of potential breeding habitat so a species polygon has been prepared.

Potential subsidence impacts on all potentially occurring threatened fauna species credit species are assessed in Section 7.2.1.

5 PRESCRIBED IMPACT ENTITIES

The BC Regulation states:

6.1 Additional biodiversity impacts to which scheme applies (sections 6.3 and 6.6(2))

(1) The impacts on biodiversity values of the following actions are prescribed (subject to subclause (2)) as biodiversity impacts to be assessed under the biodiversity offsets scheme—

(a) the impacts of development on the following habitat of threatened species or ecological communities—

(i) karst, caves, crevices, cliffs and other geological features of significance,

(ii) rocks,

(iii) human made structures,

(iv) non-native vegetation,

(b) the impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range,

(c) the impacts of development on movement of threatened species that maintains their lifecycle,

(d) the impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining or other development),

(e) the impacts of wind turbine strikes on protected animals,

(f) the impacts of vehicle strikes on threatened species of animals or on animals that are part of a threatened ecological community.

(2) The additional biodiversity impacts prescribed by this clause—

(a) are prescribed for the purposes of assessment and biodiversity assessment reports under the Act, but are not additional biodiversity impacts for the purposes of calculating the number and class of biodiversity credits that are required under a biodiversity assessment report to be retired to offset the residual impact on biodiversity values of proposed development, proposed clearing of native vegetation or proposed biodiversity certification of land, and

(b) may be taken into account in the determination of the biodiversity credits required to be retired (or other conservation measures required to be taken) under a planning approval or vegetation clearing approval or under a biodiversity certification of land.

Prescribed impact entities are described below.

5.1 KARSTS, CAVES, CREVICES, CLIFFS, ROCKS AND OTHER GEOLOGICAL FEATURES

As described in Section 2.4, no karst, caves, cliffs, or other geological features occur in the Subject Land (ELA 2022; MSEC 2022). There are some small localised areas of surface rock in the northern end of the Subject Land (Figure 5). The Pink-tailed Legless Lizard (*Aprasia parapulchella*) is a threatened species that can be found under surface rock. The Pink-tailed Legless Lizard has been recorded approximately 16 km north of the Subject Land (Future Ecology 2019). This prescribed impact entity is discussed further in Section 7.

5.2 HUMAN MADE STRUCTURES AND NON-NATIVE VEGETATION

There are no human made structures that provide habitat for threatened species in the Subject Land (ELA 2022). There are no areas of non-native vegetation that provide habitat for threatened species in the Subject Land (ELA 2022). This prescribed impact entity is not discussed further.

5.3 HABITAT CORRIDORS OR LINKAGES

The woodland/forest habitat in the Subject Land is on the edge of the existing mining area and is therefore not part of a corridor linking two areas of existing woodland/forest habitat. The woodland/forest habitat is linked to the extensive area of existing woodland/forest habitat associated with Wollemi National Park. This prescribed impact entity is not discussed further.

5.4 FAUNA MOVEMENT

The woodland/forest habitat in the Subject Land could provide for the movement of threatened species that maintains their lifecycle. It is possible for any species in Tables 4 and 7 (with species polygons) to move through the Subject Land. This prescribed impact entity is discussed further in Section 7.

5.5 WATERBODIES OR HYDROLOGICAL PROCESSES THAT SUSTAIN THREATENED SPECIES AND THREATENED ECOLOGICAL COMMUNITIES

Waterbodies are described in Section 2.2. No threatened species or communities are likely to be dependent on the first and second order unnamed ephemeral drainage lines in the Subject Land.

No vegetation within the Subject Land is likely to use groundwater, however some potential Groundwater Dependent Vegetation occurs in the surrounds (Bureau of Meteorology 2022; ELA 2022). Hunter Eco (2019) undertook a study to provide advice on the likely level of groundwater dependence of the vegetation in the South Bates Extension Area given current groundwater levels and expert knowledge of the vegetation communities in the region. It was identified that the River Oak community along North Wambo Creek (associated with PCT 485) meets the attributes of a Groundwater Dependent Ecosystem (GDE) (Hunter Eco 2019). However, rather than being dependent on a permanent aquifer water source, River Oak are a facultative user of groundwater when available and are able to sustain themselves through lengthy dry periods. SLR Consulting Australia Pty Ltd (SLR) (2022) describes that based on groundwater level observations, the GDE is likely to have periodic access to groundwater due to periodic saturation of the alluvium from high rainfall and flow events in North Wambo Creek. PCT 485 is not part of a threatened ecological community.

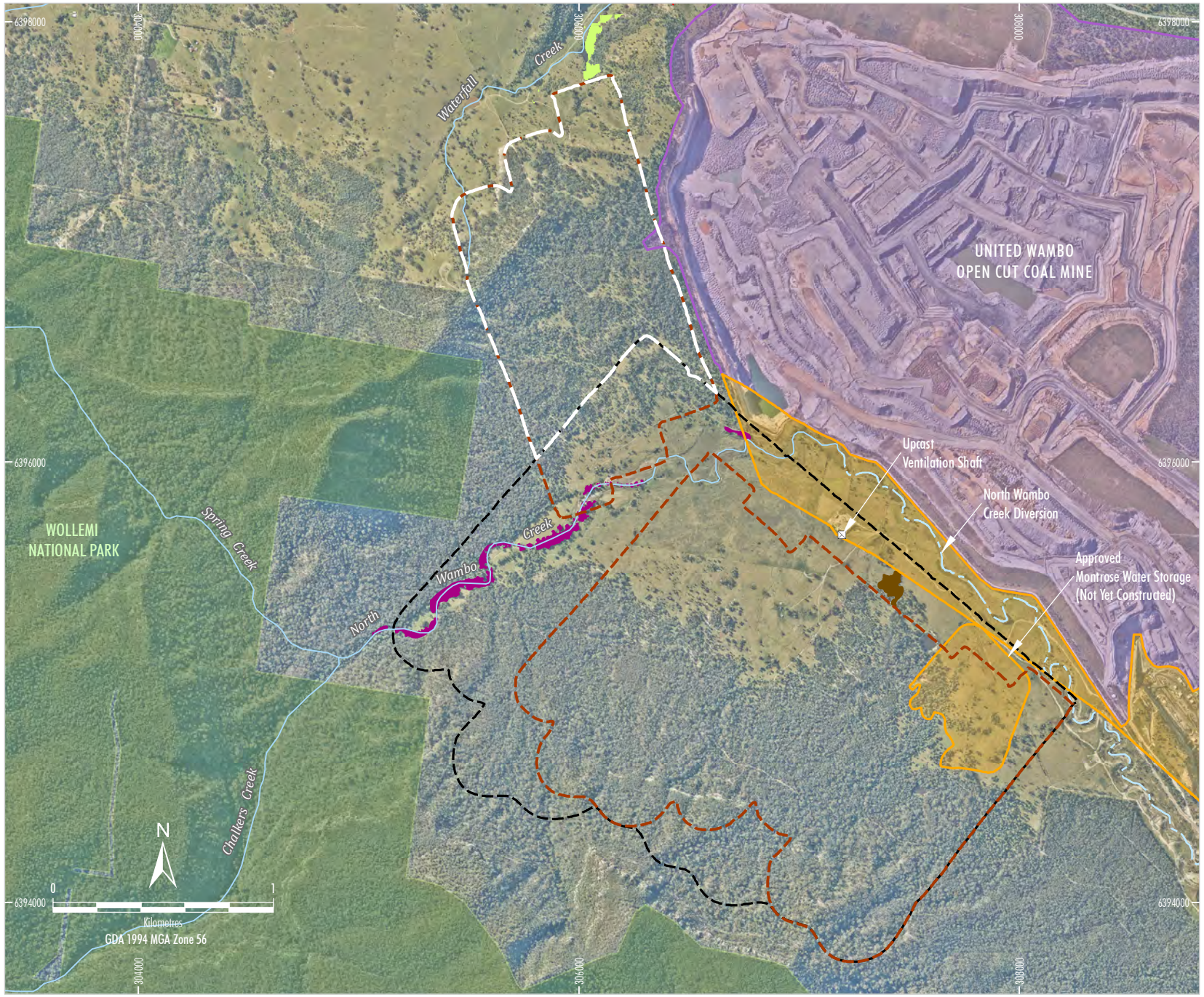
Hunter Eco (2019) also identified *Melaleuca decora* Low Forest (PCT 922) as a GDE. ELA (2022) mapped the *Melaleuca decora* Low Forest (PCT 922) within the area that would no longer be subsided due to the Modification (Figure 10). PCT 922 is not part of a threatened ecological community.

The downstream reach of Waterfall Creek is mapped as a medium potential GDE (Bureau of Meteorology 2022). ELA (2022) identified PCT 1598 at the headwaters of Waterfall Creek.

This prescribed impact entity is discussed further in Section 7.

5.6 WIND TURBINES

The Modification would not involve wind turbines. This prescribed impact entity is not discussed further in Section 7.



LEGEND

- National Park
- SSD 7142 Operational Area
- Existing/Approved Wambo Coal Mine Surface Development Area
- Ventilation Shaft
- Approved Extent of Conventional Subsidence (20 mm subsidence contour)
- Modified Extent of Conventional Subsidence (20 mm subsidence contour)
- Subject Land

Groundwater Dependant Ecosystems

- River Oak Riparian Grassy Tall Woodland of the Western Hunter Valley, Brigalow Belt South Bioregion and Sydney Basin Bioregion (PCT 485)
- *Melaleuca decora* Low Forest of the Central Hunter Valley Sydney Basin Bioregion (PCT 922)
- Central Hunter Swamp Oak Riparian Forest (PCT 4015)

Source: Eco Logical Australia (2022 as modified by Hunter Eco); MSEC (2022, 2021); State Government of NSW and Department of Planning and Environment (2022); WCPL (2022); NSW Spatial Services (2022)
Orthophoto: WCPL (May 2022)

Peabody

WAMBO COAL MINE

Groundwater Dependent Ecosystems

Figure 10

WAM-09-15_SBX Mod LW24-26_BDAR_211C

5.7 THREATENED SPECIES AT RISK FROM VEHICLE STRIKE

The Modification would not involve an increase in vehicles that could present a risk to threatened species in the Subject Land. This prescribed impact entity is not discussed further in Section 7.

6 AVOID AND MINIMISE IMPACTS

Underground mining methods significantly reduce environmental impacts, including vegetation and habitat disturbance, in comparison to open cut mining methods. The Modification includes the following changes to the approved Wambo Coal Mine longwalls:

- reorienting Longwalls 24 and 25 of the South Bates Extension Underground Mine; and
- an additional longwall panel (i.e. Longwall 26).

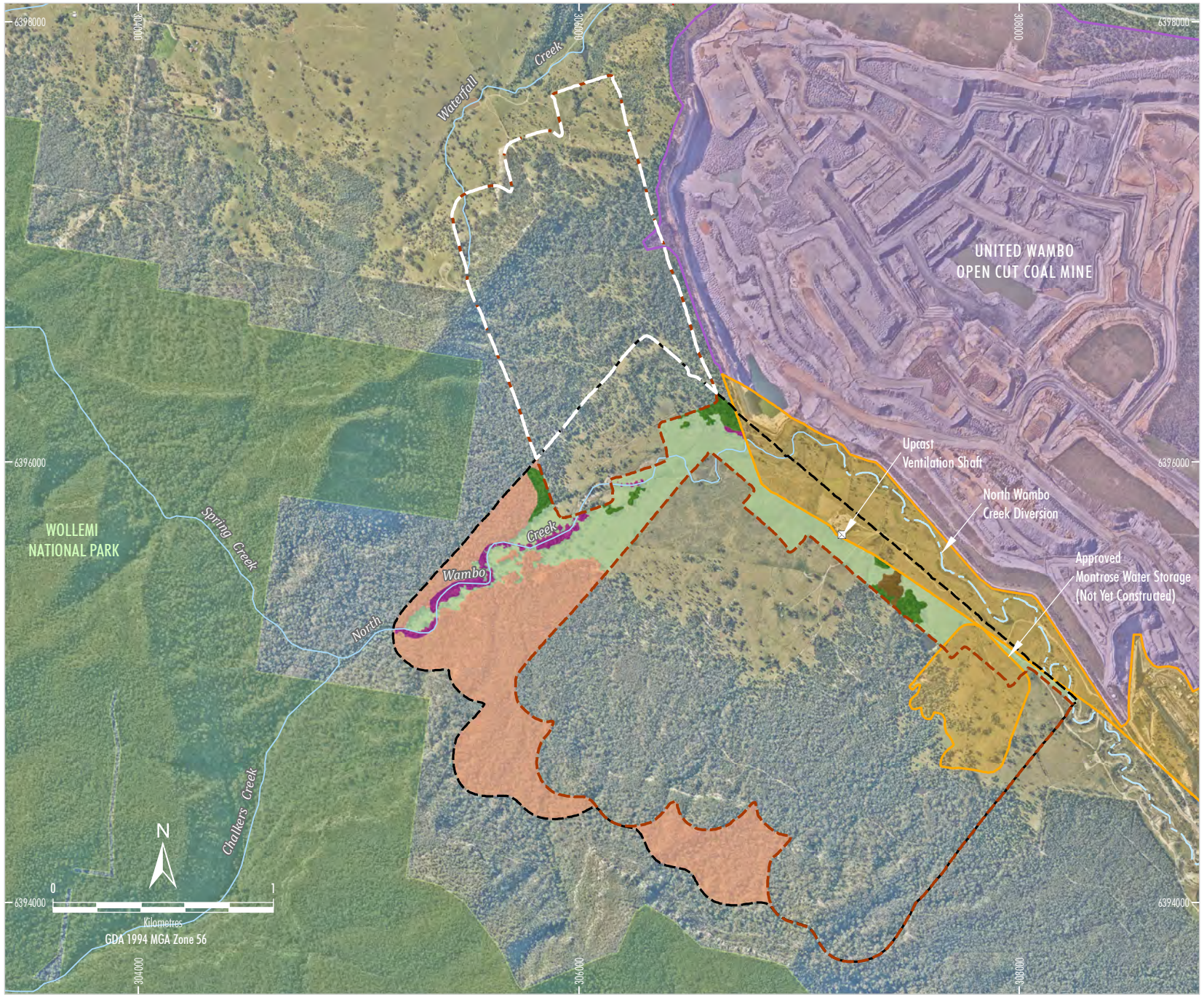
No changes to the mining method or technology are proposed. The Modification would not result in any direct impacts on native vegetation or habitat as no additional land clearance is proposed.

