MANGOOLA
OPEN CUT

GLENCORE

Biodiversity Offset Management Plan and Strategy

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Glossary	
BAM	Biodiversity Assessment Methodology
BC Act	NSW Biodiversity Conservation Act 2016
BCD	Biodiversity Conservation Division
BCF	Biodiversity Conservation Fund
BCT	Biodiversity Conservation Trust
BSA	Biodiversity Stewardship Agreement
BOA	Biodiversity Offset Area
BOS	Biodiversity Offset Strategy
CA	Conservation Agreement
CEEC	Critically endangered ecological community
CEMP	Construction Environment Management Plan
DNG	Derived native grassland
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
MZ	Management Zone
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
GDP	Ground disturbance permit
KTP	Key threatening process
Mangoola	Mangoola Open Cut
MAP	Management Action Plan
OEH	Office of Environment and Heritage NSW
PA	Project Approval
PAD	Potential Archaeological deposit
PCT	Plant Community Type
RMP	Rehabilitation Management Plan
SSD	State Significant Development
TEC	Threatened Ecological Community
WMP	Water Management Plan

1. Purpose

This Mangoola Open Cut (Mangoola) Biodiversity Offset Management Plan and Strategy (BOMPS) has been prepared to guide the ongoing management of the:

a) Mangoola Biodiversity Offset Areas (BOAs) for biodiversity conservation and enhancement purposes (as identified within their respective Biodiversity Offset Strategies (from the respective Environmental Impact Statements (EIS's))

b) biodiversity values present in the Approved Disturbance Area for the mine to ensure minimisation of harm during clearing activities.

The BOMPS provides a framework for the implementation of ecological management actions, regeneration and revegetation strategies, controls and monitoring programs for the Mangoola BOAs.

1.1 Background

Mangoola is an open cut coal mine located near Wybong, approximately 20 kilometres west of Muswellbrook and approximately 10 kilometres north of Denman in the Muswellbrook Local Government Area (LGA) (Figure 1-1). Mangoola has been in operation since 2010.

The Mangoola BOAs have been established as biodiversity offsets for the predicted ecological impacts of Mangoola operations. The BOAs cover over 4,770 hectares of land located adjacent and proximal to Mangoola (Figure 1-2 and 1-3). These sites are provided in Table 1-1 below. Each BOA is separated into Management Zones (see Figure 1-4) based on their requirements..

Table 1-1: Mangoola Coal Biodiversity Offset Areas

Biodiversity Offset Area Name	Type of Agreement	Area	Date commenced
Big Flat Creek	Conservation (CA)	307.3 ha	7 May 2019
Eastern Conservation Area	Conservation (CA)	641.1 ha	7 May 2019
Northern Corridor	Conservation (CA)	479.7 ha	9 May 2019
Southern Offset	Conservation (CA)	439.1 ha	9 May 2019
Western Corridor and Anvil Hill	Conservation (CA)	1,160.9 ha	13 May 2019
Mangoola	Biodiversity Stewardship (BSA)	993 ha	19 April 2024
Wybong Heights	Biodiversity Stewardship (BSA)	751 ha	14 February 2024

In accordance with the proposed offset strategy, two additional BSA sites were also prepared, being Highfields BSA and Mangrove BSA. Credits from these BSA's were required to meet Condition B53 of SSD8642 and Condition 9 of EPBC 2018/8280. Mangrove BSA protects approximately 13.3 hectares of *Prasophyllum* sp. Wybong habitat required to be protected under a BSA by Condition 10a of EPBC 2018/8280. These two additional BSA's are managed by another Glencore operation.

Figure 1-1: Location of Mangoola Open Cut

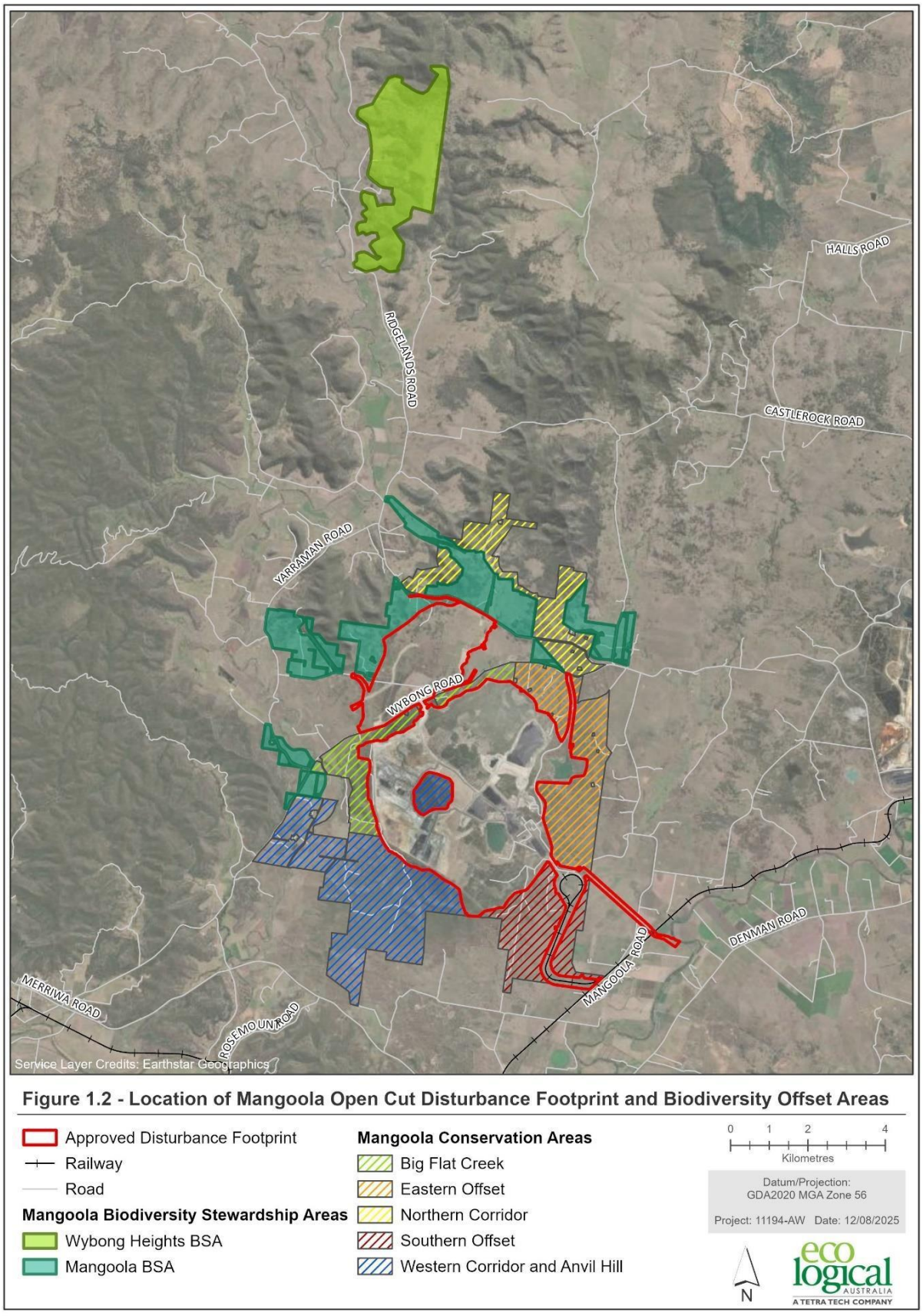

Figure 1-2: Location of Mangoola Open Cut Disturbance Footprint and Biodiversity Offset Areas

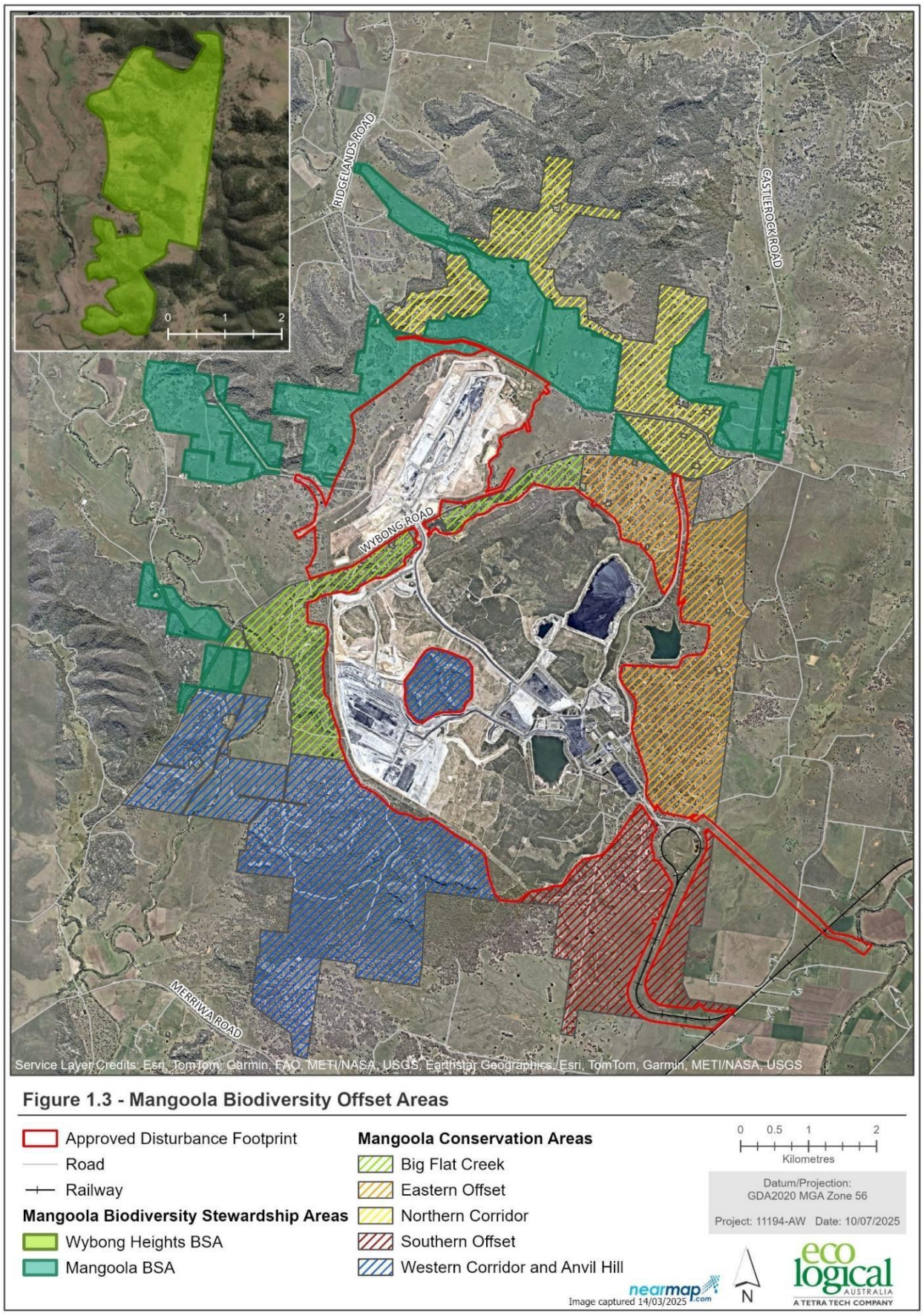

Figure 1-3: Mangoola Open Cut Disturbance Footprint and Biodiversity Offset Areas

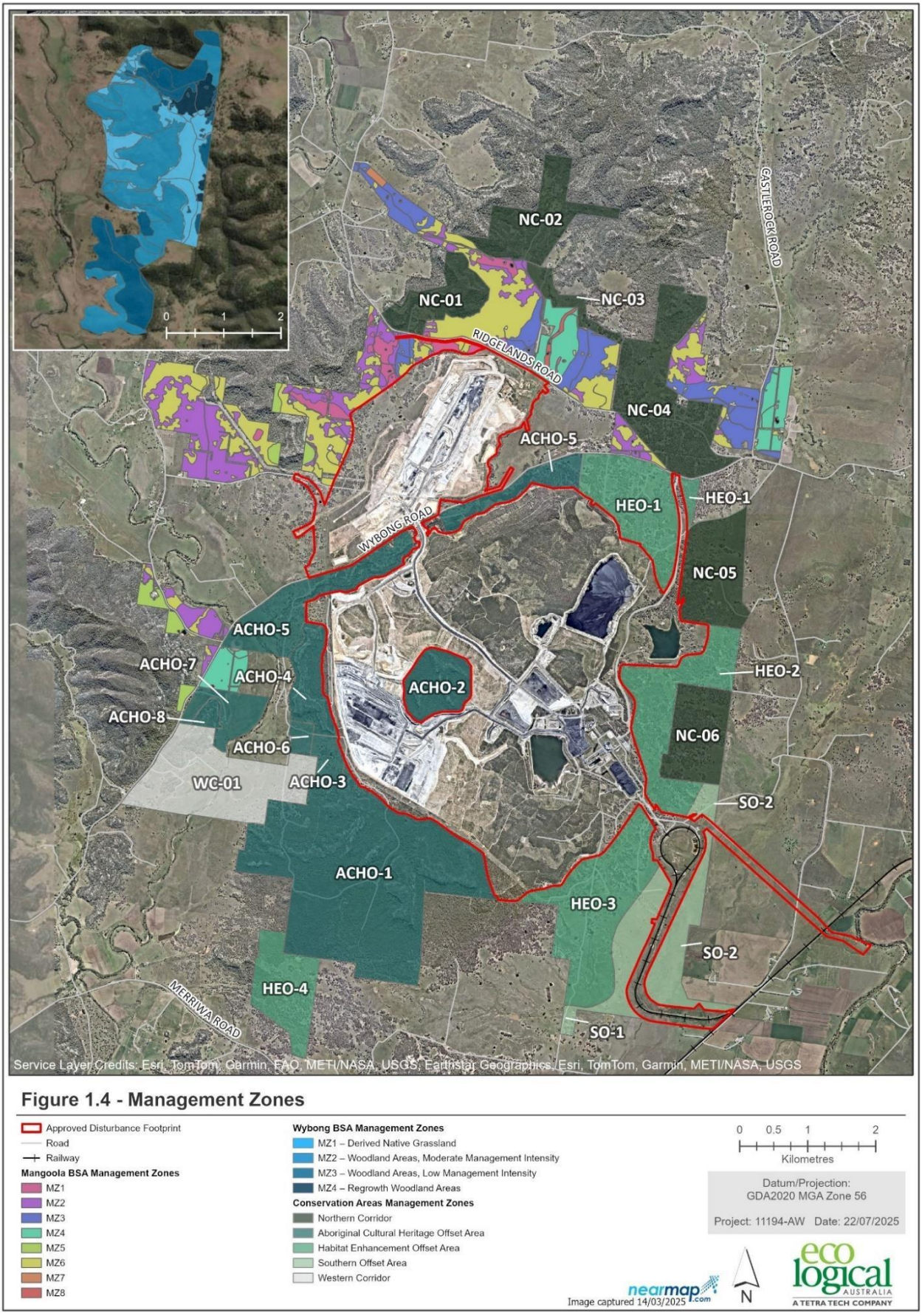

Figure 1-4: Mangoola BOA Management Zones

1.2 Statutory Requirements

On 26 April 2021, the NSW Independent Planning Commission (IPC) approved the Development Application (DA) for the Mangoola Coal Continued Operations (MCCO) project State Significant Development (SSD) 8642. On 21 November 2022, Mangoola surrendered PA 06_0014 in accordance with Schedule 2, Condition A15 of SSD 8642. This BOMPS addresses the requirements of SSD 8642, however the original BOAs and their associated management requirements remain unchanged. Approval conditions relevant to the BOMPS are provided in Table 1-2 below.

On 1 October 2021 the Commonwealth Minister for the Environment approved the Mangoola Coal Continued Operations (MCCO) Project, Wybong NSW (EPBC 2018/8280). Two variations of conditions (EPBC 2018/8280) were made 25 July 2023 and 20 February 2024 where conditions 9 and 10 were updated to allow more time for BSA's to be secured and credits to be retired under NSW *Biodiversity Conservation Act 2016* to the satisfaction of BCT.

1.3 Regulatory Requirements

Table 1-2 State Project Approval Conditions Relevant to BOMPS

<table>
<tr><th>Condition</th><th>Relevant Section in BOMPS</th></tr>
<tr><td colspan="2">State Significant Development (SSD) 8642</td></tr>
<tr><td colspan="2">Biodiversity Credits Required</td></tr>
<tr><td>B53. Prior to the commencement of mining operations north of Wybong Road, or other timeframe agreed by the Planning Secretary, the Applicant must retire the biodiversity credits specified in Table 7 below. The retirement of credits must be carried out in consultation with BCS and in accordance with the Biodiversity Offsets Scheme of the BC Act, to the satisfaction of the BCT.

Table 7: Biodiversity credit requirements
<table>
<tr><th>Credit Type</th><th>Credits Required</th></tr>
<tr><td colspan="2">Ecosystem Credits</td></tr>
<tr><td>HU812 Forest Red Gum grassy open forest on floodplains of the lower Hunter</td><td>1,874</td></tr>
<tr><td>HU816 Spotted Gum – Narrow-leaved Ironbark shrub – grass open forest of the central and lower Hunter</td><td>369</td></tr>
<tr><td>HU817 Narrow-leaved Ironbark – Bull Oak – Grey Box shrub – grass open forest of the central and lower Hunter</td><td>13,457</td></tr>
<tr><td>HU821 Blakely’s Red Gum – Narrow-leaved Ironbark – Rough-barked apple shrubby woodland of the Hunter</td><td>253</td></tr>
<tr><td>HU906 Bull Oak grassy woodland of the central Hunter Valley</td><td>1,597</td></tr>
<tr><td>HU945 Swamp Oak – Weeping Grass grassy riparian forest of the Hunter Valley</td><td>168</td></tr>
<tr><td colspan="2">Species Credits</td></tr>
<tr><td>Wybong leek orchid (Prasophyllum petilum)</td><td>8,983</td></tr>
<tr><td>Pine donkey orchid (Diuris tricolor)</td><td>17,238</td></tr>
<tr><td>Southern Myotis (Myotis macropus)</td><td>20</td></tr>
<tr><td>Large-eared pied bat (Chalinolobus dwyeri)</td><td>27</td></tr>
</table>
Note: the credits in Table 7 were calculated in accordance with Framework for Biodiversity Assessment of the NSW Biodiversity Offset Policy for Major Projects (OEH, 2014) and may need to be converted to reasonably equivalent ‘biodiversity credits’, within the meaning of the BC Act, if the credits are to be retired in accordance with the Biodiversity Offsets Scheme of the BC Act.</td><td>Section 2.3.3</td></tr>
<tr><td>B54: The Applicant must implement the Biodiversity Offset Strategy for the development as described in the documents listed in condition A2(c) and shown conceptually in Appendix 6.</td><td>Whole document</td></tr>
<tr><td colspan="2">Threatened Species</td></tr>
<tr><td>B55: The Applicant must continue to implement the mitigation and management measures described in the approved Translocation Plan for Orchids and Other Threatened Flora, dated September 2012 and</td><td>Section 5.10</td></tr>
</table>

Condition	Relevant Section in BOMPS
prepared by Umwelt for the Mangoola Coal Project disturbance area, to the satisfaction of the Planning Secretary.	
Rehabilitation Offsets	
B56: Within 10 years of the cessation of mining operations, or other timeframe agreed by the Planning Secretary, the Applicant must make suitable arrangements for the long term protection of the ecological mine rehabilitation and offset areas described in the document/s listed in condition A2(c) , including appropriate covenants to the satisfaction of the BCT> IF the rehabilitation area does not meet the listing criteria of the Plant Community Type or the completion criteria, then the Applicant must retire the relevant deficient biodiversity credits in accordance with the Biodiversity Offsets Scheme of the BC Act, to the satisfaction of the BCT**.** **Note:** *The rehabilitation offset performance and completion criteria form a component of the Rehabilitation Management Plan required under condition B91.*	Not triggered – Timing for the protection of ecological mine rehabilitation is required within 10 years after the cessation of mining allowing for the rehabilitation of mining areas within ML1815 and ML1817. A Rehabilitation Management Plan (RMP) has been prepared to satisfy the requirements of Condition B91 and Mining Lease (ML) conditions for ML 1815 and ML 1817.
Biodiversity Management Plan	
B57 – The applicant must prepare a Biodiversity Management Plan to the satisfaction of the Planning Secretary. This plan must:	This document.
a) be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Planning Secretary	This document was prepared by Associate Ecologist, Janene Devereux, who was endorsed by the Planning Secretary
b) be prepared in consultation with BCS	*A copy of the document will be provided.*
c) describe the short, medium- and long-term measures to be undertaken to manage the remnant vegetation and fauna habitat on the site and in any offset area	*Section 5*
d) describe how biodiversity management would be integrated with similar measures within other management plans, including the Rehabilitation Management Plan referred to in Condition B91	This is described within the Environmental Management Strategy (EMS)
e) include detailed performance and completion criteria for evaluation the performance of the Biodiversity Offset Strategy and include triggers for remedial action, where these performance or completion criteria are not met	*Appendix E*
f) include strategy that describes how the biodiversity credits in Table 7 will be identified, secured and retired	*Section 2.3.*3
g) describe the measures to be implemented within the approved disturbance areas to	
(i) minimise the amount of clearing	*Section 5.1*
(ii) minimise impacts on fauna, including undertaking pre-clearance surveys	*Section 5.3*
(iii) provide for the salvage, transplanting and/or propagation of threatened flora found during pre-clearance surveys, in accordance with the *Guidelines for the Translocation of Threatened Plants in Australia* (Valle et al. 2004) and	*Section 5.13*

Condition	Relevant Section in BOMPS
(iv) maximise the salvage of resources, including tree hollows, vegetation and soil resources, for beneficial reuse, including fauna habitat enhancement	*Section 5.11*
h) describe the measures to be implemented on the site to:	
(i) minimise the impacts to threatened ecological communities listed under the BC Act and EPBC Act, and contribute to conservation strategies for these communities	*Section 5*
(ii) minimise impacts on fauna habitat resources such as hunting and foraging areas, habitat trees, fallen timber and hollow bearing trees	*Section 5.3 and 5.18*
(iii) 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 4*
(iv) introduce naturally scarce fauna habitat features such as nest boxes and salvaged tree hollows and promote use of these introduced habitat features by threatened fauna species	*Section 5.11*
(v) manage any potential conflicts with Aboriginal heritage values	*Section 4.4.2 and 5.6*
(vi) protect vegetation and habitat outside of the approved disturbance areas	*Section 5.1*
(vii) manage the collection and propagation of seed from the local area	*Section 5.12*
(viii) control weeds, including measures to avoid and mitigate the spread of noxious weeds	*Section 5.9*
(ix) control feral pests with consideration of actions identified in relevant threat abatement plans	*Section 5.10*
(x) control erosion	*Section 5.15*
(xi) manage any grazing and agriculture	*Section 5.7*
(xii) control access to vegetated or revegetated areas and	*Section 5.2*
(xiii) manage bushfire hazards.	*Section 5.16*
i) Include a seasonally based program to monitor and report on the effectiveness of the above measures, progress against detailed performance indicators and competition criteria and identify improvements that could be implemented to improve biodiversity outcomes	*Section 6.2*
j) Identify the potential risks to the successful implementation of the biodiversity offset requirements, and include a description of the contingency measures to be implemented to mitigate these risks, including provisions for alternative direct and/or supplementary offset measures where regeneration of EECs and/or the propagation/translocation of threatened flora do not meet performance and completion criteria	*Section 8.4*
k) include details of who will be responsible for monitoring, reviewing and implementing the plan	*Section 10*
l) identify the measures that would be implemented to ensure the continued implementation of the biodiversity offset and rehabilitation requirements identified under the Mangoola Coal Project (PA 06_0014), with a particular focus of the re-establishment of: (i) Significant and/or threatened plant communities, including: • Ironbark woodland Complex • Bulloak Woodland • Paperbark Woodland • Slaty Box Woodland • Forest Red Gum Riparian Woodland	*Section 4, Section 5.11 and Section 5.14*

Condition	Relevant Section in BOMPS
• Rough Barked Apple Woodland • Swamp Oak Riparian Forest. (ii) Weeping Myall Woodland i. Significant and/or threatened plant species, including: • *Goodenia macbarronii* • *Diuris tricolor* • *Prasophyllum petilum* • *Pterostylis praetermissa* • *Cymbidium canaliculatum* • *Bothriochloa biloba* • *Acacia pendula* • *Androcalva rosea and* • *Pomaderris queenslandica.* ii. Significant and/or threatened animal species, including molluscan fauna.	
B58: The Applicant must not commence mining operations north of Wybong Road until the Biodiversity Management Plan is approved by the Planning Secretary.	
B59: The Applicant must implement the Biodiversity Management Plan as approved by the Planning Secretary.	

Table 1-3 provides the relevant conditions from the Commonwealth Approval (EPBC 2018/8280) and where they have been addressed in this BOMPS.

Table 1-3: Commonwealth Project Approval Conditions Relevant to BOMPS

Condition	Relevant Section in BOMPS
Commonwealth Approval (EPBC 2018/8280)	
Listed threatened species and ecological communities	
8. The approval holder must not exceed the clearing limits specified below and shown in Annexure 2: a) 24.3 hectares of the White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland EPBC Act listed ecological community. b) 148 hectares of Regent Honeyeater (*Anthochaera phrygia*) habitat. c) 148 hectares of Swift Parrot (*Lathamus discolor*) habitat. d) 162.7 hectares of Grey-headed Flying-Fox (*Pteropus poliocephalus*) habitat. e) 148 hectares of land containing *Prasophyllum* sp. Wybong habitat.	*Section 5.1*

Condition	Relevant Section in BOMPS
9. Prior to the commencement of coal extraction in the MCCO Additional Project Area, or other timeframe agreed to be the minister, the approval holder must retire the biodiversity credits specified in Table 1. The credits must be retired in accordance with the NSW Biodiversity Offset Scheme of the NSW *Biodiversity Conservation Act 2016* and to the satisfaction of the Biodiversity Conservation Trust.	Section 2.3.3

Table 1: Credits to be retired

Protected Matter	Credit Type	Area (ha)	Credits Required
White-Box – Yellow Box Blakely's Red Gum Woodland and Derived Native Grassland ecological community	HU812 Forest Red Gum grassy open forest on floodplains of the lower Hunter	17.8	1,136
	HU821 Blakely's Red Gum – Narrow-leaved Ironbark – Rough-barked apple shrubby woodland of the Hunter	6.46	253
Regent Honeyeater (*Anthochaera phrygia*)/ Swift Parrot (*Lathamus discolor*)	HU816 Spotted Gum – Narrow-leaved Ironbark shrub – grass open forest of the central and lower Hunter	6.30	369
	HU817 Narrow-leaved Ironbark – Bull Oak – Grey Box shrub – grass open forest of the central and lower Hunter	135.2	7,821
	HU821 Blakely's Red Gum – Narrow-leaved Ironbark – Rough-barked apple shrubby woodland of the Hunter	6.46	253
Grey-Headed Flying-Fox (*Pteropus poliocephalus)*	HU812 Forest Red Gum grassy open forest on floodplains of the lower Hunter	14.7	1,151
	HU816 Spotted Gum – Narrow-leaved Ironbark shrub – grass open forest of the central and lower Hunter	6.3	369
	HU817 Narrow-leaved Ironbark – Bull Oak – Grey Box shrub – grass open forest of the central and lower Hunter	135.2	7,821
	HU821 Blakely's Red Gum – Narrow-leaved Ironbark – Rough-barked apple shrubby woodland of the Hunter	6.46	253

Note: The credits in Table 1 were calculated in accordance with the Framework for Biodiversity Assessment of the NSW Biodiversity Offsets Policy for major Projects (OEH, 2014), and will need to be converted to reasonably equivalent "biodiversity credits', within the meaning of the NSW *Biodiversity Conservation Act 2016*, for the credits to be retired in accordance with the Biodiversity Offset Scheme of the NSW Biodiversity Conservation Act 2016 .

Condition	Relevant Section in BOMPS
10. For the protection of the *Prasophyllum* sp. Wybong, prior to the commencement of coal extraction in the MCCO Additional Project Area, or other timeframe agreed to with the Minister, the approval holder must provide the Minister with: a) Evidence that 193.1 ha of *Prasophyllum* sp. Wybong offset habitat has been secured under a Biodiversity Stewardship Agreement b) A *Prasophyllum* sp. Wybong offset management plan (this can be provided separately or as part of the Biodiversity Management Plan). This plan must be prepared by a suitably qualified *Prasophyllum* sp. Wybong expert and must include but not be limited to: i. identification of potential direct and indirect impacts to the *Prasophyllum* sp. Wybong individuals and/or habitat in the offset area ii. management actions proposed to minimise impacts to the *Prasophyllum* sp. Wybong individuals and/or habitat in the offset area iii. Performance indicators and trigger thresholds for the population size and habitat condition. Both short and long term performance indicators and trigger thresholds should be included to account for seasonal variations iv. A program to monitor and evaluate the population size and habitat condition against the performance indicators and trigger thresholds v. An action plan to respond to exceedances and/or failure to meet the performance indicators and thresholds.	Section 2.3.2 Appendix D
11. The approval holder must provide the Minister with an annual report outlining the results of the monitoring and management actions required under the *Prasophyllum sp*. Wybong offset management plan, within 60 business days of the end of calendar year.	Appendix D
12. The approval holder must comply with condition B57 of the State development consent to prepare and implement the Biodiversity Management Plan. The approval holder must comply with conditions B54, B55[1], B56, B57, B58 and B59 of Part B of the State development consent (to the extent the conditions in Part B relate to EPBC Act threatened species and ecological communities).	Section 5.13

[1] These species are no longer listed under the BC Act or the EPBC Act.
[2] This species is now listed as *Prasophyllum petilum* (BC Act) and *Prasophyllum* sp. Wybong (EPBC Act).
[3] The TSC Act was repealed following Project Approval and superseded by the BC Act.
[a] Extension to initial timeframe was provided.

Regulatory consultation documentation is provided in Appendix A.

1.4 Other Requirements

In accordance with commitments of the EIS (Umwelt 2019), the following commitments (Table 1-4) are also relevant to this BOMPS.

Table 1-4: EIS Commitments Relevant to the BOMPS

Commitment	Relevant Section in BOMPS
Section 6.9.3.2 – Mitigation Measures Mitigation measures will include (but not be limited to) measures that address the following direct and potential indirect impacts: • vegetation and habitat clearing protocols • feral animal and weed control • fencing and access control • bushfire management • sediment and erosion control • pathogen management.	Section 5.3 and Rehabilitation Management Plan Section 5.10 and 5.9 Section 5.2 Section 5.16 Section 5.15 Section 5.4 Section 5.5

1.5 Objectives of the BOMPS

The objective of this BOMPS is to provide direction for the short to long term management and enhancement of the ecological values of the Mangoola BOAs, as well as provide a detailed description of the measures to be implemented to achieve this over the next three-year period (2025-2028). The BOMPS will be implemented for the life of mine. Mangoola BOA's are protected in perpetuity under Conservation Agreements (CA's) or Biodiversity Stewardship Agreements (BSA's).

The objectives of the BOMPS are to:

a) identify and describe the area of land that will be required to be managed in accordance with this BOMPS

b) provide clear and concise directions for the management measures of the Mangoola BOAs and Approved Project Disturbance Area to adhere to the Project Approval Conditions (Section 1.3), regulatory requirements (Section 1.4), achieve the conservation management objectives (Section 1.6.1) and minimise the impacts of key threats

c) provide a working schedule for the implementation of activities required from the BOMPS

d) describe monitoring, performance evaluation and reporting procedures that are informative, practical and achievable.

1.5.1 Conservation Management Objectives

The conservation management objectives of the Mangoola BOAs and Approved Project Disturbance Area form the basis of the BOMPS. The proposed management and improvement strategies (Section 5) will enable these conservation management objectives and the conditions of approval to be met. Specific performance indicators and completion criteria (Section 7) will be used to track the success of the BOMPS in achieving these objectives.

The conservation management objectives are to:

a) minimise impacts to biodiversity when undertaking necessary clearing activities within the Approved Project Disturbance Area

b) conserve and enhance native vegetation and habitats for a range of threatened species, endangered populations and threatened ecological communities (TECs) across the BOAs

c) improve the habitat values and connectivity of the remnant native vegetation within the CA's

d) establish additional treed vegetation within areas of existing Derived Native Grassland (DNG) in the CA's (by active revegetation or passive regeneration)

e) maintain a balance of habitats by preserving up to 338* hectares of the CA's as existing DNG (note: DNG does not conform to a PCT)

f) protect and improve the biodiversity values of Mangoola BSA (993 ha) and Wybong Heights BSA (751 ha) in accordance with BSA requirements

* Note 338 hectares is approximate target for Derived Native Grassland across the five CA areas based on original targets of PA 06_0014 (surrendered 2022). Calculated using total CA area (3,028 hectares) minus existing baseline treed area in 2011 (1,586 hectares) and target revegetation/regeneration area (1,104 hectares).

2. Description of Biodiversity Offset Areas

A detailed description of the baseline condition and environment of the Mangoola BOAs is provided in the:

a) Anvil Hill Project Environmental Assessment (Umwelt 2006)

b) Modifications to MOC Mine Plans and Relocation of 500 kV Electricity Transmission Line: Environmental Assessment (Umwelt 2010)

c) Conservation Agreement for Big Flat Creek Conservation Area (Umwelt 2018a)

d) Conservation Agreement for Western Corridor and Anvil Hill Conservation Area (Umwelt 2018b)

e) Conservation Agreement for Southern Offset Conservation Area (Umwelt 2018c)

f) Conservation Agreement for Eastern Offset Conservation Area (Umwelt 2018d)

g) Conservation Agreement for Northern Corridor Conservation Area (Umwelt 2018e)

h) Mangoola Coal Continued Operations Project – Biodiversity Assessment Report (Umwelt 2019).

i) Mangoola Biodiversity Stewardship Agreement (Umwelt 2024a)

j) Wybong Heights Biodiversity Stewardship Agreement (Umwelt 2024b)

The following sections provide a summary of the characteristics and biodiversity values of the Mangoola BOAs, as relevant to this BOMPS. Further details are provided in site specific Conservation Agreements and Biodiversity Stewardship Agreements.

2.1 Locations

The Mangoola BOAs protect over 4,770 hectares of lands located surrounding the Mangoola mine, lying approximately 20 kilometres west of Muswellbrook and 10 kilometres north of Denman in the Muswellbrook LGA (Figure 1-1, Figure 1-2 and Figure 1-3). The Mangoola BOAs are strategically positioned in the landscape near to several existing conservation reserves and areas of Crown land including Manobalai Nature Reserve, Wollemi National Park and Goulburn River National Park (Figure 1-2). The Myambat Military Area also conserves large areas of native vegetation in the region.

These BOAs were selected due to their proximity to Mangoola, biodiversity values and their combined valuable corridor function within a fragmented and primarily agricultural landscape. The BOAs connect with nearby secure habitats within either the conservation or Crown lands systems.

2.2 Land Tenure

The current ownership and land use for the BOAs and surrounds is shown in Figure 2-1. This figure identifies the current access tracks, rental properties, vacant residences and current land uses across the Mangoola BOAs.

All properties comprising the BOAs are owned by Glencore. Land surrounding the BOAs is used for mining or grazing cattle, with a minor extent of cropping. Private residences occur directly adjacent to the BOAs in some locations.

The historical land use of the BOAs has primarily been agricultural, principally cattle and sheep grazing, with harvest crops on the floodplain. Many of the properties have been maintained for agricultural purposes since the late 1800's. The floodplain areas have been more heavily grazed and cultivated and as such the land here is more degraded than many of the foothills and slopes.

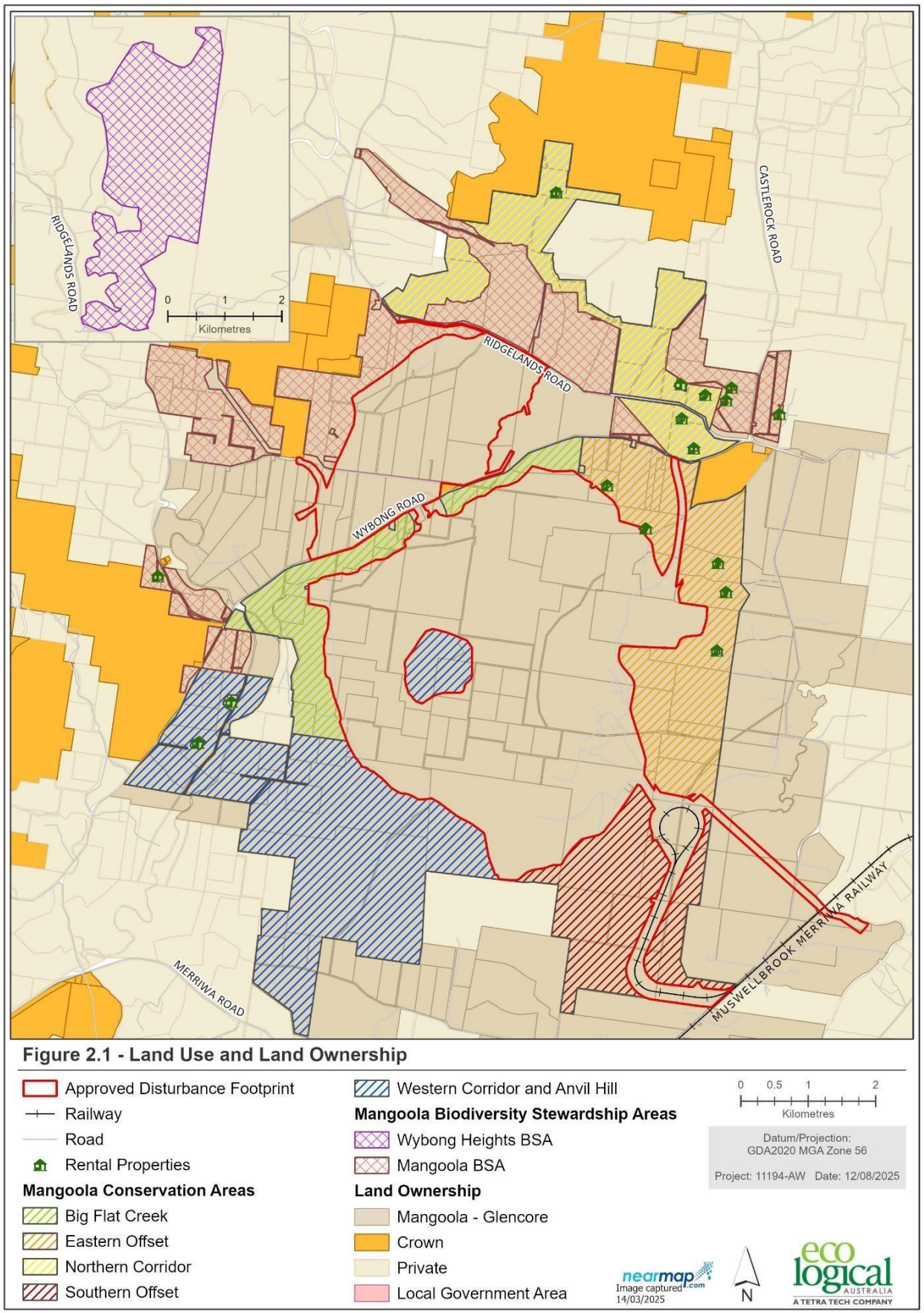

Figure 2-1: Land Use and Land Ownership of the Mangoola Open Cut and Biodiversity Offset Areas

2.3 Long Term Biodiversity Offset Security

2.3.1 Conservation Agreements

The BOAs approved under PA 06_0014 have been secured under Conservation Agreements (CAs) in consultation with OEH and as administered by the Minister administering the *National Parks and Wildlife Act 1974* (NPW Act). A CA is a legal agreement under section 69 of the NPW Act for an area of land with significant conservation value. These CAs are legally binding on both current and future landholders and are registered on the land titles. The CAs were approved and operational in May of 2019. The CAs document:

a) conservation values present
b) management arrangements and costings
c) monitoring arrangements.

2.3.2 Stewardship Agreements

Land-based offsets for the MCCO project include Mangoola Offset Area, Wybong Heights Offset Area, Highfields Offset Area and Mangrove Offset Area. Mangoola Offset Area and Wybong Heights Offset Area were managed as conservation areas from MCCO Project commencement and Biodiversity Stewardship Agreements (BSAs) were established for these offsets in accordance with SSD 8642. BSA's provide for the management and in- perpetuity conservation of these offset sites. Highfields Offset Area and Mangrove Offset Area are not managed by Mangoola but are also secured under BSA's in accordance with MCCO offsetting requirements under SSD 8642 and EPBC 2018/8280.

Evidence was provided to the Commonwealth Minister for the Environment that 193.1 ha of *Prasophyllum* sp. Wybong offset habitat has been secured under a BSA's in accordance with Condition 10a of EPBC 2018/8280 on 27 June 2024. This habitat is protected by Mangoola BSA and Mangrove BSA.

2.3.3 Credit Retirement

The following ecosystem and species credits (Table 2-1) are required to be retired to offset the residual biodiversity impacts of the project under SSD 8642. The retirement of ecosystem and species credits was carried out in consultation with BCS and in accordance with the Biodiversity Offset Scheme (BOS) of the BC Act, to the satisfaction of the BCT.

Table 2-1 Biodiversity Credits to be Retired

Credit Type	Credits Required (SSD/EPBC)	Equivalent Credits (reasonable equivalence)
Ecosystem Credits		
HU812 Forest Red Gum grassy open forest on floodplains of the lower Hunter	1,874*	982
HU816 Spotted Gum – Narrow-leaved Ironbark shrub – grass open forest of the central and lower Hunter	369*	188
HU817 Narrow-leaved Ironbark – Bull Oak – Grey Box shrub – grass open forest of the central and lower Hunter	13,457*	7319

Credit Type	Credits Required (SSD/EPBC)	Equivalent Credits (reasonable equivalence)
HU821 Blakely's Red Gum – Narrow-leaved Ironbark – Rough-barked apple shrubby woodland of the Hunter	253*	119
HU906 Bull Oak grassy woodland of the central Hunter Valley	1,597	791
HU945 Swamp Oak – Weeping Grass grassy riparian forest of the Hunter Valley	168	85
Species Credits		
Wybong leek orchid (*Prasophyllum petilum*)	8,983	740
Pine donkey orchid (*Diuris tricolor*)	17,238	1405
Southern Myotis (*Myotis macropus*)	20	20
Large-eared pied bat (*Chalinolobus dwyeri*)	27	106

* Meets EPBC 2018/8280 Condition 9 requirements

Ecosystem and species credits were retired in accordance with the offset strategy and requirements of SSD 8642 Schedule 2 Conditions B53, B54 and EPBC 2018/8280 Condition 9. Credits required were calculated via a reasonable equivalence process due to the Framework for Biodiversity Assessment method that the required credits were calculated under being replaced within the current Biodiversity Offset Scheme. Ecosystem credits matching the credit type listed were not able to be generated under the new system and predicted surplus credits were not able to be generated as the number of credits generated from the same land under the new system has been greatly reduced. There is no simple equivalence measure between the two sets of credits, therefore Mangoola was required to retire all credits generated by Mangoola BSA, Wybong Heights BSA, a proportion of Highfields BSA and all species credits generated by Mangrove BSA to meet the resulting "shortfall" between the two systems. None of the expected surplus credits were able to be generated and the proposed credits from ecological rehabilitation could not be assessed under the Biodiversity Offsets Scheme as the MCCO rehabilitation is not yet complete and not due for completion until 10 years after the cessation of mining in accordance with SSD 8642 Condition B56. Credits were originally proposed to be retired as indicated in Table 2-2.

