



Biodiversity Management Plan

Executive Summary

No.	Mitigation / Management Measure	Section	Timing
1	Baseline vegetation condition monitoring has been undertaken prior to mining and further condition monitoring will be triggered by measurable impacts on alluvial groundwater levels in the vicinity of the GDEs that are attributable to the Project.	Section 9.8.2	As required
2	United Wambo has undertaken monitoring of stygofauna in the alluvial aquifers within (or near to, subject to bore suitability) the predicted drawdown areas prior to the commencement of mining and will continue to monitor every three years thereafter.	Section 9.8.3	Every three years
3	The remaining offset credits will be retired within 24 months of commencement of Phase 1A, as approved by DPIE. This BMP will be revised and resubmitted once the credits have been retired.	Section 10.2	Within 24 months of commencement of Phase 1A – delayed with approval from DPE
4	Prior to the commencement of Stage 2, United Wambo will undertake a review of the disturbance undertaken during Stage 1 to identify areas where disturbance has been avoided. Disturbance that has been avoided will be used to offset the future staged credit requirements.	Section 10.2	Prior to the commencement of Stage 2
5	As required by Condition E11 (b) of SSD 7142, United Wambo will report on the progress of biodiversity credit retirements and the associated actual versus proposed surface disturbance for each stage for each calendar year in the Annual Review.	Section 10.2	Annually
6	Prior to any ground disturbing activities, a Ground Disturbance Permit (GDP) will be required to be approved by the Environment and Community Department, Mine Surveyor and task coordinator. Controls outlined on the GDP are to be implemented before any ground disturbing activities may commence.	Section 11.1	Prior to disturbance
7	Pre-clearance surveys are required to be undertaken before areas of remnant native vegetation (including grasslands, shrublands and open woodlands) are to be cleared. The surveys are to be undertaken by suitably qualified and experienced personnel.	Section 11.1.1	Prior to disturbance
8	Any threatened flora species found during pre-clearance surveys should be propagated or translocated to appropriate locations in nearby offset sites, where practicable.	Section 11.1.1	As required

No.	Mitigation / Management Measure	Section	Timing
9	The United Wambo Habitat Pre-Clearing Survey and Habitat Tree Felling Procedure will be implemented to minimise the potential for impacts on native fauna species (including threatened species) as a result of the clearing of hollow-bearing trees. The procedure details the necessary pre-clearing activities, requirements during clearing operations, and post-clearing requirements.	Section 11.1.2	Prior to and during tree felling
10	Removal of non-hollow bearing trees/vegetation as close to the hollow-bearing tree felling date as practicable (in order to discourage fauna usage of the area). It is not necessary for the suitably qualified and experienced person to be present to supervise such works	Section 11.1.2	As required
11	Section 11.1.2: Hollow-bearing tree felling procedures, including (but not limited to): • supervision of all hollow-bearing tree felling works by a suitably qualified and experienced person; • visual canopy inspection on the day of the felling of hollow-bearing trees to check for individual animals in the canopy; • shaking of hollow-bearing tree (with heavy machinery where safe to do so) to encourage resident fauna to abandon tree, prior to felling; • lowering of hollow-bearing trees as gently as possible (soft-felled) with machinery; • inspection of all hollows in felled trees; • capture of any displaced/injured fauna; • if a threatened species is identified in a habitat tree on the day of felling, the supervising person should advise the most appropriate method to minimise potential harm; • release of unharmed fauna into nearby secure habitats; • injured fauna to be assessed and taken to wildlife carer, if necessary; • felled trees are to be rolled so that the number of hollows blocked against the ground are minimised; • all felled trees are to remain in place overnight to allow any unidentified fauna to escape; and • salvage of suitable hollows for use as compensatory habitat, where practicable.	Section 11.1.2	During tree felling
12	All personnel who will capture/handle/house and/or transport native fauna species (injured or uninjured) will be suitably qualified and experienced.	Section 11.1.2	During tree felling
13	Where practical, a selection of habitat features will be salvaged for reuse in rehabilitation areas and nearby offset areas. This will include suitable:	Section 11.1.3	As required

No.	Mitigation / Management Measure	Section	Timing
	- seed resources; - tree hollows; - hollow logs; and - fallen timber and woody debris.		
14	Salvageable habitat features (i.e. with good structural integrity and suitability for relocation and fauna use) will be identified during pre-clearing surveys, and collected as part of the clearing process, where suitable and feasible to do so. Salvaged features will then be stockpiled for use in rehabilitation to increase the habitat diversity and availability of rehabilitation areas, thus making them more suitable for native fauna colonisation (particularly threatened species).	Section 11.1.3	During pre-clearance surveys
15	Where practicable, seed collection for canopy, mid storey and groundcover species is to be undertaken prior to clearance for propagation and use in rehabilitation areas and stewardship sites.	Section 11.1.3	Prior to disturbance
16	If threatened flora species are recorded in the disturbance footprint during pre-clearance surveys (refer to Section 11.1.1) options for salvage, translocation and/or propagation will be investigated and recommendations sought from a suitably qualified person in accordance with the Guidelines for the Translocation of Threatened Plants in Australia (Vallee et al. 2004). Where possible, the threatened flora will be translocated to suitable locations within the biodiversity stewardship sites.	Section 11.1.4	Prior to disturbance
17	United Wambo has prepared a weed action plan which identifies the key weed areas that require treatment, and the recommended timeframes and methods for control, based on the type of weeds present. The plan is attached in <i>Appendix H</i> . The action plan will be reviewed annually.	Section 11.2	Annually
18	The plan will be monitored via regular inspections of mining and non-mining lands to monitor the effectiveness of control programs and to identify any new infestations.	Section 11.2	Annually
19	The presence of weeds is also recorded during annual rehabilitation and ecological monitoring programs which are conducted on both mining and non-mining lands.	Section 11.2	Annually
20	Weed management activities and the effectiveness of those activities to prevent seed set/dispersal or recruitment will be reported on an annual basis in the Annual Review.	Section 11.2	Annually
21	Pest control activities will be reported in the Annual Review.	Section 11.3	Annually

No.	Mitigation / Management Measure	Section	Timing
22	Any hazard reduction and ecological burns are to be completed in accordance with the Bushfire Environmental Assessment Code for New South Wales (NSW Rural Fire Service, 2006) and the Draft Revised Bush Fire Environmental Assessment Code (NSW Rural Fire Service, 2017).	Section 11.4	As required
23	United Wambo will re-establish ground fauna habitat through the relocation of habitat features to targeted mine site rehabilitation areas, where practicable.	Section 11.5	During rehabilitation
24	Dams will be constructed in the post-mining landform to facilitate the re-colonisation of woodland fauna communities.	Section 11.5	During rehabilitation
25	Habitat enhancement of retained vegetation, such as provision of nest boxes, salvaged hollows, fallen timber, hollow logs and boulders, as deemed necessary	Section 11.5	As required
26	Local provenance seed will be targeted for collection at United Wambo including during clearing activities (i.e. collection of seeds from felled trees) and potential harvesting of native grass species	Section 11.6	As required
27	Seed collection activities will be managed in accordance with the Flora Bank Guidelines (Florabank 2013).	Section 11.6	As required
28	Seed propagation activities will be undertaken by an external contractor who is suitably trained, licenced and experienced in propagation of the species required for revegetation.	Section 11.6	As required
29	Inductions for staff, contractors and visitors will be undertaken to make them aware of the key ecological issues present in the Project Area and so that they know their role and responsibilities in the protection and/or minimisation of impacts to all native biodiversity.	Section 11.7	All inductions
30	Inductions will identify the location of known sensitive flora and fauna and the policies being implemented to protect the biodiversity values of such areas.	Section 11.7	All inductions
31	Appropriate lighting controls to minimise impacts will be implemented as part of the Project including minimisation of fugitive lighting emissions following Australian Standards.	Section 11.8	As required
32	Adequate fencing will be installed and maintained along all boundaries of stock grazing areas and monitoring will take place as necessary to ensure fence condition is upheld.	Section 11.9	As required
33	Quarterly inspections will be undertaken within the United Wambo BSSs and on mine buffer land over the life of the Project. These will comprise walkover inspections targeting revegetation/ regeneration areas and creek lines. These will assess:	Section 13.1	Quarterly

No.	Mitigation / Management Measure	Section	Timing
	a) the condition of site features such as fences, gates and access tracks; b) any evidence of unauthorised access or stock grazing; c) areas of erosion or sedimentation; d) weed infestations; e) evidence of pest fauna; f) effectiveness of revegetation works; and g) adequacy of bushfire management, including fuel loads, water availability and access.		
34	A standard inspection checklist (the United Wambo Offset Area Inspection Form or United Wambo Mine Buffer Land Inspection Form) will be used to record the outcomes of the inspection	Section 13.1	Quarterly
35	Any required management actions that are identified as part of the inspection will be implemented as soon as practical, with actions recorded in CMO. Where necessary, management strategies will be amended accordingly with the aim of continually improving the success of the management strategies.	Section 13.1	As required
36	The results of the rehabilitation monitoring program will be reported in the Annual Review for the Project.	Section 13.2	Annually
37	Initial establishment inspections – within approximately three months of each rehabilitation campaign to provide early identification of potential issues to minimise harm to the establishing rehabilitation	Section 13.2	Within three months of rehabilitation
38	Routine general inspections to be undertaken at least annually until it can be demonstrated that completion criteria has been met. Parameters may include growing media conditions, the presence and extent of erosion, the stability of drainage and sediment control structures, revegetation germination rates, plant health, species density and diversity, presence of colonising fauna (e.g. ants, foraging birds), control of unauthorized access, effectiveness of habitat augmentation features and presence and/or impact of feral animals and weeds.	Section 13.2	Annually
39	Annual walkover inspections are to be conducted annually to provide the mine with a snapshot of the condition of the rehabilitated areas and highlight any areas that require maintenance activities such as erosion, weed presence, evidence of pest animal presence, low tree densities or signs of unhealthy plants. These surveys are not quantitative in nature. Areas to be included in the annual walkover inspections include the following: Riparian Vegetation	Section 13.4.1.1	Annually

No.	Mitigation / Management Measure	Section	Timing
	- Grassland (Agricultural) - HU816 – Spotted Gum – Narrow-leaved Ironbark shrub – grass open forest of the central and lower Hunter (conforming to Central Hunter Ironbark – Spotted Gum – Grey Box Forest EEC under the BC Act) - HU905 – Narrow-leaved Ironbark – Grey Box grassy woodland of the central and upper Hunter (conforming to Central Hunter Valley Eucalypt Forest and Woodland CEEC under the EPBC Act) - HU905 – Narrow-leaved Ironbark – Grey Box grassy woodland of the central and upper Hunter - Woodland/Open Woodland During the walkover inspections any problems with the rehabilitation area, such as land stability and weeds, will be recorded and reported to the United Wambo JV environmental representative on a zone-by-zone basis.		
40	Plots and transects surveys will be undertaken in the following locations: - reference sites - grassland (agricultural) - ecological rehabilitation (HU816, HU905 (CEEC) and HU905) - woodland/open woodland rehabilitation areas	Section 13.4.1.2	As required
41	At each monitoring sites within the United Wambo ecological rehabilitation, a BAM floristic and vegetation integrity plot in accordance with Section 5 of the BAM (OEH 2017) will be undertaken. The data and attributes to be recorded are detailed in the Section 13.4.1.2 .	Section 13.4.1.2	As required
42	Habitat assessment will also be undertaken in each 50 x 20 metre plot and data will be collected on a standard monitoring pro-forma for future comparability. Habitat features recorded at each site are listed in Section 13.4.2 .	Section 13.4.2	As required
43	Photo monitoring will be undertaken at each permanent flora monitoring site and is used to identify any observable changes in the vegetation condition and development of vegetation structure over time. They are completed facing left, centre and right at the start of the 50 metre transect as well as a photo at the end of the 50 metre transect facing centrally back towards the start.	Section 13.4.3	As required
44	The seasonal fauna monitoring schedule is outlined in Table 13-2 .	Section 13.4.4	As required
45	Additional nest-box monitoring surveys will be undertaken where new nest boxes are installed as habitat enhancement measures.	Section 13.4.6	Every second year

No.	Mitigation / Management Measure	Section	Timing
	Content and condition monitoring will be completed ever second year. Monitoring of nest boxes should be completed for a minimum of 10 years.		
46	United Wambo will complete the necessary review of this BMP at commencement of Phase 2 as per condition E6 of SSD 7142.	Section 14.2	At commencement of Phase 2
47	An internal review of the BMP will also be undertaken every three years, or as required, to refine and make improvements to the management strategies and to assess performance against preliminary performance indicators and completion criteria. The three year review will seek opportunities to improve the management strategies and further develop and forecast the longer term performance indicators and completion criteria	Section 14.2	Every three years
48	Section 14.3: Ecological, BSS and rehabilitation monitoring results will be reported in the Annual Review. The Annual Review will include a comparison of data against previous year's results as well as a list of management recommendations derived from the monitoring reports, and a statement of compliance with EPBC approval conditions. The Annual Review will be made available on the United Wambo public website.	Section 14.3	Annually

Table of Contents

1.	Project Description	1
2.	Purpose.....	4
3.	Scope	4
4.	Objectives	4
5.	Statutory Requirements	5
5.1	Environmental Planning & Assessment Act 1979	5
5.2	Environment Protection and Biodiversity Conservation Act 1999	8
6.	Glencore Coal Assets Australia Requirements	9
7.	Stakeholder Consultation	9
8.	Preparation of the BMP	10
9.	Existing Environment.....	10
9.1	Project Disturbance Area	10
9.2	Climatic Conditions	13
9.3	Topography, Drainage and Natural Features.....	13
9.4	Landuse and Vegetation History	14
9.5	Native Vegetation	14
9.6	Threatened Species.....	20
9.6.1	Ecosystem-Credit Species.....	20
9.6.2	Species-Credit Species.....	22
9.7	Migratory Species.....	22
9.8	Groundwater Dependent Ecosystems	23
9.8.1	Potential GDEs Within the Additional Disturbance Area	23
9.8.2	Potential GDEs Outside of the Additional Disturbance Area	23
9.8.3	Stygofauna.....	24
10.	Biodiversity Offset Strategy	25
10.1	Biodiversity Stewardship Sites	25
10.1.1	Highfields Biodiversity Stewardship Site.....	27
10.1.2	Mangrove Biodiversity Stewardship Site	30
10.1.3	Wambo Biodiversity Stewardship Site	36
10.1.4	Jerrys Plains Biodiversity Stewardship Site	40
10.1.5	Brosi Biodiversity Stewardship Site.....	44
10.1.6	South Wambo Biodiversity Stewardship Site.....	49
10.2	Biodiversity Credit Requirements	55
10.3	EPBC Offset Requirements.....	59
11.	Management and Mitigation Measures at the Mine Site	65
11.1	Land Clearing.....	65

11.1.1	Pre-Clearance Surveys.....	65
11.1.2	Habitat Tree-Felling.....	66
11.1.3	Resource Salvaging.....	66
11.1.4	Salvage of Threatened Flora Species.....	67
11.2	Weed Control.....	67
11.3	Pest and Feral Animal Control.....	67
11.4	Bushfire Management.....	68
11.5	Fauna Habitat Enhancement and Reinstatement.....	69
11.6	Seed Collection and Propagation.....	69
11.7	Employee Education and Training.....	70
11.8	Indirect Impact Management	70
11.9	Grazing and Agriculture	71
11.10	Mitigation Measures Summary.....	73
12.	Ecological Mine Rehabilitation.....	75
12.1	Target Plant Community Types for Mine Rehabilitation	76
12.2	Rehabilitation Management Plan	76
12.2.1	Preliminary Performance Indicators and Completion Criteria.....	77
12.3	Security of Ecological Mine Rehabilitation.....	86
13.	Monitoring and Inspections	87
13.1	Inspections	87
13.2	Mine Rehabilitation Monitoring	88
13.3	Stewardship Site Ecological Monitoring Program.....	89
13.4	Mine Rehabilitation Monitoring Program.....	89
13.4.1	Rehabilitation Flora Monitoring.....	89
13.4.2	Habitat Assessment.....	91
13.4.3	Photo Monitoring.....	92
13.4.4	Seasonal Fauna Monitoring.....	92
13.4.5	Threatened Species Monitoring.....	94
13.4.6	Nest Box Monitoring	94
14.	Review, Reporting and Improvement.....	95
14.1	Adaptive Management Process	95
14.1.1	Biodiversity Trigger Action Response Plan.....	95
14.2	Review of BMP	99
14.3	Reporting.....	99
15.	Document Information	101
15.1	Related Documents.....	101
15.2	Reference Information.....	101
15.3	Change Information	104
16.	Accountabilities.....	105
	Appendix A - Stakeholder Consultation.....	106

A.1	Phase 1A.....	106
A.2	Phase 1B.....	107
Appendix B - DPE Approval		110
Appendix C - Correspondence from Umwelt		111
Appendix D - United Wambo Pre-Clearing Survey and Habitat Tree Felling Procedure ...		113
Appendix E - United Wambo Pre-Clearing Survey Form		124
Appendix F - Habitat Tree Felling Form		127
Appendix G - United Wambo Biodiversity Offset Area Inspection Form		131
Appendix H - United Wambo Buffer Land Inspection Form.....		133
Appendix I - Weed Action Plan.....		135

Figures

Figure 1-1 - Locality Plan.....	2
Figure 1-2 - United Wambo Project Overview.....	3
Figure 9-1: Project Disturbance Area	12
Figure 9-2: Vegetation Zones in the Additional Disturbance Area	17
Figure 9-3: Threatened Ecological Communities Listed under the Biodiversity Conservation Act	18
Figure 9-4: Central Hunter Valley Eucalypt Forest and Woodland CEEC under the EPBC Act.....	19
Figure 9-5: Threatened Ecosystem and Species-Credit Species at United Wambo.....	21
Figure 9-6: GDE Locations	24
Figure 10-1: Strategic Location of Glencore and United Wambo Biodiversity Stewardship Sites.....	26
Figure 10-2: Highfields Stewardship Site Biodiversity Features	29
Figure 10-3: Mangrove Stewardship Site Biodiversity Features	34
Figure 10-4: Wambo Biodiversity Stewardship Site Biodiversity Features.....	39
Figure 10-5: Jerrys Plains Biodiversity Stewardship Site Biodiversity Features.....	43
Figure 10-6: Brosi Biodiversity Stewardship Site Biodiversity Features.....	47
Figure 10-7: South Wambo Biodiversity Stewardship Site Biodiversity Features	52
Figure 10-8: Staged Disturbance Areas.....	57
Figure 11-1: Approved Final Landform Plan	72

Tables

Table 4-1: Objectives of the Biodiversity Management Plan.....	5
Table 5-1: SSD 7142 Requirements for Biodiversity Management.....	5
Table 5-2: EPBC E015/7600 Requirements for Biodiversity Management.....	8
Table 9-1: Annual Climate Statistics.....	13
Table 9-2: Project Area Vegetation Communities and Threatened Ecological Communities	15
Table 9-3: Ecosystem-Credit Species	20
Table 9-4: Species-Credit Species Recorded Within the United Wambo Project Area	22
Table 9-5: Migratory Species with the Potential to Occur.....	22
Table 10-1: Plant Communities at the Highfields Biodiversity Stewardship Site.....	28
Table 10-2: Ecosystem-Credit Species at the Highfields Stewardship Site	30
Table 10-3: Plant Communities at the Mangrove Stewardship Site	33
Table 10-4: Ecosystem-Credit Species at the Mangrove Stewardship Site.....	35
Table 10-5: Species-Credit Species at the Mangrove Stewardship Site.....	35
Table 10-6: Plant Communities at the Wambo Biodiversity Stewardship Site.....	37

Table 10-7: Ecosystem-Credit Species at the Wambo Biodiversity Stewardship Site	40
Table 10-8: Plant Communities at the Jerrys Plains Biodiversity Stewardship Site	41
Table 10-9: Plant Communities at the Brosi Biodiversity Stewardship Site.....	45
Table 10-10: Ecosystem-Credit Species at the Brosi Biodiversity Stewardship Site	48
Table 10-9: Plant Communities at the South Wambo Biodiversity Stewardship Site	50
Table 10-10: Ecosystem-Credit Species at the South Wambo Biodiversity Stewardship Site	53
Table 10-11: Stage 1 Credit Requirements – BioBanking Calculations	58
Table 10-12: Staged Offsetting Requirements – BioBanking Calculations	59
Table 10-13: Summary of Impact and Offset Areas for MNES.....	61
Table 10-14: Summary of Impact and Offset Areas for Central Hunter CEEC	62
Table 10-15: Credit Allocation for Central Hunter CEEC in Stage 1	63
Table 11-1: Pest Animals and Management	68
Table 11-2: Mitigation Measures	73
Table 12-1: Target PCTs for Mine Rehabilitation	76
Table 12-2: Preliminary Performance Indicators and Completion Criteria by PCT for Ecological Mine Rehabilitation.....	77
Table 13-1: Cover Abundance Scale to be Utilised for Flora Monitoring	91
Table 13-2: Seasonal Fauna Monitoring Schedule.....	92
Table 14-1: Biodiversity Trigger Action Response Plan.....	95
Table 14-2: Reporting Requirements as Relevant to the BMP	101
Table 15-1: Related documents	101
Table 15-2: Reference information	101
Table 15-3: Change information	104

1. Project Description

The United Wambo Open Cut Coal Mine (United Wambo) is situated approximately 15 kilometres west of Singleton, near the village of Warkworth, New South Wales (**Figure 1-1**). United Wambo Joint Venture (United Wambo) is a 50:50 joint venture between neighbouring mines operated by United Collieries Pty Limited (United) and Wambo Coal Pty Limited (Wambo).

United is owned 95 per cent by Abelshore Pty Limited, a wholly owned subsidiary of Glencore Coal Pty Limited (Glencore) and 5 per cent by the Construction, Forestry, Mining and Energy Union (CFMEU), which is managed by Glencore. Wambo is a subsidiary of Peabody Energy Australia Pty Limited.

United Wambo combines the existing open cut operations at Wambo with a new open cut coal mine at United. United Wambo has approval to extract up to 10 million tonnes per annum (mtpa) of Run of Mine (ROM) coal from the combined Wambo Open Cut (Wambo Pit) and United Open Cut (United Pit). All coal is transported and processed through the Wambo Coal Handling and Processing Plant (CHPP) and transported by rail from Wambo to the Port of Newcastle for export.

Open cut mining is managed by United on behalf of the joint ventures, while Wambo manages the CHPP and train loading facilities as well as Wambo's continued underground operations.

Figure 1-2 shows an overview of the project and the project approval boundary for United Wambo.



Figure 1-1 - Locality Plan

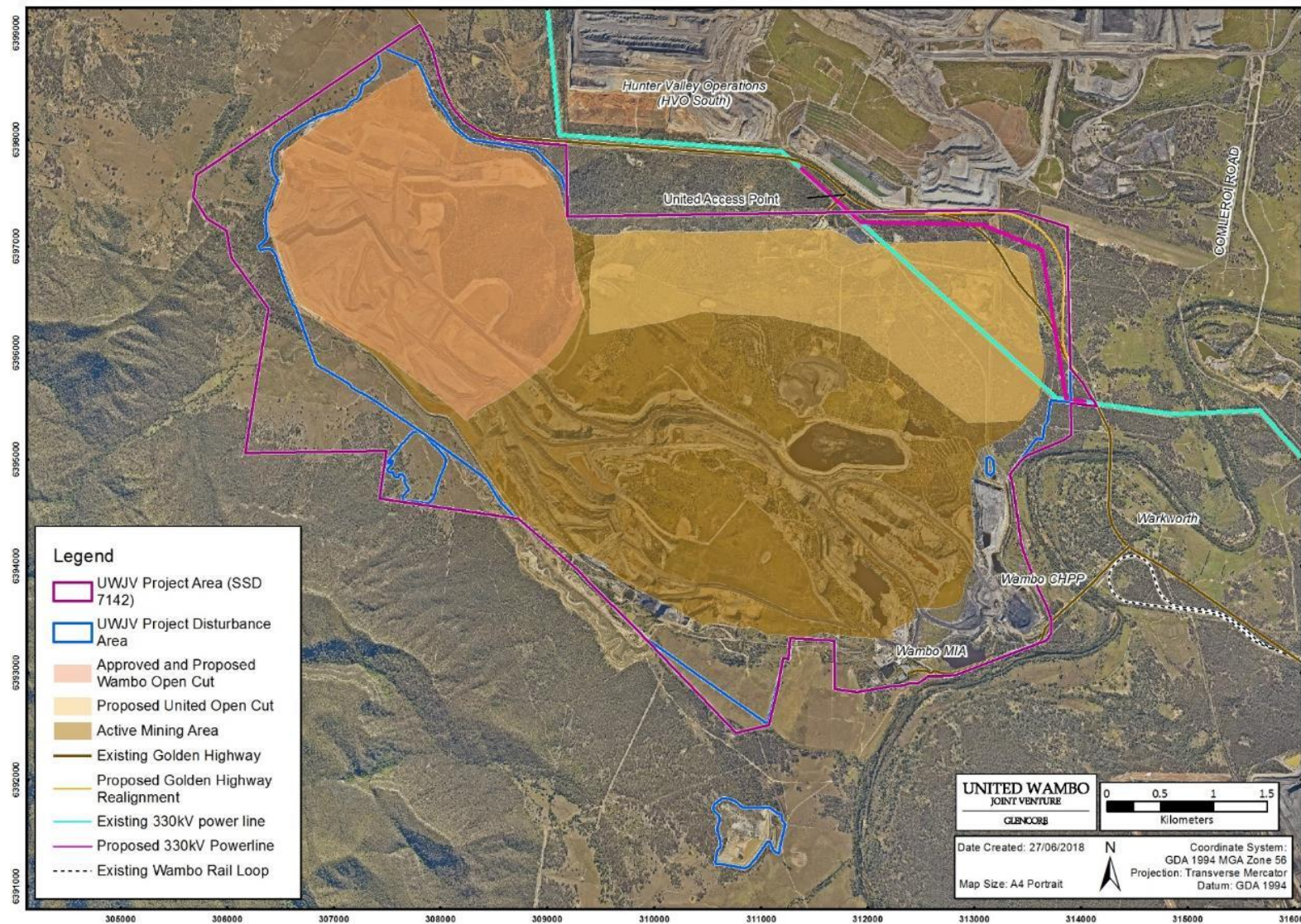


Figure 1-2 - United Wambo Project Overview

2. Purpose

The purpose of the Biodiversity Management Plan (BMP) is to describe the ecological management strategies, procedures, controls and monitoring programs, including pre-disturbance procedures to be implemented for the management of biodiversity, stewardship sites and flora and fauna within the United Wambo Project Area.

The BMP is intended to meet statutory and internal requirements, particularly the Development Consent SSD 7142, Glencore Coal Assets Australia (GCAA) Standards, and Controlled Action approval 2015/7600 issued under the Commonwealth Environment Protection and Biodiversity Conservation Act, 1999 (EPBC Act).

Additionally, the preparation of this BMP has considered the Final Draft Environmental Management Plan – Post Approval Requirements Series prepared by DPIE (2017).

3. Scope

This BMP applies to all operational activities and land within the project approval boundary. The Biodiversity Stewardship Sites (BSSs) identified in **Section 10** are not addressed specifically in this BMP as there will be separate management for each site, including:

- Highfields Biodiversity Stewardship Site;
- Mangrove Biodiversity Stewardship Site;
- Wambo Biodiversity Stewardship Site;
- Jerrys Plains Biodiversity Stewardship Site
- Brosi Biodiversity Stewardship Site; and
- South Wambo Biodiversity Stewardship Site.

The BMP applies to all United Wambo employees and contractors working for, or on behalf of, United Wambo within the project approval boundary. This BMP forms part of United Wambo's Environmental Management System (EMS).

This BMP applies to all activities conducted under SSD 7142. Activities undertaken by Wambo under DA 305-7-2003, including the Wambo underground mine, CHPP and train loading facility, will continue to be managed by Wambo in accordance with the relevant Wambo Development Consent conditions and the Wambo Biodiversity Management Plan.

4. Objectives

Table 1 1 outlines the ecological objectives of this plan to ensure that appropriate management and mitigation strategies are identified and implemented to reduce the impacts on flora, fauna and ecological features.

Table 4-1: Objectives of the Biodiversity Management Plan

Objective	Section in Plan
Minimising impacts to flora and fauna wherever possible	Section 11
Implementing clearing procedures to minimise the impacts of the clearing process and maximise the recovery of any valuable biodiversity resources (e.g. seed collection, re-use of hollows)	Section 11.1
Avoiding direct impacts and retaining habitat features	Section 11
Implementing appropriate environmental management measures as part of the mining operations to minimise the potential for indirect impacts	Section 11.8
Mitigating or ameliorating impacts, as a last resort, including compensating or offsetting for any unavoidable significant residual impacts	Section 10
Managing stewardship sites to provide for appropriate biodiversity outcomes, while ensuring consideration of other important government and community expectations for these lands, such as continued agricultural use	Section 10
Undertaking training of key employees regarding the key biodiversity mitigation and management measures relevant to the work they undertake	Section 11.7

5. Statutory Requirements

This BMP has been prepared to fulfil the biodiversity and offset requirements of State Significant Development (SSD) 7142 and Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) Approval 2015/7600.

5.1 Environmental Planning & Assessment Act 1979

United Wambo received Development Consent (SSD 7142), in accordance with Part 4 of the Environmental Planning & Assessment Act 1979 (EP&A Act), from the NSW Independent Planning Commission (IPC) on 29 August 2019. SSD 7142 was modified on 25 November 2021 to allow for the increase in storage for ROM coal stockpiles. There were no changes to the management of biodiversity as part of the modification. Conditions within SSD 7142 relating to biodiversity and offsets management, and where these are addressed within this document, are provided in **Table 5-1**.

Table 5-1: SSD 7142 Requirements for Biodiversity Management

Condition	Condition Details	MP Section
B71	The Applicant must prepare a Biodiversity Management Plan to the satisfaction of the Planning Secretary. This plan must:	
B71 (a)	be prepared by a suitably qualified and experienced person/s;	Section 8

Condition	Condition Details	MP Section
B71 (b)	be prepared in consultation with BCD;	Section 7
B71 (c)	describe the short, medium, and long term measures to be undertaken to manage vegetation and fauna habitat on the site;	Section 11.10
B71 (d)	describe how biodiversity management would be integrated with similar measures within the Water Management Plan referred to in condition B52 and the Rehabilitation Management Plan referred to in condition B103;	Section 9.8 Section 12.2
B71 (e)	include a Biodiversity Offset Strategy that:	Section 10
B71 (e) (i)	recalculates, if necessary, in accordance with the BC Act, the number of biodiversity credits required under condition B55 to offset the impacts of the development;	Section 10.2
B71 (e) (ii)	describes how the biodiversity credits in Table 5 (or as recalculated) of SSD 7142 will be identified, secured and retired;	Section 10.2
B71 (e) (iii)	if adjustments are made to the staging of credit retirements in Table 5 of SSD 7142 (see conditions B58 and B59 of SSD 7142), detail the adjusted stages and associated surface disturbance areas; and	Section 10.2
B71 (e) (iv)	describes how significantly impacted threatened species and communities listed under the EPBC Act would be suitably offset;	Section 10
B71 (f)	describe the measures to be implemented within approved disturbance areas on the site to:	Section 11
B71 (f)(i)	minimise the amount of clearing and employ temporary vegetation strategies (see condition B99)	Section 11.8
B71 (f)(ii)	minimise impacts on fauna, including undertaking pre-clearance surveys;	Section 11.1.1
B71 (f) (iii)	provide for the salvage, transplanting and/or propagation of any threatened flora found during pre-clearance surveys, in accordance with the <i>Guidelines for the Translocation of Threatened Plants in Australia</i> (Vallee et al., 2004); and	Section 11.1.4
B71 (f) (iv)	maximise the salvage of resources, including tree hollows, vegetation and soil resources, for beneficial reuse, including fauna habitat enhancement;	Section 11.1.3
B71 (g)	describe the measures to be implemented on the site to:	

Condition	Condition Details	MP Section
B71 (g) (i)	– minimise impacts on fauna habitat resources such as hunting and foraging areas, habitat trees, fallen timber and hollow-bearing trees;	Section 11.1 and Section 11.5
B71 (g) (ii)	– enhance the quality of vegetation, vegetation connectivity and wildlife corridors including through the assisted regeneration and/or targeted revegetation of appropriate canopy, sub-canopy, understorey and ground strata;	Section 12
B71 (g) (iii)	– introduce naturally scarce fauna habitat features such as nest boxes and salvaged tree hollows and promote the use of these introduced habitat features by threatened fauna species;	Section 11.5
B71 (g) (iv)	– manage any potential conflicts with Aboriginal heritage values; and	Section 11.1.1
B71 (g) (v)	– protect vegetation and fauna habitat outside of the approved disturbance areas, including stands of Weeping Myall (<i>Acacia pendula</i>)	Section 11.8
B71 (g) (vi)	– manage potential indirect impacts on threatened flora and fauna species, including Swift Parrot, Regent Honeyeater, Spotted-tail Quoll and Koala;	Section 11.1 and Section 11.8
B71 (g) (vii)	– manage the collection and propagation of seed from the local area;	Section 11.6
B71 (g) (viii)	– control weeds, including measures to avoid and mitigate the spread of noxious weeds ;	Section 11.2
B71 (g) (ix)	– control feral pests with consideration of actions identified in relevant threat abatement plans;	Section 11.3
B71 (g) (x)	– control erosion;	Section 11.8
B71 (g) (xi)	– manage any grazing and agriculture;	Section 11.9
B71 (g) (xii)	– control access to vegetated or revegetated areas; and	Section 11.8
B71 (g) (xiii)	– manage bushfire hazards;	Section 11.4
B71 (h)	• include a seasonally-based program to monitor and report on the effectiveness of the above measures, progress against the detailed performance and completion criteria, and improvements that could be implemented to improve biodiversity outcomes;	Section 13

Condition	Condition Details	MP Section
B71 (i)	identify the potential risks to the successful implementation of the Biodiversity Offset Strategy, and include a description of the contingency measures to be implemented to mitigate against these risks; and	Section 14.1
B71 (j)	include details of who would be responsible for monitoring, reviewing, and implementing the plan.	Section 16

5.2 Environment Protection and Biodiversity Conservation Act 1999

United Wambo received Controlled Action Approval 2015/7600, issued by the Commonwealth Department of Environment and Energy (DoEE) under the authority of the EPBC Act. Conditions within EPBC 2015/7600 that regulate biodiversity management at the United Wambo JV project are provided in **Table 5-2**. Offsetting matters relating to EPBC Act issues are detailed in **Section 10.3**.

Table 5-2: EPBC E015/7600 Requirements for Biodiversity Management

Condition	Condition Details	Section Addressed
2	Within the area shown at Annexure 1 (2015/7600), the approval holder must not clear more than:	
2 (a)	203.7 hectares of Regent Honeyeater (<i>Anthochaera phrygia</i>) habitat;	Table 10-15
2 (b)	203.7 hectares of Swift Parrot (<i>Lathamus discolor</i>) habitat;	Table 10-15
2 (c)	352.9 hectares of Spotted-tail Quoll (<i>Dasyurus maculatus maculatus</i>) habitat; and	Table 10-15
2 (d)	246.8 hectares of the <i>Central Hunter Valley Eucalypt Forest and Woodland</i> ecological community.	Table 10-15
3	The approval holder must comply with the State development consent conditions B55, B56, B57, B58, B59, B60, B61, B62, B69, B71, B72 and B73.	Section 10
3 (a)	To compensate for the loss of the listed threatened species and ecological community habitat identified at condition 2, the approval holder must submit the Biodiversity Offset Strategy plan (specified at condition B71 (e) of the State development consent) to the Department for approval.	Section 10
3 (a) (i)	The approval holder must not commence Phase 1A until the Biodiversity Offset Strategy plan has been approved by the Department.	Section 10

Condition	Condition Details	Section Addressed
3 (a) (ii)	The approval holder must implement the Biodiversity Offset Strategy plan as approved by the Department.	Section 10
4	The approval holder must comply with the State development consent conditions B97, B98, B100, B101, B102, B103, B104 and B105.	Refer to RMP
9	The approval holder must:	
9 (a)	submit the Biodiversity Offset Strategy plan at condition 3 (a) electronically to the Department for approval;	Section 10
9 (b)	publish the Biodiversity Offset Strategy plan on the website within 20 business days of the date the Biodiversity Offset Strategy plan is approved by the Department or of the date a revised Biodiversity Offset Strategy plan is submitted to the Department, unless otherwise agreed to in writing by the Department;	Section 10
9 (c)	exclude or redact sensitive ecological data from the Biodiversity Offset Strategy plan published on the website or provided to a member of the public; and	Section 10
9 (d)	keep the Biodiversity Offset Strategy plan published on the website until the end date of this approval.	Section 10

6. Glencore Coal Assets Australia Requirements

Glencore Coal Assets Australia (GCAA) operations requires that all sites meet the requirements of Glencore HSEC Policies and Standards, State and Commonwealth Approval Conditions, legal and statutory obligations and relevant industry guidelines relating to the establishment of biodiversity objectives, conservation outcomes and monitoring programs.

This BMP has been prepared in consideration of the GCAA standards and protocols.

7. Stakeholder Consultation

As required by Condition B71 (b) of SSD 7142, this BMP has been prepared in consultation with the Biodiversity & Conservation Division (BCD) within the former Department of Planning, Industry and Environment (DPIE), now Department of Planning and Environment (DPE) and submitted to the Secretary for approval.

The BMP was provided to BCD for consultation on 5 September 2019. BCD declined to comment on the BMP, noting that the BMP could be provided to the Energy and Resources Division of DPIE without their comment.

Furthermore, the BMP includes a recommendation from the BCD in regard to the Rehabilitation Management Plan to incorporate an additional monitoring activity within the rehabilitation. This is described in **Section 13.4.1**.

The BMP was submitted to the Secretary for approval on 5 September 2019. DPIE provided comments on 11 October 2019, and the BMP was subsequently updated and resubmitted for approval on 6 November 2019. Approval was received from DPIE on 12 November 2019.

The BMP was reviewed for Phase 1B of SSD 7142, and only minor formatting changes were made. The BMP was resubmitted to DPIE in June 2020 and was approved on 13 July 2020 following some minor comments being addressed.