The Modification would avoid and minimise potential impacts from the approved South Bates Extension Underground Mine because the Modification would:

- result in an overall reduction in the area of native vegetation predicted to experience potential subsidence impacts (22.7 ha reduction) (Figure 11);
- decrease the impact to named waterbodies because approximately 2 km of North Wambo Creek would no longer be undermined or subject to subsidence; and
- materially reduce subsidence to vegetation that may use groundwater.

ELA (2022) evaluated the vegetation integrity of the area that would be subsided and the area that would be avoided as part of the Modification and found that vegetation integrity was similar.

As shown on Figure 9, a record of Pomaderris would no longer be undermined or subject to subsidence. The Pomaderris record is assigned as *Pomaderris queenslandica* in *BioNet Atlas* (DPE 2022c), however, ELA (pers comm) recently collected samples that were identified by Gavin Phillips and Neville Walsh as Cotoneaster Pomaderris (*Pomaderris cotoneaster*).



LEGEND

- National Park
- SSD 7142 Operational Area
- Existing/Approved Wambo Coal Mine Surface Development Area
- ⊠ Ventilation Shaft
- Approved Extent of Conventional Subsidence (20 mm subsidence contour)
- Modified Extent of Conventional Subsidence (20 mm subsidence contour)
- Subject Land

Vegetation Communities

- River Oak Riparian Grassy Tall Woodland of the Western Hunter Valley, Brigalow Belt South Bioregion and Sydney Basin Bioregion (PCT 485)
- *Melaleuca decora* Low Forest of the Central Hunter Valley Sydney Basin Bioregion (PCT 922)
- Slaty Box - Grey Gum Shrubby Woodland on Footslopes of the Upper Hunter Valley Sydney Basin Bioregion (PCT 1176)
- Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter (Good) (PCT 1603)
- Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter (DNG) (PCT 1603)

Source: Eco Logical Australia (2022 as modified by Hunter Eco); MSEC (2022, 2021); WCPL (2022); NSW Spatial Services (2022)
Orthophoto: WCPL (May 2022)

Peabody

WAMBO COAL MINE

Impact Avoidance

Figure 11

WAM-09-15_SBX Mod LW24-26_BDAR_210D

7 EVALUATION OF POTENTIAL IMPACTS

7.1 DIRECT IMPACTS ON NATIVE VEGETATION AND HABITAT

The Modification would not result in any direct impacts on native vegetation or habitat as no additional land clearance is proposed.

7.2 INDIRECT IMPACTS ON NATIVE VEGETATION AND HABITAT

7.2.1 Potential Subsidence Impacts

Figure 7 shows the approved extent of predicted conventional subsidence as well as the proposed extent of predicted conventional subsidence from the Modification (MSEC 2022)[4]. The difference in the type and area of vegetation in the Subject Land compared to the area that will no longer be subsided is quantified in Table 8.

Table 8
Native Vegetation within the Subsidence Area

Vegetation Zone	PCT	PCT Name	Condition	Subject Land Area (ha)	Reduced Subsidence Area (ha)	Difference (ha)
Grassy Woodlands Formation – Coastal Valley Grassy Woodlands Class						
1 (A, C)	1603	Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter	Woodland	84.5	5	+79.5
1a	1603	Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter	DNG	10	41	-31
1b (A, C)	1603	Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter	Regenerating	4.5	0	+4.5
Dry Sclerophyll Forests Formation (Shrubby sub-formation) Western Slopes Dry Sclerophyll Forests Class						
2 (B, C)	1176	Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley Sydney Basin Bioregion	Woodland	6	76.5	-70.5
Dry Sclerophyll Forests Formation (Shrub/grass sub-formation) Hunter-Macleay Dry Sclerophyll Forests Class						
-	922	*Melaleuca decora* low forest of the central Hunter Valley, Sydney Basin Bioregion	Woodland	0	1	-1

[4] ELA (2022) undertook the biodiversity review on the subsidence 'angle of draw' (MSEC 2022) however this BDAR assesses the impact of the predicted 20 mm conventional subsidence extent (MSEC 2022) as this is the relevant area that would be subsided.

Vegetation Zone	PCT	PCT Name	Condition	Subject Land Area (ha)	Reduced Subsidence Area (ha)	Difference (ha)
Forested Wetlands Formation (Eastern Riverine Forests)						
-	485	River Oak Riparian Grassy Tall Woodland of the western Hunter Valley, Brigalow Belt South Bioregion and Sydney Basin Bioregion	Woodland	0	4.2	-4.2
			Total Woodland/Forest	**95**	**86.7**	**8.3**
			Total Derived Native Grassland	**10**	**41**	**-31**
			Total	**105**	**127.7**	**-22.7**

A Central Hunter Grey Box–Ironbark Woodland listed under the BC Act

B Hunter Valley Footslopes Slaty Gum Woodland listed under the BC Act

C Central Hunter Valley Eucalypt Forest and Woodland

~ BAM Calculator.

Surface Cracking Impacts on Vegetation and Remediation

During the flora assessment for the approved South Bates Extension Underground Mine, FloraSearch (2017) undertook an inspection of vegetation on undermined areas and concluded that the condition of the vegetation on undermined areas was not noticeably different from that on adjacent similar areas that had not been subject to undermining. Tree, shrub and ground layers of the undermined woodland were in good health and showed no signs of dieback. In the fauna assessment, ELA (2017) presented a consistent view that the South Bates Extension Underground Mine was not expected to result in the loss of vegetation cover or alter community structure and species habitat.

The South Bates Extension Underground Mine operates under approved subsidence performance measures in Development Consent (DA 305-7-2003) and, for biodiversity[5] the performance measure is minor cracking of the land surface or other impact with negligible environmental consequences. Biodiversity management and monitoring at the Wambo Coal Mine is conducted in accordance with the approved Biodiversity Management Plan prepared in accordance with Condition B75, Schedule 2 of the Development Consent (DA 305-7-2003). The monitoring programme is extensive and includes biometric sites, riparian vegetation monitoring, groundwater dependent vegetation monitoring and a visual subsidence inspection.

Underground mining at the Wambo Coal Mine has subsided many hundreds of hectares of woodland since operations began with no observable alteration to canopy condition in the most recent Nearmap aerial (6 May 2022). Monitoring in the South Bates Extension Underground Mine area has recorded no evidence of mine subsidence impacting native vegetation condition, despite observed subsidence cracks (ELA 2020 and 2021). Potential impacts on trees (dieback or tree fall) from surface cracking are unlikely based on previous experience and monitoring results. No change to the vegetation abundance or integrity is likely to occur.

The predicted vertical subsidence, maximum predicted tilt and curvatures above the modified Longwalls 24 to 26 are similar to those predicted for the existing/approved Longwalls 17 to 23 and therefore the potential impacts to vegetation above the modified Longwalls 24 to 26 would be similar to the existing/approved Longwalls 17 to 23 (MSEC 2022).

Minor cracks (i.e. less than 50 mm) that develop elsewhere are not expected to require remediation, as geomorphological processes would result in these cracks filling naturally over time. There is no evidence of surface cracking draining the landscape or changing soil hydrological conditions.

[5] Species, populations or communities listed under the BC Act or EPBC Act

The Modification would undermine a larger area of *Central Hunter Grey Box–Ironbark Woodland* listed under the BC Act (an overall increase of approximately 84 ha), but would undermine a smaller area of *Hunter Valley Footslopes Slaty Gum Woodland* listed under the BC Act (reduction of approximately 70.5 ha) (Table 8). For the reasons outlined above, negligible impacts are likely on the threatened ecological communities despite this difference.

In the event that a subsidence impact or environmental consequence exceeds a performance measure, WCPL would be required to remediate the impact in accordance with Development Consent (DA 305-7-2003). If subsidence remediation measures are not considered to be reasonable or feasible, or have not been successful in remediating the impact, WCPL is required to provide an offset to compensate for the impact or environmental consequence in accordance with Development Consent (DA 305-7-2003).

Prior to any remediation of surface cracks, WCPL would undertake a review of environmental impacts that may result from the remediation at the specific location and consider if remediation of surface cracks is environmentally beneficial or if alternative methods of remediating the crack are warranted (e.g. without machinery).

Overall, consistent with the approved Wambo Coal Mine, subsidence from the modified underground mining layout is unlikely to materially impact native vegetation within the predicted subsidence area. The existing subsidence performance measures are considered to be appropriate for the Modification as the subsidence impacts associated with the Modification longwalls are similar to the approved South Bates Extension Underground Mine.

Ponding and Remediation

The South Bates Extension Underground Mine is approved to have minor ponding of the land surface with negligible environmental consequences. Ponding occurs within a few years following commencement of mining.

As a result of the Modification, approximately 2 km of North Wambo Creek would no longer be undermined or subject to subsidence (due to the Modification, only approximately 625 m would be undermined) (Figure 5).

Alluvium Consulting (2022) and MSEC (2022) have identified the potential for ponding to occur as a result of the Modification and conclude:

- overall, less surface area would be affected by topographical depressions and potential ponding for the Modified Layout compared to the approved MOD 17 Layout;
- ponding areas are predicted to develop along North Wambo Creek and once the ponded area fills it would overflow into North Wambo Creek; and
- MSEC (2022) describe that if adverse impacts were to develop due to the increased ponding, these could be remediated to re-establish the natural gradients.

Ponding areas are predicted to occur mostly within PCT 1603 derived native grassland (<1 ha) with some minor areas in PCT 1603 woodland (<0.13 ha) along a tributary of North Wambo Creek and PCT 485 (<0.13 ha). MSEC (2022) note that ponding predictions are conservative and are expected to be smaller than predicted.

Further, the potential ponding area in PCT 485 is in the main North Wambo Creek bed and has a stand of mature and regenerating River Oaks. Hunter Eco (2019) described River Oaks as being capable of both periodic inundation and lengthy dry periods. As such, no long-term impact on the River Oaks is likely to occur.

The location of predicted ponding in PCT 1603 woodland is in an area with regrowth and some existing wetland depressions, as evidenced by the rushes in Plates 1 and 2.

Dr Colin Driscoll (Hunter Eco) undertook an inspection of the Subject Land and surrounds on the 4 November 2022, which included inspecting potential ponding areas for any potentially occurring threatened trees and shrubs. No threatened trees or shrubs were found.

Plates 1 and 2 The Location of Predicted Ponding in PCT 1603 Woodland

Prescribed Impacts Related to Subsidence

Prescribed impacts related to subsidence are discussed in Section 7.3.

Threatened Species

Table 9 provides an assessment of the potential subsidence impacts on threatened species. As described above, there is no likelihood of significant change to habitat structure and content as a consequence of subsidence. Consequently, there would be no loss of any of the threatened species listed in Table 9 were they to occur in the Subject Land.

Overall Summary

The Modification is likely to result in minor cracking and ponding of the land surface with negligible environmental consequences, consistent with the approved mine. This finding is consistent with ELA (2022).

Table 9
Potential Subsidence Impacts on Threatened Species

Scientific Name	Common Name	Conservation Status[1]		Class of Credit[2]	Impact Assessment
		BC Act	EPBC Act		
Flora					
Angophora inopina	Charmhaven Apple	V	V	S	The nearest record of this species is approximately 35 km east of the Subject Land. Occurs most frequently in four main vegetation communities: (i) *Eucalyptus haemastoma–Corymbia gummifera–Angophora inopina* woodland/forest; (ii) *Hakea teretifolia–Banksia oblongifolia* wet heath; (iii) *Eucalyptus resinifera–Melaleuca sieberi–Angophora inopina* sedge woodland; (iv) *Eucalyptus capitellata–Corymbia gummifera–Angophora inopina* woodland/forest. PCT 1603 does not have these characteristics, and therefore this species is unlikely to be present in the Subject Land. If this species were present, it is unlikely to be impacted as no significant adverse impacts on native vegetation are likely to occur.
Asperula asthenes	Trailing Woodruff	V	V	S	Only one record in the Hunter IBRA sub-region approximately 18 km north-east of the Subject Land. This species is unlikely to be present in the Subject Land. If this species were present, it is unlikely to be impacted as no significant adverse impacts on native vegetation are likely to occur.
Cryptostylis hunteriana	Leafless Tongue Orchid	V	V	S	While this orchid is predicted to occur in the Hunter IBRA sub region there are no records. This species is unlikely to be present in the Subject Land. If this species were present, it is unlikely to be impacted as no significant adverse impacts on native vegetation are likely to occur. The Modification would reduce the predicted extent of subsidence on PCT 1176 (70.5 ha) (Figure 11, Table 8) further reducing the potential for adverse impacts to this species.
Cymbidium canaliculatum – endangered population	Tiger Orchid population in the Hunter Catchment	E	-	S	Possibly occurring. Saprophytic in living or dead trees, stumps or logs which would not be impacted by subsidence. This species is unlikely to be impacted as no significant adverse impacts on native vegetation are likely to occur. Further, the Modification would reduce the predicted extent of subsidence by 22.7 ha.
Cynanchum elegans	White-flowered Wax Plant	E	E	S	Nearest records are approximately 26 km north-west and south-east of the Subject Land. However, possible occurrence could not be ruled out. This species is unlikely to be impacted as no significant adverse impacts on native vegetation are likely to occur.