Table 2-2 Summary of BOS Ecosystem and Species Credits Proposed for Retirement under Framework for Biodiversity Assessment Method

Credit Type	Credits from New Offsets		Credits from Existing Offsets		Credits from Ecological Rehabilitation	Biodiversity Conservation Fund	Total Offset Credits to be Used	Credit Surplus / Shortfall from BOA's
	Mangoola Offsets	Wybong Heights Offset	Highfields Offset	Mangrove Offset				
HU812 Forest Red Gum grassy open forest on floodplains of the lower Hunter	510	0	0	0	1,364	0	1,874	-1,364
HU816 Spotted Gum – Narrow-leaved Ironbark shrub – grass open forest of the central and lower Hunter	742	2,042	0	0	0	0	369	2,415
HU817 Narrow-leaved Ironbark – Bull Oak – Grey Box shrub – grass open forest of the central and lower Hunter	8,991	3,015	790	0	661	0	13,457	-661
HU821 Blakely's Red Gum – Narrow-leaved Ironbark – Rough-barked apple shrubby woodland of the Hunter	860	2,549	0	0	0	0	253	3,156
HU906 Bull Oak grassy woodland of the central Hunter Valley	0	1,597	0	0	0	0	1,597	0
HU945 Swamp Oak – Weeping Grass grassy riparian forest of the Hunter Valley	17	0	0	0	151	0	168	-151
Wybong leek orchid (*Prasophyllum petilum*)	12,637	0	0	3,109	0	0	8,983	6,763
Pine donkey orchid (*Diuris tricolor*)	124,661	0	0	25,183	0	0	17,238	132,606
Southern Myotis (*Myotis macropus*)	0	11	0	0	0	9	20	-9
Large-eared pied bat (*Chalinolobus dwyeri*)	667	0	0	0	0	0	27	640

Table 2-3 Summary of BOS Ecosystem and Species Credits Retired under the Biodiversity Offsets Scheme of the Biodiversity Conservation Act

Credit Type	Credits from Mangoola Offsets		Credits from Other Offsets		Credits from Ecological Rehabilitation (not equivalenced)	Biodiversity Conservation Fund	Total Offset Credits Required under Reasonable Equivalence	Total Offset Credits Retired
	Mangoola BSA	Wybong Heights BSA	Highfields BSA	Mangrove BSA				
HU812 Forest Red Gum grassy open forest on floodplains of the lower Hunter (PCT1598)	157	0	0	0	0	0	157	157
HU816 Spotted Gum – Narrow-leaved Ironbark shrub – grass open forest of the central and lower Hunter (PCT1602)	43	0	0	0	0	0	43	43
HU817 Narrow-leaved Ironbark – Bull Oak – Grey Box shrub – grass open forest of the central and lower Hunter (PCT1603)	979	0	0	0	0	0	979	979
HU821 Blakely's Red Gum – Narrow-leaved Ironbark – Rough-barked apple shrubby woodland of the Hunter (PCT1607)	282	16	0	0	0	0	298	298
HU906 Bull Oak grassy woodland of the central Hunter Valley (PCT1692)	0	0	0	0	0	0	0	0
HU945 Swamp Oak – Weeping Grass grassy riparian forest of the Hunter Valley (PCT1731)	0	0	0	0	0	0	0	0
PCT1731 Swamp Oak – Weeping grassy riparian forest of the Hunter Valey	1	0	0	0	0	0	1	1
PCT1602 Spotted Gum – Narrow-leaved Ironbark shrub – grass open forest of the central and lower Hunter	699	505	0	0	0	0	1204	1204

Credit Type	Credits from Mangoola Offsets		Credits from Other Offsets		Credits from Ecological Rehabilitation (not equivalenced)	Biodiversity Conservation Fund	Total Offset Credits Required under Reasonable Equivalence	Total Offset Credits Retired
	Mangoola BSA	Wybong Heights BSA	Highfields BSA	Mangrove BSA				
PCT1605 Narrow-leaved Ironbark – Native Olive shrubby open forest of the central Hunter	0	883	0	0	0	0	883	883
PCT618 White Box x Grey Box – red gum – Rough-barked Apple grassy woodland on rich soils on hills in the upper Hunter Valley	0	0	330	0	0	0	330	330
PCT1603 Narrow-leaved Ironbark – Bull Oak – Grey Box shrub – grass open forest of the central and lower Hunter	1279	0	0	0	0	0	1279	1279
PCT1607 Blakely's Red Gum – Narrow-leaved Ironbark – Rough-barked Apple shrubby woodland of the upper Hunter	0	315	0	0	0	0	315	315
PCT1691 Narrow-leaved Ironbark – Grey Box grassy woodland of the central and upper Hunter	0	457	0	0	0	0	457	457
PCT617 Narrow-leaved Ironbark – box – Mock Olive shrubby open forest mainly on basalt slopes over sandstone in the upper Hunter Valley, Brigalow Belt South Bioregion and Sydney Basin Bioregion	0	406	0	0	0	0	406	406
PCT1612 Narrow-leaved Ironbark – Grey Gum – Native Olive woodland of Central Hunter	108	0	0	0	0	0	108	108

Credit Type	Credits from Mangoola Offsets		Credits from Other Offsets		Credits from Ecological Rehabilitation (not equivalenced)	Biodiversity Conservation Fund	Total Offset Credits Required under Reasonable Equivalence	Total Offset Credits Retired
	Mangoola BSA	Wybong Heights BSA	Highfields BSA	Mangrove BSA				
PCT1655 Grey Box – Slaty Box shrub – grass woodland on sandstone slopes of the upper Hunter and Sydney Basin	109	0	0	0	0	0	109	109
PCT1654 Narrow-leaved Ironbark – Grey Gum shrubby open forest on sandstone ranges of the upper Hunter Valley	0	160	0	0	0	0	160	160
Tarengo leek orchid (*Prasophyllum petilum*)	2919	0	0	526	0	0	3445	3445
Pine donkey orchid (*Diuris tricolor*)	2919	0	0	526	0	0	3445	3445
Southern Myotis (*Myotis macropus*)	0	0	0	0	0	20	20	20
Large-eared pied bat (*Chalinolobus dwyeri*)	0	0	0	0	0	106	106	106

Retired Biodiversity credits for BSAs are detailed below in Table 2-4. Ecosystem Credits generated by and retired from each BSA are provided below. No species credits were generated by Wybong Heights BSA or Highfields BSA, species credits retired via Mangoola BSA and Mangrove BSA are provided in Table 2-5.

Table 2-4: Ecosystem credits generated and retired Biodiversity Stewardship Sites (BSA's)

BSA	Credit Type	Offset trading group	Credits Required	
			With hollows	Without hollows
Wybong Heights	617-Narrow-leaved Ironbark -box - Mock Olive shrubby open forest mainly on basalt slopes over sandstone in the upper Hunter Valley, Brigalow Belt South Bioregion and Sydney Basin Bioregion	Western Slopes Dry Sclerophyll Forests >=50% and <70%	405	1
	1602-Spotted Gum – Narrow-leaved Ironbark shrub – grass open forest of the central and lower Hunter	Hunter-Macleay Dry Sclerophyll Forests >=50% and <70%	505	0
	1607-Blakely's Red Gum - Narrow-leaved Ironbark - Rough-barked Apple shrubby woodland of the upper Hunter	North-west Slopes Dry Sclerophyll Woodlands >=50% and <70%	315	16
	1605-Narrow-leaved Ironbark - Native Olive shrubby open forest of the central and upper Hunter	Central Hunter Grey Box—Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions	883	0
	1654-Narrow-leaved Ironbark - Grey Gum shrubby open forest on sandstone ranges of the upper Hunter Valley	Western Slopes Dry Sclerophyll Forests <50%	160	0
	1691-Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter	Coastal Valley Grassy Woodlands >=70% and <90%	183	274
Mangoola	1598-Forest Red Gum grassy open forest on floodplains of the lower Hunter	Coastal Floodplain Wetlands <50%	112	45
	1602-Spotted Gum – Narrowleaved Ironbark shrub – grass open forest of the central and lower Hunter	Hunter-Macleay Dry Sclerophyll Forests >=50% and <70%	699	43
	1603-Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter	Coastal Valley Grassy Woodlands >=70% and<90%	0	1279
	1603-Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter	Central Hunter Grey Box-Ironbox Woodland in the New South Wales North Coast and Sydney Basin Bioregions	979	0
	1731-Swamp Oak - Weeping Grass grassy riparian forest of the Hunter Valley	Coastal Swamp Forest >=50% and <70%	0	1

	1607-Blakely's Red Gum - Narrow-leaved Ironbark - Rough-barked Apple shrubby woodland of the upper Hunter	North-west Slopes Dry Sclerophyll Woodlands >=50% and <70%	0	282
	1612-Narrow-leaved Ironbark - Grey Gum - Native Olive woodland of Central Hunter	Hunter-Macleay Dry Sclerophyll Forests <50%	108	0
	1655-Grey Box - Slaty Box shrub - grass woodland on sandstone slopes of the upper Hunter and Sydney Basin	Western Slopes Dry Sclerophyll Forests <50%	0	23
	1655-Grey Box - Slaty Box shrub - grass woodland on sandstone slopes of the upper Hunter and Sydney Basin	Hunter Valley Footslopes Slaty Gum Woodland in the Sydney Basin Bioregion	86	0
Highfields	618-White Box x Grey Box – red gum – rough barked Apple grassy woodland on rich soils on hills in the upper Hunter Valley	White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions		170
	618-White Box x Grey Box – red gum – rough barked Apple grassy woodland on rich soils on hills in the upper Hunter Valley	White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions	128	32

Table 2-5: Species credits generated and retired Mangoola and Mangrove BSA's

BSA	Species name	Common name	Number of credits
Mangoola	*Cymbidium canaliculatum* - endangered population	Cymbidium canaliculatum population in the Hunter Catchment	1*
	Diuris tricolor	Pine Donkey Orchid	2919
	Prasophyllum petilum	Tarengo Leek Orchid	2919
Mangrove	*Diuris tricolor*	Pine Donkey Orchid	526
	Prasophyllum petilum	Tarengo Leek Orchid	526

* Not required to be retired by the reasonable equivalence

2.3.4 Rehabilitation Offsets

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

SSD 8642 Condition B56 states, within 10 years of the cessation of mining operations associated with the MCCO Project (or at an agreed timeframe with the Planning Secretary), Mangoola will make suitable arrangements for the long term protection of the Wybong Pit ecological mine rehabilitation and BOAs listed in condition A2(c) of SSD 8642, including appropriate covenants to the satisfaction of the BCT.

If the rehabilitation area does not meet the listing criteria of the target PCT or completion criteria, then Mangoola will retire the relevant deficient biodiversity credits in accordance with the BOS of the BC Act, to the satisfaction of the BCT.

In accordance with the BAR, restoration of up to 456 ha of native vegetation communities will be undertaken as part of ecological mine rehabilitation in Wybong Pit.

2.3.5 Conservation Bond

SSD 8642 Condition B60 states, a Conservation Bond for each CA must be lodged within six months of approval of the BOMPS. The purpose of this bond is to cover the cost of the management of land required to be set aside as a BOA, should the mine consent holder be unable or unwilling to continue management of the land. The Conservation Bond value is based on all the activities identified in the approved BOMPS, for the life of the plan (three years).

The sum of the bond must be determined by:

a) calculating the full cost of implementing the BOS at third party rates (excluding land acquisition costs

b) employing a suitably qualified, independent and experienced person to verify the calculated costs.

SSD 8642 Condition B61 states, the calculations behind the Conservation Bond must be submitted to the Department at least two months prior to lodgement of the bond.

2.4 Baseline Information

2.4.1 Climatic Information

The following table (Table 2-6) provides monthly averages for each climate category for 2024 and averages to date.

Table 2-6: Climate Data from the Mangoola Area (BOM 2025)

Month	2024 Monthly Mean		Total Rainfall (mm)	Historical Averages		Rainfall (median)
	Min Temp (^{0}C)	Max Temp (^{0}C)		Min Temp (^{0}C)	Max Temp (^{0}C)	
January	11.9	41.3	24.94	10.7	39.6	72.8
February	14.7	41.9	38.8	10.1	38.1	44.1

Month	2024 Monthly Mean		Total Rainfall (mm)	Historical Averages		Rainfall (median)
	Min Temp (^{0}C)	Max Temp (^{0}C)		Min Temp (^{0}C)	Max Temp (^{0}C)	
March	9.9	38.3	52.8	7.9	35.1	54
April	4.1	30.6	138.4	3.8	30.2	39.4
May	-0.7	24.6	64.0	-0.4	25.8	35.5
June	-2.2	22.0	102.6	-2.4	21.9	33
July	-1.6	20.5	60.8	-2.9	21.8	26.8
August	-1.8	27.7	50.4	-2.4	24.9	30
September	-2.0	28.0	46.8	0.2	29.6	34.4
October	3.5	32.5	40.2	2.7	33.2	46.2
November	8.5	39.5	98.6	5.8	36.6	53.6
December	8.1	40.0	49.6	8.6	38.0	67.8

The Wybong area is influenced by a temperate weather system and experiences warm summer and mild winter temperatures. Summer maximum temperatures typically have an average of 30° C during the day and 18° C at night. Winter minimums are experienced in June to August with an average maximum of 17° C during the day and minimum of 4.2° C at night. The average rainfall is 626.9 millimetres per year with higher rainfalls typically occurring during warmer months (November to March).

2.4.2 Physical Geography and Soils

The following section draws on information from the Anvil Hill Project Soil Survey and Land Resource Assessment Report (GSS Environmental 2006) which was prepared for the Anvil Hill Project Environmental Assessment (EA) (Umwelt 2006). Figure 2-2 shows the topography and soil types prevalent within the project approval area and BOAs.

The Mangoola BOAs are on the edge of the Permian Singleton Coal Measures (now known as the Singleton Supergroup) mapping with much of the surface geology formed by the Triassic Narrabeen group. They are part of a disjunct eastern occurrence of the dissected Triassic sandstone and conglomerate plateau that forms the Goulburn River complex to the west. To the south is the more extensive dissected sandstone plateau of the Wollemi Wilderness, while to the north a more eroded Triassic sandstone and conglomerate complex has formed low hills and escarpments in the Moobi district to the west of Aberdeen. To the east and extending north-north-east to Scone and east-south-east to Maitland are the highly eroded Permian lowlands of the floor of the Hunter Valley. The Mangoola BOAs support both low Permian hills and valleys, and Triassic conglomerate outcrops and escarpments.

The topography varies from lower slopes towards the Hunter River, through undulating and hilly lands to rocky outcrops. A notable topographical feature within the BOAs is Anvil Hill which rises approximately 70 metres above the surrounding area at its highest point. The hills to the west of the mine although not

officially named, are known locally as “Wallaby Rocks”. Wallaby Rocks rise to a height of 264 metres Australian Height Datum (mAHD), being approximately 100 metres above the surrounding area, and contain a visually dominant escarpment along the western side. The rocky area to the south known as Limb of Addy Hill rises to a height of 302 mAHD, which is also approximately 100 metres above the surrounding area.

Alluvium is mapped as being present along Wybong Creek to the west, and Sandy Creek, in the south east.

The landform of the Wybong area consists mainly of undulating low hills between 140 and 210 m AHD, with natural slope gradients ranging from 1 to 6 per cent. This undulating landform is prevalent throughout all parts of Mangoola including BOAs, except the far south-east which is situated on the alluvial plain of Sandy Creek and the Hunter River.

The undulating landform is interrupted by several prominent steep outcropping hills, such as Anvil Hill, Wallaby Rocks and Limb of Addy.

Five main tributaries occur within the project approval area and BOAs, these being Big Flat Creek, Wybong Creek, Sandy Creek, Anvil Creek and Clarks Gully. The major ephemeral stream draining the area, Big Flat Creek, flows in a westerly direction through the centre of the project approval area before flowing into Wybong Creek, which discharges into the Goulburn River. Clarks Gully flows to the north of Anvil Hill and Anvil Creek to the south.

The majority of Mangoola including the BOAs are located within the Wybong Creek catchment; however, some lands on the margins are in a separate catchment and drain towards the south-east into Sandy Creek, which discharges into the Hunter River.

The wider Mangoola area contains eight soil landscapes that relate directly to geology and patterns of vegetation (GSS Environmental 2006). The soil landscapes of the Mangoola BOAs are listed in Table 2-7 (soil landscapes as per Kovac and Lawrie 1991).

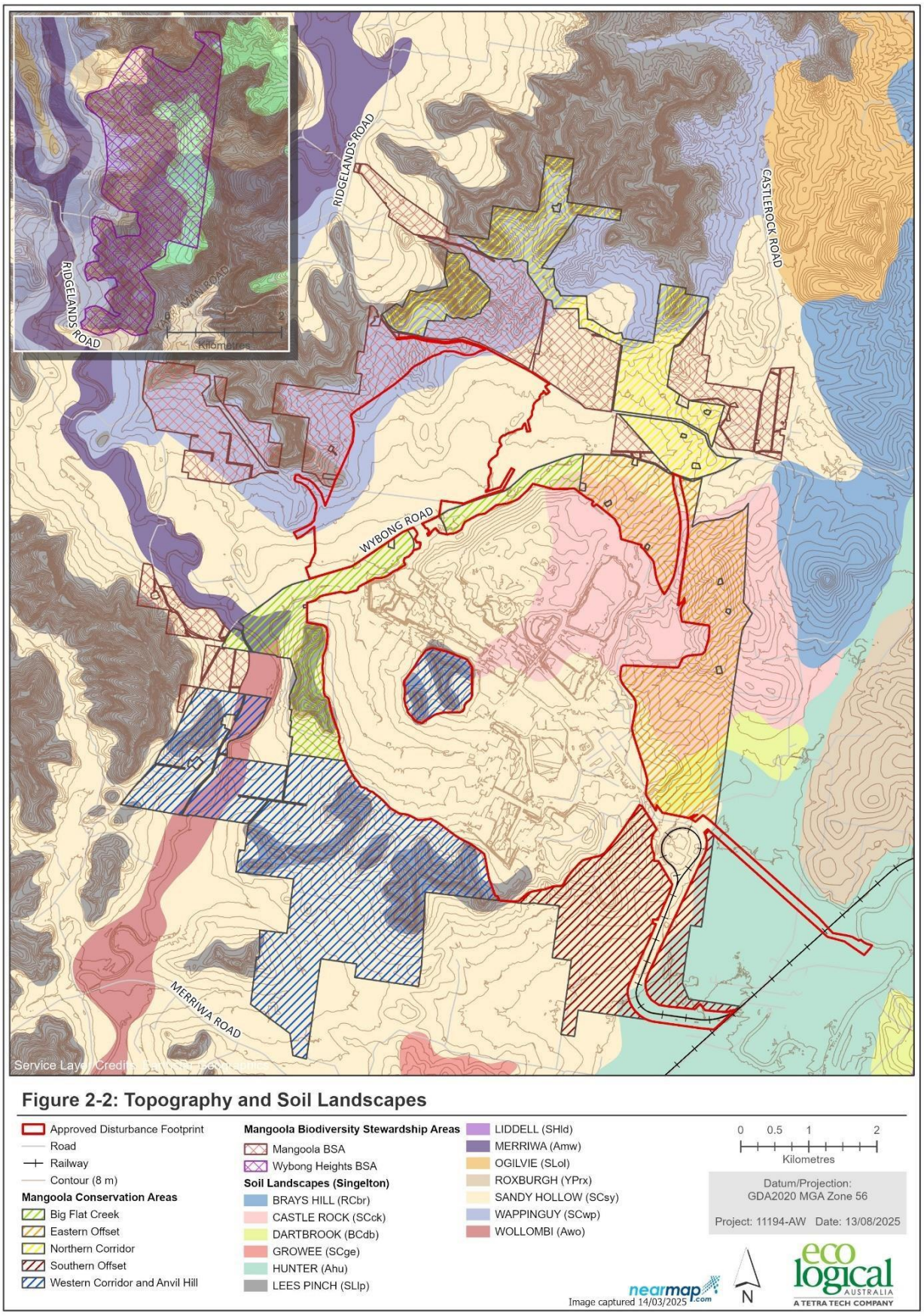

Figure 2-2: Topography and Soil Landscape of the Mangoola Open Cut and Biodiversity Offset Areas

Table 2-7: Soil Landscapes and Associated Soil Units of the Mangoola BOAs

Soil Landscape	Age and Stratigraphy	Topography	Associated Soil Units
Sandy Hollow	Quaternary Colluvium derived from Narrabeen Group	Undulating rises between 160 and 500 metres. Slopes are smooth and generally < than 10 per cent. Prone to moderate erosion.	Red Solodic, Yellow Solodic, Brown Solodic, Red Earth, Siliceous Sands and Alluvial Soils
Dartbrook	Quaternary Alluvium	Undulating rises and low hills with elevation ranges of 100 to 140 metres and 200 to 260 metres. Slopes are gentle (0 to 10 per cent). Prone to minor erosion.	Brown Clays, Black Earths, Euchrozems, Non-calcic Brown Soils, Prairie Soils, Red-brown Earths, Chocolate Soil-Red-brown Earth intergrades and Chocolate Soils
Lees Pinch	Narrabeen Group	Rolling hills to steep mountains with rounded summits, elevation ranges between 180 and 800 metres. Steep slopes to 90 per cent with irregular benches. Prone to moderate erosion.	Shallow Siliceous Sands, Lithosols, Yellow/Brown Earths, Yellow Soloths, Grey Soloths, Yellow Podzolic Soils and Earthy Sands
Hunter	Quaternary Alluvium	Level plains and river terraces with elevations 20 to 60 metres. Slopes are 0 to 3 per cent. Prone to minor erosion.	Brown Clays, Black Earths, Chernozems, Alluvial Soils, Red Podzolic Soils, Lateritic Podzolic, Non-calcic Brown Soils and Yellow Solodic Soils
Wollombi	Narrabeen Group and Quaternary Alluvium	Valley flats and levees between 60 and 140 metres elevation. Slopes are up to 3 per cent. Prone to minor erosion.	Earthy Sands
Merriwa	Quaternary Alluvium	Alluvial terraces and gently undulating rises, up to 12 metres above stream bed, slopes 3 per cent. Prone to minor erosion.	Alluvial Soils, Chernozems, Prairie Soils, Grey/Brown Clays and Black Earths
Castle Rock	Permian Sandstone	Undulating low hills and footslopes on areas of colluviums. Elevation from 240 to 460 metres, local relief is 40 to 80 metres and slopes 1 to 5 per cent. Prone to minor erosion.	Yellow Solodics, Black Solodics and Alluvial Soils (loams)

Soil Landscape	Age and Stratigraphy	Topography	Associated Soil Units
Wappinguy	Narrabeen Group and Pilliga Sandstone	Rolling low hills with some rocky sandstone knolls, hills and cuestas. Elevations between 800 to 1000 metres. Slopes typically <15%. Prone to minor erosion.	Solodic Soils, Siliceous and Earthy Sands, Brown Clays, Red Earth - Euchrozem intergrades, Euchrozems, Prairie Soils, Alluvial Loams, Black Earths and Gleyed Soloths
Ant Hill	Tertiary basalt. Weathered basalt and basalt colluvium. Alluvium in drainage depressions.	Rolling low hills to rolling hills with elevations ranging from 500 – 620 m. Local relief varies from 100 – 180 m with slopes of 5 – 15%. Slope lengths are up to 2,500 m. There are isolated basaltic knolls and hillocks. Drainage depressions are up to 1,000 m apart.	Black Earths situated on the mid to lower slopes. Red Clays occupy the upper slopes with Brown Clays midslope. Grey Clays are associated with areas of waterlogging such as in drainage depressions. Euchrozems occur on isolated well-drained slopes and to the south near the Roscommon soil landscape
Bow	Tertiary basalt. Weathered in situ basalt and basalt colluvium.	Undulating rises to undulating low hills with some small rocky knolls and valley side benches. Elevations range from 360 – 450 m; with slopes of 3 – 10%. Slope lengths are 2,000 – 5,000 m. Local relief is 20 – 80 m. Drainage lines occur at 800 – 2,000 m intervals.	Black Earths on the slopes, with occasional Red Clays or Lithosols on crests. There are also Euchrozems and Brown Clays on some midslopes.
Rossgole	Tertiary basalt. In situ weathered basalt and dolerite.	A plateau of undulating low hills and hills, ranging in elevation from 400-640m. Local relief is 60-120m. Slopes are 2-7%, with slope lengths ranging from 500-2,000m. Drainage lines occur at 200m intervals	Main soils are Black Earths on the steeper slopes with Euchrozems on the flatter slopes. Outcrops of sandstone on the perimeter at the boundary with the Lees Pinch soil landscape

2.4.3 Key Ecological Values

The following section provides information on the vegetation communities, threatened and migratory species, endangered populations and TECs (as listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)) recorded within the BOAs. This information is sourced from the Anvil Hill Project Environmental Assessment (EA) (Umwelt 2006), Mangoola Coal Continued Operations Project – Biodiversity Assessment Report (Umwelt 2019) and surveys for post-approval projects such as modifications, pre-clearing surveys and annual ecological monitoring surveys, as well as the Upper Hunter Strategic Assessment (Umwelt 2015a) and Mangoola North Pre-feasibility studies (Umwelt 2015b).

2.4.3.1 Vegetation Communities and Threatened Ecological Communities

Native treed vegetation occurs over large portions of the BOAs, particularly in less productive slopes and foothills and in escarpment areas. Remaining areas comprise grassland of varying condition, including grasslands dominated by native grasses and forbs and grasslands dominated by exotic annual or perennial species.

Vegetation communities mapped within the Mangoola BOAs are provided on Figure 2-3, Figure 2-4 and Figure 2-5. PCT mapping provided within these figures is the result of updated mapping across all BOAs to provide a consistent view across all sites.

Detailed descriptions of the characteristics of each of these communities are provided in Anvil Hill Project Environmental Assessment (EA) (Umwelt 2006), site specific Conservation Agreements and Biodiversity Stewardship Site Assessment Reports as well as from the planting lists provided in Appendix B.

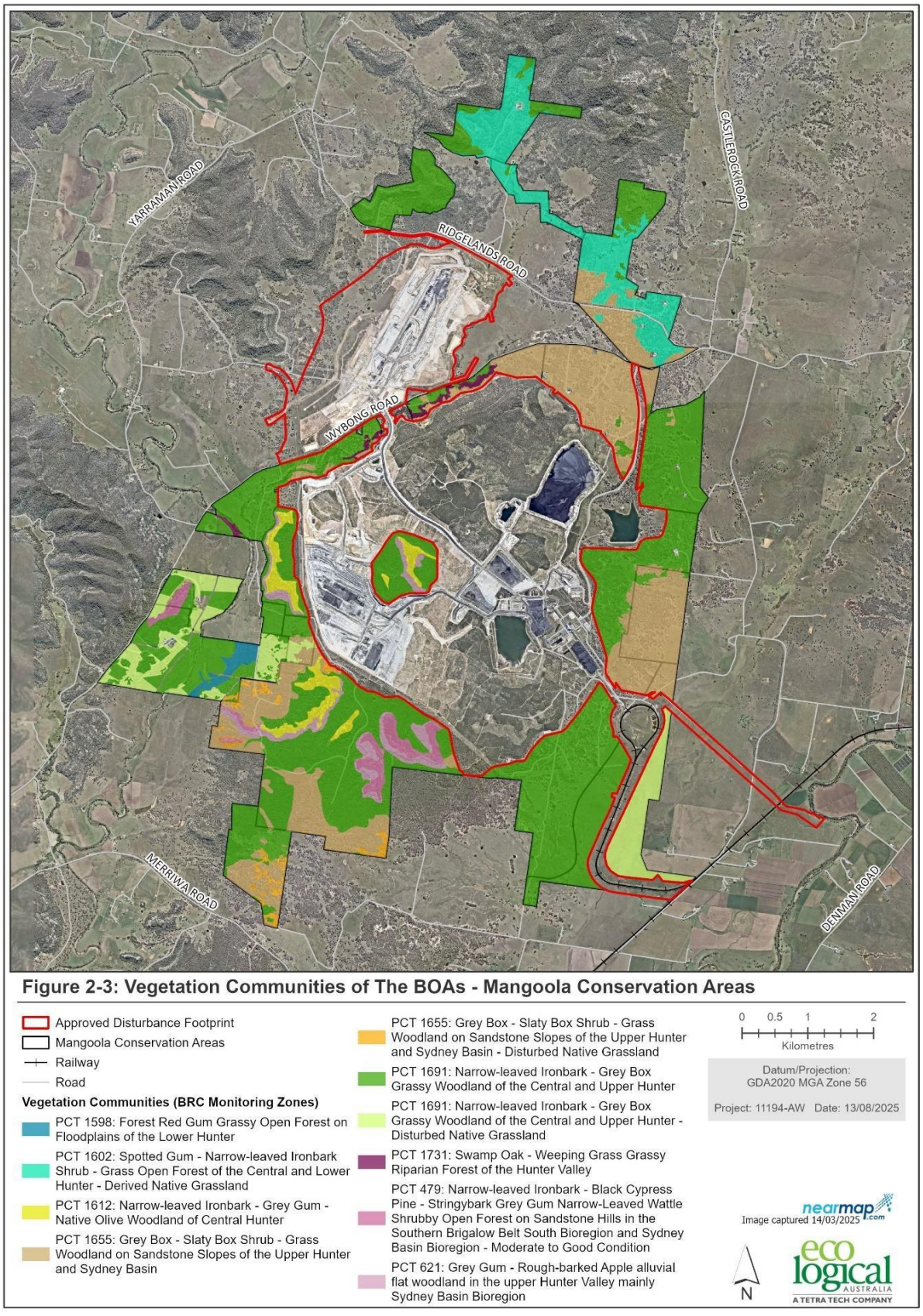

Figure 2-3: Vegetation communities of the Mangoola Conservation Areas

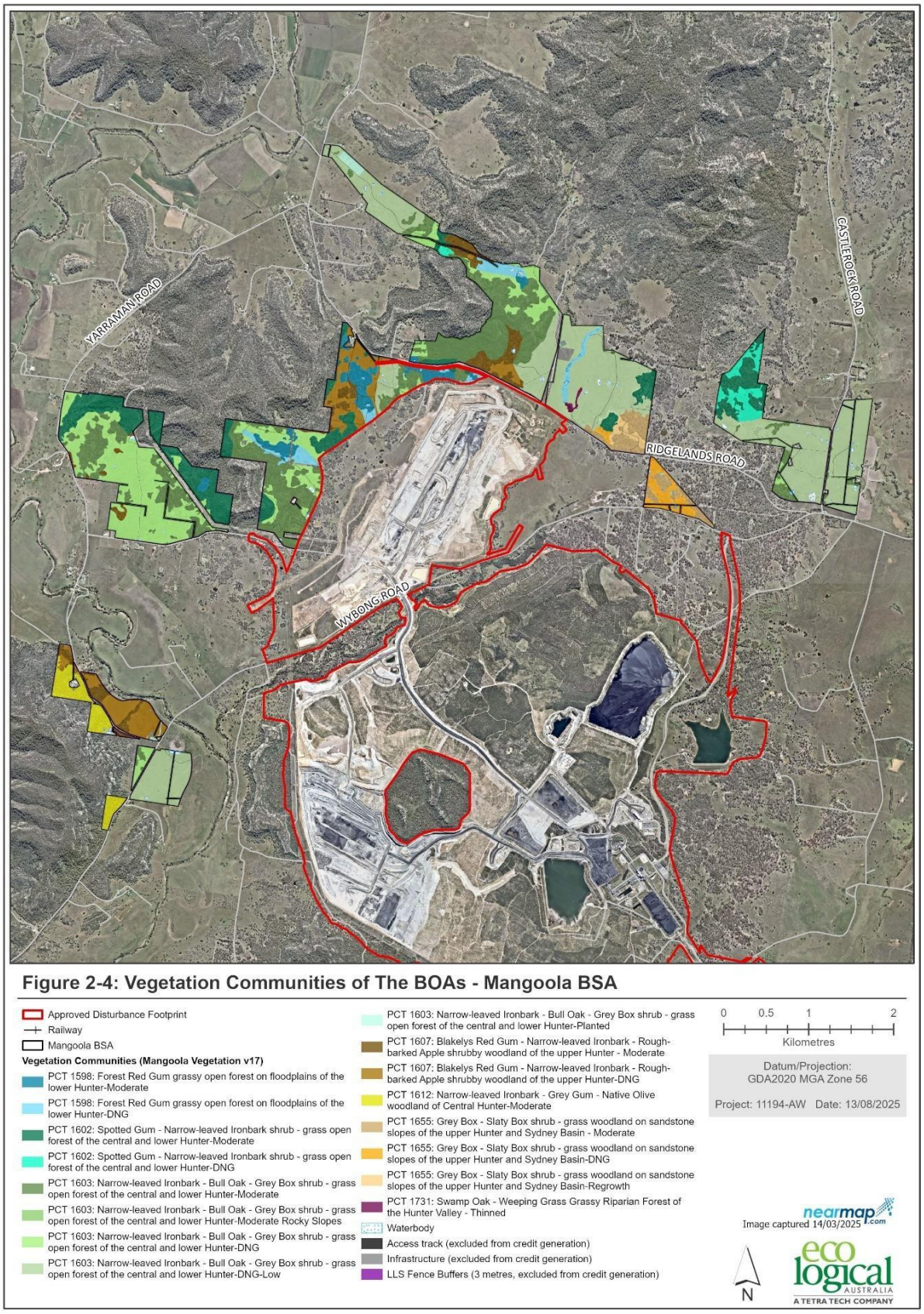

Figure 2-4:PCT Mapping of the Biodiversity Stewardship Areas – Mangoola

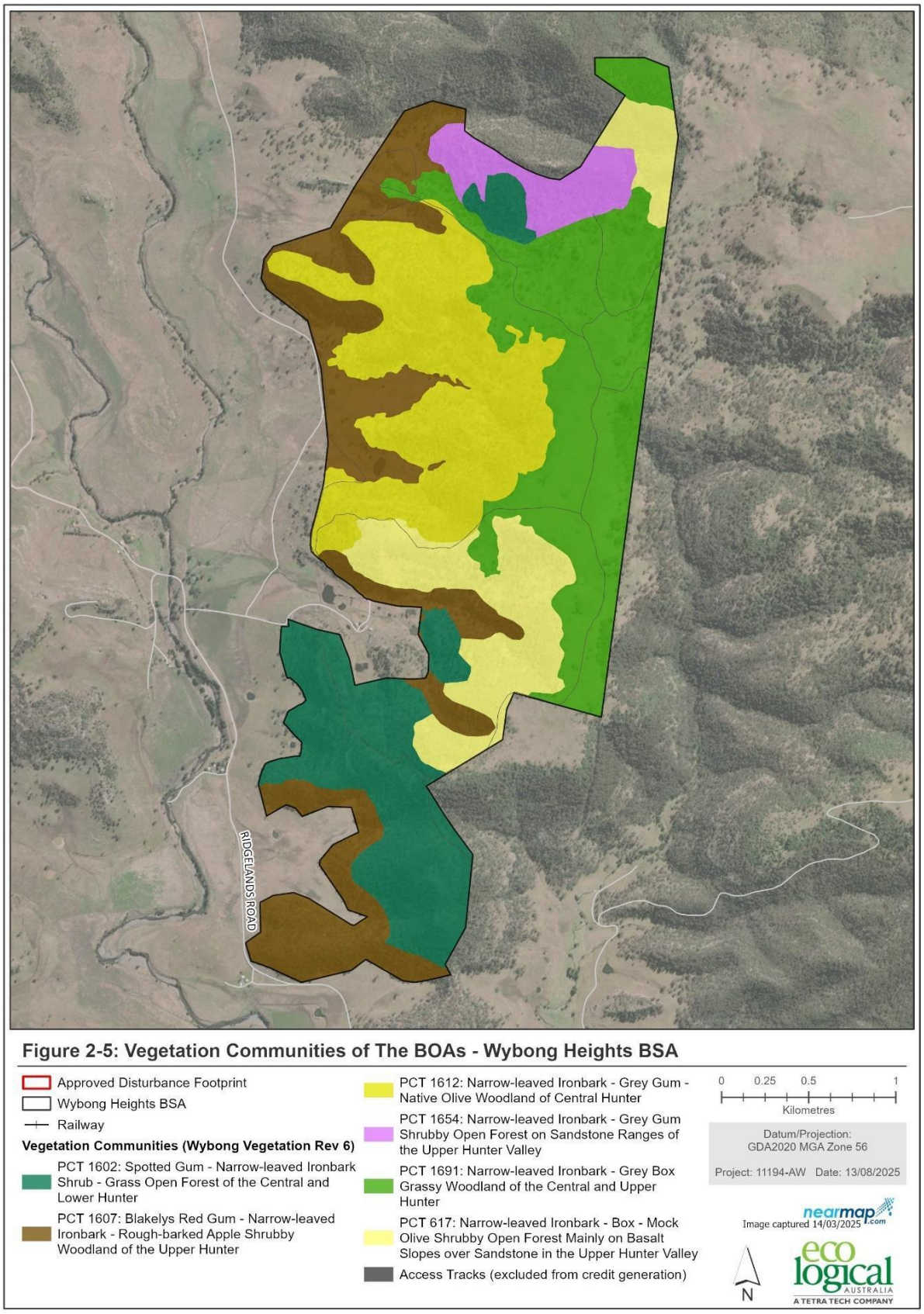

Figure 2-5:PCT Mapping of the Biodiversity Stewardship Areas – Wybong Heights

2.4.3.2 Threatened Flora Species and Endangered Flora Populations

Table 2-8 documents each of the currently listed threatened flora species and endangered flora populations recorded in the BOAs. . These are cumulative records including those from the Anvil Hill Ecological Assessment (Umwelt 2006), Mangoola Coal Continued Operations Project – Biodiversity Assessment Report (Umwelt 2019), as well as other surveys as part of post-approval requirements such as monitoring and pre-clearing surveys, modification assessments, as well as the Upper Hunter Strategic Assessment (Umwelt 2015a) and Mangoola North Pre-feasibility studies (Umwelt 2015b).

Table 2-8: Threatened Flora Species and Endangered Populations Recorded in the Mangoola BOAs

Species	BC Act	EPBC Act
Threatened Flora Species		
Androcalva rosea[1]	E	E
Pine donkey orchid (*Diuris tricolor*)	V	-
Lasiopetalum longistamineum	V	V
Scant pomaderris (*Pomaderris queenslandica*)	E	-
Denman pomaderris (*Pomaderris reperta*)	CE	CE
Prasophyllum petilum[2]/	E	E
Small purple pea (*Swainsona recta*)	E	E
Austral toadflax (*Thesium australe*)	V	V
Endangered Flora Populations		
Painted Diuris (*Diuris tricolor*) in the Muswellbrook local government area	EP	-
Tiger orchid (*Cymbidium canaliculatum*) in the Hunter Catchment	EP	-
Weeping myall (*Acacia pendula*) in the Hunter Catchment	EP	-

CE critically endangered
E endangered
EP endangered population
V vulnerable
[1] was *Commersonia rosea*

[2] synonymous with *Prasophyllum* sp. Wybong

2.4.3.3 Threatened Fauna Species

Table 2-9 documents each of the currently listed threatened and migratory fauna species recorded in the BOAs and these are shown on Figure 2-6. These are cumulative records including those from the Anvil Hill Ecological Assessment (Umwelt 2006), Mangoola Coal Continued Operations Project – Biodiversity Assessment Report (Umwelt 2019), as well as other surveys as part of post-approval requirements such as monitoring and pre-clearing surveys, ecological monitoring and those completed for modification assessments.

Table 2-9: Threatened and Migratory Fauna Species Recorded in the Mangoola BOAs

Species	BC Act	EPBC Act
Birds		
White-bellied sea-eagle (*Haliaeetus leucogaster*)	V	-
Spotted harrier (*Circus assimilis*)	V	-
Black falcon (*Falco subniger*)	V	-
Little Eagle (*Hieraaetus morphnoides*)	V	-
Glossy black-cockatoo (*Calyptorhynchus lathami*)	V	-
Little lorikeet (*Glossopsitta pusilla*)	V	-
Turquoise parrot (*Neophema pulchella*)	V	-
Powerful owl (*Ninox strenua*)	V	-
Masked owl (*Tyto novaehollandiae*)	V	-
Brown treecreeper (*Climacteris picumnus victoriae*)	V	-
Speckled warbler (*Chthonicola sagittata*)	V	-
Scarlet robin (*Petroica boodang*)	V	-
Flame robin (*Petroica phoenicea*)	V	-
Hooded robin (*Melanodryas cucullata cucullata*)	V	-
Grey-crowned babbler (*Pomatostomus temporalis temporalis*)	V	-
Varied sittella (*Daphoenositta chrysoptera*)	V	-
Diamond firetail (*Stagonopleura guttata*)	V	-
Dusky woodswallow (*Artamus cyanopterus cyanopterus*)	V	-
Mammals		
Koala (*Phascolarctos cinereus*)[1]	V	V
Squirrel glider (*Petaurus norfolcensis*)	V	-
Brush-tailed rock-wallaby (*Petrogale penicillata*)	E	V

Species	BC Act	EPBC Act
Spotted-tailed Quoll (*Dasyurus maculatus*)	V	E
Grey-headed flying-fox (*Pteropus poliocephalus*)	V	V
Yellow-belled sheathtail-bat (*Saccolaimus flaviventris*)	V	-
Eastern freetail-bat (*Mormopterus norfolkensis*)	V	-
Little bentwing-bat (*Miniopterus australis*)	V	-
Eastern bentwing-bat (*Miniopterus schreibersii oceanensis*)	V	-
Large-eared pied bat (*Chalinolobus dwyeri*)	V	V
Greater long-eared bat (*Nyctophilus corbeni*)	V	V
Greater broad-nosed bat (*Scoteanax rueppellii*)	V	-
Eastern false pipistrelle (*Falsistrellus tasmaniensis*)	V	-
Southern myotis (*Myotis macropus*)	V	-
Eastern cave bat (*Vespadelus troughtoni*)	V	-
Migratory Species		
Rainbow bee-eater (*Merops ornatus*)	-	M
White-throated needletail (*Hirundapus caudacutus*)	-	M
Satin flycatcher (*Myiagra cyanoleuca*)	V	V, M

[1] this is from a single scat record during the Anvil Hill Impact assessment surveys, no evidence of this species has been identified since.