Feedback and correspondence in relation to the BMP is provided in **Appendix A - Stakeholder Consultation**.

A copy of the DPIE approval of the BMP is in **Appendix A - Stakeholder Consultation**.

8. Preparation of the BMP

This BMP has been prepared by Umwelt and United Wambo.

In recognition of the requirements of Condition B71 (a) of SSD 7142, the draft BMP prepared by United Wambo has been reviewed by suitably experienced and qualified ecologists at Umwelt. The detailed review of the BMP has been undertaken by Senior Ecologist and Accredited BAM Assessor Bill Wallach with additional review undertaken by Principal Ecologist/Environmental Scientist, Naomi Buchhorn. A letter of confirmation from Umwelt is provided in **Appendix C - Correspondence from Umwelt**.

9. Existing Environment

The existing environment of United Wambo has been assessed in detail in the following:

- Environmental Impact Statement, Umwelt August 2016 (EIS), including UHSA Statement of Consistency, Umwelt August 2016 (refer to Appendix 13);
- Response to Submissions Part B, Umwelt May 2017 (RTS), including the Biodiversity Assessment Report, Umwelt May 2017 (refer to Appendix 4); and
- Response to IPC Review Report, Umwelt June 2018, including Addendum Report for Additional Offset Sites, Umwelt May 2018.

A summary of the information presented in these assessments is provided in the sections below.

9.1 Project Disturbance Area

The Project Area for United Wambo covers approximately 3015 hectares, which is mostly land that is already disturbed from existing mining operations (or is subject to disturbance under an existing mining approval). The Project Disturbance Area is approx. 2752 hectares and covers the area approved for surface disturbance under DA 305-7-2003 and the 673 hectares 'Additional Disturbance Area' approved under SSD 7142 (see **Figure 9-1**).

Initially, an additional 714 hectares was proposed to be disturbed as a result of the Project, however, the Project design was refined to reduce the additional disturbance footprint by 37 hectares. This

reduction in the additional disturbance footprint has resulted in the following reductions in impacts to Biodiversity from the Project:

- avoidance of impacts on 19.2 hectares of vegetation conforming to the EPBC Act listed Central Hunter Valley Eucalypt Forest and Woodland Critically Endangered Ecological Community (CEEC);
- avoidance of impacts on 27.1 hectares of native woodland vegetation and fauna habitat; and
- avoidance of impacts on 7.9 hectares of native grassland vegetation.

An additional reduction of approximately four hectares was made to the additional disturbance area following surveying of the Project Area site boundaries. The surveys identified that the NSW Government supplied cadastral boundaries used to determine the Project Area are not survey-accurate, which required a minor amendment to the Project Area and additional disturbance area was required along the northern boundary.

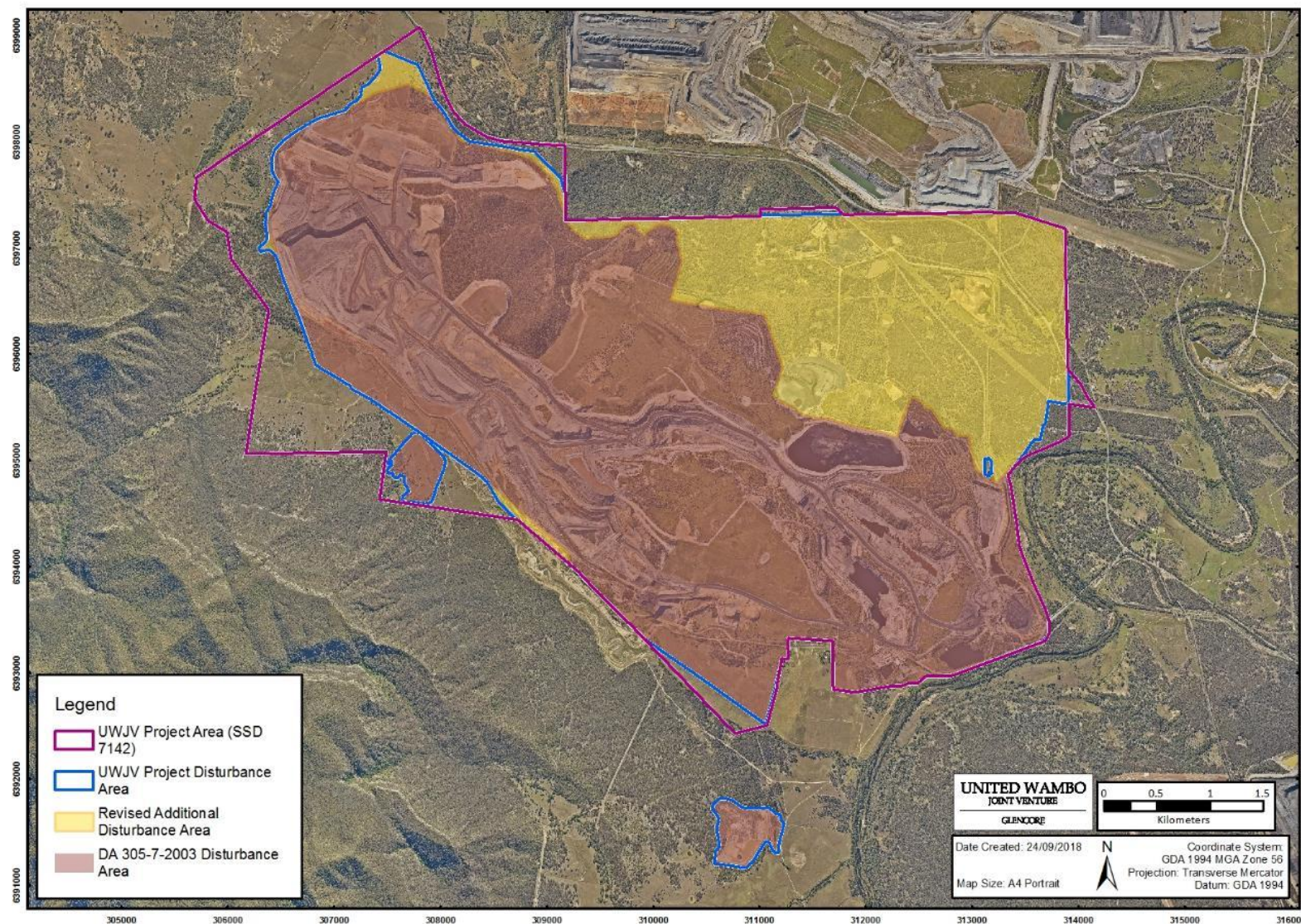


Figure 9-1: Project Disturbance Area

Number: [UWOC 1689771511-878](#)/[UWOC-1689771511-368](#)
Owner: Environment & Community Manager

Status: [Draft](#)/[Approved](#)
Version: [0-12.0](#)

Effective: [21/04/2021](#)
Review: [21/04/2022](#)

9.2 Climatic Conditions

The annual statics for wind speed, temperature and rainfall data for the Jerrys Plains region is provided in **Table 9-1**.

Table 9-1: Annual Climate Statistics

Month	2019 Monthly Mean ¹		2019 Total Rainfall ¹ (mm)	Historical Averages ²		
	Min Temp (°C)	Max Temp (°C)		Min Temp (°C)	Max Temp (°C)	Rainfall Median (mm)
January	21.6	36.2	78.2	17.2	31.8	77.1
February	18.0	31.8	29.2	17.1	30.9	73.1
March	17.6	30.0	166.2	15.0	28.9	59.7
April	12.0	26.2	6.6	11.0	25.3	44.0
May	7.2	22.6	12.4	7.4	21.3	40.7
June	5.1	19.4	5.4	5.3	18.0	48.1
July	4.1	19.8	16.8	3.8	17.4	43.4
August	3.7	21.0	28.6	4.4	19.4	36.1
September	8.2	25.4	23.4	7.0	22.9	41.7
October	10.6	29.4	1.2	10.3	26.3	51.9
November	14.1	32.0	19.4	13.2	29.1	61.9
December	16.9	33.7	0.0	15.7	31.2	67.5

¹ Data taken from Wambo meteorological station

² Data from Jerrys Plains Post Office (www.bom.gov.au)

9.3 Topography, Drainage and Natural Features

The topography of the Project Area is characterised by gently sloping alluvial plains and undulating hills, with lower topographic areas associated with drainage lines. The foothills of the Wollemi National Park lie to the west of the existing Wambo Open Cut and form the dominant landscape feature surrounding United Wambo. There is also a minor ridgeline extending to a height of 200 metres AHD, situated to the north-west of United Wambo.

The majority of the Project Area is located within the catchment area of Wollombi Brook, which is a major tributary of the Hunter River. This catchment includes sub-catchments of Wambo Creek, North Wambo Creek and Redbank Creek.

North Wambo Creek is a tributary of Wollombi Brook flowing in a generally south-easterly direction through and along the southern flank of the Project Area and joining Wollombi Brook approximately one kilometre south of the Project Area. A section of North Wambo Creek has previously been diverted as part of the approved Wambo Open Cut mining operation.

South Wambo Creek, including its tributary, Stony Creek, flows in a north-easterly direction and joins Wollombi Brook approximately two kilometres upstream of the Project Area.

Redbank Creek is a fourth order watercourse that flows in an easterly direction through the Project Area before joining Wollombi Brook approximately four kilometres upstream of the confluence with Hunter River. Redbank Creek is an ephemeral watercourse with flows only occurring in the creek during storm events or after prolonged rainfall. Redbank Creek and its catchment are highly modified due to mining activities, with Redbank Creek flowing through the centre of the United mine site and into a clean water catch dam. Redbank Creek will be removed within the Project Disturbance Area as part of mining operations at United Wambo.

Waterfall Creek, a sub-catchment and minor tributary of the Hunter River, is a minor drainage line located to the north of United Wambo, which flows away from the Project Area in a north-easterly direction into the Hunter River.

Previous mining operations within the Project Area have modified local catchments through the capture of runoff from mining areas within the water management systems of both the existing United and Wambo Mines and diversion of upslope runoff around the mining operations.

9.4 Landuse and Vegetation History

The landscape is characterised by mining land, grazing land, cropping and dairying on the Hunter River alluvial zone and some private and public woodland. Wollemi National Park is located approximately 0.5 kilometre west of United Wambo at its closest point to the western boundary of the Project Area.

The landuse within and surrounding United Wambo is dominated by existing coal mining activities including United, Wambo and Hunter Valley Operations and the associated mine-owned buffer land, which is predominantly utilised for grazing.

Prior to the establishment of mining operations, the area had a long history of agricultural land uses, such as grazing.

The Project Area contains large areas of cleared and disturbed land due to a combination of mining operations and infrastructure, infrastructure corridors and past agricultural clearing.

There are substantial areas of remnant vegetation also present within the Project Area, including native vegetation communities providing woodland, riparian, shrubland and grassland habitat and rehabilitated communities. Farm dams and ephemeral watercourses provide drinking water for fauna species.

Due to widespread clearing in the area, most woodland areas are less than approximately 55 years in age and dominated by regenerating and 'middle aged' trees of less than 35 years. The majority of the native vegetation is regrowth revegetation from the period between 1983 and 1992, i.e. at most 35 years old (regrown since 1983), which is most likely related to change in land use from agriculture to mining during this period.

9.5 Native Vegetation

There are six Plant Community Types (PCTs) identified across 10 condition classes within the Additional Disturbance Area, as identified in the Biodiversity Assessment Report completed for the Project. Eight of the vegetation zones conform to Threatened Ecological Communities (TECs) listed

under the state *Biodiversity Conservation Act, 2016* (BC Act) and the Commonwealth EPBC Act. The PCTs and listed TECs identified within the Project Area are summarised in **Table 9-2** and illustrated in **Figure 9-2, Figure 9-3 and Figure 9-4**.

Table 9-2: Project Area Vegetation Communities and Threatened Ecological Communities

PCT/BVT Number	PCT/Vegetation Zone	Area (ha)	Condition	Threatened Ecological Communities
1598/HU812	Forest Red Gum grassy open forest on floodplains of the lower Hunter	0.29	Moderate to Good	<i>Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions EEC</i> (BC Act)
1602/HU816	Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the central and lower Hunter	29.42	Moderate to Good – Plantation/ Rehabilitation	<i>Central Hunter Ironbark – Spotted Gum – Grey Box Forest in NSW North Coast and Sydney Basin Bioregion EEC</i> (BC Act) <i>1.17 ha Central Hunter Valley Eucalypt Forest and Woodland CEEC</i> (EPBC Act)
1655/HU869	Grey Box - Slaty Box shrub - grass woodland on sandstone slopes of the upper Hunter and Sydney Basin	1.56	Moderate to Good	<i>Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion VEC</i> (BC Act) <i>1.13 ha Central Hunter Valley Eucalypt Forest and Woodland CEEC</i> (EPBC Act)
1691/HU905	Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter	93.70	Low Condition – Derived Native Grassland	<i>10.49 ha Central Hunter Valley Eucalypt Forest and Woodland CEEC</i> (EPBC Act)
		146.09	Moderate to Good	<i>Central Hunter Grey Box – Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions</i> (BC Act) <i>143.46 ha Central Hunter Valley Eucalypt Forest and Woodland CEEC</i> (EPBC Act)
		80.07	Moderate to Good – Cooba Open Shrubland	NA
		26.55	Moderate to Good – Regeneration	<i>Central Hunter Grey Box – Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions EEC</i> (BC Act)

PCT/BVT Number	PCT/Vegetation Zone	Area (ha)	Condition	Threatened Ecological Communities
				22.79 ha <i>Central Hunter Valley Eucalypt Forest and Woodland CEEC</i> (EPBC Act)
		0.08	Moderate to Good – Thinned Canopy	<i>Central Hunter Grey Box – Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions EEC</i> (BC Act) 0.08 ha <i>Central Hunter Valley Eucalypt Forest and Woodland CEEC</i> (EPBC Act)
1692/HU906	Bull Oak grassy woodland of the central Hunter Valley	117.43	Moderate to Good	3.10 ha <i>Central Hunter Grey Box – Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions EEC</i> (BC Act) 10.19 ha <i>Central Hunter Valley Eucalypt Forest and Woodland CEEC</i> (EPBC Act)
1731/HU945	Swamp Oak - Weeping Grass grassy riparian forest of the Hunter Valley	31.50	Moderate to Good	NA

CEEC Critically Endangered Ecological Community

EEC Endangered Ecological Community

VEC Vulnerable Ecological Community

Within the footprint of the Wambo Open Cut, there is, as of November 2020, 99 hectares of native vegetation that has been approved for disturbance under DA 305-7-2003. This vegetation has been mapped as Narrow-leaved Ironbark – Grey Box Woodland, which conforms to the threatened ecological communities *Central Hunter Grey Box – Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions* (BC Act) and *Central Hunter Valley Eucalypt Forest and Woodland CEEC* (EPBC Act). The approval and offsetting of this disturbance has been accounted for under DA 305-7-2003. Impacts on this vegetation will be managed in accordance with the management and mitigation measures detailed in **Section 11**.

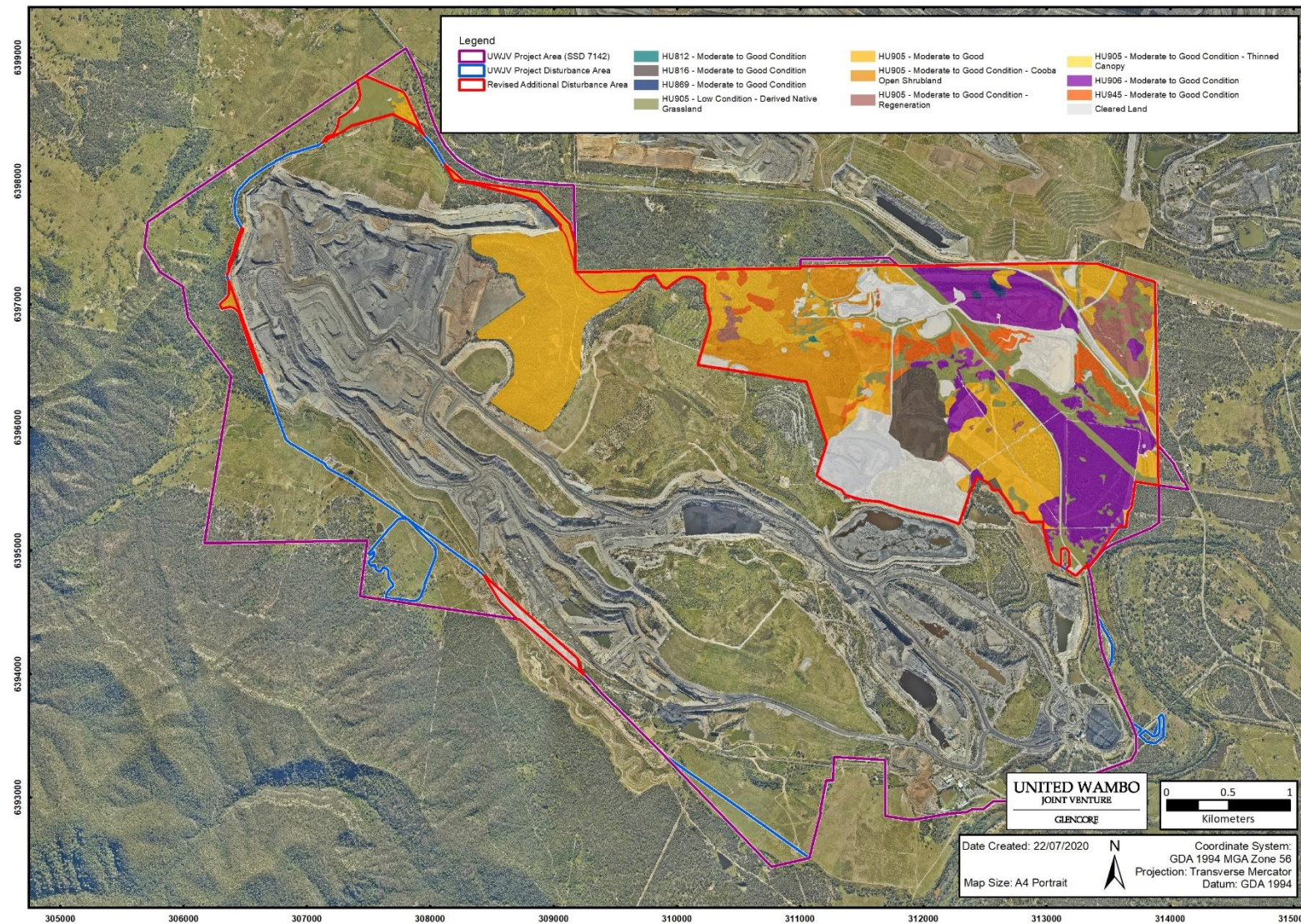


Figure 9-2: Vegetation Zones in the Additional Disturbance Area

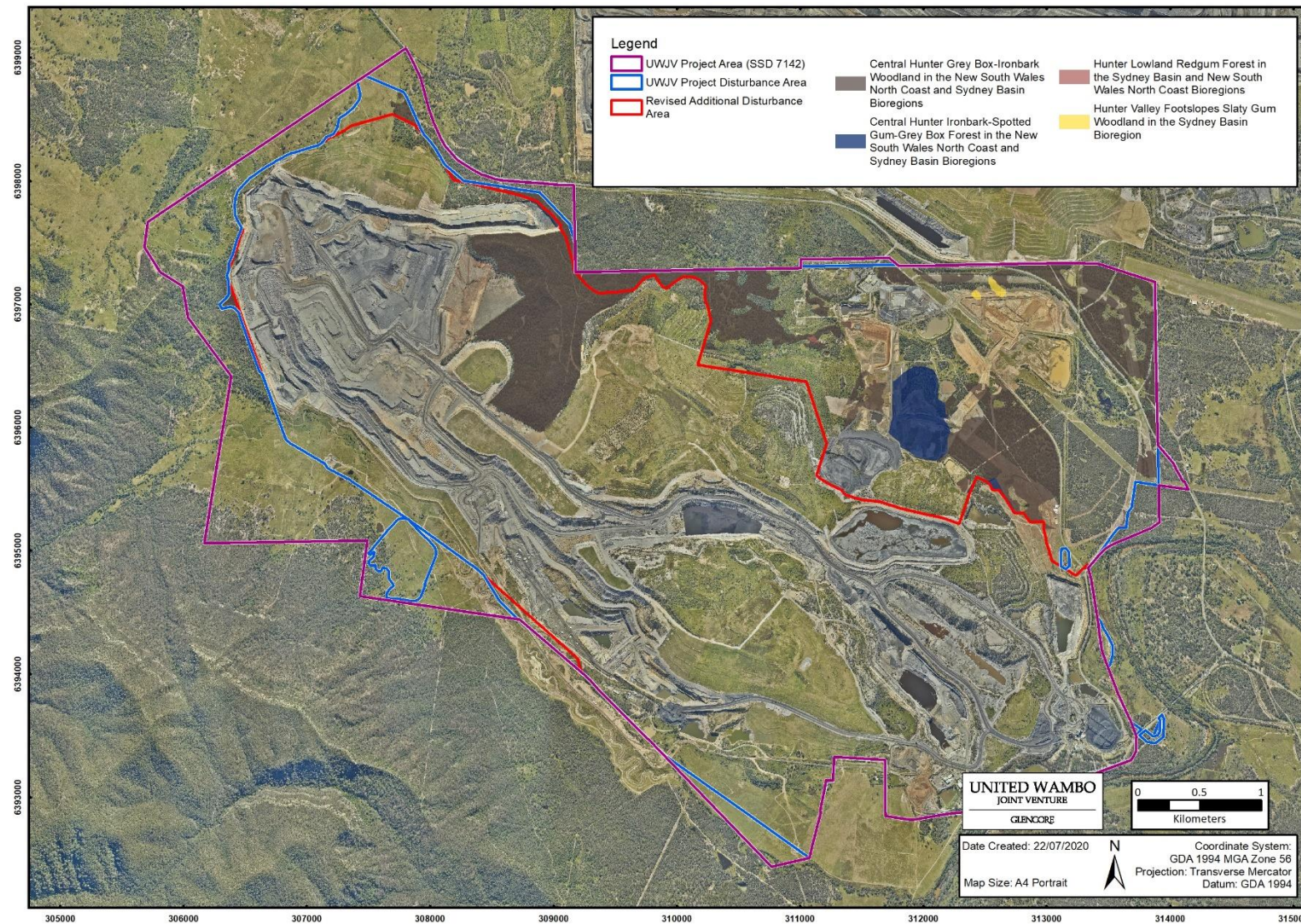


Figure 9-3: Threatened Ecological Communities Listed under the Biodiversity Conservation Act

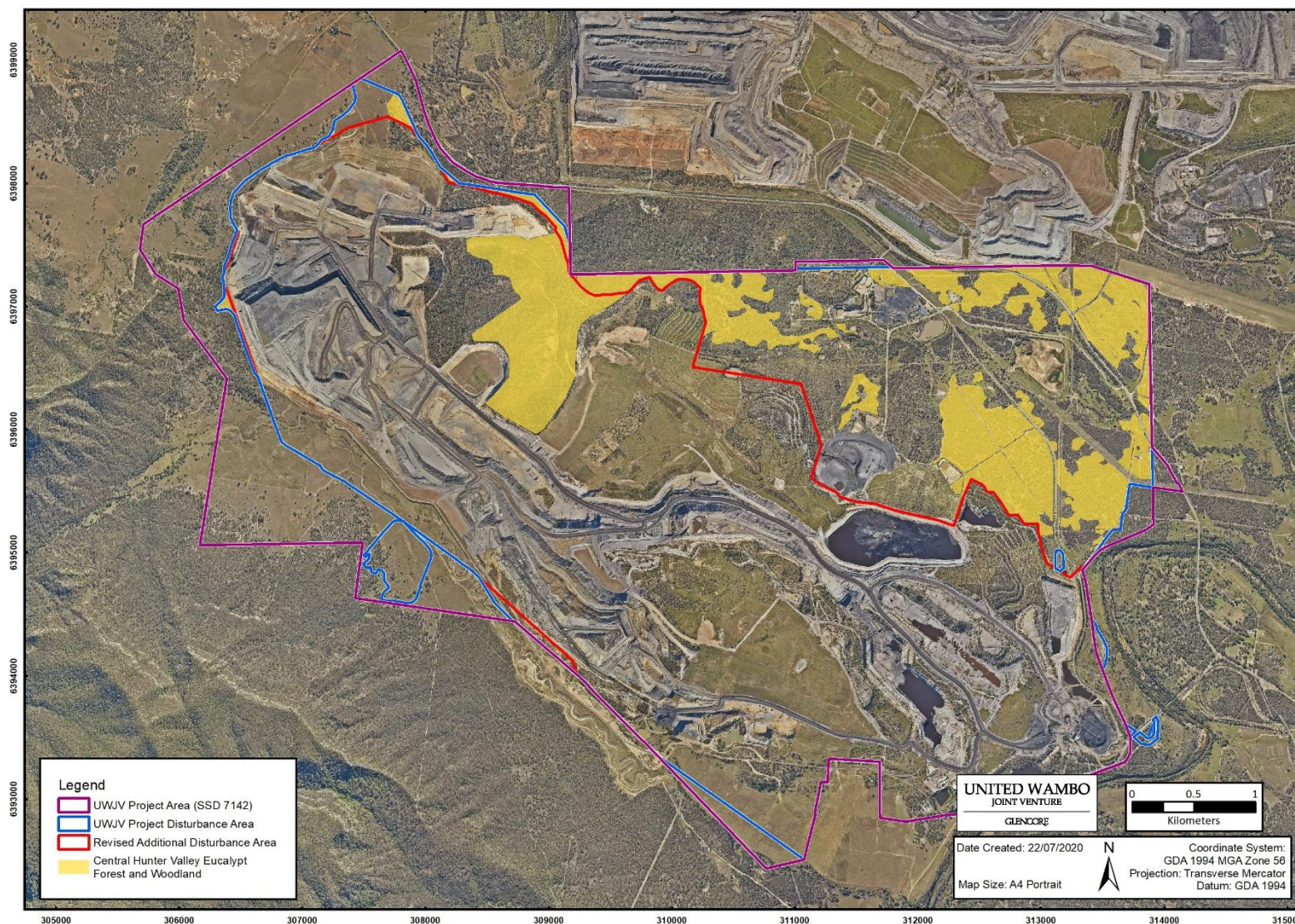


Figure 9-4: Central Hunter Valley Eucalypt Forest and Woodland CEEC under the EPBC Act

All other areas not mapped as part of a vegetation zone were cleared land, heavily disturbed areas or non-native. Cleared land comprised disturbed land, grassland rehabilitation areas, woodland rehabilitation areas with poor or absent understorey and groundcover layers, mixed species revegetation planation and water bodies. There was a total of 146.67 hectares mapped within the development footprint.

A full description of the vegetation communities present within the Project Area is included in Section 3.2.1 of the Biodiversity Assessment Report (refer to Appendix 4 of the RTS).

9.6 Threatened Species

In accordance with the FBA methodology, species are categorised as either ecosystem-credit species or species-credit species, which are defined as:

- ecosystem-credit species: species that can be reliably predicted to occur in PCTs and have high likelihood of occurring on site, therefore, targeted surveys are not required; or
- Species-credit species: species that cannot be reliably predicted based on a PCT, distribution or otherwise on the site. Targeted surveys are required to determine their presence or otherwise on site.

9.6.1 Ecosystem-Credit Species

The ecosystem-credit species recorded within the Additional Disturbance Area during surveys undertaken for the Biodiversity Assessment Report, Atlas of NSW Wildlife records or previous surveys are listed in **Table 9-3** and illustrated in **Figure 9-5**.

Table 9-3: Ecosystem-Credit Species

Species Name	BC Act	EPBC Act
Diamond firetail - <i>Stagonopleura guttata</i>	Vulnerable	-
East coast freetail-bat - <i>Mormopterus norfolkensis</i>	Vulnerable	-
Glossy black-cockatoo - <i>Calyptorhynchus lathami</i>	Vulnerable	-
Greater broad-nosed bat - <i>Scoteanax rueppellii</i>	Vulnerable	-
Grey-crowned babbler - <i>Pomatostomus temporalis</i> subsp. <i>temporalis</i>	Vulnerable	-
Hooded robin - <i>Melanodryas cucullata</i> subsp. <i>cucullata</i>	Vulnerable	-
Speckled warbler - <i>Chthonicola sagittata</i>	Vulnerable	-
Spotted-tailed quoll - <i>Dasyurus maculatus</i>	Vulnerable	Endangered
Varied sittella - <i>Daphoenositta chrysoptera</i>	Vulnerable	-
Yellow-bellied sheath-tail-bat - <i>Saccolaimus flaviventris</i>	Vulnerable	-

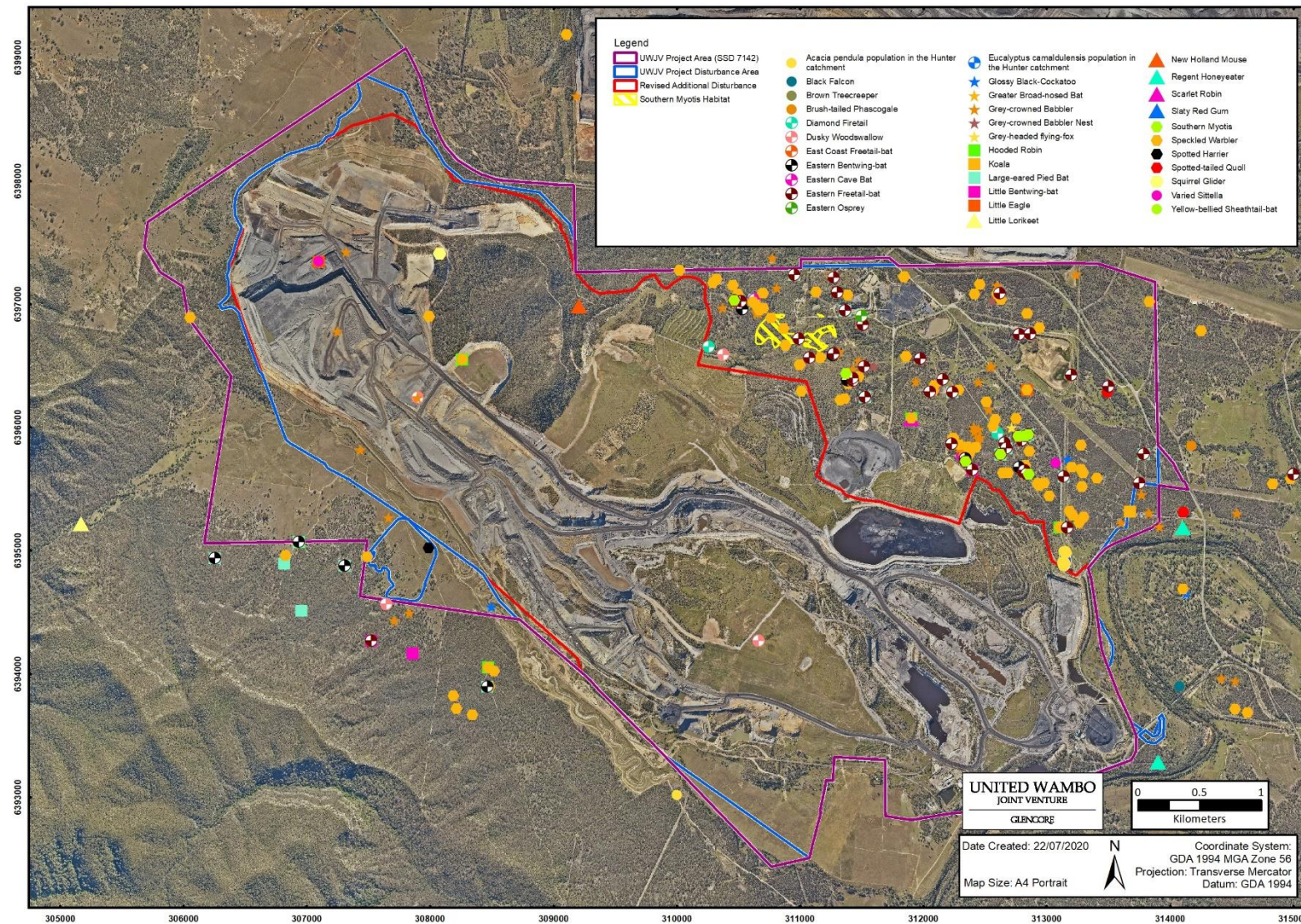


Figure 9-5: Threatened Ecosystem and Species-Credit Species at United Wambo

9.6.2 Species-Credit Species

Two species-credit species have been recorded in the United Wambo Project Area. These species are outlined in **Table 9-4** and illustrated in **Figure 9-5**.

Table 9-4: Species-Credit Species Recorded Within the United Wambo Project Area

Species Name	Impacted by the Project	Justification
Eastern osprey <i>Pandion cristatus</i>	No	The single record of the eastern osprey occurs in the United Wambo Project Area. This species was observed roosting in a tree during spotlighting surveys. The OEH Atlas of NSW Wildlife does not contain any other eastern osprey records within 10 kilometres of the Project Area. The nearest records on the BCD Atlas of NSW Wildlife are approximately 60 kilometres to the east of the Development Site. The species usually prefers coastal areas, especially the mouths of large rivers, lagoons and lakes and it feeds on fish over clear, open water. Any individuals of this species recorded in the Hunter Valley are considered to be vagrants. Therefore, it is considered that the Project Area does not provide foraging habitat for this species.
Southern myotis <i>Myotis macropus</i>	Yes	Southern myotis has been recorded on three occasions within the United Wambo Project Area. The BCD Atlas of NSW Wildlife contains a total of four records within 10 kilometres of the Development Site. This species roosts close to water in caves, bridges, culverts, hollow-bearing trees and other structures. A total of 7.3 hectares of potential breeding habitat, which occurs within a 200 metre buffer of Redbank Creek, has been identified for this species within the Additional Disturbance Area.

9.7 Migratory Species

The EIS identified a total of 12 species listed as Migratory under the EPBC Act and listed under international conventions as having the potential to occur within 10 kilometres of the Project Area following a review of the DoEE Protected Matters Database. **Table 9-5** lists the species that were identified by the Protected Matters Database, and their likelihood of occurrence.

Table 9-5: Migratory Species with the Potential to Occur

Scientific Name	Common Name	International Convention
Species or Species' Habitat Known to Occur		
<i>Ardea alba</i>	Great egret	JAMBA
<i>Monarcha melanopsis</i>	Black-faced monarch	Bonn
<i>Hirundapus caudacutus</i> *	White-throated needletail	CAMBA, JAMBA, ROKAMBA

Scientific Name	Common Name	International Convention
<i>Myiagra cyanoleuca</i>	Satin flycatcher	Bonn
<i>Rhipidura rufifrons</i>	Rufous fantail	Bonn
Species or Species' Habitat Likely to Occur		
<i>Apus pacificus</i>	Fork-tailed swift	CAMBA, JAMBA, ROKAMBA
<i>Pandion cristatus</i> *	Eastern osprey	Bonn
Species or Species' Habitat May Occur		
<i>Gallinago hardwickii</i>	Latham's snipe	Bonn, JAMBA, ROKAMBA
<i>Merops ornatus</i> *	Rainbow bee-eater	JAMBA
<i>Ardea ibis</i>	Cattle egret	JAMBA
<i>Motacilla flava</i>	Yellow wagtail	CAMBA, JAMBA, ROKAMBA
<i>Tringa nebularia</i>	Common greenshank	Bonn, CAMBA, JAMBA, ROKAMBA

* Species has been recorded in the Project Area

9.8 Groundwater Dependent Ecosystems

9.8.1 Potential GDEs Within the Additional Disturbance Area

Potential groundwater dependent ecosystems (GDEs) within the Additional Disturbance Area, as identified in the EIS, comprise the following vegetation types:

- Swamp Oak – Weeping Grass Grassy Riparian Forest (vegetation zone 11); and
- Forest Red Gum Grassy Open Forest on Floodplains (vegetation zone 2).

Both occur in a patchy distribution along Redbank Creek. The remaining vegetation types within the riparian zone (e.g. grassland communities) are unlikely to be GDEs.

The two potential GDEs will be removed within the Project Additional Disturbance Area as part of mining operations at United Wambo.

9.8.2 Potential GDEs Outside of the Additional Disturbance Area

The Groundwater Impact Assessment for the Project identified two areas within the zone of cumulative drawdown that have been labelled for the purpose of the groundwater impact assessment as GDE1 and GDE2 (refer to **Figure 9-6**).

Potential GDEs occurring at GDE1 include areas of Central Hunter Swamp Oak Forest and a small number of River Red Gum trees along Redbank Creek, areas of Hunter Valley River Oak Forest, some River Red Gum trees and Hunter Floodplain Redgum Woodland Complex along Wollombi Brook.

Potential GDEs occurring at GDE2 include areas of Hunter Valley River Oak Forest.

GDE 1 and GDE 2 will be impacted by groundwater level due to cumulative impacts from mining (nearby operations and the Project).

Baseline vegetation condition monitoring has been undertaken prior to mining and further condition monitoring will be triggered by measurable impacts on alluvial groundwater levels in the vicinity of the GDEs that are attributable to the Project. The GDE Monitoring Program will be developed and described in detail in **United Wambo Groundwater Management Plan** prepared as per consent conditions B51 and B52 (e: v) of SSD 7142.

