MAULES CREEK COAL MINE

BIODIVERSITY MANAGEMENT PLAN

12 April 2017

Document History

Edition	Rev.	Comments	Date
1	0	Initial Draft Document	
1	1	MCC Final Draft Review for Consultation	December 2012
1	2	Revision to address consultation comments	March 2013
1	3	Revision to address DP&I comments	April 2013
		Approval of the BMP by DP&I	21 June 2013
1	4	Revision for further consultation with OEH	October 2013
1	5	Revision to address OEH consultation comments and for submission to DotE	February 2014
1	6	Revisions to address DP&I comments	March 2014
1	7	Revisions to address OEH comments	May 2014
		Approval of the BMP by DP&E	14 May 2014
1	8	Annual review	July 2014
1	9	Revisions to address stakeholder comments	August 2014
1	10	Revisions to address stakeholder comments	October 2014
		Approval of the BMP by DP&E	23 October 2014
2	1	Revisions to address Condition 53	17 March 2015
2	2	Revisions to address stakeholder comments	23 April 2015
2	3	Revisions to address stakeholder comments	13 April 2016
2	4	Revisions to address stakeholder comments	3 August 2016
2	5	Revisions to address stakeholder comments	12 April 2017
		Approval of the BMP by DP&E	26 April 2017

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

LIST OF TABLES

TABLE OF CONTENTS (continued)

LIST OF TABLES (continued)

TABLE OF CONTENTS (continued)

LIST OF FIGURES

TABLE OF CONTENTS (continued)

LIST OF FIGURES (continued)

LIST OF PLATES

LIST OF APPENDICES

EXECUTIVE SUMMARY

The purpose of this Biodiversity Management Plan (this BMP) is to provide a consolidated plan for the management of flora and fauna within the Maules Creek Coal Mine (MCCM) Project Boundary and the biodiversity offset areas. This revision of the BMP is required in accordance with Condition 53 of Schedule 3 to PA 10_0138 and incorporates:

- the revised and approved New South Wales (NSW) Biodiversity Offset Strategy (Whitehaven, 2015) prepared in accordance with Condition 45 of Schedule 3 to PA 10_0138;
- the outcomes of an Agricultural Suitability Assessment for the offset properties in accordance with Condition 46(a) of Schedule 3 to PA 10_0138;
- the approved *MCCM Threatened Fauna Implementation Plan* in accordance with Condition 50(c) of Schedule 3 to PA 10_0138;
- the approved *MCCM Box-Gum Woodland Endangered Ecological Community Implementation Plan* in accordance with Condition 48(d) of Schedule 3 to PA 10_0138;
- the *Maules Creek Coal Mine 2015 Independent Environmental Audit*; and
- the *Maules Creek Coal Mine Biodiversity and Cultural Heritage Compliance Audit*.

This BMP has been prepared in consultation with Dr David Freudenberger (Australian National University), a restoration ecologist and co-author of the Commonwealth Government's *Guide to Managing Box Gum Grassy Woodlands*. This revision of the BMP provides:

- the outcomes of further detailed planning around the management of the offset areas and streamlined management procedures;
- updated weed and feral animal control procedures with contemporary guidelines prepared by Department of Primary Industries (DPI);
- initial results from commencement of the offset area monitoring program by a team of experienced ecologists from Australian Museum Consulting; and
- an update on the propagation of *Tylophora linerais* and Scant Pomaderris (*Pomaderris queenslandica*) being undertaken with assistance from Dr Colin Driscoll (HunterEco).

This BMP has been finalised following consultation with stakeholders (Commonwealth Department of the Environment (DotE), NSW Department of Planning and Environment (DP&E), Office of Environment and Heritage, North West Local Land Services, MCCM Community Consultative Committee (MCCM CCC), Forestry Corporation of NSW, DPI - Land and Natural Resources, and local landholders in the Maules Creek community..