E endangered

M migratory

V vulnerable

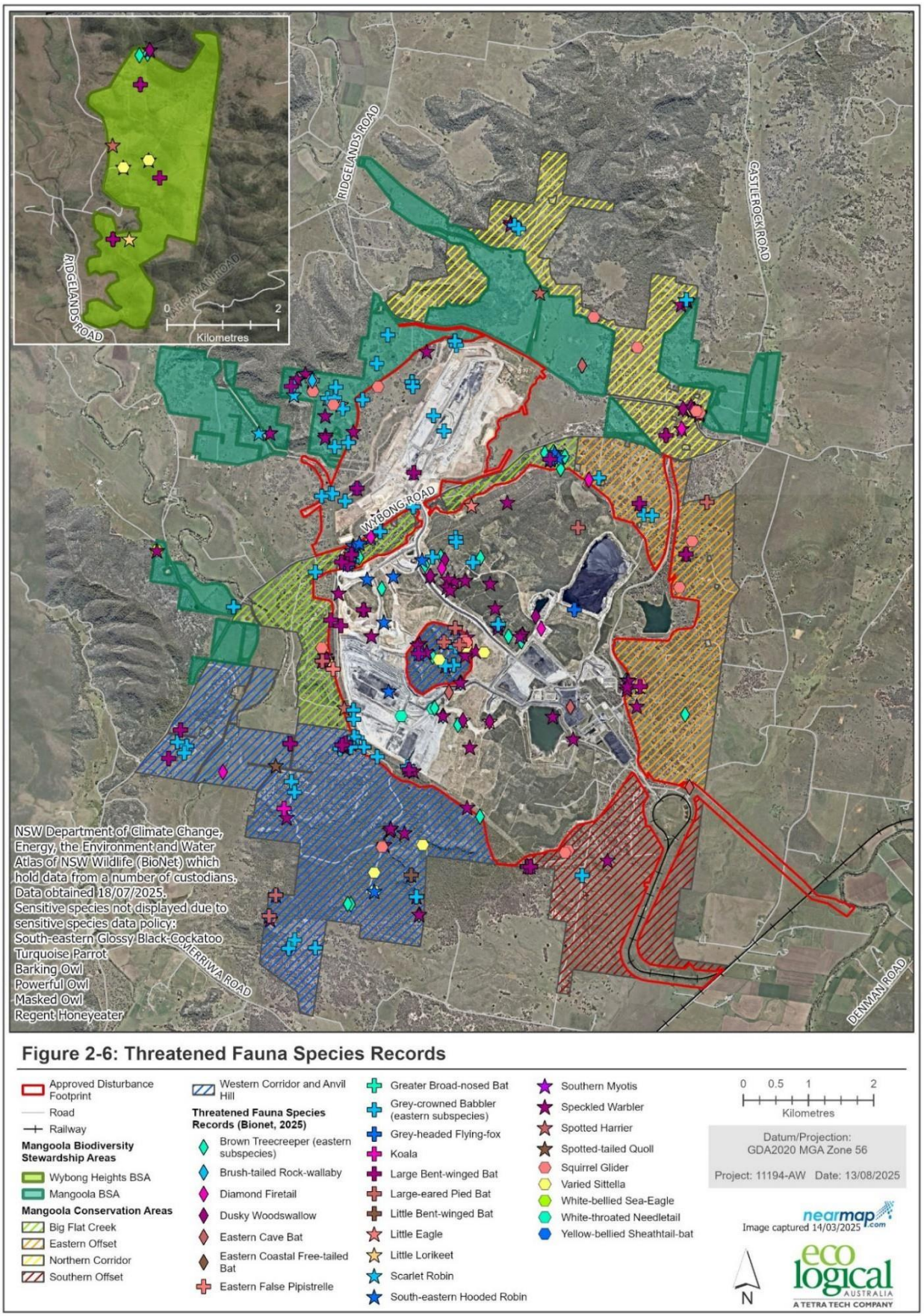

Figure 2-6: Threatened Fauna Species Records in the Mangoola Open Cut and Biodiversity Offset Areas

2.4.3.4 Introduced Species

The introduced fauna species provided in Table 2-10 have been identified within the BOAs or have been inferred as occurring based on their known presence in the local area.

Table 2-10: Introduced Fauna Species Recorded in BOAs

Common Name	Scientific Name
Mammals	
Pig	*Sus scrofa*
Dog	*Canis lupus familiaris*
Fox	*Vulpes vulpes*
Cat	*Felis catus*
Fallow deer	*Dama dama*
Red deer	*Cervus elaphus*
Cattle	*Bos taurus*
Goat	*Capra hircus*
Sheep	*Ovis aries*
Rabbit	*Oryctolagus cuniculus*
Brown hare	*Lepus capensis*
Black rat	*Rattus rattus*
House mouse	*Mus musculus*
Birds	
Eurasian skylark	*Alaudidae arvensis*
Rock dove	*Columbia livia*
Common starling	*Sturnis vulgaris*
Common myna	*Acridotheres tristis*

The introduced flora species provided in Table 2-11 have been identified within the BOAs and have legislative status as listings under the *Biosecurity Act 2015*, High Threat Weeds (in accordance with the Biodiversity Assessment Methodology), environmental weeds, Weeds of National Significance or as key threatening processes (KTPs).

Table 2-11: Introduced Flora Species Recorded in BOAs with Legislative or Environmental Weed Status

Common Name	Scientific Name	Biosecurity Duty
Grasses or Grass-like Species		
African lovegrass	*Eragrostis curvula*	High Threat Weed General Biosecurity Duty
Coolatai grass	*Hyparrhenia hirta*	High Threat Weed General Biosecurity Duty Regional Recommended Measure - Land managers should mitigate the risk of new weeds being introduced to their land. Land managers should mitigate spread from their land. The plant should not be bought, sold, grown, carried or released into the environment.
Fountain grass	*Pennisetum clandestinum*	High Threat Weed General Biosecurity Duty
Kikuyu Grass	*Cenchrus clandestinus*	High Threat Weed General Biosecurity Duty
Narrow-leafed Carpet Grass	*Axonopus fissifolius*	High Threat Weed General Biosecurity Duty
Onion weed	*Romulea rosea*	High Threat Weed
Panic Veldtgrass	*Ehrharta erecta*	High Threat Weed General Biosecurity Duty
Parramatta Grass	*Sporobolus africanus*	General Biosecurity Duty
Paspalum	*Paspalum dilatatum*	High Threat Weed General Biosecurity Duty
Rhodes Grass	*Chloris gayana*	High Threat Weed General Biosecurity Duty
Spiny rush	*Juncus acutus* subsp. *acutus*	Regional Recommended Measure Land managers should mitigate the risk of the plant being introduced to their land. Land managers should mitigate spread of the plant from their land. A person should not buy, sell, move, carry or release the plant into the environment. Land managers should reduce the impact of the plant on assets of high economic, environmental and/or social value.
Herbs		
Blue heliotrope	*Heliotropium amplexicaule*	High Threat Weed General Biosecurity Duty
Brazilian nightshade	*Solanum seaforthianum*	General Biosecurity Duty

Common Name	Scientific Name	Biosecurity Duty
Bridal Creeper	*Asparagus asparagoides*	High Threat Weed General Biosecurity Duty - Prohibition on dealings – Must not be imported into the State or sold
Chilean Whitlow Wort, Brazilian Whitlow	*Paronychia brasiliana*	General Biosecurity Duty
Cobblers pegs	*Bidens pilosa*	High Threat Weed
Fireweed	*Senecio madagascariensis*	High Threat Weed General Biosecurity Duty Prohibition on dealings – Must not be imported into the State or sold
Fleabane	*Conyza bonariensis*	General Biosecurity Duty
Greater Beggar's Ticks	*Bidens subalternans*	High Threat Weed General Biosecurity Duty
Inkweed	*Phytolacca octandra*	General Biosecurity Duty
Khaki weed	*Alternanthera pungens*	High Threat Weed General Biosecurity Duty
Mother of millions	*Bryophyllum delagoense*	General Biosecurity Duty Regional Recommended Measure* (for Regional Priority - Asset Protection) Land managers should mitigate the risk of the plant being introduced to their land. Land managers should mitigate spread of the plant from their land. A person should not buy, sell, move, carry or release the plant into the environment. Land managers should reduce the impact of the plant on assets of high economic, environmental and/or social value.
Nodding thistle	*Carduus nutans*	Regional Recommended Measure Land managers should mitigate the risk of the plant being introduced to their land. Land managers should mitigate spread of the plant from their land. A person should not buy, sell, move, carry or release the plant into the environment. Land managers should reduce the impact of the plant on assets of high economic, environmental and/or social value.
Nodding thistle	*Carduus nutans* subsp. *nutans*	General Biosecurity Duty
Noogoora Burr	*Xanthium occidentale*	General Biosecurity Duty
Paddy's Lucerne	*Sida rhombifolia*	General Biosecurity Duty

Common Name	Scientific Name	Biosecurity Duty
Paterson's curse	*Echium plantagineum*	High Threat Weed General Biosecurity Duty Regional Recommended Measure - Land managers should mitigate the risk of new weeds being introduced to their land. Land managers should mitigate spread from their land. The plant should not be bought, sold, grown, carried or released into the environment.
Purpletop	*Verbena bonariensis*	General Biosecurity Duty
Saffron thistle	*Carthamus lanatus*	High Threat Weed General Biosecurity Duty
Scotch thistle	*Onopordum acanthium*	General Biosecurity Duty
Sheep sorrel	*Acetosella vulgaris*	High Threat Weed General Biosecurity Duty
Spear thistle	*Cirsium vulgare*	High Threat Weed General Biosecurity Duty
St John's Wort	*Hypericum perforatum*	High Threat Weed General Biosecurity Duty
Star thistle	*Centaurea calcitrapa*	General Biosecurity Duty
Wandering Trad	*Tradescantia fluminensis*	General Biosecurity Duty
Succulents		
Galenia	*Galenia pubescens*	High Threat Weed General Biosecurity Duty
Prickly pear	*Opuntia stricta* var. *stricta*	High Threat Weed General Biosecurity Duty Prohibition on dealings – Must not be imported into the State or sold
Tiger pear	*Opuntia aurantiaca*	High Threat Weed General Biosecurity Duty Prohibition on dealings – Must not be imported into the State or sold
Shrubs		
African boxthorn	*Lycium ferocissimum*	High Threat Weed General Biosecurity Duty
Bathurst burr	*Xanthium spinosum*	High Threat Weed General Biosecurity Duty

Common Name	Scientific Name	Biosecurity Duty
Blackberry	*Rubus fruticosus* sp. agg.	High Threat Weed General Biosecurity Duty Prohibition on dealings – Must not be imported into the State or sold Regional Recommended Measure - Land managers should mitigate the risk of new weeds being introduced to their land. Land managers should mitigate spread from their land. The plant should not be bought, sold, grown, carried or released into the environment. Protect conservation areas, natural environments and primary production lands that are free of blackberry
Crofton weed	*Ageratina adenophora*	High Threat Weed Regional Recommended Measure Land managers should mitigate the risk of the plant being introduced to their land. Land managers should mitigate spread of the plant from their land. A person should not buy, sell, move, carry or release the plant into the environment. Land managers should reduce the impact of the plant on assets of high economic, environmental and/or social value
Trees		
African olive	*Olea europaea* subsp. *cuspidata*	Regional Recommended Measure An exclusion zone is established for all land in the region, except the core infestation which includes parts of: Dungog Local Government Area, Lake Macquarie Local Government Area Maitland Local Government Area, MidCoast Local Government Area, Port Stephens Local Government Area, Singleton Local Government Area. Entire Hunter Local Land Services region: Land managers should mitigate the risk of the plant being introduced to their land. Exclusion zone: Notify local control authority if found. Land managers should eradicate the plant from the land and keep the land free of the plant. A person should not deal with the plant, where dealings include but are not limited to buying, selling, growing, moving, carrying or releasing the plant. Core infestation: Land managers should mitigate spread of the plant from their land. A person should not buy, sell, move, carry or release the plant into the environment. Land managers should reduce the impact of the plant on assets of high economic, environmental and/or social value.
Olive	*Olea europaea subsp. europaea*	General Biosecurity Duty
Pepper Tree	*Schinus areira*	General Biosecurity Duty
Weeping willow	*Salix babylonica*	General Biosecurity Duty Prohibition on dealings – Must not be imported into the State or sold

General Biosecurity Duty: All plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

While not having any specific legislative status, sharp rush (*Juncus acutus*), Rhodes grass (*Chloris gayana*), kikuyu grass (*Pennisetum clandestinum*), paspalum (*Paspalum dilatatum*), panic veldtgrass (*Ehrharta erecta*), purpletop (*Verbena bonariensis*) and pigeon grass (*Setaria parviflora*) have been recorded in the BOAs and have potential to be problematic in areas where revegetation works are being undertaken if not appropriately managed.

3. Biodiversity Offset Area Management Zones

The BOAs comprise seven Management Zones (MZs), which are further subdivided into sub-domains on the basis of habitat and land management objectives to assist in refining and targeting ecological management strategies (Figure 1-4). The seven MZs are:

a) Aboriginal Cultural Heritage Offset (ACHO)

b) Habitat Enhancement Offset (HEO)

c) Southern Offset (SO)

d) Northern Corridor (NC)

e) Western Corridor (WC)

f) Mangoola Offset Area (MO) and

g) Wybong Heights Offset Area (WH).

Individual BSAs are also separated into additional management zones or sub-domains.

Table 3-1 lists the baseline vegetation communities within each of the BOA's and the key management actions proposed for each.

Table 3-1: Ecological management zones of the BOAs

BOA	MZ	Area (ha)	Baseline Vegetation	Management Actions Required
Big Flat Creek CA	ACHO-3 (part) ACHO-4 ACHO-5 ACHO-6	307.34	• PCT 116 - Weeping Myall - Coobah - Scrub Wilga Shrubland of the Hunter Valley • PCT 1612 - Narrow-leaved Ironbark - Grey Gum - Native Olive Woodland of Central Hunter • PCT 1655 - Grey Box - Slaty Box Shrub - Grass Woodland on Sandstone Slopes of the • Upper Hunter and Sydney Basin • PCT 1691 - Narrow-leaved Ironbark - Grey Box Grassy Woodland of the Central and Upper Hunter • PCT 1731 - Swamp Oak - Weeping Grass Grassy Riparian Forest of the Hunter Valley • PCT 485 - River Oak Riparian Grassy Tall Woodland of the Western Hunter Valley • PCT 621 - Grey Gum - Rough-barked Apple Alluvial Flat Woodland in the Upper Hunter Valley, mainly Sydney Basin Bioregion • Disturbed/Modified Native Grassland • Exotic Rushland • Mixed Species Revegetation Plantation	• Works requiring ground disturbance require a Ground Disturbance Permit (GDP) in accordance with GCAA procedure. The GDP procedure includes appropriate due diligence pre-clearance surveys. • Weed management • Infill planting in previously revegetated areas (if required) • Seed collection and propagation • Feral fauna management • Nest box monitoring • Fencing maintenance • Track maintenance • Rubbish removal (if required) • Quarterly offset inspections • Monitoring and reporting in accordance with CA
Eastern CA	HEO-1 HEO-2 NC-05 NC-06 SO-2 (north)	641.1	• PCT 1655 - Grey Box - Slaty Box Shrub - Grass Woodland on Sandstone Slopes of the Upper Hunter and Sydney Basin • PCT 1691 - Narrow-leaved Ironbark - Grey Box Grassy Woodland of the Central and Upper Hunter • Disturbed/Modified Native Grassland	• Works requiring ground disturbance require a Ground Disturbance Permit (GDP) in accordance with GCAA procedure. The GDP procedure includes appropriate due diligence pre-clearance surveys. • Weed management • Infill planting in previously revegetated areas (if required) • Seed collection and propagation

BOA	MZ	Area (ha)	Baseline Vegetation	Management Actions Required
				• Feral fauna management • Nest box monitoring • Fencing maintenance • Track and Asset Protection Zone (APZ) maintenance in accordance with Bushfire Management Plan • Rubbish removal (if required) • Quarterly offset inspections • Monitoring and reporting in accordance with CA
Northern Corridor CA	NC-01 NC -02 NC -03 NC -04	479.68	• PCT 1655 - Grey Box - Slaty Box shrub - grass woodland on sandstone slopes of the upper Hunter and Sydney Basin • PCT 1678 - Brown Bloodwood - Currawang - Caley's Ironbark shrubby • PCT 1691 - Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter • Disturbed/Modified Native Grassland • PCT 1602 - Spotted Gum – Narrow-leaved Ironbark Shrub – Grass Open Forest of the Central and Lower Hunter	• Works requiring ground disturbance require a Ground Disturbance Permit (GDP) in accordance with GCAA procedure. The GDP procedure includes appropriate due diligence pre-clearance surveys. • Weed management • Infill planting in previously revegetated areas (if required) • Seed collection and propagation • Feral fauna management • Nest box monitoring • Fencing maintenance • Track and Asset Protection Zone (APZ) maintenance in accordance with Bushfire Management Plan • Rubbish removal (if required) • Quarterly offset inspections • Monitoring and reporting in accordance with CA

BOA	MZ	Area (ha)	Baseline Vegetation	Management Actions Required
Southern CA	SO-1 SO-2 (south) HEO-3	439.05	• PCT 1655 - Grey Box - Slaty Box shrub - grass woodland on sandstone slopes of the upper Hunter and Sydney Basin • PCT 1691 - Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter • Disturbed/Modified Native Grassland	• Works requiring ground disturbance require a Ground Disturbance Permit (GDP) in accordance with GCAA procedure. The GDP procedure includes appropriate due diligence pre-clearance surveys. • Weed management • Infill planting in previously revegetated areas (if required) • Seed collection and propagation • Feral fauna management • Nest box monitoring • Fencing maintenance • Track maintenance in accordance with Bushfire Management Plan • Rubbish removal (if required) • Grazing management in accordance with the CA conditions (SO-1 only) • Quarterly offset inspections • Monitoring and reporting in accordance with CA

BOA	MZ	Area (ha)	Baseline Vegetation	Management Actions Required
Western Corridor and Anvil Hill CA	ACHO-1 ACHO-2 ACHO-3 (part) ACHO-7 ACHO-8 HEO-4 WC-01	1160.9	• PCT 1598 – Forest Red Gum Grassy Open Forest on Floodplains of the Lower Hunter • PCT 1612 – Narrow-leaved Ironbark - Grey Gum - Native Olive woodland of Central Hunter • PCT 1655 – Grey Box - Slaty Box shrub - grass woodland on sandstone slopes of the upper Hunter and Sydney Basin • PCT 1691 – Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter • PCT 479 – Narrow-leaved Ironbark- Black Cypress Pine - stringybark +/- Grey Gum +/- Narrow-leaved Wattle shrubby open forest on sandstone hills in the southern Brigalow Belt South Bioregion • PCT 485 – River Oak Riparian Grassy Tall Woodland of the Western Hunter Valley • PCT 621 – Grey Gum - Rough-barked Apple alluvial flat woodland in the upper Hunter Valley, mainly Sydney Basin Bioregion • PCT 922 – Melaleuca decora low forest of the central Hunter Valley, Sydney Basin Bioregion • Bulloak Woodland • Disturbed/Modified Native Grassland • Drooping Sheoak Woodland • Mixed Species Revegetation Plantation • Red Ash Sheltered Forest • Weeping Myall Woodland (Regenerating).	• Works requiring ground disturbance require a Ground Disturbance Permit (GDP) in accordance with GCAA procedure. The GDP procedure includes appropriate due diligence pre-clearance surveys. • Weed management • Infill planting in previously revegetated areas (if required) • Seed collection and propagation • Feral fauna management • Nest box monitoring • Fencing maintenance • Track and Asset Protection Zone (APZ) maintenance in accordance with Bushfire Management Plan • Rubbish removal (if required) • Quarterly offset inspections • Monitoring and reporting in accordance with CA

BOA	MZ	Area (ha)	Baseline Vegetation	Management Actions Required
Mangoola BSA	MZ1 MZ2 MZ3 MZ4 MZ5 MZ6 MZ7 MZ8	993	• 1598-Forest Red Gum grassy open forest on floodplains of the lower Hunter • 1602-Spotted Gum - Narrow-leaved Ironbark shrub - grass open forest of the central and lower Hunter • 1603-Narrow-leaved Ironbark - Bull Oak - Grey Box shrub -grass open forest of the central and lower Hunter • 1731-Swamp Oak – Weeping Grass grassy riparian forest of the Hunter Valley • 1607-Blakely's Red Gum -Narrow-leaved Ironbark -Rough-barked Apple shrubby woodland of the upper Hunter • 1612-Narrow-leaved Ironbark -Grey Gum - Native Olive woodland of Central Hunter • 1655-Grey Box - Slaty Box shrub - grass woodland on sandstone slopes of the upper Hunter and Sydney Basin	• Works requiring ground disturbance require a Ground Disturbance Permit (GDP) in accordance with GCAA procedure. The GDP procedure includes appropriate due diligence pre-clearance surveys. • Weed management • Active revegetation (MZ4 and MZ8 only) in accordance with BSA • Seed collection and propagation • Feral fauna management • Nest box monitoring • Boundary fencing and removal of internal fences • Track and Asset Protection Zone (APZ) maintenance in accordance with Bushfire Management Plan • Rubbish removal – including demolition of two houses • Quarterly offset inspections
Wybong Heights BSA	MZ1 MZ2 MZ3 MZ4	751	• 617-Narrow-leaved Ironbark - box - Mock Olive shrubby open forest mainly on basalt slopes over sandstone in the upper Hunter Valley, Brigalow Belt South Bioregion and Sydney Basin Bioregion • 1602-Spotted Gum - Narrowleaved Ironbark shrub - grass open forest of the central and lower Hunter • 1607-Blakely's Red Gum - Narrow-leaved Ironbark - Rough-barked Apple shrubby woodland of the upper Hunter • 1605-Narrow-leaved Ironbark - Native Olive shrubby open forest of the central and upper Hunter • 1654-Narrow-leaved Ironbark - Grey Gum shrubby open forest on sandstone ranges of the upper Hunter Valley • 1691-Narrow-leaved Ironbark - Grey Box grassy woodland of the central and upper Hunter	• Works requiring ground disturbance require a Ground Disturbance Permit (GDP) in accordance with GCAA procedure. The GDP procedure includes appropriate due diligence pre-clearance surveys. • Weed management • No active revegetation • Feral fauna management • Fencing maintenance • Track maintenance • Rubbish removal (if required) • Quarterly offset inspections

4. Regeneration and Revegetation

The following regeneration and revegetation strategies have been developed for the Mangoola BOAs to ensure that the conditions of approval (Table 1-2) and the BOMPS conservation management objectives (Section 1.5.1) are met.

The aim of revegetation/regeneration works within the Mangoola BOAs is to restore areas of existing grassland and degraded vegetation to a condition that is representative of the target benchmark communities, thus improving habitat quality and connectivity throughout these areas.

Approximately 338 hectares of existing grasslands will be retained as part of the revegetation/regeneration strategy. It is noted that the existing grassland does not conform to an existing grassland PCT, creating a challenge for ecological monitoring and completion criteria setting for these areas. Grassland areas are woodland PCT's with canopy and mid-storey species missing, due to historical land use practices. These areas are likely to regenerate towards woodland PCT's over time.

The principles guiding the regeneration/revegetation strategies are listed in Section 4.1. The planned targets and commitments are detailed in Section 4.2. The management strategies to be implemented in order to meet those targets are outlined in Section 4.3. Section 7.0 then provides the performance criteria and preliminary completion criteria against which the success of regeneration/revegetation works will be tracked.

Figure 4-1 identifies areas (to date) where natural regeneration of tree and shrub species has occurred since Year 1 (2011) of the operation of the BOMPS, or where active revegetation methods have commenced. From this, revegetation has commenced over approximately 530 hectares of the BOAs.

Natural regeneration has been documented in over 33 hectares of the CAs. The total area of grassland to be returned back to treed vegetation via a combination of active revegetation and passive regeneration, is 1,104 hectares. At Year 15 (2025), revegetation/regeneration has commenced over a total of approximately 525 hectares across the CAs, leaving 545 hectares of the CA's to be returned to treed condition. It is noted that these areas have not reached maturity and would not yet meet the completion criteria for return of benchmark vegetation communities. These areas will be subject to infill planting and additional management (as required) as part of ongoing works.

Planting works over the next three-year period will be focused on infill planting in areas previously planted where results have not met and are not expected to meet completion criteria. Further work will be carried out to assess areas of regeneration since baseline to determine the progress against the original target of 1,104 Ha treed and 330 Ha grassland in the CA's. While PA 06_0014 was relinquished in 2022 and these targets have been adopted to guide the revegetation efforts in the CA's. The targets are no longer required by the project approval but instead are used to track progress against the original commitments for the CA's.

Planting works over the next three-year period will include planting of MZ4 and MZ8 in Mangoola BSA in accordance with the BSA commitments.

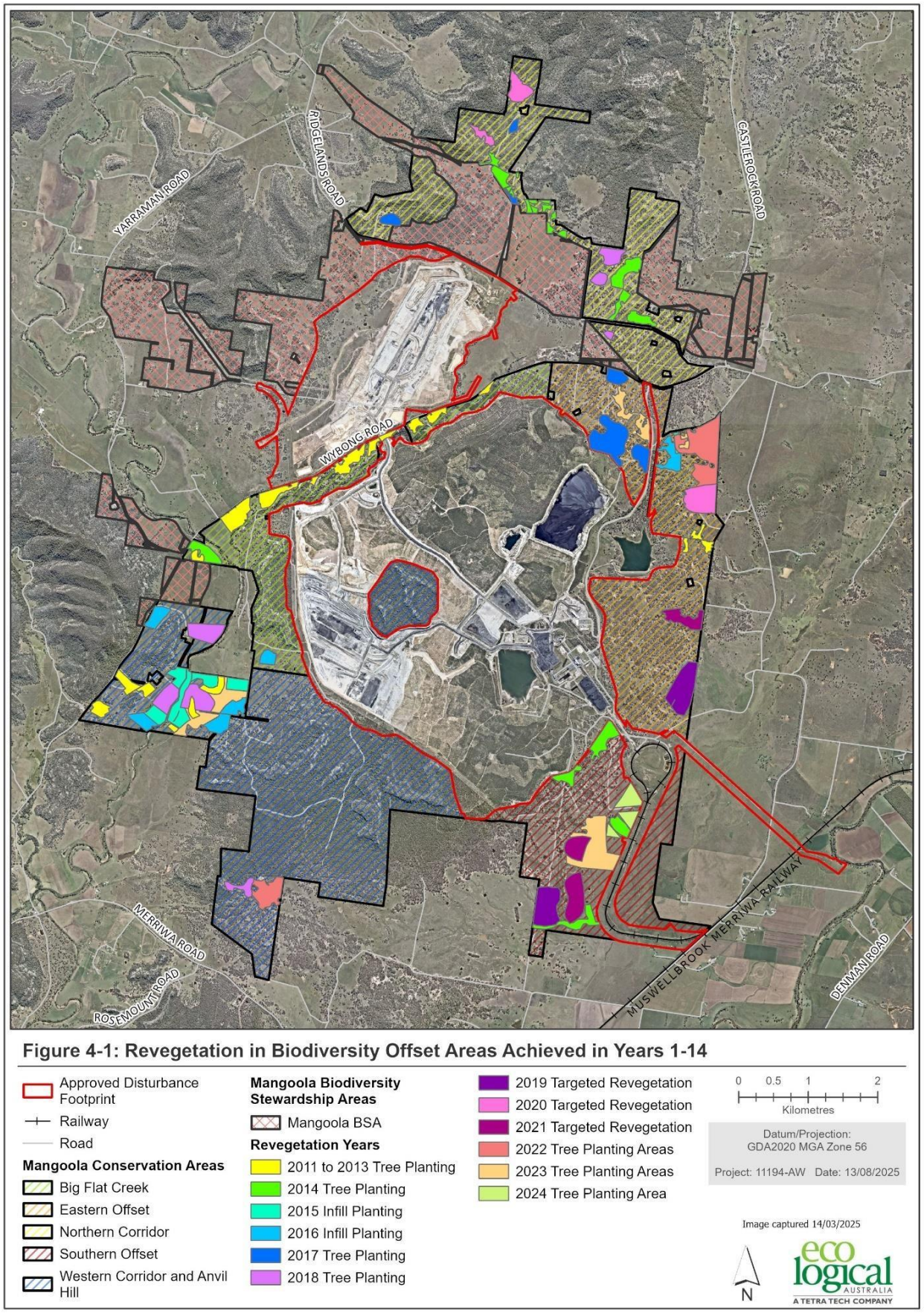

Figure 4-1: Revegetation and Regeneration Achieved in Biodiversity Offset Areas Years 1-15

4.1 Revegetation and Regeneration Guiding Principles

Revegetation and regeneration activities within the Mangoola BOAs are guided by the following principles, where relevant:

a) revegetation will be established as soon as possible to minimise lag time in habitat compensation and connectivity

b) replanting within revegetation areas will be appropriately designed with structural and floristic diversity suitable to meet the benchmark vegetation community targets

c) revegetation will involve the use of local provenance seed that will be either utilised for direct seeding or for the propagation of tubestock for replanting

d) revegetation and regeneration areas will be subject to appropriate regular management (weeding, replacement of failed plantings and bushfire management (in accordance with the Mangoola Bushfire Management Plan or BSA site specific Bushfire Management Plans/Management Action Plan (MAP)))

e) revegetation and regeneration areas will be subject to appropriate regular monitoring with appropriate feedback to allow continual improvement in methodology and results

f) relevant areas of revegetation will be appropriately protected from access by unauthorised personnel and grazing (as required). Such protection may be in the form of permanent or temporary fencing, signage or exclusion zones as appropriate for the situation.

4.2 Revegetation and Regeneration Targets

Broad targets for reinstating native vegetation within the Mangoola BOAs are directed by Condition B57(l) of SSD 8642.

Target areas for regeneration/revegetation can further be refined by vegetation community. Figure 2-3, Figure 2-4 and Figure 2-5 show the vegetation communities that were present in Year 1 (2011 for PA 06_0014 and 2019 for SSD 8642), while the conceptual target areas for each vegetation community for Years 12-14 are shown on Figure 4.2, 4.3 and 4.4.

The preliminary target stem densities for the key target vegetation communities within the Mangoola CAs are displayed in Table 4-1. Stem densities for plantings in Mangoola BSA are provided in Table 4-2. Planting is not proposed for Wybong Heights BSA. These preliminary targets are based on data obtained from existing vegetation communities on site. These preliminary target densities will be reviewed and refined should updated data become available.

Table 4-1 - Preliminary Target Revegetation Species Density for Conservation Areas

Planned Revegetation Community	Target Final Stems/ha		
	Canopy (Stem count)	Understorey (%)*	Ground Cover (%)*
PCT 1612 Narrow-leaved Ironbark - Native Olive Shrubby Open Forest of the Central Hunter	300-400	10-35	45-70
PCT 1691 Narrow-leaved Ironbark – Grey Box Grassy Woodland of the Central and Upper Hunter	150-250	10-35	45-70
PCT 1655 Grey Box – Slaty Box Shrub – Grass Woodland on Sandstone Slopes of Upper Hunter and Sydney Basin	200-300	0-40	5-30
PCT 1598 Forest Red Gum Grassy Open Forest on Floodplains of the Lower Hunter	350-450	0-40	70-100
PCT 1607 Blakely's Red Gum – Narrow-leaved Ironbark – Rough-barked Apple shrubby woodland of the upper Hunter Moderate – Good	300-400	0-40	70-100
PCT 1731 Swamp Oak – Weeping Grass Grassy Riparian Forest of the Hunter Valley	400-600	0-20	30-50
PCT 42 River Red Gum / River Oak riparian woodland wetland in the Hunter Valley	100-200	0-10	60-90
PCT 922 *Melaleuca decora* Low Forest of the Central Hunter Valley, Sydney Basin Bioregion	350-450	0-40	10-60
PCT 116 Weeping Myall - Coobah - Scrub Wilga Shrubland of the Hunter Valley	150-200	0-20	30-80
PCT 1602 Spotted Gum – Narrow-leaved Ironbark shrub – grass open forest of the central and lower Hunter	350-450	0-40	20-60

* Foliage cover as per Biodiversity Assessment Method 2017 (OEH 2017).

Table 4-2 - Preliminary Target Revegetation Species Density for Mangoola BSA

Species' common name	Species scientific name	Management Zone/s of planting	Number of plants per area
Grey box	*Eucalyptus moluccana*	MZ4 (Target 5 tree species)	300 stems/ha (Target 100-300 tree stems/ha or 30% cover)
Narrow-leaved Ironbark	*Eucalyptus crebra*		
Kurrajong	*Brachychiton populenus*		
Rough-barked Apple	*Angophora floribunda*		
Narrow-leaved mock- olive	*Notelaea microcarpa*		
Red Ash	*Alphitonia excelsa*		
Forest red gum	*Eucalyptus tereticornis*		200 stems/ha

Species' common name	Species scientific name	Management Zone/s of planting	Number of plants per area
Blakely's red gum	*Eucalyptus blakelyi*	MZ8 (Target 4 tree species)	(Target 100- 200 tree stems/ha or 21% cover)
Rough-barked Apple	*Angophora floribunda*		
Kurrajong	*Brachychiton populneus*		
Red Ash	*Alphitonia excelsa*		

Note: Any of the above listed species may be supplemented/replaced with other native tree species that are known to occur locally, have local provenance seed available and are characteristic of the target PCTs.

4.3 Priority Areas for Revegetation Works

Over the period 2026 to 2028 (Years 16-18) Mangoola will plant:

- Mangoola BSA MZ4 – 115.9Ha at 300 stems per hectare (approximately 35,000 total) native trees consistent with PCT1603
- Mangoola BSA MZ8 – 5.1Ha at 200 stems per hectare (approximately 1020 total) native trees consistent with PCT1598

Infill planting in areas previously planted will be undertaken where necessary, during the period 2025-2028. This infill planting will focus on areas in the Northern CA which may require exclusion fencing for goats prior to replanting, and areas of the Western CA along Wybong Creek which may require more extensive weed control work including spraying, slashing or potentially burning (in consultation with BCT) to achieve the desired outcome. Any other previously planted areas may be targeted for further infill planting during the period of this BOMPS, based on results of monitoring or recommendations made by an ecologist.

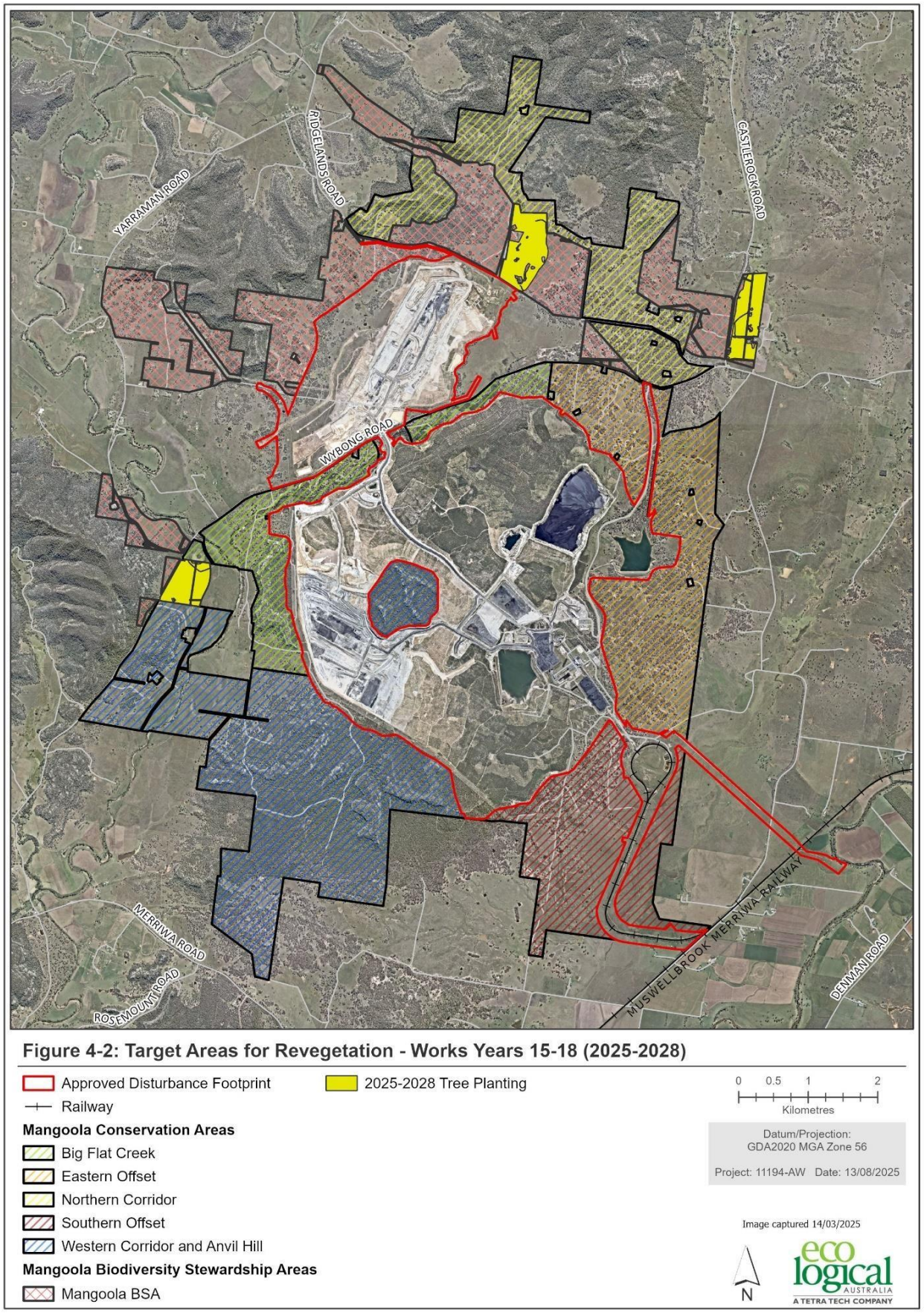

Figure 4-2: Target areas for revegetation works (2025-2028)

4.4 Regeneration and Revegetation Strategies

4.4.1 Passive Regeneration

Passive regeneration (assisted natural regeneration) principles will be applied across the Mangoola BOAs to improve the biodiversity values of the vegetation and habitats within areas of existing un-treed areas. Assisted natural regeneration is the most effective and most economical way to expand patches of native vegetation and improve their condition. This form of regeneration works best in small, grassed patches adjacent to remnant vegetation where natural recruitment is already occurring.

Natural regeneration has already progressed in some portions of the Mangoola BOAs as a result of stock removal and other management strategies implemented since the establishment of the BOAs. Management strategies for the next three-year period will aim to continue to expand on these areas of natural regeneration to contribute to the final target of 2690 hectares of treed vegetation (including remnant, revegetation and regeneration areas within the CA's.

Existing grassland areas will be managed to return treed vegetation (i.e. native woodland or forest vegetation) through passive management strategies including stock removal (except for targeted grazing within the SO), weed control and feral animal management.

Natural regeneration sites are monitored biennially to determine if natural regeneration is likely to lead to successful establishment (details in Appendix C), with annual progress also documented by way of a simplified scoring system. In the event that monitoring results reveal that passive regeneration actions alone are not resulting in the performance indicators and completion criteria being met (or trending towards being met), corrective actions will be implemented. Such actions are likely to involve the introduction of active or mosaic revegetation strategies in these areas, as described in the following sections. Assisted regeneration methods may include introducing tree, shrub and groundcover species by tubestock planting, brush matting or direct seeding to supplement species diversity in strata that are lacking. Thinning of excessively dense pioneer species such as *Acacia* sp. may also be beneficial to allow a greater diversity of species to colonise.

Monitoring data to date is indicating that the dominant species in the passive regeneration areas are germinating well, however the understorey diversity is low. The understorey diversity is expected to increase as natural selection and senescence thin the canopy and provides roosting habitat for birds and mammals to disperse understorey species from the surrounding intact vegetation communities. This will be monitored over time and may require active revegetation if understorey success is not appropriate.

4.4.2 Active Revegetation

Areas of active revegetation are subject to Aboriginal due diligence prior to planting commencement. If any potential archaeological deposits (PADs) are encountered during this due diligence, these areas are demarcated according to the GDP procedure and no planting (ground disturbance or revegetation) will take place in these areas.

Areas in which active revegetation has already commenced are shown on Figure 4-1.

Active revegetation methods that may be utilised in the approved areas of the Mangoola BOAs include some or all of the following:

a) revegetation weed management (which may include weed spraying and/or slashing)

b) ground preparation works which may include ripping and/or augering and soil amelioration

c) tubestock planting (propagated from local provenance seed from species lists provided in Appendix B for CA's only. BSA planting will be in accordance with the BSA.

d) direct seeding/brush matting (using local provenance seed from species lists provided in Appendix B

e) supplementary plantings for threatened species, such as the glossy black-cockatoo (*Calyptorhynchus lathami*) and squirrel glider (*Petaurus norfolcensis*) if required

f) ongoing inspections and ecological monitoring to assess success or otherwise of the revegetation strategies

g) follow-up actions based on outcomes of inspections and ecological monitoring (weed management, herbivore control, etc).

Care should be taken when undertaking active regeneration in areas with remnant paddock trees. Where remnant paddock trees are present, they will be avoided and not damaged.

4.4.3 Revegetation Care and Maintenance

Based on the outcomes of the monitoring program, a care and maintenance program will be implemented until revegetation is shown to meet the completion criteria. The scope of the care and maintenance program may include weed and feral animal control, fertilising, watering, re-seeding or planting and erosion and sediment control works where required.

5. General Management and Improvement Strategies

Management and improvement strategies are specific to each BOA, with general guidance provided within these subsections below. Biodiversity Stewardship Agreements provide specific guidance for each site, and are reviewed every five years. Any general guidance regarding mangagement and monitoring is current when this BOMPS was prepared, but should updates occur, the details below may be superseeded. Reference should be made to each BSA Agreement and the Management Action Plans (MAP) developed for these sites.

5.1 Fencing, Signage and Access Control

Where appropriate to do so, any permanent fencing installed (including during maintenance works) within the BOAs and on the boundary of the Approved Project Disturbance Area will use plain wire (not barbed wire), unless specifically required to restrict the movement of stock from neighbouring properties, to ensure minimal impact on native fauna species. Where barbed wire has been used for boundary fencing to restrict stock movement into BOA's, top and bottom wires will be plain wire. Where fencing is required in the vicinity of the known Aboriginal cultural heritage sites, such works will be completed in consideration of the requirements of the ACHMP.

Fences will be installed to demarcate the Mangoola BOAs from the Approved Project Disturbance Area and surrounding properties. These fences will protect the Mangoola BOAs from unauthorised access and disturbance. All boundary gates will have signs detailing that the lands are protected for conservation and activities are restricted. Redundant fence lines will be identified, and staged removal will continue as needed to allow free movement of fauna throughout the BOAs. All redundant fences will be removed prior to cessation of mining, or as per the agreed timing within the BSA site MAPs.

The maintenance and installation of fencing or signage within BSAs must follow the requirements as set out in the MAP and as agree within the site specific BSAs.

Continued monitoring and maintenance of fences, signage and access will occur as part of ongoing management of the BOAs.

Areas of revegetation may be subject to temporary fencing to prevent access and damage to establishing vegetation if needed.

5.2 Pathogen Management

Phytophthora cinnamomi is a soil fungus that attacks the root (and sometimes stem) systems of plants, destroying the ability of the plant to uptake water and nutrients (Commonwealth of Australia 2001). '*Infection of native plants by Phytophthora cinnamomi*' is listed as a KTP under the BC Act and '*Dieback caused by the root-rot fungus Phytophthora cinnamomi*' is also listed as a KTP under the EPBC Act.

Project conditions previously required soil investigations to determine whether the soil fungus *Phytophthora cinnamomi* was present at Mangoola, and therefore whether specific management

measures were required. Extensive sampling (Umwelt 2008) did not identify any occurrences of *Phytophthora cinnamomi*, and therefore no management procedures were deemed necessary.

Since commencement of construction activities no signs of presence of *Phytophthora cinnamomi* (being unexplained areas of vegetation dieback) have been observed as part of ecological monitoring, during onsite pre-clearing surveys or as part of day-to-day operations. As no evidence of presence has been observed since this time, ongoing management actions for this pathogen are not considered necessary except for monitoring for evidence of its presence.

As a precautionary measure, Mangoola has onsite vehicle and machinery wash down areas which can be utilised for removal of excessive soil particulates if required. If any areas are reasonably suspected to be infected with this pathogen in future (areas of unexplained vegetation death, for example), a targeted sampling, diagnosis and management strategy will be designed to address impacts and further spread.

5.3 Cultural Heritage Management

Areas of active revegetation are subject to Aboriginal due diligence prior to planting commencement. If any potential archaeological deposits (PADs) are encountered during this due diligence, these areas are pegged off and no planting (ground disturbance or revegetation) will take place in these areas.

The BOAs detailed in this plan overlap with the areas that will also be managed as Aboriginal Cultural Heritage Offset Areas (ACHO) (namely ACHO-01, ACHO-02, ACHO-03, ACHO-04, ACHO-05, ACHO-06, ACHO-07 and ACHO-08). Management strategies relating to Aboriginal cultural heritage sites and values within the BOAs are provided in the approved Aboriginal Cultural Heritage Management Plan (ACHMP) and any subsequent updates or addenda. The strategies identified in this BOMPS have been developed in accordance with the ACHMP.

The ACHMP documents management strategies that enable the regeneration/ revegetation of areas within the ACHOs, as well as other parts of the BOAs. The proposed regeneration/revegetation activities documented in this BOMPS have been designed to provide adaptive measures for restricted areas. The techniques in each area may need to be amended upon completion of archaeological surveys in order to avoid disturbance of culturally sensitive areas during the revegetation/ regeneration process.

A Ground Disturbance Permit (GDP) is required for all activities on previously undisturbed land and includes a review of cultural heritage impacts. If the proposed works are outside the previously cultural heritage assessed area for the project, due diligence must be completed in accordance with the site approved Aboriginal Cultural Heritage Management Plan.