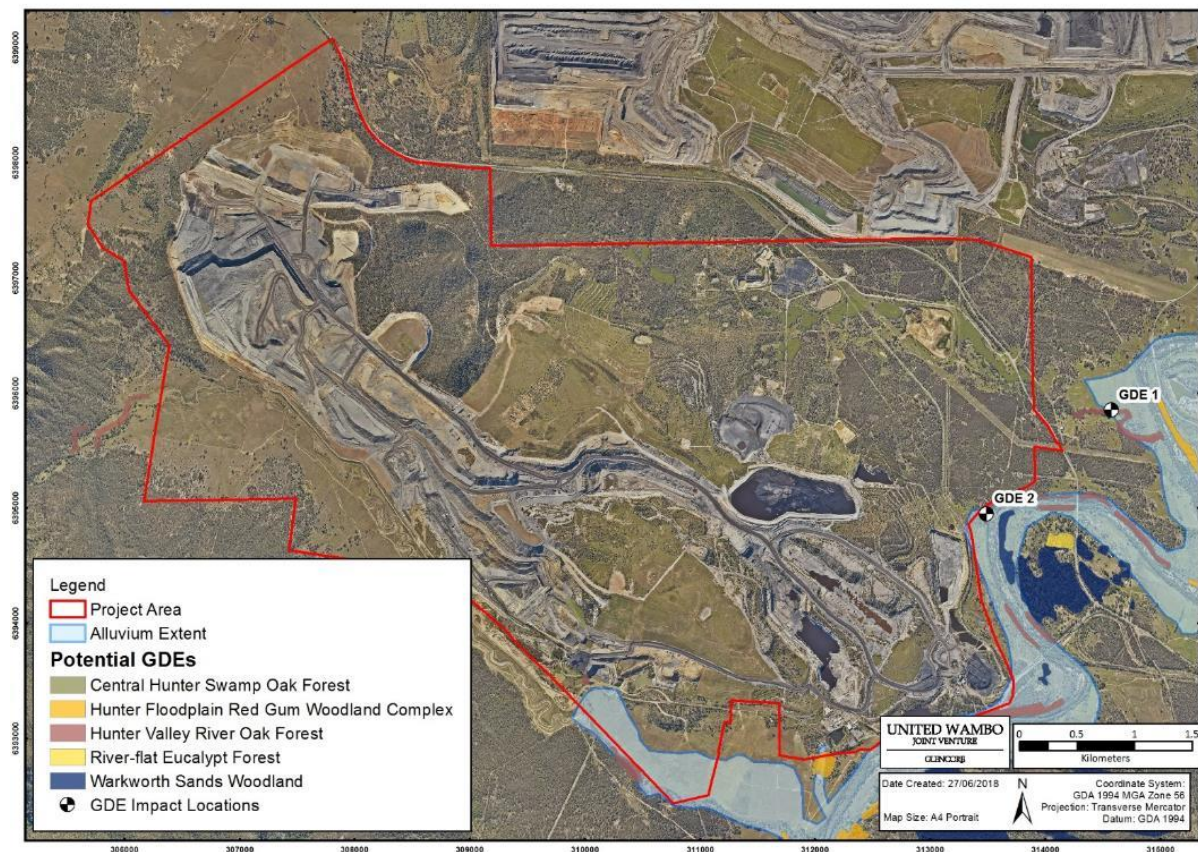


Figure 9-6: GDE Locations

9.8.3 Stygofauna

An assessment of the presence and potential impacts on stygofauna communities within the aquifers surrounding United Wambo was undertaken by Stygoecologia. The assessment was completed in accordance with the *Risk Assessment Guidelines* for Groundwater Dependent Ecosystems (Serov et al. 2012). The assessment showed that stygofauna exist in small isolated populations within the shallow alluvial aquifers in the area surrounding the Project Area, including those associated with Wollombi Brook and North Wambo Creek.

The relative consistency of the stygofauna community composition between the bores and aquifers surveyed indicates connectivity within the shallow alluvial aquifers and consistency in the environmental conditions of this aquatic ecosystem. The biodiversity of the stygofauna community across the alluvial aquifers was found to be high with hotspots of biodiversity that potentially have a high degree of endemism.

United Wambo has undertaken monitoring of stygofauna in the alluvial aquifers within (or near to, subject to bore suitability) the predicted drawdown areas prior to the commencement of mining and will continue to monitor every three years thereafter. The Stygofauna Monitoring Program is described in the **United Wambo Groundwater Management Plan**, prepared as per consent condition B52 (e: v) of SSD 7142.

10. Biodiversity Offset Strategy

United Wambo has established a Biodiversity Offset Strategy (BOS) to appropriately compensate for the unavoidable loss of ecological values as a result of the United Wambo Project. The BOS consists of the following:

- establishment of United Wambo managed Biodiversity Stewardship Sites (BSSs) under Biodiversity Stewardship Agreements, ensuring in-perpetuity conservation and reporting consistent with the Biodiversity Offsets Scheme ;
- ecological mine rehabilitation (see **Section 12**) contributing up to 25 per cent of the overall biodiversity offset requirements and up to 20 per cent of the Central Hunter Valley Eucalypt Forest and Woodland CEEC requirements, including:
 - restoration of up to 878 hectares of native vegetation communities (including *Central Hunter Valley Eucalypt Forest and Woodland CEEC*); and
- payments into the Biodiversity Offset Fund and/or establishment of further offset sites for the residual credits that need to be retired.

In-perpetuity conservation will be achieved through the retirement of biodiversity credits through the establishment of the following BSSs:

- Highfields Biodiversity Stewardship Site;
- Mangrove Biodiversity Stewardship Site;
- Wambo Biodiversity Stewardship Site;
- Jerrys Plains Biodiversity Stewardship Site;
- Brosi Biodiversity Stewardship Site; and
- South Wambo Biodiversity Stewardship Site.

A summary of each of the BSSs are provided in **Section 10.1**. This BMP solely addresses the onsite management requirements and monitoring requirements of the Ecological Mine Rehabilitation, while the management and monitoring requirements for the BSSs will be presented separately in the individual Biodiversity Stewardship Site Assessment Reports (BSSARs). The BSSARs were submitted for approval by the BCT on 2 February 2022.

The BOS was approved by DoEE prior to the commencement of Phase 1A and was published on the United website within 20 business days of DoEE approval. Where appropriate, sensitive ecological data has been excluded or redacted.

10.1 Biodiversity Stewardship Sites

The location of the stewardship sites in relation to other Glencore biodiversity offset sites, United Wambo and National Parks are displayed in **Figure 10-1**. Details on these proposed stewardship sites,

including a description of the vegetation communities mapped and species lists for flora and fauna recorded in the BSSs, is provided in the following sections.

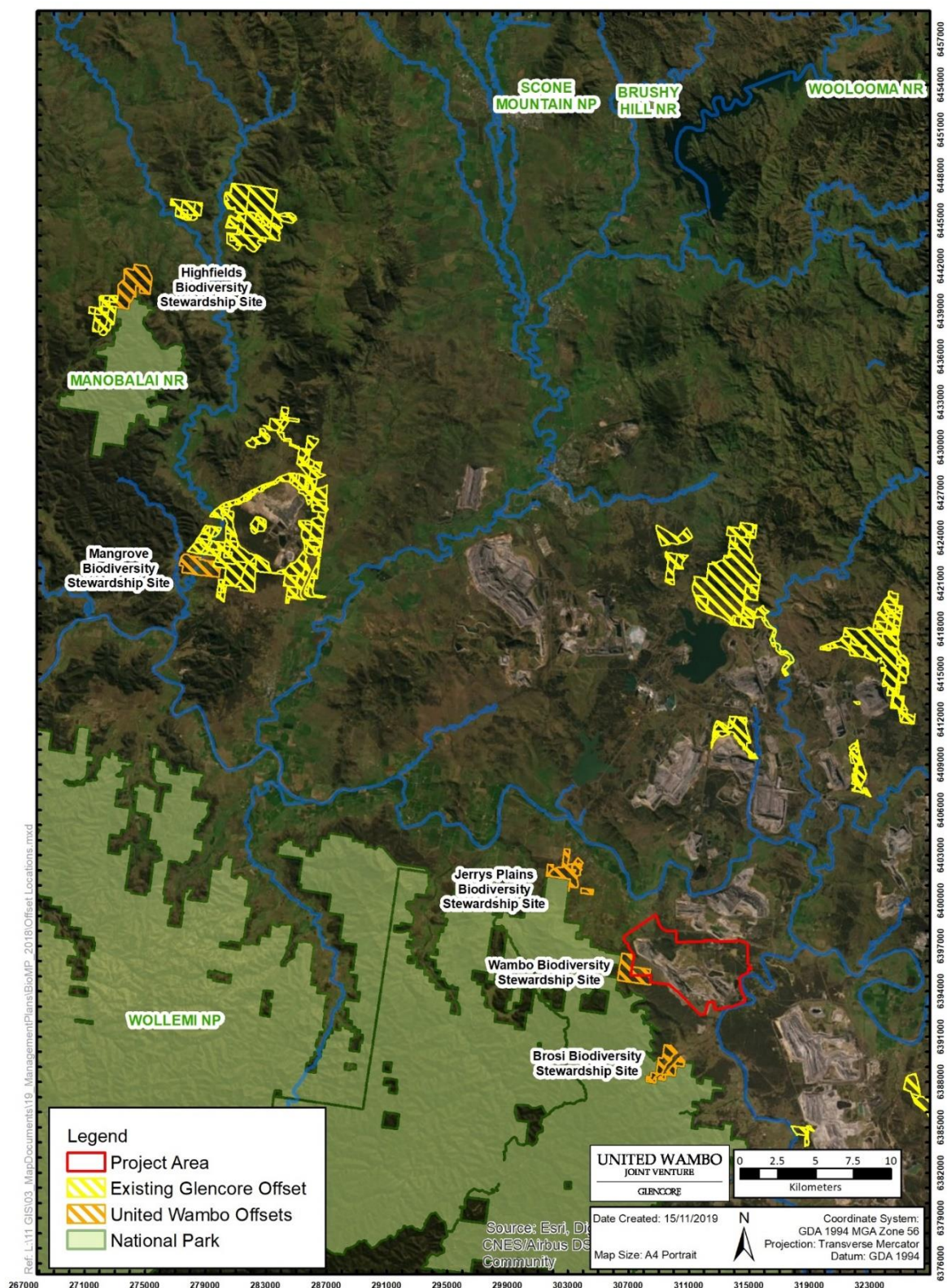


Figure 10-1: Strategic Location of Glencore and United Wambo Biodiversity Stewardship Sites

10.1.1 Highfields Biodiversity Stewardship Site

The Highfields Biodiversity Stewardship Site (Highfields Offset) comprises of land owned by Glencore and is located in the Manobalai area, approximately 60 kilometres north-west of United Wambo (refer to **Figure 10-1**).

The Highfields Offset is 427 hectares in size, with approximately 11 per cent having been previously cleared for agricultural purposes. This cleared land occurs on the lower slopes and undulating land on the plateaus. The site has steep, rising hills with vegetative cover that ranges from open to dense woodland and containing ridgelines, outcrops and caves. The remainder of the Offset is characterised by remnant woodland on the upper and lower slopes and drainage lines.

The Highfields Offset contains an array of basalt, sandstone and conglomerate outcropping, primarily along the lower slopes and within the semi-regular ridgelines that line the elevated sections. These ridgelines, which form an escarpment in elevated areas, contain numerous caves. The gullies within the Offset range from gradual to steep in slope and are generally dry with few aquatic or inundation dependent flora species present. There are a few small farm dams scattered on the lower slopes and upper plateaux of the Offset in areas cleared for livestock grazing. The alluvial flats and lower slopes trend from open grassland, to grassland with scattered trees to woodland areas, representing several different vegetation community types. The mid-slope areas tend to be dominated by forest and woodland, with woodland dominating above the ridgelines.

The historical land use of the Highfields Offset has been agricultural, primarily cattle and sheep grazing. The property has been maintained as a landholding for this purpose since the late 1800s. Currently, this property is maintained by Glencore and utilised for cattle grazing. Large portions of the property contain native vegetation cover.

10.1.1.1 Key Biodiversity Features

The Highfields Offset occupies an important position in the landscape, particularly due to its proximity to Manobalai Nature Reserve and location within the corridor proposed as part of the Great Eastern Ranges Initiative. The Highfields Offset is also located in proximity to the Reedy Valley and Esparanga Offset Sites, which were established for the approved Bulga Optimisation Project and Mount Owen Continued Operations Project in the Hunter Valley. The Highfields Offset contains the following key biodiversity features relevant for the offsetting strategy for United Wambo:

- 306 hectares of White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC under the EBPC Act, and White Box Yellow Box Blakely's Red Gum Woodland EEC under the BC Act;
- Woodland and forest habitat suitable key threatened species such as spotted-tailed quoll (*Dasyurus maculatus*), regent honeyeater (*Anthochaera phrygia*) and swift parrot (*Lathamus discolor*);
- riparian habitat associated with a third order stream being Dry Creek; and
- it is within the area targeted for conservation as part of the Great Eastern Ranges Initiative.

10.1.1.2 Native Vegetation

Surveys of the Highfields Offset identified four Biometric Vegetation Types (BVTs) and seven vegetation zones within the site, which were collated using previous survey effort and refined in accordance with the requirements under the former BioBanking Assessment Methodology (OEH 2014c) (BBAM). Within these, two vegetation types also conform to listed TECs under the BC Act and the EPBC Act. The vegetation zones, their condition classes and listed TECs are outlined in **Table 10-1** and illustrated on **Figure 10-2**. Further details and description is provided in the BAR.

Table 10-1: Plant Communities at the Highfields Biodiversity Stewardship Site

PCT/ BVT Number	Vegetation Type	Area within Offset Site (ha)	Condition	Threatened Ecological Communities
HU714	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion EPBC/TSC	2.5	Moderate to Good	<i>White Box Yellow Box Blakely's Red Gum Woodland EEC (BC Act)</i> <i>White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (EPBC Act)</i>
HU730	HU730 - White Box x Grey Box - Red Gum - Rough-barked Apple grassy woodland on rich soils on hills in the upper Hunter Valley	158.2	Moderate to Good	<i>White Box Yellow Box Blakely's Red Gum Woodland EEC (BC Act)</i> <i>White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (EPBC Act)</i>
		105.6	Moderate to Good – Shrubby variant	<i>White Box Yellow Box Blakely's Red Gum Woodland EEC (BC Act)</i> <i>White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (EPBC Act)</i>
		39.7	Moderate to Good – Derive Native Grassland	<i>White Box Yellow Box Blakely's Red Gum Woodland EEC (BC Act)</i> <i>White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (EPBC Act)</i>
HU821	Blakely's Red Gum - Narrow- leaved Ironbark - Rough- barked Apple shrubby woodland of the upper Hunter	24.9	Moderate to Good	-
HU868	Narrow-leaved Ironbark - Grey Gum shrubby open forest on sandstone ranges of the upper Hunter Valley	90.1	Moderate to Good	-
		6.5	Low	-

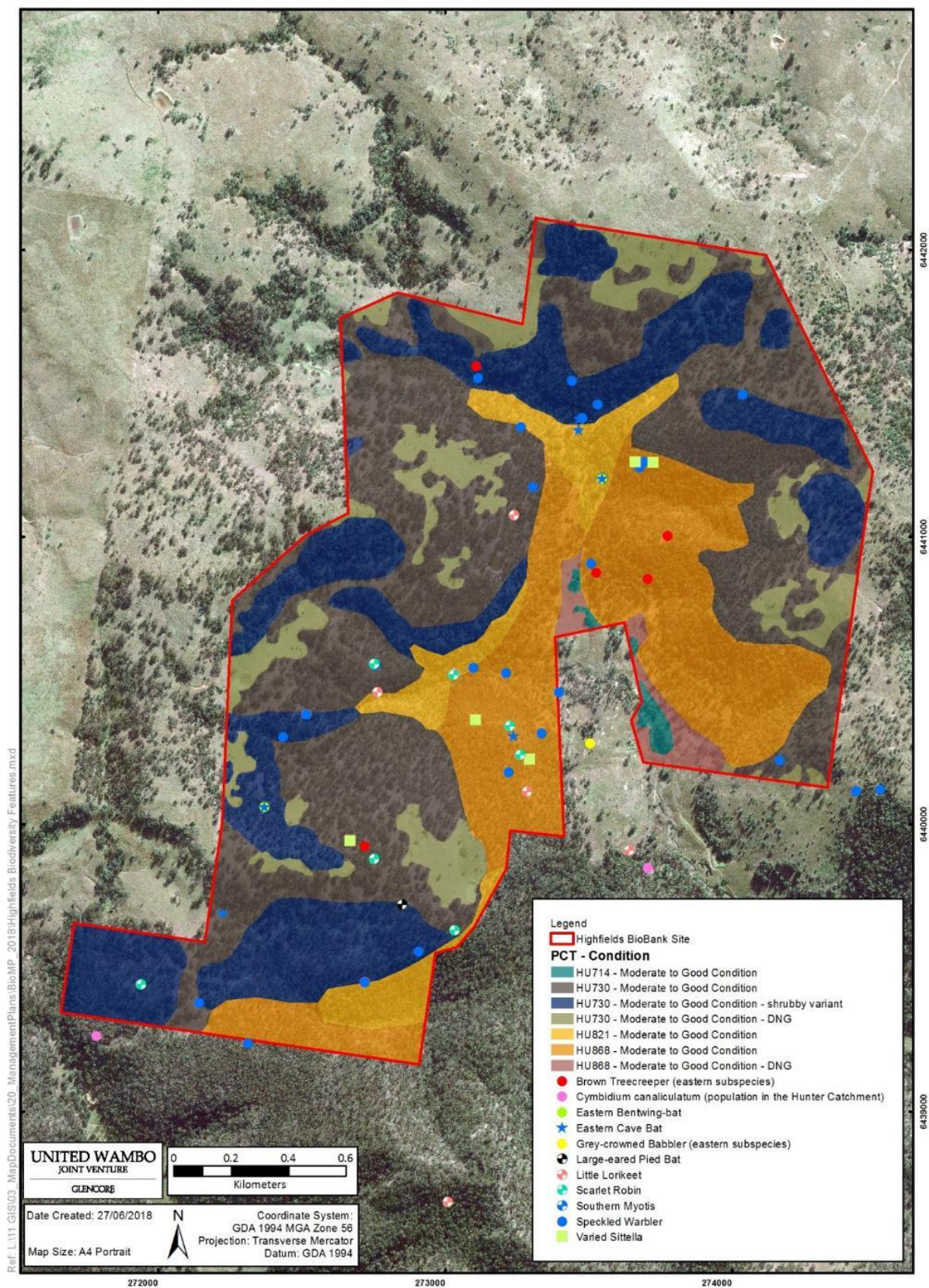


Figure 10-2: Highfields Stewardship Site Biodiversity Features

10.1.1.3 Ecosystem-Credit Species

A list of ecosystem-credit species known to occur in the Highfields Offset through previous surveys are identified in **Table 10-2**. This list will be updated if additional species are recorded during monitoring.

The location of ecosystem-credit species is shown on **Figure 10-2**.

The BAR contains a list ecosystem-credit species which may potentially occur but have not been recorded during surveys.

Table 10-2: Ecosystem-Credit Species at the Highfields Stewardship Site

Species Name	BC Act Status	EPBC Status	TS Offset Multiplier	Further Information on Records
brown treecreeper (eastern subspecies) <i>Climacteris picumnus</i> subsp. <i>victoriae</i>	V	-	2.0	Previously recorded during fauna surveys undertaken in April and May 2013
little lorikeet <i>Glossopsitta pusilla</i>	V	-	1.8	Previously recorded during fauna surveys undertaken in April and May 2013
scarlet robin <i>Petroica boodang</i>	V	-	1.3	Previously recorded during fauna surveys undertaken in May 2013
speckled warbler <i>Chthonicola sagittata</i>	V	-	2.6	Previously recorded during fauna surveys undertaken in April and May 2013 and August 2015
varied sittella <i>Glossopsitta pusilla</i>	V	-	1.3	Previously recorded during fauna surveys undertaken in April 2013

10.1.1.4 Species-Credit Species

No species-credit species are known to occur in the Highfields Offset. According to the BBCC tool and previous local records of species, the following species-credit species may occur at the Highfields Offset:

- Tiger Orchid *Cymbidium canaliculatum* Population in the Hunter Catchment – this species has been recorded immediately adjacent to the offset site boundary.

Furthermore, potential escarpment habitat for large-eared pied bat (*Chalinolobus dwyeri*), eastern bentwing-bat (*Miniopterus schreibersii oceanensis*) and eastern cave bat (*Vespadelus troughtoni*) occurs within the Highfields Offset. These species have been positively identified from echolocation recordings during fauna surveys undertaken in April and May 2013 (Umwelt 2013).

10.1.2 Mangrove Biodiversity Stewardship Site

The Mangrove Biodiversity Stewardship Site (Mangrove Offset) is owned by Glencore and is located approximately 41 kilometres north-west of United Wambo and approximately 18 kilometres south of the Highfields Offset in the Manobalai area (refer to **Figure 10-1**).

The Mangrove Offset is 259 hectares in size, with approximately 68 per cent having been cleared for agricultural purposes. This cleared land occurs on the lower and mid slopes. Steep, rising hills range from open to moderately dense woodland and contain ridgelines, outcrops and caves. The remainder of the Stewardship Site is characterised by remnant woodland on the slopes and along Wybong Creek. The site is dominated by generally cleared creek flats/floodplain, with some rock outcropping, in particular on the western end of the property. Small farm dams are scattered on the lower and mid slopes of the site, in areas cleared for livestock grazing.

Wybong Creek runs through the lowest section of the Stewardship Site and is a semi-permanent watercourse with a mix of sand-silt based pools and stony riffles. The creek has deeply incised banks, however, the floodplains are gently sloping.

The historical land use of the proposed Mangrove Stewardship site has been agricultural, primarily cattle and sheep grazing and limited crop production. Currently, this property is maintained by Glencore and utilised for cattle grazing. Sections of the property, however, contain retained native vegetation cover.

10.1.2.1 Key Biodiversity Features

The Mangrove Stewardship Site adjoins other offset sites that are protected as part of the offset for Glencore's Mangoola Mine. It will protect important lowland, river flat and creekline habitats, while also providing a link from the Mangoola offsets to vacant Crown land to the west, and ultimately to Manobalai Nature Reserve and Goulburn River National Park. The Mangrove Stewardship Site contains the following key biodiversity features relevant for the offsetting strategy for United Wambo:

- 20 hectares of Central Hunter Grey Box – Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions EEC under the BC Act;
- 15.2 hectares of Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions EEC under the BC Act and White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC under the EPBC Act;
- suitable breeding (hollow-bearing tree) habitat for southern myotis (*Myotis macropus*);
- woodland and forest habitat suitable key threatened species such as spotted-tailed quoll (*Dasyurus maculatus*), regent honeyeater (*Anthochaera phrygia*) and swift parrot (*Lathamus discolor*); and
- riparian habitat associated with a sixth order stream being Wybong Creek.

10.1.2.2 Native Vegetation

Surveys of the Mangrove Stewardship Site identified four PCTs/ BVTs and eight vegetation zones, which were collated using previous survey effort and refined following the surveys in December 2015 (as described in the BAR), in accordance with the requirements under BBAM (OEH 2014c). Within these, two vegetation zones also conform to the BC Act, whilst one conforms to the EPBC Act, listed TECs. These vegetation zones, their condition classes and listed TECs are outlined in

Table 10-3 and illustrated on **Figure 10-3**. Further details and description is provided in BAR.

Table 10-3: Plant Communities at the Mangrove Stewardship Site

PCT/ BVT Number	Vegetation Type	Area within Offset Site (ha)	Condition	Threatened Ecological Communities
HU599	River Red Gum / River Oak riparian woodland wetland in the Hunter Valley	1.80	Moderate to Good	-
		4.20	Moderate to Good – Derived Native Grasses	-
HU678	Black Cypress Pine - Ironbark+/-Narrow-leaved Wattle Low Open Forest Mainly on Narrabeen Sandstone in the Upper Hunter Region of the Sydney Basin	44.90	Moderate to Good	-
HU812	Forest Red Gum Grassy Open Forest on Floodplains of the Lower Hunter	15.20	Moderate to Good	<i>Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions EEC (BC Act)</i> <i>White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (EPBC Act)</i>
		73.80	Low Derived Native Grasses	-
HU905	Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter	20.00	Moderate to Good	<i>Central Hunter Grey Box – Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions EEC (BC Act)</i>
		86.70	Moderate to Good – Derived Native Grasses	-
HU812	Forest Red Gum Grassy Open Forest on Floodplains of the Lower Hunter	11.90	Moderate to Good - Poor	-
-	Cleared Land/ Waterbody	0.50	-	-

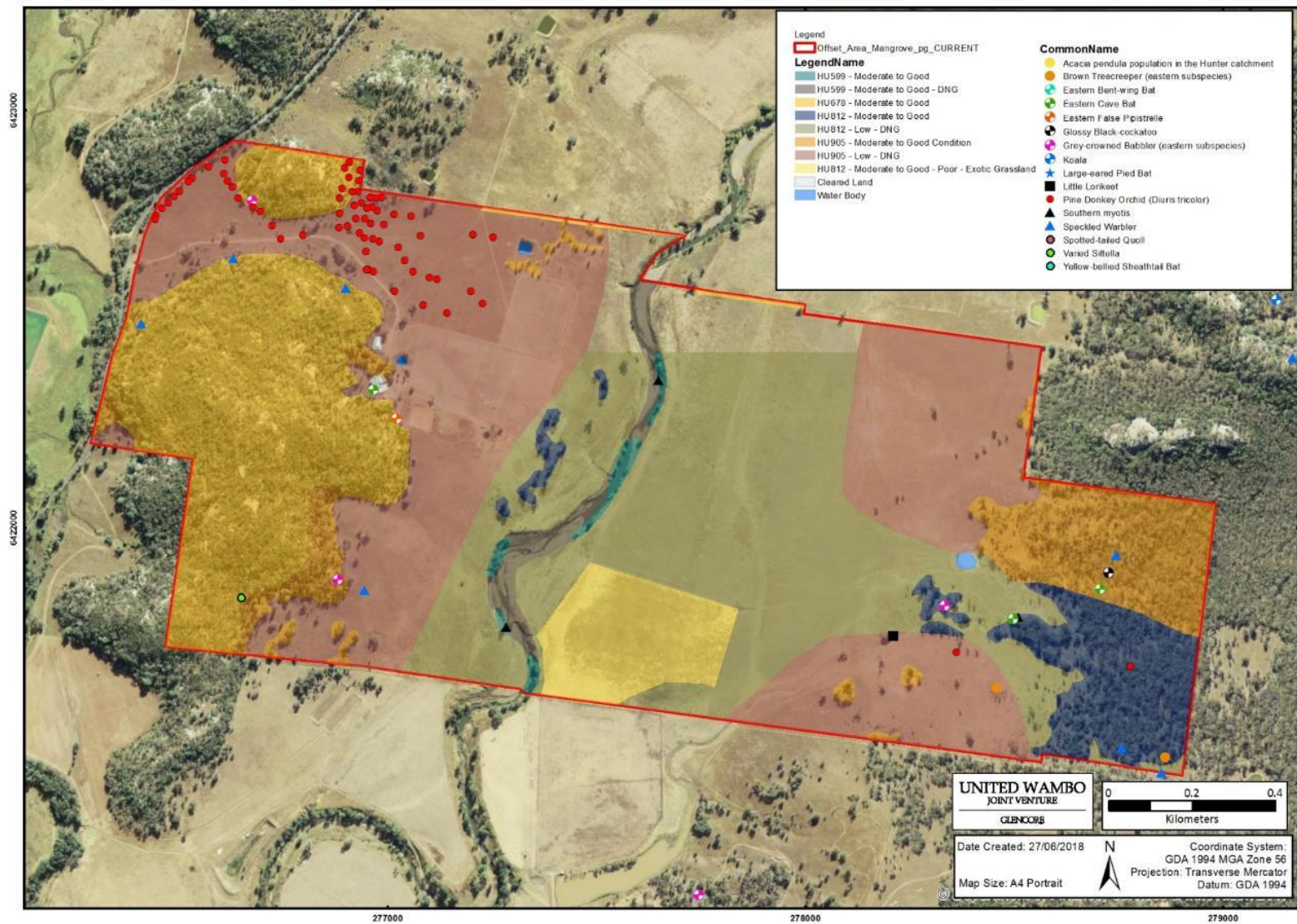


Figure 10-3: Mangrove Stewardship Site Biodiversity Features

10.1.2.3 Ecosystem-Credit Species

A list of ecosystem-credit species known to occur in the Mangrove Stewardship Site through previous surveys are identified in **Table 10-4**. This list will be updated if additional species are recorded during monitoring.

The location of ecosystem-credit species is shown on **Figure 10-3**.

The BAR contains a list ecosystem-credit species which may potentially occur but have not been recorded during surveys.

Table 10-4: Ecosystem-Credit Species at the Mangrove Stewardship Site

Species Name	BC Act Status	EPBC Status	Further Information on Records
brown treecreeper (eastern subspecies) <i>Climacteris picumnus</i> subsp. <i>victoriae</i>	V	-	Recorded during fauna surveys undertaken in April and May 2012 (Umwelt 2012).
eastern false pipistrelle <i>Falsistrellus tasmaniensis</i>	V	-	Recorded during fauna surveys undertaken in April and May 2012 (Umwelt 2012).
speckled warbler <i>Chthonicola sagittata</i>	V	-	Recorded during fauna surveys undertaken in April and May 2012 (Umwelt 2012).
varied sittella <i>Daphoenositta chrysoptera</i>	V	-	Recorded during fauna surveys undertaken in April and May 2012 (Umwelt 2012).
yellow-bellied sheath-tail-bat <i>Saccolaimus flaviventris</i>	V	-	Recorded during fauna surveys undertaken in April and May 2012 (Umwelt 2012).

10.1.2.4 Species-Credit Species

A list of ecosystem-credit species known to occur in the Mangrove Stewardship Site through previous surveys are identified in **Table 10-5**. This includes species that are species-credit species for certain habitat components. This list will be updated if additional species are recorded during monitoring.

The location of species-credit species previously recorded on the site is shown on **Figure 10-3**.

Table 10-5: Species-Credit Species at the Mangrove Stewardship Site

Species Name	BC Act Status	EPBC Status	Further Information on Records
pine donkey orchid <i>Diuris tricolor</i>	V	-	1114 individuals recorded on the Mangrove BioBank Site in 2015 as part of targeted flora surveys (Umwelt 2015)

Species Name	BC Act Status	EPBC Status	Further Information on Records
southern myotis <i>Myotis macropus</i>	V	-	Species was recorded from a positively identified echolocation recordings from fauna surveys undertaken in November 2015 as part of this assessment. Hollow-bearing tree habitat occurs within the native forest and woodland within 200m of Wybong Creek (seventh order stream) as it runs through the site. Three hectares has been calculated as potential breeding habitat for the species at this site.

Furthermore, potential cliff, cave and escarpment habitat for large-eared pied bat (*Chalinolobus dwyeri*), eastern bentwing-bat (*Miniopterus schreibersii oceanensis*) and eastern cave bat (*Vespadelus troughtoni*) occurs within the Mangrove Stewardship Site. These species have been positively identified from echolocation recordings during fauna surveys undertaken in April and May 2012 (Umwelt 2012).

10.1.3 Wambo Biodiversity Stewardship Site

The Wambo Biodiversity Stewardship Site is located immediately west of United Wambo. It comprises land owned by Wambo, located in the Jerrys Plains area, approximately 20 kilometres west of Singleton, NSW, and adjacent to Wollemi National Park (refer to **Figure 10-1**).

The Wambo Biodiversity Stewardship Site is 337.9 hectares in size, with approximately 20 per cent having been previously cleared for agricultural purposes. The site is positioned on the lower slopes of the southern rim of the Hunter Valley at the base of steep slopes and sandstone escarpments to the south-west. The majority of the site contains Hunter Valley floor woodland vegetation, with small pockets of derived native grassland which have previously been cleared, and areas of riparian vegetation along North Wambo Creek. The vegetation is reasonably young and, as a result, the hollow-bearing tree density is generally low. The woodland vegetation within the site occurs at the interface of land which has been predominantly cleared of trees and converted to grassland for grazing purposes.

The historical land use of the proposed Wambo Biodiversity Stewardship Site has been agricultural, primarily cattle and sheep grazing, although currently the site is relatively unutilised. Parts of the proposed Wambo Biodiversity Stewardship Site are currently subject to proposed underground longwall panels as part of the South Bates Extension Modification Project.

As discussed in the BAR (Umwelt, 2017), the potential impacts of this mining activity (if approved) have been assessed (FloraSearch 2017) and were considered unlikely to result in a measurable impact on the quality of the native vegetation and habitats in the Biodiversity Stewardship site.

Given the high conservation value offered by the large area of CEEC at the Wambo Biodiversity Stewardship site, the establishment of an offset site at this location is considered an appropriate outcome.

Further detailed assessment of the potential subsidence impacts associated with any future application to mine under this area will be undertaken as part of the approval process for that

development application. A summary of the key findings of the assessments completed to date was provided in the BAR (Umwelt, 2017).

10.1.3.1 Key Biodiversity Features

The Wambo Biodiversity Stewardship Site provides locational relevance to United Wambo, conserving an important area of intact valley floor vegetation and habitats in proximity to United Wambo and connecting to Wollemi National Park to the west. The Wambo Biodiversity Stewardship Site contains the following key biodiversity features relevant for the offsetting strategy for the Project:

- 149.6 hectares of *Central Hunter Valley Eucalypt Forest and Woodland CEEC* under the EPBC Act (and 47.9 hectares of grassland able to be restored to conform to the CEEC);
- 215.9 hectares of Hunter Valley Foothills Slaty Gum Woodland in the Sydney Basin Bioregion VEC under the BC Act;
- 41.8 hectares of Central Hunter Grey Box – Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions EEC under the BC Act;
- Woodland and forest habitat suitable key threatened species such as spotted-tailed quoll (*Dasyurus maculatus*) and swift parrot (*Lathamus discolor*);
- riparian habitat associated with a fifth order stream being North Wambo Creek; and
- proximity to the impacts of the Project (immediately to the west of United Wambo).

10.1.3.2 Native Vegetation

Surveys of the Wambo Biodiversity Stewardship Site identified three PCTs/ BVTs and eight vegetation zones, which were collated following the surveys in December 2015 (as described in the EIS), in accordance with the requirements under BBAM (OEH 2014c). Five vegetation zones conform to the EPBC Act, whilst three zones also conform to the BC Act for listed TECs. These vegetation zones, their condition classes and listed TECs are outlined in **Table 10-6** and illustrated on **Figure 10-4**. Further details and description is provided in BAR included as **Appendix 4** of the RTS.

Table 10-6: Plant Communities at the Wambo Biodiversity Stewardship Site

PCT/ BVT Number	Vegetation Type	Area within Offset Site (ha)	Condition	Threatened Ecological Communities
HU618	Slaty Box – Grey Gum Shrubby Woodland on Foothills of the Upper Hunter Valley, Sydney Basin Bioregion	204.7	Moderate to Good	<i>Central Hunter Valley Eucalypt Forest and Woodland CEEC</i> (EPBC Act) <i>Hunter Valley Foothills Slaty Gum Woodland in the Sydney Basin Bioregion VEC</i> (BC Act)
		11.2	Moderate to Good - Regeneration	<i>Central Hunter Valley Eucalypt Forest and Woodland CEEC</i> (EPBC Act) <i>Hunter Valley Foothills Slaty Gum Woodland in the Sydney Basin Bioregion VEC</i> (BC Act)
HU712	River Oak Riparian Grassy Tall Woodland of the	12.6	Moderate to Good	-

PCT/ BVT Number	Vegetation Type	Area within Offset Site (ha)	Condition	Threatened Ecological Communities
	Western Hunter Valley (Brigalow Belt South)	7.3	Moderate to Good – Derived Native Grasses	-
HU817	Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter	28.5	Moderate to Good	<i>Central Hunter Grey Box – Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions EEC (BC Act) Central Hunter Valley Eucalypt Forest and Woodland CEEC (EPBC Act)</i>
		4.0	Moderate to Good – Cooba Woodland Variant	-
		52.7	Moderate to Good – Derived Native Grasses	<i>Central Hunter Valley Eucalypt Forest and Woodland CEEC (EPBC Act)</i>
		13.3	Moderate to Good – Regeneration	<i>Central Hunter Grey Box – Ironbark Woodland in the NSW North Coast and Sydney Basin Bioregions EEC (BC Act) Central Hunter Valley Eucalypt Forest and Woodland CEEC (EPBC Act)</i>
-	Cleared Land/ Waterbodies	3.6	-	-

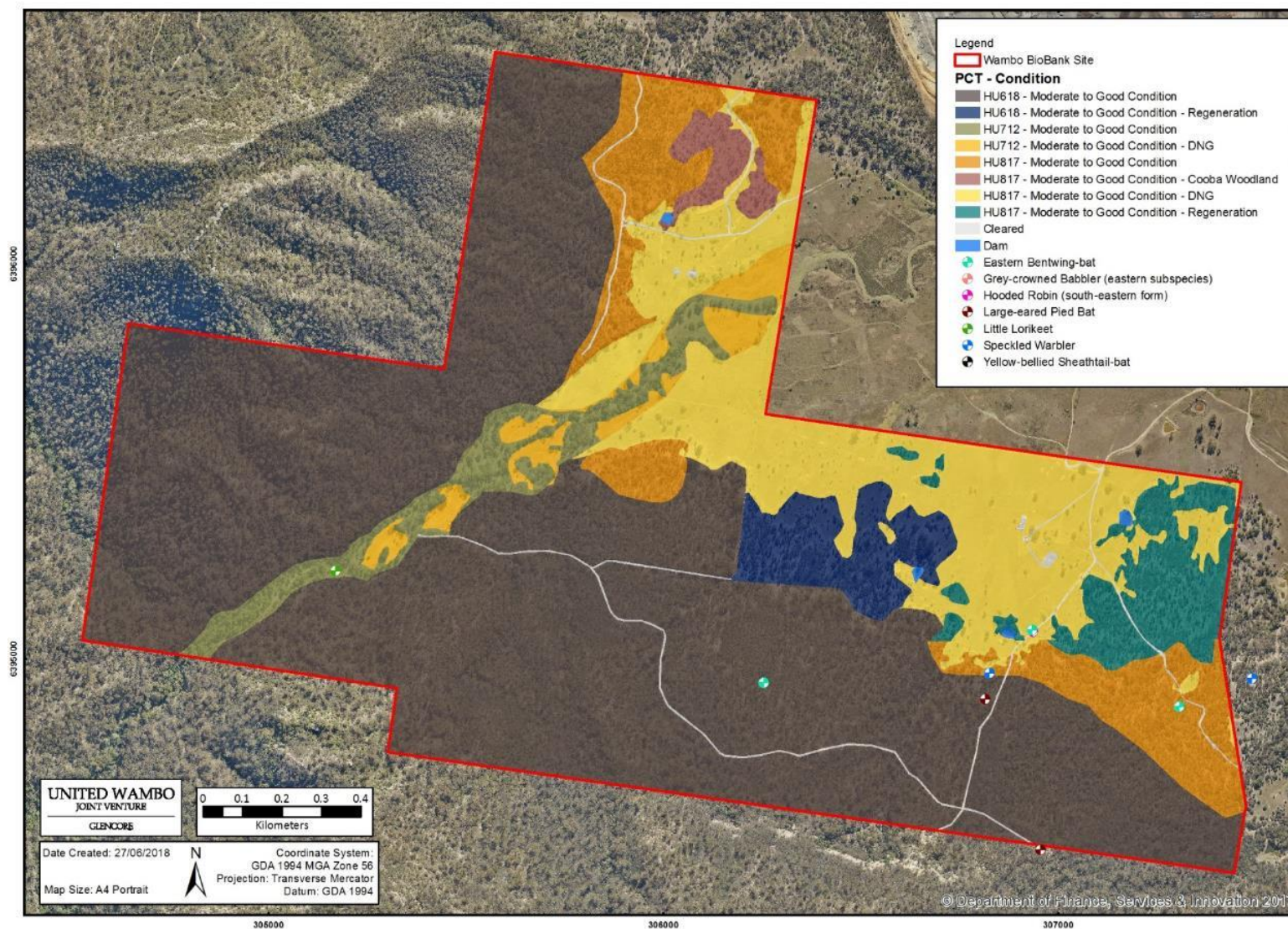


Figure 10-4: Wambo Biodiversity Stewardship Site Biodiversity Features

10.1.3.3 Ecosystem-Credit Species

A list of ecosystem-credit species known to occur in the Wambo Biodiversity Stewardship Site through previous surveys are identified in **Table 10-7**. This list will be updated if additional species are recorded during monitoring.