1 INTRODUCTION

1.1 BACKGROUND

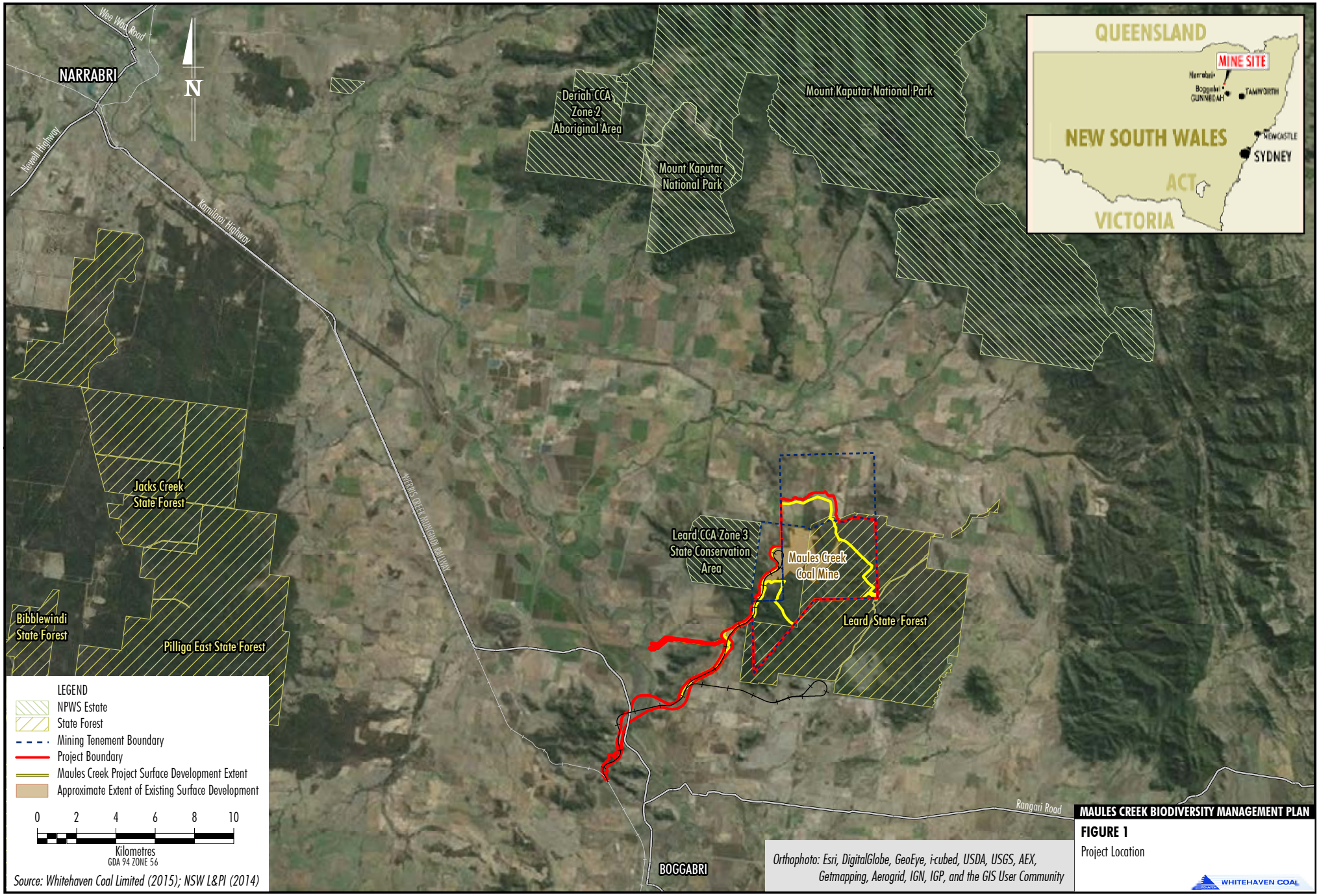
The Maules Creek Coal Mine (MCCM) is located in the Gunnedah Basin approximately 18 kilometres (km) to the north-east of Boggabri in the north-west region of New South Wales (NSW) (Figures 1 and 2). The MCCM is a joint venture between Aston Coal 2 Pty Limited (a wholly owned subsidiary of Whitehaven Coal Limited [Whitehaven]) (75 percent [%]), ICRA MC Pty Ltd (an entity associated with ITOCHU Corporation) (15%) and J-Power Australia Pty Ltd (a wholly owned subsidiary of Electric Power Development Co., Ltd.) (10%). Maules Creek Coal Pty Ltd (MCC) is a wholly owned subsidiary of Whitehaven which manages the MCCM on behalf of Aston Coal 2 Pty Ltd, ICRA MC Pty Ltd and J-Power Australia Pty Ltd.

Project approval under the NSW *Environmental Planning and Assessment Act* (EP&A Act) was granted for the MCCM by the Planning Assessment Commission (PAC) under delegation of the Minister for Planning and Infrastructure on 23 October 2012 (Project Approval [PA] 10_0138). The Commonwealth Minister for the Environment granted approval for the MCCM under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 11 February 2013 (Approval Decision 2010/5566).

The purpose of this Biodiversity Management Plan (BMP) is to provide a consolidated plan for the management of flora and fauna within the MCCM Project Boundary and the MCCM offset areas. This BMP addresses the relevant key requirements outlined in the NSW PA 10_0138, as modified, and the requirements for the Offset Management Plan outlined in the Commonwealth Approval Decision 2010/5566.

This revision of the BMP was prepared in accordance with Condition 53 of Schedule 3 to PA 10_0138. This revision of the BMP incorporates:

- the revised and approved NSW Biodiversity Offset Strategy (Whitehaven, 2015) prepared in accordance with Condition 45 of Schedule 3 to PA 10_0138;
- the outcomes of an Agricultural Suitability Assessment for the offset properties in accordance with Condition 46(a) of Schedule 3 to PA 10_0138;
- the approved *MCCM Threatened Fauna Implementation Plan* (Whitehaven, 2015a) in accordance with Condition 50(c) of Schedule 3 to PA 10_0138;
- the approved *MCCM Box-Gum Woodland Endangered Ecological Community Implementation Plan* (Whitehaven, 2015b) in accordance with Condition 48(d) of Schedule 3 to PA 10_0138;
- the *Maules Creek Coal Mine 2015 Independent Environmental Audit* (SMEC Australia Pty Limited, 2015); and
- the *Maules Creek Coal Mine Biodiversity and Cultural Heritage Compliance Audit* (Umwelt, 2015).