5.4 Grazing Management

All domestic stock is currently excluded from the Mangoola BOAs (except for the Southern Offset Area), to assist in the natural establishment of native species. Within the Southern Offset Area, controlled grazing in the grassland areas may occur to assist in the enhancement of ecological values and achieve progress towards completion criteria. Grazing in this BOA is undertaken in accordance with its relevant CA or BSA/MAP. The grazing strategies in the Southern Offset Area aim to increase the abundance and vigour of native pasture species and control introduced species. The strategies also allow for selected areas of revegetation/regeneration of treed vegetation within the Southern Offset Area area.

When conditions are appropriate, Southern Offset Area grazing will be undertaken in accordance with the criteria defined within the Southern Offset Conservation Agreement.

5.5 Track Establishment and Maintenance

Access tracks within the Mangoola BOAs are required for the implementation of management actions, bushfire control and asset protection (access management for bushfire management is discussed further in Section 5.16). Routine slashing and grading maintenance of tracks within the Mangoola BOAs will be undertaken as required to ensure adequate access throughout the BOAs for firefighting access, on-ground management and monitoring activities. Fire management in BSAs must be specific to the Management Actions specified within each BSA Agreement and as per the requirements of the MAP.

Slashing and grading activities will be limited to existing tracks to a maximum width of four metres (grading and/or slashing) plus one metre either side (slashing).

New tracks cannot be created within BSAs without written approval of BCT. If new access tracks are required within CAs (including any works requiring additional ground disturbance), prior to their construction ecological due diligence inspections will be undertaken by a suitably qualified person for threatened flora species, endangered populations, TECs and important habitats for threatened fauna species, such as hollow-bearing trees and dams, in accordance with the GDP process.

Any ground disturbance will be carried out under the Ground Disturbance Permit (GDP) process and must comply with requirements under site specific Conservation Agreements and Biodiversity Stewardship Agreements. Should ground disturbance be required, Mangoola will implement measures to minimise impacts on these features, including the redesign of the layout of access tracks/roads where possible. The measures to be undertaken to minimise impacts on these features include:

a) Designing the access tracks for the minimisation of environmental impacts including minimising the length and width of the track

b) Undertaking pre-clearance surveys (through the GDP process) in the proposed areas for track construction to determine constraints and avoidance options

c) Habitat trees identified via pre-clearance inspections will not be felled within BOA's.

d) Topsoil will not be stripped for the construction and maintenance of tracks in BOA's. Grading works will leave this material in situ and may use this for erosion and sediment control works for the track being constructed where appropriate.

In accordance with the *Rural Fires Act 1997*, in the event of a declared bushfire emergency, all efforts will be made to reduce and/or eliminate the fire hazard/risk. This may include the construction of emergency access tracks/roads to enable firefighting personnel access to the fire front and/or the construction of fire breaks without undertaking a due diligence assessment prior to clearing activities.

Erosion and sediment control structures will, where necessary, be established in conjunction with any tracks constructed through the CAs. Construction of erosion and sediment control structures will also be considered in the maintenance of access tracks.

The condition of tracks will be assessed during quarterly inspections and as part of the annual bush fire monitoring program, with maintenance works undertaken as necessary.

5.6 Weed Management

The success of the revegetation and regeneration strategies proposed for the Mangoola BOAs has potential to be greatly affected by the presence of invasive weed species. Competition for moisture, nutrients and light from introduced grasses and broad-leafed weeds adjacent to newly planted seedlings (or naturally regenerating seedlings) may result in failed revegetation activities. Control of weed species is also required to maintain or improve the ecological integrity of existing native vegetation.

Section 2.4.2.4 and Table 5-1 identify the environmental weeds that have been recorded within the Mangoola BOAs, their control priorities and recommended control methods required to manage these weeds as listed in the NSW Department of Primary Industries Noxious and Environmental Weed Control Handbook (DPI 2014). These species are listed in Table 5-1 in order of control priority within the Mangoola CAs, with BSA (Wybong Heights and Mangoola) specific species required for management and control provided within Table 5.2 and 5.3. These weed species will be the focus of the weed management program in the Mangoola BOAs, however priorities may change over time, and other species will be managed if deemed necessary in accordance with relevant guidelines and legislation. Weed management within BSAs is specific to the details contained within the site-specific MAP and Biodiversity Stewardship Agreements.

Table 5-1 - Priority Weeds for Control within Mangoola Conservation Areas

Botanical Name	Common Name	Local Infestation	Control Method
High Priority			
Echium plantagineum	Paterson's Curse	Scattered infestations throughout HEO-01	Due to low numbers (at this stage) hand removal digging out root is recommended. Foliar spray can also be undertaken- however follow-up treatment is likely.
Galenia pubescens	Galenia	Scattered infestations throughout BOAs, particularly within NC.	Selective herbicide application.
Hypericum perforatum	St John's wort	Scattered infestations throughout HEO-1 and NC.	Selective herbicide application. Concentrated effort needed during flowering to prevent from seeding.
Lycium ferocissimum	African boxthorn	Dense infestations throughout SO-1, and along Big Flat Creek in ACHO-05. Scattered infestations likely to occur widely across the BOAs.	Direct cut and paint stems, herbicide application, physical removal.
Medium Priority			
Eragrostis curvula	African lovegrass	Low abundance in HEO-2 areas of Grassland.	Selective herbicide application. Control in spring before flowering
Hyparrhenia hirta	Coolatai grass	Grassland areas	Selective herbicide application. Maintenance of a dense native groundcover is most effective.
Xanthium spinosum	Bathurst burr	Along Big Flat Creek in ACHO-05 and rail loop in SO-2. Other potential occurrences across BOAs.	Slashing, selective herbicide application.

Botanical Name	Common Name	Local Infestation	Control Method
Opuntia aurantiaca	tiger pear	Wide occurrence across BOAs.	Physical removal, burning, selective herbicide application.
Opuntia stricta var. *stricta*	prickly pear	Wide occurrence across BOAs.	Selective herbicide application, biological control.
Rubus fruticosus sp. agg.	blackberry	Dense infestations occur in the middle stretch of Big Flat Creek in ACHO-05. Also likely to occur in other disturbed riparian environments.	Physical removal, selective herbicide application.
Senecio madagascariensis	fireweed	Wide occurrence across BOAs.	Foliar spray
Olea europaea subsp. *cuspidata*	African olive	Scattered infestations throughout BOAs.	Direct cut and paint stems, herbicide application, physical removal.
Tradescantia fluminensis	wandering trad	Scattered infestations throughout WC-01.	Foliar spray
Heliotropium amplexicaule	Blue heliotrope	Low abundance in woodland areas of NC-05 and grassland areas of HEO-3 and ACHO-7.	Foliar spray can also be undertaken- however follow-up treatment is likely.
Low Priority			
Chloris gayana	Rhodes grass	Recorded along Big Flat Creek (ACHO-05) and from HEO-1 however is likely to occur more extensively throughout the BOAs.	Slashing combined with herbicide application.
Paspalum dilatatum	paspalum	Scattered infestations throughout the BOAs.	Slashing combined with herbicide application.
Pennisetum clandestinum	kikuyu grass	Scattered infestations throughout the BOAs.	Slashing combined with herbicide application.

Botanical Name	Common Name	Local Infestation	Control Method
Juncus acutus subsp. *acutus*	sharp rush	Significant occurrences along Big Flat Creek in ACHO-05, lower numbers within riparian areas elsewhere within the BOAs.	Physical removal where appropriate. Herbicide application where appropriate (consideration of herbicide use in proximity to riparian zone required).
Salix babylonica	weeping willow	Riparian zone of Wybong and Big Flat Creeks. Isolated stands within riparian areas throughout BOAs.	Direct cut and paint stems, herbicide application, physical removal.
Schinus areira	pepper tree	Riparian zone of Wybong and Big Flat Creeks. Isolated stands within riparian areas throughout BOAs.	Direct cut and paint stems, herbicide application, physical removal.
Ehrharta erecta	panic veldtgrass	Recorded along Big Flat Creek (ACHO-05) and from HEO-1, however it is likely that they occur more extensively throughout the BOAs.	Slashing combined with herbicide application.
Verbena bonariensis	purpletop	Scattered infestations throughout BOAs.	Physical removal, herbicide application.
Asparagus asparagoides	bridal creeper	One record along Big Flat Creek in ACHO-05, possible scattered occurrences elsewhere.	Physical removal, selective herbicide application.
Carduus nutans	nodding thistle	Scattered infestations throughout BOAs.	Spot spray
Conyza bonariensis	fleabane	Scattered infestations throughout BOAs.	Spot spray
Carthamus lanatus	saffron thistle	Scattered infestations throughout BOAs.	Spot spray
Onopordium acanthium	scotch thistle	Scattered infestations throughout BOAs.	Manual removal and spot spray

Table 5-2 - Priority Weeds for Control within Wybong Heights Biodiversity Stewardship Area

Botanical Name	Common Name	Cover and Location	Management Zone
High Priority			

Botanical Name	Common Name	Cover and Location	Management Zone
Asparagus asparagoides	Bridal Creeper	Approximate cover: <1%. Location: Recorded in one location in very low cover.	MZ3
Solanum seaforthianum	Climbing Nightshade	Approximate cover: <1%. Location: Recorded in one location in very low cover.	MZ2
Ageratina adenophora	Crofton Weed	Approximate cover: <1%. Location: Recorded in one location in very low cover.	MZ3
Opuntia aurantiaca	Tiger Pear	Approximate cover: 1-2%. Location: Recorded in half of the locations at very low densities.	MZ2, MZ3 & MZ4
Opuntia stricta	Prickly Pear	Approximate cover: <1-5%. Location: Recorded in half of the locations at very low densities.	MZ2, MZ3 & MZ4
Moderate Priority			
Paspalum dilatatum	Paspalum	Approximate cover: <1%. Location: Recorded in one location in a very low cover.	MZ1
Carthamus lanatus	Saffron Thistle	Approximate cover: <1%. Location: Recorded in one location in a very low cover.	MZ1
Sida rhombifolia	Paddy's Lucerne	Approximate cover: 1-40%. Location: Recorded within multiple locations at low and intermediate cover levels.	MZ1, MZ2, MZ3 & MZ4
Phytolacca octandra	Inkweed	Approximate Cover: <1%. Location: Recorded in one location at low cover	MZ2
Paronychia brasiliana	Chilean whitlow wort	Approximate Cover: <1% Location: Recorded in one location at low cover	MZ1
Low to Moderate Priority			
Sporobolus africanus	Parramatta Grass	Approximate cover: <1%. Location: Recorded in one location at very low cover.	MZ3

Botanical Name	Common Name	Cover and Location	Management Zone
Low Priority			
Bidens pilosa	Cobbler's Pegs	Approximate cover: 0-5%. Location: Recorded in majority of plot locations in low density.	MZ1, MZ2, MZ3 & MZ4
Senecio madagascariensis	Fireweed	Approximate cover: 0-30%. Location: Recorded in majority of plot locations in varied density from low to medium.	MZ1, MZ2, MZ3 & MZ4
Ehrharta erecta	Panic Veldt grass	Approximate cover: <1%. Location: Recorded in low densities across all locations except for P_20284_024WH where the species reached 60% cover.	MZ2 & MZ3
Carduus nutans subsp. nutans	Nodding Thistle	Approximate cover: <1%. Location: Recorded in minimal locations at very low cover.	MZ1
Cenchrus clandestinus	Kikuyu	Approximate cover: <1%. Location: Recorded in one location in a very low cover.	MZ1

Table 5-3 - Priority Weeds for Control within Mangoola Biodiversity Stewardship Area

Botanical Name	Common Name	Cover and Location	Management Zone
High Priority			
Bryophyllum delagoense	Mother of millions	Approximate cover: 0-10% Location: Recorded at one plot at 10% cover. Observed in a few isolated occurrences elsewhere.	MZ6
Eragrostis curvula	African lovegrass	Approximate cover: 1-5% Location: Recorded at low cover at three plots in the western parts of the Site.	MZ2, MZ3 and MZ4
Galenia pubescens	Galenia	Approximate cover: 1-10% Location: Recorded at half of all plots generally at <1%, however 10- 15% cover at plots 18, 27 and 67 (MZ2 and MZ5).	All
Hypericum perforatum	St John's wort	Approximate cover: <1% Location: Recorded at one plot (P3) at 0.2% cover.	MZ2

Botanical Name	Common Name	Cover and Location	Management Zone
Juncus acutus subsp. acutus	Sharp rush	Approximate cover: <1% Location: Recorded at one plot (P54) at 0.2% cover.	MZ1
Lycium ferocissimum	African boxthorn	Approximate cover: 0-25% Location: Recorded at one plot (P54) at 25% cover. Likely to be scattered individuals and isolated patches of high density across the site.	MZ1
Olea europaea subsp. europaea	European olive	Approximate cover: 0-40% Location: Recorded at P20, P49, and P71 at 15%, 35% and 40% cover respectively (MZ7).	MZ7
Opuntia stricta var. stricta	Common prickly pear	Approximate cover: <1% Location: Recorded at half of all plots always at <0.5%.	All
High to Moderate Priority			
Hyparrhenia hirta	Coolatai grass	Approximate cover: 1-45% Location: Recorded at a third of all plots, generally at <1% cover, however >10% at five plots (MZ1 and MZ2) and 45% at P32 (MZ3).	All
Moderate Priority			
Asparagus asparagoides	Bridal creeper	Approximate cover: <1% Location: Recorded at only one plot (P90) at very low cover.	MZ6
Cenchrus clandestinus	Kikuyu	Approximate cover: 30% Location: Recorded at only one plot (P81).	MZ1
Chloris gayana	Rhodes grass	Approximate cover: 1-10% Location: Recorded at only one plot at 1% cover, however observed elsewhere, in particular at gates and roadsides.	MZ3
Rubus fruticosus sp. Agg.	Blackberry	Approximate cover: <1% Location: A small number of isolated patches recorded across the site.	MZ1, MZ4and MZ8
Low Priority			
Axonopus fissifolius	Narrow- leafed carpet grass	Approximate cover: <1% Location: Recorded in two plots at low cover.	MZ1 and MZ6

Botanical Name	Common Name	Cover and Location	Management Zone
Bidens pilosa	Cobblers pegs	Approximate cover: 1-5% Location: Recorded at half of all plots in low to moderate cover.	All
Acetosella vulgaris	Sheep sorrel	Approximate cover: <1% Location: Recorded at only three plots at very low cover	MZ2
Bidens subalternans	Greater beggars ticks	Approximate cover: 0.1-25% Location: Recorded at four plots generally at <0.5%, however 25% at one site.	MZ6
Ehrharta erecta	Panic veldtgrass	Approximate cover: 80% (isolated) Location: Recorded at one plot (P54) at 80% cover.	MZ1
Paspalum dilatatum	Paspalum	Approximate cover: 0-5% Location: Recorded at three plots generally at up to 5% cover.	MZ1,MZ2 and MZ6
Senecio madagascariensis	Fireweed	Approximate cover: 1-30% Location: Recorded at 71 out of 76 plots, generally at <1% cover, however a several instances of up to 10% cover and few locations at 20-30% cover.	All
Solanum seaforthianum	Climbing nightshade	Approximate cover: 0<1% Location: Recorded at one plot at 40% cover along Big Flat Creek	MZ1
Xanthium occidentale	Noogoora burr	Approximate cover: <1% Location: Recorded at one location at 0.1% cover.	MZ6

Weed management within the Mangoola BOAs will include:

a) annual review of the Weed Control Action Plan across the Mangoola BOAs targeting weeds in accordance with relevant legislation and best practice techniques

b) the implementation of weed management measures

c) weed management in revegetation areas prior to planting or seeding activities

d) monitoring and inspections of BOA's to assess the effectiveness of weed control and to ascertain the requirement for further work

e) consultation with the relevant authorities regarding weed priorities, weed occurrence and management.

Weed management at Mangoola BSAs are detailed within site specific Integrated Weed Management Plans which are updated as per the Biodiversity Stewardship Agreements.

Chemicals to be used on site for the purposes of weed control will be used in accordance with the Safety Data Sheet and chemical label to determine their suitability for control of target species, as well as the safety and environmental requirements during their use. Chemical spraying will be carried out in accordance with the *Pesticides Act 1999* and records will be kept of spraying activities within the BOAs.

A summary of the weed management activities carried out within the Mangoola BOAs will be reported annually in the AR.

5.7 Pest Fauna Management

Of the pest fauna species known to occur (Table 2-1), the priorities for management are currently wild dogs, fallow deer, goats, pigs, rabbits and foxes. These species may impact on the native fauna species through predation and competition for resources such as food, shelter, and breeding sites. Feral animals can also have a detrimental effect on regenerating areas as well as soil stability.

Feral animal management in the CAs is undertaken in accordance with the Pest Animal Action Plan which is revised annually with actions undertaken documented in a Pest Animal Control Register. Feral animal management in the BSAs is undertaken in accordance with the Integrated Feral Pest Management Plan. A combination of baiting (using 1080 poison), trapping and open range shooting is currently being implemented within the BOAs, with the scheduling of pest animal management actions determined by evidence of the presence of populations of target pest species.

Pest management will continue to involve the implementation of appropriate control programs for target species, on an as needed basis as determined through monitoring. Records of significant populations of such species may trigger appropriate control strategies to reduce and control numbers. Experienced and qualified pest management contractors will be appointed to implement the pest management program. Mangoola undertakes collaboration with the Wybong Wild Dog Association to ensure a more effective local approach to the management of this species. Mangoola also addresses pest fauna management as part of regular Community Consultative Committee meetings.

Monitoring of pest animal species populations and the effectiveness of the control program will be through monitoring, quarterly inspections, annual ecological monitoring and observations from feral animal control contractors. The implementation of the feral animal action plan in the Mangoola BOAs will be reported on annually in the AR for the Mangoola Mine.

5.8 Habitat Salvage and Augmentation

The loss of fauna habitat from the Approved Project Disturbance Area will result in increased pressure on surrounding vegetation for displaced fauna competing for foraging resources, shelter and nesting/roosting habitats.

Habitat augmentation is the process of installing habitat features for a range of fauna species in previously disturbed or depauperate areas (in this case relating to the rehabilitation). Specific designs of habitat augmentation can greatly contribute to the quality of habitat for key threatened species in an area and provide valuable refuge for fauna species as they move across the landscape. Specific habitat features are those that can be a limiting factor to population thresholds, which may include:

a) nest boxes

b) fallen timber and hollow logs

c) rock/boulders

d) foraging resources.

The aim of habitat augmentation will be to increase the quality or abundance of specific habitat features for key threatened species, to increase the carrying capacity of the rehabilitation to support displaced species, and to augment with specific habitat features to encourage use by target species earlier than may naturally occur.

Relocation of fallen timber, hollow logs and rocks and boulders should be avoided in areas where it would cause unnecessary ground disturbance or damage to regenerating trees or revegetated areas.

The following section outlines the methods for tree hollow augmentation, and for augmentation of other habitat features.

5.8.1 Habitat Feature Salvage

Habitat features are not to be taken from the BOA's. Habitat features deemed as being appropriate for salvage during the pre-clearing stage in the approved disturbance boundary (including but not limited to logs, stag trees, hollow logs and boulders/rocks) will be considered for relocation to areas considered depauperate in such features, with a preference for rehabilitated areas.

5.8.2 Tree Hollow Augmentation

Installing nest boxes has been undertaken at Mangoola since 2010. Table 5-4 provides the density recorded during the environmental assessment process for remnant woodland and riparian vegetation formations (Umwelt 2006).

Table 5-4 - Hollow-bearing Tree Density per Vegetation Formation

Vegetation Formation	Hollows Per Hectare
Woodland	7.1
Riparian/Floodplain	9.4

The densities presented in Table 5-4 have been used to guide nest box installation locations at Mangoola. Over 1,800 nest boxes have been installed across the Mangoola BOAs and rehabilitation areas with current locations provided in Figure 5-1. Nest box installation will occur when required and locations will focus on areas with low

natural hollow and nest box densities. Placement of nest boxes within revegetation areas may also occur once vegetation reaches suitable maturity. .

Nest boxes have been included in rehabilitation areas mounted on poles or trees to provide amelioration of hollow loss from the Approved Project Disturbance Area. Nest boxes comprise a diverse range of designs to encompass the range of hollows lost as part of felling practices.

Installed nest boxes will be monitored for condition and content as provided in Appendix D Section 7.

5.8.3 Supplementary Plantings for Threatened Species

As per Umwelt (2006) Anvil Hill Project EIS, supplementary planting of specific plant species for targeted threatened fauna, being the glossy black cockatoo (*Calyptorhynchus lathami*) and squirrel glider (*Petaurus norfolcensis*) where appropriate may be undertaken in the offset revegetation areas included within the Anvil Hill Project EIS (Umwelt 2006). These plantings will contribute to the amelioration of the loss of known foraging habitat from the Disturbance Area.

For the glossy black cockatoo (*Calyptorhynchus lathami*), supplementary plantings will comprise planting of pockets of drooping she-oak (*Allocasuarina verticillata*).

For the squirrel glider (*Petaurus norfolcensis*), supplementary plantings will comprise plantings of small pockets of flora species selected from Table 5-5 below.

Table 5-5 – Flora species to be used for Squirrel Glider Supplementary Plantings

Scientific Name	Common Name
Acacia binervia	coast myall
Acacia cheelii	Motherumbah
Acacia crassa subsp. crassa	Curracabah
Acacia decora	western golden wattle
Acacia deanei subsp. deanei	Deane's wattle
Acacia doratoxylon	Currawang
Acacia falcata	hickory wattle
Acacia falciformis	broad-leaved hickory
Acacia hakeoides	hakea wattle
Acacia implexa	hickory wattle
Acacia irrorata	green wattle
Acacia linearifolia	stringybark wattle
Acacia melvillei	Yarran
Acacia paradoxa	kangaroo thorn

Scientific Name	Common Name
Acacia parvipinnula	silver-stemmed wattle
Acacia pendula	weeping myall
Acacia piligera	gold-dust wattle
Acacia pravifolia	coil-pod wattle
Acacia salicina	Cooba
Acacia spectabilis	Mudgee wattle
Acacia uncinata	gold-dust wattle
Corymbia maculata	spotted gum
Eucalyptus moluccana	grey box
Eucalyptus tereticornis	forest red gum

* This list was developed based upon known species present at Mangoola as well as from DEC 2004b and OEH 2016.

5.8.4 Topsoil Salvage

Topsoil salvage is undertaken in accordance with the RMP for the Approved Project Disturbance Area and will be respread on areas of rehabilitation as soon as possible after removal to retain the native seedbank.

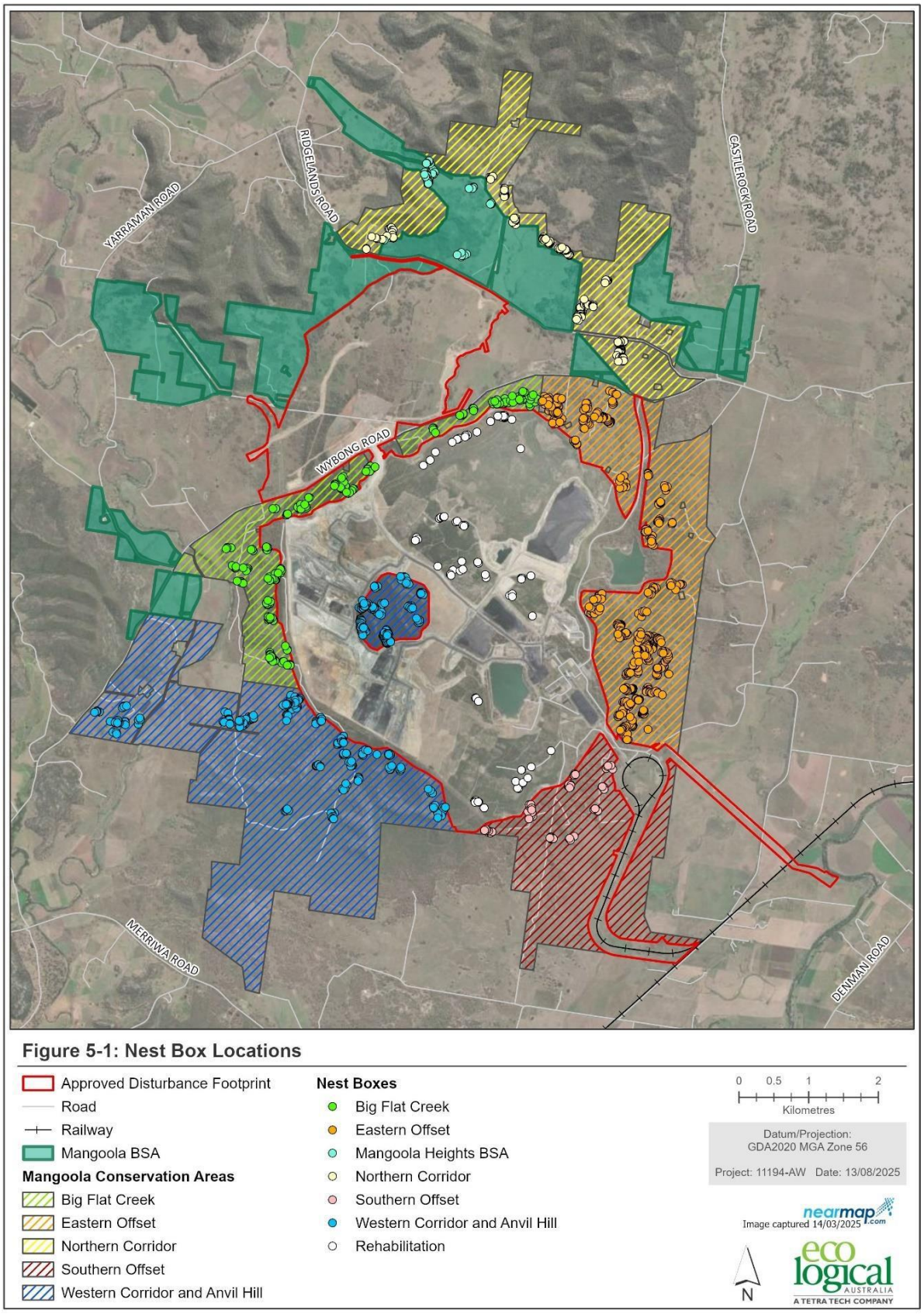

Figure 5-1 Nest Box locations

5.9 Seed Collection and Propagation

Mangoola has a well-established seed collection program, undertaken by suitably qualified and experienced personnel. Over the course of the next three years, the seed collection program will continue to focus on:

a) seed collection of species from target vegetation communities

b) meeting the required volumes of local provenance seed to propagate the required numbers of tubestock to meet revegetation requirements

c) recording of the collection and propagation process, including seed collection methods, timing, seed storage, seed quantity and seed treatments

Seeds will be harvested by suitably qualified personnel and stored generally in accordance with the FloraBank (2013) Guidelines. These include recommended practices for native seed collection, drying, extraction, cleaning and storing to maximise its longevity and viability for revegetation practices. Record keeping will include as a minimum:

a) Identification

b) Collection date

c) Collector

d) Species

e) Plants sampled

g) Site name

i) Map reference/coordinates.

5.9.1 Licencing Requirements for Seed Collectors and Propagators

Approval to collect these species is inherent as part of Project Approval. In addition to this, specific commitments have been made as part of the approvals process, with input from the relevant agencies. As such a separate licence to remove and/or propagate these plants from within the project approval area is not necessary.

5.10 Translocation Works

Detailed strategies have been developed to guide translocation efforts for the tiger orchid (*Cymbidium canaliculatum*), terrestrial orchids, and other threatened flora species from the Approved Project Disturbance Area to nearby secure BOAs, or suitable areas within the post-mining rehabilitated land. These strategies are documented in the Translocation of Threatened Species Management Plan.

The management of translocated species into the Mangoola BOAs will be in accordance with this document and in consideration of the Australian Network for Plant Conservation Guidelines for the Translocation of Threatened Plants in Australia (Vallee *et al* 2004).

5.11 Undescribed Molluscs

Concerns about undescribed land snails were raised in a public submission prior to approval of the Anvil Hill Project in 2006. Information from this submission documented that there is believed to be at least three endemic undescribed camaenid land snails in the Wybong region, and these occur in areas with rocky outcrops. According to that submission, none of these species have been adequately studied and are consequently poorly known.

Due to the probable preference of these species for rocky outcrop and escarpment areas, it is likely that the known habitat for these species will be retained and protected within the BOAs. Installation of rock/boulder piles (described in Section 5.11.1) may also increase availability of habitat for these species.

These camaenid land snails are included in the ecological monitoring program, and any changes to their habitat or any specific management requirements required to improve their habitat are documented within the monitoring reporting (Section 6.2).

The ecological monitoring program designed for the Mangoola BOAs includes searches for molluscs in appropriate habitat and will report changes in their habitat and any specific management actions required to improve or protect habitat for this faunal group (described in greater detail in Appendix D Section 6.2).

5.12 Erosion, Sediment and Salinity

Owing to the dense and moderate vegetation cover across most of the Mangoola BOAs, erosion is not currently a significant management issue. Erosion is monitored during the quarterly inspections of the offset areas, and annually during channel stability surveys. Any issues identified through these processes will be addressed accordingly, through measures such as appropriate short-term erosion and sediment controls or longer-term bank stabilisation and vegetation actions.

Small areas of land affected by salinity have been identified in the project approval boundary in the past; however salinity has not been identified as a significant management issue within the Mangoola BOAs. If quarterly inspection (Section 6.1) identifies evidence of salinity issues (such as salt crusting) Mangoola will investigate causes and remediation requirements.

Erosion and sediment control works are undertaken in accordance with the Erosion and Sediment Control Plan.

5.13 Bushfire Management

Bushfire Management within the CAs will be undertaken in accordance with the Bushfire Management Plan. Appropriate management of the vegetation of the Mangoola BOAs will ensure the protection of life and property while providing the necessary protection to the significant ecological features of the area.

This plan is updated every three years.

Bushfire Management within the BSAs are managed under a site specific Fire for Conservation Management Plan. This plan will provide details including (but not limited to):

- Areas to be burnt identified on the Ecological Burn Map
- Requirements for each vegetation type or Threatened Species
- Monitoring and inspection details
- Performance measures

5.14 Waste Management

Mangoola will continue the staged removal of derelict houses, infrastructure, rubbish (such as tyres, car bodies and old farming equipment) from within the BOAs.

If new waste features are identified during routine inspections or ecological monitoring, these will be promptly recognised, documented, and their collection and disposal scheduled.

All general waste generated by contractors when accessing the BOAs (particularly for revegetation works) will be removed on completion of tasks.

5.15 Ecological Due Diligence in BOAs

Where essential works within the Mangoola BOAs requiring ground disturbance, vegetation clearing or impact to vegetation (including grassland areas) are proposed, a due diligence process must be followed to determine what work can occur, under the CAs or BSAs and to survey for significant ecological features, minimise impacts and to identify and implement appropriate mitigation/offsetting measures to address potential impacts on these areas.

Due diligence inspections will be conducted to assess any proposed area of disturbance for potential impacts on threatened and migratory species, endangered populations and TECs listed under the BC Act or the EPBC Act. If potential impacts on threatened and migratory species, endangered populations or TECs are identified during the inspections, where possible, the proposed sites will be relocated to an area of reduced impact or appropriate management mitigation measures implemented.

Where appropriate, timing of due diligence surveys will be seasonal to target key threatened species known to occur or deemed to have potential to occur.

5.16 *Prasophyllum* sp. Wybong Offset Management Plan

A *Prasophyllum* sp. Wybong specific management plan addressing the requirements of Approval EPBC 2018/8280 is provided in Appendix F.

A summary of this plan includes:

a) identification of potential direct and indirect impacts to the *Prasophyllum* sp. Wybong individuals and/or habitat in their BOAs

b) management actions proposed to minimise impacts to the *Prasophyllum* sp. Wybong individuals and/or habitat in the offset area

c) Performance indicators (both short and long term) and trigger thresholds for the population size and habitat condition.

d) A program to monitor and evaluate the population size and habitat condition against the performance indicators and trigger thresholds

e) An action plan to respond to exceedances and/or failure to meet the performance indicators and thresholds.

5.17 Water Management Plan

A Water Management Plan (WMP) was prepared to fulfil requirements of SSD 8642 and EPL 12894. The WMP includes three additional management plans as per SSD 8642. These include;

- Erosion and Sediment Control Plan (ESCP);
- Surface Water Management Plan (SWMP); and
- Groundwater Management Plan (GWMP)

6. Monitoring and Inspections

Monitoring and Inspections are sourced from requirements under Conditions of Consents ((SSD) 8642 and EPBC 2018/8280) and CAs and BSAs.

6.1 Quarterly Inspections

Quarterly inspections will be undertaken within the Mangoola BOAs over the life of the Project comprising general walkover inspections . These will assess:

- Fencing – Check condition (holes, fallen/cut sections)
- Weeds (observed occurrences, success of controlled areas)
- Revegetation (effectiveness and condition of revegetation and rehabilitation efforts, areas of significant natural regeneration) (where applicable)
- Feral Pests (animals observed, signs of pests)
- Tracks (quality of tracks, any required maintenance)
- Erosion (evidence of previously unrecorded erosion, condition of remediated areas)
- Security (signs of unauthorised entry, gates locked, signs in place)
- Grazing (signs of unauthorised grazing, stock sighted in offset areas)
- Translocation plots (fencing secure, evidence of new orchid growth or flowering) (where applicable)
- Waste (old fencing wire, rubbish etc)

Any required management actions that are identified as part of the inspection will be implemented as soon as practical.

A standard inspection checklist (the *Mangoola Offset Area Inspection Form*) is completed as part of the inspection.

In addition, during these inspections, site specific requirements as per the Biodiversity Stewardship Site inspections (see site specific BSAs and Section D.1.2.2) will also be completed, where required.

6.2 Ecological Monitoring Program

BOA monitoring site locations, monitoring frequencies and seasons are detailed in Appendix C. It is intended that this monitoring will continue for the life of mine, in perpetuity for BSAs or until sites are deemed redundant or signed off. Monitoring works will include, floristic monitoring, including Vegetation Integrity (VI) or biometric plots, photo monitoring, fauna monitoring and nest box monitoring. Figure 6-1 to 6-3 illustrate the location of each monitoring site. Nest box monitoring locations are illustrated in Figure 5-1.

The data collected from the ecological monitoring program has been designed to address whether revegetated and regenerating sites are meeting required completion criteria (structure, composition and functionality requirements of relevant PCTs).

The rehabilitation monitoring program is detailed separately within the RMP.

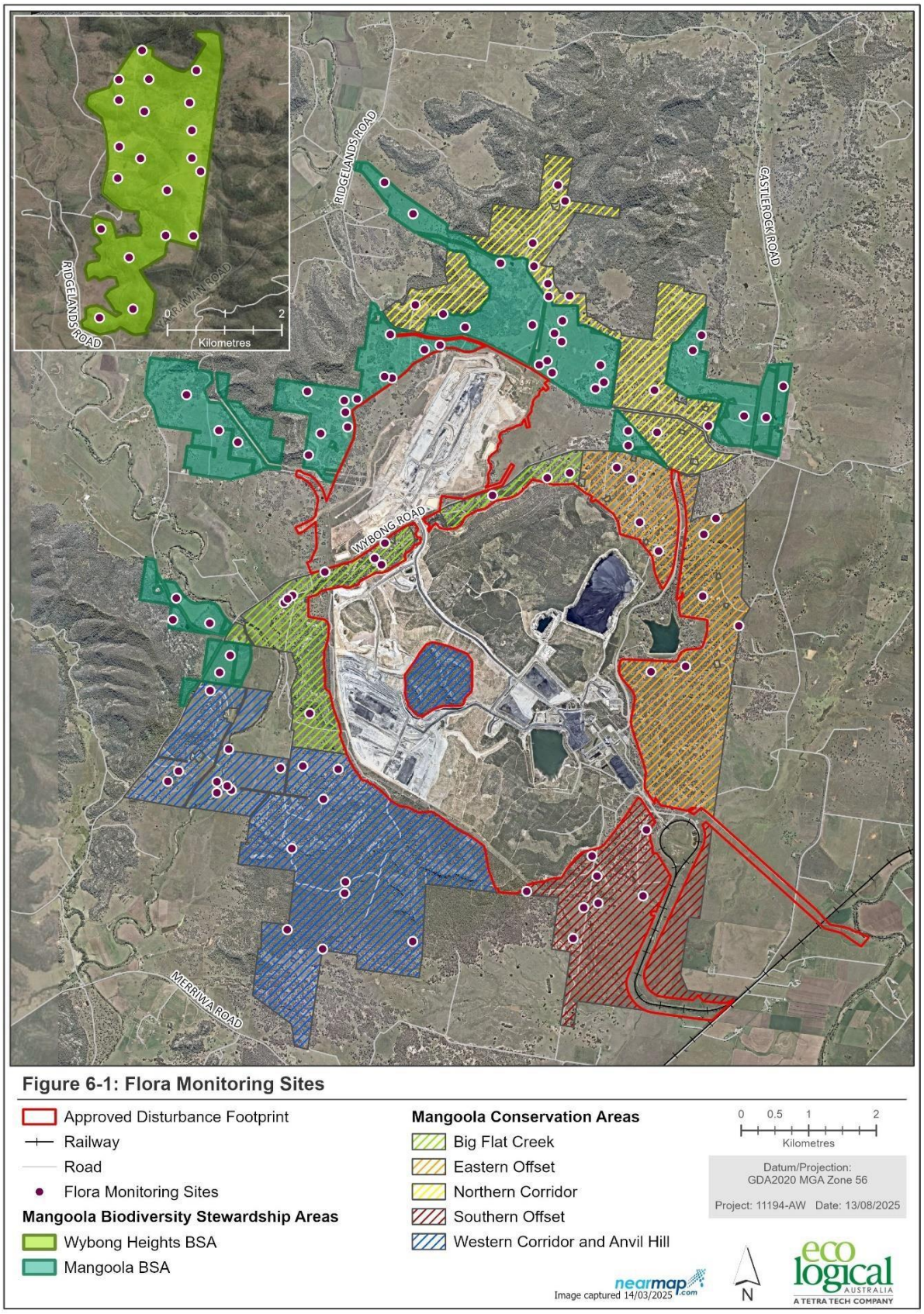

Figure 6-1: Flora Monitoring Sites

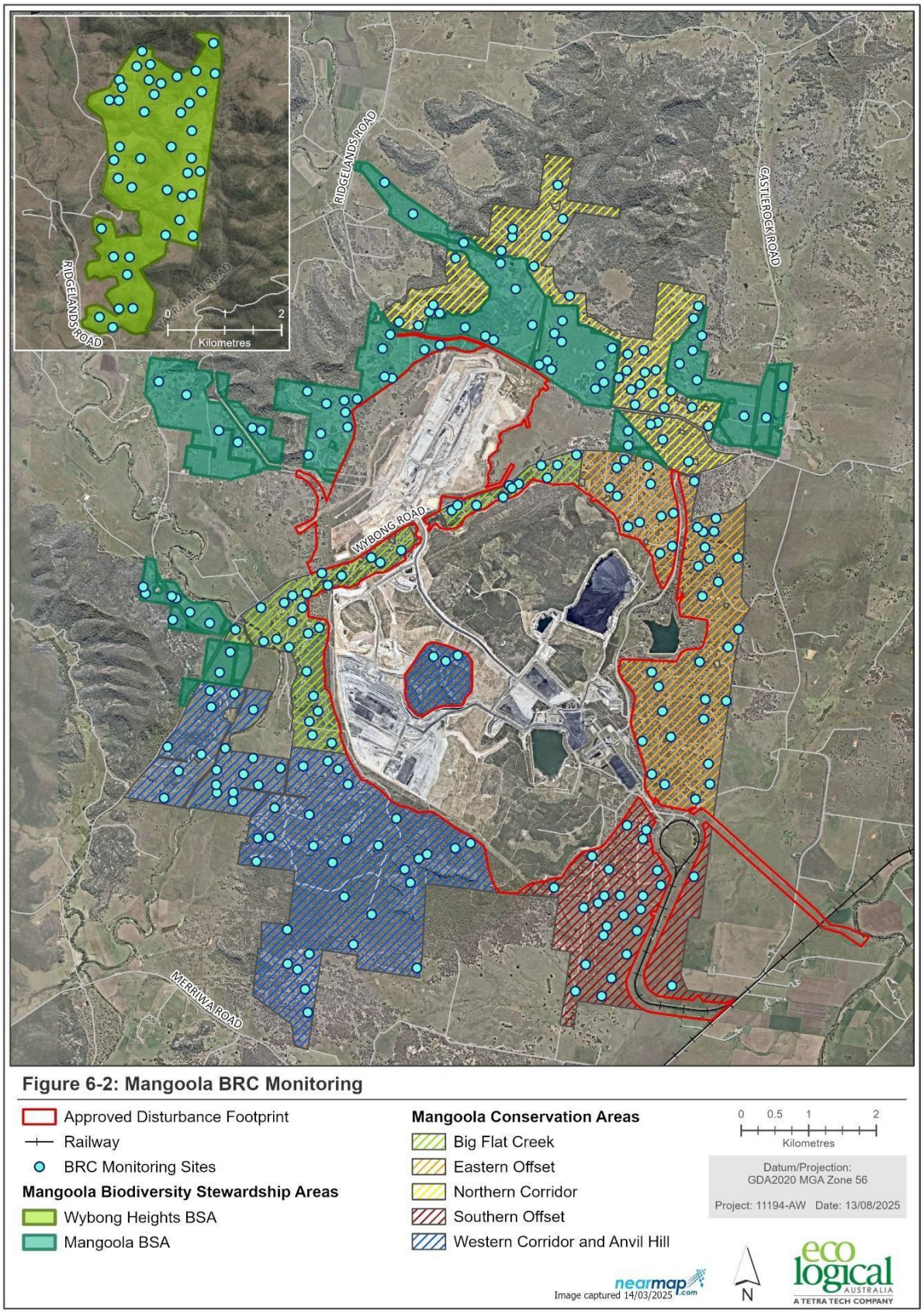

Figure 6-2: BRC Monitoring Sites

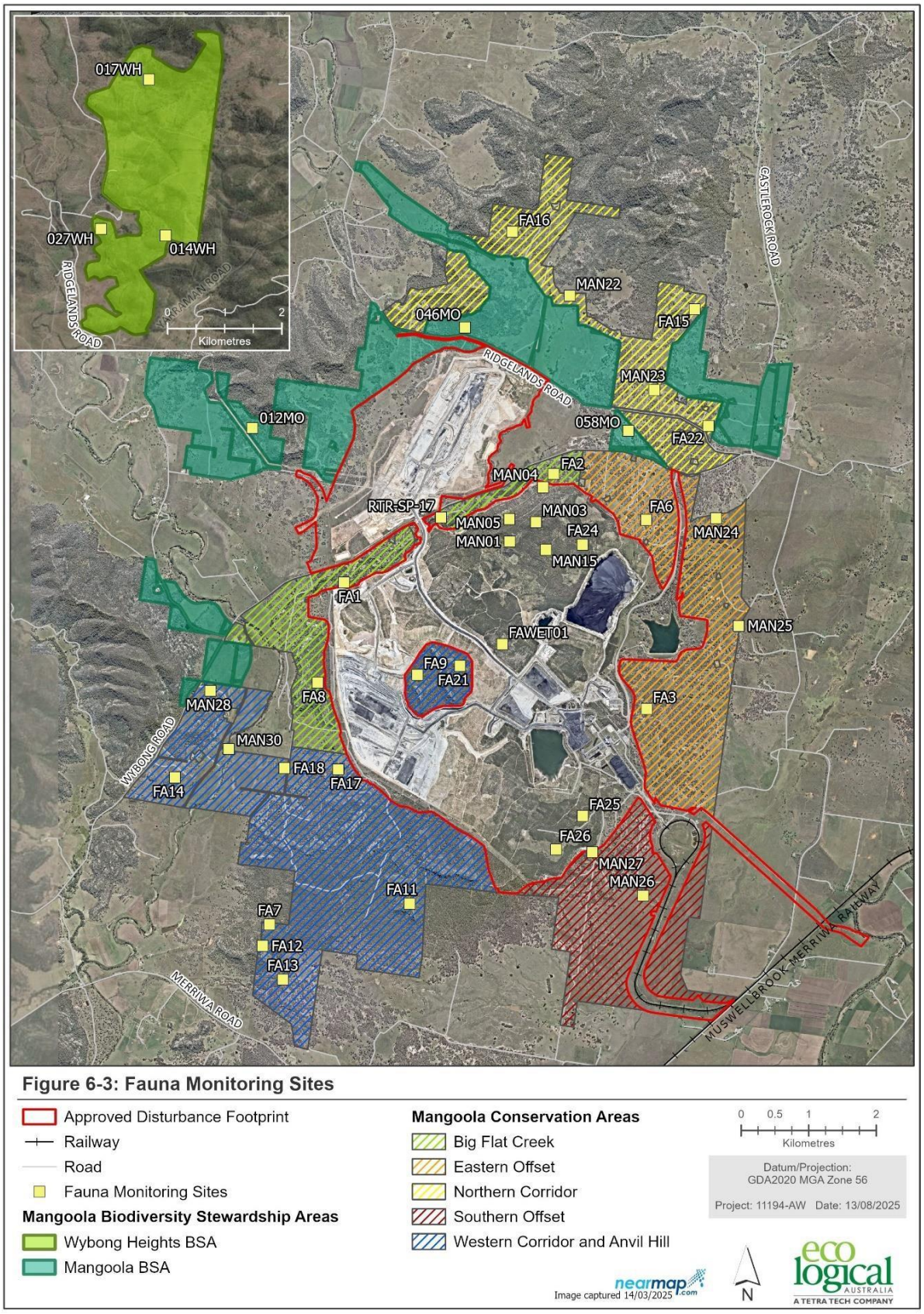

Figure 6-3: Fauna Monitoring Sites

6.2.1 Monitoring Objectives

In relation to the management of the Mangoola BOAs, the broad objectives of the ecological monitoring program are to:

a) assess for compliance of remnant, revegetated and regenerating vegetation against short term and long-term performance indicators

b) identify any potential loss of biodiversity values over the Mangoola BOAs

c) document the ecological characteristics of remnant woodland vegetation in the BOAs to establish a baseline for developing accurate performance indicators and completion criteria for the regeneration/revegetation of grassland

d) assess the recovery of grassland areas to woodland/forest

e) assess and map the presence of threats such as significant populations of pest fauna species or weed infestations

f) identify the need for additional or corrective management measures to achieve the performance indicators and completion criteria

g) document the progress and improvement of biodiversity within BSAs

6.2.2 Monitoring Site Selection

Stratified monitoring sites have been established in target communities of the Mangoola BOAs to provide reference sites to which the success of regeneration/revegetation works can be compared. Each of these sites will continue to be monitored in accordance with established monitoring methods. Replicate monitoring sites have also be established in representative regeneration /revegetation areas as those works progressed.