Scientific Name	Common Name	Conservation Status[1]		Class of Credit[2]	Impact Assessment
		BC Act	EPBC Act		
Diuris tricolor	Pine Donkey Orchid	V	-	S	Possibly occurring. This species is unlikely to be impacted as no significant adverse impacts on native vegetation are likely to occur. Further, the Modification would reduce the predicted extent of subsidence by 22.7 ha.
Eucalyptus glaucina	Slaty Red Gum	V	V	S	Possible occurrence could not be ruled out. If this species were present, it is unlikely to be impacted as no significant adverse impacts on native vegetation are likely to occur.
Eucalyptus pumila	Pokolbin Mallee	V	V	S	Restricted to one area in the Brokenback Range 35 km south-east of the Subject Land. This species is unlikely to be present in the Subject Land. If this species were present, it is unlikely to be impacted as no significant adverse impacts on native vegetation are likely to occur. The Modification would reduce the predicted extent of subsidence on PCT 1176 (70.5 ha) (Figure 11, Table 8) further reducing the potential for adverse impacts to this species.
Grevillea parviflora subsp. *parviflora*	Small-flower Grevillea	V	V	S	One record from Wambo mine lease in Spotted Gum/Red Ironbark forest, habitat not present in the Subject Land. This species is unlikely to be present in the Subject Land. If this species were present, it is unlikely to be impacted as no significant adverse impacts on native vegetation are likely to occur.
Monotaxis macrophylla	Large-leafed Monotaxis	E	-	S	One record 75 km north of the Subject Land. However, being a fire ephemeral species, its presence cannot be ruled out. This species is unlikely to be impacted as no significant adverse impacts on native vegetation are likely to occur. Further, the Modification would reduce the predicted extent of subsidence by 22.7 ha.
Ozothamnus tesselatus	-	V	V	S	One record 25 km north-east of the Subject Land. However, its presence cannot be ruled out. If this species were present, it is unlikely to be impacted as no significant adverse impacts on native vegetation are likely to occur. The Modification would reduce the predicted extent of subsidence on PCT 1176 (70.5 ha) (Figure 11, Table 8) further reducing the potential for adverse impacts to this species.
Pomaderris queenslandica	Scant Pomaderris	E	-	S	Nearest record 30 km north-west of the Subject Land. However, its presence cannot be ruled out. This species is unlikely to be impacted as no significant adverse impacts on native vegetation are likely to occur. Further, the Modification would reduce the predicted extent of subsidence by 22.7 ha.

Scientific Name	Common Name	Conservation Status[1]		Class of Credit[2]	Impact Assessment
		BC Act	EPBC Act		
Pomaderris reperta	Denman Pomaderris	CE	CE	S	Nearest record 27 km north-west of the Subject Land. However, its presence cannot be ruled out. This species is unlikely to be impacted as no significant adverse impacts on native vegetation are likely to occur. The Modification would reduce the predicted extent of subsidence on PCT 1176 (70.5 ha) (Figure 11, Table 8) further reducing the potential for adverse impacts to this species.
Prostanthera cineolifera	Singleton Mint Bush	V	V	S	Nearest record 27 km south-west of the Subject Land. Grows on open sandstone ridges, habitat not present in the Subject Land. This species is unlikely to be present in the Subject Land. If this species were present, it is unlikely to be impacted as no significant adverse impacts on native vegetation are likely to occur. The Modification would reduce the predicted extent of subsidence on PCT 1176 (70.5 ha) (Figure 11, Table 8) further reducing the potential for adverse impacts to this species.
Prostanthera cryptandroides subsp. cryptandroides	Wollemi Mint-bush	V	V	S	Nearest record 30 km north-west of the Subject Land. Occurs in heathy communities on Narrabeen sandstone, habitat not present in the Subject Land. This species is unlikely to be present in the Subject Land. If this species were present, it is unlikely to be impacted as no significant adverse impacts on native vegetation are likely to occur. The Modification would reduce the predicted extent of subsidence on PCT 1176 (70.5 ha) (Figure 11, Table 8) further reducing the potential for adverse impacts to this species.
Pterostylis chaetophora	Rusty Greenhood	V	-	S	Nearest record 40 km south-east of the Subject Land. However, its presence cannot be ruled out. If this species were present, it is unlikely to be impacted as no significant adverse impacts on native vegetation are likely to occur.
Pterostylis gibbosa	Illawarra Greenhood	E	E	S	Nearest record 18 km south-east of the Subject Land. However, its presence cannot be ruled out. If this species were present, it is unlikely to be impacted as no significant adverse impacts on native vegetation are likely to occur.
Rutidosis heterogama	Heath Wrinklewort	V	V	S	Nearest record 27 km south-east of the Subject Land. However, its presence cannot be ruled out. If this species were present, it is unlikely to be impacted as no significant adverse impacts on native vegetation are likely to occur. The Modification would reduce the predicted extent of subsidence on PCT 1176 (70.5 ha) (Figure 11, Table 8) further reducing the potential for adverse impacts to this species.

Scientific Name	Common Name	Conservation Status[1]		Class of Credit[2]	Impact Assessment
		BC Act	EPBC Act		
Thesium australe	Austral Toadflax	V	V	S	Nearest record 35 km north-west of the Subject Land. However, its presence cannot be ruled out. This species is unlikely to be impacted as no significant adverse impacts on native vegetation are likely to occur. Further, the Modification would reduce the predicted extent of subsidence by 22.7 ha.
Reptiles					
Aprasia parapulchella	Pink-tailed Legless Lizard	V	V	S	There are some small localised areas of surface rock in the northern end of the Subject Land (Figure 5). These minor occurrences of surface rock are likely to persist despite subsidence. The Pink-tailed Legless Lizard has been recorded approximately 16 km north of the Subject Land (Future Ecology 2019).
Hoplocephalus bitorquatus	Pale-headed Snake	V	-	S	The Pale-headed Snake has not been previously recorded in the general locality, despite many surveys, and so it is unlikely to be present. Trees with hollows* and potential foraging habitat do occur, however, the Modification would reduce the predicted extent of subsidence by 22.7 ha and no significant adverse impacts on native vegetation are likely to occur.
Birds					
Falco subniger	Black Falcon	V	-	E	The wide-ranging birds of prey may forage over the Subject Land but there are no known roost sites. The Little Eagle and Spotted Harrier have been recorded in the locality (Figure 9). ELA (2017) concluded that the approved South Bates Extension Underground Mine would not have a significant impact on these species. The Modification would reduce the predicted extent of subsidence by 22.7 ha and no significant adverse impacts on native vegetation are likely to occur.
Lophoictinia isura	Square-tailed Kite	V	-	S/E	
Circus assimilis	Spotted Harrier	V	-	E	
Hieraaetus morphnoides	Little Eagle	V	-	S/E	
Tyto novaehollandiae	Masked Owl	V	-	S/E	ELA (2017) recognised that potential foraging habitat was present but concluded that the approved South Bates Extension Underground Mine would not have a significant impact on these species. No owl breeding sites were identified by ELA (2017). Trees with hollows* (which some of these species could use as roosts) do occur, however, no significant adverse impacts on native vegetation are likely to occur. The Modification would reduce the predicted extent of subsidence by 22.7 ha and no significant adverse impacts on native vegetation are likely to occur.
Ninox strenua	Powerful Owl	V	-	S/E	
Ninox connivens	Barking Owl	V	-	S/E	
Hirundapus caudacutus	White-throated Needletail	-	V	E	The Modification is unlikely to impact this species as it is a wide-ranging aerial species.

Scientific Name	Common Name	Conservation Status[1]		Class of Credit[2]	Impact Assessment
		BC Act	EPBC Act		
Burhinus grallarius	Bush Stone-curlew	E	-	S	Some of these woodland birds have been previously recorded in the general locality (Figure 9), and others are unlikely to occur. Some of these species may roost in trees with hollows, though the vegetation in the Subject Land has a relatively low abundance of hollow-bearing trees and stags (ELA 2022). ELA (2017) concluded that the approved South Bates Extension Underground Mine would not have a significant impact on these species. The Modification would reduce the predicted extent of subsidence by 22.7 ha and no significant adverse impacts on native vegetation are likely to occur.
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	V	S/E	
Callocephalon fimbriatum	Gang-gang Cockatoo	V	E	S/E	
Glossopsitta pusilla	Little Lorikeet	V	-	E	
Neophema pulchella	Turquoise Parrot	V	-	E	
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V	-	E	
Chthonicola sagittata	Speckled Warbler	V	-	E	
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V	-	E	
Grantiella picta	Painted Honeyeater	V	V	E	
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	V	-	E	
Petroica phoenicea	Flame Robin	V	-	E	
Petroica boodang	Scarlet Robin	V	-	E	
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V	-	E	
Daphoenositta chrysoptera	Varied Sittella	V	-	E	
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	-	E	
Stagonopleura guttata	Diamond Firetail	V	-	E	
Mammals					
Phascogale tapoatafa	Brush-tailed Phascogale	V	-	S	The Brush-tailed Phascogale has not been previously recorded in the general locality, despite many surveys, and so it is unlikely to be present. Trees with hollows* and potential foraging habitat do occur, however, no significant adverse impacts on native vegetation are likely to occur. ELA (2017) concluded that the approved South Bates Extension Underground Mine would not have a significant impact on this species.

Planigale maculata	Common Planigale	V	-	S	The Common Planigale has not been previously recorded in the general locality, despite many surveys, and so it is unlikely to be present. If it were present, the Modification would reduce the potential for adverse impacts as the Modification would reduce the predicted extent of subsidence by 22.7 ha.
Phascolarctos cinereus	Koala	E	E	S	In consideration of DPE (2022e), PCT 1176 and 1603 are considered potential habitat for the Koala given the presence of Rough-barked Apple (*Angophora floribunda*), Narrow-leaved Ironbark (*Eucalyptus crebra*) and Grey Box (*Eucalyptus moluccana*). The Koala has not been recorded in or near the Subject Land as described in Section 7.4. Potential foraging habitat does occur, however, the Modification would reduce the predicted extent of subsidence by 22.7 ha and no significant adverse impacts on native vegetation are likely to occur.
Cercartetus nanus	Eastern Pygmy-possum	V	-	S	The Eastern Pygmy-possum has not been previously recorded in the general locality, despite many surveys, and so it is unlikely to be present. Trees with hollows* and potential foraging habitat do occur, however, the Modification would reduce the predicted extent of subsidence by 22.7 ha and no significant adverse impacts on native vegetation are likely to occur.
Petaurus norfolcensis	Squirrel Glider	V	-	S	The Squirrel Glider has been previously recorded in the general locality (Figure 9). ELA (2017) concluded that the approved South Bates Extension Underground Mine would not have a significant impact on this species. The Modification would reduce the predicted extent of subsidence on PCT 1176 (Figure 11) further reducing the potential for adverse impacts. No significant adverse impacts on breeding or foraging habitat are likely to occur as part of the Modification.
Miniopterus orianae oceanensis	Large Bent-winged Bat	V	-	S/E	ELA (2017) concluded that the Modification would not have a significant impact on these bats. The Modification would reduce the predicted extent of subsidence by 22.7 ha, further reducing the potential for adverse impacts. No caves, crevices or cliffs or human made structures that provides breeding habitat occurs in the predicted extent of subsidence represented by the Subject Land. Trees with hollows* (which some of these species could use as roosts) and potential foraging habitat do occur, however, no significant adverse impacts on native vegetation are likely to occur.
Miniopterus australis	Little Bent-winged Bat	V	-	S/E	
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	S	
Myotis macropus	Southern Myotis	V	-	S	
Vespadelus troughtoni	Eastern Cave Bat	V	-	S	

[1] Threatened flora species status under the BC Act and/or EPBC Act (current as at November 2022).
V = Vulnerable; E = Endangered; CE = Critically Endangered; EP = Endangered Population.

[2] Biodiversity credit class under the TBDC (DPE 2022a) (current as at November 2022). E = Ecosystem; S = Species.

* ELA (2022) describes that the vegetation in the Subject Land has a relatively low abundance of hollow-bearing trees and stags.

7.2.2 Other Indirect Impacts

The Modification is underground only and therefore the Modification would not:

- increase human activity in the locality;
- increase inadvertent impacts on adjacent habitat or vegetation;
- reduce the viability of adjacent habitat due to edge effects;
- result in the loss of breeding habitats;
- reduce the viability of adjacent habitat due to noise, dust or light spill;
- involve the transport of weeds and pathogens from the site to adjacent vegetation;
- increase the risk of fauna starvation, exposure and loss of shade or shelter;
- involve the trampling of threatened flora species;
- involve inhibition of nitrogen fixation and increased soil salinity;
- involve fertiliser drift;
- involve rubbish dumping;
- involve wood collection;
- involve bush rock removal;
- increase predatory species populations;
- increase pest animal populations;
- increase risk of fire; or
- increase disturbance to specialist breeding and foraging habitat.

7.3 PRESCRIBED BIODIVERSITY IMPACTS

7.3.1 Crevices and Rocks

As described in Section 5.1, there are some small localised areas of surface rock in the northern end of the Subject Land (Figure 5). The Modification would not result in any direct impacts on rocks as no land clearance is proposed.

7.3.2 Fauna Movement

The Modification would not result in any direct impacts on native vegetation or habitat as no land clearance is proposed. The Modification would not result in impacts on movement of threatened species that maintains their lifecycle.

7.3.3 Water Quality, Water Bodies and Hydrological Processes that Sustain Threatened Species and Threatened Ecological Communities

Water Quality

The Modification would result in a reduction in potential North Wambo Creek water quality impacts compared to the approved South Bates Extension Underground Mine (Alluvium Consulting 2022).

Subsidence of the Modification longwalls may result in an increase in suspended sediments in Waterfall Creek due to increased erosion. These potential water quality impacts are expected to be managed using existing management techniques (Alluvium Consulting 2022).

Waterbodies

As described in Section 5.5, no named streams, aside from Waterfall Creek occur within the Subject Land. The Modification would decrease the impact to named waterbodies because:

- approximately 2 km of North Wambo Creek would no longer be undermined or subject to subsidence (due to the Modification, only approximately 625 m would be undermined) (Figure 5); and
- no subsidence impacts would occur on Waterfall Creek as it is located north of the Subject Land (Figure 5).

Groundwater Dependent Vegetation

As described in Section 5.5, no vegetation within the Subject Land is likely to use groundwater, however GDEs have been identified in the wider area (Bureau of Meteorology 2022; ELA 2022) (Figure 10). The Groundwater Assessment for the Modification (SLR 2022) assesses the cumulative impacts on groundwater and those GDEs identified in the wider area. The Modification is not likely to increase the impact to GDEs because:

- the Modification would materially reduce subsidence to vegetation that may use groundwater as approximately 91% (4.2 ha) of PCT 485 along North Wambo Creek would no longer be undermined or subject to subsidence (due to the Modification, only approximately 0.4 ha would be undermined) (Figure 10);
- no incremental or cumulative drawdown is predicted in alluvium/regolith along Waterfall Creek due to the Modification (SLR 2022);
- no incremental drawdown is predicted for the North Wambo Creek alluvium due to the Modification (SLR 2022); and
- monitoring of the GDE along North Wambo Creek has recorded no discernible change in the extent of the River Oak riparian tall woodland (ELA 2021).