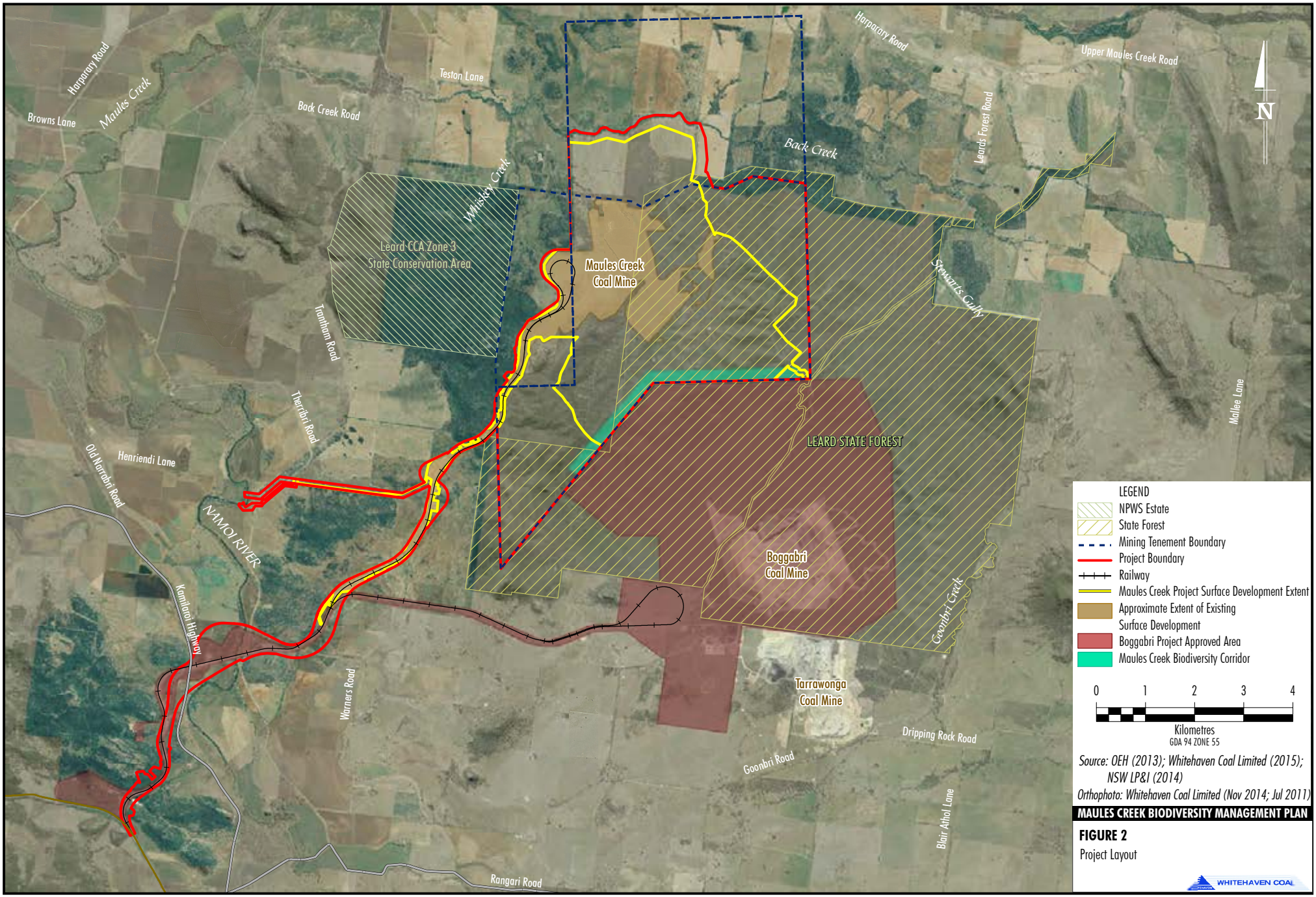
MAULES CREEK BIODIVERSITY MANAGEMENT PLAN

FIGURE 1

Project Location

WHITEHAVEN COAL

WHC-14-22 RBMP_209B



Source: OEH (2013); Whitehaven Coal Limited (2015); NSW LP&I (2014)

Orthophoto: Whitehaven Coal Limited (Nov 2014; Jul 2011)

MAULES CREEK BIODIVERSITY MANAGEMENT PLAN

FIGURE 2

Project Layout

WHITEHAVEN COAL

WHC-14-22 RBMP_210D

In accordance with Condition 16 of Schedule 2 to PA 10_0138, the BMP for the MCCM has been submitted to the Department of Planning and Environment (DP&E) on a progressive basis and has been approved progressively. The BMP approved on 21 June 2013 was approved for the construction phase of the MCCM. The BMP approved in May and October 2014 was approved for the operations phase of the MCCM. This BMP is for all stages of the MCCM, to the extent that these remain to be completed at the date of the approval of this BMP by the NSW Secretary of the DP&E. Upon its approval, this BMP will supersede any previous BMP that was approved for the MCCM.