CA and BSA monitoring sites are described in the CA's and BSA's.

6.2.3 Monitoring Methods

Methodologies will be undertaken at monitoring sites as identified in Appendix D.

6.2.4 Monitoring Reporting

Outcomes of ecological monitoring works undertaken will include specification of progress against short term and long-term performance indicators as well as information on strategies for improvement if relevant performance indicators are not being met.

For offset revegetation/regeneration monitoring, reporting will:

a) outline compliance against Approval conditions and other statutory commitments

c) report key trends in monitoring results and progression towards achievement of revegetation/regeneration objectives and completion criteria

d) assess effectiveness of revegetation/regeneration methods implemented

e) identify any opportunities for improvement in revegetation/regeneration practices

f) where required, identify modifications required for the monitoring program.

For BOA remnant vegetation monitoring, reporting will:

a) outline compliance against Approval conditions and other statutory commitments

b) compare if vegetation is increasing, decreasing or remaining stable in terms of biodiversity value

c) report key trends in monitoring results

d) assess effectiveness of any management actions implemented.

6.3 Groundwater Dependent Ecosystem Monitoring Program

GDE monitoring is undertaken in accordance with the Water Management Plan (see Section 5.2.1)

7. Performance Indicators and Completion Criteria

The performance indicators and completion criteria listed in Appendix E will be used to determine the success of the ongoing management of the BOAs in accordance with the specified project approval conditions and conservation management objectives. Those listed in Table 1 of Appendix E relate to the regeneration and revegetation activities as outlined in Section 4, while Table 2 of Appendix E relates to the general management strategies as described in Section 5.

The performance indicators and completion criteria are preliminary and are intended to apply to Years 15-17 (2025-2027) of the current BOMPS implementation. These will be assessed every three years and will be revised (as appropriate) in response to monitoring outcomes and the success of the management and improvement strategies.

8. Review and Improvement

8.1 Adaptive Management Process

Adaptive management of the BOMPS will be responsive to any new and relevant data that may arise through the monitoring described in Section 6.0, legislative change or any other studies completed across the BOAs. This will enable a flexible approach to management commitments, allowing ongoing feedback and refinement of the BOMPS. Adaptive management will be a key mechanism to address the risks to the successful implementation of the BOMPS. Adaptive management steps include regular review of the BOMPS, adaptation of targets and performance indicators, recognising potential risks to the successful implementation of the BOMPS and having a framework in place for corrective actions.

8.2 Review of BOMPS

The BOMPS is to undergo an internal review and revision every three years to refine the management strategies and to assess their performance against preliminary performance indicators and completion criteria. The three-year review will aim to improve the management strategies and further refine the longer-term performance indicators and completion criteria. In addition, a BOMPS review will be required when any criteria of Part D, D.7 and D.7 are triggered.

8.3 Progressive Development of Targets and Performance Indicators

The performance indicators and completion criteria are preliminary and apply to the sixth three-year period of the BOMPS implementation (2025 - 2027). The targets and performance indicators will need to adapt and change as targets are met and new management challenges arise. Each three years, they will be assessed and redeveloped as appropriate in response to monitoring outcomes and the success or otherwise of the management and improvement strategies. Modifications to the targets and performance indicators will be recorded in a revised BOMPS.

8.4 Potential Risks and Corrective Actions

There are several potential risks, or situations where performance indicators and completion criteria may not be achieved. A list of potential situations where biodiversity conservation objectives of this BOMPS may not be met is provided in Table 8-1, along with potential corrective actions. This list is adapted from Rawlings et al (2010).

Table 8-1 - Biodiversity Trigger, Action and 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.
		Clearing outside of Approved Project Disturbance Area	Undertake supplementary planting to compensate for vegetation lost.
	Weed management in Conservation Areas	Infestation of perennial weeds listed as High or Medium Priority in Section 3 of the Weed Management Action Plan and/or weeds listed for Primary Weed Control in Annexure C of the Conservation Agreements Total exotic cover greater than 10% above baseline levels (prescribed in Annexure D of the Conservation Agreements).	Investigate species responsible for increased cover. Treat significant weed infestations that are identified as a risk to rehabilitation or regeneration areas. Target treatment for perennial weeds listed as High or Medium Priority in Section 3 of the Weed Management Action Plan and weeds listed for Primary Weed Control in Annexure C of the Conservation Agreements
	Feral fauna management	Infestations of pest animals are increasing or new species detected.	Adapt Pest Animal Action Plan or Integrated Feral Pest Management Plan and modify strategies accordingly.
	Pathogens	Signs of *Phytophthora cinnamomi* 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 offset areas	Complaints to be handled in accordance with the MANOC-1772150304-825 Complaints Management Procedure
Revegetation/ Regeneration Success	Species composition	No regeneration of plants, or indicator species missing.	Assess exclusion fencing where installed 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. Assess 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 (e.g. nest boxes, specific foraging resources,).
	Tree cover	Low or no tree cover.	Plant/direct seed trees at appropriate rate using minimal ground disturbance.
	Survivorship	Tree dieback (from insect pressure, water stress).	Revegetate with dense shrubs to increase diversity and insectivorous birds. Increase patch size through revegetation during periods of average to above average rainfall.
	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 the label. 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 if available and if doing so will not cause ground disturbance or damage revegetation/regeneration. 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.
Grazing Management (SO-2 only)	Overgrazing	Pasture monitoring indicates increased introduced flora species coverage accompanied by decreased flora species diversity.	Remove cattle grazing and implement weed management strategies.
		Grazing is taking place in vegetation with groundcover less than 80 percent foliage cover and average sward height less than 10cm high	Remove cattle grazing
		Grazing exceeds three consecutive days and minimum rest period of 28 days	Remove cattle grazing
		Herbage mass is insufficient to support the head of cattle proposed for grazing	Remove cattle grazing
		Grazing is taking place outside of the period between March to October.	Remove cattle grazing
	Inappropriate grazing	Grazing of revegetation areas occurs within first five years of planting.	Grazing will be removed from revegetation areas.

Management Aspect	Key Element	Trigger	Potential Corrective Action
	Regeneration impediment	No natural regeneration identified in northern areas of SO proposed for natural regeneration as a result of grazing.	Grazing will be removed from areas proposed for natural regeneration.
Bushfire Management	Bushfire management	Unplanned bushfire event occurs.	Review procedures in place and update Bushfire Management Plan based on findings if required. Map bushfire extent. 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 appropriate due diligence inspection prior in accordance with GDP procedure). Undertake track remediation works.
Tiger Orchid Translocation	Translocation methods	Attachment of tiger orchid to tree is failing.	Replace tiger orchid attachment to tree.
	Translocation success	Health of tiger orchid is failing.	Investigate causes of deterioration of orchid heath.
Nest Box Installation	Installation methods	Monitoring identifies attachment of nest box is failing	Re-attach nest box to tree.
	Success as supplementary habitat	Monitoring identifies nest boxes not being used by target species	Continue to monitor. No action required. Bees may be removed in a nest box if deemed necessary and this can be safely achieved.
		Monitoring identifies nest box condition deteriorating	Replace nest box or repair if possible.

9. Reporting and Documentation Requirements

In accordance with Condition A24.(c) of SSD 8642, Mangoola will report all activities associated with measures taken to implement the BOMPS in the Annual Review (AR), which will be published on the Mangoola website.

Additional reporting will be undertaken in accordance with the requirements contained within the relevant Conservation Agreements and Biodiversity Stewardship Agreements.

10. Accountabilities

Responsibility for the implementation of the BOMPS lies with Mangoola, with input from external specialists and contractors as required. Table 10-1 below lists the key roles and responsibilities of specific positions concerning the implementation of the BOMPS.

Table 10-1: Roles and responsibilities

Title	Roles and responsibilities
Operations Manager	• ensure that sufficient resources are allocated for the implementation of this BOMPS.
Environment and 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 BOAs • allocate sufficient resources and time for the implementation of the BOMPS monitoring programs • ensure that the results of the BOMPS 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 BOMPS • ensure that all relevant records are effectively maintained on site • authorisation of essential clearing activities in accordance with the BOMPS through the Ground Disturbance Permit process.
Environment and Community Coordinator or Delegate	• coordinate the day to day implementation of this BOMPS, including the design and implementation of ecological management activities and as delegated by the Environment and Community Manager • coordinate monitoring requirements as per the BOMPS 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 BOMPS activities are appropriately qualified, licensed and experienced to undertake the task.
Mining and Land Management Contractors	• undertake all activities directly in accordance with the requirements of the BOMPS, as directed by the Environment and Community Manager, Coordinator and Officer.

11. Document Information

11.1 Related Documents

Related documents, listed in Table 11.1 below, are internal documents directly related to or referenced from this document.

Table 11-1 - Related Internal Documents

Reference	Title
MANOC-1772150304-3936	*Mangoola Pest Animal Action Plan*
MANOC-1772150304-1412	*Tiger Orchid Translocation and Monitoring Form*
MANOC-1772150304-4110	*Habitat Tree Felling Form*
MANOC-1772150304-4327	*Pre-clearance Survey, Land Clearing and Topsoil Stripping*
MANOC-1772150304-4291	*Bushfire Management Plan*
MANOC-1772150304-2867	*Translocation Management Plan*
MANOC-1772150304-6221	*Water Management Plan*
-MANOC-1772150304-4291	*Bushfire Management Plan*

11.2 Reference Information

Reference information, listed in Table 11.2 below, is information that is directly related to the development of this document or referenced from within this document.

Table 11-2 - References

Reference	Title
Bureau of Meteorology (BOM) 2021	Climate Data Online. Accessed from *http://www.bom.gov.au/climate/data/* July 2025
Commonwealth of Australia 2001	Threat Abatement Plan for Dieback Caused by the Root-rot Fungus *Phytophthora cinnamomi*.
Department of Planning and Infrastructure 2014	Hunter Valley Coal Mines: Best Practice Guidelines for Biodiversity Offset Management Plans.
DEC 2004a	Department of Environment Conservation (DEC) 2004. Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities. Working Draft, November 2004.
DEC 2004b	Department of Environment Conservation (DEC) 2004b. Nectar Food Trees. Natural resource Management Advisory Series: Note 4

Reference	Title
Department of Primary Industries (DPI) 2014	Noxious and environmental weed control handbook – A guide to weed control in non-crop, aquatic and bushland situations 6th Edition
Department of Primary Industries (DPI) 2025	NSW WeedWise website. *http://weeds.dpi.nsw.gov.au/*
Eastcoast Flora Survey 2016	Monitoring of translocated threatened orchids (*Diuris tricolor*, *Prasophyllum petilum*) at Mangoola Coal: 2015 Results
GSS Environmental 2006	Anvil Hill Project Soil Survey and Land Resource Assessment Report. Prepared by GSS Environmental for Umwelt (Australia) Pty Limited.
Kovac, M. and Lawrie, J.W. 1991	Soil Landscapes of the Singleton 1:250 000 Sheet. Soil Conservation Service of New South Wales, Sydney.
Mangoola Open Cut	Aboriginal Cultural Heritage Management Plan.
Office of Environment and Heritage 2016	OEH 2016. Planting to Conserve Threatened Nomadic Pollinators in NSW. Saving Our Species. 59 Goulburn Street, Sydney NSW 2000 PO Box A290, Sydney South NSW 1232
Office of Environment and Heritage 2017	Biodiversity Assessment Method. Office of Environment and Heritage for the NSW Government. 59 Goulburn Street, Sydney NSW 2000 PO Box A290, Sydney South NSW 1232
Rawlings, K., Freudenberger, D. and Carr, D. 2010	A guide to managing box gum grassy woodlands. Department of the Environment, Water, Heritage and the Arts, Canberra.
Umwelt 2006	Anvil Hill Project Environmental Assessment, Appendix 9 – Ecological Assessment. Prepared by Umwelt on behalf of Centennial Coal, June 2006.
Umwelt 2008	Investigations into the Status of *Phytophthora cinnamomi*, Mangoola Mine. Report to Mangoola Coal, November 2008.
Umwelt 2010	Modifications to Mangoola Mine Plans and Relocation of 500kV Electricity Transmission Line: Environmental Assessment. Prepared by Umwelt on behalf of Xstrata Coal, December 2010.
Umwelt 2011a	Rehabilitation and Offset Management Plan, Mangoola Mine. Prepared on behalf of Glencore.
Umwelt 2015a	Upper Hunter Strategic Assessment- Mangoola Coal Biodiversity Certification Assessment Report. Prepared on behalf of Glencore
Umwelt 2015b	Ecological Study for Mangoola North Project Pre-feasibility Study. Prepared on behalf of Mangoola Coal
Umwelt 2019	Mangoola Coal Continued Operations Project – Environmental Impact Statement. Prepared on behalf of Mangoola Open Cut
Unwelt 2024a	Biodiversity Stewardship Agreement - Mangoola
Umwelt 202b	Biodiversity Stewardship Agreement – Wybong Heights

Reference	Title
Valee, L., Hogbin, T., Monks, L., Makinson, B., Matthes, M. And Rossetto, M. 2004	Australian Network for Plant Conservation Guidelines for the Translocation of Threatened Plants in Australia. Second edition.

11.3 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 11.3 below.

Table 11.3 – Change Information

Version	Date	Review team (consultation)	Change Summary
1	1/5/2009	DoP&I	Original BMP approved by DP&I.
2	4/08/2010	Mangoola Coal	Submitted to DoP&I for review.
3	24/10/2010	Mangoola Coal	Comments from DoP&I review in August 2010 incorporated and sent as final for approval.
4	30/04/2013	Mangoola Coal	Review following Modification 4, updated following DP&I request for a Blast Fume Management Strategy and general review of monitoring sites/general content. Submitted to DP&I and EPA.
5	May 2013	Mangoola Coal	Re-submitted in June to DP&I with amendment to ETL pylon ppv limits to reflect latest TransGrid Agreement.
6	September 2013	Mangoola Coal	BMP approved by DP&I on 11th September 2013. Approval letter attached and document date changed to September 2013.
7	June 2014	Mangoola Coal	Review following Modification 6
8	May 2015	Mangoola Coal	Updated to reflect EPL changes and monitoring station locations.
9	September 2016	Mangoola Coal Umwelt (Australia) Pty Limited	Updated at end of three year cycle period for revegetation and regeneration requirements. Updated to contain detailed biodiversity (fauna, flora, habitat, translocation, photographic, aquatic, LFA and nest box) monitoring requirements including methodology, timing and site locations.
10	May 2018	Umwelt (Australia) Pty Limited	Updated to reflect changes associated with Conservation Agreement preparation, renaming of SAO to SO, repealment of TSC Act and Noxious Weed Act.
11	October 2018	Umwelt (Australia) Pty Limited Mangoola Coal	Updated to incorporate additional offset area in Western Corridor to compensate for the removal of Crown Roads from Conservation Agreement areas. Addition of revegetation plans for 2019-2021.

Version	Date	Review team (consultation)	Change Summary
12	November 2018	DPE	BOMP approval.
13	September 2021	Mangoola Coal Umwelt (Australia) Pty Limited	Full review of document: Triennial update as required for PA 06_0014 requirements. Inclusion of SSD 8642 requirements, including commitments of the EIS. Update of description section of new BOAs (including long term security and key ecological values). Addition of new priority weeds. Inclusion of approval dates of CAs. New section on SSD 8642 credit retirement. Integration of rehabilitation planning for PA 06_0014 and SSD 8642. Update of proposed revegetation areas for next three year cycle. Change to monitoring frequency of nest boxes and translocated terrestrial orchids. Update of performance and completion criteria (with a focus on revegetation/regeneration areas). Inclusion of pre-clearing and tree-felling supervision sections. Inclusion of new monitoring locations (new BOAs, GDEs and rehabilitation). Change to new Glencore Management Plan template
14	December 2025	Mangoola Coal Eco Logical Australia	Full review of document: Update credit retirement details from 2024 reasonable equivalence and credit retirement Update details in accordance with new BSA's established 2024 Update on conditions of consent – removal of PA 06_0014 (surrendered) Addition of new priority weeds. Update to fauna monitoring methods and streamlined presentation of flora monitoring sites

Appendix A - Regulatory Consultation and Authority Correspondence

Stakeholder	Consultation Activities and form of Consultation	Matters Subject to Consultation	Actions Arising from consultation
Conservation Programs, Heritage & Regulation Group (CPHR) (a division of DCCEEW NSW)	Via the Major Projects Portal, email and letters	15 August 2025 – Mangoola submission of updated BOMPS via portal with consultation 15 September 2025 – CPHR RFI 18 September 2025 – Mangoola provision of requested information 10 October 2025 – Response from CPHR with BOMPS recommendations 31 October 2025 – Mangoola submit updated BOMPS via the portal and response to CPHR feedback	• CPHR recommends that similar weed cover targets are adopted for Mangoola Coal BOAs as to those described in Table 11-7 in Appendix E of the BOMPS for the Biodiversity Stewardship Sites. Update the BOMPS to demonstrate this. • The Annual Review from 2024 describes weed management activities. CPHR recommends that timing (dates), effort (person hours) and mapping (hectares) of such weed management activities be reported on in the Annual Review reporting. • Provide reasoning for the (above) changes noted in the BOMPS – Table 1.4, Chapter 5 and Appendix D of the BOMPS – addressed in correspondence.
BCS	Face to face meetings and email correspondence	Consultation with BCS regarding reasonable equivalencies for credit requirements	• Approved reasonable equivalence received for credits required by SSD 8642 Condition B53. Equivalent credits retired in accordance with SSD 8642 Condition B53 and EPBC 2018/8280 Condition 9. • Details provided within Section
BCS	Face to face meetings and email correspondence	Biodiversity Stewardship Sites were set up in consultation with BCS	• BSA's implemented in accordance with SSD 8642 Condition B54 and EPBC 2018/8280 Condition 10a.

Appendix B - Recommended Planting List

This recommended planting list applies to CAs and is not a complete species list of each vegetation community. Species have been selected based on their ability to be used in revegetation, such as success in direct seeding or nursery propagation. Flora species for each vegetation community have been selected from the Anvil Hill (Mangoola) EA (Umwelt 2006), MCCO Project Biodiversity Assessment Report (Umwelt 2019), vegetation surveys undertaken at Mangoola and surrounding areas and Vegetation of the Central Hunter (Peake 2006).

Due to seasonal variability affecting flowering and fruiting abundance, it is not considered realistic for the direct seeding mix or tube stock composition to include all of the species displayed in these tables, however the species composition for revegetation should be selected from the species displayed here. Additional information is provided for species that can be used in the secondary phase of revegetation, such as brush-matting or translocation.

The following abbreviations or symbols are used in the lists:

C3	Grass that establishes and undergoes active growth in Autumn/Winter/Spring (perennial adapted to cool conditions)
C4	Grass that establishes and or undergoes active growth in Spring/Summer/Autumn (perennial adapted to hot conditions)
X	Potential species for secondary (in-fill) planting/translocation that are not suitable for the primary planting
BR	Species suitable for brush-matting
T	Species suitable for translocation following the primary planting
subsp.	subspecies and
var.	variety

For growth forms, the following abbreviations are used (from Silvertsen 2009):

T	Tree Woody plant >2 m tall with a single stem or branches well above the base.
S	Shrub Woody plant, multi-stemmed at the base (or within 200 mm from ground level) or, if single stemmed, <2 m tall.
Z	Heath shrub usually <2 m tall, commonly with ericoid leaves (nanophyll or smaller categories).
G	Tussock grass Forms discrete but open tussocks usually with distinct individual shoots, or if not, then not forming a hummock, e.g. *Poa*.
V	Sedge Herbaceous, usually perennial, erect plants generally with a tufted habit and of the families Cyperaceae and Restionaceae.
R	Rush Herbaceous, usually perennial erect plants. Rushes are grouped in the families Juncaceae, Typhaceae, Restionaceae and the genus *Lomandra*.
F	Forb Herbaceous or slightly woody annual or sometimes perennial plant; not a grass.
E	Fern characterised by large usually branched leaves (fronds), herbaceous to arborescent and terrestrial to aquatic; spores in sporangia on leaves.
L	Vine Climbing, twining, winding or sprawling plant usually with a woody stem.

Common names used follow Harden (1992, 1993, 2000 & 2002) where available, and draw on other sources.

For consistency with PA 06_0014, listed below is a comparison of the original vegetation community names with their approximate PCT naming conventions.

Vegetation Community	Corresponding Plant Community Type
Bulloak Woodland	PCT 1692 – Bull Oak Grassy Woodland of the Central Hunter Valley
Coastal Myall Exposed Woodland	PCT 1612 – Narrow-leaved Ironbark - Grey Gum – Native Olive Woodland of the Central Hunter
Currawang Tall Woodland	PCT 1698 – Brown Bloodwood - Currawang - Caley's Ironbark Shrubby Woodland
Disturbed/Modified Native Grassland	NA
Drooping Sheoak Woodland	NA
Exotic Rushland	NA
Forest Redgum Riparian Woodland	PCT 1598 Forest Red Gum Grassy Open Forest on Floodplains of the Lower Hunter
Ironbark Woodland Complex	PCT 1691 – Narrow-leaved Ironbark –Grey Box Grassy Woodland of the Central and Upper Hunter)
Mixed Species Revegetation Plantation	NA
Paperbark Woodland	PCT 922 – Melaleuca decora Low Forest of the Central Hunter Valley, Sydney Basin Bioregion
Red Ash Sheltered Forest	NA
River Oak Riparian	PCT 485 River Oak Riparian Grassy Tall Woodland of the Western Hunter Valley)
Rough-barked Apple Woodland	PCT 1607 Blakely's Red Gum – Narrow-leaved Ironbark – Rough-barked Apple shrubby woodland of the upper Hunter)
Sheltered Grey Gum Woodland	PCT 621 - Grey Gum – Rough-barked Apple Alluvial Flat Woodland in the Upper Hunter Valley)
Slaty Box Woodland	PCT 1655 Grey Box – Slaty Box Shrub – Grass Woodland on Sandstone Slopes of Upper Hunter and Sydney Basin
Spotted Gum Open Forest	PCT 1602 – Spotted Gum - Narrow-leaved Ironbark Scrub - Grass Open Forest of the Central and Lower Hunter)
Swamp Oak Riparian Forest	PCT 1731 – Swamp Oak – Weeping Grass Grassy Riparian Forest of the Hunter Valley)
Tall Mixed Shrubland Complex	PCT 479 Narrow-leaved Ironbark- Black Cypress Pine - Stringybark +/- Grey Gum +/- Narrow-leaved Wattle Shrubby Open Forest on Sandstone Hills in the Southern Brigalow Belt South Bioregion and Sydney Basin Bioregion - Moderate to Good Condition
Weeping Myall Woodland	PCT 116 – Weeping Myall - Coobah - Scrub Wilga Shrubland of the Hunter Valley
Weeping Myall Woodland - Regenerating	PCT 116 – Weeping Myall - Coobah - Scrub Wilga Shrubland of the Hunter Valley

Table B1 - Table Numbers for Each Proposed Revegetation Community

Table Number	Planned Revegetation Community
Table 2	Ironbark Woodland Complex (PCT 1691)
Table 3	Slaty Box Woodland (PCT 1655)
Table 4	Forest Red Gum Riparian Woodland (PCT 621)
Table 5	Spotted Gum Open Forest (PCT 1602)
Table 6	Rough-barked Apple Woodland (PCT 1607)
Table 7	Swamp Oak Riparian Woodland (PCT 1731)
Table 8	River Red Gum Floodplain Woodland (PCT 42)
Table 9	Weeping Myall Woodland (PCT 116)

Table B2 - Ironbark Woodland Complex (PCT 1612)

Family/Subfamily	Scientific Name	Common Name	Composition (per cent)	Growth Form	Notes
Tree					
Myrtaceae	*Angophora floribunda*	rough-barked apple	2, BR	T	
	Eucalyptus blakelyi	Blakely's red gum	2, BR	T	
	Eucalyptus crebra	narrow-leaved ironbark	30, BR	T	
	Eucalyptus moluccana	grey box	20, BR	T	squirrel glider feed species
Low Tree					
Casuarinaceae	*Allocasuarina gymnanthera*		X	T	Glossy-black cockatoo foraging resource
	Allocasuarina luehmannii	bulloak	1, BR	T	Glossy-black cockatoo foraging resource
	Allocasuarina littoralis	black she-oak	0.5, BR	T	Glossy-black cockatoo foraging resource
Cupressaceae	*Callitris endlicheri*	black cypress pine	1, BR	T	
Fabaceae (Mimosoideae)	*Acacia implexa*	hickory wattle	1, BR	T	Squirrel glider resource
Malvaceae	*Brachychiton populneus* subsp. *populneus*	kurrajong	X	T	
Rubiaceae	*Psydrax odorata*	lamboto	1	T	Fleshy fruits
Shrub					
Asteraceae	*Cassinia arcuata*		X,BR	S	
	Cassinia quinquefaria	sifton bush	X, BR	S	
	Olearia elliptica	sticky daisy bush	2, BR	S	
	Ozothamnus diosmifolius	white dogwood	X, BR	S	
Chenopodiaceae	*Chenopodium melanocarpum*	Black crumbweed	0.25	S	

Family/Subfamily	Scientific Name	Common Name	Composition (per cent)	Growth Form	Notes
	Maireana microphylla	eastern cottonbush	1	S	
Dilleniaceae	*Hibbertia acicularis*		0.25	S	
	Hibbertia aspera	rough guinea flower	0.25	S	
	Hibbertia obtusifolia	hoary guinea flower	0.25	S	
Ericaceae (Epacridoideae)	*Melichrus urceolatus*	urn-heath	X	Z	
Fabaceae (Faboideae)	*Hardenbergia violacea*	false sarsaparilla	X	L	Nitrogen fixing
	Hovea lanceolata		X	S	Nitrogen fixing
	Swainsona galegifolia	smooth darling pea	X	F	Nitrogen fixing
	Templetonia stenophylla	leafy templetonia	0.25	S	Nitrogen fixing
Fabaceae (Mimosoideae)	*Acacia amblygona*	fan wattle	1, BR	S	Nitrogen fixing
	Acacia decora	western silver wattle	1, BR	S	Nitrogen fixing
	Acacia falcata	sickle wattle	0.5, BR	S	Nitrogen fixing, squirrel glider feed species
	Acacia implexa	hickory wattle	X	S	Nitrogen fixing , squirrel glider feed species
	Acacia paradoxa	kangaroo thorn	1, BR	S	Nitrogen fixing, squirrel glider feed species
	Acacia parvipinnula	silver-stemmed wattle	1, BR	S	Nitrogen fixing, squirrel glider feed species
	Acacia salicina	cooba	1, BR	T	Nitrogen fixing, squirrel glider feed species
Lamiaceae	*Teucrium juncea*	Bead bush	X	S	
Malvaceae	*Sida hackettiana*	golden rod	X, BR	S	
Scrophulariaceae	*Myoporum montanum*	western boobialla	1	T	

Family/Subfamily	Scientific Name	Common Name	Composition (per cent)	Growth Form	Notes
Oleaceae	*Notelaea microcarpa* var. *microcarpa*	native olive	1	T	
Phyllanthaceae	*Breynia oblongifolia*	coffee bush	0.5	S	
Pittosporaceae	*Bursaria spinosa* subsp. *spinosa*	blackthorn	2, BR	T	
Santalaceae	*Santalum lanceolatum*	Northern sandalwood	0.25	S	
Sapindaceae	*Dodonaea viscosa*	sticky hop-bush	1, BR	T	
Solanaceae	*Solanum brownii* or *Solanum cinereum*	nightshade	X, BR	S	
Groundcover					
Acanthaceae	*Brunoniella australis*	blue trumpet	0.25	F	
	Rostellularia adscendens	pink tongues	X	F	
Apiaceae	*Daucus glochidatus*	native carrot	X	F	
	Hydrocotyle laxiflora		X	F	
Anthericaceae	*Dichopogon fimbriatus* or *Dichopogon strictus*	nodding chocolate lily	0.25	F	
	Laxmannia gracilis	slender wire lily	0.25	F	
Asparagaceae	*Arthropodium milleflorum*	vanilla lily	0.25	F	
Asteraceae	*Brachyscome ciliaris*		X	F	
	Calocephalus citreus	lemon beauty heads	X	F	
	Calotis lappulacea	yellow burr-daisy	1, BR	F	
	Chrysocephalum apiculatum or *Chrysocephalum semipapposum*	yellow buttons	1, BR	F	
	Cymbonotus lawsonianus		X	F	

Family/Subfamily	Scientific Name	Common Name	Composition (per cent)	Growth Form	Notes
	Euchiton gymnocephalus	creeping cudweed	X	F	
	Glossocardia bidens	cobblers tack	X	F	
	Leptorhynchus squamatus	Scaly buttons	X	F	
	Sigesbeckia orientalis	Indian weed	0.25	F	
	Vittadinia cervicularis or *Vittadinia cuneata* or *Vittadinia sulcata*	fuzzweed	1, BR	F	
	Vernonia cinerea		0.25	F	
Campanulaceae	*Wahlenbergia communis* or *Wahlenbergia gracilis* pr *Wahlenbergia stricta*	bluebell	0.25	F	
Chenopodiaceae	*Einadia hastata* or *Einadia nutans (*subsp. *nutans* or *linifolia)* or *Einadia trigonos*	saltbush	1, T	F	
Commelinaceae	*Commelina cyanea*	native wandering Jew	X	F	
Convolvulaceae	*Dichondra repens*	kidney weed	X, T	F	
	Convolvulus erubescens	pink bindweed	X	F	
	Convolvulus alsinoides var. *decumbens*		X	F	
Cyperaceae	*Cyperus gracilis*		0.25	V	
	Fimbristylis dichotoma		X	V	
Fabaceae (Faboideae)	*Desmodium rhytidophyllum*		0.25	L	
	Desmodium varians		0.25	L	
	Glycine tabacina		0.25	L	
Geraniaceae	*Geranium solanderi*	native geranium	X	F	

Family/Subfamily	Scientific Name	Common Name	Composition (per cent)	Growth Form	Notes
Goodeniacea	*Goodenia hederaceae* subsp. *hederaceae*		X	F	
	Goodenia heterophylla subsp. *heterophylla*		X	F	
Lamiaceae	*Mentha satureioides*		X	F	
Lobeliaceae	*Lobelia purpurascens*	white root	0.25	F	
Lomandraceae	*Lomandra filiformis* subsp. *filiformis*	wattle matt-rush	1, T	R	
	Lomandra longifolia		X	R	
	Lomandra multiflora subsp. *multiflora*	many-flowered mat-rush	1, T	R	
Malvaceae	*Sida corrugata*		0.25	F	
Oxalidaceae	*Oxalis perennans*		X	F	
Phormiaceae	*Dianella caerulea* var. *caerulea*	blue-flax-lily	0.5	F	
	Dianella revoluta		X	F	
Plantaginaceae	*Plantago debilis*		0.25	F	
	Plantago varia		X	F	
Poaceae	*Aristida leichhardtiana* or *Aristida personata* or *Aristida ramosa* or *Aristida vagans*	wiregrass	3, BR	G	C4
	Rytidosperma fulva or *Rytidosperma setaceum* *or* *Rytidosperma richardsonii*	wallaby grass	1, BR	G	
	Austrostipa scabra var. *scabra*	speargrass	1, BR	G	C3
	Austrostipa verticillata	slender bamboo grass	1, BR	G	C3

Family/Subfamily	Scientific Name	Common Name	Composition (per cent)	Growth Form	Notes
	Bothriochloa decipiens or *Bothriochloa macra*		2, BR	G	C4
	Chloris ventricosa or *Chloris truncata*	chloris	1, BR	G	C4
	Cymbopogon refractus	barbed wire grass	1, BR	G	C4
	Dichanthium sericeum	Queensland bluegrass	1, BR	G	C4
	Digitaria diffusa	open summer-grass	1, BR	G	C4
	Echinopogon caespitosus	bushy hedgehog-grass	1, BR	G	C3
	Eragrostis brownii or *Eragrostis parviflora* or *Eragrostis leptostachya*	lovegrass	1, BR	G	C4
	Eriochloa pseudoacrotricha	early spring grass	X	G	C4
	Microlaena stipoides var. *stipoides*	weeping grass	1, BR	G	C3
	Panicum effusum	two-colour panic	1, BR	G	C4
	Sporobolus creber	slender rats tail grass	1, BR	G	C4
Phyllanthaceae	*Phyllanthus virgatus*		0.25	F	
Pteridaceae	*Cheilanthes sieberi*	poison rock fern	0.25	E	
	Cheilanthes distans	bristly cloak fern	0.25	E	
Rubiaceae	*Asperula conferta*	Common woodruff	0.25	F	
Scrophulariaceae	*Eremophila debilis*	winter apple	0.25	S	
Stackhousiaceae	*Stackhousia viminea*		X	F	

Table B3 - Slaty Box Woodland (PCT 1655)

Family/Subfamily	Scientific Name	Common Name	Composition (per cent)	Growth Form	Notes
Tree					
Malvaceae	*Brachychiton populneus*	kurrajong	X	T	
Myrtaceae	*Eucalyptus crebra*	grey box	5, BR	T	
	Eucalyptus dawsonii	slaty box	70, BR	T	
	Eucalyptus moluccana	narrow-leaved ironbark	3, BR	T	squirrel glider feed species
Low Tree					
Casuarinaceae	*Allocasuarina luehmannii*	bulloak	1, BR	T	Glossy-black cockatoo foraging resource
Cupressaceae	*Callitris endlicheri*	black cypress pine	0.25, BR	T	
Fabaceae (Mimosoideae)	*Acacia binervia*	coast myall	0.25	T	Nitrogen fixing, squirrel glider feed species
	Acacia implexa	hickory wattle	0.25, BR	T	Nitrogen fixing, squirrel glider feed species
Rutaceae	*Geijera salicifolia*	brush wilga	0.5	T	Fleshy fruits
Shrub					
Asteraceae	*Cassinia quinquefaria*	sifton bush	X, BR	S	
	Olearia elliptica	sticky daisy bush	0.5, BR	S	
	Ozothamnus diosmifolius	white dogwood	X, BR	S	
Chenopodiaceae	*Maireana microphylla*	small-leaf bluebush	X	S	
	Sclerolaena muricata	black rolypoly	X	S	
Fabaceae (Faboideae)	*Daviesia genistifolia*	broom bitter pea	X	S	Nitrogen fixing
	Templetonia stenophylla	leafy templetonia	X	S	Nitrogen fixing
	Acacia amblygona	fan wattle	0.25, BR	S	Nitrogen fixing

Family/Subfamily	Scientific Name	Common Name	Composition (per cent)	Growth Form	Notes
Fabaceae (Mimosoideae)	*Acacia decora*	western silver wattle	0.5, BR	S	Nitrogen fixing, squirrel glider feed species
	Acacia falcata		0.25, BR	S	Nitrogen fixing, squirrel glider feed species
	Acacia salicina	cooba	0.5, BR	T	Nitrogen fixing, squirrel glider feed species
Lamiaceae	*Teucrium juncea*	Bead bush	X	S	
Malvaceae	*Sida corrugata* or *Sida hackettiana*	sida	X, BR	S	
Scrophulariaceae	*Myoporum montanum*	western boobialla	0.5	T	Fleshy fruits
Phyllanthaceae	*Breynia oblongifolia*	coffee bush	0.5	S	
Pittosporaceae	*Bursaria spinosa* subsp. *spinosa*	blackthorn	0.5, BR	T	
Solanaceae	*Solanum brownii* or *Solanum cinereum*	nightshade	X, BR	S	
Groundcover					
Acanthaceae	*Brunoniella australis*	blue trumpet	0.25	F	
Anthericaceae	*Dichopogon fimbriatus* or *Dichopogon strictus*	nodding chocolate lily	X	F	
	Laxmannia gracilis	slender wire lily	X	F	
Apiaceae	*Daucus glochidatus*	native carrot	X	F	
Asparagaceae	*Arthropodium milleflorum*	vanilla lily	0.25	F	
Asteraceae	*Calotis lappulacea*	yellow burr-daisy	0.5, BR	F	

Family/Subfamily	Scientific Name	Common Name	Composition (per cent)	Growth Form	Notes
	Chrysocephalum apiculatum or *Chrysocephalum semipapposum*	yellow buttons	0.5, BR	F	
	Euchiton gymnocephalus	creeping cudweed	X	F	
	Vittadinia cervicularis or *Vittadinia cuneata* or *Vittadinia sulcata*	fuzzweed	1, BR	F	
Campanulaceae	*Wahlenbergia communis* or *Wahlenbergia gracilis*	bluebell	0.25	F	
Chenopodiaceae	*Einadia hastata* or *Einadia nutans*	saltbush	0.5,T	F	
Convolvulaceae	*Dichondra repens*	kidney weed	X, T	F	
Cyperaceae	*Cyperus gracilis*		0.25	V	Low-lying areas
	Fimbristylis dichotoma		X	V	Low-lying areas
	Gahnia aspera	rough saw-sedge	0.25	V	
Fabaceae (Faboideae)	*Desmodium brachypodum*	large tick trefoil	X	L	Nitrogen fixing
	Desmodium rhytidophyllum		0.25	L	Nitrogen fixing
	Glycine clandestina		X	L	Nitrogen fixing
	Glycine tabacina		X	L	Nitrogen fixing
	Glycine latifolia		0.25	L	Nitrogen fixing
	Hardenbergia violacea		0.25	L	Nitrogen fixing
Goodeniaceae	*Goodenia hederaceae* var. *hederaceae*		X	F	
Lomandraceae	*Lomandra filiformis* subsp. *filiformis*	wattle matt-rush	1, BR	R	
	Lomandra multiflora subsp. *multiflora*	many-flowered mat-rush	0.5, BR	R	
Malvaceae	*Sida corrugata*	corrugated sida	X	F	

Family/Subfamily	Scientific Name	Common Name	Composition (per cent)	Growth Form	Notes
Phormiaceae	*Dianella caerulea* var. *caerulea*	blue-flax-lily	0.25	F	
Phyllanthaceae	*Phyllanthus virgatus*		X	F	
Plantaginaceae	*Plantago varia*		X	F	
Poaceae	*Aristida leichhardtiana* or *Aristida personata* or *Aristida ramosa*	wiregrass	2, BR	G	C4
	Rytidosperma fulva	wallaby grass	1, BR	G	C3
	Rytidosperma bigeniculata		X	G	C3
	Austrostipa scabra var. *scabra*	speargrass	0.5, BR	G	C3
	Austrostipa verticillata	slender bamboo grass	0.25, BR	G	C3
	Bothriochloa decipiens or *Bothriochloa macra*		1, BR	G	C4
	Chloris ventricosa or *Chloris truncata*	chloris	0.5, BR	G	C4
	Cymbopogon refractus	barbed wire grass	0.5, BR	G	C4
	Dichanthium sericeum	Queensland bluegrass	0.5, BR	G	C4
	Digitaria diffusa	open summer-grass	0.5, BR	G	C4
	Echinopogon caespitosus	bushy hedgehog-grass	0.5, BR	G	C3
	Eragrostis brownii or *Eragrostis parviflora*	lovegrass	0.5, BR	G	C4
	Microlaena stipoides var. *stipoides*	weeping grass	0.5, BR	G	C3
	Panicum effusum	two-colour panic	0.25, BR	G	C4

Family/Subfamily	Scientific Name	Common Name	Composition (per cent)	Growth Form	Notes
	Paspalidium distans		0.25	G	
	Sporobolus creber	slender rats tail grass	1, BR	G	C4
Polygonaceae	*Rumex brownii*	swamp dock	X	F	Low-lying areas
Pteridaceae	*Cheilanthes sieberi*	poison rock fern	0.25	E	
	Cheilanthes distans	bristly cloak fern	0.25	E	
Scrophulariaceae	*Eremophila debilis*	amulla	0.25	S	
Solanaceae	*Solanum esuriale*	quena	X	F	Fleshy fruits
Stackhousiaceae	*Stackhousia viminea*	Slender stackhousia	X	F	

Table 4 - Forest Red Gum Riparian Woodland (PCT 621)

Family/Subfamily	Scientific Name	Common Name	Composition (per cent)	Growth Form	Notes
Tree					
Myrtaceae	*Angophora floribunda*	rough-barked apple	15, BR	T	
	Corymbia maculata	spotted gum	X	T	squirrel glider feed species
	Eucalyptus crebra	narrow-leaved ironbark	X	T	
	Eucalyptus tereticornis	forest red gum	40, BR	T	squirrel glider and koala feed species
Low Tree					
Rhamnaceae	*Alphitonia excelsa*	red ash	2, BR	T	
Shrub					
Fabaceae (Faboideae)	*Daviesia ulicifolia*	gorse bitter pea	X	S	Nitrogen fixing
	Jacksonia scoparia	dogwood	X	S	Nitrogen fixing
Fabaceae (Mimosoideae)	*Acacia implexa*	hickory wattle	2, BR	T	Nitrogen fixing, squirrel glider feed species