7.4 STATE ENVIRONMENTAL PLANNING POLICY (BIODIVERSITY CONSERVATION)

The *State Environmental Planning Policy (Biodiversity and Conservation) 2021* (Biodiversity and Conservation SEPP) began on 1 March 2022 and consolidates, transfers and repeals provisions of various SEPPs in NSW including the Koala Habitat Protection SEPP (2020 and 2021). The provisions within the repealed SEPPs have been transferred to the new Biodiversity and Conservation SEPP.

The land associated with the Subject Land is zoned RU1 Rural. Chapter 3 of the Biodiversity and Conservation SEPP (Koala Habitat Protection 2020) applies for all RU1, RU2 and RU3 zoned land outside of the Sydney Metropolitan Area and some LGAs of the Central Coast. The Singleton LGA is included in the Central Coast Koala Management Area (KMA).

Schedule 3 of the Biodiversity and Conservation SEPP lists Koala use tree species for each KMA. For the Central Coast KMA, the following tree species are listed that occur in woodland within the Subject Land:

- Rough-barked Apple (*Angophora floribunda*);
- Narrow-leaved Ironbark (*Eucalyptus crebra*); and

- Grey Box (*Eucalyptus moluccana*).

The Koala has not been recorded in or near the Subject Land. The closest Koala record is from 2006 and occurs approximately 6 km to the north-east of the Subject Land in Lemington (DPE 2022c). The Koala has also been recorded on multiple occasions to the south-west of the Subject Land within the Wollemi National Park. The closest Koala record within the Wollemi National Park is from 2002 and occurs approximately 9 km west of the Subject Land. The majority of Koala records in the wider vicinity are more than 15 years old with the most recent Koala, observed in December 2021, being recorded approximately 20 km south-west of the Subject Land (DPE 2022c).

Development controls within the Koala Habitat Protection 2020 do not apply to Part 4 development applications (such as the Modification) which are determined by a consent authority other than a local council.

As described in Table 9, both PCTs within the Subject Land are considered potential habitat for the Koala given the presence of three key food tree species, namely Rough-barked Apple (*Angophora floribunda*), Narrow-leaved Ironbark (*Eucalyptus crebra*) and Grey Box (*Eucalyptus moluccana*).

7.5 WOLLEMI NATIONAL PARK

The South Bates Extension Underground Mine operates under approved subsidence performance measures in Development Consent (DA 305-7-2003) and for Wollemi National Park the performance measure is negligible subsidence impacts with negligible environmental consequences.

The Wollemi National Park is located approximately 115 m south-west of the Modification longwalls at the closest point (Figure 5). The Modification was designed to maintain WCPL's commitment to maintain an offset equivalent to a 26.5° angle of draw from the base of the Wollemi National Park escarpment, which effectively mitigates subsidence risk to the escarpment.

MSEC (2022) describe that land within the Wollemi National Park is predicted to experience very low levels (i.e. less than 20 mm) of vertical subsidence and no measurable tilts, curvatures or strains from the Modification longwalls. The magnitude of the predicted vertical subsidence is similar to the natural movements that occur due to the wetting and drying of the surface soils (MSEC 2022).

MSEC (2022) consider it unlikely the Wollemi National Park would be adversely impacted by subsidence movements from the Modification and the performance measure (negligible subsidence impacts with negligible environmental consequences) remains relevant.

7.6 WAMBO BIODIVERSITY STEWARDSHIP SITE

The proposed Wambo Biodiversity Stewardship Site (Umwelt (Australia) Pty Limited 2021) is located partly (approximately 5%, 13.6 ha) within the Subject Land (Figure 5). The Biodiversity Stewardship Site Assessment Report contains measures to manage the potential risks of underground mining, consistent with those in Section 8. The Biodiversity Stewardship Site Assessment Report includes separate monitoring and, to ensure that any potential future remediation works can adequately be funded, a provisional contingency sum of $50,000 has been included in the Total Fund Deposit.

If subsidence remediation measures are not considered to be reasonable or feasible, or have not been successful in remediating the impact, WCPL is required to provide an offset to compensate for the impact or environmental consequence in accordance with Development Consent (DA 305-7-2003).

8 MEASURES TO MITIGATE AND MANAGE IMPACTS

Given the Modification would not result in an increased impact on biodiversity values, there would be no change to the approved mitigation, management and monitoring measures for the existing Wambo Coal Mine. No specific or additional mitigation measures, management or monitoring of biodiversity are required for the Modification.

Monitoring

Biodiversity management and monitoring at the Wambo Coal Mine is conducted in accordance with the approved Biodiversity Management Plan prepared in accordance with Condition B75, Schedule 2 of the Development Consent (DA 305-7-2003). Furthermore, the management of potential biodiversity impacts associated with the second workings of the South Bates Extension Underground Mine is undertaken in accordance with the Extraction Plan in accordance with Condition B7, Schedule 2 of the Development Consent (DA 305-7-2003). The monitoring programme is extensive and includes biometric sites, riparian vegetation monitoring, groundwater dependent vegetation monitoring and a visual subsidence inspection.

Remediation

In the event that a subsidence impact or environmental consequence exceeds a performance measure WCPL would be required to remediate the impact in accordance with Development Consent (DA 305-7-2003). If subsidence remediation measures are not considered to be reasonable or feasible, or have not been successful in remediating the impact, WCPL is required to provide an offset to compensate for the impact or environmental consequence in accordance with Development Consent (DA 305-7-2003).

Management measures outlined in the approved Water Management Plan include:

- Remediation of surface cracks[6] along North Wambo Creek and in other areas where practicable using conventional earthmoving equipment (e.g. a backhoe) including:
  - infilling of surface cracks with soil or other suitable materials; or
  - locally re-grading and re-compacting the surface.
- Stabilisation of any areas of surface cracking or erosion using erosion protection measures (e.g. vegetation planting).
- Review of remediation measures and implementation of additional measures if required.

Extraction Plan

Prior to causing any subsidence, WCPL are required to prepare and submit an Extraction Plan for approval by the DPE. This is an approval required by standard conditions of development consents for underground coal mines in NSW. Extraction Plans are prepared for a series of panels that are a subset of the approved mine layout. There is a process to review the adequacy and effectiveness of an Extraction Plan during the preparation of a new Extraction Plan for subsequent panels.

WCPL implement an adaptive management approach to ensure the performance measures are achieved for the Wambo Coal Mine. Adaptive management involves the monitoring and periodic evaluation of the environmental consequences against the performance measures, and adjustment (if necessary) of the management and control measures to achieve the adopted performance measures.

[6] Minor cracks that develop are not expected to require remediation as geomorphologic processes would result in natural filling of these cracks over time.

Extraction Plans prepared for the Wambo Coal Mine include:

- a summary of relevant background or baseline data;
- a review of predictions of the potential subsidence effects, subsidence impacts and environmental consequences, incorporating any relevant information obtained since the Environmental Impact Statement (such as monitoring results obtained during mining);
- a monitoring program to provide data to assist with the management of the risks associated with subsidence, validate subsidence predictions and analyse the relationship between subsidence effects and impacts and any ensuing environmental consequences;
- a plan to manage and remediate subsidence impacts and/or environmental consequences (e.g. remediation of observed cracking);
- trigger action response plans to identify risks and outline specific follow up actions to avoid exceedances of agreed performance measures;
- contingency plans that provide for adaptive management where monitoring indicates that there has been an exceedance of agreed performance measures; and
- reporting and review mechanisms.

Extraction Plans include the following key component plans in accordance with Development Consent (DA 305-7-2003):

- Water Management Plan;
- Biodiversity Management Plan;
- Land Management Plan;
- Heritage Management Plan;
- Built Features Management Plan;
- Public Safety Management Plan; and
- Subsidence Monitoring Program.

An adaptive management plan (as per the BAM) is not proposed as WCPL has proposed mitigation measures to address remaining impacts and an adaptive management approach is already proposed through the standard conditions of development consents for underground coal mines in NSW.

Other Measures

General biodiversity management measures outlined in the approved Biodiversity Management Plan include weed management program and animal pest control program.

9 IMPACT SUMMARY

No impacts are requiring offset in accordance with Section 9.2 of the BAM (DPIE 2020a) as no direct impacts are proposed as part of the Modification. There are no areas not requiring assessment in accordance with Section 9.3 of the BAM (DPIE 2020a).

10 SERIOUS AND IRREVERSIBLE IMPACTS

Under the BC Act, a determination of whether an impact is serious and irreversible must be made for 'potential Serious and Irreversible Impact (SAII) entities' identified in the BAM-C (DPE 2022f). There are two SAII entities that have been assumed to be present for the purpose of this assessment (Table 10). Information for these SAII entities is provided in Attachment D.

Table 10
SAII Entities Assumed to be Present for the Purpose of this Assessment

Scientific Name	Common Name	Conservation Status[1]		Associated Vegetation Zone/s
		BC Act	EPBC Act	
Eucalyptus pumila	Pokolbin Mallee	V	V	1176
Pomaderris reperta	Denman Pomaderris	CE	CE	1176

Although these species are assumed to be present for the purpose of this assessment, it is considered that these species are unlikely to occur because:

- Pokolbin Mallee is restricted to one area in the Brokenback Range, approximately 35 km south-east of the Subject Land.
- The nearest record of Denman Pomaderris is approximately 27 km north-west of the Subject Land.

Were these species to be present they would not be at risk of an SAII as there would be no habitat loss due to clearing or subsidence.

Both of these species are potentially associated with PCT 1176. The Modification would result in an overall reduction in the area of PCT 1176 predicted to experience potential subsidence impacts. The Subject Land contains 6 ha of PCT 1176 and the area no longer to be subsided contains 76.5 ha, a 70.5 ha reduction in the area of PCT 1176 predicted to experience potential subsidence impacts (Table 8).

Large Bent-winged Bat and Little Bent-winged Bat are not relevant SAII entities to the Modification as no breeding habitat occurs within the Subject Land or within 100 m of the Subject Land (Table 9).

11 CONCLUSION

The Modification would not result in any direct impacts on native vegetation or habitat as no land clearance is proposed. In regard to indirect impacts, the Modification would result in an overall reduction in the area of native vegetation predicted to experience potential subsidence impacts (22.7 ha reduction). The Modification is likely to result in minor cracking and ponding of the land surface with negligible environmental consequences, consistent with the approved mine.

12 REFERENCES

Alluvium Consulting Pty Limited (2022) *Wambo Coal Mine Longwalls 24-26 Modification. Surface Water Assessment.* Prepared for Wambo Coal Pty Limited.

Bureau of Meteorology (2022) *Groundwater Dependent Ecosystems Atlas*. Website: http://www.bom.gov.au/water/groundwater/gde/.

Department of Climate Change, Energy, the Environment and Water (2020), *Interim Biogeographic Regionalisation for Australia (Subregions) v. 7 (IBRA) [ESRI shapefile]*.

Department of Climate Change, Energy, the Environment and Water (2022a) *Directory of Important Wetlands of Australia.* Website: https://www.environment.gov.au/wetlands.

Department of Climate Change, Energy, the Environment and Water (2022b) *National Flying-fox Monitoring Viewer.*

Department of Planning, Industry and Environment (2020a) *Biodiversity Assessment Method*, NSW Government DPIE Sydney, October 2020.

Department of Planning, Industry and Environment (2020b) *Surveying Threatened Plants and Their Habitats: NSW Survey Guide for the Biodiversity Assessment Method.*

Department of Planning and Environment (2022a) *Threatened Biodiversity Data Collection*. Viewed in July 2022. Website: https://www.environment.nsw.gov.au/atlaspublicapp/UI_Modules/ATLAS_/AtlasSearch.aspx.

Department of Planning and Environment (2022b) *BioNet Vegetation Classification*. Website: http://www.environment.nsw.gov.au/NSWVCA20PRapp/LoginPR.aspx?ReturnUrl=%2fNSWVCA20PRapp%2fdefault.aspx.

Department of Planning and Environment (2022c) *BioNet Atlas*. Website: https://www.environment.nsw.gov.au/atlaspublicapp/UI_Modules/ATLAS_/AtlasSearch.aspx?who=0b679421-e424-47ea-b672-f30693729a7e.

Department of Planning and Environment (2022d) Biodiversity Offsets and Agreement Management System.

Department of Planning and Environment (2022e) *Koala (Phascolarctos cinereus): Biodiversity Assessment Method Survey Guide*.

Department of Planning and Environment (2022f) *Serious and irreversible impacts of development on biodiversity*. Website: https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity-offsets-scheme/local-government-and-other-decision-makers/serious-and-irreversible-impacts-of-development.

Department of Primary Industries – Water (2017) *Strahler Stream Order Mapping.*

Department of the Environment (2014) *Approved Conservation Advice for Pomaderris reperta (Denman pomaderris)*. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/77103-conservation-advice.pdf.

Department of the Environment (2015) *Approved Conservation Advice (including listing advice) for the Central Hunter Valley eucalypt forest and woodland ecological community*. Canberra: Department of the Environment. Available from:

http://www.environment.gov.au/biodiversity/threatened/communities/pubs/130-conservation-advice.pdf. In effect under the EPBC Act from 07-May-2015.d

Department of the Environment, Water, Heritage and the Arts (2008) *Approved Conservation Advice for Eucalyptus pumila (Pokolbin Mallee)*. Canberra: Department of the Environment, Water, Heritage and the Arts. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/16510-conservation-advice.pdf.

Eco Logical Australia (2017) *Wambo Coal Mine - South Bates Extension Modification – Fauna Assessment.* Prepared for Wambo Coal Pty Limited.

Eco Logical Australia (2020). *Wambo Coal Mine - Annual Biodiversity Monitoring Report*. Prepared for Wambo Coal Pty Limited.

Eco Logical Australia (2021) *Wambo Coal Mine Annual Flora and Fauna Monitoring Report 2021.* Prepared for Wambo Coal Pty Limited.

Eco Logical Australia (2022) *Wambo Coal Mine Longwalls 24-26 Modification Biodiversity Review.* Prepared for Wambo Coal Pty Limited.