The BMP will be reviewed annually and revised as necessary. Further revisions will be made to this BMP, from time to time, as required for the effective administration of the biodiversity impacts of the MCCM and the revisions will be progressively submitted to DP&E and the Commonwealth Department of the Environment (DotE). Section 7.3 provides the triggers for updating this BMP.

1.2 DESCRIPTION OF THE MCCM OFFSET

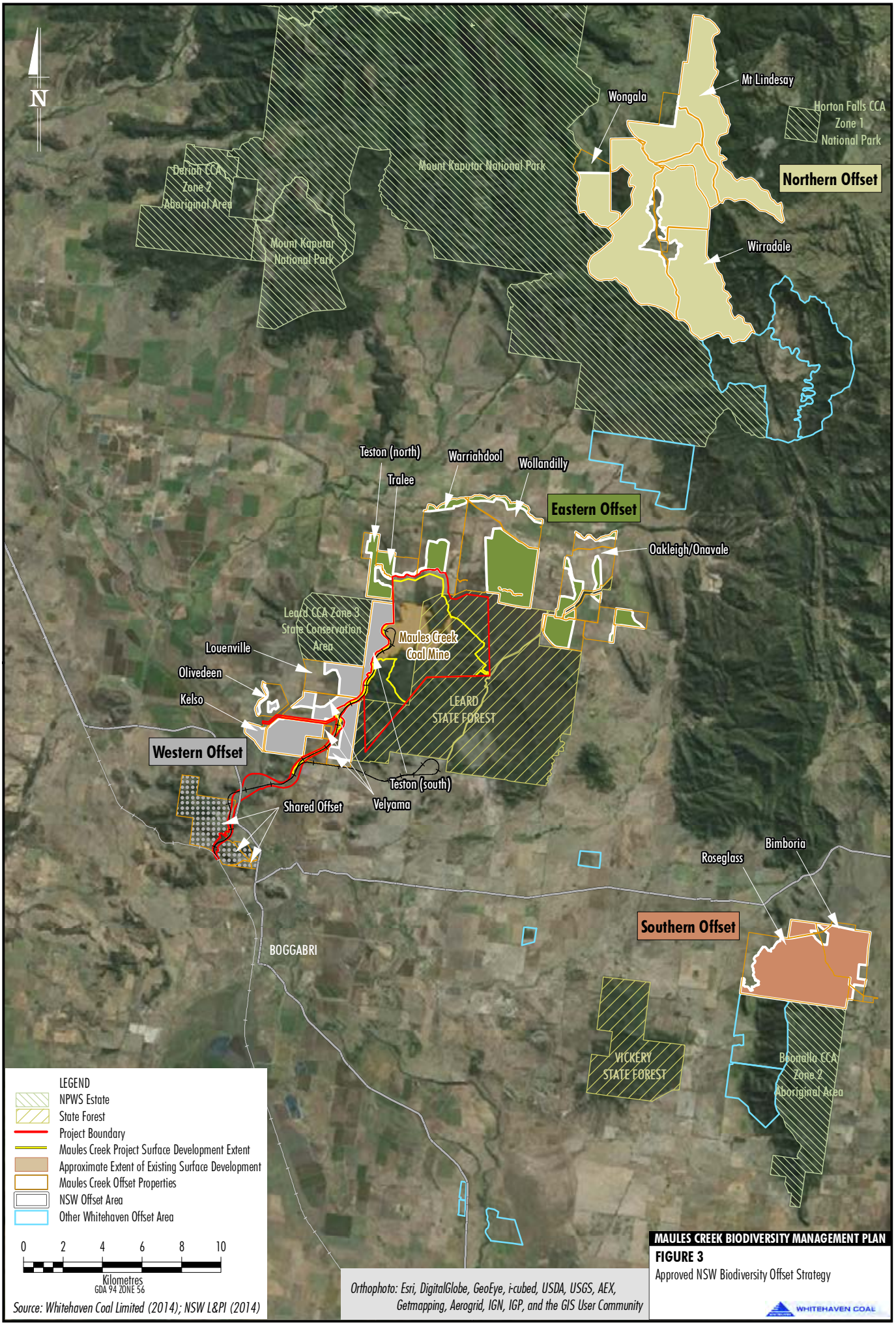
The biodiversity offset package for the MCCM includes a NSW Biodiversity Offset Strategy and Commonwealth offset areas subject to Approval Decision EPBC 2010/5566 as described below (Figures 3 and 4).

1.2.1 NSW Biodiversity Offset Strategy

MCC formally submitted a revised NSW Biodiversity Offset Strategy to the NSW Secretary of the DP&E for approval in accordance with Condition 45 of Schedule 3 to PA 10_0138. The revised NSW Biodiversity Offset Strategy was endorsed by the Office of Environment and Heritage (OEH) and subsequently approved by DP&E on the 27 October 2015.

This BMP incorporates the revised and approved NSW Biodiversity Offset Strategy (Whitehaven, 2015). The revised and approved NSW Biodiversity Offset Strategy (Whitehaven, 2015) is shown on Figure 3. Figure 5 shows the cumulative offset areas in the locality surrounding Leard State Forest.