Family/Subfamily	Scientific Name	Common Name	Composition (per cent)	Growth Form	Notes
	Acacia parvipinnula	silver-stemmed wattle	5, BR	S	Nitrogen fixing, squirrel glider feed species
	Acacia salicina	cooba	1, BR	T	Nitrogen fixing, squirrel glider feed species
Malvaceae	*Brachychiton populneus* subsp. *populneus*	kurrajong	X	T	
	Sida hackettiana	sida	X, BR	S	
Scrophulariaceae	*Myoporum montanum*	western boobialla	2	T	Fleshy fruits
Myrtaceae	*Melaleuca thymifolia*	thyme honey-myrtle	4, BR	S	Nectar resource
Phyllanthaceae	*Breynia oblongifolia*	coffee bush	X	S	Fleshy fruits
Pittosporaceae	*Billardiera scandens*	hairy apple berry	X	S	Fleshy fruits
	Bursaria spinosa subsp. *spinosa*	blackthorn	3, BR	T	
Proteaceae	*Persoonia linearis*	narrow-leaved geebung	X	S	Fleshy Fruits
Rosaceae	*Rubus parvifolius*	native raspberry	X	S	Fleshy fruits
Solanaceae	*Solanum brownii* or *Solanum cinereum*	nightshade	X, BR	S	
Groundcover					
Acanthaceae	*Brunoniella australis*	blue trumpet	0.25	F	
Asteraceae	*Calotis lappulacea*	yellow burr-daisy	1, BR	F	
	Chrysocephalum apiculatum or *Chrysocephalum semipapposum*	yellow buttons	1, BR	F	
	Lagenifera stipitata		X	F	
	Vittadinia cervicularis or *Vittadinia cuneata* or *Vittadinia sulcata*	fuzzweed	1, BR	F	

Family/Subfamily	Scientific Name	Common Name	Composition (per cent)	Growth Form	Notes
	Vernonia cinerea		X	V	
Campanulaceae	*Wahlenbergia communis* or *Wahlenbergia gracilis*	tufted bluebell	0.25	F	
Chenopodiaceae	*Einadia hastata* or *Einadia nutans*	saltbush	1, T	F	
Convolvulaceae	*Dichondra repens*	kidney weed	X, T	F	
Cyperaceae	*Carex appressa*	tall sedge	0.5, BR	V	
	Gahnia clarkei	tall saw-sedge	0.5, BR	V	
	Lepidosperma laterale	variable saw-sedge	1, BR	V	Low-lying areas
Fabaceae (Faboideae)	*Glycine clandestina*		X	L	Nitrogen fixing
	Desmodium varians		X	L	Nitrogen fixing
Juncaceae	*Juncus australis* or *Juncus continuus* or *Juncus filicaulis*		1	R	Low-lying areas
Lobeliaceae	*Lobelia purpurascens*	whiteroot	X, T	F	
Lomandraceae	*Lomandra longifolia*		X	R	
	Lomandra multiflora subsp. *multiflora*	many-flowered mat-rush	1, BR	R	
Malvaceae	*Sida corrugata*		X, BR	F	
Phormiaceae	*Dianella caerulea* var. *caerulea*	blue-flax-lily	0.5	F	
Poaceae	*Aristida leichhardtiana* or *Aristida personata* or *Aristida ramosa*		2, BR	G	C4
	Rytidosperma richardsonii	wallaby grass	0.5, BR	G	C3
	Austrostipa verticillata	slender bamboo grass	1, BR	G	C3

Family/Subfamily	Scientific Name	Common Name	Composition (per cent)	Growth Form	Notes
	Bothriochloa decipiens or *Bothriochloa macra*		1, BR	G	C4
	Chloris ventricosa or *Chloris truncata*	tall chloris	1, BR	G	C4
	Cymbopogon refractus	barbed wire grass	0.25, BR	G	C4
	Dichanthium sericeum	Queensland bluegrass	1, BR	G	C4
	Echinopogon caespitosus	bushy hedgehog-grass	0.5, BR	G	C3
	Eragrostis brownii or *Eragrostis parviflora*	lovegrass	0.5, BR	G	C4
	Entolasia stricta		0.25, BR	G	
	Eriochloa pseudoacrotricha	early spring grass	0.5, BR	G	C4
	Microlaena stipoides var. *stipoides*	weeping grass	2, BR, T	G	C3
	Panicum simile	two-colour panic	1, BR	G	C4
Pteridaceae	*Cheilanthes sieberi*	poison rock fern	0.25	E	
Rubiaceae	*Pomax umbellata*		X	F	
Plantaginaceae	*Veronica plebeia*	trailing speedwell	X	F	

Table 5 - Spotted Gum Open Forest (PCT 1602)

Family/Subfamily	Scientific Name	Common Name	Composition (per cent)	Growth Form	Notes
Tree					
Myrtaceae	*Eucalyptus blakelyi*	Blakely's red gum	3, BR	T	
	Eucalyptus crebra	narrow-leaved ironbark	8, BR	T	
	Eucalyptus moluccana	grey box	3, BR	T	squirrel glider feed species
	Corymbia maculata	spotted gum	50, BR	T	squirrel glider feed species
Low Tree					
Casuarinaceae	*Allocasuarina luehmannii*	bulloak	X	T	Glossy-black cockatoo foraging resource
Cupressaceae	*Callitris endlicheri*	black cypress pine	1, BR	T	
Shrub					
Asteraceae	*Cassinia quinquefaria*	sifton bush	X, BR	S	
	Olearia elliptica	sticky daisy bush	1, BR	S	
	Ozothamnus diosmifolius	white dogwood	X, BR	S	
Dilleniaceae	*Hibbertia acicularis*		X	S	
	Hibbertia obtusifolia	hoary guinea flower	0.25	S	
Ericaceae (Epacridoideae)	*Melichrus urceolatus*	urn-heath	X	Z	
Fabaceae (Faboideae)	*Hardenbergia violacea*	false sarsaparilla	X	V	Nitrogen fixing
	Hovea lanceolata		X, BR	S	Nitrogen fixing
	Indigofera ausralis	Australian indigo	X	S	Nitrogen fixing
	Daviesia ulicifolia	gorse bitter pea	0.5, BR	S	Nitrogen fixing
	Pultenaea microphylla	spreading bush-pea	X	S	Nitrogen fixing

Family/Subfamily	Scientific Name	Common Name	Composition (per cent)	Growth Form	Notes
	Templetonia stenophylla	leafy templetonia	X	S	
Fabaceae (Mimosoideae)	*Acacia amblygona*	fan wattle		S	Nitrogen fixing
	Acacia decora	western silver wattle	1, BR	S	Nitrogen fixing, squirrel glider feed species
	Acacia falcata	sickle wattle	1, BR	S	Nitrogen fixing, squirrel glider feed species
	Acacia paradoxa	kangaroo thorn	1, BR	S	Nitrogen fixing, squirrel glider feed species
	Acacia parvipinnula	silver-stemmed wattle	0.25, BR	S	Nitrogen fixing, squirrel glider feed species
Malvaceae	*Sida hackettiana*	sida	X, BR	S	
Oleaceae	*Notelaea microcarpa* var. *microcarpa*			S	Fleshy fruits
Myrtaceae	*Kunzea ambigua*	tick bush	X	S	
Phyllanthaceae	*Phyllanthus gunnii*		X	S	
	Phyllanthus hirtellus		X	S	
	Phyllanthus virgatus		0.25	S	
Pittosporaceae	*Bursaria spinosa* subsp. *spinosa*	blackthorn	2, BR	T	
Proteaceae	*Persoonia linearis*	narrow-leaved geebung	X	S	Fleshy fruits
Sapindaceae	*Dodonaea viscosa*	sticky hop-bush	1, BR	T	Nectar resource
Scrophulariaceae	*Myoporum montanum*	water bush	X	S	Fleshy fruits
Solanum	*Solanum prinophyllum*		X	F	
Groundcover					
Acanthaceae	*Brunoniella australis*	blue trumpet	X	F	
Anthericaceae	*Dichopogon fimbriatus* or *Dichopogon strictus*	nodding chocolate lily	0.25	F	

Family/Subfamily	Scientific Name	Common Name	Composition (per cent)	Growth Form	Notes
	Laxmannia gracilis	slender wire lily	0.25	F	
Asparagaceae	*Arthropodium milleflorum*	vanilla lily	0.25	F	geophyte
Asteraceae	*Brachycome multifida*		X	F	
	Calotis lappulacea	yellow burr-daisy	2, BR	F	
	Chrysocephalum apiculatum or *Chrysocephalum semipapposum*	yellow buttons	2, BR	F	
	Galium leptogonium		X	F	
	Leptorhynchus squamatus	scaly buttons	X	F	
	Vittadinia cervicularis or *Vittadinia cuneata* or *Vittadinia sulcata*	fuzzweed	1, BR	F	
Campanulaceae	*Wahlenbergia communis* or *Wahlenbergia gracilis*	bluebell	0.25	F	
Chenopodiaceae	*Einadia hastata* or *Einadia nutans*	saltbush	0.5,T	F	
Commelinaceae	*Commelina cyanea*	native wandering Jew	X	F	
Convolvulaceae	*Dichondra repens*	kidney weed	X, T	F	
Fabaceae (Faboideae)	*Bossiaea prostrata*		X	F	
	Glycine clandestina		X	L	Nitrogen fixing
	Glycine microphylla		X	L	Nitrogen fixing
	Glycine tabacina		X	L	Nitrogen fixing
	Desmodium brachypodum		X	L	Nitrogen fixing
	Desmodium rhytidophyllum		0.5	L	Nitrogen fixing
	Desmodium varians		X	L	Nitrogen fixing
	Hardenbergia violacea	false sarsaparilla	X	L	Nitrogen fixing

Family/Subfamily	Scientific Name	Common Name	Composition (per cent)	Growth Form	Notes
Goodeniaceae	*Goodenia hederacea*	forest goodenia	X	F	
	Goodenia heterophylla subsp. *heterophylla*		X		
Lamiaceae	*Ajuga australis*	austral bugle	X	F	
Lobeliaceae	*Lobelia purpurascens*	white root		F	
Lomandraceae	*Lomandra filiformis* subsp. *filiformis*	wattle matt-rush	1, BR	R	
	Lomandra multiflora subsp. *multiflora*	many-flowered mat-rush	1, BR	R	
Malvaceae	*Sida corrugata*	sida	X, BR	F	
Scrophulariaceae	*Eremophila debilis*	amulla	0.5	S	
Oxalidaceae	*Oxalis chnoodes*			F	
	Oxalis exilis			F	
	Oxalis perennans		X	F	
Phormiaceae	*Dianella caerulea* var. *caerulea*	blue-flax-lily	0.5	F	
Plantaginaceae	*Plantago debilis*		X	F	
Poaceae	*Aristida leichhardtiana* or *Aristida personata* or *Aristida ramosa*		3, BR	G	C4
	Austrostipa scabra var. *scabra*	speargrass	3, BR	G	C3
	Rytidosperma fulva or *Rytidosperma richardsonii* or *Rytidosperma setaceum* or *Rytidosperma tenuoir*	wallaby grass	3, BR	G	C3
	Bothriochloa decipiens or *Bothriochloa macra*		0.5, BR	G	C4

Family/Subfamily	Scientific Name	Common Name	Composition (per cent)	Growth Form	Notes
	Chloris ventricosa or *Chloris truncata*	chloris	0.5, BR	G	C4
	Cymbopogon refractus	barbed wire grass	1, BR	G	C4
	Dichanthium sericeum	Queensland bluegrass	0.5, BR	G	C4
	Digitaria diffusa	open summer-grass	0.5, BR	G	C4
	Entolasia stricta	wiry panic	1, BR	G	
	Eragrostis brownii or *Eragrostis parviflora*	lovegrass	0.5, BR	G	C4
	Microlaena stipoides var. *stipoides*	weeping grass	0.25, BR	G	C3
	Panicum effusum		0.25, BR	G	C4
	Sporobolus creber	slender rats tail grass	1, BR	G	C4
	Themeda triandra	kangaroo grass	1, BR	G	C4
Rubiaceae	*Opercularia diphylla*	stinkweed	X	F	
Scrophulariaceae	*Eremophila debilis*	Winter apple	X	S	
Stackhousiaceae	*Stackhousia viminea*	slender stackhousia	X	F	

Table 6 - Rough-barked Apple Woodland (PCT 1691)

Family/Subfamily	Scientific Name	Common Name	Composition (per cent)	Growth Form	Notes
Tree					
Myrtaceae	*Angophora floribunda*	rough-barked apple	40, BR	T	
	Eucalyptus blakelyi	Blakely's red gum	2,BR	T	
	Eucalyptus crebra	grey box	10, BR	T	
	Eucalyptus dawsonii	slaty box	2, BR	T	
	Eucalyptus tereticornis	forest red gum	10, BR	T	squirrel glider and koala feed species
Low Tree					
Casuarinaceae	*Allocasuarina luehmannii*	bulloak	2, BR	T	Glossy-black cockatoo foraging resource
Shrub					
Fabaceae (Mimosoideae)	*Acacia implexa*	hickory wattle	1, BR	T	Nitrogen fixing, squirrel glider feed species
	Acacia parvipinnula	silver-stemmed wattle	1, BR	S	Nitrogen fixing, squirrel glider feed species
	Acacia salicina	cooba	1, BR	T	Nitrogen fixing, squirrel glider feed species
Oleaceae	*Notelaea microcarpa*	mock olive	X	S	Fleshy fruits
Malvaceae	*Sida hackettiana*	sida	X, BR	S	
Scrophulariaceae	*Myoporum montanum*	western boobialla	1		Fleshy fruits
Phyllanthaceae	*Phyllantus virgatus*	wiry spurge	X	S	
Pittosporaceae	*Bursaria spinosa* subsp. *spinosa*	blackthorn	1, BR		
Rosaceae	*Rubus parvifolius*	native raspberry	X		Fleshy fruits
Sapindaceae	*Dodonaea viscosa*	sticky hop-bush	1, BR		Nectar resource
Solanaceae	*Solanum brownii* or *Solanum cinereum*	nightshade	X, BR		

Family/Subfamily	Scientific Name	Common Name	Composition (per cent)	Growth Form	Notes
Groundcover					
Anthericaceae	*Dichopogon fimbriatus* or *Dichopogon strictus*	nodding chocolate lily	0.25	F	
	Laxmannia gracilis	slender wire lily	0.25	F	
Asparagaceae	*Arthropodium milleflorum*	vanilla lily	0.25	F	
Asteraceae	*Calotis lappulacea*	yellow burr-daisy	1, BR		
	Chrysocephalum apiculatum or *Chrysocephalum semipapposum*	yellow buttons	1, BR		
	Vittadinia cervicularis or *Vittadinia cuneata* or *Vittadinia sulcata*	fuzzweed	1, BR		
Campanulaceae	*Wahlenbergia communis* or *Wahlenbergia gracilis*	bluebell	0.25	F	
Chenopodiaceae	*Einadia hastata* or *Einadia nutans*	saltbush	0.5, T	F	
	Enchylaena tomentosa	ruby saltbush	X	F	
Commelinaceae	*Commelina cyanea*	native wandering Jew	0.5	F	
Convolvulaceae	*Dichondra repens*	kidney weed	X, T	F	
Fabaceae (Faboideae)	*Glycine microphylla*		X	L	
Juncaceae	*Juncus australis* or *Juncus continuus* or *Juncus filicaulis*		1	R	Low-lying areas

Family/Subfamily	Scientific Name	Common Name	Composition (per cent)	Growth Form	Notes
Lomandraceae	*Lomandra longifolia*		1,BR	R	
	Lomandra multiflora subsp. *multiflora*	many-flowered mat-rush	1, BR	R	
Malvaceae	*Sida corrugata*	sida	X, BR	F	
Oxalidaceae	*Oxalis perennans*		X	F	
Phormiaceae	*Dianella caerulea* var. *caerulea*	blue-flax-lily	0.5	F	
Poaceae	*Aristida leichhardtiana* or *Aristida personata* or *Aristida ramosa* or *Aristida vagans*	purple wire-grass	4, BR	G	C4
	Rytidosperma richardsonii	wallaby grass	1, BR	G	C3
	Austrostipa scabra subsp. *falcata* or *Austrostipa verticillata*	slender bamboo grass	3, BR	G	C3
	Chloris ventricosa or *Chloris truncata*	chloris	2, BR	G	C4
	Cymbopogon refractus	Barbed wire grass	1, BR	G	C4
	Dichanthium sericeum	Queensland bluegrass	1, BR	G	C4
	Echinopogon caespitosus	bushy hedgehog-grass	0.5, BR	G	C3
	Eragrostis brownii or *Eragrostis parviflora*	lovegrass	0.5, BR	G	C4
	Eriochloa pseudoacrotricha	early spring grass	0.5, BR	G	C4
	Microlaena stipoides var. *stipoides*	weeping grass	4, BR	G	C3
	Panicum simile	two-colour panic	1, BR	G	C4
Pteridaceae	*Cheilanthes sieberi*	poison rock fern	X	E	
Rubiaceae	*Pomax umbellata*	pomax	X	F	

Table 7 - Swamp Oak Riparian Woodland (PCT 1731)

Family/Subfamily	Scientific Name	Common Name	Composition (per cent)	Growth Form	Notes
Tree					
Casuarinaceae	*Casuarina glauca*	swamp oak	70, BR	T	Glossy-black cockatoo foraging resource
Myrtaceae	*Angophora floribunda*	rough-barked apple	3, BR	T	
	Eucalyptus tereticornis	forest red gum	3, BR	T	squirrel glider and koala feed species
Shrub					
Fabaceae (Mimosoideae)	*Acacia implexa*	hickory wattle	1, BR	T	Nitrogen fixing, squirrel glider feed species
	Acacia parvipinnula	silver-stemmed wattle	1, BR	S	Nitrogen fixing, squirrel glider feed species
	Acacia salicina	cooba	1, BR	T	Nitrogen fixing, squirrel glider feed species
Lamiaceae	*Plecvtranthus parviflorus*	Cockspur flower	X	S	
Scrophulariaceae	*Myoporum montanum*	western boobialla	1	T	Fleshy fruit
Phyllanthaceae	*Breynia oblongifolia*	coffee bush	X	S	
Pittosporaceae	*Bursaria spinosa* subsp. *spinosa*	blackthorn	1, BR	T	
Rosaceae	*Rubus parvifolius*	native raspberry	X	S	Fleshy fruit
Solanaceae	*Solanum brownii* or *cinereum* or *prinophyllum*	nightshade	X, BR	S	

Family/Subfamily	Scientific Name	Common Name	Composition (per cent)	Growth Form	Notes
Groundcover					
Acanthaceae	*Brunoniella australis*	blue trumpet	0.25	F	
Amaranthaceae	*Alternanthera denticulata*		X	F	
Apiaceae	*Centella asiatica*		X	F	
Araliaceae	*Hydrocotyle sibthorpioides*		X	F	Low-lying areas
Apocynaceae	*Parsonsia stramineae*	monkey rope	X	L	
Commelinaceae	*Commelina cyanea*		X	F	
Campanulaceae	*Wahlenbergia communis* or *Wahlenbergia gracilis*	bluebell	1	F	
Chenopodiaceae	*Einadia hastata* or *Einadia nutans* or *Einadia trigonos*	saltbush	1, T	F	
Convolvulaceae	*Dichondra repens*	kidney weed	X, T	F	
Cyperaceae	*Carex appressa*	tall sedge	1, BR	V	Low-lying areas
	Carex inversa			V	Low-lying areas
	Gahnia clarkei	tall saw-sedge	1, BR	V	sedge
Juncaceae	*Juncus australis* or *Juncus continuus* or *Juncus filicaulis* *Or* *Juncus usitatus*		1	R	Low-lying areas
Lomandraceae	*Lomandra longifolia*		X	R	
	Lomandra multiflora subsp. *multiflora*		X	R	
Oxalidaceae	*Oxalis perennans*		X	F	

Family/Subfamily	Scientific Name	Common Name	Composition (per cent)	Growth Form	Notes
Phormiaceae	*Dianella caerulea* var. *caerulea*	blue-flax-lily	0.5	F	
Poaceae	*Aristida leichhardtiana* or *Aristida personata* or *Aristida ramosa*	wiregrass	1, BR	G	C4
	Austrostipa verticillata	slender bamboo grass	3, BR	G	C3
	Echinopogon caespitosus	bushy hedgehog-grass	1, BR	G	C3
	Microlaena stipoides var. *stipoides*	weeping grass	3, BR	G	C3
	Panicum simile	two-colour panic	1, BR	G	C4
	Phragmites australis	common reed	3	G	C3, Low-lying areas
Polygonaceae	*Rumex brownii*		X	S	Low-lying areas
Pteridaceae	*Adiantum aethiopicum*	Maidenhair fern	X	E	
	Cheilanthes sieberi	poison rock fern	0.25	E	
	Cheilanthes distans	bristly cloak fern	0.25	E	
Ranunculaceae	*Clematis glycinoides*	headache vine	X	E	
Rosaceae	*Rubus parvifolius*		X	L	
Typhaceae	*Typha orientalis*	cumbungi		R	Low-lying areas

Table 8 - River Red Gum Floodplain Woodland (PCT 42)

Family/Subfamily	Scientific Name	Common Name	Composition (per cent)	Growth Form	Notes
Tree					
Myrtaceae	*Angophora floribunda*	rough-barked apple	5, BR	T	
	Eucalyptus camaldulensis	river red gum	25, BR	T	Koala feed tree
	Eucalyptus crebra	narrow-leaved ironbark	2, BR	T	
	Eucalyptus melliodora	yellow box	15, BR	T	
	Eucalyptus tereticornis	forest red gum	5, BR	T	squirrel glider feed species
Low Tree					
Casuarinaceae	*Casuarina glauca*	swamp oak	X	T	Glossy-black cockatoo foraging resource
Shrub					
Fabaceae (Mimosoideae)	*Acacia implexa*	hickory wattle	0.5, BR	T	Nitrogen fixing, squirrel glider feed species
	Acacia salicina	cooba	0.5, BR	T	Nitrogen fixing, squirrel glider feed species
Malvaceae	*Sida hackettiana*	golden rod	X, BR	S	
Scrophulariaceae	*Myoporum montanum*	western boobialla	1	T	Fleshy fruits
Pittosporaceae	*Bursaria spinosa* subsp. *spinosa*	blackthorn	2, BR	T	
Solanaceae	*Solanum brownii* or *Solanum cinereum*	violet nightshade or Narrawa burr	X, BR	S	
Ground Cover					
Amaranthaceae	*Alternanthera denticulata*		X	F	
Asteraceae	*Calotis lappulacea*	yellow burr-daisy	2, BR	F	
	Chrysocephalum apiculatum or *Chrysocephalum semipapposum*	yellow buttons	2, BR	F	

Family/Subfamily	Scientific Name	Common Name	Composition (per cent)	Growth Form	Notes
	Vittadinia cervicularis or *Vittadinia cuneata* or *Vittadinia sulcata*	fuzzweed	2, BR	F	
Boraginaceae	*Cynoglossum australe*		X	F	
Brassicaceae	*Lepidium pseudohyssopifolium*		X	F	
Campanulaceae	*Wahlenbergia communis* or *Wahlenbergia gracilis*	bluebell	1	F	
Chenopodiaceae	*Einadia hastata* or *Einadia nutans* or *Einadia trigonos*	saltbush	3, T	F	
Commelinaceae	*Commelina cyanea*		X	F	
Convolvulaceae	*Dichondra repens*	kidney weed	X, T	F	
Cyperaceae	*Carex appressa*	tall sedge	0.5, BR	V	Low-lying areas
	Cyperus fulvus			V	Low-lying areas
	Cyperus gracilis		X	V	Low-lying areas
Fabaceae (Faboideae)	*Glycine clandestina*			L	Nitrogen fixing
	Glycine tabacina			L	Nitrogen fixing
	Desmodium varians			L	Nitrogen fixing
Geraniaceae	*Geranium solanderi*	native geranium	X	F	
Juncaceae	*Juncus australis* or *Juncus continuus* or *Juncus filicaulis*		1	R	Low-lying areas
Lomandraceae	*Lomandra multiflora* subsp. *multiflora*	many-flowered mat-rush	1, BR	R	

Family/Subfamily	Scientific Name	Common Name	Composition (per cent)	Growth Form	Notes
Malvaceae	*Sida corrugata*	corrugated sida	X, BR	F	
Marsileaceae	*Marsilea drummondii*	Common nardoo	X	F	aquatic
Oxalidaceae	*Oxalis exilis*			F	
Phormiaceae	*Dianella caerulea* var. *caerulea*	blue-flax-lily	0.5	F	
Poaceae	*Aristida leichhardtiana* or *Aristida personata* or *Aristida ramosa*	wiregrass	5, BR	G	C4
	Austrostipa verticillata	slender bamboo grass	5, BR	G	C3
	Chloris ventricosa or *Chloris truncata*	chloris	3, BR	G	C4
	Dichanthium sericeum	Queensland bluegrass	1, BR	G	C4
	Echinopogon caespitosus	bushy hedgehog-grass	2, BR	G	C3
	Eragrostis brownii or *Eragrostis parviflora*	lovegrass	2, BR	G	C4
	Eriochloa pseudoacrotricha	early spring grass	1, BR	G	C4
	Microlaena stipoides var. *stipoides*	weeping grass	2, BR	G	C3
	Panicum simile	two-colour panic	1, BR	G	C4
	Rytidosperma richardsonii	wallaby grass	1, BR	G	C3
	Sporobolus creber	slender rats tail grass	0.25, BR	G	C4
Polygonaceae	*Rumex browni*		X	S	
Plantaginaeae	*Plantago debilis*		X	F	
Urticaceae	*Urtica incisa*	stinging nettle	X	F	

Table 9 - Weeping Myall Woodland (PCT 116)

Family/Subfamily	Scientific Name	Common Name	Composition (per cent)	Growth Form	Notes
Shrubs					
Asteraceae	*Ozothamnus diosmifolius*	white dogwood	X, BR	S	
Chenopodiaceae	*Maireana microphylla*	Bluebush	X	S	
Fabaceae (Mimosoideae)	*Acacia decora*	western silver wattle	1, BR	S	Nitrogen fixing, squirrel glider feed species
	Acacia falcata	sickle wattle	1, BR	S	Nitrogen fixing, squirrel glider feed species
	Acacia melvillei-homalophylla		1, BR	S	Nitrogen fixing, squirrel glider feed species
	Acacia pendula	weeping myall	60, T	T	Nitrogen fixing, squirrel glider feed species
	Acacia salicina	cooba	1, BR	T	Nitrogen fixing, squirrel glider feed species
Oleaceae	*Notelaea microcarpa* var. *microcarpa*	velvet mock olive	X	T	Fleshy fruits
Lamiaceae	*Teucrium juncea*	Bead bush	X	S	
Malvaceae	*Sida hackettiana*	golden rod	1, BR	S	
Pittosporaceae	*Bursaria spinosa* subsp. *spinosa*	blackthorn	1, BR	T	
Sapindaceae	*Dodonaea viscosa*		X	T	Nectar resource
Solanaceae	*Solanum brownii* or *Solanum cinereum*	violet nightshade or Narrawa Burr	X, BR	S	
Ground Cover					
Asteraceae	*Calotis lappulacea*	yellow burr-daisy	1, BR	F	

Family/Subfamily	Scientific Name	Common Name	Composition (per cent)	Growth Form	Notes
	Chrysocephalum apiculatum or *Chrysocephalum semipapposum*	yellow buttons	1, BR	F	
	Vittadinia cervicularis or *Vittadinia cuneata* or *Vittadinia sulcata*	fuzzweed	1, BR	F	
Chenopodiaceae	*Einadia hastata* or *Einadia nutans*	berry saltbush or climbing saltbush	1, T	F	
Fabaceae (Faboideae)	*Desmodium rhytidophyllum*		1	L	Nitrogen fixing
Lomandraceae	*Lomandra filiformis* subsp. *filiformis*	wattle matt-rush	1, BR	R	
	Lomandra multiflora subsp. *multiflora*	many-flowered mat-rush	1, BR	R	
Malvaceae	*Sida corrugata*	corrugated sida	1, BR	F	
Scrophulariaceae	*Eremophila debilis*	amulla	1	S	
Phormiaceae	*Dianella caerulea* var. *caerulea*	blue-flax-lily	1	F	
Poaceae	*Aristida leichhardtiana* or *Aristida personata* or *Aristida ramosa*	purple wiregrass	3, BR	G	C4
	Rytidosperma fulva	wallaby grass	3, BR	G	C3
	Austrostipa scabra var. *scabra*	speargrass	3, BR	G	C3
	Bothriochloa decipiens *Or* *Bothriochloa macra*	red grass	2, BR	G	C4
	Chloris ventricosa or *Chloris* truncata	chloris	2, BR	G	C4
	Cymbopogon refractus	barbed wire grass	2, BR	G	C4
	Dichanthium sericeum	Queensland bluegrass	2, BR	G	C4

Family/Subfamily	Scientific Name	Common Name	Composition (per cent)	Growth Form	Notes
	Entolasia stricta	wiry panic	2, BR	G	
	Eragrostis brownii or *Eragrostis parviflora*	Brown's lovegrass or weeping lovegrass	2, BR	G	C4
	Panicum effusum	two-colour panic	1, BR	G	C4
	Sporobolus creber	slender rats tail grass	1, BR	G	C4
	Themeda triandra	kangaroo grass	1, BR	G	C4

Appendix C - Monitoring Site Locations

Table C1 Permanent Flora Monitoring Sites – Conservation Agreements

BOA	MZ Code	Site Name/ Plot ID	Plot Type	Easting	Northing
Big Flat Creek	ACHO-5	1	Photo	279270	6426052
Big Flat Creek	ACHO-5	5	Photo	282306	6427587
Big Flat Creek	ACHO-5	6	Photo	283446	6427919
Big Flat Creek	ACHO-5	10	Photo	280712	6426875
Big Flat Creek	ACHO-5	11	Photo	280664	6426557
Big Flat Creek	ACHO-4	12	Photo	279600	6424352
Big Flat Creek	ACHO-5	MAN06	Photo and quadrat	283116	6427845
Big Flat Creek	ACHO-5	MAN11	Photo and quadrat	279822	6426451
Big Flat Creek	ACHO-5	6NE	Photo and quadrat	279222	6425994
Big Flat Creek	ACHO-5	7NE	Photo and quadrat	279343	6426103
Big Flat Creek	ACHO-5	10NE	Photo and quadrat	280561	6426655
Eastern Offset	HEO-2	3	Photo	285163	6425048
Eastern Offset	HEO-1	7	Photo	284361	6427828
Eastern Offset	HEO-2	26	Photo	284653	6424971
Eastern Offset	NC-05	MAN12	Photo and quadrat	285437	6427005
Eastern Offset	HEO-1	MAN14	Photo and quadrat	284767	6426760
Eastern Offset	NC-05	MAN20	Photo and quadrat	285418	6426088
Eastern Offset	NC-05	MAN24	Photo and quadrat	285616	6427245
Eastern Offset	HEO-2	MAN25	Photo and quadrat	285952	6425648
Eastern Offset	HEO-1	MAN07 (MAN-EAS-RMN-1655-01)	Photo and quadrat	284146	6427997
Eastern Offset	HEO-1	MAN08 (MAN-EAS-RVG-1655-17-01)	Photo and quadrat	284487	6427190
Northern Corridor	NC-04	4	Photo	284743	6428524
Northern Corridor	NC-01	19	Photo	281161	6430412
Northern Corridor	NC-02	20	Photo	283382	6431957
Northern Corridor	NC-02	21	Photo	282901	6431332
Northern Corridor	NC-03	22	Photo	283125	6430726
Northern Corridor	NC-03	23	Photo	283138	6430535
Northern Corridor	NC-04	MAN13	Photo and quadrat	285503	6428616
Northern Corridor	NC-03	MAN21	Photo and quadrat	282917	6430990

Northern Corridor	NC-03	MAN22	Photo and quadrat	283449	6430549
Northern Corridor	NC-04	MAN23	Photo and quadrat	284702	6429149
Northern Corridor	NC-01	VCA1NE	Photo and quadrat	281571	6430279
Northern Corridor	NC-02	2NE	Photo and quadrat	283276	6432190
Southern Offset	HEO-3	8	Photo	283501	6421014
Southern Offset	HEO-3	9a	Photo	282812	6421707
Southern Offset	HEO-3	9b	Photo	283856	6421932
Southern Offset	HEO-3	MAN18 (MAN-SOU-RGN-1691-05)	Photo and quadrat	283869	6421537
Southern Offset	HEO-3	MAN19 (MAN-SOU-RGN-1691-06)	Photo and quadrat	283656	6421469
Southern Offset	HEO-3	20NE (MAN-SOU-RMN-1691-01)	Photo and quadrat	284587	6422623
Southern Offset	HEO-3	MAN27 (MAN-SOU-RVG-1691-15-01)	Photo and quadrat	283780	6422235
Southern Offset	SO-1	MAN26 (MAN-SOU-RVG-1691-24-01)	Photo and quadrat	284535	6421643
Western Corridor and Anvil Hill	WC-01	2	Photo	278373	6423275
Western Corridor and Anvil Hill	ACHO-1	13	Photo	279799	6423079
Western Corridor and Anvil Hill	ACHO-1	14	Photo	280125	6421852
Western Corridor and Anvil Hill	ACHO-1	15	Photo	279791	6420853
Western Corridor and Anvil Hill	ACHO-1	16	Photo	281124	6420969
Western Corridor and Anvil Hill	ACHO-1	17	Photo	279333	6422343
Western Corridor and Anvil Hill	WC-01	25	Photo	277499	6423341
Western Corridor and Anvil Hill	WC-01	12NE	Photo and quadrat	278435	6423212
Western Corridor and Anvil Hill	HEO-4	14NE	Photo and quadrat	279266	6421141
Western Corridor and Anvil Hill	WC-01	15NE	Photo and quadrat	277657	6423496
Western Corridor and Anvil Hill	WC-01	16NE	Photo and quadrat	278223	6423176
Western Corridor and Anvil Hill	ACHO-1	18NE	Photo and quadrat	280116	6421681
Western Corridor and Anvil Hill	ACHO-3	MAN10	Photo and quadrat	280019	6423520

Western Corridor and Anvil Hill	WC-01	MAN17	Photo and quadrat	279497	6423568
Western Corridor and Anvil Hill	ACHO-7	MAN28	Photo and quadrat	278125	6424686
Western Corridor and Anvil Hill	WC-01	MAN29	Photo and quadrat	278226	6423339
Western Corridor and Anvil Hill	WC-01	MAN30	Photo and quadrat	278398	6423820
Western Corridor and Anvil Hill	WC-01	MAN09 (MAN-WES-RVG-1598-23-01)	Photo and quadrat	279165	6423541

Table C- 2: Permanent Flora Monitoring Sites – Biodiversity Stewardship Agreements

BOA	MZ Code	Plot ID	Plot Type	Easting	Northing	Bearing
Mangoola BSA	MZ1	1	Vegetation Plot	280817	6429329	157
Mangoola BSA	MZ8	2	Vegetation Plot	283117	6429586	0
Mangoola BSA	MZ8	3	Vegetation Plot	283341	6430174	0
Mangoola BSA	MZ8	4	Vegetation Plot	283226	6429990	270
Mangoola BSA	MZ1	5	Vegetation Plot	281530	6429815	52
Mangoola BSA	MZ2	6	Vegetation Plot	285399	6429960	175
Mangoola BSA	MZ6	7	Vegetation Plot	285273	6429737	233
Mangoola BSA	MZ5	8	Vegetation Plot	279579	6428186	50
Mangoola BSA	MZ6	9	Vegetation Plot	280300	6429020	20
Mangoola BSA	MZ3	10	Vegetation Plot	286030	6428764	350
Mangoola BSA	MZ3	11	Vegetation Plot	281128	6431762	130
Mangoola BSA	MZ3	12	Vegetation Plot	282898	6430116	26
Mangoola BSA	MZ4	13	Vegetation Plot	278419	6425209	350
Mangoola BSA	MZ4	14	Vegetation Plot	283327	6429866	334
Mangoola BSA	MZ4	15	Vegetation Plot	286358	6428743	0
Mangoola BSA	MZ3	16	Vegetation and Orchid Plot	283903	6429520	0
Mangoola BSA	MZ4	17	Vegetation Plot	286612	6429201	0
Mangoola BSA	MZ4	18	Vegetation Plot	282995	6429522	0
Mangoola BSA	MZ2	19	Vegetation and Orchid Plot	280158	6428598	135
Mangoola BSA	MZ2	20	Vegetation Plot	280107	6428995	270
Mangoola BSA	MZ2	21	Vegetation and Orchid Plot	278251	6428551	0
Mangoola BSA	MZ2	22	Vegetation and Orchid Plot	277776	6429081	0
Mangoola BSA	MZ6	23	Vegetation and Orchid Plot	279762	6428507	104
Mangoola BSA	MZ6	24	Vegetation Plot	281296	6429748	52

Mangoola BSA	MZ6	25	Vegetation Plot	278536	6428373	15
Mangoola BSA	MZ6	26	Vegetation Plot	281898	6430080	225
Mangoola BSA	MZ7	27	Vegetation Plot	280707	6432231	295
Mangoola BSA	MZ1	28	Vegetation Plot	283187	6429407	337
Mangoola BSA	MZ2	29	Vegetation Plot	278117	6425687	250
Mangoola BSA	MZ2	30	Vegetation and Orchid Plot	280706	6429348	165
Mangoola BSA	MZ2	31	Vegetation Plot	280792	6429973	270
Mangoola BSA	MZ6	32	Vegetation and Orchid Plot	277621	6426061	0
Mangoola BSA	MZ5	33	Vegetation Plot	277571	6425739	300
Mangoola BSA	MZ2	34	Vegetation Plot	284317	6428325	352
Mangoola BSA	MZ6	35	Vegetation Plot	284317	6428546	275
Mangoola BSA	MZ6	36	Vegetation Plot	283957	6429264	30
Mangoola BSA	MZ6	37	Vegetation and Orchid Plot	283830	6429166	126
Mangoola BSA	MZ4	38	Vegetation Plot	278263	6424960	0
Mangoola BSA	MZ1	39	Vegetation Plot	280128	6428823	304
Mangoola BSA	MZ1	40	Vegetation Plot	282424	6431032	270
Mangoola BSA	MZ2	41	Vegetation Plot	279566	6429129	0
Wybong Heights BSA	MZ2	P_014WH	VI and Photo	280931	6440091	247
Wybong Heights BSA	MZ3	P_036WH	VI and Photo	280956	6440884	179
Wybong Heights BSA	MZ3	P_016WH	VI and Photo	280295	6439705	310
Wybong Heights BSA	MZ3	P_026WH	VI and Photo	280360	6438800	154
Wybong Heights BSA	MZ1	P_027WH	VI and Photo	279799	6440205	348
Wybong Heights BSA	MZ1	P_010WH	VI and Photo	280113	6442823	258
Wybong Heights BSA	MZ2	P_032WH	VI and Photo	280122	6441649	338
Wybong Heights BSA	MZ2	P_009WH	VI and Photo	280519	6443334	240
Wybong Heights BSA	MZ2	P_019WH	VI and Photo	280112	6442461	270
Wybong Heights BSA	MZ2	P_025WH	VI and Photo	279770	6438647	205
Wybong Heights BSA	MZ2	P_023WH	VI and Photo	280490	6441440	80
Wybong Heights BSA	MZ2	P_030WH	VI and Photo	280094	6441095	107
Wybong Heights BSA	MZ3	P_034WH	VI and Photo	280559	6442266	40
Wybong Heights BSA	MZ1	P_038WH	VI and Photo	281466	6442985	88
Wybong Heights BSA	MZ1	P_003WH	VI and Photo	281392	6441930	295
Wybong Heights BSA	MZ1	P_013WH	VI and Photo	281415	6440080	185
Wybong Heights BSA	MZ1	P_044WH	VI and Photo	281386	6441446	349
Wybong Heights BSA	MZ3	P_045WH	VI and Photo	281542	6441212	145
Wybong Heights BSA	MZ4	P_017WH	VI and Photo	280639	6442826	120

Table C3: Orchid Translocation Monitoring Sites

Location	Site Name	Descriptor	Monitoring Type	Monitoring Season
Limvardy Rd HEO-1	#2-1	Translocation site off Limvardy road in HEO-1 near the house	Translocated terrestrial orchid monitoring	September /October
Wybong Rd (HEO-1)	#3-1	Translocation site of Wybong Rd in HEO-1 in the west	Translocated terrestrial orchid monitoring	September /October
Wybong Rd (HEO-1)	#3-2	Translocation site of Wybong Rd in central HEO-1	Translocated terrestrial orchid monitoring	September /October
Wybong Rd (HEO-1)	#3-3	Translocation site of Wybong Rd in HEO-1 in the east	Translocated terrestrial orchid monitoring	September /October
Wybong Rd (HEO-1)	#4-1	Translocation site of Wybong Rd in HEO-1 in the west	Translocated terrestrial orchid monitoring	September /October
Wybong Rd (HEO-1)	#5-1	Translocation site of Wybong Rd in HEO-1 in the west	Translocated terrestrial orchid monitoring	September /October
Wybong Rd (HEO-1)	#6HEO1-1	Translocation site of Wybong Rd in HEO-1 in the north	Translocated terrestrial orchid monitoring	September /October
Wybong Rd (EO-1)	#6EO1-2	Translocation site of Wybong Rd in HEO-1 in the west	Translocated terrestrial orchid monitoring	September /October
Western Corridor	#6WC-1	Translocation site of Wybong Rd in HEO-1 in the south	Translocated terrestrial orchid monitoring	September /October
Western Corridor	#6WC-2	Translocation site of Wybong Rd in HEO-1 in the west	Translocated terrestrial orchid monitoring	September /October
Mine rehabilitation	#6Rehab-1	Translocation site in rehabilitation area 3A	Translocated terrestrial orchid monitoring	September /October
Mine rehabilitation	#6Rehab-2	Translocation site in rehabilitation area 3B	Translocated terrestrial orchid monitoring	September /October

Location	Site Name	Descriptor	Monitoring Type	Monitoring Season
Mine rehabilitation	#6Rehab-3	Translocation site in rehabilitation area 4A	Translocated terrestrial orchid monitoring	September /October
Mine rehabilitation	#6Rehab-4	Translocation site in rehabilitation area 4B	Translocated terrestrial orchid monitoring	September /October
Mine rehabilitation	#6Rehab-5	Translocation site in rehabilitation area	Translocated terrestrial orchid monitoring	September /October
Western Corridor	#7WC-3	Translocation site in Western Corridor in the south	Translocated terrestrial orchid monitoring	September /October
Mine rehabilitation	#7Rehab-2	Translocation site in rehabilitation area 4C	Translocated terrestrial orchid monitoring	September /October
Control outside Mangoola Project Area	C1	Control site 1	Translocated terrestrial orchid monitoring	September /October
Control outside Mangoola Project Area	C2	Control site 2	Translocated terrestrial orchid monitoring	September /October
Control outside Mangoola Project Area	C3	Control site 3	Translocated terrestrial orchid monitoring	September /October
Control in EO-1	C4	Control site 4	Translocated terrestrial orchid monitoring	September /October

NOTE: Eastings and Northings are not provided as these locations are of a sensitive nature