FloraSearch (2017) *South Bates Extension Modification Environmental Assessment – Flora Assessment.* Prepared for Wambo Coal Pty Limited.

Future Ecology (2019) *Maxwell Project Baseline Fauna Survey Report*. Prepared for Malabar Coal Limited.

Geoscience Australia (1997) *Australia's River Basins.* Bioregional Assessment Source Dataset. Website: http://data.bioregionalassessments.gov.au/dataset/d4561e86-2d13-4dcb-bf9e-aae75ba4850c.

Hunter Eco (2019) *Wambo Coal Mine South Bates Extension Underground - Groundwater Dependent Ecosystems Vegetative Assessment*. Prepared for Wambo Coal Pty Ltd.

Keith, D. (2004) *Ocean Shores to Desert Dunes: The Native Vegetation of New South Wales and the ACT.* Department of Environment and Conservation.

Kovac, M. and Lawrie, J.W. (1991) *Soil Landscapes of the Singleton 1:250 000 Sheet.*

Mahony, S. V., Cutajar, T., & Rowley, J. J. (2022) *A new species of Delma Gray 1831 (*Squamata: Pygopodidae*) from the Hunter Valley and Liverpool Plains of New South Wales*. Zootaxa, 5162(5), 541-556.

Mine Subsidence Engineering Consultants (2017) *Wambo Coal: South Bates Extension Modification Subsidence Assessment Subsidence Predictions and Impact Assessments for the Natural and Built Features in Support of the Modification Application for the South Bates Extension Modification*.

Mine Subsidence Engineering Consultants (2022) *South Bates Extension Underground Mine Longwalls 24 to 26 Modification Subsidence Assessment*. Prepared for Wambo Coal Pty Limited.

Mitchell, P. (2002) *NSW Landscapes Mapping: Background and Methodology*. Report prepared for the NSW National Parks and Wildlife Service.

National Parks and Wildlife Service (2022) *NPWS Fire History – Wildfires and Prescribed Burns Dataset*. Published by the Department of Planning, Industry and Environment.

NSW Scientific Committee (2010a) *Central Hunter Grey Box-Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions - endangered ecological community listing.*

NSW Scientific Committee (2010b) *Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion - vulnerable ecological community listing.*

SLR Consulting Australia Pty Ltd (2022) *Wambo Coal Mine Longwalls 24-26 Modification. Groundwater Assessment.* Prepared for Wambo Coal Pty Limited.

Umwelt (Australia) Pty Limited (2021) *Wambo Stewardship Site Biodiversity Stewardship Site Assessment Report Draft.*

ATTACHMENT A
VEGETATION DESCRIPTIONS (ELA 2022)

Table A1 PCT 1176 - Slaty Box - Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion

Vegetation formation / class	Dry Sclerophyll Forests (Shrubby sub-formation)/Western Slopes Dry Sclerophyll Forests
Description	This PCT occurs along undulating to steep ridges and slopes on colluvium derived from Narrabeen and Permian sediments. Soils are usually dry, stony and relatively infertile and giving rise to a sparse and depauperate understorey. Most occurrences have a northerly aspect and as such this PCT is the second most prevalent over the study area, dominating the ridge lines and steeps slopes to the west and adjacent to Wollemi National Park plateau.
Characteristic canopy trees	*Eucalypts dawsonii* (Slaty Gum) and *Eucalyptus crebra*
Characteristic mid-storey	*Acacia binervia* (Coast Myall), *Olearia elliptica subsp. elliptica* (Sticky Daisy Bush), *Bursaria spinosa subsp. spinosa*, *Dodonaea viscosa subsp. cuneate* (Wedge-leaf Hop-bush), *Allocasuarina verticillata* (Drooping Sheoak), *Notelaea microcarpa*, *Grevillea montana (Mountain Grevillea)* and *Bertya oleifolia*
Characteristic groundcovers	*Panicum simile* (Two-colour Panic), *Entolasia marginata* (Bordered Panic), *Cymbopogon refractus*, *Panicum effusum*, *Lepidosperma laterale* (Variable Swordsedge) and *Entolasia stricta*
Mean native richness	27
Exotic species / HTW cover	*Senecio madagascariensis*, *Bidens pilosa var. pilosa*, *Cyclospermum leptophyllum* (Slender Celery), *Cestrum parqui* (Green Cestrum), *Cirsium vulgare* (Spear Thistle), *Sida rhombifolia* (Paddy's Lucerne), *Opuntia aurantiaca* (Tiger Pear), *Galenia pubescens* and *Eragrostis curvula* (African Lovegrass) / 2.1%
Condition	High
Variation and disturbance	This PCT is generally consistent in condition across the study area, however areas dominated by monocultures of *Acacia binervia* (see below) occur sporadically and likely in relation to a combination of past fire and disturbance events favouring this species. An additional form of this PCT was noted by Flora Search (2017) to occur along the shelf like escarpment areas far south-west of the study area. This PCT was not accessed on ground due to time and access issues. Aerial photographs (see photographs below) were utilised to determine the dominate canopy species to be *E. dawsonii* and *E. crebra* and PCT 1176 still the 'best fit' community.

Table A2 PCT 1603 - Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter

Vegetation formation / class	Grassy Woodland/Coastal Valley Grassy Woodland
Description	This PCT dominates the flat non-floodplain areas of the valley floor and the adjoining gently undulating lower slopes and ridges. This PCT is the second most extensive woodland vegetation type on the study area. On low flat areas it forms an open forest with sparse low shrubs and groundcover. Shrub size and density tend to increase on sloping sites and in upper gullies. Broad low drainage lines within the PCT support more or less dense stands of *Melaleuca decora*, where drainage is impeded.
Characteristic canopy trees	*Eucalyptus crebra* and *Eucalyptus moluccana* (Grey Box)
Characteristic mid-storey	*Allocasuarina luehmannii (Bulloak)*, *Acacia salicina*, *Acacia binervia*, *Acacia implexa*, *Melaleuca decora*, *Psydrax odorata*, *Notelaea microcarpa* and *Geijera salicifolia*
Characteristic groundcovers	*Calotis lappulacea*, *Eragrostis brownii* (Brown's Lovegrass), *Aristida personata* (Purple Wire-grass), *Cymbopogon refractus* and *Panicum effusum*
Mean native richness	35
Exotic species / HTW cover	*Senecio madagascariensis*, *Galenia pubescens*, *Eragrostis curvula*, *Cestrum parqui*, *Bidens subalternans* and *Axonopus fissifolius* / 9.5%
Condition	High
Variation and disturbance	This PCT is generally consistent in condition across the study area, with more disturbed patches adjoining the previously cleared areas of the valley floor.

Table A3 PCT 1603 Derived Native Grassland - Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter

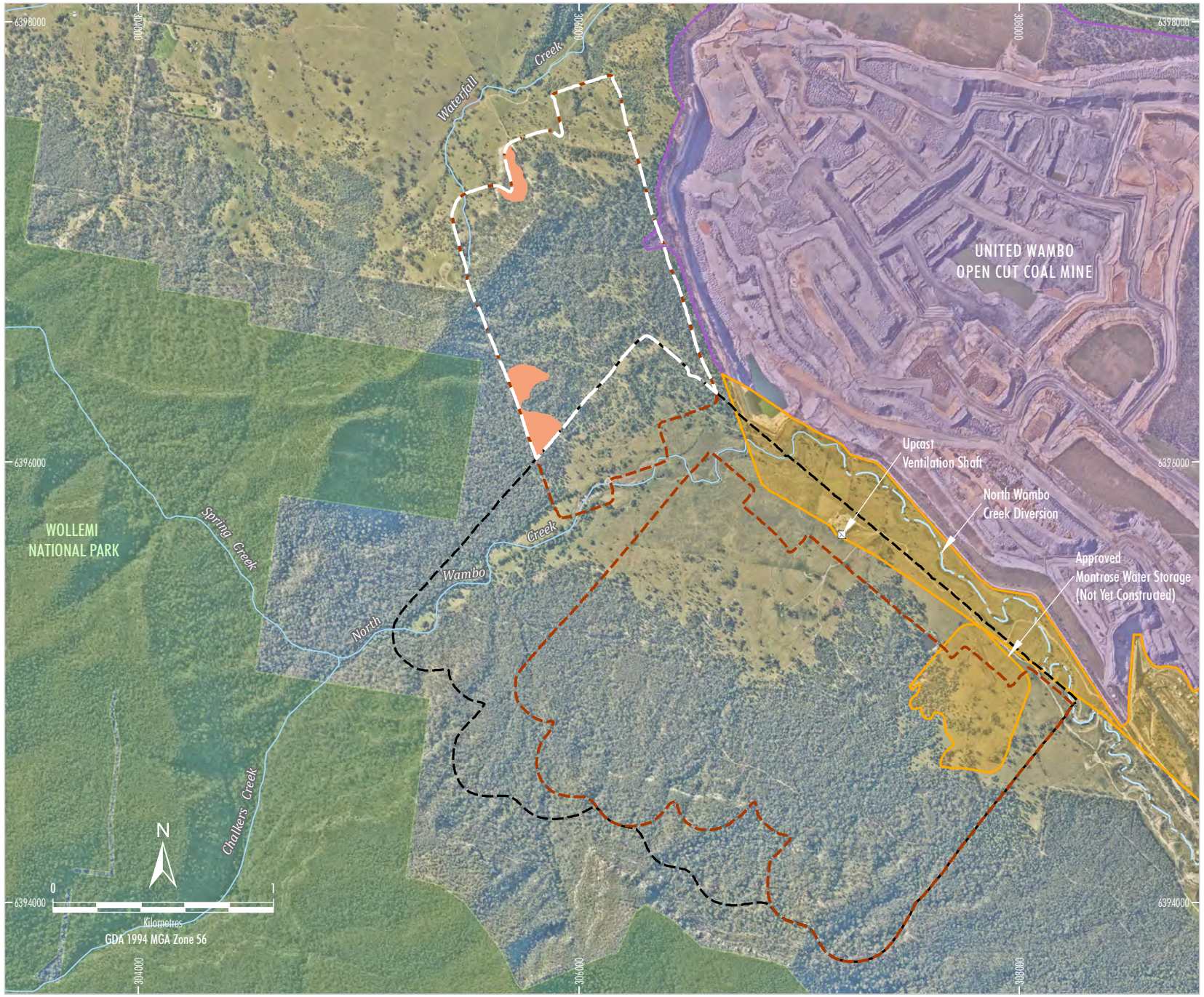
Vegetation formation / class	Dry Sclerophyll Forests (Shrubby sub-formation)/ Western Slopes Dry Sclerophyll Forests
Description	This PCT occurs as a result of past clearing and human disturbance valley floor and flatter terrain associated with the valley floor woodlands and now occurs as derived native grasslands. It dominates the majority of the valley to the north and south of North Wambo creek.
Characteristic canopy trees	Isolated regenerating canopy species included *Eucalyptus crebra*
Characteristic mid-storey	Occasional *Allocasuarina luehmannii* and *Acacia salicina*
Characteristic groundcovers	*Sporobolus creber*, *Bothriochloa decipiens* (Red Grass), *Aristida personata*, *Cymbopogon refractus* and *Panicum effusum*
Mean native richness	19
Exotic species / HTW cover	*Axonopus fissifolius*, *Bidens subalternans*, *Cenchrus clandestinus* (Kikuyu Grass), *Galenia pubescens* and *Senecio madagascariensis* / 8.3%
Condition	Low
Variation and disturbance	This PCT is generally consistent in condition across the study area, with more disturbed patches adjoining tracks and areas of anthropogenic disturbance.

ATTACHMENT B
VEGETATION INTEGRITY (SITE CONDITION) DATA (ELA 2022)

Table B1 Vegetation Integrity (Site Condition) Data (ELA 2022)

Plot	PCT	Condition	Easting	Northing	Bearing	Composition						Structure						Function										
						Tree	Shrub	Grass	Forbs	Ferns	Other	Tree	Shrub	Grass	Forbs	Ferns	Other	Large Trees	Hollow Trees	Litter Cover	Length Fallen Logs	TreeStem5to9	TreeStem10to19	TreeStem20to29	TreeStem30to49	TreeStem50to79	Tree Regen	High Threat Exotic
1	1603	W	305591	6396883	30	6	7	13	6	1	4	80.3	11.9	92.2	13.5	0.2	4.3	0	0	60	15	1	1	1	1	0	1	5.5
2	1603	W	306360	6396601	155	6	10	13	8	1	4	75.0	4.9	83.3	15.7	0.2	2.5	0	0	51	12	1	1	1	1	0	1	0.3
3	1603	W	305979	6396457	110	6	6	11	7	0	3	96.0	5.7	127.7	5.0	0.0	0.5	0	0	48	11	1	1	1	0	0	1	0.4
5	1603	Regen	306448	6396320	89	6	3	13	7	0	3	47.3	10.4	99.2	24.6	0.0	0.6	1	0	74	5	1	1	1	1	1	1	3.0
6	1603	W	306188	6397185	185	5	7	9	9	1	3	80.1	9.0	107.2	7.4	0.1	0.9	0	0	29	12	1	1	1	1	0	1	0.5
18	1603	DNG	306108	6397593	300	0	1	21	8	1	2	0.0	0.2	202.8	16.6	0.1	0.3	0	0	36	1	0	0	0	0	0	0	14.0
19	1603	Regen	305894	6397700	220	3	6	15	10	1	2	100.0	18.9	130.6	9.9	1.0	0.2	1	0	33	5	1	1	1	1	1	1	5.1
20	1176	W	305716	6397266	150	6	5	13	11	0	2	48.9	28.7	35.5	7.2	0.0	0.3	0	0	87	55	1	1	1	1	0	1	0.7
21	1176	W	305828	6396107	200	4	7	8	2	1	1	53.9	4.4	7.3	1.1	0.1	0.1	0	0	90.2	10	1	1	1	1	0	1	0.0
22	1603	W	306107	6396371	280	5	5	13	6	1	3	46.3	5.6	88.0	1.8	0.2	0.4	0	0	43	0	1	1	1	1	0	1	1.0
25	1603	DNG	305616	6397413	210	0	0	10	4	1	1	0.0	0.0	86.2	0.6	0.1	0.1	0	0	56	0	0	0	0	0	0	1	10.0
26	1603	W	305906	6396357	225	4	8	10	19	1	6	24.1	9.9	79.7	2.4	0.1	0.9	2	0	38	38	1	1	1	1	1	1	0.3
32	1603	W	306046	6396713	110	6	6	18	5	0	2	41.6	2.6	128.4	0.6	0.0	1.0	0	0	54	9	1	1	1	1	1	1	1.1