The location of ecosystem-credit species is shown on **Figure 10-4**.

The BAR contains a list ecosystem-credit species which may potentially occur but have not been recorded during surveys.

Table 10-7: Ecosystem-Credit Species at the Wambo Biodiversity Stewardship Site

Species Name	BC Act Status	EPBC Status	Predicted to Occur at the Wambo Offset Site by the BBCC
speckled warbler <i>Chthonicola sagittata</i>	V	-	Recorded on site in 2010 (OEH BioNet 2016).
yellow-bellied sheath-tail-bat <i>Saccolaimus flaviventris</i>	V	-	Potential to occur due to suitable habitat and nearby records.

10.1.3.4 Species-Credit Species

No species-credit species are known to occur in the Wambo Biodiversity Stewardship Site.

Potential cliff, cave and escarpment habitat for large-eared pied bat (*Chalinolobus dwyeri*) and eastern bentwing-bat (*Miniopterus schreibersii oceanensis*) occurs on Wambo-owned land adjacent to the Wambo Biodiversity Stewardship Site. These species have been positively identified from echolocation recordings during surveys undertaken in 2010 and 2011 (OEH BioNet 2016), as outlined in the EIS. These species are species-credits for breeding habitat only (caves, escarpments, rock outcrops). This habitat may occur at the Wambo Biodiversity Stewardship Site. Further targeted fauna surveys may be required to confirm the presence of potential species-credit species at the Wambo Biodiversity Stewardship Site. The location of species-credit species in the locality is shown on **Figure 10-4**.

10.1.4 Jerrys Plains Biodiversity Stewardship Site

The proposed Jerrys Plains Biodiversity Stewardship Site is located approximately six kilometres north-west of United Wambo. It is located south and west of the Jerrys Plains township and is adjacent to Wollemi National Park (refer to **Figure 10-1**).

The Jerrys Plains Biodiversity Stewardship Site is 275 hectares in size. The Mitchell Landscape is described as the Central Hunter Foothills. The site is located in the Hunter-Central Rivers major catchment area, with an unnamed tributary of Redmanvale Creek (third order stream) and Gees Creek and an unnamed tributary (both second order streams) flowing through the area.

The vegetation is mainly comprised of woodland to open forest on the gently sloping mid and lower slopes and some flats. Disturbance to vegetation are widespread due to pastoral activities, grazing and past vegetation thinning. There are some areas of native grasses occurring on the flats and slopes.

10.1.4.1 Key Biodiversity Features

The Jerrys Plains Biodiversity Stewardship Site is within a strategic location in the form of a riparian buffer on both sides of a third order stream as defined under the BBAM (OEH 2014c) (tributary of Redmanvale Creek).

The Jerrys Plains Biodiversity Stewardship Site contains the following key biodiversity features relevant for the offsetting strategy for the Project:

- 215.5 ha of Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin VEC under the BC Act;
- 212.7 ha of Central Hunter Valley Eucalypt Forest and Woodland CEEC under the EPBC Act;
- 25.8 ha of Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions EEC under the BC Act;
- 1.7 ha Hunter Valley Vine Thicket in the NSW North Coast and Sydney Basin Bioregions EEC under the BC Act;
- acacia pendula population in the Hunter Catchment;
- suitable breeding (hollow-bearing tree) habitat for southern myotis (*Myotis macropus*);
- woodland and forest habitat suitable key threatened species such as spotted-tailed quoll (*Dasyurus maculatus*), regent honeyeater (*Anthochaera phrygia*) and swift parrot (*Lathamus discolor*); and
- riparian habitat associated with a third order stream being a tributary of Redmanvale Creek.

10.1.4.2 Native Vegetation

There are three PCTs/ BVT identified across nine condition classes within the Jerry Plains Biodiversity Stewardship Site, as identified in the Addendum Report for Additional Offset Sites (Umwelt, May 2018) (Addendum Report), appended to the Response to IPC Review Report (Umwelt, July 2018). The three vegetation zones also conform to the state BC Act, and the Commonwealth EPBC Act, listed TECs. The PCTs and listed TECs identified within the Jerrys Plains Biodiversity Stewardship Site are outlined in **Table 10-8** and illustrated in **Figure 10-5**.

Further details and description is provided in the Addendum Report.

Table 10-8: Plant Communities at the Jerrys Plains Biodiversity Stewardship Site

PCT Number	Vegetation Type	Area (ha)	Condition	Threatened Ecological Communities
HU618	HU618 - Slaty Box - Grey Gum Shrubby Woodland on Footslopes of the Upper Hunter Valley, Sydney Basin Bioregion	165.8	Moderate to Good	165.8 ha Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin VEC (BC Act) 165.8 ha Central Hunter Valley Eucalypt Forest and Woodland CEEC (EPBC Act)
		49.7	Moderate to Good - Regeneration	49.7 ha Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin VEC (BC Act) 21.6 ha Central Hunter Valley Eucalypt Forest and Woodland CEEC (EPBC Act)

PCT Number	Vegetation Type	Area (ha)	Condition	Threatened Ecological Communities
		26.1	Moderate to Good - Derived Native Grassland	0.2 ha <i>Central Hunter Valley Eucalypt Forest and Woodland CEEC</i> (EPBC Act)
HU905	Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter	20.7	Moderate to Good	20.7 ha <i>Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions EEC</i> (BC Act) 20.7 ha <i>Central Hunter Valley Eucalypt Forest and Woodland CEEC</i> (EPBC Act)
		2.6	Regeneration	2.6 ha <i>Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregion EEC</i> 1.5 ha <i>Central Hunter Valley Eucalypt Forest and Woodland CEEC</i> (EPBC Act)
		2.1	Derived Native Grassland	0.3 ha <i>Central Hunter Valley Eucalypt Forest and Woodland CEEC</i> (EPBC Act)
		0.9	Bullock Dominated	0.9 ha <i>Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions EEC</i> (BC Act) 0.9 ha <i>Central Hunter Valley Eucalypt Forest and Woodland CEEC</i> (EPBC Act)
		1.6	Colluvial	1.6 ha <i>Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions EEC</i> (BC Act) 1.6 ha <i>Central Hunter Valley Eucalypt Forest and Woodland CEEC</i> (EPBC Act)
HU757	Rusty Fig - Native Quince - Native Olive dry rainforest of the Central Hunter Valley	1.7	Moderate to Good	1.7 ha <i>Hunter Valley Vine Thicket in the NSW North Coast and Sydney Basin Bioregions EEC</i> (BC Act)

CEEC Critically Endangered Ecological Community
VEC Vulnerable Ecological Community

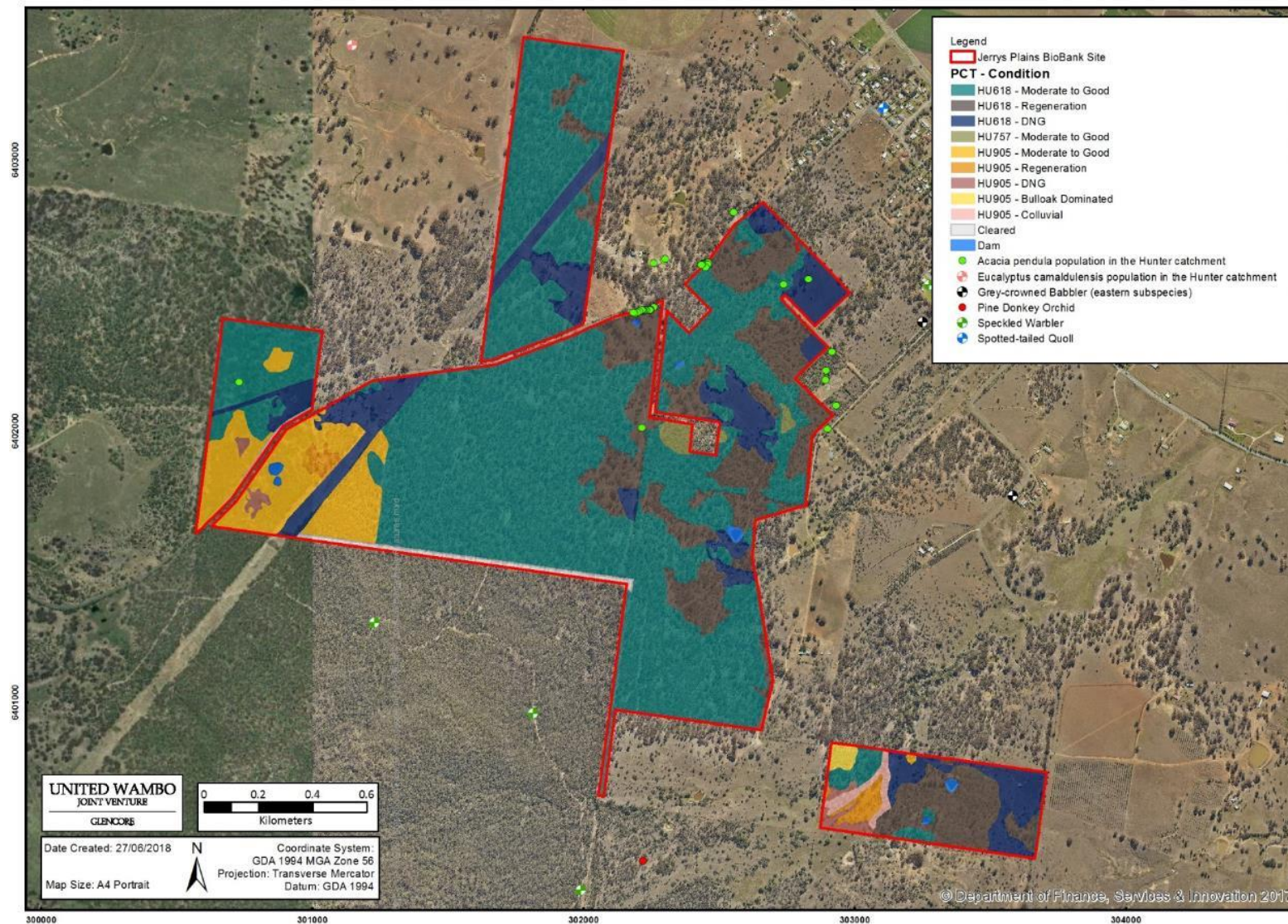


Figure 10-5: Jerrys Plains Biodiversity Stewardship Site Biodiversity Features

10.1.4.3 Ecosystem-Credit Species

No ecosystem credit species have been specifically recorded within the Jerrys Plains Biodiversity Stewardship Site, however, the following have been recorded from the locality and are likely to occur:

- speckled warbler (*Chthonicola sagittata*);
- grey-crowned babbler (*Pomatostomus temporalis temporalis*);
- varied sittella (*Daphoenositta chrysoptera*);
- large-eared pied bat (*Chalinolobus dwyeri*); and
- spotted-tailed quoll (*Dasyurus maculatus*).

10.1.4.4 Species-Credit Species

One species-credits species has been previously recorded on the Atlas of NSW Wildlife (OEH 2017a) within the Jerrys Plains Biodiversity Stewardship Site, being the weeping myall (*Acacia Pendula*) population in the Hunter catchment. Records of this population mainly occur along Jones Reserve Road and were recorded recently (2016) during targeted surveys for the species in the locality. There are a number of records of this population in the locality including, in particular, at the adjoining Jerrys Plain Cemetery.

Pine donkey orchid (*Diuris tricolor*) and river red gum (*Eucalyptus Camaldulensis*) have been recorded in the locality of the Jerrys Plains Biodiversity Stewardship Site, but not confirmed within the Biodiversity Stewardship site boundary. Pine donkey orchid, in particular, may occur on the site, however, recent seasons have been very dry and low occurrences of the species were observed across the Hunter Valley in the 2017 flowering season.

The records of these threatened species are shown in **Figure 10-5**.

10.1.5 Brosi Biodiversity Stewardship Site

The Brosi Biodiversity Stewardship Site is located approximately four kilometres south of United Wambo. It is located northwest of the Bulga township and is adjacent to Wollemi National Park in the west (refer to **Figure 10-5**).

The Jerrys Plains Biodiversity Stewardship Site is 215.5 hectares in size. The Mitchell landscape is described as Central Hunter Foothills, Central Hunter Alluvial Plains and Yengo Plateau. The site is located in the Hunter-Central Rivers major catchment area, with Wambo Creek, a fifth order creek flowing through.

The vegetation is mainly comprised of open forest on mid to lower slopes in the low hills and rises. Disturbances to vegetation are low to moderate, and generally restricted to the edge where pastoral activities, grazing and past vegetation thinning has occurred. Advanced regeneration of trees and shrubs is occurring in some previously cleared areas.

There is also vegetation comprised of open forest occurring on slopes and gullies and open grassland occurring on the lower slopes and flats within the Biodiversity Stewardship site. The area is highly disturbed from past to grazing activities and vegetation thinning, and numerous weed species are present.

10.1.5.1 Key Biodiversity Features

The Brosi Biodiversity Stewardship Site is within a strategic location in the form of a riparian buffer 20 metres either side of a fourth or fifth order stream as defined under the BBAM (OEH 2014c) (Wambo Creek).

The Brosi Biodiversity Stewardship Site contains the following key biodiversity features relevant for the offsetting strategy for the Project:

- 128.9 ha of Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions EEC under the BC Act and Central Hunter Valley Eucalypt Forest and Woodland CEEC under the EPBC Act;
- suitable breeding (hollow-bearing tree) habitat for southern myotis (*Myotis macropus*);
- woodland and forest habitat suitable key threatened species such as spotted-tailed quoll (*Dasyurus maculatus*), regent honeyeater (*Anthochaera phrygia*) and swift parrot (*Lathamus discolor*); and
- riparian habitat associated with a fourth or fifth order stream being a tributary of Wambo Creek.

10.1.5.2 Native Vegetation

There are three PCTs/BVT identified across six condition classes within the Brosi Biodiversity Stewardship Site, as identified in the Addendum Report. The three vegetation zones also conform to the state BC Act, and the Commonwealth EPBC Act, listed TECs. These vegetation zones, their condition classes and listed TECs are outlined in **Table 10-9** and illustrated in **Figure 10-6**. Further details and description are provided in the Addendum Report.

Table 10-9: Plant Communities at the Brosi Biodiversity Stewardship Site

PCT Number	Vegetation Type	Area (ha)	Condition	Threatened Ecological Communities
HU712	River Oak Riparian Grassy Tall Woodland of the Western Hunter Valley (Brigalow Belt South)	4.1	Moderate to Good	This vegetation zone does not conform to any TEC (BC/ EPBC Act)
HU816	Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the Central and Lower Hunter	47.1	Moderate to Good	This vegetation zone does not conform to any TEC (BC/ EPBC Act)
HU818	Narrow-leaved Ironbark - Grey Box - Spotted Gum shrub - grass woodland of the Central and Lower Hunter	109.4	Moderate to good	109.4 ha <i>Central Hunter Grey Box-Ironbark –Forest EEC</i> (BC Act) 109.4 ha <i>Central Hunter Valley Eucalypt Forest and Woodland CEEC</i> (EPBC Act)
		19.4	Regeneration	19.4 ha <i>Central Hunter Grey Box-Ironbark –Forest EEC</i> (BC Act) 19.4 ha <i>Central Hunter Valley Eucalypt Forest and Woodland CEEC</i> (EPBC Act)

PCT Number	Vegetation Type	Area (ha)	Condition	Threatened Ecological Communities
		33.9	Derived Native Grasslands	This vegetation zone does not currently confirm to the <i>Central Hunter Valley Eucalypt Forest and Woodland CEEC</i> (EPBC Act), however is likely to be able to be restored to this TEC.
		1.0	Low	This vegetation zone does not conform to any TEC (BC/ EPBC Act)

CEEC Critically Endangered Ecological Community

EEC Endangered Ecological Community

VEC Vulnerable Ecological Community

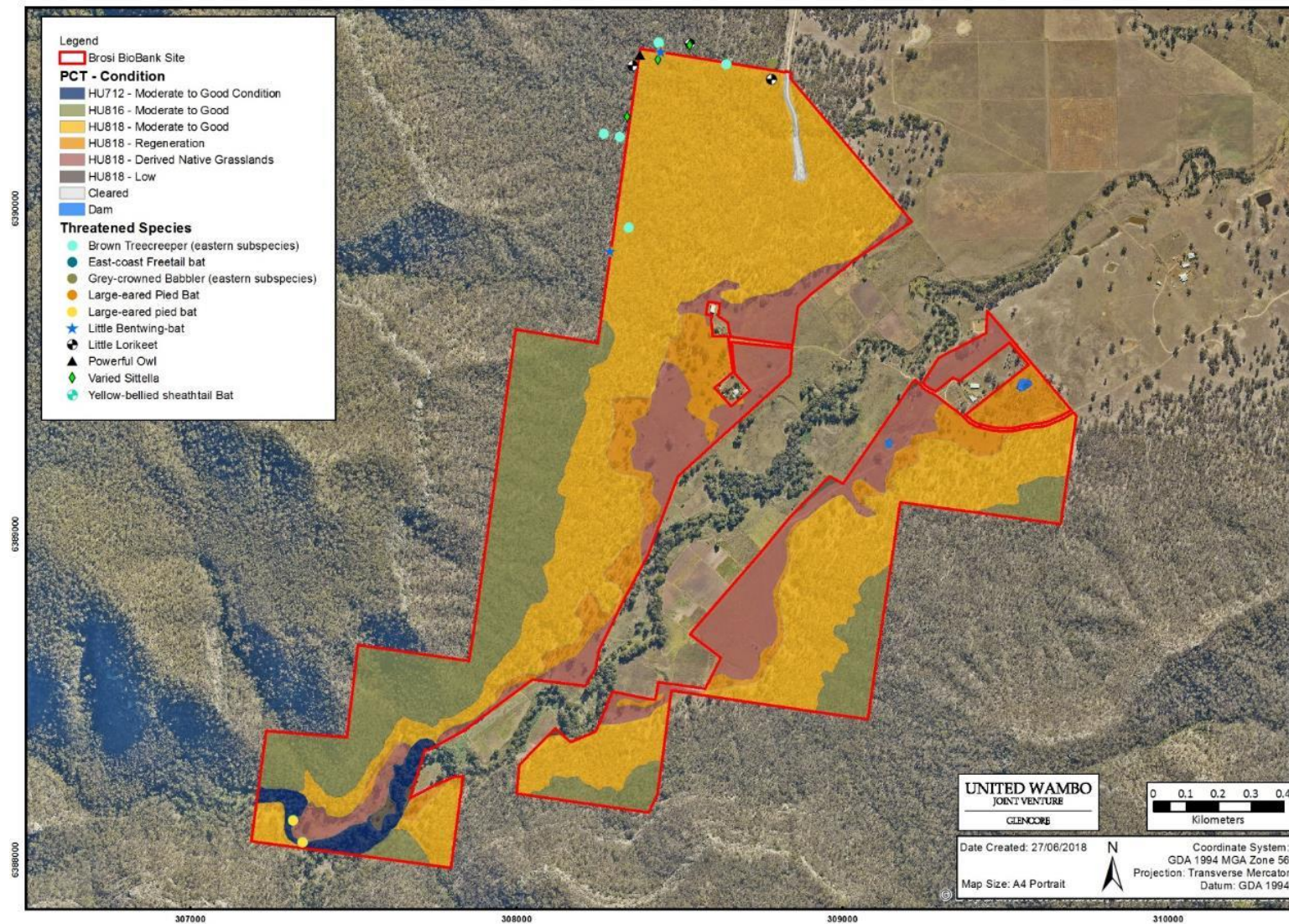


Figure 10-6: Brosi Biodiversity Stewardship Site Biodiversity Features

10.1.5.3 Ecosystem-Credit Species

A list of ecosystem-credit species predicted to occur in the Brosi Biodiversity Stewardship Site through NSW Atlas records are identified in **Table 10-10**. This list will be updated if additional species are recorded during monitoring.

The location of ecosystem-credit species is shown on **Figure 10-6**.

The Addendum Report contains a list ecosystem-credit species which may potentially occur but have not been recorded during surveys.

Table 10-10: Ecosystem-Credit Species at the Brosi Biodiversity Stewardship Site

Species Name	BC Act Status	EPBC Status	Further Information on Records
Large-eared pied bat (<i>Chalinolobus Dwyeri</i>);	V	V	Records on the Atlas of NSW Wildlife
Little bentwing bat (<i>Miniopterus Australis</i>);	V	-	Records on the Atlas of NSW Wildlife
East coast freetail bat (<i>Mormopterus Norfolkensis</i>);	V	-	Records on the Atlas of NSW Wildlife
Yellow-bellied sheath-tail-bat (<i>Saccolaimus Flaviventris</i>)	V	-	Records on the Atlas of NSW Wildlife
Brown treecreeper (<i>Climacteris Picumnus Victoriae</i>).	V	-	Records on the Atlas of NSW Wildlife

10.1.5.4 Species-Credit Species

No species-credits species were recorded during the surveys or have been previously recorded on the Atlas of NSW Wildlife (OEH 2017a).

Despite targeted surveys for the Southern Myotis, the species was not positively identified during the Anabat Express surveys undertaken at the Brosi Biodiversity Stewardship Site. The habitat assessment identified that the riparian zone of Wambo Creek contained old growth rough-barked apple (*Angophora Floribunda*), river oak (*Casuarina Cunninghamiana*) and narrow-leaved ironbark (*Eucalyptus Crebra*) containing suitable hollow and fissure habitat for micro-bat occupation. Mature trees with hollow habitat appeared to be concentrated along the riparian zone, while forested habitats upslope tended to be younger and with fewer hollow resources. At the time of the survey, Wambo Creek was primarily dry, likely due to the prevailing drought conditions experienced during the 2017/2018 summer season.

Should the Southern Myotis be recorded within the Brosi Biodiversity Stewardship Site, the woodland habitats associated with the riparian zone (i.e. within 200 metres of Wambo Creek) would be considered to provide suitable breeding habitat for the species.

10.1.6 South Wambo Biodiversity Stewardship Site

The South Wambo Stewardship Site is located adjacent to the south-western boundary of the United Wambo Project Area. It is located northwest of the Bulga township and approximately 1.5 km east of Wollemi National Park (refer to **Figure 10-5**).

The South Wambo Biodiversity Stewardship Site is 268.8 hectares in size. The Mitchell landscape is described as Central Hunter Foothills and Central Hunter Alluvial Plains and Yengo Plateau. The site is located in the Hunter-Central Rivers major catchment area, with North Wambo Creek, a fifth order creek, and Stony Creek, a fourth order creek, flowing through.

10.1.6.1 Key Biodiversity Features

The South Wambo Biodiversity Stewardship Site is within a strategic location in the form of a band of riparian vegetation either side of a fourth or fifth order stream as defined under the BBAM (OEH 2014c) (North Wambo Creek and Stony Creek).

The South Wambo Biodiversity Stewardship Site contains the following key biodiversity features relevant for the offsetting strategy for the Project:

- 212.1ha of vegetation that conforms to the *Central Hunter Valley Eucalypt Forest and Woodland CEEC under the EPBC Act*;
- 125.5 ha of Central Hunter Grey Box-Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions EEC under the BC Act;
- Records of and 90.5ha of suitable breeding (hollow-bearing tree) habitat for southern myotis (*Myotis macropus*);
- woodland and forest habitat suitable key threatened species such as spotted-tailed quoll (*Dasyurus maculatus*), regent honeyeater (*Anthochaera phrygia*) and swift parrot (*Lathamus discolor*); and
- riparian habitat associated with a fourth or fifth order stream being a tributary of North Wambo Creek and Stony Creek.

10.1.6.2 Native Vegetation

There are five PCTs/BVT identified across nine condition classes within the South Wambo Biodiversity Stewardship Site, as identified in the Addendum Report. The three vegetation zones also conform to the state BC Act, and the Commonwealth EPBC Act, listed TECs. These vegetation zones, their condition classes and listed TECs are outlined in **Table 10-9** and illustrated in **Figure 10-6**. Further details and description are provided in the Addendum Report.

Table 10-11: Plant Communities at the South Wambo Biodiversity Stewardship Site

Zone	PCT	Condition	BC Act TEC	EPBC Act TEC	Area (ha)
1	116 Weeping Myall - Coobah - Scrub Wilga shrubland of the Hunter Valley	Moderate to Good	<i>Hunter Valley Weeping Myall Woodland CEEC</i>	<i>Hunter Valley Weeping Myall (Acacia pendula) Woodland CEEC</i>	1.1
2	116 Weeping Myall -Coobah - Scrub Wilga shrubland of the Hunter Valley	Regeneration	<i>Hunter Valley Weeping Myall Woodland CEEC</i>	<i>Hunter Valley Weeping Myall (Acacia pendula) Woodland CEEC</i>	1.1
5	1598 Forest Red Gum grassy open forest on floodplains of the lower Hunter	Moderate to Good	<i>Hunter Floodplain Red Gum Woodland EEC</i>	-	2.8
6	PCT1655 Grey Box - Slaty Box shrub - grass woodland on sandstone slopes of the upper Hunter and Sydney Basin	Moderate to Good	<i>Hunter Valley Footslopes Slaty Gum Woodland VEC</i>	<i>Central Valley Hunter Eucalypt Forest and Woodland CEEC</i>	34.4
7	PCT1655 Grey Box - Slaty Box shrub - grass woodland on sandstone slopes of the upper Hunter and Sydney Basin	Disturbed	<i>Hunter Valley Footslopes Slaty Gum Woodland VEC</i>	<i>Central Valley Hunter Eucalypt Forest and Woodland CEEC</i>	12.7

Zone	PCT	Condition	BC Act TEC	EPBC Act TEC	Area (ha)
8	1691 Narrow-leaved Ironbark – Grey Box grassy woodland of the central and upper Hunter	Derived Native Grassland	-	Parts of this vegetation zone conform to <i>Central Hunter Valley Eucalypt Forest and Woodland CEEC</i> where it occurs in gaps between patches of woodland which are consistent with the CEEC. All remaining areas of this zone will be restored to future CEEC.	2.5 ha of this veg zone currently conforms to the CEEC. 32.2 ha of this zone will be revegetated to future CEEC condition
9	1691 Narrow-leaved Ironbark – Grey Box grassy woodland of the central and upper Hunter	Moderate to Good	<i>Central Hunter Grey Box – Ironbark Woodland EEC</i>	<i>Central Hunter Valley Eucalypt Forest and Woodland CEEC</i>	122.5
10	1691 Narrow-leaved Ironbark – Grey Box grassy woodland of the central and upper Hunter	Regeneration	<i>Central Hunter Grey Box – Ironbark Woodland EEC</i>	<i>Central Hunter Valley Eucalypt Forest and Woodland CEEC</i>	3.0
11	1692 Bull Oak grassy woodland of the central Hunter Valley	Moderate to Good	-	Parts of this zone, where the appropriate density of diagnostic trees occur, conform to: <i>Central Hunter Valley Eucalypt Forest and Woodland CEEC</i>	37 ha of this zone conforms to the CEEC

CEEC Critically Endangered Ecological Community

EEC Endangered Ecological Community

VEC Vulnerable Ecological Community

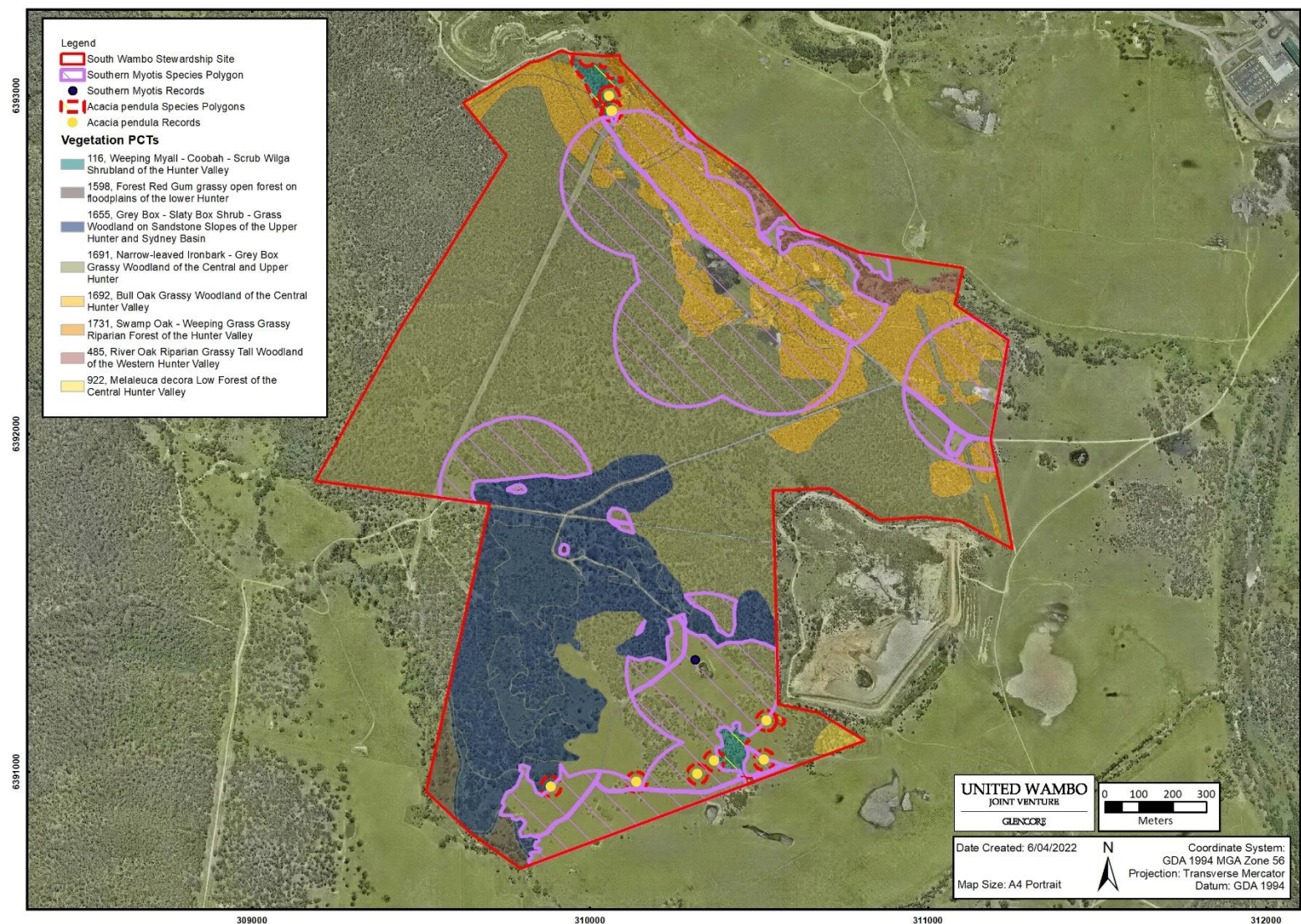


Figure 10-7: South Wambo Biodiversity Stewardship Site Biodiversity Features

10.1.6.3 Ecosystem-Credit Species

A list of ecosystem-credit species predicted to occur in the South Wambo Biodiversity Stewardship Site through the BAM Calculator are identified in **Table 10-10**. This list will be updated if additional species are recorded during monitoring.

The location of ecosystem-credit species is shown on **Figure 10-6**.

The Addendum Report contains a list ecosystem-credit species which may potentially occur but have not been recorded during surveys.

Table 10-12: Ecosystem-Credit Species at the South Wambo Biodiversity Stewardship Site

Species Name	BC Act Status	EPBC Status
regent honeyeater <i>Anthochaera phrygia</i>	CE	CE
gang-gang cockatoo <i>Callocephalon fimbriatum</i>	V	-
glossy black cockatoo <i>Calyptorhynchus lathami</i>	V	-
speckled warbler <i>Chthonicola sagittata</i>	V	-
spotted harrier <i>Circus assimilis</i>	V	-
brown treecreeper (eastern subsp.) <i>Climacteris picumnus victoriae</i>	V	-
varied sittella <i>Daphoenositta chrysoptera</i>	V	-
spotted-tailed quoll <i>Dasyurus maculatus</i>	V	E
black falcon <i>Falco subniger</i>	V	-
eastern false pipistrelle <i>Falsistrellus tasmaniensis</i>	V	-
little lorikeet <i>Glossopsitta pusilla</i>	V	-
painted honeyeater <i>Grantiella picta</i>	V	V
white-bellied sea-eagle <i>Haliaeetus leucogaster</i>	V	-
little eagle <i>Hieraaetus morphnoides</i>	V	-
white-throated needletail <i>Hirundapus caudacutus</i>	-	V
swift parrot <i>Lathamus discolor</i>	E	CE

square-tailed kite (foraging) <i>Lophoictinia isura</i>	V	-
hooded robin (south-eastern form) <i>Melanodryas cucullata cucullata</i>	V	-
black-chinned honeyeater (eastern subspecies) <i>Melithreptus gularis gularis</i>	V	-
eastern coastal free-tailed bat <i>Micronomus norfolkensis</i>	V	-
large bent-winged bat (foraging) <i>Miniopterus orianae oceanensis</i>	V	-
turquoise parrot <i>Neophema pulchella</i>	V	-
barking owl (foraging) <i>Ninox connivens</i>	V	-
powerful owl (foraging) <i>Ninox strenua</i>	V	-
Corben's long-eared bat <i>Nyctophilus corbeni</i>	V	V
scarlet robin <i>Petroica boodang</i>	V	-
flame robin <i>Petroica phoenicea</i>	V	-
Koala (foraging) <i>Phascolarctos cinereus</i>	V	V
grey-crowned babbler (eastern subspecies) <i>Pomatostomus temporalis temporalis</i>	V	-
grey-headed flying-fox (foraging) <i>Pteropus poliocephalus</i>	V	V
yellow-bellied sheath-tail-bat <i>Saccolaimus flaviventris</i>	V	-
greater broad-nosed bat <i>Scoteanax rueppellii</i>	V	-
diamond firetail <i>Stagonopleura guttata</i>	V	-
eastern grass owl <i>Tyto longimembris</i>	V	-
masked owl (foraging) <i>Tyto novaehollandiae</i>	V	-

10.1.6.4 Species-Credit Species

Two species credit species have been recorded within the South Wambo Stewardship Site, being the southern myotis (*Myotis macropus*) and weeping myall (*Acacia pendula*). The species polygons for both species are shown on **Figure 10-7**.

As part of the Anabat express surveys, the southern myotis (*Myotis macropus*) was recorded as part of a species group with *Nyctophilus geoffroyi* and *Nyctophilus gouldi* given their similar calls. All habitat that occurs within 200m of a waterbody with a pool or stretch at least 3 metres wide, and is within a PCT that is associated with the species, has been mapped as a species polygon for the southern myotis. Within the South Wambo site only PCTs 1691 and 1692 are vegetation associations for the southern myotis. The total area of the species polygon for the southern myotis is 90.5 hectares, which includes 1.9 hectares of waterbodies.

Weeping myall (*Acacia pendula*) has been recorded throughout the South Wambo site. There are two large patches conforming to the Weeping Myall Woodland EEC, as well as smaller patches of fewer individuals scattered throughout grassland areas or the edges of woodland. The combined area of the species polygons for *Acacia pendula* is 2.4 hectares.

There is also potential future opportunity to generate slaty red gum (*Eucalyptus glaucina*) species-credits, with a BioNet Atlas of NSW Wildlife record present with the South Wambo Stewardship Site. Further targeted surveys would be required to confirm the number of individuals.

10.2 Biodiversity Credit Requirements

United Wambo has approval to retire biodiversity credits progressively based on the staging of native vegetation disturbance in line with the progressive development of the mine. The three stages of disturbance being proposed are approximately seven year stages, and are referred to as Stage 1, Stage 2 and Stage 3, and are shown in **Figure 10-8**.

Condition B56 of the United Wambo Open Cut Coal Mine (United Wambo) Development Consent SSD 7142 has the requirement for United Wambo to retire the Stage 1 biodiversity credits as specified in Table 5 of Condition B55 of SSD 7142 within 12 months of commencing Phase 1A of the development, that being 6 January 2021.

Condition B56 also states that the Applicant must notify the Planning Secretary of its intention to satisfy Stage 1 credits using Ecological Mine Rehabilitation and provide details of the particular ecosystem credits proposed to be satisfied in this manner within 12 months of commencing Phase 1A.

The biodiversity credit requirements listed in Condition B55 were calculated using the BioBanking Assessment Methodology (BBAM). Following the commencement of the Biodiversity Conservation Act 2016 and the completion of savings and transitional arrangements, BBAM credits can no longer be created. Following consultation with the Biodiversity and Conservation Division (BCD), the Biodiversity Conservation Trust (BCT) and the Department of Planning and Environment (DPE), it has been determined that United Wambo must retire credits created under the Biodiversity Assessment Method (BAM credits).