A reconciliation of Condition 44 of Schedule 3 to PA 10_0138 against the revised and approved NSW Biodiversity Offset Strategy (Whitehaven, 2015) is provided in Appendix A. The NSW offset areas cover a total of approximately 12,168.9 ha.



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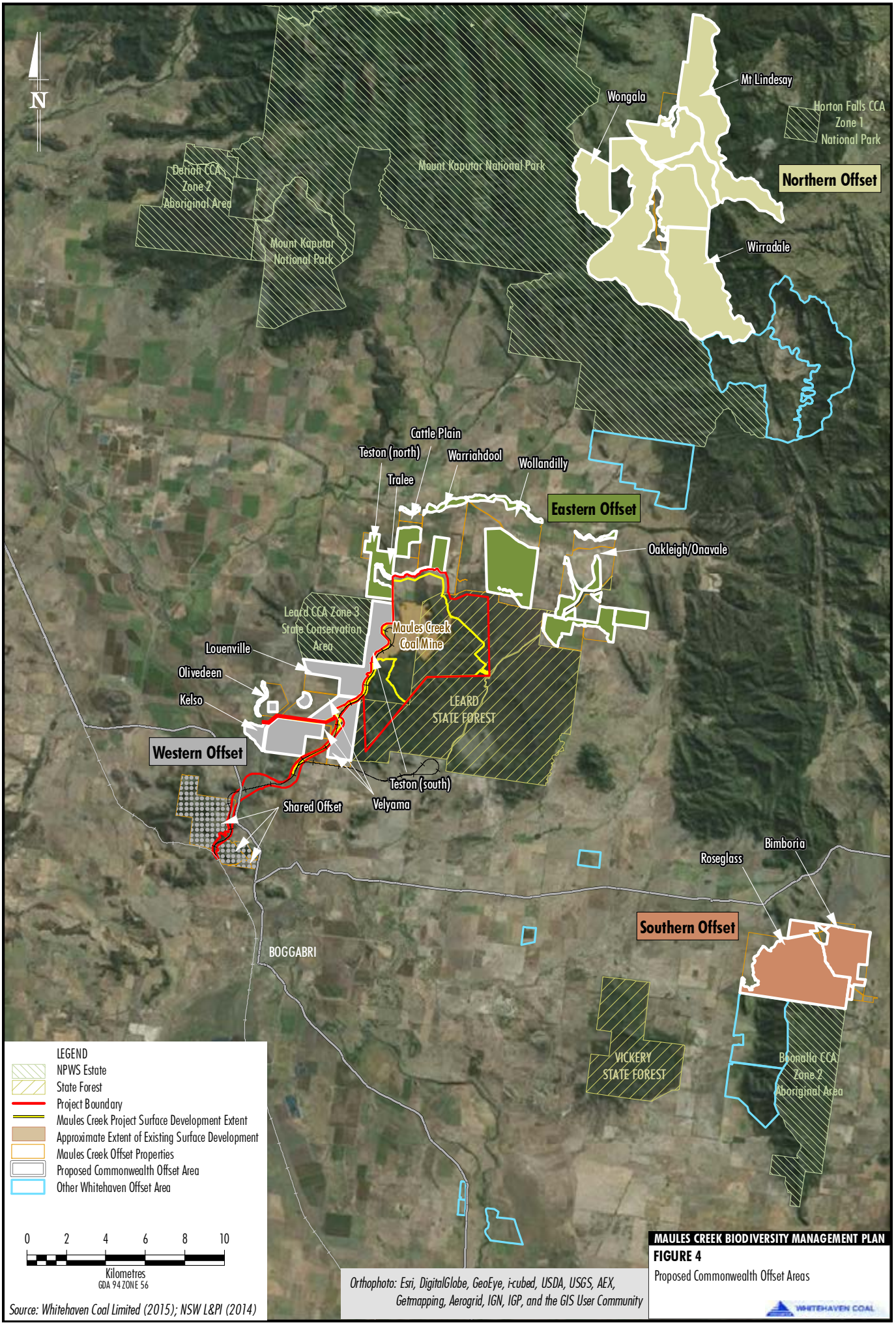