Table C-3: BRC Monitoring Site Locations

MZ Code	Plot ID	Easting	Northing	Vegetation Condition
Conservation Agreement Areas				
Big Flat Creek				
ACHO-4	MAN-BFC-RMN-0621-01	279724	6424385	Remnant
ACHO-4	MAN-BFC-RMN-0621-02	279574	6425537	Remnant
ACHO-5	MAN-BFC-RVG-1691-14-01	279778	6426431	Revegetation
ACHO-5	MAN-BFC-RVG-1691-14-02	279222	6425994	Revegetation
ACHO-5	MAN-BFC-RMN-1655-01	283115	6427844	Remnant
ACHO-5	MAN-BFC-RMN-1691-01	279343	6426102	Remnant
ACHO-5	MAN-BFC-RMN-1655-02	283268	6428038	Remnant
ACHO-5	MAN-BFC-RMN-1691-02	280512	6426666	Remnant
ACHO-5	MAN-BFC-RMN-1731-01	282067	6427441	Remnant
ACHO-5	MAN-BFC-RMN-1731-02	282694	6427758	Remnant
ACHO-4	MAN-BFC-RMN-1612-01	279736	6425619	Remnant
ACHO-4	MAN-BFC-RMN-1612-03	279552	6424976	Remnant
ACHO-4	MAN-BFC-RMN-1612-02	279653	6424609	Remnant
ACHO-5	MAN-BFC-RMN-1655-03	279869	6426255	Remnant
ACHO-5	MAN-BFC-RMN-1655-04	280069	6426394	Remnant
ACHO-5	MAN-BFC-RMN-1691-03	282554	6427731	Remnant
ACHO-5	MAN-BFC-RMN-1691-04	279552	6426129	Remnant
ACHO-5	MAN-BFC-RMN-1691-05	279291	6425333	Remnant
ACHO-5	MAN-BFC-RMN-1731-03	280955	6426772	Remnant
ACHO-5	MAN-BFC-RVG-1691-14-03	278499	6425596	Revegetation
ACHO-5	MAN-BFC-RVG-1691-14-04	281700	6427362	Revegetation
ACHO-5	MAN-BFC-RVG-1691-24-01	278878	6425921	Revegetation
ACHO-5	MAN-BFC-RVG-1691-24-02	279109	6425453	Revegetation
ACHO-6	MAN-BFC-RVG-1691-16-01	279636	6424032	Revegetation
ACHO-6	MAN-BFC-RGN-1691-19-01	279593	6424231	Regeneration
ACHO-3	MAN-BFC-RGN-1691-19-01	279923	6423911	Regeneration
ACHO-5	MAN-BFC-RGN-1691-19-01	279337	6425710	Regeneration
ACHO-5	MAN-BFC-RGN-1691-19-01	279490	6425922	Regeneration
ACHO-5	MAN-BFC-RGN-1691-19-01	280643	6426592	Regeneration
ACHO-5	MAN-BFC-RGN-1731-19-01	278919	6425422	Regeneration
ACHO-5	MAN-BFC-RGN-1731-19-02	282592	6427696	Regeneration
ACHO-5	MAN-BFC-RGN-1655-19-01	283548	6428192	Regeneration

MZ Code	Plot ID	Easting	Northing	Vegetation Condition
ACHO-5	MAN-BFC-RGN-1655-19-02	283029	6428032	Regeneration
ACHO-5	MAN-BFC-RGN-1655-19-03	282461	6427560	Regeneration
ACHO-5	MAN-BFC-RGN-1655-19-04	281785	6427443	Regeneration
Eastern Offset				
HEO-1	MAN-EAS-RMN-1655-02	284155	6427578	Remnant
NC-05	MAN-EAS-RVG-1691-22-01	285422	6427044	Revegetation
NC-05	MAN-EAS-RMN-1691-01	285411	6426087	Remnant
HEO-1	MAN-EAS-RMN-1655-01	284146	6427997	Remnant
HEO-2	MAN-EAS-RVG-1691-16-01	285950	6425599	Revegetation
HEO-1	MAN-EAS-RMN-1691-02	284788	6426724	Remnant
NC-05	MAN-EAS-RMN-1691-04	285357	6426537	Remnant
HEO-1	MAN-EAS-RVG-1655-17-01	284487	6427190	Revegetation
NC-05	MAN-EAS-RVG-1691-22-02	285615	6427245	Revegetation
HEO-2	MAN-EAS-RMN-1691-05	284767	6424749	Remnant
HEO-2	MAN-EAS-RMN-1655-03	284855	6423297	Remnant
NC-06	MAN-EAS-RMN-1655-04	284948	6424002	Remnant
NC-06	MAN-EAS-RMN-1655-05	285436	6424268	Remnant
HEO-1	MAN-EAS-RMN-1655-06	285294	6427793	Remnant
HEO-1	MAN-EAS-RVG-1655-17-02	284607	6428022	Revegetation
HEO-1	MAN-EAS-RVG-1655-17-03	284969	6426833	Revegetation
HEO-1	MAN-EAS-RVG-1655-17-04	284315	6427119	Revegetation
HEO-1	MAN-EAS-RVG-1655-23-01	284648	6427756	Revegetation
HEO-1	MAN-EAS-RVG-1655-23-02	284985	6427322	Revegetation
NC-05	MAN-EAS-RVG-1655-23-03	285590	6427053	Revegetation
NC-05	MAN-EAS-RVG-1691-16-02	285453	6426815	Revegetation
NC-05	MAN-EAS-RVG-1691-16-03	285342	6427112	Revegetation
NC-05	MAN-EAS-RVG-1691-22-03	285940	6426656	Revegetation
NC-05	MAN-EAS-RVG-1691-22-04	285651	6426304	Revegetation
NC-06	MAN-EAS-RVG-1655-21-02	285460	6424560	Revegetation
NC-06	MAN-EAS-RVG-1655-21-03	285766	6424534	Revegetation
SO-2	MAN-EAS-RVG-1655-21-01	285528	6423303	Revegetation
NC-06	MAN-EAS-RVG-1655-21-04	285506	6423601	Revegetation
HEO-2	MAN-EAS-RMN-1691-03	285372	6425114	Remnant
SO-2	MAN-EAS-RGN-1655-19-01	285315	6423080	Regeneration
HEO-2	MAN-EAS-RGN-1655-19-02	284665	6423448	Regeneration
HEO-1	MAN-EAS-RGN-1655-19-03	284264	6428116	Regeneration

MZ Code	Plot ID	Easting	Northing	Vegetation Condition
HEO-1	MAN-EAS-RGN-1655-19-04	284037	6427698	Regeneration
HEO-1	MAN-EAS-RGN-1655-19-05	284806	6427277	Regeneration
HEO-2	MAN-EAS-RGN-1691-19-01	284524	6423938	Regeneration
HEO-2	MAN-EAS-RGN-1691-19-01	284822	6424383	Regeneration
HEO-2	MAN-EAS-RGN-1691-19-01	284666	6424964	Regeneration
HEO-2	MAN-EAS-RGN-1691-19-01	285795	6425338	Regeneration
NC-05	MAN-EAS-RGN-1691-19-01	285521	6426647	Regeneration
NC-03	MAN-NTH-RVG-1602-16-01	282917	6430990	Revegetation
NC-04	MAN-NTH-RMN-1602-01	285259	6428896	Remnant
NC-04	MAN-NTH-RVG-1602-15-02	284686	6429101	Revegetation
NC-03	MAN-NTH-RGN-1602-19-01	283449	6430550	Regeneration
NC-01	MAN-NTH-RMN-1691-01	281524	6430292	Remnant
NC-02	MAN-NTH-RVG-1602-20-01	283277	6432192	Revegetation
NC-04	MAN-NTH-RMN-1602-02	285504	6428618	Remnant
NC-04	MAN-NTH-RMN-1602-03	284309	6429679	Remnant
NC-02	MAN-NTH-RMN-1602-04	282597	6431420	Remnant
NC-02	MAN-NTH-RMN-1602-05	283100	6431441	Remnant
NC-04	MAN-NTH-RMN-1655-01	284497	6429238	Remnant
NC-04	MAN-NTH-RMN-1655-02	284176	6429332	Remnant
NC-04	MAN-NTH-RMN-1655-03	284756	6428670	Remnant
NC-04	MAN-NTH-RMN-1655-04	285209	6428091	Remnant
NC-04	MAN-NTH-RMN-1691-02	285355	6430398	Remnant
NC-02	MAN-NTH-RMN-1691-03	282432	6431216	Remnant
NC-01	MAN-NTH-RMN-1691-04	281757	6431106	Remnant
NC-01	MAN-NTH-RMN-1691-05	280920	6430159	Remnant
NC-04	MAN-NTH-RVG-1602-16-02	284562	6429414	Revegetation
NC-04	MAN-NTH-RVG-1602-16-03	284850	6428888	Revegetation
NC-01	MAN-NTH-RVG-1602-17-01	281373	6430314	Revegetation
NC-04	MAN-NTH-RVG-1602-18-01	284547	6429738	Revegetation
NC-04	MAN-NTH-RVG-1602-18-02	284291	6429438	Revegetation
NC-02	MAN-NTH-RVG-1602-20-02	282602	6431537	Revegetation
NC-04	MAN-NTH-RGN-1655-19-01	284826	6428416	Regeneration
NC-04	MAN-NTH-RGN-1655-19-02	284646	6428641	Regeneration
NC-04	MAN-NTH-RGN-1655-19-03	284363	6429160	Regeneration
NC-04	MAN-NTH-RGN-1691-19-01	285281	6430217	Regeneration
NC-01	MAN-NTH-RGN-1691-19-02	281208	6430107	Regeneration

MZ Code	Plot ID	Easting	Northing	Vegetation Condition
NC-01	MAN-NTH-RGN-1691-19-03	281425	6430414	Regeneration
NC-02	MAN-NTH-RGN-1602-19-02	283346	6431689	Regeneration
NC-04	MAN-NTH-RGN-1602-19-03	284728	6429446	Regeneration
NC-04	MAN-NTH-RGN-1602-19-04	284949	6429134	Regeneration
NC-04	MAN-NTH-RGN-1602-19-05	284419	6428932	Regeneration
Southern Offset				
HEO-3	MAN-SOU-RMN-1691-01	284587	6422623	Remnant
HEO-3	MAN-SOU-RGN-1691-19-05	283869	6421537	Regeneration
HEO-3	MAN-SOU-RGN-1691-19-06	283656	6421469	Regeneration
SO-1	MAN-SOU-RVG-1691-24-01	284535	6421643	Revegetation
HEO-3	MAN-SOU-RVG-1691-15-01	283780	6422235	Revegetation
HEO-3	MAN-SOU-RMN-1691-02	283217	6421767	Remnant
HEO-3	MAN-SOU-RMN-1691-03	283961	6421643	Remnant
HEO-3	MAN-SOU-RMN-1691-04	284030	6422037	Remnant
SO-1	MAN-SOU-RVG-1691-24-02	284500	6421446	Revegetation
SO-1	MAN-SOU-RVG-1691-24-03	284747	6422020	Revegetation
SO-1	MAN-SOU-RVG-1691-24-04	284797	6421802	Revegetation
HEO-3	MAN-SOU-RVG-1691-21-01	283686	6420621	Revegetation
HEO-3	MAN-SOU-RVG-1691-21-02	283533	6420231	Revegetation
SO-1	MAN-SOU-RVG-1691-15-02	283920	6420154	Revegetation
HEO-3	MAN-SOU-RVG-1691-21-03	284001	6421189	Revegetation
HEO-3	MAN-SOU-RVG-1691-21-04	284066	6420421	Revegetation
HEO-3	MAN-SOU-RVG-1691-15-03	284298	6422688	Revegetation
HEO-3	MAN-SOU-RVG-1691-23-01	283947	6421056	Revegetation
SO-1	MAN-SOU-RVG-1691-23-02	284444	6421122	Revegetation
SO-1	MAN-SOU-RVG-1691-23-03	284249	6421355	Revegetation
HEO-3	MAN-SOU-RVG-1691-23-04	284200	6421645	Revegetation
SO-1	MAN-SOU-RGN-1691-19-01	284295	6420777	Regeneration
SO-2	MAN-SOU-RGN-1691-19-02	284964	6420306	Regeneration
SO-2	MAN-SOU-RGN-1691-19-03	285291	6421930	Regeneration
HEO-3	MAN-SOU-RGN-1691-19-04	284533	6422485	Regeneration
Western Corridor & Anvil Hill				
WC-01	MAN-WES-RVG-1691-16-04	278225	6423176	Revegetation
ACHO-3	MAN-WES-RMN-1655-01	280019	6423521	Remnant
WC-01	MAN-WES-RVG-1691-16-03	278348	6423830	Revegetation
WC-01	MAN-WES-RVG-1691-16-05	278213	6423293	Revegetation

MZ Code	Plot ID	Easting	Northing	Vegetation Condition
WC-01	MAN-WES-RGN-1691-19-01	279499	6423566	Revegetation
WC-01	MAN-WES-RVG-1598-23-01	279165	6423541	Revegetation
WC-01	MAN-WES-RVG-1691-16-02	278465	6423178	Revegetation
HEO-4	MAN-WES-RMN-1691-01	279268	6421141	Remnant
WC-01	MAN-WES-RMN-1691-02	277656	6423495	Remnant
ACHO-1	MAN-WES-RMN-1655-02	280108	6421628	Remnant
ACHO-7	MAN-WES-RVG-1691-16-01	278125	6424685	Revegetation
ACHO-8	MAN-WES-RMN-0479-01	278140	6424446	Remnant
ACHO-1	MAN-WES-RMN-0479-02	279012	6422519	Remnant
ACHO-1	MAN-WES-RMN-0479-03	281979	6422423	Remnant
ACHO-1	MAN-WES-RMN-0479-04	281338	6422261	Remnant
ACHO-1	MAN-WES-RMN-0479-05	281091	6421837	Remnant
ACHO-2	MAN-WES-RMN-0621-01	281435	6425196	Remnant
ACHO-1	MAN-WES-RMN-0621-02	280143	6422475	Remnant
ACHO-1	MAN-WES-RMN-0621-03	281756	6422349	Remnant
ACHO-1	MAN-WES-RMN-0621-04	281215	6422196	Remnant
ACHO-1	MAN-WES-RMN-0621-05	281006	6422037	Remnant
ACHO-2	MAN-WES-RMN-1612-01	281615	6425126	Remnant
ACHO-1	MAN-WES-RMN-1612-02	280168	6423296	Remnant
ACHO-1	MAN-WES-RMN-1612-03	280618	6422393	Remnant
ACHO-1	MAN-WES-RMN-1612-04	279653	6422388	Remnant
ACHO-1	MAN-WES-RMN-1655-03	279079	6422949	Remnant
ACHO-1	MAN-WES-RMN-1655-04	278832	6422496	Remnant
HEO-4	MAN-WES-RMN-1655-05	279528	6420258	Remnant
ACHO-1	MAN-WES-RMN-1655-06	280243	6420918	Remnant
ACHO-1	MAN-WES-RMN-1691-03	280516	6421368	Remnant
ACHO-1	MAN-WES-RMN-1691-04	279937	6422135	Remnant
ACHO-2	MAN-WES-RMN-1691-05	281796	6425212	Remnant
WC-01	MAN-WES-RMN-1691-06	277491	6423855	Remnant
ACHO-1	MAN-WES-RMN-1691-07	280883	6422788	Remnant
ACHO-7	MAN-WES-RVG-1691-18-01	278766	6424407	Revegetation
WC-01	MAN-WES-RVG-1691-18-02	278221	6423510	Revegetation
WC-01	MAN-WES-RVG-1691-18-03	278620	6423449	Revegetation
HEO-4	MAN-WES-RVG-1691-18-04	279270	6420635	Revegetation
HEO-4	MAN-WES-RVG-1691-22-01	279593	6420781	Revegetation
HEO-4	MAN-WES-RVG-1691-22-02	279416	6420551	Revegetation

MZ Code	Plot ID	Easting	Northing	Vegetation Condition
WC-01	MAN-WES-RVG-1691-16-06	278759	6423684	Revegetation
WC-01	MAN-WES-RVG-1598-23-03	278836	6423285	Revegetation
WC-01	MAN-WES-RVG-1598-23-02	278461	6423045	Revegetation
ACHO-1	MAN-WES-RGN-1655-19-01	281187	6420574	Regeneration
HEO-4	MAN-WES-RGN-1655-19-02	279567	6419912	Regeneration
ACHO-1	MAN-WES-RGN-1655-19-03	279590	6422849	Regeneration
ACHO-1	MAN-WES-RGN-1655-19-04	278812	6422154	Regeneration
WC-01	MAN-WES-RGN-1691-19-05	277994	6423741	Regeneration
WC-01	MAN-WES-RGN-1691-19-04	277444	6423096	Regeneration
ACHO-7	MAN-WES-RGN-1691-19-03	278484	6424644	Regeneration
ACHO-3	MAN-WES-RGN-1691-19-02	279867	6423642	Regeneration
Biodiversity Stewardship Site				
Mangoola				
MZ1	MAN-MNG-RGN-1598-01	280817	6429329	Regeneration
MZ1	MAN-MNG-RMN-1598-01	281530	6429815	Remnant
MZ2	MAN-MNG-RGN-1602-01	285074	6429542	Regeneration
MZ6	MAN-MNG-RMN-1602-01	285273	6429737	Remnant
MZ2	MAN-MNG-RGN-1603-01	280158	6428598	Regeneration
MZ2	MAN-MNG-RGN-1603-02	280107	6428995	Regeneration
MZ3	MAN-MNG-RGN-1603-03	286030	6428764	Regeneration
MZ3	MAN-MNG-RGN-1603-04	281128	6431762	Regeneration
MZ3	MAN-MNG-RGN-1603-05	282898	6430116	Regeneration
MZ6	MAN-MNG-RMN-1603-01	279762	6428507	Remnant
MZ6	MAN-MNG-RMN-1603-02	281296	6429748	Remnant
MZ2	MAN-MNG-RGN-1603-06	278251	6428551	Regeneration
MZ7	MAN-MNG-RMN-1603-03	280707	6432231	Remnant
MZ5	MAN-MNG-RMN-1602-02	279579	6428186	Remnant
MZ6	MAN-MNG-RMN-1603-04	281898	6430080	Remnant
MZ2	MAN-MNG-RGN-1607-01	278117	6425687	Regeneration
MZ2	MAN-MNG-RGN-1607-03	280706	6429348	Regeneration
MZ2	MAN-MNG-RGN-1607-05	280792	6429973	Regeneration
MZ5	MAN-MNG-RMN-1612-01	277571	6425739	Remnant
MZ2	MAN-MNG-RGN-1655-01	284317	6428325	Regeneration
MZ6	MAN-MNG-RMN-1655-01	284317	6428546	Remnant
MZ6	MAN-MNG-RMN-1655-02	283957	6429264	Remnant
MZ6	MAN-MNG-RMN-1655-03	283830	6429166	Remnant

MZ Code	Plot ID	Easting	Northing	Vegetation Condition
MZ6	MAN-MNG-RMN-1602-03	278748	6428587	Remnant
MZ2	MAN-MNG-RGN-1603-08	277776	6429081	Regeneration
MZ6	MAN-MNG-RMN-1607-01	277621	6426061	Remnant
MZ3	MAN-MNG-RGN-1603-09	283903	6429520	Regeneration
MZ8	MAN-MNG-RVG-1598-26-01	283117	6429586	Revegetation
MZ8	MAN-MNG-RVG-1598-26-02	283341	6430174	Revegetation
MZ8	MAN-MNG-RVG-1598-26-03	283226	6429990	Revegetation
MZ1	MAN-MNG-RMN-1598-02	280679	6429763	Remnant
MZ1	MAN-MNG-RMN-1598-03	278882	6428555	Remnant
MZ1	MAN-MNG-RMN-1598-04	279845	6428948	Remnant
MZ1	MAN-MNG-RGN-1598-02	280128	6428823	Regeneration
MZ6	MAN-MNG-RMN-1602-04	277362	6429276	Remnant
MZ6	MAN-MNG-RMN-1602-05	284081	6429773	Remnant
MZ6	MAN-MNG-RMN-1602-06	280300	6429020	Remnant
MZ2	MAN-MNG-RGN-1602-02	285333	6429301	Regeneration
MZ2	MAN-MNG-RGN-1602-03	285405	6429959	Regeneration
MZ6	MAN-MNG-RMN-1603-05	278536	6428373	Remnant
MZ6	MAN-MNG-RMN-1603-06	282651	6430651	Remnant
MZ6	MAN-MNG-RMN-1607-03	277554	6426091	Remnant
MZ6	MAN-MNG-RMN-1607-04	281880	6431335	Remnant
MZ6	MAN-MNG-RMN-1607-02	282201	6429952	Remnant
MZ2	MAN-MNG-RGN-1607-02	282321	6429895	Regeneration
MZ2	MAN-MNG-RGN-1607-04	277826	6425852	Regeneration
MZ5	MAN-MNG-RMN-1612-03	277166	6426127	Remnant
MZ5	MAN-MNG-RMN-1612-02	277134	6426232	Remnant
MZ1	MAN-MNG-RGN-1598-03	282424	6431032	Regeneration
MZ2	MAN-MNG-RGN-1603-10	279563	6429127	Regeneration
Wybong Heights				
MZ1	MAN-WYH-RGN-1607-01	280426	6443063	Regeneration
MZ1	MAN-WYH-RGN-1691-01	281415	6440080	Regeneration
MZ1	MAN-WYH-RGN-1607-02	280122	6441649	Regeneration
MZ1	MAN-WYH-RGN-1691-02	281386	6441446	Regeneration
MZ2	MAN-WYH-RMN-0617-01	280931	6440091	Remnant
MZ2	MAN-WYH-RMN-1607-01	280112	6442461	Remnant
MZ2	MAN-WYH-RMN-1605-01	280490	6441440	Remnant
MZ2	MAN-WYH-RMN-1607-02	279770	6438647	Remnant

MZ Code	Plot ID	Easting	Northing	Vegetation Condition
MZ2	MAN-WYH-RMN-1605-02	280559	6442266	Remnant
MZ3	MAN-WYH-RMN-1691-01	280639	6442826	Remnant
MZ3	MAN-WYH-RMN-1602-01	280360	6438800	Remnant
MZ3	MAN-WYH-RMN-1602-02	279799	6440205	Remnant
MZ3	MAN-WYH-RMN-1654-01	281466	6442985	Remnant
MZ4	MAN-WYH-RMN-1691-02	281566	6442620	Remnant
MZ4	MAN-WYH-RMN-1691-03	281352	6442420	Remnant
MZ1	MAN-WYH-RGN-1607-03	280113	6442823	Regeneration
MZ1	MAN-WYH-RGN-1607-04	280023	6441415	Regeneration
MZ1	MAN-WYH-RGN-0617-01	280339	6440937	Regeneration
MZ2	MAN-WYH-RMN-0617-02	281227	6440766	Remnant
MZ2	MAN-WYH-RMN-0617-03	281803	6442936	Remnant
MZ2	MAN-WYH-RMN-0617-04	281177	6440361	Remnant
MZ2	MAN-WYH-RMN-0617-05	280956	6440884	Remnant
MZ1	MAN-WYH-RGN-1691-03	281390	6440815	Regeneration
MZ1	MAN-WYH-RGN-1691-04	281542	6441212	Regeneration
MZ1	MAN-WYH-RGN-1691-05	281319	6441190	Regeneration
MZ1	MAN-WYH-RGN-1691-06	281392	6441930	Regeneration
MZ3	MAN-WYH-RMN-1602-03	280851	6442763	Remnant
MZ3	MAN-WYH-RMN-1602-04	280015	6439708	Remnant
MZ3	MAN-WYH-RMN-1602-05	280295	6439705	Remnant
MZ3	MAN-WYH-RMN-1602-06	280257	6439394	Remnant
MZ2	MAN-WYH-RMN-1605-03	280094	6441095	Remnant
MZ2	MAN-WYH-RMN-1605-04	280169	6442694	Remnant
MZ2	MAN-WYH-RMN-1605-05	281029	6441648	Remnant
MZ2	MAN-WYH-RMN-1605-06	280732	6442569	Remnant
MZ2	MAN-WYH-RMN-1607-03	280519	6443334	Remnant
MZ2	MAN-WYH-RMN-1607-04	280109	6438798	Remnant
MZ2	MAN-WYH-RMN-1607-05	280001	6438471	Remnant
MZ2	MAN-WYH-RMN-1607-06	279940	6442470	Remnant
MZ3	MAN-WYH-RMN-1654-02	281132	6442886	Remnant
MZ3	MAN-WYH-RMN-1654-03	280667	6443096	Remnant
MZ3	MAN-WYH-RMN-1691-04	281774	6443473	Remnant
MZ4	MAN-WYH-RMN-1691-05	281197	6442249	Remnant

Table C-4: Fauna Monitoring Sites

Site	Site Type	Easting	Northing	Monitoring Year - Even	Monitoring Year - Odd
012MO	Biodiversity Stewardship Agreement	278747	6428586		X
014WH	Biodiversity Stewardship Agreement	280930	6440090		X
017WH	Biodiversity Stewardship Agreement	280638	6442825		X
027WH	Biodiversity Stewardship Agreement	279798	6440204	X	
046MO	Biodiversity Stewardship Agreement	281898	6430078	X	
058MO	Biodiversity Stewardship Agreement	284317	6428545	X	
FA1	Conservation Agreement	280105	6426294		X
FA11	Conservation Agreement	281078	6421526		X
FA12	Conservation Agreement	278900	6420900		X
FA13	Conservation Agreement	279200	6420400		X
FA14	Conservation Agreement	277600	6423400	X	
FA15	Conservation Agreement	285299	6430350	X	
FA16	Conservation Agreement	282599	6431500	X	
FA17	Conservation Agreement	280018	6423520	X	
FA18	Conservation Agreement	279222	6423538	X	
FA2	Conservation Agreement	283210	6427904		X
FA21	Conservation Agreement	281821	6425055	X	
FA22	Conservation Agreement	285503	6428615	X	
FA3	Conservation Agreement	284590	6424418		X
FA6	Conservation Agreement	284581	6427223		X
FA7	Conservation Agreement	279002	6421218		X
FA8	Conservation Agreement	279716	6424808		X
FA9	Conservation Agreement	281193	6424923		X
MAN23	Conservation Agreement	284702	6429149	X	
RTR-SP-17	Conservation Agreement	281543	6427259	X	
FA24	Rehabilitation	282554	6426854	X	
FA25	Rehabilitation	283642	6422827	X	
FA26	Rehabilitation	283247	6422330	X	
FAWET01	Rehabilitation	282451	6425376		X
MAN01	Rehabilitation	282561	6426902		X
MAN03	Rehabilitation	282948	6427189		X
MAN04	Rehabilitation	283055	6427707		X
MAN05/ FA19	Rehabilitation	282555	6427234		X

MAN15	Rehabilitation	283096	6426779		X
MAN22	Revegetation	283449	6430549	X	
MAN24	Revegetation	285616	6427245	X	
MAN25	Revegetation	285952	6425647	X	
MAN26	Revegetation	284535	6421643	X	
MAN27	Revegetation	283783	6422288	X	
MAN28	Revegetation	278125	6424685	X	
MAN30	Revegetation	278398	6423819	X	

Table 11-3: Nestbox location and monitoring schedule

BOA	Number of nest boxes in BOA	Year of survey		
		2027	2028	2029
Big Flat Creek	253	X		
Eastern Offset	550			X
Mangoola BSA	41		X	
Northern Corridor	172	X		
Rehabilitation	173	X		
Southern Offset	84			X
Western Corridor and Anvil Hill	520		X	

Appendix D - Monitoring Methods

D.1 Floristic Monitoring

Floristic monitoring will be undertaken at each of the permanent flora monitoring sites according to the frequency outlined in Appendix C. Methods can differ depending on the type of site (i.e. Conservation Agreement, Biodiversity Stewardship Area or Biodiversity Report Card Site). Table 11-4 below gives a brief overview of the methods

Table 11-4: Flora monitoring, methods and timing summary

Monitoring group	Survey type	Frequency
CA monitoring	Photo monitoring at all sites	Every year
	Quadrat monitoring at selected sites	Every year
	Walk through assessment*	Every year
Quarterly inspections	Inspection to determine the physical condition of fencing and gates	Every year
	Inspection to determine the number of Stock and date/s when Stock have entered the Management Zones on site (Wybong Heights BSA only)	Every 3 months
	Inspection to determine any human disturbance on the site	Every 6 months
	Inspection to estimate levels of browsing and/or burrowing impacts.	Biannual
	Inspection to determine the presence of Rubbish on the site	Every 6 months
	Inspection to detect the presence of pest fauna	During any inspection
	Inspection to assess the effectiveness of Threatened Species habitat management actions (Mangoola BSA only)	Every year
	Inspection to determine the physical condition of existing firetrails and access tracks (Mangoola BSA only)	Every 6 months
BSA monitoring	Photo points	Every year
	BAM plots	Every 5 years (starting at year 1 (2024) and again at year 5 (2028))

	Remote camera trapping (Approximately 3 cameras installed for 1 month per event) (Wybong Heights)	Annually (Years 1-20) Biennially (years 20+)
	Any other specific requirements as per the BSA	See site specific BSA
	Camera monitoring for pest species as per site specific BSA	See site specific BSA
	Biodiversity Stewardship Site inspections*	Annual
BRC Monitoring	Annual offset inspections *	Annual
	BAM plots	Every 3 years (see Table C3)
	Photo Points	Annual
Mangoola BSA	Threatened species monitoring - Sampling of eight, 10 x10m plots (nested in the BAM Integrity plots).	Annually in Years 1-20 then every two years ongoing.– Ground Orchid Every 5 year - Cymbidium

* Walkover component of annual monitoring

D.1.1 Conservation Agreements

Flora monitoring must be completed by a suitably qualified person (such as an ecologist). The location for each site is provided in Figure 6-1 and Appendix C, Table C-1.

Flora sites under a Conservation Agreement include the following methods;

- photo monitoring – where four photos are required to be taken at each of the monitoring photo points. Further details are provided in Section D.3 below.
- quadrat monitoring – further details are provided within Section D.1.1.1 below.
- walk through assessment to record opportunistic sightings within the Conservation Area which will follow the methods detailed within BRC Annual Offset Inspections as per Section D2.1.

D.1.1.1 Quadrat Monitoring

Data collected at each quadrat includes:

- Native species richness
- Overstorey cover (% pfc)
- Mid-storey cover (% pfc)
- Ground cover – Grasses
- Ground cover – Shrubs (% pfc)
- Ground cover – other (% pfc)

- Proportion overstorey regeneration
- Exotic cover
- Number of trees with hollows
- Total length of fallen logs

In addition, the following information will be recorded at each floristic monitoring site, with reference to the whole vegetation zone:

- general health of vegetation
- evidence of natural recruitment
- signs of disturbance by stock or humans
- evidence of feral animals

Data should be compared and analysed against baseline data presented in respective CA's as well as historical reports.

D.1.2 Biodiversity Stewardship Sites

This monitoring will be completed in a manner consistent with Biodiversity Assessment Methodology (BAM) (OEH 2020) and as per the requirements outlined within each Biodiversity Stewardship Agreement. Further guidance is provided within each Management Action Plan and in accordance with the Biodiversity Stewardship Agreement. Each site will be monitored annually, at a minimum, with additional tasks required as frequently as 3 monthly. The location for each site is provided in Figure 6-1 and Appendix C, Table C-2. Monitoring in relation to fire management will be included in a site specific fire management plan.

Methods required for monitoring include;

D.1.2.1 Photo points

Completed at each site specified within Table C-2. Methods are provided below in Section D.3.

D.1.2.2 Biodiversity Stewardship Site inspections

These inspections will be completed in conjunction with the Quarterly Inspections, as detailed in Section 6.1. Data collection requirements and the intervals for each of these inspections are provided within Table 11-4 and additional details are provided within the site specific BSA.

D.1.2.3 BAM plots

For each flora species recorded in the plot, the following data will be collected in accordance with Table 2 of the BAM (OEH 2020):

a) Stratum/layer in which the species occurs
b) Growth form
c) Scientific name and common name
d) Cover and
e) Abundance.

The following attributes will be recorded at each floristic plot, in accordance with the BAM (OEH 2020) to determine the condition of the vegetation zone:

a) **Composition** - native plant species richness by growth form (within the 20 x 20 m plot)

b) **Structure** – estimate foliage cover of native and exotic species by growth form (within the 20 x 20 m plot)

c) **Function -** (within the 20 x 50 m 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 m plots), number of trees with hollows and high threat exotic cover.

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/analogue sites. This will assist in tracking the progression of revegetation/regeneration sites in relation to performance

D.1.2.4 Orchid monitoring

Ground Orchid monitoring is required at the Mangoola BSA within all MZs at locations specified within Table C-2. This monitoring involves the sampling of eight, 10 x10m plots (nested in the BAM Integrity plots).

Ground Orchid plots sampled during active flowering period for species (approximately late August to early October – check local reference plots). Within each plot:

- Careful searching for flowering target orchids is undertaken across the plot and a count of each recorded.
- Where located, metal U-pegs and numbered tags are positioned ~5cm from the base of each orchid, colour coded for each species (yellow for *Diuris tricolor*, blue for *Prasophyllum petilum*).
- Due to difficulty distinguishing *Prasophyllum* from *Microti*s, only flowering specimens are marked and numbered.
- Habitat condition attributes recorded (density of exotic grasses, shrub and tree regen)
- Anything additional as specified by the qualified ecologist to observe response to burn trials.

Ground Orchid monitoring plots to be surveyed annually in Years 1-20 and then every second year ongoing

Additional plots to be added to the monitoring program over time if required due to appropriately monitor success or otherwise of management actions.

Monitoring of *Cymbidium canaliculatum* is required within MZ6 every 5 years and includes inspections of individual and report any signs of poor health (dieback, pests, diseases, host tree health etc).

D.2 Biodiversity Report Card Monitoring

Biodiversity Report Card (BRC) is a procedure designed by Glencore Coal Assets Australia (GCAA) operations in New South Wales (NSW). The BRC is specific to biodiversity offsets and this procedure applies to all GCAA operations where approvals require the establishment, management and monitoring of BOAs. The primary purpose of the BRC is to gather information that allows demonstration of the progress of BOAs towards meeting regulatory commitments and completion criteria, and to identify underperforming areas requiring corrective or improvement actions. The location of BRC sites is provided in Figure 6-2 and Appendix C, Table C-3.

The development of the BRC is a combination of spatial and GIS-based desktop assessments combined with field monitoring techniques, and post-processing of field monitoring results for analysis. The BRC can be broken down into four logical steps, being:

- Step 1 – Site Stratification, which involves the site being stratified into two distinct zones, being:
    - Remnant Vegetation or
    - Regeneration/Revegetation Areas.
- Step 2 – Preliminary Desktop Assessments, including two desktop assessments;
    - Progress against the revegetation schedule (i.e. completion of planting or seeding commitments); and
    - Progress against the habitat construction schedule (i.e. installation of nest boxes or other artificial habitat features).
- Step 3 – Field Monitoring, can include;
    - Annual Offset Inspection – walking / driving assessment designed to ground truth land management and non-plot based indicators, and identify any management issues at the broader landscape scale.
    - Remnant Monitoring – BAM based assessment of vegetation condition to allow a comparison against baseline values.
    - Revegetation Monitoring – modified BAM assessment, principally to determine revegetation / regeneration success and progress towards meeting success criteria.
    - Fauna Monitoring – comprises only site-based regulatory monitoring requirements, there is no minimum fauna monitoring requirement for the BRC.
    - Site specific requirements
- Step 4 – Compilation of the BRC to allow for comparison of results against specific performance categories.

Full details on the background and methods relating to BRC Monitoring is provided within GCAA Biodiversity Report Card NSW Procedure and Biodiversity Report Card Monitoring Scope for NSW Operations. Additional details on the background of the procedure can be sourced from the Biodiversity Report Card Scientific Background Report.

D.2.1 Annual Offsets Inspections

The inspection comprises two components:

1. Pre-inspection desktop assessment
2. Field inspection

The purpose of the pre-inspection desktop assessment is to review and verify compliance data provided by the site for completion criteria (e.g., fencing construction, completion of feral animal control, area of revegetation, installation of habitat features, management of threatened flora species, etc). The process for completing these checks is outlined in the NSW Development of the Annual Biodiversity Report Card Procedure.

The field inspection shall adopt a methodical approach whereby all formal access tracks are driven, and appropriate geographical coverage of the monitoring zone is achieved via meandering walking transects. Whilst completing the inspection, opportunistic assessment and identification of the following must be recorded and documented:

a) Presence of waste materials;

b) Presence of redundant fencing material;

c) Presence or evidence of usage of non-approved tracks;

d) Condition of approved access tracks;

e) Condition of boundary or required internal fences and signage;

f) Weed infestations (extent and severity/density) including Priority Weeds (LLS), HTEs (BAM) and other problematic species;

g) Presence of pest animals (sightings or evidence of presence) and levels of impact;

h) Presence of cattle or other stock (sightings or evidence of presence);

i) Presence of erosion issues and/or evidence of previous erosion management;

j) Condition of constructed artificial habitat features (locations provided by Site); and

k) Presence of visual impacts from pathogens (disease or dieback) on native flora/fauna.

l) Sighting of threatened species

m) Secondary evidence of fauna use such as scats, tree scratches or diggings.

Key findings and observations made during the inspection shall be documented and briefly discussed in a specific section of the monitoring report and shown on a geo-referenced map of the offset site. Findings of the inspection are also to be entered into the BRC Workbook upon completion.

D.2.2 Revegetation Monitoring

The procedure for revegetation monitoring for areas which are required to conform to a specific ecological community, such as a threatened ecological community (TEC) or plant community type (PCT). Each site includes the assessment of variables within a 20 x 50m plot. Data within each plot should be collected as per a BAM (2020) Vegetation Integrity Plot. Additional data associated with BioBanking Assessment Method (BBAM) is required at specific CA sites.

D.2.3 Remnant Vegetation Monitoring

Similarly to plots completed within Revegetation Monitoring, the procedure for the long-term biodiversity monitoring for remnant vegetation includes the use of a 20x50m plot as per the BAM 2020.

D.3 Photo Monitoring

Photo monitoring photos must be taken from the exact location and bearing to allow subsequent comparison and assessment. Phots must be taken at each permanent flora monitoring location from the north-east plot corner facing 0°, 90°, 180° and 270° (i.e. north, east, south and west).

D.4 Translocation Monitoring

Translocation monitoring is undertaken for both translocated terrestrial threatened orchids painted diuris (*Diuris tricolor*) and *Prasophyllum petilum*/*Prasophyllum sp.* Wybong as well as for translocated tiger orchids (*Cymbidium canaliculatum*). The locations of these translocated species are listed in Appendix C, however their co-ordinates are not included to minimise the risk of damage by the public.

D.4.1 Terrestrial Orchid Monitoring

Terrestrial orchid monitoring is undertaken on an annual basis, during orchid flowering (September/October). Plants have been tagged with metal stakes for ease of identification. This monitoring comprises counts of emerged individuals of each species.

D.4.2 Tiger Orchid Monitoring

Tiger orchid monitoring was undertaken in accordance with standard internal document *Tiger Orchid Translocation and Monitoring Form*. For translocated tiger orchids, they are monitored biannually for the first year while the chances of translocation failure are higher, then every second year until five years after translocation (i.e. four times in total for each translocated orchid). Monitoring frequency is increased if identified as needed during monitoring events. Monitoring occurs during spring and autumn.

The following aspects are documented for translocated tiger orchids:

a) Orchid reference number

b) Date and personnel undertaking monitoring

c) Photos of condition

d) Health of plant

e) Attachment to tree.

f) Three naturally occurring tiger orchids (reference plants) are also monitored for each of the above (with the exception of tree attachment) to identify whether changes to translocated tiger orchid health are a likely consequence of being translocated or natural fluctuations.

A register of the locations of these records is maintained onsite at Mangoola.

All translocated Tiger orchids have now completed the required period for monitoring. This monitoring will apply to any new Tiger orchids found during due diligence pre-clearance inspections in Wybong Pit. All Tiger orchids identified will be translocated and monitored according to the Translocation of Threatened Species Management Plan. No new Tiger orchids have been identified in the Wybong Pit pre-clearance area to date.

D.4.3 Denman Pomaderris Monitoring

There are four 12m by 12 m translocation plots of Denman Pomaderris, two in the mine rehabilitation and two in the Mangoola BOAs. Monitoring and research of these translocated specimens was undertaken by the NSW Biodiversity Conservation Division (BCD), as a Saving Our Species project.

D.5 Fauna Monitoring

Fauna monitoring will be undertaken at each of the permanent fauna monitoring locations (including revegetation/regeneration sites once they are appropriately established), according to the frequency outline in Appendix C. Fauna monitoring to be undertaken at each site will consist of diurnal woodland bird surveys, micro-bat surveys, diurnal herpetofauna surveys, spotlighting surveys, call playback surveys, remote camera surveys, and mollusc searches. Each of these is described in greater detail below.

Surveys are undertaken in spring each year.

The spring survey event will comprise diurnal birds, diurnal herpetofauna, remote cameras, Anabats (or other ultrasonic microbat recorders), call playback, spotlighting (mammals, birds, reptiles and amphibians) and mollusc monitoring.

D.5.1 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.

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.

D.5.2 Diurnal Herpetofauna Surveys

Targeted diurnal searches will be conducted for reptile and amphibian species (herpetofauna) within an approximate two-hectare area. One person/hour of diurnal herpetofauna surveys will be undertaken for each site. Searches will comprise a slow walking meander searching areas of likely habitat such as under rocks and logs, in bark at the base of trees, around water resources and in man-made features.

D.5.3 Anabat Echolocation Surveys

Micro-bat surveys will be undertaken with Anabat devices for each permanent fauna monitoring location and will be placed along a flyway or over a riparian body. Micro-bat surveys will comprise two full survey nights of Anabat surveys for each site. Anabats will be set to record all micro-bat calls prior to dusk until after dawn.

Anabat data will be analysed by suitably qualified personnel.

D.5.4 Spotlighting Surveys

Spotlighting will target 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.

D.5.5 Nocturnal Call Playback

Call playback sessions will be required in spring (preferably October to November) and will be undertaken at each of the fauna monitoring locations using a directional loud hailer. Calls will be broadcast for;

- powerful owl (*Ninox strenua*),
- barking owl (*Ninox connivens*),
- masked owl (*Tyto novaehollandiae*),
- 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.

D.5.6 Mollusc Searches

Targeted diurnal searches will be conducted for molluscs (specifically *Meridolum* "Denman/Castlerock") within an approximate two-hectare area of each fauna monitoring site. One person/hour of mollusc surveys will be undertaken for each site. Searches will comprise a slow walking meander searching areas of likely habitat such as under rocks and logs, in bark at the base of trees, and in man-made features.

During this time all molluscs observed will be recorded and numbers documented.

D.5.7 Remote-sensing Camera Surveys

Remote-sensing camera monitoring will be undertaken at each fauna monitoring site and will target multiple species as well as exotic vertebrate fauna.

Two remote cameras will be installed at each monitoring site and should be installed for a minimum of 2 weeks. Bait should include a mix of oats, honey and peanut butter and should be encased in a canister with small holes at each end which limits bait theft. The tree or stake which holds the bait should also be sprayed with a mixture of honey and water to attract fauna.

One camera will be positioned approximately 30cm above the ground, to target terrestrial mammals. Bait should be secured to a tree or stake between 20 and 30cm above the ground.

The second camera should be positioned for arboreal fauna, at least 1.5m above the ground. Bait should be contained within a canister and placed opposite the camera. The distance between bait and the camera may be influenced by the specifications of each remote camera.

It is recommended that the bait canisters are all of equal size, to allow for measurements and size comparisons where required. Alternatively, a ruler or other measurement-based device can be installed adjacent bait canister to provide some guidance on measurements. Remote cameras will then be downloaded and resultant images analysed at the completion of the two weeks.

D.5.8 Threatened Species Monitoring

During all aspects of the above surveys, any threatened or migratory species and endangered populations listed under the *Biodiversity Conservation Act 2016* (BC Act) and *Environment Protection and* Biodiversity *Conservation Act 1999* (EPBC Act) will be recorded. Where identified, information recorded will include:

a) Coordinates of sighting

b) Number of individuals recorded

c) Evidence of breeding/nesting activity etc

d) 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.

D.6 Nest Box Monitoring

All nest boxes installed in the BOAs are subject to monitoring for condition and content. Due to the extent of nest boxes that have now been installed, they have been grouped based on location and are monitored in a three year cycle. These groupings are:

Group 1: Big Flat Creek, Northern Corridor, Rehabilitation
Group 2: Mangoola BSA; Western Corridor and Anvil Hill
Group 3: Eastern Offset; Southern Offset

This cycle of monitoring will commence in 2027 (see Table 11-3), with surveys in 2026 completing the previous three year cycle (2024-2026) as per the approved BOMPS at the time.

Details recorded for nest box monitoring every year is as follows:

a) 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.