In a letter dated 18 September 2020, Joe Thompson, Director Hunter Central Coast Branch, BCD, has proposed the following process to address the issues regarding the retirement of the proposed offset credits:

1. Establish Biodiversity Stewardship Agreements across the proposed offset lands for Stage 1 (or all stages) of the project to generate BAM offset credits. Data already collected from BBAM plots across the offset sites will require supplementation with new BAM data collected from each plot.
2. Once all Stage 1 (or all stages) Biodiversity Stewardship Agreements have been established, apply for an 'assessment of reasonable equivalence' to have the BBAM credits for the development footprint changed to BAM credits.

Once steps 1 and 2 above are completed you will be able to compare the BAM credit obligation for the project with the BAM credits generated by the Biodiversity Stewardship Sites of the project and be able to retire the credits.

To allow time to complete the process proposed by BCD, United Wambo requested an extension from the Planning Secretary of the timeframe specified in Condition B56 from 12 months to 24 months, i.e. from 6 January 2021 until 6 January 2022. This extension was granted on 20 October 2020. A further extension request was made in November 2021 to allow for a further 12 months.

United Wambo have identified 100 per cent of the required offset credits for Stage 1 of the Project as per **Table 10-13** according to an assessment of biodiversity credits under the former FBA process using the BioBanking assessment methodology. This provides 'like for like' credit allocation between the credits required and those created since the Project was assessed using the former FBA methodology.

As discussed, United Wambo will make an application for an 'assessment of reasonable equivalence' to have the BBAM credits for the development footprint changed to BAM credits. Following the outcome of this assessment, this BMP will be updated to reflect any changes to the offset strategy and credits.

United Wambo will notify the Planning Secretary of its intention to satisfy Stage 1 credits using Ecological Mine Rehabilitation, and provide details of the particular ecosystem credits proposed to be satisfied in this manner as required by Condition B56 of SSD 7142.

Biodiversity credits related to the EPBC Act-listed *Central Hunter Valley Eucalypt Forest and Woodland CEEC* are proposed to be retired in a like-for-like manner. That is, all biodiversity credits generated from land-based offsets represent the CEEC either as currently conforming to, or will be restored to be, the community.

This BMP will be revised and resubmitted once the credits have been retired.

Where possible throughout the construction and operation of the Project, native vegetation areas will be avoided to minimise the loss of habitats and reduce the future offset credit requirement for the Project. The staged approach allows United Wambo to benefit from any reductions in disturbance area through a reduction in biodiversity credits that need to be retired. This creates a situation which will drive focus on opportunities to continue to minimise disturbance throughout the life of the mining operation.

Prior to the commencement of Stage 2, United Wambo will undertake a review of the disturbance undertaken during Stage 1 to identify areas where disturbance has been avoided. Disturbance that has been avoided will be used to offset the future staged credit requirements.

As required by Condition E11 (b) of SSD 7142, United Wambo will report on the progress of biodiversity credit retirements and the associated actual versus proposed surface disturbance for each stage for each calendar year in the Annual Review.

An overview of the current proposed Stage 1, Stage 2 and Stage 3 credit requirements are provided in **Table 10-14**.

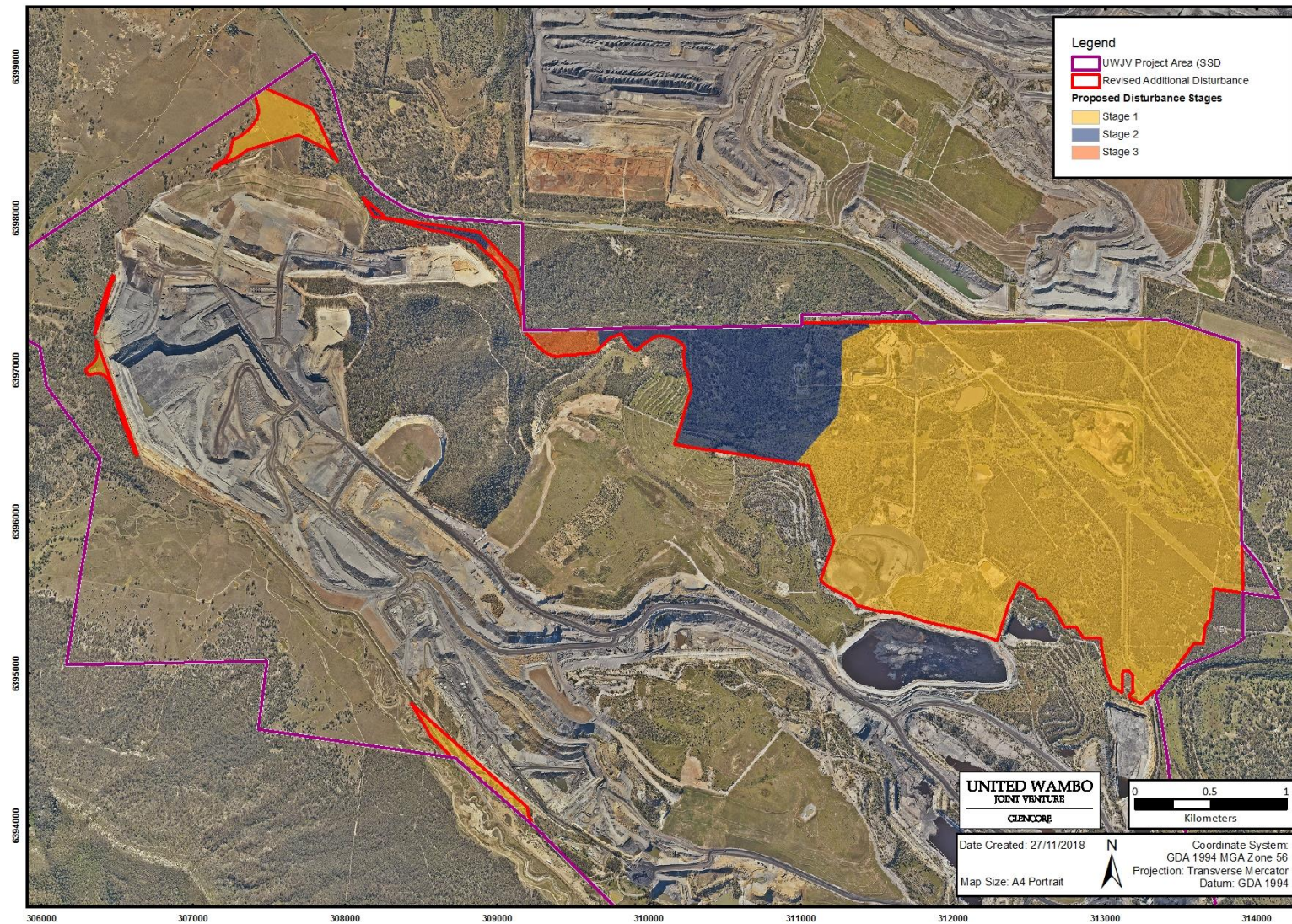


Figure 10-8: Staged Disturbance Areas

Table 10-13: Stage 1 Credit Requirements – BioBanking Calculations

Impacted Feature	STAGE 1 Credits Required	Wambo	Mangrove	Highfields	Jerrys Plains	Brosi	South Wambo	Ecological Mine Rehab	Percent Credit Allocation for Stage 1
<i>Central Hunter Valley Eucalypt Forest and Woodland CEEC under the EPBC Act</i>	11,287	3,175	0	0	3,211	2,464	270	2,167	100%
<i>Hunter Floodplain Red Gum Woodland EEC under the BC Act</i>	0	0	0	0	0	0	0	0	100%
<i>Central Hunter Ironbark - Spotted Gum - Grey Box Forest EEC under the BC Act</i>	1,424	0	0	0	0	656	0	768	100%
<i>Central Hunter Grey Box - Ironbark Woodland EEC under the BC Act</i>	356	0	295	0	31	0	30	0	92%
HU905 - Narrow-leaved Ironbark - Grey Box grassy Woodland of the Central and Upper Hunter	3,562	0	1,437	0	296	0	813	1,016	77%
HU906 - Bull Oak Grassy Woodland of the Central Hunter Valley	2,973	0	0	2,802	0	13	158	0	95%
HU945 - Swamp Oak - Weeping Grass Grassy Riparian Forest of the Hunter Valley	1,844	0	1,555	0	0	0	10	279	84%
Southern Myotis (<i>Myotis Macropus</i>)	15	0	15	0	0	0	0	0	100%
TOTAL ECOSYSTEM CREDITS	21,446	3,175	3,302	2,802	3,538	3,153	1,281	4,230	100%
TOTAL SPECIES CREDITS	15	0	15	0	0	0		0	100%

Table 10-14: Staged Offsetting Requirements – BioBanking Calculations

Impacted Feature	STAGE 1 Credits Required	STAGE 2 Credits Required	STAGE 3 Credits Required	Total
Central Hunter Valley Eucalypt Forest and Woodland CEEC under the EPBC Act	11,287	2,570	620	14,477
Hunter Floodplain Red Gum Woodland EEC under the BC Act	0	20	0	20
Central Hunter Ironbark - Spotted Gum - Grey Box Forest EEC under the BC Act	1,424	0	0	1,424
Central Hunter Grey Box - Ironbark Woodland EEC under the BC Act	356	101	0	457
HU905 - Narrow-leaved Ironbark - Grey Box grassy Woodland of the Central and Upper Hunter	3,562	1,344	1	4,907
HU906 - Bull Oak Grassy Woodland of the Central Hunter Valley	2,973	0	0	2,973
HU945 - Swamp Oak - Weeping Grass Grassy Riparian Forest of the Hunter Valley	1,844	281	0	2,125
Southern Myotis (<i>Myotis Macropus</i>)	15	547	0	562
TOTAL ECOSYSTEM CREDITS	21,446	4,316	621	26,383
TOTAL SPECIES CREDITS	15	547	0	562

10.3 EPBC Offset Requirements

As per the detailed Assessments of Significance prepared for the EPBC Referral, *Central Hunter Valley Eucalypt Forest and Woodland critically endangered ecological community (CEEC)* was found to be significantly impacted as a result of the Project. Following submission of the Referral, the following MNES were considered by DoEE to be potentially significantly impacted by the Project:

- Central Hunter Valley Eucalypt Forest and Woodland CEEC;
- regent honeyeater (*Anthochaera phrygia*);
- swift parrot (*Lathamus discolor*); and
- spotted-tailed quoll (*Dasyurus maculatus maculatus*).

All of the required credits in Stage 1 for the Central Hunter Valley Eucalypt Forest and Woodland CEEC and the other MNES listed above have been secured through land-based offsets as the Commonwealth Government has not currently accredited the use of the Offset Fund for retirement for credits required for Matters of National Environmental Significance (MNES). Offsetting requirements for Stage 2 and Stage 3 for the Central Hunter Valley Eucalypt Forest and Woodland

CEEC are also proposed to be secured through land-based offsets. Should the Commonwealth government accredit the Offset Fund process in the future, this may be considered for offsetting requirements for Stage 2 and Stage 3 if available.

In accordance with the EPBC Act Environmental Offset Policy (DSEWPC 2012), the Biodiversity Offset Strategy has been developed with the aim to maintain and improve biodiversity with a focus on habitats for threatened species in the Hunter Valley and the CEEC. With the inclusion of substantial areas of woodland and forest restoration at the Wambo, Highfields, Mangrove, Jerrys Plains and Brosi BioBank Sites, it is predicted that such an improvement will occur.

The offset sites are proposed to be secured with a Stewardship Agreement which provides in-perpetuity protection and funding for management and improvement of the biodiversity of the site. Each of the proposed offset sites is on land wholly owned by United/Glencore and Wambo and is available for offsetting as part of the Project. The application of Stewardship Agreements for these sites provides for a transparent, consistent and scientifically robust method of monitoring and management in accordance with NSW biodiversity legislation.

In relation to the area of ecological mine rehabilitation to be restored to the Central Hunter Valley Eucalypt Forest and Woodland CEEC, United is committed to securing this area using an appropriate in-perpetuity conservation mechanism following the achievement of the completion criteria outlined in the RMP and the closure of the mine. The mechanism for in-perpetuity conservation may be a Stewardship Agreement, or similar mechanism available at the time, and will be determined in consultation with DoEE as part of the mine closure process at the end of the mine life.

Further offsets are currently being investigated for Stage 2 and Stage 3 of the Project. United will provide appropriate offsets for Stage 2 and Stage 3 based on the approved mechanisms at the time of retirement. DoEE has not raised any issues with the staged offsetting approach proposed for the Project.

Table 10-15 provides a summary of the key impacts and the minimum area of offsets proposed for Stage 1 impacts for the listed MNES above. The hectares of habitat quoted at each offset site in

Table 10-15 are estimates and the final area formally conserved at each site under a Biodiversity Stewardship Agreement (BSA) may result in minor amendments to the total area following a formal survey of property boundaries. With regard to MNES, United commits to conserving the total habitat areas quoted in

Table 10-15 for each MNES as a minimum land based offset for the impacted MNES and any reductions at a particular site due to the administrative process of securing the sites under a BSA will be balanced by other land based offsets to ensure the total area stated in **Table 10-15** is met. This may include the use of land based offsets secured for Stage 2 and Stage 3.

Table 10-14 provides a specific breakdown of the Central Hunter Valley Eucalypt Forest and Woodland CEEC impact and offset outcomes. **Table 10-17** provides further detail on how each impacted BVT was offset.

Table 10-15: Summary of Impact and Offset Areas for MNES

MNES	Impact Area (ha) ALL STAGES	Proposed Offset Area (ha) STAGE 1	Offset Ratio Proposed Offsets
Central Hunter Valley Eucalypt Forest and Woodland CEEC	246.8 (known habitat)	197.5 ha at Wambo Offset Site	4.6:1
		269.2 ha at Jerrys Plains Offset Site	
		162.8 ha at Brosi Offset Site	
		505.8 ha in mine rehabilitation	
Total	246.8	1135.6	
Regent honeyeater (<i>Anthochaera phrygia</i>)	203.7 (potential habitat)	314.4 ha at Wambo Offset Site	6.9:1
		421.0 ha at Highfields Offset Site	
		195.7 ha at Mangrove Offset Site	
		266.3 ha at Jerrys Plains Offset Site	
		209.9 ha at Brosi Offset Site	
Total	203.7	1407.3	
Swift parrot (<i>Lathamus discolor</i>)	203.7 (potential habitat)	314.4 ha at Wambo Offset Site	6.9:1
		421.0 ha at Highfields Offset Site	
		195.7 ha at Mangrove Offset Site	
		266.3 ha at Jerrys Plains Offset Site	
		209.9 ha at Brosi Offset Site	
Total	203.7	1407.3	
	352.9 (potential habitat)	335.2 ha at Wambo Offset Site	4.3:1

MNES	Impact Area (ha) ALL STAGES	Proposed Offset Area (ha) STAGE 1	Offset Ratio Proposed Offsets
Spotted-tailed quoll (<i>Dasyurus maculatus maculatus</i>)		427.5 ha at Highfields Offset Site	
		258.5 ha at Mangrove Offset Site	
		271.2 ha at Jerrys Plains Offset Site	
		214.9 ha at Brosi Offset Site	
Total	352.9	1507.3	

Table 10-16: Summary of Impact and Offset Areas for Central Hunter CEEC

Development Vegetation ALL STAGES				Offset Vegetation STAGE 1				
BVT	BVT Condition	Credits	Area (ha)	Site	BVT	BVT Condition	Credits	Area (ha)
HU816	Plantation	59	1.17	WAMBO	HU618	Mod/Good	1462	87.8
HU869	Mod/Good	108	1.56			Regen	200	11.2
HU905	Mod/Good	9,035	140.98		HU817	Mod/Good	429	28.5
	Regen	1,087	24.32			Regen	206	13.3
	Thinned	3	0.08			DNG	818	52.7
	DNG	350	12.79			Cooba	60	4.0
HU906	Mod/Good	3,835	65.86		Subtotal		3,175	197.5
TOTAL		14,477	246.76	JERRYS PLAINS	HU618	Mod/Good	2,085	165.4
						Regen	719	49.6
						DNG	407	26.3
					HU905	Mod/Good	231	20.7
						Regen	36	2.6
						Bulloak	31	2.5
						DNG	29	2.1

Development Vegetation ALL STAGES	Offset Vegetation STAGE 1				
		Subtotal		3,211	269.2
	BROSI	HU818	Mod/Good	1,486	103.8
			Regen	422	25.0
			DNG	556	33.9
			Subtotal		2,464
	ECOLOGICAL MINE REHAB	HU905	Rehab	2,437	505.8
		Subtotal		2,437	505.8
		TOTAL		11,287	1,135.3

Table 10-17: Credit Allocation for Central Hunter CEEC in Stage 1

DEVELOPMENT VEGETATION STAGE 1				OFFSET VEGETATION STAGE 1				
BVT	Condition	Credits	Area (ha)	Site	BVT	Condition	Credits	Area (ha)
HU816	Plantation	59	1.17	Jerrys Plains	HU618	DNG	59	3.9
HU869	Mod/Good	108	1.56	Wambo	HU618	Mod/Good	108	6.5
HU905	Mod/Good	6,018	93.91	Wambo	HU618	Mod/Good	1,354	81.3
						Regen	200	11.2
					HU817	Mod/Good	429	28.5
						DNG	655	42.2
				Jerrys Plains	HU618	Mod/Good	384	30.5
						Regen	559	38.6
				Mine Rehab	HU905	Rehab	2,437	505.8
HU905	Regen	932	20.84	Wambo	HU817	Regen	206	13.3
						Cooba	60	4

DEVELOPMENT VEGETATION				OFFSET VEGETATION				
STAGE 1				STAGE 1				
						DNG	163	10.5
				Jerrys Plains	HU618	Mod/Good	503	39.9
HU905	Thinned	3	0.08	Jerrys Plans	HU618	Mod/Good	3	0.2
HU905	DNG	332	12.12	Jerrys Plains	HU618	DNG	261	16.8
						Regen	71	4.9
HU906	Mod/Good	3,835	65.86	Brosi	HU818	Mod/Good	1,486	103.8
						Regen	422	25.0
						DNG	556	33.9
				Jerrys Plains	HU618	Mod/Good	1,195	94.8
						Regen	89	6.1
						DNG	87	5.6
				Jerrys Plains*	HU905	Mod/Good	231	20.7
						Regen	36	2.6
						Bullock	31	2.5
						DNG	29	2.1
TOTAL		11,287	195.54				11,614	1,135.2

*27.9 hectares of Central Hunter Valley Eucalypt Forest and Woodland CEEC occurs within the Jerrys Plains Offset Site, however due to credit requirements for Stage 1, credits from this area have been formally allocated to impacts on non-CEEC HU905. This area in the Jerrys Plains Offset Site currently conforms to the CEEC or will be restored to the CEEC, resulting in a total Stage 1 CEEC offset of 1,135.2 hectares.

11. Management and Mitigation Measures at the Mine Site

United Wambo has identified a number of specific management and mitigation strategies to minimise and alleviate the potential impacts to biodiversity at United Wambo, as well as protect and enhance the native vegetation and species habitat within the BSSs. Specific details on these measures are outlined in the following sections.

These management and mitigation measures are specific and applicable to the United Wambo project area and not the Wambo surface development area.

11.1 Land Clearing

Prior to any ground disturbing activities, a Ground Disturbance Permit (GDP) will be required to be approved by the Environment and Community Department, Mine Surveyor and task coordinator. The purpose of the GDP is to ensure that the required environmental approvals have been received and appropriate environmental management controls have been implemented prior to the commencement of work. Controls outlined on the GDP are to be implemented before any ground disturbing activities may commence.

11.1.1 Pre-Clearance Surveys

Pre-clearance surveys are required to be undertaken before areas of remnant native vegetation (including grasslands, shrublands and open woodlands) are to be cleared. The surveys are to be undertaken by suitably qualified and experienced personnel in accordance with the United Wambo Pre-Clearing Survey and Habitat Tree Felling Procedure (**Appendix D - United Wambo Pre-Clearing Survey and Habitat Tree Felling Procedure**).

The United Wambo Pre-Clearing Survey Form (**Appendix E - United Wambo Pre-Clearing Survey Form**) has been developed to minimise the impact of clearing on native species (both threatened and non-threatened), as well as significant habitat features. The pre-clearance survey aims to identify significant ecological features within areas to be cleared and provide recommendations to minimise the impact of the clearing on them.

The purpose of the pre-clearance survey is to:

- identify and mark habitat trees;
- identify habitat resources for salvage (hollow-bearing logs etc.);
- identify presence of any threatened flora and fauna;
- identify potential seed collection resources; and
- identify any requirements for weed control to be undertaken prior to clearing.

Following the completion of the pre-clearance inspection, the tree felling procedure (**Section 11.1.2**) is to be followed.

Any threatened flora species found during pre-clearance surveys should be propagated or translocated to appropriate locations in nearby offset sites, where practicable.

Prior to disturbance, a review of Aboriginal heritage values will also be undertaken. This will be undertaken in accordance with the **United Wambo Aboriginal Heritage Management Plan**.

11.1.2 Habitat Tree-Felling

The United Wambo Habitat Pre-Clearing Survey and Habitat Tree Felling Procedure will be implemented to minimise the potential for impacts on native fauna species (including threatened species) as a result of the clearing of hollow-bearing trees (see **Appendix D - United Wambo Pre-Clearing Survey and Habitat Tree Felling Procedure**). The procedure details the necessary pre-clearing activities, requirements during clearing operations and post-clearing requirements. The procedure includes the following requirements:

- removal of non-hollow bearing trees/vegetation as close to the hollow-bearing tree felling date as practicable (in order to discourage fauna usage of the area). It is not necessary for the suitably qualified and experienced person to be present to supervise such works;
- hollow-bearing tree felling procedures, including (but not limited to):
 - supervision of all hollow-bearing tree felling works by a suitably qualified and experienced person;
 - visual canopy inspection on the day of the felling of hollow-bearing trees to check for individual animals in the canopy;
 - shaking of hollow-bearing tree (with heavy machinery where safe to do so) to encourage resident fauna to abandon tree, prior to felling;
 - lowering of hollow-bearing trees as gently as possible (soft-felled) with machinery;
 - inspection of all hollows in felled trees;
 - capture of any displaced/injured fauna;
 - if a threatened species is identified in a habitat tree on the day of felling, the supervising person should advise the most appropriate method to minimise potential harm;
 - release of unharmed fauna into nearby secure habitats;
 - injured fauna to be assessed and taken to wildlife carer, if necessary;
 - felled trees are to be rolled so that the number of hollows blocked against the ground are minimised;
 - all felled trees are to remain in place overnight to allow any unidentified fauna to escape; and
 - salvage of suitable hollows for use as compensatory habitat, where practicable.

All personnel who will capture/handle/house and/or transport native fauna species (injured or uninjured) will be suitably qualified and experienced.

11.1.3 Resource Salvaging

Where practical, a selection of habitat features will be salvaged for reuse in rehabilitation areas. This will include suitable:

- seed resources;
- tree hollows;
- hollow logs; and
- fallen timber and woody debris.

Salvageable habitat features (i.e. with good structural integrity and suitability for relocation and fauna use) will be identified during pre-clearing surveys, and collected as part of the clearing process, where suitable and feasible to do so. Salvaged features will then be stockpiled for use in rehabilitation to increase the habitat diversity and availability of rehabilitation areas, thus making them more suitable for native fauna colonisation (particularly threatened species) (refer to **Section 11.5**).

Where practicable, seed collection for canopy, mid storey and groundcover species is to be undertaken prior to clearance for propagation and use in rehabilitation areas and stewardship sites (see **Section 11.6**).

11.1.4 Salvage of Threatened Flora Species

No threatened flora species are known to occur in the Proposed Disturbance Area. If threatened flora species are recorded in the disturbance footprint during pre-clearance surveys (refer to **Section 11.1.1**), options for salvage, translocation and/or propagation will be investigated and recommendations sought from a suitably qualified person in accordance with the **Guidelines for the Translocation of Threatened Plants in Australia** (Vallee et al. 2004). Where possible, the threatened flora will be translocated to suitable locations within the biodiversity stewardship sites.

11.2 Weed Control

Weed species could be inadvertently brought into United Wambo with imported materials, or could invade naturally through removal of native vegetation. The presence of weed species has the potential to be an impediment to rehabilitation outcomes.

United Wambo has prepared a weed action plan which identifies the key weed areas that require treatment, and the recommended timeframes and methods for control, based on the type of weeds present. The plan is attached in **Appendix H**. The action plan will be reviewed annually.

The plan will be monitored via regular inspections of mining and non-mining lands to monitor the effectiveness of control programs and to identify any new infestations. The presence of weeds is also recorded during annual rehabilitation and ecological monitoring programs which are conducted on both mining and non-mining lands. Weed management activities and the effectiveness of those activities to prevent seed set/dispersal or recruitment will be reported on an annual basis in the Annual Review.

The United Wambo Mining Operations Plan includes specific weed control inspections and management for rehabilitation area.

11.3 Pest and Feral Animal Control

The objective of pest animal control at United Wambo is to reduce and, where possible, eliminate declared vertebrate pest species, through an integrated approach involving a combination of chemical and physical control methods. Assessment for the presence of vertebrate pests is to be undertaken as part of the ongoing flora and fauna monitoring program and routine inspections. Opportunistic sightings by any personnel are also recorded.

Pest animals that are known to potentially occur at United through fauna monitoring and opportunistic sightings include rabbits, brown hares, wild dogs, cats, foxes and pigs. These species can potentially impact on native fauna species through predation and by competing with native fauna for resources such as shelter, breeding sites and food. Pest animals can also degrade soil quality and, hence, reduce the productivity of the land.

Pest animal control will be undertaken in consideration of the control recommendations outlined in the Department of Primary Industries Vertebrate Pest Control Manual (DPI 2014), the NSW Codes of Practices (COPs) and Standard Operating Procedures (SOPs) (<http://www.dpi.nsw.gov.au/agriculture/pests-weeds/vertebrate-pests/publications/model-codes-of-practice>) and recommendations in relevant Threat Abatement Plans (TAP) (<http://www.environment.gov.au/biodiversity/threatened/threat-abatement-plans/approved>).

Pest animals relevant to this BMP are outlined in **Table 11-1**. Pest control activities will be reported in the Annual Review.

Table 11-1: Pest Animals and Management

Pest Species	Threat Abatement Plan	Suitable Control Method
Wild dog	No TAP available	1080 poisoning Soft-jaw trapping Opportunistic shooting
Red fox	Threat Abatement Plan for Predation by the Red Fox (DEWHA 2008)	1080 poisoning Canid pest ejectors Cage trapping
Pigs	Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (DoE 2017)	1080 poisoning Trapping Opportunistic shooting
Feral Cats	Threat Abatement Plan for Predation by Feral Cats (DoE 2015)	Baiting Trapping
Rabbits	Threat abatement plan for competition and land degradation by rabbits (DoE 2016)	1080 or Pindone poisoning Burrow fumigation and destruction Trapping

11.4 Bushfire Management

The vegetation that will be retained within United Wambo will require appropriate bushfire management to protect life and property, while supporting appropriate conditions for the significant ecological features identified. Appropriate bushfire management controls, taking into consideration biodiversity management, are included in the United Wambo Bushfire Management Plan. The plan provides details of fire management actions, bushfire controls and emergency response procedures should a bushfire occur and defines asset protection zones, access tracks and infrastructure corridors adjacent to and within United Wambo.

Use of fire as a tool for ecological management may improve the outcomes of weed control and biodiversity enhancement activities. The United Wambo Bushfire Management Plan includes details for prescribed burns for ecological purposes and includes consideration of issues such as the time since fire, intensity of burns, ignition patterns and impacts upon invasive weeds.

Bushfire management will consider:

- exclusion of planned bushfire from revegetation and regeneration areas to allow replanted and regenerating communities to mature to a stage where they are able to withstand bushfire and regenerate naturally following such an event;
- consideration of the sensitivities of threatened species and threatened ecological communities to bushfire and appropriate bushfire planning and management in relation to known occurrences of these;
- the use of ecologically appropriate fire regimes (be they related to burn frequency, duration or intensity), as these have the potential to impact negatively on significant ecological features;
- asset protection; and
- appropriate incorporation of all relevant ecological requirements into bushfire management plans.

Any hazard reduction and ecological burns are to be completed in accordance with the **Bushfire Environmental Assessment Code for New South Wales** (NSW Rural Fire Service, 2006) and the **Draft Revised Bush Fire Environmental Assessment Code** (NSW Rural Fire Service, 2017).

11.5 Fauna Habitat Enhancement and Reinstatement

United Wambo will re-establish ground fauna habitat through the relocation of habitat features to targeted mine site rehabilitation areas, where practicable. This will contribute to the more rapid development of fauna species diversity in the medium to long term as vegetation establishment progresses. The following habitat enhancement and reinstatement mitigation measures will be considered in the detailed planning of rehabilitation of the site:

- dams will be constructed in the post-mining landform to facilitate the re-colonisation of woodland fauna communities. Dams provide a source of permanent water in the landscape and associated fauna species such as frogs and invertebrates will constitute suitable prey for many additional fauna species such as reptiles and amphibians; and
- habitat enhancement of retained vegetation such as provision of nest boxes, salvaged hollows, fallen timber, hollow logs and boulders, as deemed necessary.

11.6 Seed Collection and Propagation

Local provenance seed will be targeted for collection at United Wambo including during clearing activities (i.e. collection of seeds from felled trees) and potential harvesting of native grass species.

Species considered suitable for seed collection should have high seed production and high levels of viability. Seed collection activities will be managed in accordance with the **Flora Bank Guidelines** (Florabank 2013). Florabank specifies the standard for conducting and recording planning, harvest, drying/cleaning, storage/packaging, testing, reporting and review.

Seed propagation activities will be undertaken by an external contractor who is suitably trained, licenced and experienced in propagation of the species required for revegetation. Ideally, all seed collected as part of the seed collection program will be used for tree propagation or direct seeding activities.

Trials of propagation methods may be undertaken throughout the revegetation program.

Whilst local provenance seed will be targeted for collection, it is unlikely to provide sufficient diversity and quantities of seed required for rehabilitation or revegetation activities. Therefore, native seed will also be purchased from suitable seed suppliers as required.

11.7 Employee Education and Training

The development of education packages and the facilitation of mine site awareness training can help to mitigate anthropogenic impacts on biodiversity. The ability of non-ecological personnel to identify key threatened species or key ecological threats can help to mitigate impacts on threatened species. Improved awareness and stewardship of mine site employees and contractors can potentially benefit all flora and fauna species and vegetation communities. The following mitigation actions will be undertaken to develop a greater understanding and awareness of biodiversity issues in non-ecological trained personnel:

- inductions for staff, contractors and visitors will be undertaken to make them aware of the key ecological issues present in the Project Area and so that they know their role and responsibilities in the protection and/or minimisation of impacts to all native biodiversity.

Inductions will identify the location of known sensitive flora and fauna and the policies being implemented to protect the biodiversity values of such areas.

11.8 Indirect Impact Management

Section 8.4.1.4 (f) of the FBA relates to onsite avoidance and minimisation measures required for consideration for impacts related to the operational phase of the Project. Section 4.2 of the FBA report outlines the mitigation measures proposed for the Project to manage indirect impacts on threatened flora and fauna species, in particular, swift parrot, regent honeyeater, spotted-tail quoll and koala. Where relevant, these are expanded upon below.

Unauthorised Impacts to Native Vegetation and Species Habitat

Impacts to native vegetation and species habitat will be managed through the United Wambo Ground Disturbance Permit (GDP) process. United Wambo will implement specific controls as required and as documented in the GDP.

Trampling of Threatened Flora Species

No threatened flora species are known to occur in the Proposed Disturbance Area. The *Acacia pendula* endangered population located south of the Proposed Disturbance Area has been actively avoided by the Project design and will not be impacted as a result of the Project. This area will be fenced to prevent unauthorised access. It is unlikely that any threatened flora species would be trampled during the operational phase of the Project.

Rubbish Dumping

During the operational phase of the Project, rubbish dumping will be unlikely to occur as suitable fencing and other security measures will be installed to ensure restrictions to access in retained vegetation areas and employee education and training will enforce awareness and stewardship of the mine site by employees and contractors. United will implement rubbish collection and management facilities.

Noise

During the operational phase of the Project, a range of noise reduction actions will be undertaken in accordance with the United Wambo Noise Management Plan, including noise attenuation on plant and equipment, use of 'silent horns', real-time monitoring with response procedures in place to assist

to manage noise with approved noise criteria and designing emplacement areas to create sheltered emplacement locations to minimise noise. These controls will all serve to minimise noise impacts on fauna.

Light Spill

Appropriate lighting controls to minimise impacts will be implemented as part of the Project, including minimisation of fugitive lighting emissions following Australian Standards.

Weed encroachment

Weed species could be inadvertently brought into the Proposed Disturbance Area with imported materials, or could invade naturally through removal of native vegetation. Weed control will be undertaken in accordance with **Section 11.2**.

Feral Animal Encroachment

Introduced fauna species such as foxes, rabbits, pigs, dogs and feral cats could change in distribution and abundance in the Proposed Disturbance Area and adjoining areas as future areas are cleared, mined and then rehabilitated. Pest and feral animal control will be undertaken in accordance with **Section 11.3**.

Nutrient Runoff

The United Wambo Erosion and Sediment Control Plan is to be utilised during the construction and operation phases of the Project will be prepared that is consistent with the requirements of **Managing Urban Stormwater: Soils and Construction** – Volume 1 and Volume 2E Mines and Quarries, or its latest version. This plan will be part of a broader Water Management Plan that will identify the water management controls to be implemented as part of the Project, including controls to minimise nutrient runoff.

Increased Risk of Fire

The vegetation that will be retained within the Proposed Disturbance Area will require appropriate bushfire management to protect life and property, while supporting appropriate conditions for the significant ecological features identified in the Proposed Disturbance Area as per **Section 11.4**.

11.9 Grazing and Agriculture

Small areas of the United Wambo site will continue to be managed for stock grazing and agricultural purposes. All such activities will be confined to specific areas identified across the site. This includes 'Grassland (Agricultural)' in **Figure 11-1**. These occur within the 330kV line in the north-east, the south-west and north-west of the United Wambo site. Adequate fencing will be installed and maintained along all boundaries of these areas and monitoring will take place as necessary to ensure fence condition is upheld.

In addition to the areas described above, land within the United Wambo site, beyond the boundary of the Conceptual Rehabilitation Area may also be exposed to stock grazing and agricultural land uses through the life of the project.

Management of stock grazing and agricultural use of land within the Wambo operated land is to be managed in accordance with the Wambo BMP.