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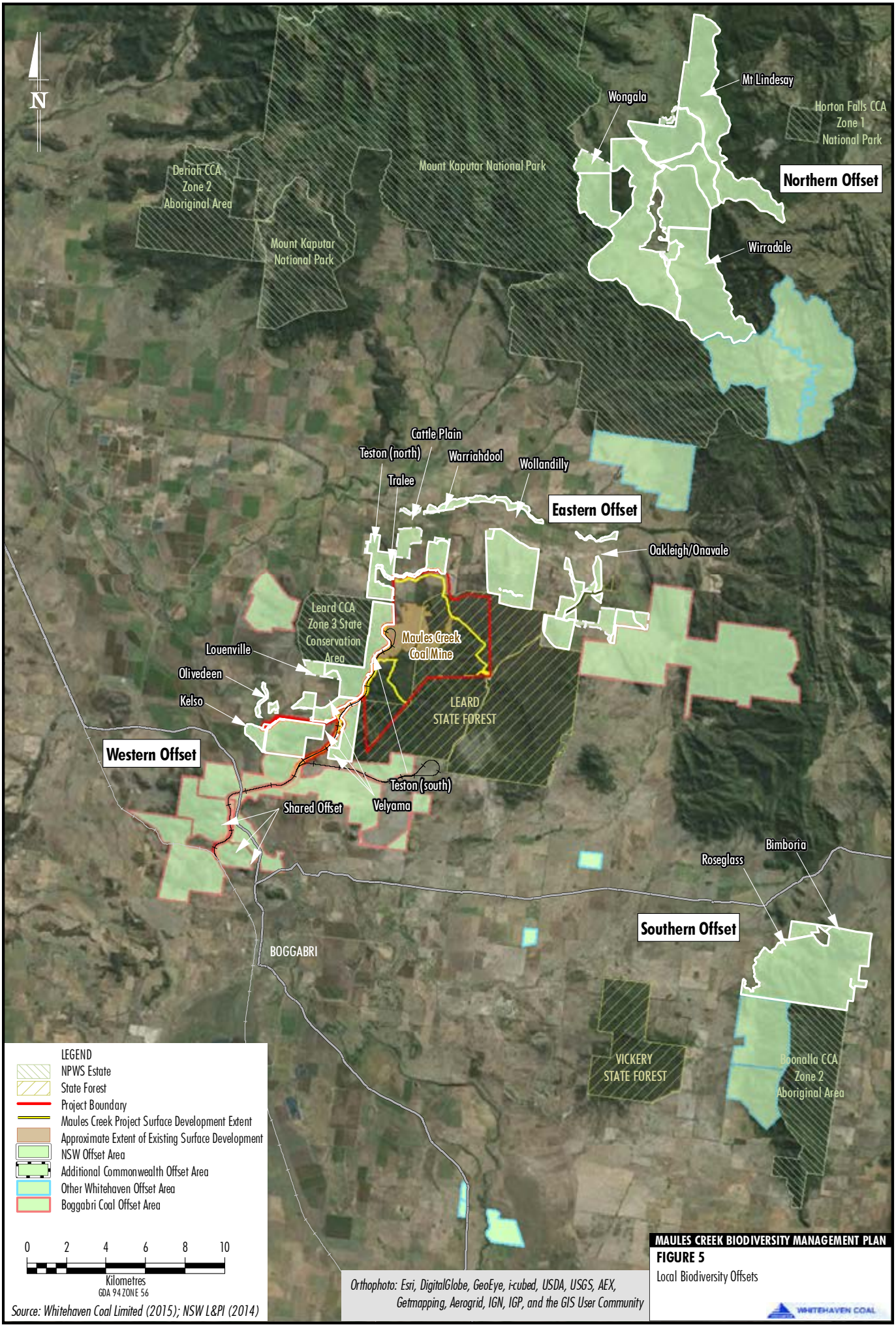

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1.2.2 Commonwealth Offset Areas

The Commonwealth offset areas subject to Approval Decision EPBC 2010/5566 are similar to those subject to the approved NSW Biodiversity Offset Strategy, however, offset areas on the following properties were added to the Commonwealth package (Figures 3 and 4) (Greenloaning Biostudies, 2013, 2014a):

- Oakleigh/Onavale Offset Property;
- Bimbooria Offset Property;
- Roseglass Offset Property; and
- Wongala Offset Property.

The total proposed Commonwealth offset areas for the MCCM cover 13,113.7 ha (i.e. a sum of the NSW revised offset areas[1] and additional proposed Commonwealth offset areas shown on Figure 4).