Presence of non-target species such as bees, wasps and introduced birds.

b) Condition, including:

- Collapsing joints.
- Missing lids.

- Bowing timber.
- Perishing timber.
- Tree attachment.

Appendix E - Performance Indicators and Completion Criteria

The performance indicators and completion criteria listed in Table 11-5, 11-6 and 11-7 below relate to the:

a) Regeneration and revegetation areas; and

b) General management strategies for Conservation Areas as outlined in detail in Section 5 of the main text.

c) Site specific performance measures for BSAs

The performance indicators are for the three years of the implementation of this BOMPS (2025-2027) and can be used to assist in demonstrating how management actions are progressing towards achieving the completion criteria.

The completion of and performance against each of these indicators/criterion needs to be assessed and documented in the AR, based on the outcome of ecological monitoring and inspections across the Mangoola CAs each year.

Performance indicators and completion criteria for BSAs are specific to each site. The MAP developed for each BSA contains management actions and performance criteria with progress against these detailed within annual monitoring reports.

Table 11-5 Years 15 to 17 Performance Indicators and Completion Criteria for Mangoola BOAs Revegetation and Regeneration Areas

Action/ Item	Short Term Performance Indicators Years 2022-2024	Medium Term Performance Indicators Years 2025-2028	Completion Criteria
Aboriginal Due Diligence	Areas of active revegetation are subject to Aboriginal due diligence prior to planting commencement.	Areas of active revegetation are subject to Aboriginal due diligence prior to planting commencement.	PADs identified.
Protection of PADs	PADs encountered during due diligence are demarcated in accordance with the GDP procedure and no ground disturbance is undertaken in these areas.	PADs encountered during due diligence are pegged off and no ground disturbance is undertaken in these areas.	PADs protected.
Control of weeds in revegetation/ regeneration areas.	Weed control works are completed in accordance with this BOMPS and actions recommended from monitoring recommendations.	Weed control works are completed in accordance with this BOMPS and actions recommended from monitoring recommendations	Total weed coverage is within 5% of the coverage of weeds provided by remnant sites. Impediment to natural recruitment is within the ranges of those in reference sites.
Control of weeds across Conservation Areas	Annual monitoring and reporting of total weed cover and change over time. Weeds identified for Primary Weed Control in Annexure C of the Conservation Agreements and perennial weeds listed as High and Medium priority in the Weed Management Action Plan are targeted in weed control.	Annual monitoring and reporting of total weed cover and change over time. Weeds identified for Primary Weed Control in Annexure C of the Conservation Agreements and perennial weeds listed as High and Medium priority in the Weed Management Action Plan are targeted in weed control.	Total exotic cover no greater than 10% above baseline levels.
Control of feral animals in revegetation/ regeneration areas.	Feral animal control works are completed, in accordance with this BOMPS and actions recommended from monitoring recommendations.	Feral animal control works are completed, in accordance with this BOMPS and actions recommended from monitoring recommendations	Natural regeneration is occurring and is being subject to grazing by feral herbivores at similar rates to that of remnant vegetation. Feral animal control is no higher than management required for reference sites
Confirmation of mapping of areas for regeneration, including appropriateness of target community	Revised in ongoing monitoring works.	Revised in ongoing monitoring works.	Accurate mapping of regeneration areas is documented and kept up to date.

Action/ Item	Short Term Performance Indicators Years 2022-2024	Medium Term Performance Indicators Years 2025-2028	Completion Criteria
Management of regeneration progress is responsive to monitoring outcomes.	Monitoring of regeneration areas occurs. Management actions are implemented in response to monitoring	Monitoring of regeneration areas occurs. Management actions are implemented in response to monitoring	Monitoring results are used to inform ongoing regeneration planning, including implementation of assisted regeneration if natural regeneration is not progressing sufficiently. Management actions undertaken are documented.
Review need for assisted regeneration where outcomes of natural regeneration is deemed lacking.	Assess progress/ outcomes of natural regeneration and assess need to implement assisted regeneration measures.	Assess progress/ outcomes of natural regeneration and assess need to implement assisted regeneration measures.	Assisted regeneration is implemented after three years if natural regeneration is deemed lacking.
Vegetation Composition The vegetation composition of the rehabilitation is recognisable as the target plant community type (PCT) contained within the NSW VIS (BioNet vegetation classification)	Native plant species recorded from 0.04 hectare fixed monitoring plots are characteristic of the target PCT (based on the BioNet vegetation classification).	Native plant species recorded from 0.04 hectare fixed monitoring plots are characteristic of the target PCT (based on the BioNet vegetation classification).	Using the PCT Assignment Tool the distance to centroid value when comparing the ecological revegetation/ regeneration site and target PCT is characteristic of the target PCT (either distance to centroid measure of 0.695 being “very strongly recognisable” or at least “strongly recognisable”
Vegetation Structure The vegetation structure of the rehabilitation is recognisable as, or is trending towards (based on ongoing monitoring data), the target PCT in the NSW VIS (BioNet vegetation classification)	Cover and abundance of plant growth forms recorded from 0.04 ha fixed monitoring plots are characteristic of the target PCT, or an ongoing trend toward becoming characteristic is evident from the monitoring data.	Cover and abundance of plant growth forms recorded from 0.04 ha fixed monitoring plots are characteristic of the target PCT, or an ongoing trend toward becoming characteristic is evident from the monitoring data.	Foliage cover of species allocated to the three dominant growth form groups for the target PCT as identified by BAM is within the 10^{th}-90^{th} percentile variation range of the specified reference sites/data approved by the consent authority For wooded target PCT(s) only: Stem abundance and diameter at breast height for trees in diameter at breast height (DBH) size classes <5 cm, 5-9, 10-19 and 20-29 cm is within the 10th-90th percentile variation range of the specified reference sites/data approved by the consent authority
Vegetation Function	Evidence of tree regeneration from 0.04 hectare fixed monitoring plots or a walk over of the ecological revegetation area	Evidence of tree regeneration from 0.04 hectare fixed monitoring plots or a walk over of the ecological revegetation area	For revegetation Sites - Second generation individuals of trees are within the 10th-90th percentile variation range of reference sites/data approved by the consent authority

Action/ Item	Short Term Performance Indicators Years 2022-2024	Medium Term Performance Indicators Years 2025-2028	Completion Criteria
Levels of ecosystem function have been established that demonstrate the rehabilitation is self-sustainable	Cover of exotic species within 0.04 hectare fixed monitoring plots is low	Cover of exotic species within 0.04 hectare fixed monitoring plots is low	Foliage cover of 'high threat exotic' (HTE) weeds is within 10th-90th percentile variation range of reference sites/data approved by the consent authority
	Litter cover is within 10th-90th percentile variation range of reference sites.	Litter cover is within 10th-90th percentile variation range of reference sites.	Litter cover is within 10th-90th percentile variation range of reference sites/data approved by the consent authority, or an ongoing trend toward this range is demonstrated
Failure of revegetation plantings Canopy Species	If inspections or monitoring identify that species plantings are failing to meet required stem count densities for requisite PCTs, supplementary tree plantings will be undertaken comprising target species provided in Appendix A. Ongoing monitoring of supplementary planting will be undertaken.	If inspections or monitoring identify that species plantings are failing to meet required stem count densities for requisite PCTs, supplementary tree plantings will be undertaken comprising target species provided in Appendix A. Ongoing monitoring of supplementary planting will be undertaken.	Failed revegetation plantings are replaced until target stem densities are met.
Failure of revegetation plantings Tree dieback	Revegetate with dense shrubs to increase diversity and insectivorous birds.	Revegetate with dense shrubs to increase diversity and insectivorous birds.	
Failure of revegetation plantings Diagnostic understorey and groundcover species	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. Ongoing monitoring of supplementary planting will be undertaken.	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. Ongoing monitoring of supplementary planting will be undertaken.	Failed revegetation plantings are replaced until target PCT understorey and groundcover cover and abundance targets are met.
Failure of revegetation plantings	Targeted weed control.	Targeted weed control. Instigate active revegetation techniques including direct seeding or tubestock	Failed revegetation plantings are replaced until target PCT understorey and groundcover cover and abundance targets are met.

Action/ Item	Short Term Performance Indicators Years 2022-2024	Medium Term Performance Indicators Years 2025-2028	Completion Criteria
Native Diversity not consistent with target community or species diversity	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.	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.	
Log coverage	Treed vegetation is increasing in DBH from previous monitoring year.	Treed vegetation is increasing in DBH from previous monitoring year.	Log coverage is present or will be present as indicated by increasing tree DBH trends.
Implement rehabilitation/ revegetation program.	Implementation of plan. Learnings from previous rehabilitation/ revegetation works implemented.	Implementation of plan. Learnings from previous rehabilitation/ revegetation works implemented.	Rehabilitation and revegetation plan implemented.
Monitoring Program	The BSA monitoring program is maintained.	The SA monitoring program is maintained.	A monitoring program to assess the progress of regeneration and revegetation areas was undertaken as required.
Positive feedback loop from monitoring results.	Feedback from monitoring is incorporated into ongoing review and improvement of plan.	Feedback from monitoring is incorporated into ongoing review and improvement of plan.	Monitoring outcomes considered in continual review and improvement of plan.
Native fauna presence in rehabilitation/ regeneration areas	Fauna monitoring completed. Native fauna utilising habitats present. Presence of some niche specialists. Native amphibian, reptile, bird and mammal species present.	Fauna monitoring completed. Native fauna utilising habitats present. Presence of some niche specialists. Native amphibian, reptile, bird and mammal species diversities within 30% of those of target ranges.	Fauna monitoring confirms that native fauna species are recorded within rehabilitation/regeneration areas and diversities are within 20% of those identified in target vegetation.
Collate data on actions implemented and results of inspections and monitoring into the AR.	AR completed annually	AR completed annually	AR completed annually
Weed inspections of remnant and rehabilitation areas	Quarterly monitoring inspections are undertaken of rehabilitation and revegetation areas to identify areas of weed infestation.	Quarterly monitoring inspections are undertaken of rehabilitation and revegetation areas to identify areas of weed infestation.	Regular inspections are undertaken for weeds, outcomes documented and recommendations implemented.

Action/ Item	Short Term Performance Indicators Years 2022-2024	Medium Term Performance Indicators Years 2025-2028	Completion Criteria
	Annual inspections are undertaken of remnant vegetation to identify areas of weed infestation. Subsequent weed management actions of infestations are undertaken in accordance with current or other best practice approaches.	Annual inspections are undertaken of remnant vegetation to identify areas of weed infestation. Subsequent weed management actions of infestations are undertaken in accordance with current or other best practice approaches.	
	Weed Control Action Plan updated in response to inspections and monitoring outcomes	Weed Control Action Plan updated in response to inspections and monitoring outcomes	

Table 11-6 Years 15 to 18 Performance Indicators and Completion Criteria for Mangoola BOAs (PA06_0014)

Action/ Item	Short Term Performance Indicators – Years 2022-2024	Medium Term Performance Indicators – Years 2025-2028	Completion Criteria
Conservation Agreement			
Pre-clearing and Tree Felling Surveys			
Native fauna in areas of vegetation being subject to clearing are appropriately surveyed to minimise the potential for harm.	Pre-clearing surveys are undertaken by personnel suitably qualified to do so.	Pre-clearing surveys are undertaken by personnel suitably qualified to do so.	Native fauna are given reasonable chance to be safely discouraged from using clearing areas.
	Pre-clearing surveys are undertaken prior to commencement of disturbance activities These surveys will identify significant ecological features and make recommendations to minimise their harm.	Pre-clearing surveys are undertaken prior to commencement of disturbance activities.	
	Significant habitat features that require supervision during felling will be clearly demarcated and accurate GPS coordinates taken.	Significant habitat features that require supervision during felling will be clearly demarcated and accurate GPS coordinates taken.	
Fauna located in trees during felling activities are given opportunity to evacuate and harm during felling is minimised	Tree-felling supervision is undertaken by personnel suitably qualified to do so.	Tree-felling supervision is undertaken by personnel suitably qualified to do so.	Native fauna are given reasonable chance to be safely relocated from felled habitat features.
	Felling activities are undertaken in accordance with the protocols of the Pre-clearance Survey, Land Clearing and Topsoil Stripping Procedures.	Felling activities are undertaken in accordance with the protocols of the Pre-clearance Survey, Land Clearing and Topsoil Stripping Procedures.	
Habitat values identified within area subject to clearing	Habitat features identified for salvage are relocated to new locations as soon as possible after they are cleared.	Habitat features identified for salvage are relocated to new locations as soon as possible after they are cleared.	Habitat features relocated to allow for use by native fauna
Track Establishment and Maintenance			

Action/ Item	Short Term Performance Indicators – Years 2022-2024	Medium Term Performance Indicators – Years 2025-2028	Completion Criteria
Slashing and grading maintenance	If required based on routine inspections and monitoring, track slashing and grading will be undertaken.	If required based on routine inspections and monitoring, track slashing and grading will be undertaken.	Adequate access of the BOAs for firefighting activities and on-ground management and monitoring activities is possible.
	Slashing and grading required to be undertaken is limited to the disturbance footprint required to achieve works,	Slashing and grading required to be undertaken is limited to the disturbance footprint required to achieve works,	
New tracks	If new tracks are required for bushfire control and asset protection, they will be subject to appropriate due diligence and cause the minimal amount of ground disturbance required to do so.	If new tracks are required for bushfire control and asset protection, they will be subject to appropriate due diligence and cause the minimal amount of ground disturbance required to do so.	Any new tracks required were subject to appropriate due diligence.
Pathogen Management			
Pathogen Management	Pathogens are considered in design and implementation of monitoring works. If identified (or potential identified), management actions for specific pathogens are developed and implemented.	Pathogens are considered in design and implementation of monitoring works. If identified (or potential identified), management actions for specific pathogens are developed and implemented.	Methods to identify potential pathogens are considered in monitoring program design (if reasonable potential of pathogen presence is identified onsite). Signs of pathogen presence (or potential presence) are immediately reported. If suspected to be onsite, detailed management actions are developed and implemented. There is no onsite infestation of *Phytophthora cinnamomi*
Fencing, Signage and Access Control			
Fencing and signage of Clearing Areas	Prior to commencing any clearing activities, areas of remnant vegetation not subject to clearing will be marked out with temporary fencing in accordance with approved plan boundaries.	Prior to commencing any clearing activities, areas of remnant vegetation not subject to clearing will be marked out with temporary fencing in accordance with approved plan boundaries.	Clearing has not occurred outside of approved areas.

Action/ Item	Short Term Performance Indicators – Years 2022-2024	Medium Term Performance Indicators – Years 2025-2028	Completion Criteria
	Temporary fencing is removed when no longer required.	Temporary fencing is removed when no longer required.	No temporary fencing remains on-site
Fencing and signage in BOAs	Inspect and maintain existing fencing and signage.	Inspect and maintain existing fencing and signage.	All required boundary fences and signage are present and regularly monitored and maintained in appropriate condition.
Removal of redundant fences	Removal of redundant fence lines in BOAs.	Progressive removal of redundant fences until none remain.	No redundant fences remain in BOAs.
Fauna appropriate fencing	Any permanent fencing erected will use plain wire, except where bordering grazing land.	Any permanent fencing erected will use plain wire, except where bordering grazing land.	Appropriate boundary fences in place do not hinder native fauna passage.
Fencing near known Aboriginal cultural heritage sites	If fencing is required near known Aboriginal cultural heritage items, their construction will take into consideration requirements of the ACHMP.	If fencing is required near known Aboriginal cultural heritage items, their construction will take into consideration requirements of the ACHMP.	Aboriginal cultural heritage sites are not impacted by any fencing erected in the BOAs.
Routine maintenance and inspection of tracks and fences throughout the Mangoola BOAs	Biannual inspection of fences and tracks are undertaken.	Biannual inspection of fences and tracks are undertaken.	All boundary fences and access track are intact and in functional condition.
Rehabilitation of unnecessary access tracks.	Tracks no longer required are progressively rehabilitated.	Tracks no longer required are progressively rehabilitated.	No unnecessary tracks are present.
New track development	If new tracks are necessary, due diligence assessments are completed to identify an alignment which minimises impacts on biodiversity.	If new tracks are necessary, due diligence assessments are completed to identify an alignment which minimises impacts on biodiversity.	New access tracks are only constructed where necessary, and subject to due diligence inspections
	If new tracks are required, they are subject to appropriate pre-clearing and tree-felling supervision procedures as needed.	If new tracks are required, they are subject to appropriate pre-clearing and tree-felling supervision procedures as needed.	

Action/ Item	Short Term Performance Indicators – Years 2022-2024	Medium Term Performance Indicators – Years 2025-2028	Completion Criteria
Grazing Management (Southern Offset Only)			
Grazing management in SO area	Controlled sustainable grazing occurs that does not impede natural recruitment. Management practices modified as needed based on monitoring to allow integration of ecological-based management.	Controlled sustainable grazing occurs that does not impede natural recruitment. Management practices modified as needed based on monitoring to allow integration of ecological-based management.	Grazing in SO has led to increased abundance and vigour of native pasture species. Introduced weed species cover and abundance are consistent with areas of local reference grassland vegetation.
Management of grazing in BOAs	Grazing excluded from BOAs except SO area	Grazing excluded from BOAs except SO area	Grazing managed within SO BOA. If undertaken, is completed in accordance with defined criteria in SO Conservation Agreement, and is informed by ecological monitoring.
Grazing as a conservation management tool	Grazing in accordance with terms defined in Southern Offset Conservation Agreement	Grazing in accordance with terms defined in Southern Offset Conservation Agreement	Grazing in accordance with terms defined in Southern Offset Conservation Agreement. If modifications were made, they were under the approval of OEH.
Watering Points	No new permanent watering points are installed.	No new permanent watering points are installed.	No new permanent watering points have been installed.
	If temporary watering points are required, permission must first be sought from OEH.	If temporary watering points are required, permission must first be sought from OEH.	Any temporary watering points utilized were first permitted by OEH.
Overgrazing or inappropriate grazing	Grazing is removed until issue identified as being resolved via inspections/monitoring.	Grazing is removed until issue identified as being resolved via inspections/ monitoring.	Issues in grazing regime are identified and corrected promptly.
Grazing of Domesticated Animals			
Exclusion of domestic grazing activities	Grazing of domesticated animals is excluded from all BOAs (excepting SO).	Grazing of domesticated animals is excluded from all BOAs (excepting SO).	Grazing is not impeding the health and recovery of the BOAs

Action/ Item	Short Term Performance Indicators – Years 2022-2024	Medium Term Performance Indicators – Years 2025-2028	Completion Criteria
Weed Management			
Develop and implement an effective annual weed action plan	Weed Control Action Plan updated annually based on the outcomes of inspections and monitoring and actions implemented	Weed Control Action Plan updated annually based on the outcomes of inspections and monitoring and actions implemented	Strategies from action plan are implemented and targets are achieved. Weed populations generally stable or declining.
Reporting of Weed Control Action Plan	A summary of the weed management activities carried out within the Mangoola Coal BOAs is reported annually in the AR.	A summary of the weed management activities carried out within the Mangoola Coal BOAs is reported annually in the AR.	Weed management was reported annually each year in the AR.
Pest Management			
Develop and implement an effective annual Pest Animal Action Plan	Pest Animal Action Plan is updated annually based on the outcomes of inspections and monitoring. Actions of plan are implemented.	Pest Animal Action Plan is updated annually based on the outcomes of inspections and monitoring. Actions of plan are implemented.	Strategies from action plans are implemented and targets are achieved. Stable or downward trend in population size recorded.
Develop a pest animal control register to document when and where each control method is implemented	Update and maintain pest animal control register	Update and maintain pest animal control register	Pest animal control register is maintained and up to date
Habitat Augmentation			
Nest box installation	Inspect, maintain and replace as identified during monitoring.	Inspect, maintain and replace as identified during monitoring.	Nest boxes in place are being monitored, maintained and replaced if required.
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.	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.	Issues with the salvaging procedure are promptly addressed if required.

Action/ Item	Short Term Performance Indicators – Years 2022-2024	Medium Term Performance Indicators – Years 2025-2028	Completion Criteria
Supplementary plantings for threatened fauna	Target flora species from Section 5.11.3 are included in revegetation and rehabilitation.	Target flora species from Section 5.11.3 are included in revegetation and rehabilitation.	Flora composition includes species consistent with those required for target threatened fauna (squirrel gliders and the glossy black cockatoo)
Seed Collection and Propagation			
Where suitable remnant vegetation is available, implementation of seed collection and handling program for use in revegetation/ rehabilitation works.	Personnel undertaking seed collection and propagation possess a Native Flora and Fauna Research Scientific Licence as issued by OEH specifically a licence class for Seed Collection.	Personnel undertaking seed collection and propagation possess a Native Flora and Fauna Research Scientific Licence as issued by OEH specifically a licence class for Seed Collection.	Seed collection and propagation were undertaken by personnel qualified to do so.
	Pre-clearing surveys identify potential seed sources. Seeds are collected, stored and handled according to appropriate program. Collected seed resources are used in revegetation/ rehabilitation works.	Pre-clearing surveys identify potential seed sources. Seeds are collected, stored and handled according to appropriate program. Collected seed resources are used in revegetation/ rehabilitation works.	Rehabilitation/ revegetation works use seeds collected onsite, thus maintaining as much genetic similarity (local provenance) as possible.
Translocation			
Translocation of tiger orchids or other threatened flora species (if encountered during pre-clearing process) to BOAs and rehabilitation.	Tiger orchids identified during pre-clearing process are salvaged during the tree felling process and are translocated into BOAs or mine rehabilitation areas. Any translocated individuals are subject to regular monitoring and maintenance works, if required. Reporting of translocation works and monitoring works is maintained.	Tiger orchids identified during pre-clearing process are salvaged during the tree felling process and are translocated into BOAs or mine rehabilitation areas. Any translocated individuals are subject to regular monitoring and maintenance works, if required. Reporting of translocation works and monitoring works is maintained.	Tiger orchids (or other threatened flora species if encountered) are salvaged from the Project Disturbance Area and successfully translocated into BOAs or mine rehabilitation areas. Detailed records are kept on the process, including regular monitoring and maintenance works as required.
Attachment of tiger orchid to tree is failing.	Replace tiger orchid attachment to tree.	Replace tiger orchid attachment to tree.	

Action/ Item	Short Term Performance Indicators – Years 2022-2024	Medium Term Performance Indicators – Years 2025-2028	Completion Criteria
Health of tiger orchid is failing.	Investigate a more appropriate mechanism of attachment.	Investigate a more appropriate mechanism of attachment.	Translocated tiger orchids are given a high chance of success through prompt action when issues identified.
Undescribed Molluscs			
Undescribed mollusc habitat	Salvaged boulder piles identified in pre-clearing and tree-felling are installed as habitat for these species.	Salvaged boulder piles identified in pre-clearing and tree-felling are installed as habitat for these species.	Undescribed molluscs are part of the habitat augmentation considerations of rehabilitation areas.
Undescribed mollusc monitoring	Mollusc monitoring (habitat requirements and population persistence) are undertaken as part of the annual monitoring program.	Mollusc monitoring (habitat requirements and population persistence) are undertaken as part of the annual monitoring program.	The habitats for, and populations of undescribed molluscs persist in the BOAs.
Erosion, Sediment and Salinity			
Erosion and sediment control	Quarterly inspections for erosion and salinity undertaken in BOAs and annually for erosion during Channel Stability Surveys.	Quarterly inspections for erosion and salinity undertaken in BOAs and annually for erosion during Channel Stability Surveys.	All riparian areas in BOAs are fundamentally stable and based on monitoring unlikely to substantially deteriorate in future
Implement erosion and sediment controls during land clearing.	Actions required by Ground Disturbance Permit are implemented if required.	Actions required by Ground Disturbance Permit are implemented if required.	Appropriate erosion and sediment control measures required have been identified and implemented. There are no areas of significant erosion or sedimentation within the BOAs due to land clearing.
Bushfire Management			
The current Bushfire Management Plan will be updated according to the approved modification. Bushfire Management Plan will be implemented.	The bushfire management plan will be updated. Implementation of requirements of updated Bushfire Management Plan.	The bushfire management plan will be updated. Implementation of requirements of updated Bushfire Management Plan.	Bushfire risk is managed according to an updated Bushfire Management Plan which allows for appropriate protection of life and property, as well as identified significant ecological features.

Action/ Item	Short Term Performance Indicators – Years 2022-2024	Medium Term Performance Indicators – Years 2025-2028	Completion Criteria
Unplanned bushfire event occurs	Review procedures in place and update Bushfire Management Plan based on findings. Monitor plant succession after bushfire event.	Review procedures in place and update Bushfire Management Plan based on findings. Monitor plant succession after bushfire event.	
Waste Management			
Waste management	Continue with progressive removal of waste within the BOAs. No additional waste products are added to BOAs.	Continue with progressive removal of waste within the BOAs. No additional waste products are added to BOAs.	All waste and derelict houses are removed from the BOAs
Ecological Due Diligence			
Detailed pre-clearing procedure is to be implemented if clearing areas of woody native vegetation (including shrub, groundcover and isolated trees in grasslands) is required.	If required pre-clearing process is to be implemented as part of GDP process. Outcomes of pre-clearing process are recorded and recommendations are implemented	If required pre-clearing process is to be implemented as part of GDP process. Outcomes of pre-clearing process are recorded and recommendations are implemented.	Pre-clearing process has been followed when required. Recommendations from pre-clearing process have been implemented, prior to tree felling if necessary. Outcomes of pre-clearing procedure are recorded and readily accessible.
Detailed tree felling process is to be implemented if clearing areas of woody native vegetation (including shrub, groundcover and isolated trees in grasslands) is required.	If required, tree felling process is to be implemented as part of the GDP process. Outcomes of tree-felling process are recorded and recommendations are implemented	If required, tree felling process is to be implemented as part of the GDP process. Outcomes of tree-felling process are recorded and recommendations are implemented	Tree felling process has been followed when required. Recommendations from tree felling process have been implemented.
Monitoring			
Monitoring Program	The BSA monitoring program is maintained.	The BSA monitoring program is maintained.	A monitoring program to assess the stability of remnant areas was undertaken as required.

Action/ Item	Short Term Performance Indicators – Years 2022-2024	Medium Term Performance Indicators – Years 2025-2028	Completion Criteria
Undertake quarterly and biannual inspections across Mangoola Coal BOAs	Annual inspections completed	Annual inspections completed	Annual inspections completed and reported on each year.
Undertake ecological monitoring program throughout Mangoola BOAs	Annual monitoring program completed. Reporting from monitoring includes recommendations for improvements.	Annual monitoring program completed. Reporting from monitoring includes recommendations for improvements.	Annual monitoring program completed and reported on each year. Recommendations from monitoring reports implemented.
Reporting			
AR completed	AR completed as required annually	AR completed as required annually	AR completed as required annually

Table 11-7: Performance measures for Biodiversity Stewardship Sites

BSA	Management Category	Management Zone/s	Management Action or method of monitoring	Performance indicator	Timing
Mangoola	Native Vegetation Management	All	Vegetation condition monitoring	Vegetation condition monitoring is undertaken (biannual native vegetation inspection and vegetation integrity plots)	Biannual inspections. Every 5 years for integrity plots, including baseline monitoring in Year 1 Additional sampling of revegetation plots in Years 3 and 7 to track progress against targets.
		All	Erosion remediation	If required by the BCT, erosion remediation is undertaken within 3 months of being identified, to the satisfaction of a supervising ecologist or the BCT: - appropriate erosion and sediment control measures should remain in place until the site is stabilised - impact on native vegetation is minimised during remediation work any exposed soil is revegetated.	As required

BSA	Management Category	Management Zone/s	Management Action or method of monitoring	Performance indicator	Timing
		All	Seed Collection	Seed collection undertaken in Years 1 and 2 in appropriate season to secure seed of the target native species as listed in the planting schedule above. Seed collection may occur on the Mangoola offset, or a nearby site that supports the target species. Supplementary seed may need to be purchased or collected from other offset sites, depending on seed yield in that time period.	Years 1 and 2
				Seed collection, storage and management results in reliable seed resources for restoration works targeting characteristic species of the target PCTs/TECs.	
		MZ4 and MZ8	Tube stock planting	Tube stock survival rates resulting in a minimum of 100 stems/ha is achieved in revegetation zones (planting should not occur in years where climatic conditions are likely to result in low success rate)	Years 3,7 and 10
				Monitoring indicates that revegetation areas support an assemblage of native species that are characteristic of the target PCT/TEC.	
		MZ4 and MZ8	Active Revegetation	BAM monitoring indicates that the vegetation integrity attributes have met or are trending towards the 5-yearly target values provided in Section 7 of the MAP.	Integrity plots in Years 1, 5, 10, 15, 20 then every 10 years ongoing. Additional survey of BAM plots in revegetation areas in Years 3 and 7. Stem counts in Years 3-7 (annual inspections)
	Threatened Species Habitat	All	Monitoring (for *Diuris tricolor* and *Prasophyllum petilum*)	Monitoring of a minimum of eight orchid monitoring plots annually from Year 1.	Annually from Year 1 (Biennially from Year 20)
				Plot-based monitoring indicates that there has been no significant and/or sustained reduction in population size (from baseline state recorded in Year 1) over time that cannot be attributed to seasonal factors. For this purpose, a 'significant' reduction is nominally set at a 20% reduction as an initial trigger, until multi-year monitoring provides a better picture of population trends/natural fluctuations over time.	Annually from Year 1 (Every 2 years from Year 20)

BSA	Management Category	Management Zone/s	Management Action or method of monitoring	Performance indicator	Timing
				Orchid population numbers vary greatly from year to year, depending on a number of factors including climatic conditions. As such, any relevant factors including rainfall and temperature would need to be considered when assessing whether any declines in population numbers are a concern and whether management actions are necessary.	
			Orchid surveys prior to implementing revegetation works	New records of Diuris tricolor or Prasophyllum petilum observed during pre- revegetation surveys are recorded with a hand-held GPS. The individual or patch is clearly demarcated with bunting with a 30 metre buffer during, or within one week of undertaking the survey.	Surveys to be undertaken in the active flowering season prior to revegetation works.
			Monitoring *Cymbidium canaliculatum*	Monitoring indicates that the individual is persisting and there is no sign of poor health such as pests or diseases.	Every 5 years ongoing
			Thinning	Vegetation thinning or slashing is undertaken in the required areas within 12 months of the recommendation.	Within 12 months of recommendation.
	Feral pest management	All	Feral pest control	Entire BSA site to be treated each year.	Biannually
			Camera monitoring	Annual remote camera monitoring (up to 6 cameras installed for 1 month for each event)	Annual (Years 1-20) then every 2 years ongoing
				Intensive camera monitoring is implemented in accordance with the BCT EMM Operational Manual when significant biodiversity impacts from feral pests are observed (allowance for every 5 years).	Every 5 years (if significant impacts are observed)
				Camera monitoring results show that: - there is no or limited damage to native flora, fauna or soil as a result of feral pest activity - there is a reduction in pest activity observed after implementation of controls (measured from baseline recorded in Year 1)	Annually
			Monitoring for Pig, Fox, Wild dog, Deer, Goat, Rabbit, Hare, Cat	Complete records of when feral pest management has been undertaken including; persons involved, methods, locations (GPS waypoints), number of successful shoots/baits taken.	Biannually
	Weed management	All	Weed Density Map Update- A detailed update to the weed density map is prepared	Entire BSA site (100%) treated annually with appropriate weed control methods, in line with the NSW weed control handbook.	Every 5 years starting Year 5

BSA	Management Category	Management Zone/s	Management Action or method of monitoring	Performance indicator	Timing
			every 5 years and submitted as part of the annual report for that year.		
			Weed management actions to be documented (including hours and areas covered). Georeferenced ESRI shapefiles of areas treated to be provided with annual report.	A record of all weed management actions are documented to demonstrate compliance with Plan	Annually
			Annual integrated weed management inspection as per template in Section 7B of MAP	New weed species identified during inspections are incorporated into the annual weed management strategy.	Annually
			Weed Density Targets as per IWMP – including those below;	Detailed, whole of site Weed Density Map prepared using GPS or similar device. To be submitted as JPEG/PDF, including a georeferenced ESRI shapefile with the annual report.	Annually
		2	Sheep sorrel	- Cover of 0-1% in MZ2 in Year 5 and ongoing - Cover does not exceed 1% in any MZ ongoing	Every 5 years
		1,6	Narrow-leafed carpet grass	- Cover of 0-1% in MZ1 and MZ6 in Year 5 and ongoing - Does not occur at >1% in any MZ ongoing	
		1	Kikuyu	- Cover of 6-10% in MZ1 in Year 5 and ongoing - Does not occur >10% in any MZ ongoing	
		6	Bridal creeper	- No occurrence in MZ6 by Year 5 - Cover does not exceed 1% in any zone ongoing	
		All	Cobblers pegs	- Cover of 2-5% or lower in all MZ by Year 5 - Cover of 1-2% or lower in all MZ by Year 10 and ongoing	
		6	Greater beggars ticks	- Cover of 6-10% in MZ6 by Year 5 - Cover of 2-5% in MZ6 by Year 10 and ongoing - Cover does not exceed 5% in any MZ ongoing	
		6	Mother of millions	- Cover of 2-5% in MZ6 by Year 5 - Cover of 1-2% in MZ6 by Year 10 and ongoing	

BSA	Management Category	Management Zone/s	Management Action or method of monitoring	Performance indicator	Timing
				- Cover does not exceed 2% in any MZ ongoing - Control of new infestations to occur within 6 months of identification (unless specific seasonal conditions are required for control)	
		3	Rhodes grass	- Cover of 1% or lower maintained in MZ3 ongoing - Cover does not exceed 10% in any MZ ongoing	
		1	Panic veldtgrass	- Cover reduced to<40% in MZ1 over time. Meeting this requirement should not be at the expense of potential erosion issues associated with the creekline environment.	
		2,3,4	African lovegrass	- Cover of 2-5% or lower in MZ2, MZ3 and MZ4 by Year 5 - Cover of 1-2% or lower in MZ2, MZ3 and MZ4 by Year 10 and ongoing -Cover does not exceed 5% in any MZ ongoing	
		All	Galenia	- Cover of 6-10% or lower in MZ2 and MZ5 by Year 5 - Cover of 2-5% or lower in MZ2 and MZ5 by Year 10 and ongoing - Cover does not exceed 2% in any MZ ongoing	
		All	Coolatai grass	- Cover of 6-10% in MZ1 and MZ2 by Year 5 then 2-5% by Year 10 and ongoing - Cover of 11-30% in MZ3 by Year 5 then 6-10% by Year 10 and ongoing - Cover of 1-2% or lower in MZ4-MZ8 by Year 5 and ongoing	
		2	St John's wort	- Cover of 0-1% or lower in all MZs ongoing	
		1	Sharp rush	- Cover of 0-1% in MZ1 ongoing - Control of new infestations to occur within 6 months of identification (unless specific seasonal conditions are required for control)	
		1	African boxthorn	- Cover in MZ1 reduced to 2-5% by Year 5 and then 0-2% ongoing - Maintain at 0-1% cover in MZ2-MZ8 ongoing	
		2,7	European Olive	- Cover of 6-10% by Year 5 in MZ2 and MZ7 by Year 5, 2-5% from Year 10 and then 0% ongoing from Year 15	

BSA	Management Category	Management Zone/s	Management Action or method of monitoring	Performance indicator	Timing
				- Control of new infestations to occur within 6 months of identification (unless specific seasonal conditions are required for control)	
		All	Common prickly pear	- Maintain at 0-1% cover in all zones ongoing	
		1,2,6	Paspalum	- Cover of 0-2% by Year 5 and ongoing in MZ1, MZ2 and MZ6 - Control of new infestations to occur within 6 months of identification (unless specific seasonal conditions are required for control)	
		All	Fireweed	- Maintain a <10% cover across the entire BSA - If appropriate, control to occur within 6 months of identification (unless specific seasonal conditions are required for control)	
		1	Climbing nightshade	- Cover in MZ1 reduced to 2-5% by Year 5 and 0-2% from Year 10 and ongoing - Control of new infestations to occur within 6 months of identification (unless specific seasonal conditions are required for control)	
		6	Noogoora burr	- Known records in MZ6 treated in Year 1 of the agreement - Maintain at 0-1% cover in all zones ongoing - Control of new infestations to occur within 6 months of identification (unless specific seasonal conditions are required for control)	
		1,4, 8	Blackberry	- Known records in MZ1 and MZ4 treated in Year 1 of the agreement - Maintain at 0-1% cover in all zones ongoing - Control of new infestations to occur within 6 months of identification (unless specific seasonal conditions are required for control)	
		All	Other Weeds	Should any new weed species (including those weeds listed above as not currently requiring management) is observed to have become a threat to the biodiversity values of the site, then that species will be updated into the management plan. The threshold for adding new weeds as a priority will vary for different species depending on a range of factors including their biology, seasonal conditions, treatment options and potential impacts on biodiversity. As a general guide, weed species that are observed at 30% cover or	

BSA	Management Category	Management Zone/s	Management Action or method of monitoring	Performance indicator	Timing
				more should be considered for more targeted control. This should be assessed by a qualified restoration ecologist, ecologist or weed contractor. If required, the weed maps and management plan will be amended to accommodate emerging weed priorities. An appropriate control program will be developed and implemented. Contingency funding has been provided in the TFD to allow for changing weed priorities if required.	
Wybong Heights	Native Vegetation Management	All	BAM vegetation Integrity Plots	Vegetation thinning is undertaken in accordance with the BCT Thinning guidelines, within 12 months of the recommendation. Vegetation condition attributes are improved within two years following implementation of ecological thinning.	As required
				Vegetation thinning is undertaken in accordance with the BCT Thinning guidelines, within 12 months of the recommendation. Vegetation condition attributes are improved within two years following implementation of ecological thinning.	As required
	Integrated Feral Pests Management	All	Biannual inspections of BSA site with daytime walkovers to visually estimate levels of browsing and/or burrowing impacts. The level of impact is to be recorded as negligible, minimal, moderate or high.	Entire BSA site (100%) to be treated annually, with evidence of presence of all feral pest species recorded.	Biannually
			Biannual inspections of BSA site with daytime walkovers to visually estimate levels of browsing and/or burrowing impacts. The level of impact is to be recorded as negligible, minimal, moderate or high.	Sustained reduction in evidence of feral pest species. No sustained increase in feral pest numbers.	Biannually
			Complete records of when feral pest management has been undertaken including; persons involved, methods, locations (GPS waypoints), number of successful shoots/baits taken.		Biannually
			Remote camera trapping (Approximately 3 cameras installed for 1 month per event)		Annually (Years 1-20) Biennially (years 20+)

BSA	Management Category	Management Zone/s	Management Action or method of monitoring	Performance indicator	Timing
			Monitoring is to also include recording the number and location of any tracks, traces or sightings of foxes, rabbits, goats, deer and pigs from site inspections, camera monitoring and/or control events. Any evidence of new species (pig wallows, signs of browsing, etc) are to be recorded and level of activity noted.	Annual camera trap monitoring and inspections (by pest control contractors) show that: - there is no or limited damage to native flora, fauna or soil as a result of feral pest activity	When undertaking any site inspection/visit, monitoring activities and/or control methods.
				Sustained reduction in number of sightings Deer, Goats, Pigs.	By Year 10
				Records of number and locations of baits distributed on the stewardship site and counts of baits taken. Evidence of bait affected animals on site reduced.	Annually
			All data is to be included in annual report.	All data is to be included in annual report.	Annually
	Integrated Weed Management	All	Detailed report with mapping and photo points to be submitted with annual report.	Entire BSA site (100%) treated annually with appropriate weed control methods, in line with the NSW weed control handbook and Section 6 of the Site Management Plan Detailed report with mapping and photo points to be submitted with annual report by weed contractors.	Annually
		All	Detailed, whole of site Weed Density Map prepared using GPS or similar device. To be submitted as a JPEG/PF, including a georeferenced ESRI shapefiles with the annual report.	Weed density targets as per IWMP A detailed update to the weed density map is prepared every 5 years and submitted with annual report. SMP updated to include new information from relevant authorities every 5 years.	Every 5 years starting Year 5
		All	Annual integrated weed management inspection as per template in Section 7B	New weed species identified during inspections are incorporated into the annual weed management strategy.	Annually
			Specific performance indicators per species;		
		MZ2, MZ3 & MZ4	Opuntia spp.	- treatment of a minimum of 3 days annually in Years 1-5 for continued suppression - reduce or maintain at <5% cover across all zones by Year 5 - reduced to and maintained at<1% cover by year 10 across all zones ongoing	Every 5 years

BSA	Management Category	Management Zone/s	Management Action or method of monitoring	Performance indicator	Timing
		All	Woody Shrubby Weeds (Cobbler's Pegs and Paddys lucerne)	- Reduce to and maintain at <10% by year 10 and ongoing Localised occurrence of (40%) Paddys Lucerne to be reduced over time to <10% cover at year 20. - Continue to monitor for new infestations - Consider additional control where infestations of >20% cover are observed	
		All	Exotic grasses – Kikuyu, Paspalum, Parramatta grass, Panic veldtgrass	- Maintain at <1% cover and ongoing - Known occurrences (shown on Figure 5) are treated in Years 1 and 2 if still present - Localised occurrence (60%) of panic veldtgrass to be reduced over time to <20% at year 20 - New infestations are documented and a treatment plan developed - Infestations of >20% cover of exotic grasses treated where appropriate (i.e. no adverse impacts to native ground covers)	
		MZ1	Priority Herbaceous HTW (excluding the above grass species) - Bridal creeper, Climbing nightshade, Saffron thistle, Crofton weed, Nodding , thistle, Fireweed	Priority herbaceous weed density in MZ1 is currently High 11-30%. - reduce to and maintain at <10% cover by Year 5 - reduce to <5% cover by year 10 and maintain ongoing.	
		MZ2		Priority herbaceous weed density in MZ2 is currently 6-10%. - reduce to and maintain at <5% by Year 5 - reduce to <2% by year 10 and maintain ongoing.	
		MZ3		Priority herbaceous weed density in MZ3 is currently 2-5% - reduce to <2% by year 10 and maintain ongoing.	
		MZ4		Priority herbaceous weed density in MZ4 is currently 2-5% - reduced to <2% cover or lower by year 10 and maintain ongoing	

Appendix F - Draft *Prasophyllum sp.* Wybong Offset Management Plan

Draft available separately on the Mangoola Open Cut Website *Mangoola Open Cut (glencore.com.au)*

Appendix G - Authority Correspondence

Department of Planning, Housing and Infrastructure

Our ref: SSD-8642-PA-99

Robyn Ellis
Environment and Community Manager
Mangoola Coal Operations Pty Ltd
PO Box 495
Muswellbrook, NSW, 2333

23/12/2025

Subject: Mangoola Coal Continued Operations (SSD-8642) - Revised Biodiversity Offset Management Plan and Strategy

Dear Ms Ellis,

I refer to your submission dated 29 October 2025 requesting approval of the revised Biodiversity Offset Management Plan and Strategy (version 14.0, December 2025), submitted in accordance with Part B, condition B53 and B57 of the consent for the Mangoola Coal Continued Operations (SSD-8642).

The Department acknowledges the revision was made as part of a regular review process and consists of administrative and operational updates to reflect current conditions and offsets obligations. The Department also notes consultation with the Conservation Programs, Heritage and Regulation Group (CPHR) was completed to inform the revision.

The Department has carefully reviewed the document and is satisfied that it meets the requirements of the relevant conditions of consent under SSD-8642.

Accordingly, as nominee of the Planning Secretary, I approve the revised Biodiversity Offset Management Plan and Strategy (version 14.0, December 2025).

You are reminded that if there are any inconsistencies between the Plan and the conditions of approval, the conditions prevail.

Please ensure you make the document publicly available on the project website at the earliest convenience.

If you wish to discuss the matter further, please contact Kiera Plumridge at kiera.plumridge@dpie.nswe.gov.au.

Yours sincerely,

Jack Turner
Team Leader
Resource Assessments

4 Parramatta Square, 12 Darcy Street, Parramatta NSW 2150 www.dphi.nsw.gov.au 1
Locked Bag 5022, Parramatta NSW 2124