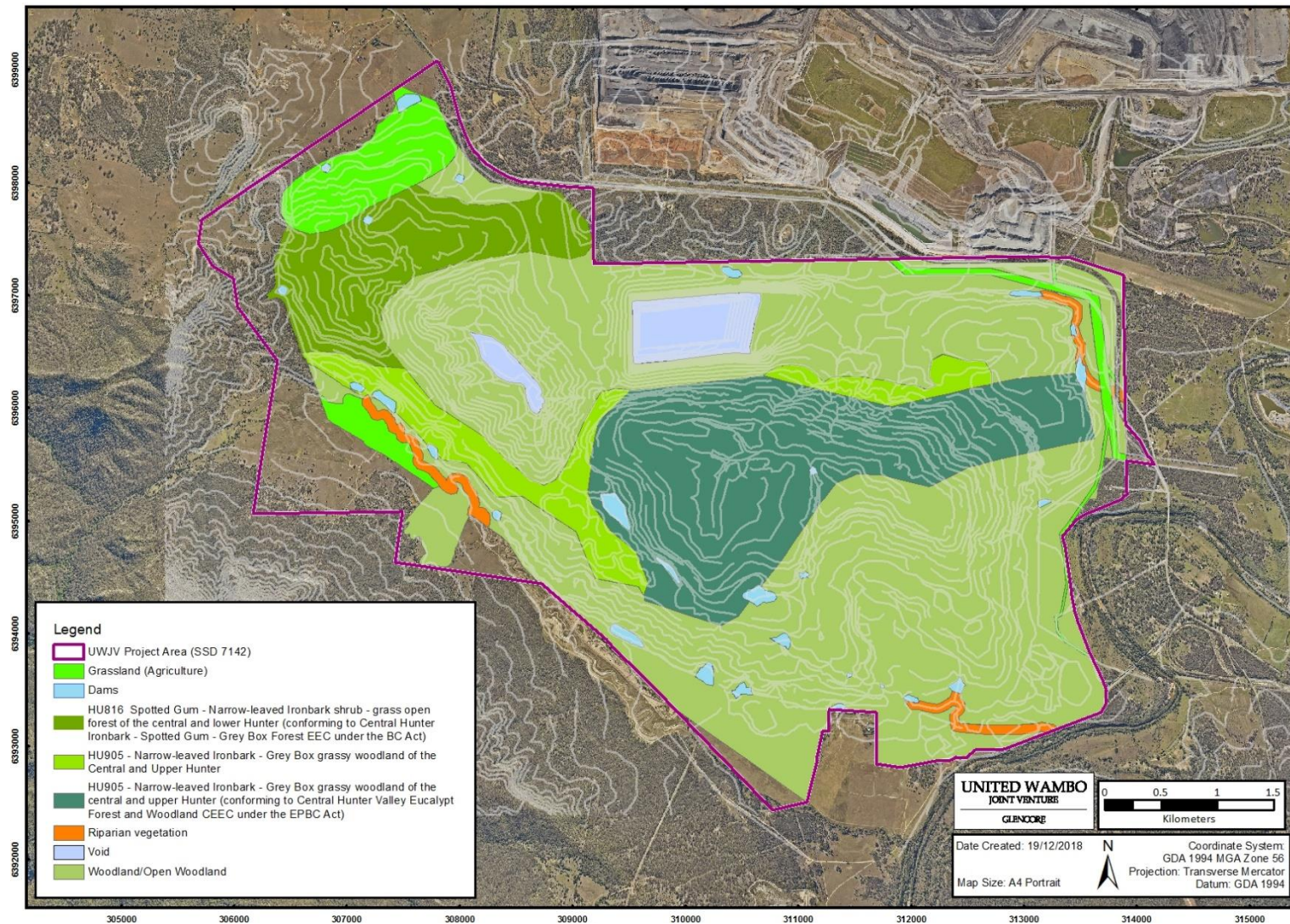


Figure 11-1: Approved Final Landform Plan

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Owner: Environment & Community Manager

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11.10 Mitigation Measures Summary

Table 11-2 provides a summary of the mitigation measures that will be implemented in the short, medium and long term to minimise the impacts of United Wambo

Table 11-2: Mitigation Measures

Action	Short term 2018 - 2020	Medium term 2021 - 2025	Long term 2026 - 2034
Minimise the impacts of the development on biodiversity	- Undertake pre-clearance surveys and tree-felling supervision - Salvage biological resources, where practicable - Develop a Weed Action Plan - Undertake weed control in accordance with Action Plan - Undertake pest control as required - Native seed collection and propagation - Monitoring and improvement	- Undertake pre-clearance surveys and salvage biological resources - Ongoing weed and pest control - Habitat augmentation in surrounding habitats using salvaged resources and nest boxes where required - Progressive rehabilitation - Monitoring and Improvement	- Progressive rehabilitation - Monitoring and Improvement
Manage the remnant vegetation and fauna habitat at the site	- Clear delineation of disturbance footprints to avoid accidental clearance - Weed and pest management - Seed collection and propagation - Monitoring and improvement - Pest and feral animal control	- Habitat augmentation in surrounding habitats using salvaged resources and nest boxes where required - Ongoing weed and pest management - Rehabilitation and compensatory planting from propagated local seed stock - Monitoring and improvement	Monitoring and improvement

Action	Short term 2018 - 2020	Medium term 2021 - 2025	Long term 2026 - 2034
Bushfire Management	As part the United Wambo Fire Management Plan, the vegetation retained within United Wambo will be appropriately managed to protect life and property, while supporting appropriate conditions for the significant ecological features identified. To assist with weed control and biodiversity enhancement activities Planned burns to be completed in accordance with the <i>Bushfire Environmental Assessment Code for New South Wales</i> (NSW Rural Fire Service, 2006) and the <i>Draft Revised Bush Fire Environmental Assessment Code</i> (NSW Rural Fire Service, 2017)	Ongoing enforcement of United Wambo Fire Management Plan	Ongoing enforcement of United Wambo Fire Management Plan , as necessary
Grazing and Agriculture	Portions of United Wambo to be managed for stock grazing and agricultural purposes Within specific areas of the Project Area, including 330kV line in the north east, the south west and north west of the United Wambo site This BMP is not responsible for the management of stock grazing and agricultural land use within the Wambo operated land	Maintenance of fencing This BMP is not responsible for the management of stock grazing and agricultural land use within the Wambo operated land	Maintenance of fencing This BMP is not responsible for the management of stock grazing and agricultural land use within the Wambo operated land

Action	Short term 2018 - 2020	Medium term 2021 - 2025	Long term 2026 - 2034
Employee Education and Training	Develop and appropriate package of educational material to be presented to site employees and contractors. Facilitate mine site awareness of biodiversity values of United Wambo and requirements of the BMP in relation to site operations Inductions for staff, contractors and visitors	Ongoing, inductions for staff, contractors and visitors	Ongoing, inductions for staff, contractors and visitors, as required

12. Ecological Mine Rehabilitation

The general rehabilitation objectives for United Wambo include the following:

- provide for the safety of employees and the public during and following the closure of the mining operations;
- provide a sustainable final landform and uses that can co-exist with surrounding land uses. This includes a commitment to the establishment of 'micro-relief' within the final landform for the Project to assist with long-term landform stability and to provide a more natural looking and functioning landform;
- establish similar native vegetation communities to those that will be impacted by United Wambo;
- establishment of ecological rehabilitation as part of the biodiversity offset for United Wambo;
- develop native vegetation corridors linking surrounding remnant vegetation areas to the southwest of United Wambo to existing remnants in the north east and south east, and the proposed future native rehabilitation areas of Hunter Valley Operations mine and Mount Thorley Warkworth; and
- inclusion of grassland areas for agricultural land use where appropriate.

In achieving these objectives, United Wambo will also aim to:

- minimise the potential environmental impacts from closure activities;
- comply with relevant regulatory requirements and attain regulatory consensus on the successful closure and rehabilitation of the site;
- reduce the need for long term monitoring and maintenance by achieving effective rehabilitation; and
- regularly consult with the relevant stakeholders during the closure and rehabilitation planning and implementation process.

The establishment of ecological rehabilitation as part of the biodiversity offset for United Wambo is discussed further below.

12.1 Target Plant Community Types for Mine Rehabilitation

The NSW *Biodiversity Offset Policy for Major Projects* (OEH 2014a) enables the use of ecological mine rehabilitation to contribute towards meeting the offset requirement of a mining project.

Ecological rehabilitation is defined by the Ecological Rehabilitation Guidelines (OEH 2015b) as a 'mine site where the rehabilitation will result in recognisable and self-sustaining plant community types (PCTs) as defined through the guidelines'. The Ecological Rehabilitation Guidelines provide objectives and preliminary completion criteria against which ecological rehabilitation can be measured to determine whether it comprises a recognisable and self-sustaining PCT.

Rehabilitated woodland areas are proposed to be created within United Wambo's post-mining landscape to contain flora species assemblages that are characteristic of the dominant vegetation communities impacted by United Wambo. The target PCTs that will comprise the ecological rehabilitation at United Wambo are outlined in **Table 12-1**. In total, the mine site ecological rehabilitation contributes up to 25 per cent of the overall biodiversity offset requirements and up to 20 per cent of the Central Hunter Valley Eucalypt Forest and Woodland CEEC requirements (as per Condition B61 of the Development Consent SSD 7142). This includes the restoration of up to 878 hectares of native vegetation communities (including Central Hunter Valley Eucalypt Forest and Woodland CEEC (as presented in **Table 12-1**).

Table 12-1: Target PCTs for Mine Rehabilitation

PCT / Species	Area (ha)	Credits
PCT 1691 (HU905) - Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter (conforming to <i>Central Hunter Valley Eucalypt Forest and Woodland CEEC</i> under the EPBC Act)	505.8	2,437
PCT 1602 (HU816) – Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the central and lower Hunter (conforming to Central Hunter Ironbark – Spotted Gum – Grey Box Forest EEC under the BC Act)	159.4	768
PCT 1691 (HU905) - Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter	212.8	1,025
Total	878.0	4,230

The approved final landform is shown in **Figure 11-1**. The broad location of the mine rehabilitation that will comprise the ecological rehabilitation will be identified over the first five years of the Project.

12.2 Rehabilitation Management Plan

Ecological rehabilitation will be undertaken in accordance with the approved **United Wambo Rehabilitation Management Plan** (RMP). The RMP details the rehabilitation objectives, performance measures and completion criteria for specific areas that are to be rehabilitated during the term of the RMP. Areas of rehabilitation will be assessed to confirm if they are meeting or trending towards

meeting the completion criteria. Subsequent reviews of the RMP will consider relevant updates to PCTs, benchmarks and assessment methodologies in relation to ongoing refinement of the final completion criteria. The preliminary performance indicators and completion criteria are discussed in **Section 12.2.1**.

12.2.1 Preliminary Performance Indicators and Completion Criteria

The preliminary performance indicators and completion criteria for the rehabilitation of the PCTs proposed to be established at United Wambo to contribute to the offset strategy for United Wambo are included in **Table 12-2**. While the values in **Table 12-2** have been guided by the Biodiversity Assessment Method (OEH 2017) (BAM), these are preliminary and in consideration of the ongoing changes in legislation and policy, mine rehabilitation indicators and criteria will be reviewed and modified as part of the RMP process and will consider the contemporary best practice guidance on ecological mine rehabilitation.

Table 12-2: Preliminary Performance Indicators and Completion Criteria by PCT for Ecological Mine Rehabilitation

Rehabilitation Objectives/ Attribute	Preliminary Performance Indicators (by Year 7)	Preliminary Completion Criteria (to generate credits for offset)
PCT1691 (HU905) - Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter Conforming to <i>Central Hunter Valley Eucalypt Forest and Woodland CEEC</i>		
Rehabilitation Objective 1 (Vegetation Composition)	Targeted planting of flora species characteristic or diagnostic of PCT1691 is undertaken, including the following species: • narrow-leaved Ironbark (<i>Eucalyptus crebra</i>); • grey box (<i>Eucalyptus moluccana</i>); • kurrajong (<i>Brachychiton populneus</i>); • native olive (<i>Notelaea microcarpa</i>); • winter apple (<i>Eremophila debilis</i>); • purple wiregrass (<i>Aristida ramosa</i>); • barbed wire grass (<i>Cymbopogon refractus</i>); • tall chloris (<i>Chloris ventricosa</i>); • yellow burr-daisy (<i>Calotis lappulacea</i>); • kidney weed (<i>Dichondra repens</i>); • paddock lovegrass (<i>Eragrostis leptostachya</i>); • weeping grass (<i>Microlaena stipoides</i>); and • slender bamboo grass (<i>Austrostipa verticillata</i>). Native species richness scores are trending towards benchmark for PCT1691 as determined through monitoring.	Rehabilitation contains at least 50 per cent of the species characteristic or diagnostic of PCT1691 as outlined in the VIS (or equivalent) or in suitable local reference sites.

Rehabilitation Objectives/ Attribute	Preliminary Performance Indicators (by Year 7)	Preliminary Completion Criteria (to generate credits for offset)
Rehabilitation Objective 2 (Vegetation Structure)	Targeted planting of flora species characteristic of growth form groups for PCT1691 is undertaken. Growth form groups include: - trees; - shrubs; - grasses; - forbs; - ferns; and - other species.	Rehabilitation contains vegetation structure and vegetation growth form covers within a suitable range of benchmark for PCT1691 as outlined in the VIS (or equivalent) or at suitable local reference sites.
	Overstorey cover scores are trending towards benchmark for PCT1691 as determined through monitoring.	Rehabilitation contains vegetation structure and vegetation growth forms covers within a suitable range of benchmark for PCT1691 as outlined in the VIS (or equivalent) or in suitable local reference sites.
	Midstorey cover scores are trending towards benchmark for PCT1691 as determined through monitoring.	Rehabilitation contains vegetation structure and vegetation growth forms covers within a suitable range of benchmark for PCT1691 as outlined in the VIS (or equivalent) or in suitable local reference sites.
	Native ground cover (grasses) scores are trending towards benchmark for PCT1691 as determined through monitoring.	Rehabilitation contains vegetation structure and vegetation growth forms covers within a suitable range of benchmark for PCT1691 as outlined in the VIS (or equivalent) or in suitable local reference sites.
	Native ground cover (shrubs) scores are trending towards benchmark for PCT1691 as determined through monitoring.	Rehabilitation contains vegetation structure and vegetation growth forms covers within a suitable range of benchmark for PCT1691 as outlined in the VIS (or equivalent) or in suitable local reference sites.
	Native ground cover (other) scores are trending towards benchmark for PCT1691 as determined through monitoring.	Rehabilitation contains vegetation structure and vegetation growth forms covers within a suitable range of benchmark for PCT1691 as outlined in the VIS (or equivalent) or in suitable local reference sites.

Rehabilitation Objectives/ Attribute	Preliminary Performance Indicators (by Year 7)	Preliminary Completion Criteria (to generate credits for offset)
	Exotic plant cover is trending towards less than 25 per cent for total ground and midstorey cover as determined through monitoring.	Exotic plant cover is <25 per cent for total ground and midstorey cover.
Rehabilitation Objective 3 (Vegetation Function)	Targeted placement of functional features is undertaken including: • leaf litter • fallen timber and logs; and • nest boxes or salvaged hollows.	Rehabilitation contains leaf litter, coarse woody debris and hollows within a suitable range of benchmark for PCT1691 as outlined in the VIS (or equivalent) or in suitable local reference sites.
	Targeted planting of characteristic canopy species is undertaken. Species include: • narrow-leaved Ironbark (<i>Eucalyptus crebra</i>); and • grey box (<i>Eucalyptus moluccana</i>).	The following characteristic canopy species are regenerating across the rehabilitation (i.e. evidence of regeneration stems <5cm DBH): • narrow-leaved Ironbark (<i>Eucalyptus crebra</i>); and • grey box (<i>Eucalyptus moluccana</i>).
	High threat weeds (OEH 2017d) do not comprise more than 20 per cent cover of any stratum.	High threat weeds (OEH 2017d) do not comprise more than ten per cent cover of any stratum.
Conformance to Central Hunter Valley Eucalypt Forest and Woodland CEEC (as per the key diagnostic characteristics and condition thresholds outlined in the EPBC Act Conservation)	Rehabilitation is identified to be within the Hunter River catchment.	<i>Central Hunter Valley Eucalypt Forest and Woodland CEEC</i> rehabilitation is identified to be within the Hunter River catchment.
	Rehabilitation is undertaken using material derived from the Permian-aged geological stratum.	<i>Central Hunter Valley Eucalypt Forest and Woodland CEEC</i> rehabilitation is restored on material derived from the Permian-aged geological stratum.
	Rehabilitation of this community is not undertaken on alluvial flats, Aeolian sands, Triassic-aged sediments or escarpments.	<i>Central Hunter Valley Eucalypt Forest and Woodland CEEC</i> rehabilitation does not occur on alluvial flats, Aeolian sands, Triassic-aged sediments or escarpments.

Rehabilitation Objectives/ Attribute	Preliminary Performance Indicators (by Year 7)	Preliminary Completion Criteria (to generate credits for offset)
Advice (DoE 2015))	Rehabilitation is trending towards a woodland or forest community with a projected canopy cover of 10 per cent or more or with a native tree density of 20 stems per hectare that are at least one metre in height.	<i>Central Hunter Valley Eucalypt Forest and Woodland CEEC</i> rehabilitation comprises a woodland or forest community with a projected canopy cover of ten per cent or more or with a native tree density of 20 stems per hectare that are at least one metre in height.
	Targeted planting of species characteristic of <i>Central Hunter Valley Eucalypt Forest and Woodland CEEC</i> is undertaken including one or more of the following: - narrow-leaved Ironbark (<i>Eucalyptus crebra</i>); - grey box (<i>Eucalyptus moluccana</i>); - spotted gum (<i>Corymbia maculata</i>); and - slaty gum (<i>Eucalyptus dawsonii</i>).	<i>Central Hunter Valley Eucalypt Forest and Woodland CEEC</i> rehabilitation comprises at least one of the following canopy species: - narrow-leaved Ironbark (<i>Eucalyptus crebra</i>); - grey box (<i>Eucalyptus moluccana</i>); - spotted gum (<i>Corymbia maculata</i>); and - slaty gum (<i>Eucalyptus dawsonii</i>).
	The following canopy species are not actively planted in the rehabilitation or removed if they appear: - forest oak (<i>Allocasuarina torulosa</i>); - white mahogany (<i>Eucalyptus acmenoides</i>); and - broad-leaved ironbark (<i>Eucalyptus fibrosa</i>).	<i>Central Hunter Valley Eucalypt Forest and Woodland CEEC</i> rehabilitation patch contains no more than two trees per hectare of the following species: - forest oak (<i>Allocasuarina torulosa</i>); - white mahogany (<i>Eucalyptus acmenoides</i>); and - broad-leaved ironbark (<i>Eucalyptus fibrosa</i>).
PCT1602 (HU816) - Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the central and lower Hunter Conforming to <i>Central Hunter Ironbark – Spotted Gum – Grey Box Forest EEC</i>		

Rehabilitation Objectives/ Attribute	Preliminary Performance Indicators (by Year 7)	Preliminary Completion Criteria (to generate credits for offset)
Rehabilitation Objective 1 (Vegetation Composition)	Targeted planting of flora species characteristic or diagnostic of PCT1691 is undertaken, including the following species: • narrow-leaved Ironbark (<i>Eucalyptus crebra</i>); • grey box (<i>Eucalyptus moluccana</i>); • kurrajong (<i>Brachychiton populneus</i>); • native olive (<i>Notelaea microcarpa</i>); • winter apple (<i>Eremophila debilis</i>); • purple wiregrass (<i>Aristida ramosa</i>); • barbed wire grass (<i>Cymbopogon refractus</i>); • tall chloris (<i>Chloris ventricosa</i>); • yellow burr-daisy (<i>Calotis lappulacea</i>); • kidney weed (<i>Dichondra repens</i>); • paddock lovegrass (<i>Eragrostis leptostachya</i>); • weeping grass (<i>Microlaena stipoides</i>); and • slender bamboo grass (<i>Austrostipa verticillata</i>). Native species richness scores are trending towards benchmark for PCT1691 as determined through monitoring.	Rehabilitation contains at least 50 per cent of the species characteristic or diagnostic of PCT1602 as outlined in the VIS (or equivalent) or in suitable local reference sites.

Rehabilitation Objectives/ Attribute	Preliminary Performance Indicators (by Year 7)	Preliminary Completion Criteria (to generate credits for offset)
Rehabilitation Objective 2 (Vegetation Structure)	Targeted planting of flora species characteristic of growth form groups for PCT1691 is undertaken. Growth form groups include: - trees; - shrubs; - Grasses; - forbs; - ferns; and - other species.	Rehabilitation contains vegetation structure and vegetation growth forms covers within a suitable range of benchmark for PCT1602 as outlined in the VIS (or equivalent) or in suitable local reference sites.
	Overstorey cover scores are trending towards benchmark for PCT1602 as determined through monitoring.	Rehabilitation contains vegetation structure and vegetation growth forms covers within a suitable range of benchmark for PCT1602 as outlined in the VIS (or equivalent) or in suitable local reference sites.
	Midstorey cover scores are trending towards benchmark for PCT1602 as determined through monitoring.	Rehabilitation contains vegetation structure and vegetation growth forms covers within a suitable range of benchmark for PCT1602 as outlined in the VIS (or equivalent) or in suitable local reference sites.
	Native ground cover (grasses) scores are trending towards benchmark for PCT1602 as determined through monitoring.	Rehabilitation contains vegetation structure and vegetation growth forms covers within a suitable range of benchmark for PCT1602 as outlined in the VIS (or equivalent) or in suitable local reference sites.
	Native ground cover (shrubs) scores are trending towards benchmark for PCT1602 as determined through monitoring.	Rehabilitation achieves between >25 per cent and <200 per cent of native ground cover (shrubs) benchmark for species characteristic to PCT1602 as outlined in the VIS (or equivalent) or in suitable local reference sites.

Rehabilitation Objectives/ Attribute	Preliminary Performance Indicators (by Year 7)	Preliminary Completion Criteria (to generate credits for offset)
	Native ground cover (other) scores are trending towards benchmark for PCT1602 as determined through monitoring.	Rehabilitation contains vegetation structure and vegetation growth forms covers within a suitable range of benchmark for PCT1602 as outlined in the VIS (or equivalent) or in suitable local reference sites.
	Exotic plant cover is trending towards less than 25 per cent for total ground and midstorey cover as determined through monitoring.	Exotic plant cover is <25 per cent for total ground and midstorey cover.
Rehabilitation Objective 3 (Vegetation Function)	Targeted placement of functional features is undertaken including: - leaf litter; - fallen timber and logs; and - nest boxes or salvaged hollows.	Rehabilitation contains leaf litter, coarse woody debris and hollows within a suitable range of benchmark for PCT1602 as outlined in the VIS (or equivalent) or in suitable local reference sites.
	Targeted planting of characteristic canopy species is undertaken. Species include: - narrow-leaved Ironbark (<i>Eucalyptus crebra</i>); and - spotted gum (<i>Corymbia maculata</i>).	The following characteristic canopy species are regenerating across the rehabilitation (i.e. evidence of regeneration stems <5cm DBH): - narrow-leaved Ironbark (<i>Eucalyptus crebra</i>); and - spotted gum (<i>Corymbia maculata</i>).
	High threat weeds (OEH 2017d) do not comprise more than 20% cover of any stratum.	High threat weeds (OEH 2017d) do not comprise more than 10% cover of any stratum.
	Number of trees with hollows (i.e. natural hollows or stags salvaged from other areas and placed into rehabilitation or installed nest boxes) occur in the rehabilitation.	Rehabilitation contains hollows within a suitable range of the number of hollow-bearing trees benchmark for PCT1602 as outlined in the VIS (or equivalent) or in suitable local reference sites. This is proposed to be achieved with the installation of artificial nest boxes.
	Targeted planting of canopy species is undertaken with natural reproduction processes (seeds, fruiting) taking place.	Rehabilitation contains dominant overstorey species naturally regenerating (i.e. not planted or seeded) within a suitable range.

Rehabilitation Objectives/ Attribute	Preliminary Performance Indicators (by Year 7)	Preliminary Completion Criteria (to generate credits for offset)
	Fallen timber and logs occur in the rehabilitation.	Rehabilitation contains total length of fallen log within a suitable range of benchmark for PCT1602 as outlined in the VIS (or equivalent) or in suitable local reference sites.
Conformance to Central Hunter Ironbark – Spotted Gum – Grey Box Forest EEC (as per the NSW Scientific Committee - final determination (OEH, 2010))	Rehabilitation is identified to be within the Hunter River catchment.	<i>Central Hunter Ironbark – Spotted Gum – Grey Box Forest EEC</i> rehabilitation is identified to be within the Hunter River catchment.
	Rehabilitation is undertaken using material derived from the Permian-aged sediments of the Hunter Valley.	<i>Central Hunter Ironbark – Spotted Gum – Grey Box Forest EEC</i> rehabilitation is restored on material derived from the Permian sediments of the Hunter Valley.
	Rehabilitation is trending towards an open forest to woodland community with a projected canopy cover of 10 per cent or more or with a native tree density of 20 stems per hectare that are at least one metre in height.	<i>Central Hunter Ironbark – Spotted Gum – Grey Box Forest EEC</i> rehabilitation comprises an open forest to woodland community with a projected canopy cover of ten per cent or more or with a native tree density of 20 stems per hectare that are at least one metre in height.
	Targeted planting of canopy species characteristic of <i>Central Hunter Ironbark – Spotted Gum – Grey Box Forest EEC</i> is undertaken including one or more of the following: - narrow-leaved Ironbark (<i>Eucalyptus crebra</i>); - grey box (<i>Eucalyptus moluccana</i>); and - spotted gum (<i>Corymbia maculata</i>).	<i>Central Hunter Ironbark – Spotted Gum – Grey Box Forest EEC</i> rehabilitation comprises at least one of the following canopy species: - narrow-leaved Ironbark (<i>Eucalyptus crebra</i>); - grey box (<i>Eucalyptus moluccana</i>); and - spotted gum (<i>Corymbia maculata</i>).

Rehabilitation Objectives/ Attribute	Preliminary Performance Indicators (by Year 7)	Preliminary Completion Criteria (to generate credits for offset)
	Targeted planting of native understorey species in rehabilitation including native grasses, herbs and shrubs. Examples include: • gorse bitter pea (<i>Daviesia ulicifolia</i>) • grey bush pea (<i>Pultenaea spinosa</i>) • coffee bush (<i>Breynia oblongifolia</i>) • bushy needlebush (<i>Hakea sericea</i>) • blackthorn (<i>Bursaria spinosa</i>) • poison rock fern (<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>) • barbed wire grass (<i>Cymbopogon refractus</i>) • weeping grass (<i>Microlaena stipoides</i>) • whiteroot (<i>Pratia purpurascens</i>) • many-flowered mat-rush (<i>Lomandra multiflora</i> subsp. <i>multiflora</i>) • blue flax lily (<i>Dianella revoluta</i>) • common everlasting (<i>Chrysocephalum apiculatum</i>) • kangaroo grass (<i>Themeda australis</i>).	<i>Central Hunter Ironbark – Spotted Gum – Grey Box Forest EEC</i> rehabilitation has a sparse to moderately dense ground cover. The understorey may have weed species present, but they should not be dominant.

12.3 Security of Ecological Mine Rehabilitation

As required in the NSW Biodiversity Offset Policy for Major Projects, a security bond will be required in order to ensure that the cost of rehabilitation will be met by the proponent. The monetary amount is to be sufficient to cover the cost of undertaking the works to achieve self-sustaining and recognisable PCTs as outlined above.

Following the completion of the rehabilitation and achievement of the criteria set out in **Table 12-2**, the ongoing land use for the area of mine rehabilitation will be native vegetation conservation to provide ongoing protection and management of the area.

Under NSW Government policy, there are a range of safeguard mechanisms in place if the situation occurs that the ecological rehabilitation does not meet the required standard and an alternative offset must be provided. It should be noted, however, that Glencore has a good record in delivery of high quality rehabilitation and is confident that it can deliver the required standard of rehabilitation.

Glencore is contributing to ongoing research projects that contribute to ongoing improvements in rehabilitation practice.

The specific performance measures and completion criteria proposed for the ecological rehabilitation will be approved by relevant government agencies as part of this plan and the Rehabilitation Management Plan and would be applied to ensure appropriate consideration of condition, composition, structure and function of the ecological mine rehabilitation to establish the CEEC. As per Appendix D of the NSW Biodiversity Offsets Policy for Major Project, if it becomes clear that the ecological rehabilitation standard for which biodiversity credits have been generated is not able to be achieved, the proponent must instead source and retire these credits from an alternate offset in order to meet its offset requirement. An agreement must be reached between the proponent and NSW government that the objectives and completion/relinquishment criteria are unable to be achieved.

Furthermore, where ecological mine rehabilitation has been used to contribute to an offset requirement, a security bond must be provided until the operator of the mine has proven through monitoring that the rehabilitation has established self-sustaining and recognisable plant community types. The bond ensures that sufficient money is available for the rehabilitation works to be completed should the mining company for any reason be unable to deliver the required works.

As discussed in **Section 10.3**, the area of ecological mine rehabilitation to be restored to the Central Hunter Valley Eucalypt Forest and Woodland CEEC will be secured using an appropriate in-perpetuity conservation mechanism following the achievement of the completion criteria outlined in the RMP and the closure of the mine.

13. Monitoring and Inspections

Monitoring and inspections will be used to assess and inform biodiversity management. The effectiveness and long-term success of mitigation actions will be evaluated against key outcomes, performance indicators and completion criteria, as outlined in **Section 12.2.1**.

This will be achieved by using formal monitoring programs and assessments that periodically examine measurable changes over time and provide information on impacts and the success or otherwise of mitigation actions.

The frequency and level of monitoring will be dependent on the environmental features to be assessed. The techniques will be targeted, systematic and repeatable.

The outcomes of biodiversity monitoring will be used to provide for the management plan to be reviewed and adapted in response to new information, as discussed in **Section 14**.

The monitoring and inspection program is discussed in the following sections.

13.1 Inspections

Quarterly inspections will be undertaken within the United Wambo BSSs and on mine buffer land over the life of the Project. These will comprise walkover inspections targeting revegetation/regeneration areas and creek lines. These will assess:

- the condition of site features such as fences, gates and access tracks;
- any evidence of unauthorised access or stock grazing;
- areas of erosion or sedimentation;
- weed infestations;

- evidence of pest fauna;
- effectiveness of revegetation works; and
- adequacy of bushfire management, including fuel loads, water availability and access.

A standard inspection checklist (the **Appendix G - United Wambo Biodiversity Offset Area Inspection Form** or **Appendix H - United Wambo Buffer Land Inspection Form**) will be used to record the outcomes of the inspection. Any required management actions that are identified as part of the inspection will be implemented as soon as practical, with actions recorded in CMO. Where necessary, management strategies will be amended accordingly with the aim of continually improving the success of the management strategies.

13.2 Mine Rehabilitation Monitoring

A detailed rehabilitation monitoring program will be implemented for mine rehabilitation at United Wambo, including ecological mine rehabilitation. The ecological rehabilitation monitoring program has been designed to evaluate the progress of the ecological rehabilitation against the preliminary completion criteria and objectives (as outlined in **Section 12.2.1** and has considered the requirements of **Section 13** (Rehabilitation Monitoring) of the Ecological Rehabilitation Guidelines (OEH 2015b). The results of the rehabilitation monitoring program will be reported in the Annual Review for the Project.

The monitoring program for the mine rehabilitation will be detailed in the RMP. Broadly, the monitoring program will include:

Initial establishment inspections are carried out within approximately three months of each rehabilitation campaign to provide early identification of potential issues to minimise harm to the establishing rehabilitation. Examples of these issues include:

- erosion that has occurred due to storm events;
- failure of drainage structures; and
- a lack of germination or establishment of ground cover.

Routine general inspections are to be undertaken at least annually until it can be demonstrated that completion criteria has been met. Parameters may include:

- growing media conditions;
- the presence and extent of erosion;
- the stability of drainage and sediment control structures;
- revegetation germination rates;
- plant health;
- species density and diversity;
- presence of colonising fauna (e.g. ants, foraging birds);
- control of unauthorised access;
- effectiveness of habitat augmentation features; and
- presence and/or impact of feral animals and weeds.

Ecosystem development monitoring is used to evaluate the progress of rehabilitation towards achieving the rehabilitation completion criteria outlined in **Table 12-2**, including a focus on

composition, function and structure. The monitoring program will also include reference (analogue) sites.

13.3 Stewardship Site Ecological Monitoring Program

The ecological monitoring program for each of the United Wambo BSSs will be prepared and presented individually within the respective Biodiversity Assessment Reports/Biodiversity Stewardship Site Assessment Reports (BSSARs). The BSSARs will be submitted for approval by the Planning Secretary within 24 months of commencing Phase 1A.

13.4 Mine Rehabilitation Monitoring Program

13.4.1 Rehabilitation Flora Monitoring

The rehabilitation monitoring program is undertaken within the United Wambo Project Area (management and monitoring requirements for the BSSs will be presented separately in the individual Biodiversity Stewardship Site Assessment Reports (BSSARs)) and targets areas of mine rehabilitation, revegetation and habitat creation. This program is consistent with the United Wambo Rehabilitation Management Plan required as part of condition B10. This monitoring includes annual walkover inspections and scientific plots/transects.

The monitoring program will identify management measures required to address issues of weed control and other improvements needed to meet completion criteria and, as such, will contribute significantly towards the identification of signals of sustainability.

The types of surveys conducted across the United Wambo JV relating to biodiversity are outlined in the sections below.

13.4.1.1 Annual Walkover Inspections

Annual walkover inspections are to be conducted annually to provide the mine with a snapshot of the condition of the rehabilitated areas and highlight any areas that require maintenance activities such as the presence of erosion, weeds, pest animals, low tree densities or signs of unhealthy plants. These surveys are not quantitative in nature.

Areas to be included in the annual walkover inspections include the following:

- riparian vegetation;
- grassland (agricultural);
- HU816 – Spotted Gum – Narrow-leaved Ironbark shrub – grass open forest of the central and lower Hunter (conforming to *Central Hunter Ironbark – Spotted Gum – Grey Box Forest EEC* under the BC Act);
- HU905 – Narrow-leaved Ironbark – Grey Box grassy woodland of the central and upper Hunter (conforming to *Central Hunter Valley Eucalypt Forest and Woodland CEEC* under the EPBC Act);
- HU905 – Narrow-leaved Ironbark – Grey Box grassy woodland of the central and upper Hunter; and
- Woodland/Open Woodland.

13.4.1.2 Scientific Plots and Transects

Plot and transect surveys will assess floristic composition, factors contributing towards sustainability, and whether the rehabilitation is tracking towards the target community in terms of species richness and density. This information will be necessary to compare against the performance indicators and completion criteria as described in **Section 12.2.1**. Plots and transects surveys will be undertaken in the following locations:

- reference sites;
- grassland (agricultural);
- ecological rehabilitation (HU816, HU905 (CEEC) and HU905); and
- woodland/open woodland rehabilitation areas.

The survey methodology for the rehabilitation flora monitoring has been designed to be in line with the Biodiversity Assessment Methodology (BAM) as it is the current ecological assessment methodology for NSW. Using BAM will also allow the benchmark data for HU816 and HU905 to be used to compare the results of the rehabilitation monitoring and assess performance indicators and trends towards completion criteria (refer to **Section 12.2.1**).

At each monitoring sites within the United Wambo ecological rehabilitation, a BAM floristic and vegetation integrity assessment will be undertaken in accordance with **Section 12** of the BAM (OEH 2017).

The methodology involves a 50 metre long transect and setting out a 20 x 50 metre and 20 x 20 metre quadrats. The locations for each site should be permanently marked with a star picket at the start and end of the 50 metre transect that are each suitably labelled with identification details (e.g. UWFI1-Start). These pickets will be critical in aligning photographs between surveys. Along the 50 metre transects, five 1 x 1 metre (at the 5 metre, 15 metre, 25 metre, 35 metre and 45 metre intervals) plots will also be assessed. The information collected within each of these areas is described below.

Roughly 45 - 60 minutes will be spent searching and recording all vascular flora species present within the 20 x 20 metre plot. Searches of each 20 x 20 metre plot should generally be undertaken through parallel transects from one side of the plot to the other.

For each flora species recorded in the plot, the following data will be collected in accordance with Table 2 of the BAM (OEH 2017):

- stratum/layer in which the species occurs;
- growth form;
- scientific name and common name;
- cover; and
- abundance.

At each vegetation integrity plot the following attributes will be recorded in accordance with the BAM (OEH 2017) to determine the condition of the vegetation zone:

- **Composition** - native plant species richness by growth form (within the 20 x 20 metre plot) (**Table 13-1**).
- **Structure** – estimate foliage cover of native and exotic species by growth form (within the 20 x 20 metre plot) (**Table 13-1**).

- **Function** - (within the 20 x 50 metre plot) including, number of large trees, presence or otherwise of tree stem size classes, presence or otherwise of canopy species regeneration, length of fallen logs, percentage cover for litter (recorded from five 1 x 1 metre plots), number of trees with hollows and high threat exotic cover.

Additional species found within a random meander within approximately 100 metres of the quadrat or transect in the same vegetation zone will also be recorded. These species will be identified as present, but will not have their cover or abundance recorded.

The rehabilitation flora monitoring will be completed at selected rehabilitation sites in spring each year.

Table 13-1: Cover Abundance Scale to be Utilised for Flora Monitoring

Cover*	Abundance
A measure or estimate of the appropriate cover measure for each recorded species; recorded from 1 – 5 per cent and then to the nearest 5 per cent. If the cover of a species is less than 1 per cent and the species is considered important, then the estimated cover should be entered (e.g. 0.4).	A relative measure of the number of individuals or shoots of a species within the plot. Use the following intervals; numbers above about 20 are estimates only: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 20, 50, 100, 500, 1,000 or specify a number greater than 1,000 if required.
Stratum (& layer)	Growth Form
Record as: • E = Emergent; • T = Upper; • M = Mid (if > 1 label as M1, M2, M3); • L= Ground (if > 1 label as L1, L2, L3)	Refer to Table 4.5 of the Native Vegetation Interim Type Standard.

* Projected foliage cover as per Biodiversity Assessment Methodology 2017 (OEH 2017)

Data collected will be analysed in order to identify changes in floristic diversity and abundance over time. Analyses will also be completed to compare revegetation/regeneration sites to their suitable benchmark/analogous sites. This will assist in tracking the progression of revegetation/regeneration sites in relation to performance criteria.

13.4.2 Habitat Assessment

Habitat assessment will also be undertaken in each 50 x 20 metre plot and data will be collected on a standard monitoring pro-forma for future comparability. Habitat features recorded at each site will include:

- general vegetation and plant health;
- general impressions of germination rates;
- evidence of natural seedling recruitment;
- occurrence and abundance of weed species and requirements for control;
- structure and floristics of vegetation cover;

- notes on areas requiring supplementary planting;
- notes on areas requiring soil amelioration;
- signs of disturbance (by stock, people or feral animals);
- nature and extent of erosion (particularly if requiring reparation);
- notes on the quality and effectiveness of existing and requirements for additional protection of rehabilitation/restoration works;
- notes on success of previous treatments from measures recommend as a result of previous monitoring regimes;
- evidence of fire;
- characteristic of ground cover (e.g. leaf litter, rocks, logs and soil);
- nectar or fruit resources and perch sites;
- water resources; and
- secondary evidence of fauna use such as scats, tree scratches or diggings.

13.4.3 Photo Monitoring

Photo monitoring will be undertaken at each permanent flora monitoring site and is used to identify any observable changes in the vegetation condition and development of vegetation structure over time. They are completed facing left, centre and right at the start of the 50 metre transect as well as a photo at the end of the 50 metre transect facing centrally back towards the start.

13.4.4 Seasonal Fauna Monitoring

United Wambo JV will conduct regular fauna monitoring across the rehabilitated forest/woodland areas. The primary aim of the monitoring program is to monitor and report on the effectiveness of the measures presented in **Section 0**, specifically in regards to swift parrot, regent honeyeater, spotted-tail quoll and koala (as per condition B71 (g) (vi). The key objectives of the program are to:

- provide information on species present;
- provide information on the distribution and habitat use of species in the management areas;
- provide information on the success of fauna management and conservation program; and
- enable informed decisions about future monitoring and management practices.

Fauna monitoring locations will be determined based on the presence of suitable habitat and will be determined at the time of collection of baseline data.

The seasonal fauna monitoring schedule is outlined in **Table 13-2**.

Table 13-2: Seasonal Fauna Monitoring Schedule

Survey	Timing (years)	Survey Unit	Replication
Winter Diurnal Bird Surveyed (targeted for swift parrots and regent honeyeaters)	1, 2, 5, 10	One person hour of survey (e.g. two people for 30 minutes) during winter, including a	In vegetation zones of PCT HU905 and HU816.

Survey	Timing (years)	Survey Unit	Replication
		period of call playback for each species.	
Spotlighting and call playback for koala	1, 2, 5, 10	One person hour of walking spotlight transects (e.g. two people for 30 minutes), including a period of call playback for the species.	In vegetation zones of PCT HU905 and HU816.
Remote Cameras (targeted for spotted-tail quoll)	1, 2, 5, 10	One camera deployed for up to four nights (full week).	Ten cameras within United Wambo
Nest box monitoring	2, 3, 4, 5, 6, 7, 8, 9 and 10	Monitor half of the total number of installed nest boxes each year. Rotating each year to ensure no nest box is monitored two years in a row. Do not monitor nest boxes until they have been installed for one year.	Where nest boxes have been installed

13.4.4.1 Diurnal Bird Surveys

Diurnal woodland bird surveys will consist of slow walking transects over an approximate two hectare area. These surveys will take place within the first four hours/last four hours of sunlight and will be in accordance with the species-time curve approach (DEC 2004). Surveys will be undertaken for a minimum of 20 minutes; after which every new species that is recorded triggers a further five minutes of survey.