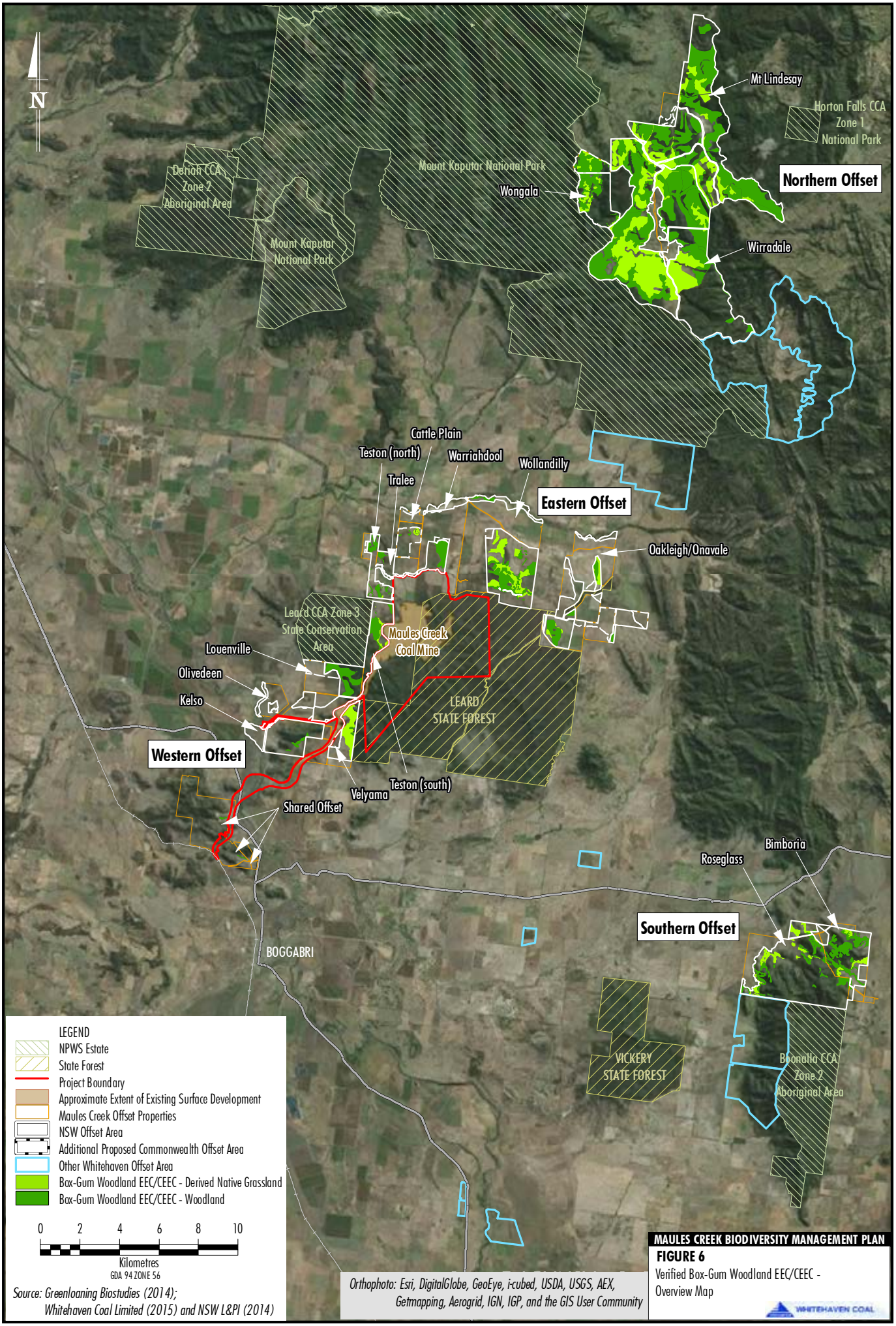
Greenloaning Biostudies (independent reviewer approved by DotE) has verified that the Commonwealth offset areas contain no less than 5,532 ha of White Box – Yellow Box – Blakely's Red *Gum Grassy Woodland and Derived Native Grassland* (Box-Gum Woodland) (listed as a Critically Endangered Ecology Community [CEEC] under the EPBC Act and an Endangered Ecological Community [EEC] under the NSW *Threatened Species Conservation Act* [TSC Act]) (Figure 6) (Greenloaning Biostudies, 2013, 2014a).

Greenloaning Biostudies (2013, 2014a) has also verified that the Commonwealth offset areas contain no less than 9,334 ha of equivalent or better quality of habitat for the Regent Honeyeater (*Xanthomyza phrygia*), Swift Parrot (*Lathamus discolor*) and the South-eastern Long-eared Bat (*Nyctophilus corbeni*) (previously Greater Long-eared Bat).

DotE has indicated that it will work with Whitehaven to ensure that the final Commonwealth offsets package reflects the overall proportion of the derived native grassland and woodland forms of Box-Gum Woodland CEEC in the areas being cleared, including, where necessary, the acquisition of additional offset property. MCC will also offset residual impacts on *Tylophora linearis* (a threatened flora species) to the satisfaction of the Commonwealth Minister. The offset areas subject to Approval Decision EPBC 2010/5566 are required to be protected by a legally binding covenant in perpetuity by 11 February 2018 or as otherwise agreed with the Commonwealth Minister (Approval Condition 13).

In addition to the above, MCC will provide $2.5 million of indirect offsets as required by Conditions 15 and 16 of Approval Decision EPBC 2010/5566. Condition 15 specifies indirect offset measures for the Box-Gum Woodland CEEC, namely the investment of $1 million for research on methodologies for achieving rehabilitation and restoration of the Box-Gum Woodland CEEC. Condition 16 specifies indirect offset measures for threatened species under the EPBC Act, namely the investment of $1.5 million to deliver activities that implement priority recovery actions for the Regent Honeyeater (*Xanthomyza phrygia*), Swift Parrot (*Lathamus discolor*) and the South-eastern Long-eared Bat (*Nyctophilus corbeni*) (formerly known as the Greater Long-eared Bat).

[1] As stated in Section 1.2.1, the NSW offset areas cover a total of approximately 12,168.9 ha.



MAULES CREEK BIODIVERSITY MANAGEMENT PLAN

FIGURE 6

Verified Box-Gum Woodland EEC/CEEC - Overview Map

WHITEHAVEN COAL

WHC-14-22 RBMP_212E

This BMP focuses on the management of the offset areas and these indirect offsets are not described further in this BMP.

The additional proposed Commonwealth offset areas shown on Figure 4 will not be subject to the management measures described in this BMP until a legally binding covenant is in place for these additional Commonwealth offset areas. Condition 13 of the Approval Decision EPBC 2010/5566 requires legally binding covenant(s) to be registered over the Commonwealth offset areas by 11 February 2018.