ATTACHMENT C
SPECIES POLYGONS



LEGEND

- National Park
- SSD 7142 Operational Area
- Existing/Approved Wambo Coal Mine Surface Development Area
- Ventilation Shaft
- Approved Extent of Conventional Subsidence (20 mm subsidence contour)
- Modified Extent of Conventional Subsidence (20 mm subsidence contour)
- Subject Land
- Species Polygon for the Leafless Tongue Orchid, Pokolbin Mallee, *Ozothamnus tesselatus*, Denman Pomaderris, Singleton Mint Bush, Wollemi Mint-bush, Heath Wrinklewort
- Slaty Box - Grey Gum Shrubby Woodland on Footslopes of the Upper Hunter Valley Sydney Basin Bioregion (PCT 1176)

Source: Eco Logical Australia (2022 as modified by Hunter Eco); MSEC (2022, 2021); WCPL (2022); NSW Spatial Services (2022)
Orthophoto: WCPL (May 2022)

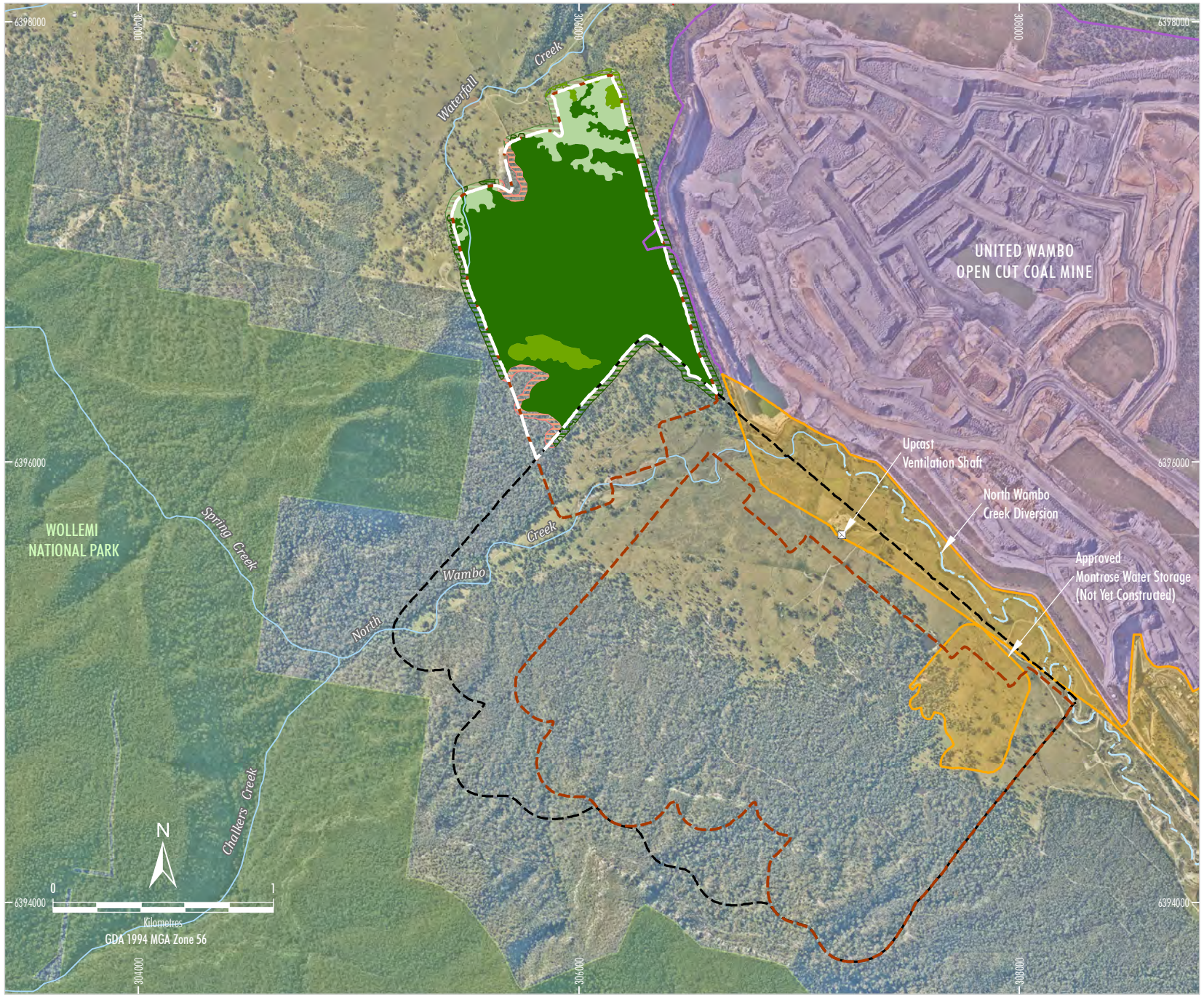
Peabody

WAMBO COAL MINE

Species Polygon for Flora Species Associated with PCT 1176

Figure C1

WAM-09-15_SBX Mod LW24-26_BDAR_AttC_201D



LEGEND

- National Park
- SSD 7142 Operational Area
- Existing/Approved Wambo Coal Mine
- Surface Development Area
- Ventilation Shaft
- Approved Extent of Conventional Subsidence (20 mm subsidence contour)
- Modified Extent of Conventional Subsidence (20 mm subsidence contour)
- Subject Land

Species Polygon for the Charmhaven Apple, Trailing Woodruff, Slaty Red Gum, Illawarra Greenhood

- Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter (Good) (PCT 1603)
- Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter (Regenerating) (PCT 1603)
- Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter (DNG) (PCT 1603)

Species Polygon for the White-flowered Wax Plant, Small-flower Grevillea, Rusty Greenhood

- Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter (Good) (PCT 1603)

Species Polygon 30 m Buffer Associated Communities for the Slaty Red Gum

- Slaty Box - Grey Gum Shrubby Woodland on Footslopes of the Upper Hunter Valley Sydney Basin Bioregion (PCT 1176)
- Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter (Good) (PCT 1603)
- Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter (Regenerating) (PCT 1603)
- Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter (DNG) (PCT 1603)

Source: Eco Logical Australia (2022 as modified by Hunter Eco); MSEC (2022, 2021); WCPL (2022); NSW Spatial Services (2022)
Orthophoto: WCPL (May 2022)

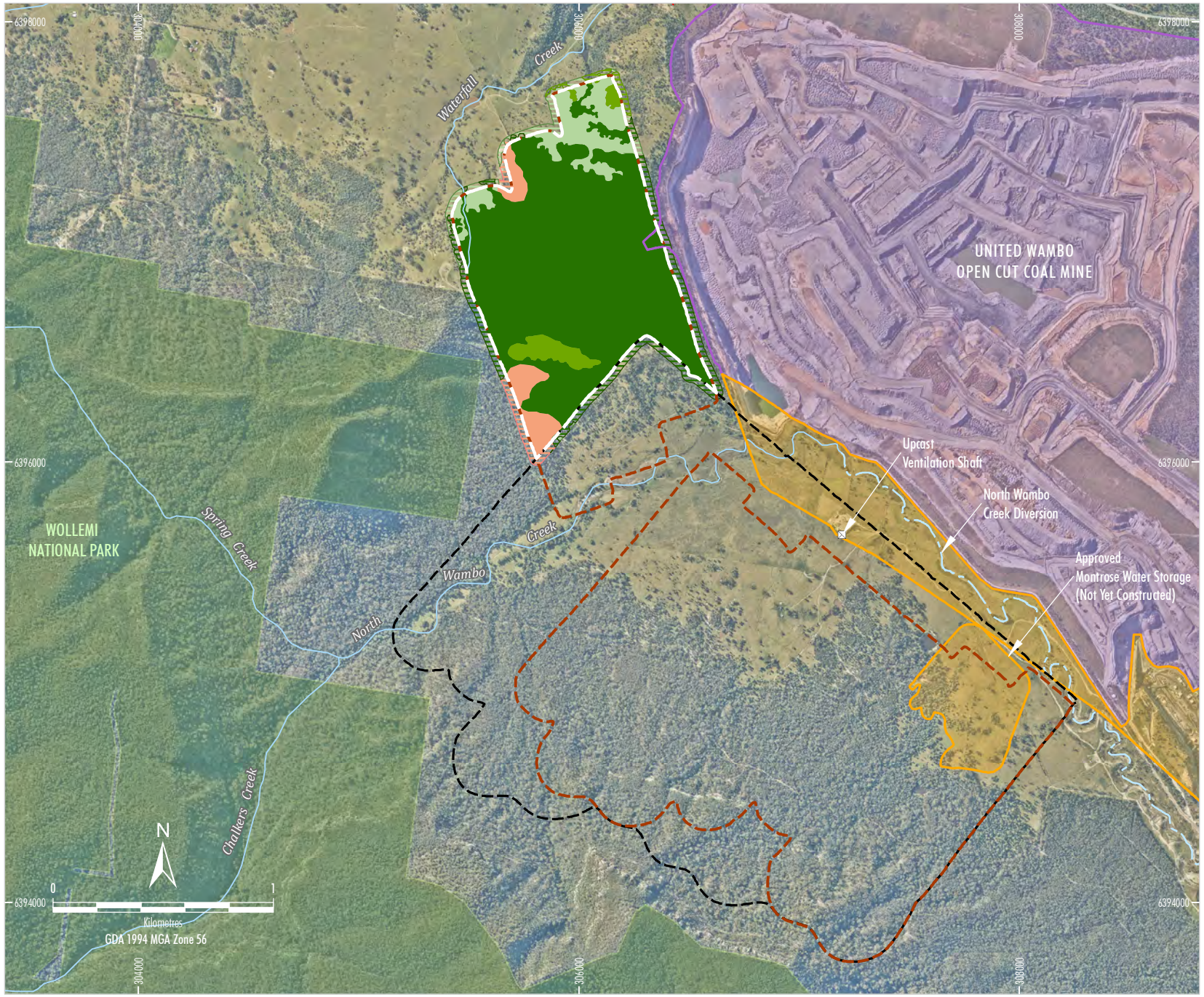
Peabody

WAMBO COAL MINE

Species Polygon for Flora Species Associated with PCT 1603

Figure C2

WAM-09-15_SBX Mod LW24-26_BDAR_AttC_202E



LEGEND

- National Park
- SSD 7142 Operational Area
- Existing/Approved Wambo Coal Mine
- Surface Development Area
- Ventilation Shaft
- Approved Extent of Conventional Subsidence (20 mm subsidence contour)
- Modified Extent of Conventional Subsidence (20 mm subsidence contour)
- Subject Land

Species Polygon for the Weeping Myall population in the Hunter catchment, Tiger Orchid population in the Hunter Catchment, Pine Donkey Orchid, Scant Pomaderris, Austral Toadflax

- Slaty Box - Grey Gum Shrubby Woodland on Footslopes of the Upper Hunter Valley Sydney Basin Bioregion (PCT 1176)
- Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter (Good) (PCT 1603)
- Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter (Regenerating) (PCT 1603)
- Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter (DNG) (PCT 1603)

Species Polygon for the Large-leafed Monotaxis

- Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter (Good) (PCT 1603)

Species Polygon 30 m Buffer Associated Communities for the Tiger Orchid population in the Hunter Catchment

- Slaty Box - Grey Gum Shrubby Woodland on Footslopes of the Upper Hunter Valley Sydney Basin Bioregion (PCT 1176)
- Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter (Good) (PCT 1603)
- Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter (Regenerating) (PCT 1603)
- Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter (DNG) (PCT 1603)

Source: Eco Logical Australia (2022 as modified by Hunter Eco); MSEC (2022, 2021); WCPL (2022); NSW Spatial Services (2022)
Orthophoto: WCPL (May 2022)