Surveys will be targeting winter migrants for the Hunter Valley, swift parrot and regent honeyeater. A call playback for each species will be completed at the start of the survey. All bird species (including counts) identified during this time will be recorded as well as detailed on whether the bird identified was within, outside or flying over the site.

13.4.4.2 Spotlight Surveys

Spotlighting will target the koala and spotted-tail quoll, however, will record all other species of nocturnal mammals, birds and herpetofauna. One person hour of spotlighting surveys will be conducted at each fauna monitoring sites within an approximate two hectare area. Spotlighting will consist of slow walking meanders undertaken after sunset.

During this time all fauna observed or heard will be recorded and numbers documented.

13.4.4.3 Nocturnal Call Playback

Call playback sessions will be undertaken at each of the fauna monitoring locations using a directional loud hailer. Calls will be broadcast for the koala (*Phascolarctos cinereus*).

Call playback sessions will commence with a quiet listening period of five minutes. Each call will be played for a minimum of two minutes followed by a listening period of two minutes. If a response or unclear noise is heard the call will be repeated.

During this time, all fauna observed or heard will be recorded and numbers documented.

13.4.4.4 Remote-Sensing Camera Surveys

Remote-sensing camera monitoring will be undertaken at each fauna monitoring site and will consist of baited motion sensing remote cameras. At each of the monitoring sites, single remote cameras will be positioned in an area of high fauna activity. The remote camera will be set up to record three photographs each time it is triggered. All remote cameras will be left in situ for a two week period. Remote cameras will then be downloaded and resultant images analysed at the completion of the two weeks.

13.4.4.5 Nest Box Monitoring

Undertake monitoring of half the total number of installed nest boxes each year. Complete monitoring in a staggered approach, ensuring that no nest box is monitored two years in a row. Furthermore, no nest box should be monitored within the first year of being installed. This will give fauna species in the area the necessary time to become accustomed with the foreign object. Monitoring will include assessment of the condition of the box (still within the tree, sitting straight, any damage or signs of use [chewing or scratching on sides or entry]) as well as content (species and number of individuals, if possible).

13.4.5 Threatened Species Monitoring

During all aspects of the above surveys, any threatened or migratory species and endangered populations listed under the BC Act and EPBC Act will be recorded. Particular attention will be placed upon swift parrot, regent honeyeater, spotted-tail quoll and koala. Where identified, information recorded will include:

- coordinates of sighting;
- number of individuals recorded;
- evidence of breeding/nesting activity etc.; and
- details on breeding age etc. (if appropriate and identifiable).

This data will be collated and compared to that recorded during previous monitoring events in order to determine any increasing or decreasing trends.

13.4.6 Nest Box Monitoring

All nest boxes installed in the rehabilitated areas are subject to monitoring for condition and content. Details recorded for nest box monitoring is as follows:

- content, including:
 - whether they are being used by target species;
 - signs of presence such as nesting material or feathers;

- predator use;
- presence of native fauna; and
- presence of non-target species such as bees, wasps and introduced birds;
- condition, including:
 - collapsing joints;
 - missing lids;
 - bowing timber;
 - perishing timber; and
 - tree attachment.

Additional nest-box monitoring surveys will be undertaken where new nest boxes are installed as habitat enhancement measures. Content and condition monitoring will be completed every second year. Monitoring of nest boxes should be completed for a minimum of ten years.

14. Review, Reporting and Improvement

14.1 Adaptive Management Process

Adaptive management of the BMP will be responsive to any new and relevant data that may arise through the monitoring and inspections described in **Section 13**, legislative change or any other studies completed across United Wambo and the BSSs. This will enable a flexible approach to management commitments, allowing ongoing feedback and refinement of the BMP. Adaptive management will be a key mechanism to address the risks to the successful implementation of the BMP. Adaptive management steps include regular review of the BMP, including adaptation of targets and performance indicators, recognising potential risks to the successful implementation of the BMP and having a framework in place for corrective actions.

14.1.1 Biodiversity Trigger Action Response Plan

There are a number of potential risks, or situations where performance indicators and completion criteria may not be achieved. A Trigger Action Response Plan (TARP) has been developed to identify required actions and adaptive management in the event of potential impacts to biodiversity conservation objectives of this BMP (refer to **Table 14-1**). This is adapted from Rawlings et al (2010).

Table 14-1: Biodiversity Trigger Action Response Plan

Management Aspect	Key Element	Trigger	Potential Corrective Action
General Management	Protection of remnant vegetation	Unauthorised stock access	Identify access points and repair fences appropriately. Communicate with agricultural managers and adjacent landholders to emphasise areas where stock are not permitted.

Management Aspect	Key Element	Trigger	Potential Corrective Action
	Weed management	Infestations of noxious and environmental weeds are increasing, or new species detected	Adapt weed management plan and modify strategies accordingly. Ensure that weed densities in rehabilitation/regeneration areas are no worse than those in remnant vegetation (analogue) sites. Ensure that there are no significant weed infestations that are identified as a risk to rehabilitation or regeneration areas.
	Feral fauna management	Infestations of pest animals are increasing, or new species detected	Adapt pest management plan and modify strategies accordingly.
	Pathogens	Signs of <i>Phytophthora cinnamomi</i> are identified during ecological monitoring	Commission suitably qualified personnel to undertake pathogen control works. Ensure any vehicles and equipment that may have come into contact with contaminated equipment is appropriately cleaned.
	Complaints	Community complaint in relation to management of the biodiversity stewardship sites	Complaints to be handled in accordance with the <i>United Wambo Complaints Management Procedure</i> .
Revegetation Success	Species composition	No regeneration of plants, or indicator species missing	Assess fencing and ensure there is no unauthorised stock access or native fauna (i.e. grazing kangaroos). Control exotic weeds and pest animals to reduce competition. If deemed necessary, instigate active revegetation techniques including direct seeding or tubestock planting, following appropriate ground preparation.

Management Aspect	Key Element	Trigger	Potential Corrective Action
	Native flora diversity	Low flora species diversity or species diversity not consistent with target community	Targeted weed control. Instigate active revegetation techniques including direct seeding or tubestock planting, following appropriate ground preparation such as weed control, ripping and auguring. Revegetate with high diversity patches. Assesses adequacy of soil present as an appropriate growth medium.
	Native fauna diversity	Fauna species diversity of rehabilitated areas is inconsistent with reference communities	Control feral predators. Increase habitat features of target fauna species (i.e. nest boxes, specific foraging resources, log and rock piles etc.).
	Tree cover	Low or no tree cover	Plant/direct seed trees at appropriate rate using minimal ground disturbance.
	Survivorship	Tree dieback (from insect pressure, herbicide drift, water stress)	Revegetate with dense shrubs to increase diversity and insectivorous birds. Avoid using defoliant near woodlands when windy. Increase patch size through revegetation. Do not fertilise and prevent fertiliser drift.
	Weed management	Patches of exotic annual and perennial grasses occur	Spot spray small clumps. Investigate suitability to undertake a spring burn. Monitor and maintain control.
	Weed management	Exotic broadleaf weeds abundant or dominant	Use bush regeneration principles to manage. Use broadleaf herbicides in accordance with best practice guidelines. Hand weed if appropriate.
	Weed management	Tree and shrubs present but dense exotic ground cover	Densely plant trees and shrubs to outcompete with the exotic ground covers. Spot spray small clumps or hand remove exotic ground covers around native ground covers.

Management Aspect	Key Element	Trigger	Potential Corrective Action
	Native flora diversity	Dense stands of colonising tree or shrub species dominate regeneration or revegetation areas	Assess whether thinning is necessary. Leave if patches are small and plants are native. Thin manually if appropriate. Leave woody debris in-situ to enhance habitat value.
Habitat Enhancement	Habitat enhancement	Scarcity of key habitat features present in relation to reference sites	Add habitat features such as logs or branches. Increase the number of vegetation layers in the patch. Establish nesting boxes for target species.
	Habitat salvage	Habitat features salvaged are damaged during salvage or during stockpiling	Investigate machinery and equipment currently being used to salvage and translocate habitat features. Update protocols based on findings. Investigate adequacy of storage emplacement areas of features. Revise locations if necessary.
Bushfire Management	Bushfire management	Unplanned bushfire event occurs	Review procedures in place and update Bushfire Management Plan based on findings. Monitor plant succession after bushfire event.
	Emergency vehicle access	Tracks are in a poor condition for emergency vehicle access	Slash vegetation on existing tracks (with due diligence inspection prior if track vegetation is greater than 1m in height). Undertake track remediation works.
Nest Box Installation	Installation methods	Monitoring identifies attachment of nest box is failing	Reattach nest box to tree.
	Success as supplementary habitat	Monitoring identifies nest boxes not being used by target species	Control pest species utilising box (by removal if possible) or replace if being utilised by dangerous species such as bees/wasps.

Management Aspect	Key Element	Trigger	Potential Corrective Action
		Monitoring identifies nest box condition deteriorating	Replace nest box or repair if possible.

14.2 Review of BMP

In accordance with Condition E7 of SSD 7142, the BMP will be reviewed within three months of:

- the submission of an incident report under condition E9;
- the submission of an annual review under condition E11;
- the submission of an Independent Environmental Audit under condition E12; and
- the approval of any modification of the conditions of this consent.

United Wambo shall review, and if necessary, revise, the strategies, plans, and programs required under this approval to the satisfaction of the Secretary. United Wambo will complete the necessary review of this BMP at commencement of Phase 2 as per condition E5 of SSD 7142.

An internal review of the BMP will also be undertaken every three years, or as required, to refine and make improvements to the management strategies and to assess performance against preliminary performance indicators and completion criteria. The three year review will seek opportunities to improve the management strategies and further develop and forecast the longer term performance indicators and completion criteria. As per Condition E7 of SSD 7142, to improve environmental performance of the development, cater for a modification or comply with a direction, this BMP must be revised to the satisfaction of the Planning Secretary. Where revisions are required, the revised document must be submitted for approval within six weeks of the review.

14.3 Reporting

External and internal reporting is undertaken in accordance with the reporting requirements outlined in the *United Wambo Environmental Management Strategy*. Reporting of specific relevance to the BMP is presented in

Table 14-2.

Ecological, BSS and rehabilitation monitoring results will be reported in the Annual Review. The Annual Review will include a comparison of data against previous year's results as well as a list of management recommendations derived from the monitoring reports, and a statement of compliance with EPBC approval conditions. The Annual Review will be made available on the United Wambo public website.

Table 14-2: Reporting Requirements as Relevant to the BMP

Requirement	Trigger	Agency
Annual Review	Various approvals – Due at 31 March each year	DPE RR BCD NOW SC
Annual EPBC Report	EPBC ref 2015/7600 – Due on the anniversary of commencement	DoEE
Incident Reporting	Material harm or unapproved impact to land, biodiversity or ecological community	DoEE DPE RR

15. Document Information

Relevant legislation, standards and other reference information must be regularly reviewed and monitored for updates and should be included in the site management system. Related documents and reference information in this section provides the linkage and source to develop and maintain site compliance information.

15.1 Related Documents

Related documents, listed in **Table 15-1** below, are *documents* directly related to or referenced from within this document.

Table 15-1: Related documents

Number	Title
UWOC-1689771511-348	United Wambo Rehabilitation Management Plan
UWOC-1689771511-360	United Wambo Environmental Management Strategy

15.2 Reference Information

Reference information, listed in **Table 15-2** below, is *information* that is directly referred to for the development of this document.

Table 15-2: Reference information

Reference	Title
Chessman et al. 1997	<i>Objective derivation of macro-invertebrate family sensitivity grade numbers for the SIGNAL biotic index: application to the Hunter River system, NSW Mar. Freshwater Res. 48: 159-172, Chessman, B.C., Growns, J.E. and Kotlash, A.R., 1997</i>
DPI 2018	<i>Weed Control Handbook, NSW Department of Primary Industries, 2018</i>
DPE 2017	<i>Final Draft for Environmental Management Plan – Post Approval Requirements Series July 2017</i>
DoEE	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
FloraBank 2013	<i>Florabank Guidelines for Seed Collection and Use, Florabank</i>
Jansen et al. 2003	<i>Development and application of a method for the rapid appraisal of riparian condition. River Management Technical Guideline No. 4, Land and Water Australia, Canberra, Jansen, A., Robertson, A., Thompson, L. and Wilson, A. 2003</i>
Jansen et al. 2005	<i>Rapid Appraisal of Riparian Condition (Version 2). River and Riparian Technical Guideline. Land and Water Australia, Canberra, Jansen, A., Robertson, A., Thompson, L. and Wilson, A., 2005</i>
NSW EPA	<i>Pesticides Act 1999</i>
NSW Rural Fire Service	<i>Draft Revised Bush Fire Environmental Assessment Code, NSW Rural Fire Service, 2017</i>
NSW Rural Fire Service	<i>Bush Fire Environmental Assessment Code, NSW Rural Fire Service, 2006</i>
OEH	<i>Biodiversity Conservation Act 2016</i>
OEH 2010	<i>Central Hunter Ironbark – Spotted Gum – Grey Box Forest EEC – Final Determination. NSW Scientific Committee, gazettal date 12/02/2010</i>
OEH 2014a	<i>NSW Biodiversity Offsets Policy for Major Projects, Office of Environment and Heritage, September 2014</i>
OEH 2014b	<i>Framework for Biodiversity Assessment – NSW Biodiversity Offsets Policy for Major Projects, Office of Environment and Heritage, September 2014</i>
OEH 2014c	<i>BioBanking Assessment Methodology 2014, Office of Environment and Heritage, September 2014</i>
OEH 2015a	<i>Draft Upper Hunter Strategic Assessment Guidelines for the Mitigation of Coal Mining Impacts on Biodiversity, Office of Environment and Heritage, provided to Glencore 17 December 2015</i>
OEH 2015b	<i>Draft Guidelines for the Ecological Rehabilitation of Recognisable and Self-sustaining Plant Community Types for the UHSA, Office of Environment and Heritage, provided to Glencore 17 December 2015</i>

Reference	Title
OEH 2016	<i>BioNet Atlas of NSW Wildlife</i> , http://www.bionet.nsw.gov.au/ accessed February 2016, Office of Environment and Heritage
OEH 2017	<i>Biodiversity Assessment Method, Consultation Draft</i> , Office of Environment and Heritage, May 2017
Peterson R.C. 1992.	<i>The RCE: a Riparian, Channel, and Environmental Inventory for small streams in the agricultural landscape</i> , Freshwater Biology, No. 21, pp. 295 – 306.
Rawlings et al. 2010	<i>A guide to managing box gum grassy woodlands</i> . Department of the Environment, Water, Heritage and the Arts, Canberra, Rawlings, K., Freudenberger, D. and Carr, D., 2010.
Serov et al. 2012	<i>Risk Assessment Guidelines for Groundwater Dependent Ecosystems</i>
Tongway and Hindley 2004	<i>Landscape Function Analysis. Procedures for monitoring and assessing landscapes</i> . CSIRO Sustainable Ecosystems, Canberra, Tongway, D. and Hindley, L., 2004.
Turak et al. 2004	New South Wales (NSW) Australian River Assessment System (AUSRIVAS) – Sampling and Processing Manual, Department of Environment and Conservation, Sydney, Turak, E., Waddell N., Johnstone G., 2004.
Umwelt 2015	<i>Upper Hunter Strategic Assessment – United Collieries Biodiversity Certification Assessment Report</i> , Umwelt, 2015
Umwelt 2016	<i>United Wambo Open Cut Coal Mine Project – Upper Hunter Strategic Assessment Statement of Consistency Report – Final August 2016</i> , Umwelt, August 2016
Umwelt 2016	<i>United Wambo Open Cut Coal Mine Project, Environmental Impact Statement</i> , August 2016
Umwelt 2017	<i>United Wambo Open Cut Coal Mine Project, Response to Submissions Part B, Umwelt May 2017 (RTS), including the Biodiversity Assessment Report, Appendix 4</i> , Umwelt, May 2017
Umwelt 2017	<i>United Wambo Open Cut Coal Mine Project, Response to Request for Further Information</i> , September 2017
Umwelt 2018a	<i>United Wambo Open Cut Coal Mine Project, Response to Independent Planning Commission Recommendations</i> , Umwelt July 2018, including Addendum Report for Additional Offset Sites, Umwelt, May 2018
Umwelt 2018b	<i>United Wambo Open Cut Coal Mine Project – Request for Additional Information</i> , letter to Department of Planning and Environment, Umwelt October 2018.

15.3 Change Information

Full details of the document history are recorded in the document control register, by version. A summary of the current change is provided in **Table 15-3** below. Example detail shown below.

Table 15-3: Change information

Version	Date	Change Details
1.0	September 2019	New document
1.1	October 2019	Consideration of comments on version 1.0 from DPE received 11 October 2019, No comments were received from BCD.
1.2	November 2019	Updated to include conditions from proposed Controlled Action Approval received 7 November 2019 and further information on MNES.
2.0	June 2020	Updated to new template and reviewed for Phase 1B and Phase 2 operations
2.1	November 2020	Updated Biodiversity Offset Strategy
3.0	April 2022	Reviewed and updated in accordance with Condition E7 – Modification 1. Addition of South Wambo offset information and update to Biodiversity Offset Strategy

16. Accountabilities

The following accountabilities have been prepared and designed in line with the organisational structure, roles and responsibilities identified in the Final Draft for Environmental Management Plan – Post Approval Requirements Series July 2017 (DPE 2017).

Role	Accountabilities for this Document
Operations Manager	Ensure that sufficient resources are allocated for the implementation of this BMP.
Environment & Community Manager	- Ensure that sufficient time and resources are allocated to allow for the implementation of long term ecological management and enhancement strategies for the BSSs. - Allocate sufficient resources and time for the implementation of the BMP monitoring programs. - Ensure that the results of the BMP monitoring programs and research trials are utilised to refine closure criteria as well as to evaluate the effectiveness of regeneration/rehabilitation practices so as to facilitate continual improvement. - Periodically review progress against performance indicators and completion criteria. - Ensure all internal and external reporting requirements are met, including necessary revisions of the BMP. - Ensure that all relevant records are effectively maintained on site. - Authorisation of essential clearing activities in accordance with the BMP through the Ground Disturbance Permit process.
Environment & Community Coordinator/ Officer	- Coordinate the day to day implementation of this BMP, including the design and implementation of ecological management activities and as delegated by the Environment and Community Manager. - Coordinate monitoring requirements as per the BMP and Glencore standards. - Coordinate reporting requirements relating to rehabilitation in the Annual Review (AR). - Ensure that personnel involved in the carrying out and monitoring of the BMP activities are appropriately qualified, licensed and experienced to undertake the task.
All Persons	Undertake activities directly in accordance with the requirements of the BMP.

Appendix A - Stakeholder Consultation

A.1 Phase 1A

Comment from DPE	Response by United Wambo Project
In accordance with condition B71(a) of the development consent, provide evidence that the BMP has been prepared by a suitably qualified and experienced person, including correspondence from Bill Wallach and Naomi Buchhorn from Umwelt indicating they are satisfied with the plan.	Umwelt have prepared a letter, which has been provided.
In accordance with condition B71(b), provide evidence that the BMP has been prepared in consultation with the Biodiversity & Conservation Division within the Department (BCD).	Evidence of consultation with BCD is provided in Appendix A of the BMP. BCD were unable to provide comment of the BMP.
Append biodiversity related forms and procedures referenced in the BMP (eg. Offset Area Inspection Form, Habitat Tree Felling Procedure, Weed Action Plan, etc) to the document.	These forms and procedures are provided as appendices to the BMP. References to the forms and procedures have been updated throughout the BMP. The Weed Action Plan has not yet been developed, a commitment is made in the BMP to prepare within six months.
Section 3 – condition B61 allows ecological mine rehabilitation to be used to satisfy up to 20 per cent	Section 10 now states: Mine site ecological rehabilitation (see Section 12) contributing up to 25 per cent of the overall biodiversity offset requirements and up to 20 per cent of the Central Hunter Valley Eucalypt Forest and Woodland CEEC requirements
It is noted that individual Biodiversity Stewardship Site Assessment Reports (BSSARs) are proposed to address the management and monitoring of the five Biodiversity Stewardship Sites. The Department accepts this approach, however, notes that the BSSARs will need to be submitted and approved by the Planning Secretary within 12 months of commencing Phase 1A. The BMP should include commitments to this effect.	Section 10 has been updated and now states: The BSSARs will be submitted for approval by the Planning Secretary within 12 months of commencing Phase 1A. (Note this has since been extended to 24 months)
It is noted that Table 1-3 2015/7600 Requirements for Biodiversity Management is incomplete and will require updating once the approval is issued.	Table 1-3 will be updated once EPBC approval has been received.

A.2 Phase 1B

Comment from DPE	Response by United Wambo Project
The Weed Action Plan committed to should be completed and provided.	The Weed Action Plan has been attached as Appendix I.

From: Steven Cox <Steven.Cox@environment.nsw.gov.au>
Sent: Thursday, 5 September 2019 5:08 PM
To: Farnon, Aislinn (United - AU)
Cc: Melanie Hollis; Wills, Gary (United - AU); Robert Gibson
Subject: RE: United Wambo SSD 7142 Biodiversity Management Plan

External sender

Hi Aislinn,

Thank you for providing the Biodiversity and Conservation Division (BCD) of the Department of Planning, Industry and Environment (the Department) with the opportunity to comment on the United Wambo Biodiversity Management Plan. However, BCD is currently unable to provide comment on the plan.

Please provide a copy of the plan to the Energy and Resources Division of the Department without comment from BCD.

Also please send any future requests for advice to rog.hcc@environment.nsw.gov.au rather than directly to individual team members or me. Such emails will be saved in our document management system (and documents from file transfer websites will be downloaded) and will be forwarded to me within 24 hrs. If I'm on leave they will go to the Acting Team Leader (so they can't be missed or lost if someone is away).

Regards
Steven

Steven Cox
Senior Team Leader Planning
Hunter Central Coast Branch

Biodiversity and Conservation Division | Department of Planning, Industry and Environment
T 02 4927 3140 | M 0472 800 088 | E steven.cox@environment.nsw.gov.au
Level 4, 26 Honeysuckle Drive, Newcastle NSW 2300
www.dpie.nsw.gov.au



Planning,
Industry &
Environment

The DPIE Hunter Central Coast Branch Planning Team has a group email address:
rog.hcc@environment.nsw.gov.au. Please address all further email correspondence in relation to Planning and Aboriginal cultural heritage regulation matters to this address.

The Department of Planning, Industry and Environment acknowledges that it stands on Aboriginal land. We acknowledge the traditional custodians of the land and we show our respect for elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.

From: Melanie Hollis <Melanie.Hollis@planning.nsw.gov.au>
Sent: Friday, 11 October 2019 2:00 PM
To: Farnon, Aislinn (United - AU)
Subject: United Wambo Biodiversity Management Plan Review

External sender
Hi Aislinn

Please address the below comments for the Biodiversity Management Plan.

Biodiversity Management Plan (BMP) (Version 1.0)

- In accordance with condition B71(a) of the development consent, provide evidence that the BMP has been prepared by a suitably qualified and experienced person, including correspondence from Bill Wallach and Naomi Buchhorn from Umwelt indicating they are satisfied with the plan.
- In accordance with condition B71(b), provide evidence that the BMP has been prepared in consultation with the Biodiversity & Conservation Division within the Department (BCD).
- Append biodiversity related forms and procedures referenced in the BMP (eg. Offset Area Inspection Form, Habitat Tree Felling Procedure, Weed Action Plan, etc) to the document.
- Section 3 – condition B61 allows ecological mine rehabilitation to be used to satisfy up to 20% of CEEC ecosystem credit requirements, not 25% as specified.
- It is noted that individual Biodiversity Stewardship Site Assessment Reports (BSSARs) are proposed to address the management and monitoring of the five Biodiversity Stewardship Sites. The Department accepts this approach, however notes that the BSSARs will need to be submitted and approved by the Planning Secretary within 12 months of commencing Phase 1A. The BMP should include commitments to this effect.

It is noted that *Table 1-3 2015/7600 Requirements for Biodiversity Management* is incomplete and will require updating once the approval is issued.

Kind Regards

Melanie Hollis
Senior Planning Officer
Resource Assessments
Level 30, 320 Pitt Street | GPO Box 39 | Sydney NSW 2001
T 02 8217 2043 E melanie.hollis@planning.nsw.gov.au



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The Department of Planning, Industry and Environment acknowledges that it stands on Aboriginal land. We acknowledge the traditional custodians of the land and we show our respect for elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.



Please consider the environment before printing this e-mail.

Appendix B - DPE Approval



**Planning,
Industry &
Environment**

Planning and Assessments
Energy and Resource Assessments
Contact: Joel Herbert
Phone: (02) 8289 6614
Email: joel.herbert@planning.nsw.gov.au

Ms Aislinn Farnon
Approvals Manager
United Wambo Coal JV Project

By email: Aislinn.Farnon@glencore.com.au

Dear Ms Farnon,

**United Wambo Open Cut Coal Mine (SSD 7142)
Approval of Management Plans**

I refer to your recent correspondence submitting the revised copies of the below management plans for Phase 1A, in accordance with the United Wambo Open Cut Coal Mine development consent (SSD 7412):

- Air Quality and Greenhouse Gas Management Plan, dated 1 November 2019 (condition B29, Part B);
- Biodiversity Management Plan, dated 6 November 2019 (condition B71, Part B); and
- Construction Environmental Management Plan, dated 4 November 2019 (condition C10, Part C).

The Department has reviewed the revised plans and now considers that they adequately address the requirements of SSD 7412. Consequently, the Department has approved these plans.

Please ensure that copies of these plans are published on your website in accordance with condition E16 of Part E.

Should you have any enquiries in relation to this matter, please contact Joel Herbert on the details listed above.

Yours sincerely

Stephen O'Donoghue
Director
Resource Assessments
as nominee of the Secretary

Appendix C - Correspondence from Umwelt



Our Ref: 4437/R01/AR/BW/21102019

5 November 2019

Melanie Hollis
Senior Planning Officer
Resource Assessments
Department of Planning, Industry and Environment
320 Pitt Street
SYDNEY NSW 2001

E | melanie.hollis@planning.nsw.gov.au

Dear Melanie

**Re: Project Approval SSD 7142 - United Wambo Open Cut Coal Mine Project -
Approval of Ecologists to Prepare the Biodiversity Management Plan**

To satisfy Part B - Condition B71(a) of the United Wambo Open Cut Coal Mine Conditions of Consent SSD 7142, Umwelt (Australia) Pty Limited (Umwelt) on behalf of United Collieries Pty Limited seeks the Secretary's approval for Mr Bill Wallach (Senior Ecologist and Accredited BAM Assessor) and Ms Naomi Buchhorn (Principal Ecologist/Environmental Scientist) from Umwelt to assist with the preparation of the Biodiversity Management Plan for the project. The letter below documents the suitable experience and qualifications of Bill and Naomi as per Condition B71 of the project approval. The draft BMP has been prepared by United, with Bill and Naomi providing detailed reviews of the document.

Bill Wallach

Bill Wallach has more than 10 years' experience in ecological consultancy. He has worked on post approval monitoring programs for a number of mining projects including undertaking long-term vegetation monitoring, rehabilitation monitoring, vegetation community change monitoring, saltmarsh and freshwater wetland monitoring, swamp oak monitoring, and mangrove forest monitoring. He has worked extensively in the planning, preparation and completion of a large vegetation monitoring project throughout New South Wales and Victoria that also involved a large body of office based data interpretation. As part of Bill's involvement in the monitoring programs across a number of Glencore mining projects, he has gained a thorough understanding of the detail and requirements for each of the respective BMPs. Ensuring that each field program is completed in accordance with the BMPs is of the upmost importance.

Recently, Bill has worked on two projects with the Office of Environment and Heritage (now Department of Planning, Industry and Energy [DPIE]) where he completed comprehensive reviews of proposed BioBanking Sites within NSW. The work included the detailed review of the BioBanking report, total fund deposit, list of management actions and online calculator assessment.

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Umwelt (Australia) Pty Limited
ABN 18 059 519 041



In preparation of this BMP, Bill has drawn on his depth of experience in implementing a range of monitoring programs. Importantly, he has also utilised a number of United Wambo existing reports, the final development conditions, communications from the Department of Industry, Environment and Planning (DPIE) and the Department of Planning and Environments (DPE) Final Draft for Environmental Management Plan – Post Approval Requirements Series July 2017 (2017). In addition to these documents, Glencore's United Project Approvals Coordinator, Sean Pigott, has contributed to site specific details required for the BMP. All of which have been reviewed by Bill.

Naomi Buchhorn

Naomi has a technical background in ecology and project management with over 27 years' experience in consulting in eastern Australia. She has experience in the management of multidisciplinary teams through the investigation and impact assessment processes for local, state and commonwealth planning approvals.

Her project experience encompasses a range of sectors, particularly linear infrastructure, resources, property development and wetland assessments. Projects have included road works, railway infrastructure projects (including rail bridges, rail deviations and duplications), transmission line, substation upgrades, open cut mines, underground mines, sand extraction operations, hard rock quarries, titanium minerals mining and property development (residential and commercial).

Naomi has technical expertise in ecology of eastern Australia particularly in the Hunter Valley, central coast, north coast of New South Wales. Studies have included ecological monitoring programs, identification of environmental constraints and opportunities, threatened species assessment, wetland assessment, conservation assessments and ecological monitoring programs. Wetland assessments have included assessment of ecological change of Ramsar wetlands and preparation with government agencies and multiple stakeholders of response strategies in keeping with Ramsar Convention. Throughout her career Naomi has prepared and reviewed a number of management plans for property developments, conservation reserves and construction projects for private landowners, government agencies and public authorities. Her experience in reviewing contractor's compliance to conditions of approval and implementation of construction environmental management plans either through her roles as one of the Project Independent Environmental Representatives, assisting the lead Environmental Management Representative or assisting lead auditors undertake environmental audits provided valuable insights into need for practical, achievable and measurable actions.

Naomi's role in preparing this BMP was to review the adequacy of the plan and ensure that the plan addressed the development conditions and requirements of the Department of Planning and Environments (DPE) Final Draft for Environmental Management Plan – Post Approval Requirements Series July 2017 (2017)

Should you have any queries or wish to discuss this, please do not hesitate to contact Allison Riley on 02 4950 5322.

We trust this information meets with your current requirements. Please do not hesitate to contact the undersigned on 1300 793 267 should you require clarification or further information.

Yours sincerely

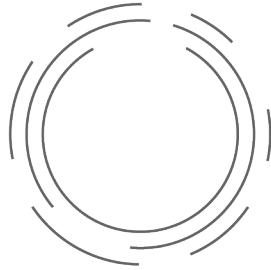
A handwritten signature in black ink, appearing to read 'AR'.

Allison Riley
NSW Ecology Manager and Accredited BAM Assessor

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Appendix D - United Wambo Pre-Clearing Survey and Habitat Tree Felling Procedure



Pre-Clearing Survey and Habitat Tree Felling Procedure



Table of Contents

1.	Purpose.....	1
2.	Scope	1
3.	Pre-clearing Survey Procedure	1
4.	Tree Felling Procedure	2
4.1	Risk Identification.....	2
4.1.1	Environment.....	2
4.1.2	Ground Inspection.....	3
4.1.3	Tree Inspections	3
4.2	Non-Habitat Tree Felling	4
4.3	Habitat Tree Felling	5
5.	Resource Salvaging	6
5.1	Salvage of Threatened Flora Species	6
6.	Document Information	7
6.1	Related Documents	7
6.2	Reference Information	7
6.3	Change Information	7
7.	Accountabilities.....	8

Figures

Figure 4-1: Risks of Tree Felling to be Identified.....	3
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Tables

Table 6-1: Related Documents.....	7
Table 6-2: Reference Information.....	7
Table 6-3: Change Information	7
Table 7-1: Accountabilities.....	8

1. Purpose

This tree felling procedure describes the process that is to be followed to minimise the potential impacts to native fauna species, particularly threatened fauna species as a result of vegetation clearing and tree felling activities.

The procedure is to be used when any clearing of remnant native trees is required on land owned or managed by United Wambo JV Project.

2. Scope

This procedure applies to all United Wambo employees, contractors and sub-contractors, who are undertaking tree felling activities on land owned or managed by United Wambo.

3. Pre-clearing Survey Procedure

Pre-clearance surveys are to be undertaken prior to any clearing of remnant native vegetation (including grasslands, shrub lands and open woodlands), as part of the Ground Disturbance Permit (GDP) process. The pre-clearance survey aims to identify any native trees that have significant ecological features within areas to be cleared and provides recommendations to minimise the impact of clearing.

The relevant Project Manager is to initiate the pre-clearing survey requirement through the submission of a GDP at least two weeks prior to the proposed clearing activities. Spatial data of the proposed clearing area must be provided to the E&C Department in the preferred form of .dxf or GIS shapefiles if available.

The Project Manager is to ensure that the site has been clearly defined in the field by the Survey Department. The Project Manager should endeavour to have this completed at least two weeks before the proposed clearing activity. The proposed clearing boundary is to be demarcated in the field via survey pegs or flagging tape.

During the pre-clearance survey a visual inspection of the trees to be cleared is to be undertaken to identify if there are any threatened fauna species present and/or the trees contain hollows, nests or other features which could inhabit fauna. These trees are classified as habitat trees and clearly marked in the field as such. Felling of habitat trees is to be undertaken in accordance with the procedures outlined in **Section 4.3**.

A detailed pre-clearance survey form (**UWOC-1689771511-393 - Pre-Clearing Survey Form**) has been developed to minimise the impact of clearing on native species (both threatened and non-threatened), as well as significant habitat features. The pre-clearance survey aims to identify significant ecological features within areas to be cleared and provide recommendations to minimise the impact of the clearing on them. The completed Pre-Clearing Survey Form will be included as part of the GDP and will include a list of the required considerations relevant to the management of the ecological and archaeological features of the site, in addition to a recommended timeline of activities.

Pre-clearance surveys are required to be undertaken before areas of remnant native vegetation (including grasslands, shrublands and open woodlands) are to be cleared. The surveys are to be undertaken by suitably qualified and experienced personnel.

The purpose of the pre-clearance survey is to:

- identify and mark habitat trees;
- identify habitat resources for salvage (hollow-bearing logs, etc.);
- identify presence of any threatened flora and fauna;
- identify potential seed collection resources; and
- identify any requirements for weed control to be undertaken prior to clearing.

Following the completion of the pre-clearance inspection, the tree felling procedure is to be followed.

Any threatened flora species found during pre-clearance surveys should be propagated or translocated to appropriate locations in nearby offset sites, where practicable.

Prior to disturbance, a review of Aboriginal heritage values will also be undertaken. This will be undertaken in accordance with the United Wambo Aboriginal Cultural Heritage Management Plan.

4. Tree Felling Procedure

4.1 Risk Identification

4.1.1 Environment

Prior to commencement of tree felling activities, ensure that the following environmental conditions are considered:

- identify and implement appropriate environmental standards, procedures and controls including but not limited to:
 - inspect area to ensure that tree felling operations are not encroaching on `non disturbance` boundaries, e.g. dozer operations;
 - ensure that a Ground Disturbance Permit (GDP) has been completed and appropriate controls have been implemented; and
 - ensure that any habitat tree, or other significant ecological features are appropriately identified, e.g. demarcated, tape, sign posted. If a habitat tree is identified refer to **Section 4.3** for further guidance. For further information contact the Project Environment and Community Team; and
 - consider environmental conditions that may impact on the health and safety of those involved in felling trees, e.g. weather conditions (rain, strong wind and fog), fauna (spiders, snakes and bees), heat and UV.

4.1.2 Ground Inspection

The following ground inspections should be considered before commencing tree felling activities:

- the slope of the ground is to be evaluated prior to commencing the task;
- general ground conditions around the tree should be inspected before commencing the task, e.g. wet, dry, boggy, hard, soft;
- the dozer operator should inspect the area for accessibility, e.g. undergrowth, saplings, and the area should be cleared of obstructions before commencing any activity; and
- inspect the whole working area including fall zones for potential overhead hazards, e.g. powerlines.

4.1.3 Tree Inspections

The integrity of the tree is critical to the safety of those working on or around them. Every tree must be inspected before work commences to determine whether it can be safely felled, or other methods need to be used.

Figure 4-1 illustrates many of the conditions that could result in serious risk if they are not identified prior to starting work.