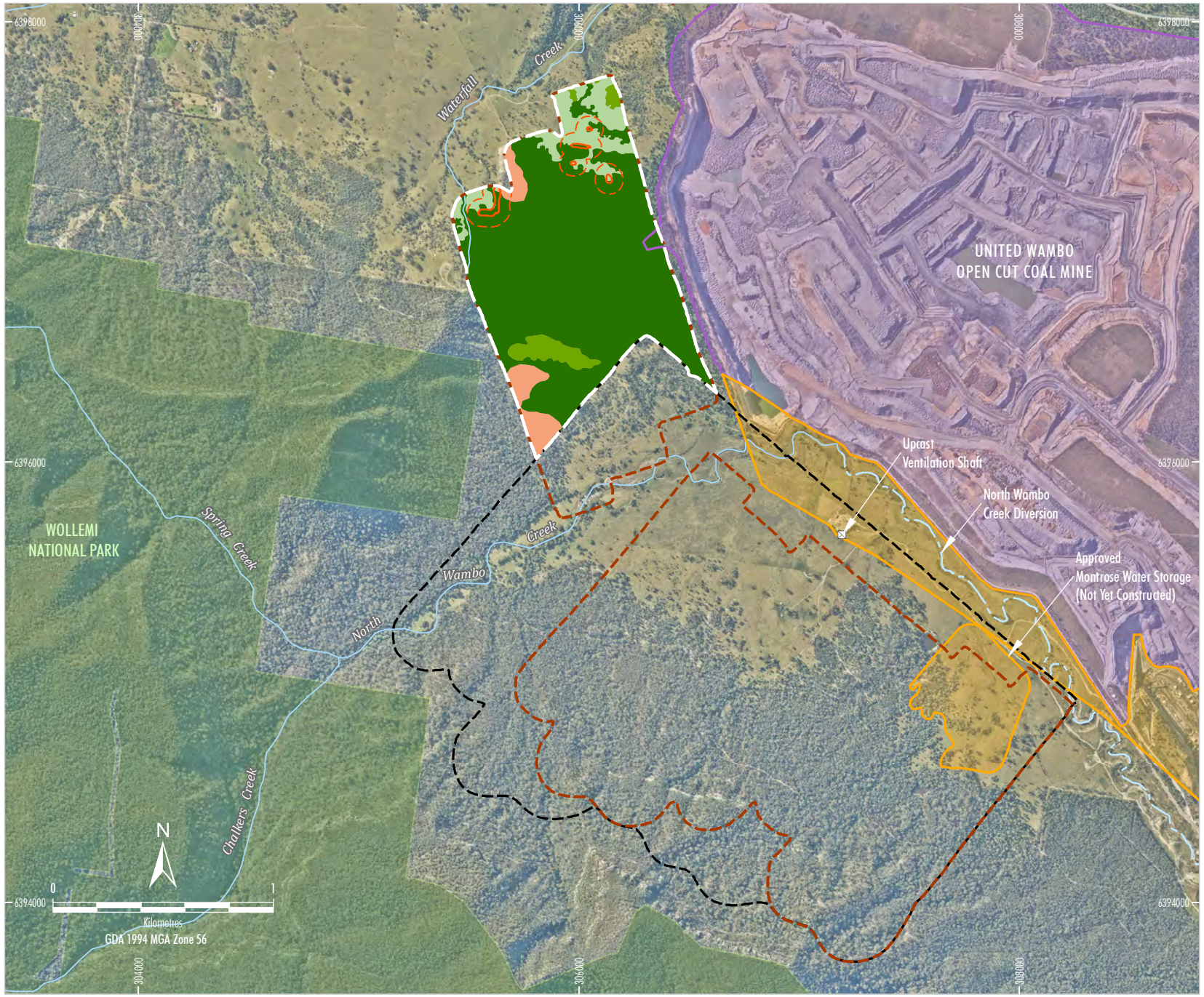
Peabody

WAMBO COAL MINE

Species Polygon for Flora Species Associated with PCT 1176, 1603

Figure C3

WAM-09-15_SBX Mod LW24-26_BDAR_AttC_203E



LEGEND

- National Park
- SSD 7142 Operational Area
- Existing/Approved Wambo Coal Mine Surface Development Area
- Ventilation Shaft
- Approved Extent of Conventional Subsidence (20 mm subsidence contour)
- Modified Extent of Conventional Subsidence (20 mm subsidence contour)
- Subject Land
- Rocky Area
- Species Polygon for the Pink-tailed Legless Lizard
- Rocky Area 50 m Buffer
- Species Polygon for the Pale-headed Snake, Square-tailed Kite, Little Eagle, Bush Stone-curlew, Glossy Black-Cockatoo, Gang-gang Cockatoo, Masked Owl, Powerful Owl, Barking Owl
- Slaty Box - Grey Gum Shrubby Woodland on Footslopes of the Upper Hunter Valley Sydney Basin Bioregion (PCT 1176)
- Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter (Good) (PCT 1603)
- Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter (Regenerating) (PCT 1603)
- Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter (DNG) (PCT 1603)

Source: Eco Logical Australia (2022 as modified by Hunter Eco); MSEC (2022, 2021); WCPL (2022); NSW Spatial Services (2022)
Orthophoto: WCPL (May 2022)

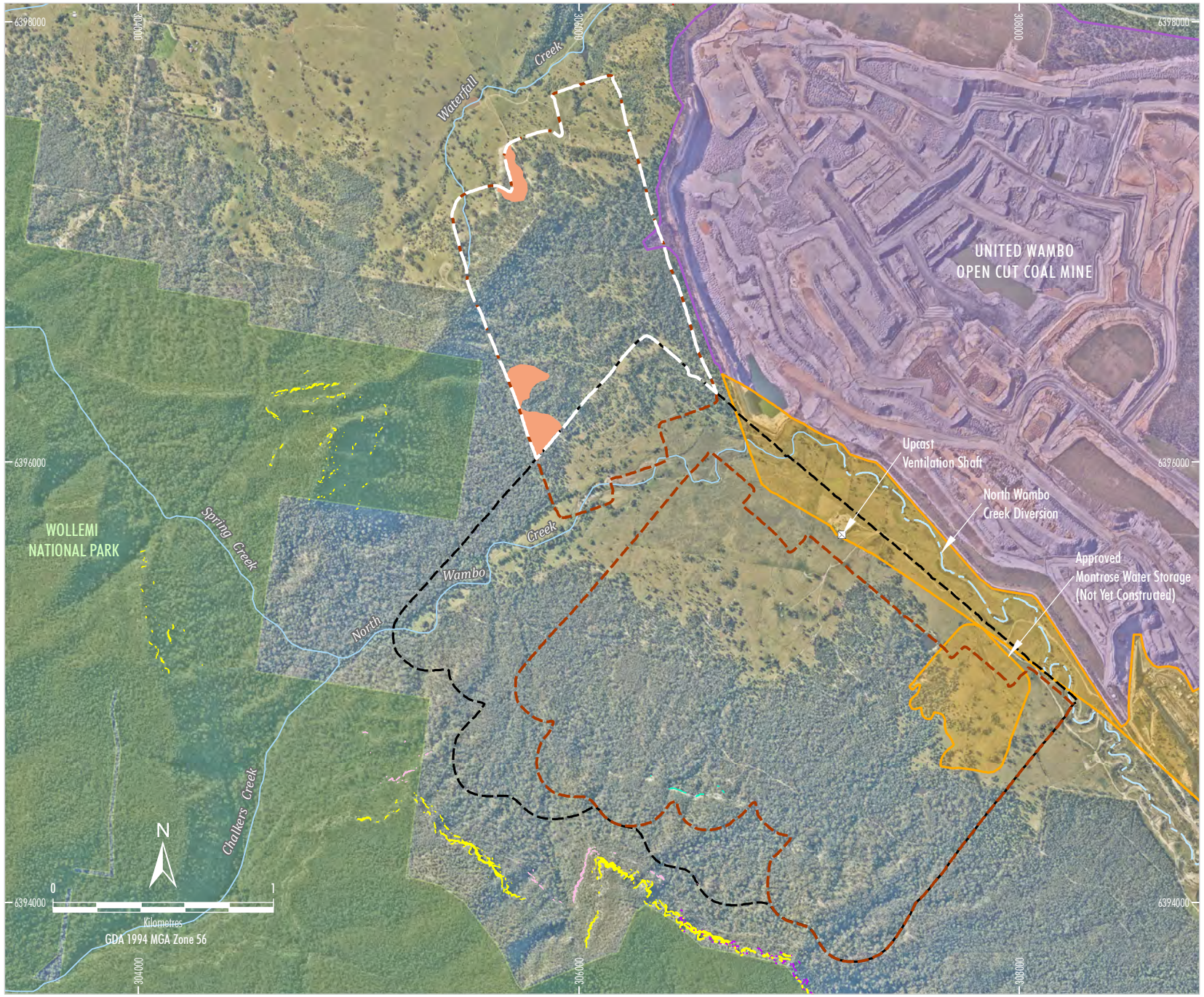
Peabody

WAMBO COAL MINE

Species Polygon for Reptiles and Birds Associated with PCT 1176, 1603

Figure C4

WAM-09-15_SBX Mod LW24-26_BDAR_AttC_204D



LEGEND

- National Park
- SSD 7142 Operational Area
- Existing/Approved Wambo Coal Mine Surface Development Area
- Ventilation Shaft
- Approved Extent of Conventional Subsidence (20 mm subsidence contour)
- Modified Extent of Conventional Subsidence (20 mm subsidence contour)
- Subject Land
- Cliff Associated with Wollemi National Park Escarpment
- Intermediate Level Cliff
- Lower Level Cliff
- Spur
- Minor Cliff
- Species Polygon for the Squirrel Glider, Little Bent-winged Bat, Eastern Cave Bat
- Slaty Box - Grey Gum Shrubby Woodland on Footslopes of the Upper Hunter Valley Sydney Basin Bioregion (PCT 1176)

Source: Eco Logical Australia (2022 as modified by Hunter Eco); MSEC (2022, 2021, 2016); WCPL (2022); NSW Spatial Services (2022)
Orthophoto: WCPL (May 2022)

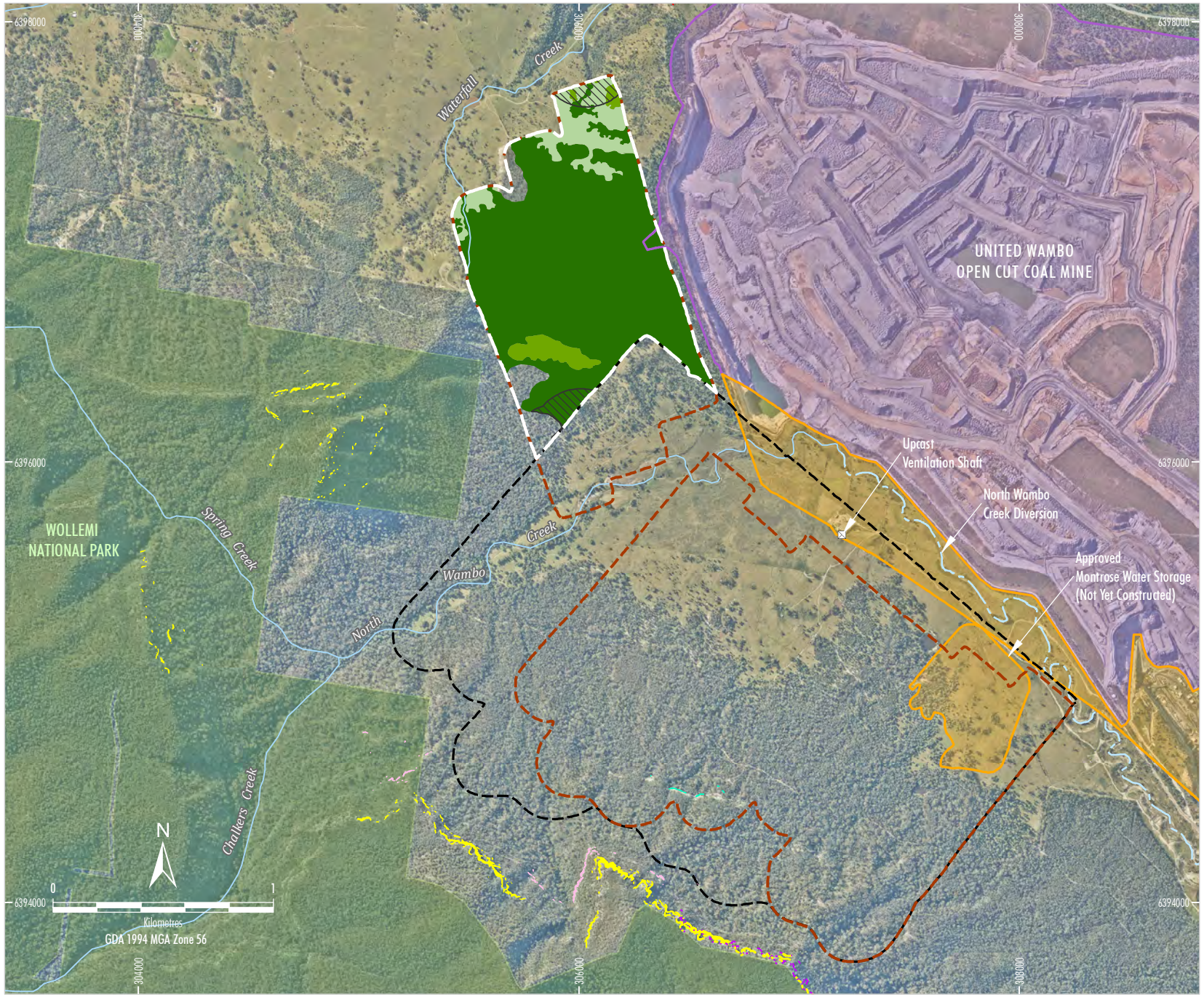
Peabody

WAMBO COAL MINE

Species Polygon for Mammals Associated with PCT 1176

Figure C5

WAM-09-15_SBX Mod LW24-26_BDAR_AttC_205D



LEGEND

- National Park
- SSD 7142 Operational Area
- Existing/Approved Wambo Coal Mine
- Surface Development Area
- Ventilation Shaft
- Approved Extent of Conventional Subsidence (20 mm subsidence contour)
- Modified Extent of Conventional Subsidence (20 mm subsidence contour)
- Subject Land
- Cliff Associated with Wollemi National Park Escarpment
- Intermediate Level Cliff
- Lower Level Cliff
- Spur
- Minor Cliff

Species Polygon for the Brush-tailed Phascogale

- Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter (Good) (PCT 1603)
- Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter (Regenerating) (PCT 1603)
- Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter (DNG) (PCT 1603)

Species Polygon for the Southern Myotis

- Waterbody/Dam 200 m Buffer

Source: Eco Logical Australia (2022 as modified by Hunter Eco); MSEC (2022, 2021, 2016); WCPL (2022); NSW Spatial Services (2022) Orthophoto: WCPL (May 2022)