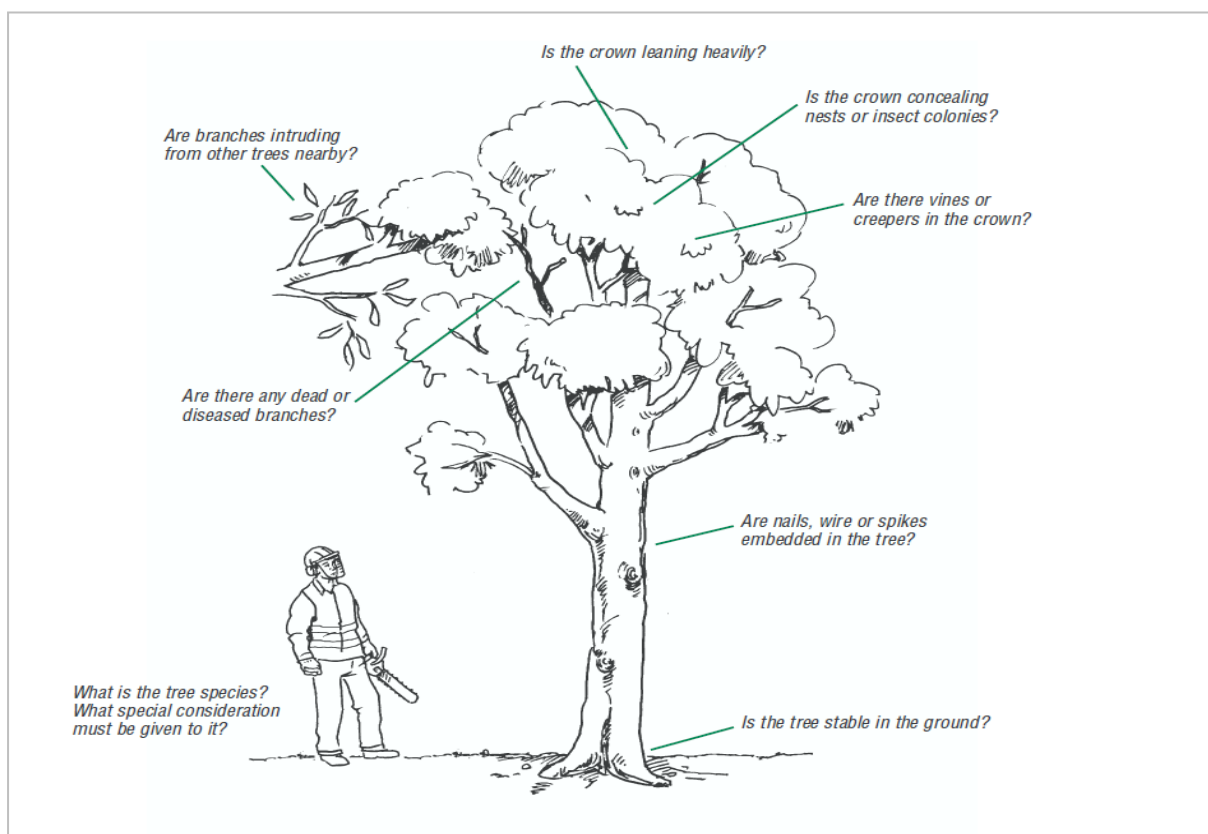


Figure 4-1: Risks of Tree Felling to be Identified

The following should be considered before commencing tree felling activities:

- trees are visually inspected to assess structural damage, defects, signs of disease and fauna;
- identify trees to be felled for the following:
 - size and height of the tree;
 - canopy size and density, e.g. canopy is thick and may impede felling of tree;
 - tree stability and structure, e.g. inspect root ball as this can mirror the crown section of the tree;
 - natural lean of the tree;
 - trees are dead, alive or partially, e.g. dead spots in tree are identified;
 - overhanging branches; and
 - general decay in tree, e.g. dead branches, knots, dead wood, splits.
- evaluate the slope and angle of the surrounding terrain to determine angle of tree felling and potential deviation;
- evaluate and identify the potential fall zone of the tree;
- evaluate the need to rip around the tree (root system) to assist with tree felling operation;
- ensure that the selected tools and equipment are fit for purpose;
- evaluate proximity to other trees in the immediate area that may introduce new workplace hazards, e.g. branches from adjacent trees impacting on people and equipment, hang-up in other trees (stored energy);
- evaluate and progressively determine tree felling sequence for individual trees;
- determine potential escape route before felling trees; and
- assess limitations of own skills in safely felling trees with dozer, and identify trees that may be considered outside skill level and seek assistance from appropriate personnel.

4.2 Non-Habitat Tree Felling

A visual canopy inspection of the area to be cleared (including non-habitat trees) must be completed by a suitably experienced person immediately prior to the felling of non-habitat trees.

If threatened species are identified, it is recommended that the tree be left overnight where possible. Should the fauna not leave, a suitably qualified and experienced person are to advise the most appropriate steps to take to avoid harm to these species.

If no nesting or threatened species are identified, then clearing of all non-habitat trees can proceed.

The clearing of non-habitat trees and habitat trees should occur as close together as possible. It is recommended that, where possible, the time lapse between the clearing of non-habitat trees and habitat trees be kept less than one week.

4.3 Habitat Tree Felling

Habitat tree felling inspections and surveys must be undertaken prior to clearing of any habitat trees identified through the **UWOC-1689771511-393 - Pre-Clearing Survey Form**, as discussed in **Section 3**.

The purpose of the inspections is to:

- minimise potential impacts from clearing of habitat trees on threatened fauna species;
- identify fauna within habitat trees and recommend management actions to minimise impact on these species;
- ensure wildlife carers are on standby to manage potentially injured fauna;
- identify safety requirements through the provision risk management systems;
- provide guidance regarding completion of **UWOC-1689771511-394 - Habitat Tree Felling Form**; and
- identify habitat features for salvage (hollow logs, fallen timber and boulders).

Where habitat trees are identified as part of the pre-clearing Survey, a **UWOC-1689771511-394 - Habitat Tree Felling Form** must be completed prior to the validation of a Ground Disturbance Permit.

The following shall be undertaken before habitat trees are felled.

- a) Complete pre-felling requirements as stipulated in the **UWOC-1689771511-394 - Habitat Tree Felling Form**:
 - i carry out canopy inspection of habitat tree within seven days prior to tree felling date to identify threatened or breeding species;
 - ii on the day of felling, all habitat tree canopy(s) are to be visually inspected for threatened fauna species by a suitably qualified and experienced person. If nothing found, progress to point a) iii. If species are found during the canopy inspection, go to point b)ib)i; and
 - iii prior to felling, shake each habitat tree for 30 seconds. If no fauna species identified, go to point c)iii. If fauna species are identified, go to point b)i.
- b) Habitat tree with micro-bat/arboreal fauna/birds identified:
 - i should fauna be identified, the tree should be gently nudged or shaken to encourage the fauna to leave the tree. Should the fauna not leave, the supervising ecologist will advise the most appropriate steps to take to avoid harm to these species;
 - ii should threatened birds be recorded nesting in the tree, leave tree undisturbed overnight and follow ecologists advice on appropriate actions. The following day go to point a)ii.
- c) Felling of all potential habitat trees:
 - i if no fauna are detected during shaking, fell tree;
 - ii suitably qualified and experienced personnel to inspect felled tree for injured fauna;
 - iii ensure no hollows are blocked against ground. If hollows are blocked, ensure the tree is rolled over (where safe and practicable) to ensure that any fauna remaining can escape overnight;
 - iv release unharmed fauna into nearby secure habitats. Any injured fauna to be assessed and taken to wildlife carer, if necessary;
 - v felled tree is left undisturbed overnight; and

- vi salvage of suitable hollows for use as compensatory habitat, where practicable.
- d) Complete ***UWOC-1689771511-394 - Habitat Tree Felling Form***:
 - i record details of any fauna that has been located prior to tree felling; and
 - ii record details of any fauna that has been relocated during or after tree felling.

5. Resource Salvaging

Where practical, a selection of habitat features will be salvaged for reuse in rehabilitation areas. This will include suitable:

- seed resources;
- tree hollows;
- hollow logs; and
- fallen timber and woody debris.

Salvageable habitat features (i.e. with good structural integrity and suitability for relocation and fauna use) will be identified during pre-clearing surveys, and collected as part of the clearing process, where suitable and feasible to do so. Salvaged features will then be stockpiled for use in rehabilitation to increase the habitat diversity and availability of rehabilitation areas, thus making them more suitable for native fauna colonisation (particularly threatened species).

Where practicable, seed collection for canopy, mid storey and groundcover species is to be undertaken prior to clearance for propagation and use in rehabilitation areas and stewardship sites.

5.1 Salvage of Threatened Flora Species

No threatened flora species are known to occur in the Proposed Disturbance Area. If threatened flora species are recorded in the disturbance footprint during pre-clearance surveys, options for salvage, translocation and/or propagation will be investigated and recommendations sought from a suitably qualified person in accordance with the *Guidelines for the Translocation of Threatened Plants in Australia* (Vallee et al. 2004). Where possible, the threatened flora will be translocated to suitable locations within the biodiversity stewardship sites.

6. Document Information

Relevant legislation, standards and other reference information must be regularly reviewed and monitored for updates and should be included in the site management system. Related documents and reference information in this section provides the linkage and source to develop and maintain site compliance information.

6.1 Related Documents

Related documents, listed in **Table 6-1** below, are *documents* directly related to or referenced from within this document.

Table 6-1: Related Documents

Number	Title
GCAA-625378177-10043	Ground Disturbance Permit
UWOC-1689771511-393	Pre-Clearance Survey Form
UWOC-1689771511-394	Habitat Tree Felling Form

6.2 Reference Information

Reference information, listed in **Table 6-2** below, is *information* that is directly referred to for the development of this document.

Table 6-2: Reference Information

Reference	Title

6.3 Change Information

Full details of the document history are recorded in the document control register, by version. A summary of the current change is provided in **Table 6-3** below.

Table 6-3: Change Information

Version	Date	Change Details
1.0	September 2019	New document

7. Accountabilities

Table 7-1: Accountabilities

Role	Accountabilities for this Document
Operations Manager	To provide sufficient resources to enable this Procedure to be implemented
Environment & Community Manager	• Authorise the Ground Disturbance Permit (CAA HSEC PER 0004) • Authorise the Pre-Clearing Survey Form • Ensure that suitably qualified and experienced personnel are employed to carry out pre-clearing surveys • Ensure that all roles and responsibilities aligned to the Ground Disturbance Permit (CAA HSEC PER 0004) are communicated to all relevant stakeholders • To provide sufficient resources to enable this procedure to be carried out
Environment & Community Coordinator	• Authorise the Ground Disturbance Permit (CAA HSEC PER 0004) • Authorise the Pre-Clearing Survey Form • Implement the procedure and complete Pre-Clearing Survey Form • Ensure the Habitat Tree Felling Form is completed • Coordinate the commencement of clearing work with the Project Manager • Monitor clearing activities to ensure compliance with this procedure and any instructions on the forms as above • Oversee the implementation of this procedure • Ensure that all roles and responsibilities are communicated to the appropriate personnel • Ensure that suitably qualified and experienced personnel are employed to carry out installation, maintenance and monitoring of nest boxes
Project Manager	Identify areas to be cleared, initiate the Pre-Clearing Surveys Form, and carry out work in accordance with any specific Conditions of the Pre-Clearing Surveys Form and Ground Disturbance Permit (CAA HSEC PER 0004).
All Employees and Contractors	To carry out work in accordance with Ground Disturbance Permit (CAA HSEC PER 0004), all requirements as an outcome from the pre-clearing surveys and the direction of the Environment & Community Coordinator (or their delegate).

Appendix E - United Wambo Pre-Clearing Survey Form

Pre-Clearing Survey Form

UNITED WAMBO
JOINT VENTURE

GLENCORE

Pre-Clearing Survey			
Details			
Location:			
GDP Permit Number:			
Habitat Tree Felling Supervisor			
Name:		Company:	
Date survey commenced:		Date survey completed:	
Ecology			
Has a canopy inspection been undertaken to identify any additional threatened species or nesting birds?	☐ Yes	☐ No	
If yes, list identified species and proposed management strategy for each:			
Resource Salvage			
Have habitat trees been clearly marked?	☐ Yes	☐ No	
How many habitat trees were identified?			
Were other habitat resources (hollow logs, fallen timber, etc) identified for salvage?	☐ Yes	☐ No	
If yes, list salvage requirements for habitat trees and other resources:			
Are there recoverable seed resources present?	☐ Yes	☐ No	
If yes, list proposed management strategy:			
Has an assessment been undertaken of the topsoil to determine suitability for re-use?	☐ Yes	☐ No	
Have samples been taken to determine ameliorant requirements?	☐ Yes	☐ No	
Recommended topsoil-stripping depth (mm):			

Number: UWOC-1689771511-393

Owner: Environment & Community Coordinator

Status: Approved

Version: 2.0

Effective: 17/08/2020

Review: 17/08/2023

Page 1 of 2

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Planning for Clearing Activities			
Are there weeds present that require treatment prior to clearing?		☐ Yes	☐ No
Recommended weed control strategy?			
Other actions to be completed prior to clearing:			
Proposed date to commence clearing:			
Proposed date to fell habitat trees:			
Proposed date to commence topsoil removal:			
Proposed date to complete all works:			
Form Approval			
Name:		Company:	
Signature:		Date:	

Appendix F - Habitat Tree Felling Form

Habitat Tree Felling Form

UNITED WAMBO
JOINT VENTURE

GLENCORE

Habitat Tree Felling			
Details			
Location:			
GDP Permit Number:			
Habitat Tree Felling Supervisor			
Name:		Company:	
Position/Qualification:		Date of Felling:	
Pre-Felling Requirements			
Has a canopy inspection of habitat trees to be cleared been carried out within 7 days of proposed felling?	☐ Yes	☐ No	
Recommendations:			
Are recommendations complete?	☐ Yes	☐ No	
Have all habitat trees to be felled been tapped prior to felling?	☐ Yes	☐ No	
Recommendations:			
Any other comments or conditions?	☐ Yes	☐ No	
Fauna Located Prior To Felling			
Species	Fate – injured/escaped/relocated		
Comments/Issues:			

Number: UWOC-1689771511-394

Owner: Environment & Community Coordinator

Status: Approved

Version: 2.0

Effective: 20/08/2020

Review: 20/08/2023

Page 1 of 2

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Fauna Located During Felling					
Species	Fate – injured/escaped/relocated				
Comments/Issues:					
Any other comments or recommendations:					
Report Sign Off <table border="1"> <tr> <td>Signature:</td> <td></td> <td>Date:</td> <td></td> </tr> </table>		Signature:		Date:	
Signature:		Date:			

Appendix G - United Wambo Biodiversity Offset Area Inspection Form

Biodiversity Offset Area Inspection Form

UNITED WAMBO
JOINT VENTURE

GLENORE

Biodiversity Offset Area Inspection		
Details		
BioBank Site Name:		
Inspected By	Date	Time
Inspection Item	Comments	Action Required
Fencing: check condition (holes, fallen sections, rust/corrosion)		
Weeds: observed infestation/occurrences, success of controlled areas		
Revegetation: effectiveness and condition of revegetation and rehabilitation efforts		
Feral Pests: animals observed, signs of pests		
Track: quality of tracks, any required maintenance		
Erosion: evidence of previously unrecorded erosion, condition of remediated areas		
Security: signs of unauthorised entry, gates locked, "Keep Out" signs in place, IR cameras in place		
Grazing: signs of unauthorised grazing, stock sighted in offset areas		
Bushfire Management: excessive build-up of fuel load, evidence of fire, water fill point capacity and access sufficient, condition of SFAZ's		
Comments:		

Number: UWOC-1689771511-392

Owner: Environment & Community Coordinator

Status: Approved

Version: 3.0

Effective: 7/03/2022

Review: 17/08/2023

Page 1 of 1

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Appendix H - United Wambo Buffer Land Inspection Form

Buffer Land Inspection Form

UNITED WAMBO
JOINT VENTURE

GLENORE

Buffer Land Inspection			
Details			
Property Name and Location:			
Paddocks/Area Inspected:			
Inspected By	Position/Title	Date	Time

Inspection Item	Findings	Action Required	Location
Fencing: check condition (holes, fallen sections, broken or loose wires, rust/corrosion)			
Infrastructure: general condition of any sheds, stockyards			
Weeds: observed infestation/occurrences, species, estimated number/area, success of controlled areas			
Feral Pests: animals observed and number, signs of pest activity, e.g. diggings, scats			
Tracks: quality of tracks and crossings, any required maintenance			
Security: signs of unauthorised entry, gates locked, security signs in place			
Erosion: evidence of previously unrecorded erosion, condition of any remediated areas			
Rubbish: signs of illegal dumping, excessive build-up of rubbish/materials by current Licensee			

Number: UWOC-1689771511-391

Owner: Environment & Community Coordinator

Status: Approved

Version: 2.0

Effective: 17/08/2020

Review: 17/08/2023

Page 1 of 2

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Inspection Item	Findings	Action Required	Location
Hydrocarbons and Chemicals: adequacy of storage, evidence of water, old dumps			
Grazing: signs of unauthorised grazing, general condition of pastures, signs of overgrazing			
Bushfire Management: evidence of fire, excessive build-up of fuel load, access to water, condition of strategic firebreaks			
Dams and Watering Points: evidence of excessive sediment build-up, integrity of dam walls, maintenance of troughs			
Other Land Management Issues:			

Appendix I - Weed Action Plan



Weed Management Plan 2020

United Wambo Joint Venture

Mining Areas

June 2020

This Weed Management Plan was produced for the United Wambo Joint Venture in June 2020. The WMP outlines a schedule for weed management on the mining areas for the 2020 period and beyond.

SUBMITTED TO	DATE	REVISION
Sean Pigott	26/06/2020	Version 1

This document can only be considered as having permission for final distribution if an original signature of an authorised representative of Hunter Land Management Pty Ltd is found below:

26/06/2020

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Table of Contents

1.0 Introduction	1
2.0 Methodology	1
3.0 Weed Management Plan 2020	
3.1 Historical Site Weeds	6
3.2 Weed Management Plan 2020	7
4.0 Monitoring and Evaluation	18
Appendices	

1.0 Introduction

This Weed Management Plan (WMP) is designed to guide the management of weeds on the United Wambo Joint Venture Mining Area for the 12-month period from June 2020 to May 2021. The plan although specific to this 12-month period it is structured with long term weed control in mind.

The WMP is only a guide to weed control as the composition and spread of weeds will most certainly vary due to seasonal conditions and other factors which may bring new weeds to site and reduce infestation of current weeds. This may occur via vehicle movements, floods and animal and air borne seed.

The main focus of the plan is to manage **Regional Recommended Measured** defined weeds first followed by **General Biosecurity Duty** defined weeds and then invasive **Environmental Weeds** which are posing a threat to the vegetation of the site including regeneration, pasture and riparian areas. Some environmental weeds are recognised to be on site however control of these species have been reduced in priority as can be seen in Table 3. Consideration of environmental impacts is also high, with the plan guiding weed control in a manner which will enhance the natural vegetation communities and safety at the site.

All weed control success is subject to the resources available to manage them. Resource input may need to be initially high with new or large weed infestations however with regular follow up control works after the primary treatment there should be a reduced amount of resources required to maintain a low presence of weeds on site.

2.0 Methodology

The WMP has been developed using the following methodology and as represented in Figure 1 below:

1. Desktop analysis of historical weed control data to define known weed species on site;
2. Undertake biannual weed control inspections with GIS mapping.
3. Plan weed control activities working from areas requiring primary control in the right seasonal period and of least infestation and or areas which have the potential to distribute propagules (seeds, plant fragments) to elsewhere on the site, such as upstream riparian areas or adjacent to vehicle tracks etc. Within this framework the following hierarchy of weeds is used:
 1. General Biosecurity Duty and Regional Control Measures as per the Biosecurity Act 2015;
 2. Environmental weeds of significance or low in number but have potential to become an issue;
 3. General environmental weeds.
4. Monitor, record and review weed control activities;

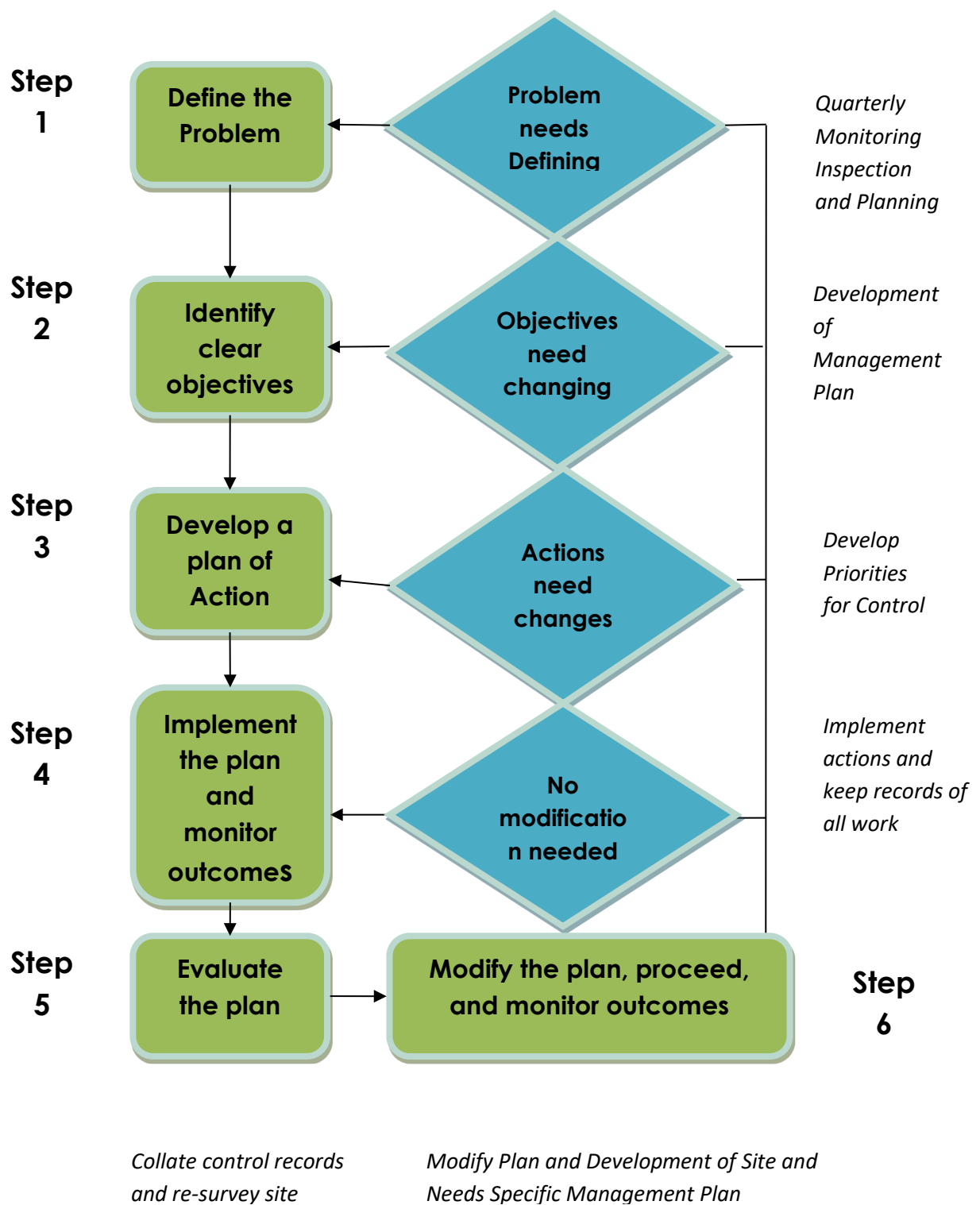


Figure 1: Summary of Weed Management methodology steps

3.0 Weed Management Plan 2020

3.1 Historical Site Weeds

Using historical site weed control records and local weed infestation data, the major weed types and those which are dominant on site were defined. Table 1 identifies all the main weeds on site including their Area and Duty under the Biosecurity Act 2015. The aim will be to see some weeds drop off the list after periods of control. As new weeds are found on site during monitoring inspections, they will be added to this list.

Table 1: Weed Schedule

Common Name	Scientific Name	Area/Duty
African Boxthorn	<i>Lycium ferocissimum</i>	All of NSW / General Biosecurity Duty +
African Olive	<i>Olea europaea ssp.cuspidata</i>	All of NSW / General Biosecurity Duty Hunter / Regional Recommended Measure - Land Area 1: Land managers should mitigate the risk of new weeds being introduced to their land.
Blue Heliotrope	<i>Heliotropium amplexicaule</i>	Not Listed - Environmental
Coolatai Grass	<i>Hyparrhenia hirta</i>	All of NSW / General Biosecurity Duty Hunter / Regional Recommended Measure - Land managers should mitigate the risk of new weeds being introduced to their land.
Creeping Pear	<i>Opuntia humifusa</i>	All of NSW / General Biosecurity Duty
Fireweed	<i>Senecio madagascariensis</i>	Prohibition on Dealings +
Galenia	<i>Galenia pubescens</i>	Not Listed - Environmental
Mother of Millions	<i>Bryophyllum species</i>	All of NSW / General Biosecurity Duty Hunter / Regional Recommended Measure - Land Area 1: Land managers should mitigate the risk of new weeds being introduced to their land.
Peppercorn Tree	<i>Schinus species</i>	Not Listed - Environmental
Prickly/Common Pear	<i>Opuntia stricta</i>	All of NSW / General Biosecurity Duty +
Saffron Thistle	<i>Carthamus lanatus</i>	Not Listed - Environmental
Scotch Thistle	<i>Onopordum acanthium</i>	Not Listed - Environmental
Tiger Pear	<i>Opuntia aurantiaca</i>	All of NSW / General Biosecurity Duty + Hunter / Regional Recommended Measure - Land Area 1: Land managers should mitigate the risk of new weeds being introduced to their land.
Verbena bonariensis (Purpletop)	<i>Verbena bonariensis</i>	Not Listed - Environmental

+ Weed of National Significance

To see the Regional Strategic Weeds Management Plans
<http://www.ils.nsw.gov.au/biosecurity/weed-control>

Source: <http://weeds.dpi.nsw.gov.au/>

3.2 Weed Management Plan 2020

For best long term weed control a planned and constant approach is required. All weed control is subject to budget constraints and resource availability at the required time. This WMP identifies the priority weeds and areas on the site to achieve the best possible result in the long term.

This plan focusses on weed control for the period from June 2020 – May 2021 and aims to address weed control at the site in accordance with the methodology outlined in section '2.0 Methodology'

The weed species profiles for weeds found on the site (Table 2) and those proposed to be controlled (Table 3 – Schedule of 2020 Weed Control) and areas for weed control (GIS Maps Pages 15) are outlined below. Table 3 provides a schedule of timing and methods for species on site. The timing of control is a key factor in achieving the best possible control of a species and preventing it from producing its seasonal seed or other propagules.

All weed control works on site is to be recorded with details such as the target specie/s, GPS Location, weather conditions and herbicide type and quantity used. A detailed GIS layer of all species in this plan has been maintain and when control work has been undertaken it can be recorded and mapped here. Appendix 1 is the Wambo United Joint Venture Weed Management Plan Action Record Sheet 2020 including an Herbicide Application Record Sheet which should be used for recording of all works completed in the next 12 months.

Table 2: Species Profiles for major weeds on site

Weed	Photo
African Boxthorn <i>Lycium ferocissimum</i> All of NSW / General Biosecurity Duty Weed of National Significance African boxthorn is a member of the Solanaceae family, which includes other plants such as silverleaf nightshade, tobacco and tomatoes. African boxthorn is an aggressive invader of pastures, roadsides, reserves, remnant bushland and waterways. It forms an impenetrable, spiny thicket that inhibits the movement of stock and provides a haven for feral animals. Many insects, including fruit fly, the common house fly and the tomato fly, breed in the fruit of this weed. It is a serious weed threat in all States and is one of the major weed threats to the semi-arid rangelands of western NSW. https://weeds.dpi.nsw.gov.au/Weeds/Details/1	
African Olive <i>Olea europaea ssp.cuspidata</i> All of NSW / General Biosecurity Duty Hunter / Regional Recommended Measure - Land Area 1 An extensive native range from South Africa, through Africa, the Middle East, Pakistan, India to China. It is spread mainly by birds eating the fruit. It is only found in undisturbed areas. http://weeds.dpi.nsw.gov.au/Weeds/Details/4	

Blue Heliotrope*Heliotropium amplexicaule***Not Listed - Environmental Weed**

Blue heliotrope is extremely drought-hardy, which increases its ability to persist and spread, and has made it a major agricultural weed in NSW. Blue heliotrope competes with desirable pasture plants and causes toxicity to stock. It is widespread and adaptable to a wide range of soil and climate types. It occupies more than 110 000 hectares in NSW

<https://weeds.dpi.nsw.gov.au/Weeds/Details/19>

**Coolatai Grass***Hyparrhenia hirta*

All of NSW / General Biosecurity Duty
Hunter / Regional Recommended
Measure

Coolatai grass (*Hyparrhenia hirta*) is an invasive drought, fire and herbicide tolerant tussock forming perennial grass. It has become a major invasive species in northern New South Wales (NSW) and southern Queensland, dominating pastures over a range of soil types and conditions.

<http://weeds.dpi.nsw.gov.au/Weeds/Details/179>



Creeping Pear

Opuntia humifusa

Not Listed - Environmental Weed

Opuntia humifusa, commonly known as the Eastern Prickly Pear or Indian Fig, is a native cactus found in parts of eastern North America.

<http://weeds.dpi.nsw.gov.au/Weeds/Details/274>

**Fireweed**

All of NSW / General Biosecurity Duty
Weed of National Significance

Fireweed is a small perennial plant. It is a highly invasive weed of the coastal and tableland areas of NSW. It is a Weed of National Significance. Fireweed is largely restricted to the south-eastern coast of Australia and has established along the entire NSW coast. First recorded in the Hunter Valley in 1918, it has spread south into Victoria and occurs as far north as central Queensland.

<http://weeds.dpi.nsw.gov.au/Weeds/Details/53>



Galenia <i>Galenia pubescens</i> Not Listed - Environmental Weed Drought and salt tolerant, galenia grows over and smothers existing vegetation by forming a thick dense mat. It invades coastal dunes, pastures, disturbed areas, lawns, roadsides and rocky outcrop vegetation. Galenia is known to produce nitrates that can be toxic to stock. Bees that collect the nectar of galenia produce honey with such a disagreeable flavour that is unsaleable https://weeds.dpi.nsw.gov.au/Weeds/Details/56	
Mother of Millions <i>Bryophyllum species</i> All of NSW / General Biosecurity Duty As the name suggests, mother of millions reproduces rapidly, producing hundreds of tiny plantlets which quickly form new colonies. It is adapted to dry conditions and can survive long periods of drought. This increases the plant's potential to persist and spread. Mother of millions is toxic when ingested by livestock; it is also poisonous to humans and household pets. https://weeds.dpi.nsw.gov.au/Weeds/Details/93	

Peppercorn Tree*Schinus species***Not Listed - Environmental Weed**

Peppercorn is widely grown as a garden and street tree. Seeds are spread by animals; it also spreads from suckers. Peppercorn tree is regarded as an environmental weed in VIC, NSW, SA and NT. Its seeds are dispersed by birds and other animals, it also spreads from suckers.

Peppercorn tree is native to South America, growing up to 10 m high.

<https://weeds.dpi.nsw.gov.au/Weeds/Details/222>

**Prickly/Common Pear***Opuntia stricta***All of NSW / General Biosecurity Duty
Weed of National Significance**

Opuntia stricta is a species of cactus from southern North America and South America. Common names include erect prickly pear and nopal estricto (Spanish). It is an erect or sprawling shrub up to 2 m in height, producing lemon yellow flowers in the spring and summer, followed by purplish-red fruits

<http://weeds.dpi.nsw.gov.au/Weeds/Details/274>



Saffron Thistle

Carthamus lanatus Linnaeus

All of NSW / General Biosecurity Duty

Saffron thistle was naturalised in Victoria by 1887, and was first proclaimed noxious in 1890. It is now particularly common in cereal cropping areas of the Wimmera, Mallee and northern districts. It favours areas with an annual rainfall between 500 mm and 875 mm and is mainly a weed of cultivation and pastures.

Seed buried in the soil can survive for over 10 years but rarely germinates at depths below 5 cm.

<http://weeds.dpi.nsw.gov.au/Weeds/Details/116>

**Scotch Thistle**

Onopordum acanthium

All of NSW / General Biosecurity Duty

Onopordum acanthium (Cotton thistle, Scotch thistle), is a flowering plant in the family Asteraceae. It is native to Europe and Western Asia. It is a vigorous biennial plant with coarse, spiny leaves and conspicuous spiny-winged stems.

<http://weeds.dpi.nsw.gov.au/Weeds/Details/252>



Tiger Pear*Opuntia aurantiaca*

All of NSW / General Biosecurity Duty
Weed of National Significance

Tiger pear is native to Uruguay and Argentina. Regarded now as the most troublesome of all cactus species in NSW and the worst *Opuntia* species in Qld. Probably introduced in late 1800's, has expanded to infest large parts of southern Qld and northern NSW, inland from the Great Dividing Range. Segments break from plants easily and are transported by water, stock and to a lesser extent by tyres. Extremely hardy, thriving in a range of habitats in the slopes and nearby plains, where large localised infestations still thrive.

<https://weeds.dpi.nsw.gov.au/Weeds/Details/251>

**Verbena bonariensis (Purpletop)**

Not Listed - Environmental Weed

Verbena bonariensis is a tall and slender-stemmed perennial. It can grow to 6 ft (183 cm) tall and can spread to 3 ft (90 cm) wide. At maturity, it will develop a woody base. Fragrant lavender to rose-purple flowers are in tight clusters located on terminal and axillary stems, blooming from mid-summer until fall frost. The stem is square with very long internodes. Leaves are ovate to ovate-lanceolate with a toothed margin and grow up to 4 in (10 cm) long.

https://en.wikipedia.org/wiki/Verbena_bonariensis





United Wambo Joint Venture **2020 Weed Management Plan** **Weed Management Plan Extent**



Compiled: Daniel Lewer Date: 26/6/2020

Priority order of Control *	Weed Name (Common Name)	Weed Name (Scientific Name)	Area/Duty under Biosecurity Act 2015	Control Method and Notes (Recommended Herbicide)	June 2020	July 2020	August 2020	September 2020	October 2020	November 2020	December 2020	January 2021	February 2021	March 2021	April 2021	May 2020
3	African Boxthorn	<i>Lycium ferrocissimum</i>	All of NSW / General Biosecurity Duty	Foliar Spray in Autumn/Winter/Spring												
2	African Olive	<i>Olea europaea ssp.cuspidata</i>	All of NSW / General Biosecurity Duty Hunter / Regional Recommended Measure	Basal Bark spraying with Diesel and Garlon® anytime												
9	Blue Heliotrope	<i>Heliotropium amplexicaule</i>	Not Listed - Environmental Weed	Foliar Spray is Spring/Summer with Dicamba 500g/l												
1	Coolatai Grass	<i>Hyparrhenia hirta</i>	All of NSW / General Biosecurity Duty Hunter / Regional Recommended Measure	Foliar Spray in Winter/Spring												
10	Creeping Pear	<i>Optuntia humifusa</i>	Not Listed - Environmental Weed	Foliar Spray is Spring/Summer												
7	Fireweed	<i>Senecio madagascariensis</i>	All of NSW / General Biosecurity Duty	Foliar Spray is Autumn/Winter with Dicamba 500g/l												
8	Galenia	<i>Galenia pubescens</i>	Not Listed - Environmental Weed	Foliar Spray is Spring/Summer												
4	Mother of Millions	<i>Gomphocarpus fruticosus</i>	All of NSW / General Biosecurity Duty	Foliar Spray in winter when flowering with various herbicides as per label												
14	Peppercorn Tree	<i>Schinus species</i>	Not Listed - Environmental Weed	Basal Bark spraying with Diesel and Garlon® anytime												
6	Prickly/Common Pear	<i>Opuntia stricta</i>	All of NSW / General Biosecurity Duty	Foliar Spray is Spring/Summer												
12	Saffron Thistle	<i>Carthamus lanatus</i>	Not Listed - Environmental Weed	Foliar Spray is Spring/Summer												
11	Scotch Thistle	<i>Onopordum acanthium</i>	Not Listed - Environmental Weed	Boom / Spot Spray in Spring in Rosette Stage												
5	Tiger Pear	<i>Opuntia aurantiaca</i>	All of NSW / General Biosecurity Duty	Foliar Spray is Spring/Summer												
13	Verbana bonariensis (Purpletop)	<i>Verbana bonariensis</i>	Not Listed - Environmental Weed	Foliar Spray in Spring/Summer												

	Biannual Weed Inspection														
	Detailed Weed Survey and Preparation of WMP for 2021														

Table 3: Schedule of Unite Wambo Joint Venture Mining Areas Weed Control

* Priority does not correlate necessarily to order of control, as the timing for control of particular weeds is timed to suit the optimal period for best control. Priority indicates the importance of the control.

4.0 Monitoring and Evaluation

Monitoring is a key component of this WMP. The weed survey which forms the basis of this WMP also provides the basis for ongoing weed monitoring at the site. During weed control activities should be recorded in the field using GPS technology and the Unit Wambo Joint Venture Mining Areas Weed Management Plan Action Record Sheet 2020 in Appendix 1 or similar, which provides the basis for mapping of control areas and planning for future works.

A biannual monitoring inspection is to be conducted throughout the 12-month weed control program in with a review of all Record Sheets, control sites and any new infestations.

Photo points should be established at key weed sites before works commence to provide before and after representations of the weeds at the site. These will be represented by an easily identifiable field marker and its location recorded. Where control works are ongoing from year to year such as for African Olive and Mother of Millions, photo points should be maintained year on year to provide a visual record of control works.

Appendices

Appendix 1 – United Wambo Joint Venture Mining Areas WMP Works Record Sheet



United Wambo Joint Venture Mining Areas WMP Action Record Sheet 2020		
Date/Date Range	Staff/Company undertaking Work	Primary Control / Follow Up (circle choice)
Weed Species Targeted	Actions/Methods Completed	Notes of actions (e.g. GPS location, photos, number/areas of weeds controlled/ hours worked etc.)
Comments (including details of GPS/GIS Files from works completed)		

**SMARTtrain****No. 222502****Location, Applicator, Date of Application**

Property/Holding: (residential address)					Date:										
Applicator's Full Name:				Owner (if not applicator):											
Address:				Address:											
Phone:				Phone:											
Mobile:	Fax:	E-mail:	Mobile:	Fax:	E-mail:										
Sensitive Areas (including distances, buffers):				Comments (including risk control measures for sensitive areas):											
<table border="1"> <tr> <td></td> <td>N</td> <td></td> </tr> <tr> <td>W</td> <td>Treated Area</td> <td>E</td> </tr> <tr> <td></td> <td>S</td> <td></td> </tr> </table>					N		W	Treated Area	E		S				
	N														
W	Treated Area	E													
	S														

Host/Pest

Paddock Number/Name:	Paddock Area:	Order of Paddocks Sprayed:
Crop/Situation:	Type of Animals:	
Crop/Pasture Variety:	Age/Growth Stage:	
Growth Stage:	Mob/Paddock/Shed:	
Pest/Disease/Weed:	Animals — Number Treated:	
Pest Density/Incidence: Heavy ☐ Medium ☐ Light ☐		

Application Data

Full Label Product Name:		Rate/Dose:	Water Rate @ L/ha:
Permit No.:	Expiry Date:	Additives/Wetters:	
Total L or kg:	WHP:	ESI:	Date Suitable for Sale:
Equipment Type:	Nozzle Type:	Nozzle Angle:	Pressure:
Date Last Calibrated:	Water Quality (pH or description):		

Weather

Showers ☐ Overcast ☐ Light Cloud ☐ Clear Sky ☐					
Rainfall (24 hours before and after)					
Before:	mm	During:	mm	After:	mm
Time (show time in this column)	Temperature °C	Relative Humidity (%)	Wind Speed	Direction	Variability (e.g. gusting)
Start					
Finish					
Comments:					

3056-specy record.p65, March 2002