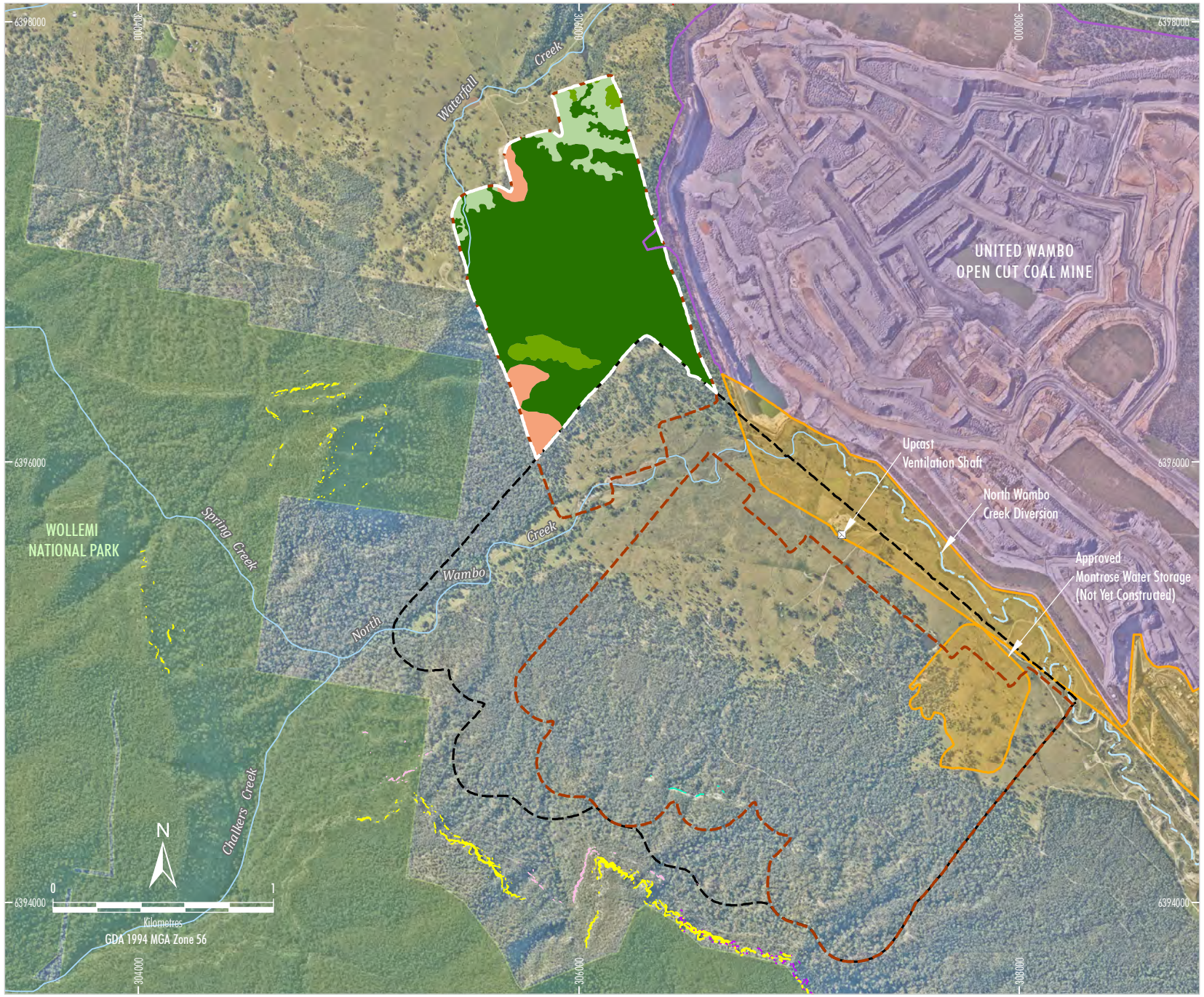
Peabody

WAMBO COAL MINE

Species Polygon for Mammals Associated with PCT 1603

Figure C6

WAM-09-15_SBX Mod LW24-26_BDAR_AttC_206D



LEGEND

- National Park
- SSD 7142 Operational Area
- Existing/Approved Wambo Coal Mine Surface Development Area
- Ventilation Shaft
- Approved Extent of Conventional Subsidence (20 mm subsidence contour)
- Modified Extent of Conventional Subsidence (20 mm subsidence contour)
- Subject Land
- Cliff Associated with Wollemi National Park Escarpment
- Intermediate Level Cliff
- Lower Level Cliff
- Spur
- Minor Cliff

Species Polygon for the Common Planigale, Koala, Eastern Pygmy possum, Large Bent-winged Bat, Large-eared Pied Bat

- Slaty Box - Grey Gum Shrubby Woodland on Footslopes of the Upper Hunter Valley Sydney Basin Bioregion (PCT 1176)
- Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter (Good) (PCT 1603)
- Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter (Regenerating) (PCT 1603)
- Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - Grass Open Forest of the Central and Lower Hunter (DNG) (PCT 1603)

Source: Eco Logical Australia (2022 as modified by Hunter Eco); MSEC (2022, 2021, 2016); WCPL (2022); NSW Spatial Services (2022)
Orthophoto: WCPL (May 2022)

Peabody

WAMBO COAL MINE

Species Polygon for Mammals Associated with PCT 1176, 1603

Figure C7

WAM-09-15_SBX Mod LW24-26_BDAR_AttC_207D

ATTACHMENT D
SERIOUS AND IRREVERSIBLE IMPACT ENTITIES

D1 Pokolbin Mallee Eucalyptus pumila

The Pokolbin Mallee is restricted to one area in the Brokenback Range 35 km south-east of the Subject Land. This species is unlikely to be present in the Subject Land. If this species were present, it is unlikely to be impacted as no significant adverse impacts on native vegetation are likely to occur. The Modification would reduce the predicted extent of subsidence on PCT 1176 (70.5 ha) (Figure 11, Table 8) further reducing the potential for adverse impacts to this species.

The BAM (DPIE 2020a) requires the following information to be provided:

9.1.2 Additional impact assessment provisions for threatened species at risk of an SAII

1. ***The assessor is required to provide further information in the BDAR or BCAR for any species at risk of an SAII, including the action and measures taken to avoid the direct and indirect impact on the species at risk of an SAII. Where these have been addressed elsewhere the assessor can refer to the relevant sections of the BDAR or BCAR.***

Measures taken to avoid direct and indirect impacts are discussed in Section 6 of the BDAR.

2. ***The assessor must consult the TBDC and/or other sources to report on the current population of the species including:***
    a. ***evidence of rapid decline (Principle 1, clause 6.7(2)(a) BC Regulation) presented by an estimate of the:***
        i. ***decline in population of the species in NSW in the past 10 years or three generations (whichever is longer), or***
        ii. ***decline in population of the species in NSW in the past 10 years or three generations (whichever is longer) as indicated by: an index of abundance appropriate to the species; decline in geographic distribution and/or habitat quality; exploitation; effect of introduced species, hybridisation, pathogens, pollutants, competitors or parasites***

None (DPE 2022a).

    b. ***evidence of small population size (Principle 2, clause 6.7(2)(b) BC Regulation) presented by:***
        i. ***an estimate of the species' current population size in NSW, and***
        ii. ***an estimate of the decline in the species' population size in NSW in three years or one generation (whichever is longer), and***
        iii. ***where such data is available, an estimate of the number of mature individuals in each subpopulation, or the percentage of mature individuals in each subpopulation, or whether the species is likely to undergo extreme fluctuations***

None (DPE 2022a).

    c. ***evidence of limited geographic range for the threatened species (Principle 3, clause 6.7(2)(c) BC Regulation) presented by:***
        i. ***extent of occurrence***
        ii. ***area of occupancy***
        iii. ***number of threat-defined locations (geographically or ecologically distinct areas in which a single threatening event may rapidly affect all species occurrences), and***

iv. whether the species' population is likely to undergo extreme fluctuations

This species is known from ≤ 3 locations and/or Area of Occupancy <10 km^2 or Extent of Occurrence < 100 m^2 (DPE 2022a). According to the Department of the Environment, Water, Heritage and the Arts (2008), Pokolbin Mallee "occurs in two locations near Singleton, NSW: the northern end of the Broken Back Range, west of Pokolbin (SE of Singleton) and the Singleton Military Area".

d. evidence that the species is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation) because:

i. known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site

ii. the species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site, or

iii. life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus)

None (DPE 2022a).

3. Where the TBDC indicates data is 'unknown' or 'data deficient' for a species for a criterion listed in Subsection 9.1.2(2.), the assessor must record this in the BDAR or BCAR.

Not applicable (after DPE 2022a).

4. In relation to the impacts from the proposal on the species at risk of an SAII, the assessor must include data and information on:

a. the impact on the species' population (Principles 1 and 2) presented by:

i. an estimate of the number of individuals (mature and immature) present in the subpopulation on the subject land (the site may intersect or encompass the subpopulation) and as a percentage of the total NSW population, and

ii. an estimate of the number of individuals (mature and immature) to be impacted by the proposal and as a percentage of the total NSW population, or

iii. if the species' unit of measure is area, provide data on the number of individuals on the site, and the estimated number that will be impacted, along with the area of habitat to be impacted by the proposal

Principles 1 and 2 are not applicable to this species (after DPE 2022a).

b. impact on geographic range (Principles 1 and 3) presented by:

i. the area of the species' geographic range to be impacted by the proposal in hectares, and a percentage of the total AOO, or EOO within NSW

ii. the impact on the subpopulation as either: all individuals will be impacted (subpopulation eliminated); OR impact will affect some individuals and habitat; OR impact will affect some habitat, but no individuals of the species will be directly impacted

iii. to determine if the persisting subpopulation that is fragmented will remain viable, estimate (based on published and unpublished sources such as scientific publications, technical reports, databases or documented field

observations) the habitat area required to support the remaining population, and habitat available within dispersal distance, and distance over which genetic exchange can occur (e.g. seed dispersal) and pollination distance for the species

iv. to determine changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds, estimate changes in environmental factors including changes to fire regimes (frequency, severity); hydrology, pollutants; species interactions (increased competition and effects on pollinators or dispersal); fragmentation, increased edge effects, likelihood of disturbance; and disease, pathogens and parasites. Where these factors have been considered elsewhere in relation to the target species, the assessor may refer to the relevant sections of the BDAR or BCAR.

The Pokolbin Mallee is restricted to one area in the Brokenback Range 35 km south-east of the Subject Land. This species is unlikely to be present in the Subject Land. If this species were present (PCT 1176), it is unlikely to be impacted as no significant adverse impacts on native vegetation are likely to occur. No individuals of the species would be directly impacted (cleared). No habitat will become fragmented as a result of the Modification. The Modification would reduce the predicted extent of subsidence on PCT 1176 (70.5 ha) (Figure 11, Table 8) further reducing the potential for adverse impacts to this species (compared to the approved South Bates Extension Underground Mine). All indirect impact from the Modification are described in Section 7.2.

D2 Denman Pomaderris Pomaderris reperta

The BAM (DPIE 2020a) requires the following information to be provided:

9.1.2 Additional impact assessment provisions for threatened species at risk of an SAII

1. The assessor is required to provide further information in the BDAR or BCAR for any species at risk of an SAII, including the action and measures taken to avoid the direct and indirect impact on the species at risk of an SAII. Where these have been addressed elsewhere the assessor can refer to the relevant sections of the BDAR or BCAR.

Measures taken to avoid direct and indirect impacts are discussed in Section 6 of the BDAR.

2. The assessor must consult the TBDC and/or other sources to report on the current population of the species including:

a. evidence of rapid decline (Principle 1, clause 6.7(2)(a) BC Regulation) presented by an estimate of the:

i. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer), or

ii. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer) as indicated by: an index of abundance appropriate to the species; decline in geographic distribution and/or habitat quality; exploitation; effect of introduced species, hybridisation, pathogens, pollutants, competitors or parasites

None (DPE 2022a).

b. evidence of small population size (Principle 2, clause 6.7(2)(b) BC Regulation) presented by:

i. an estimate of the species' current population size in NSW, and

ii. an estimate of the decline in the species' population size in NSW in three years or one generation (whichever is longer), and

iii. where such data is available, an estimate of the number of mature individuals in each subpopulation, or the percentage of mature individuals in each subpopulation, or whether the species is likely to undergo extreme fluctuations

None (DPE 2022a).

c. evidence of limited geographic range for the threatened species (Principle 3, clause 6.7(2)(c) BC Regulation) presented by:

i. extent of occurrence

ii. area of occupancy

iii. number of threat-defined locations (geographically or ecologically distinct areas in which a single threatening event may rapidly affect all species occurrences), and

iv. whether the species' population is likely to undergo extreme fluctuations

This species is known from ≤ 3 locations and/or Area of Occupancy <10 km^2 or Extent of Occurrence < 100 m^2 (DPE 2022a). According to the Department of the Environment (2014), "three populations are known within an extent of 50 km^2 (TSSC 2008) and there may be a fourth population 50 km to the west of Denman (ALA 2013)".

d. evidence that the species is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation) because:

i. known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site

ii. the species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site, or

iii. life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus)

None (DPE 2022a).

3. Where the TBDC indicates data is 'unknown' or 'data deficient' for a species for a criterion listed in Subsection 9.1.2(2.), the assessor must record this in the BDAR or BCAR.

Not applicable (after DPE 2022a).

4. In relation to the impacts from the proposal on the species at risk of an SAII, the assessor must include data and information on:

a. the impact on the species' population (Principles 1 and 2) presented by:

i. an estimate of the number of individuals (mature and immature) present in the subpopulation on the subject land (the site may intersect or encompass the subpopulation) and as a percentage of the total NSW population, and

ii. an estimate of the number of individuals (mature and immature) to be impacted by the proposal and as a percentage of the total NSW population, or

iii. if the species' unit of measure is area, provide data on the number of individuals on the site, and the estimated number that will be impacted, along with the area of habitat to be impacted by the proposal

Principles 1 and 2 are not applicable to this species (after DPE 2022a).

b. impact on geographic range (Principles 1 and 3) presented by:

i. the area of the species' geographic range to be impacted by the proposal in hectares, and a percentage of the total AOO, or EOO within NSW

ii. the impact on the subpopulation as either: all individuals will be impacted (subpopulation eliminated); OR impact will affect some individuals and habitat; OR impact will affect some habitat, but no individuals of the species will be directly impacted

iii. to determine if the persisting subpopulation that is fragmented will remain viable, estimate (based on published and unpublished sources such as scientific publications, technical reports, databases or documented field observations) the habitat area required to support the remaining population, and habitat available within dispersal distance, and distance over which genetic exchange can occur (e.g. seed dispersal) and pollination distance for the species

iv. to determine changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds, estimate changes in environmental factors including changes to fire regimes (frequency, severity); hydrology, pollutants; species interactions (increased competition and effects on pollinators or dispersal); fragmentation, increased edge effects, likelihood of disturbance; and disease, pathogens and parasites. Where these factors have been considered elsewhere in relation to the target species, the assessor may refer to the relevant sections of the BDAR or BCAR.

Nearest record of Denman Pomaderris is approximately 27 km north-west of the Subject Land. However, its presence cannot be ruled out in PCT 1176. This species it is unlikely to be impacted as no significant adverse impacts on native vegetation are likely to occur. No individuals of the species would be directly impacted (cleared). No habitat will become fragmented as a result of the Modification. The Modification would reduce the predicted extent of subsidence on PCT 1176 (70.5 ha) (Figure 11, Table 8) further reducing the potential for adverse impacts to this species (compared to the approved South Bates Extension Underground Mine). All indirect impact from the Modification are described in Section 7.2.