1.3 STRUCTURE OF THE BIODIVERSITY MANAGEMENT PLAN

This BMP is divided into two parts. Part A of this BMP describes the management of flora and fauna within the MCCM Project Boundary and Part B of this BMP describes the management of flora and fauna within the offset areas. The structure of this plan is as follows:

Section 2	Requirements for this BMP.
Section 3	Description of the Existing Environment Relevant to the Mine Site.
Section 4	Description of the Management Actions to be undertaken at the Mine Site.
Section 5	Description of the Existing Environment Relevant to the Offset Areas.
Section 6	Description of the Management Actions to be undertaken within the Offset Areas.
Section 7	Description of Reporting and Review Requirements.

The following are appended to this BMP:

Appendix A	Reconciliation of the Biodiversity Offset Strategy in Condition 44 against the Offset Areas
Appendix B	Reconciliation of the BMP against the MCCM Threatened Fauna Implementation Plan and MCCM Box-Gum Woodland Endangered Ecological Community Implementation Plan
Appendix C	*Tylophora linearis* Propagation and Translocation Program
Appendix D	*Pomaderris queenslandica* Propagation and Translocation Program
Appendix E	Offset Area - Vegetation Descriptions
Appendix F	Offset Area Risk Assessment

1.4 CONSULTATION

The following stakeholders have been involved in consultations in respect of prior versions of this BMP:

- DP&E;
- OEH;

- DotE (formerly the Department of Sustainability, Environment, Water, Population and Communities [SEWPaC]);
- North West Local Land Services (formerly the Namoi Catchment Management Authority [Namoi CMA]); and
- MCCM Community Consultative Committee (CCC).

A draft revision of the BMP was provided to all of the below listed stakeholders on the 17 and 18 March 2015 for comment:

- DP&E;
- OEH;
- DotE;
- North West Local Land Services;
- MCCM CCC (note that the MCCM CCC were consulted about the document on the 4 March 2015);
- Forestry Corporation of NSW (formerly Forests NSW); and
- Department of Primary Industries (DPI) - Crown Lands and DPI - Agriculture NSW (formerly DPI Catchments and Lands).

MCC specifically met with the following stakeholders to discuss the BMP:

- DP&E on the 18 March 2015;
- OEH on the 20 March 2015;
- DotE on the 19-20 March 2015;
- North West Local Land Services on the 19 March 2015; and
- DPI - Crown Lands on the 19 March 2015.

Comments on the BMP were provided during these discussions and also on the following dates:

- OEH on the 10 April 2015;
- Forestry Corporation of NSW on the 16 April 2015;
- North West Local Land Services on the 1 April 2015;
- DPI - Crown Lands on the 10 April 2015; and
- DotE on the 23 April 2015.

The BMP was revised in light of comments by or discussions with those stakeholders before it was submitted to DP&E for approval (23 April 2015). Additional comments on the BMP were provided by OEH, DP&E and MCCM CCC (23 November 2015). The BMP was again revised in light of comments by those stakeholders.

A draft revision of the BMP (this document) was provided to all of the below listed stakeholders during April 2016 for comment:

- DP&E;
- OEH;
- DotE;
- North West Local Land Services;
- MCCM CCC;
- Forestry Corporation of NSW;
- DPI - Crown Lands; and
- Local Maules Creek landholders.

Comments on the BMP were provided on the following dates:

- OEH on the 16 May 2016;
- Forestry Corporation of NSW on the 27 May 2016;
- NWLLS on the 10 May 2016;
- DotE on the 13 May 2016;
- Landholders on the 10 June 2016;
- CCC representatives 9 August 2016; and
- DP&E on the 23 January 2017.

The BMP was again revised in light of comments by those stakeholders before it was submitted to DP&E for approval.

1.5 RESPONSIBILITIES

MCC will be ultimately responsible for managing, monitoring and implementing the management activities in this BMP. If MCC elect a third party to take on responsibilities for managing, monitoring and implementing the management activities on its behalf, MCC will provide details of the responsible parties, including their position or status as a separate contractor to DotE in accordance with Condition 18(f) of the Approval Decision EPBC 2010/5566.

2 REQUIREMENTS FOR THE BIODIVERSITY MANAGEMENT PLAN

The State PA 10_0138 and Commonwealth Approval Decision EPBC 2010/5566 have informed the structure and scope of this BMP. The relevant conditions of PA 10_0138 are listed in Section 2.1 and the relevant conditions of Approval Decision EPBC 2010/5566 are listed in Section 2.2.

2.1 RELEVANT STATE APPROVAL CONDITIONS

The conditions of PA 10_0138 relevant to biodiversity management are detailed in Table 2-1, together with a reference to where these conditions are addressed in this BMP.

Table 2-1
Project Approval 10_0138 Requirements

Condition Number	Condition			Relevant BMP Section
SCHEDULE 3: ENVIRONMENTAL PERFORMANCE CONDITIONS				
Biodiversity Offset Strategy				
44	*Area*	*Offset Type*	*Minimum Size (ha)*	Section 1.2.1 and Appendix A
	Northern Offset Area currently owned or under option by the Proponent	*Existing native woodland/forest[2] of 4,286 hectares (ha) to be protected and enhanced.* *Additional native vegetation to be established with the restoration of at least 1,470 ha of derived native grassland including 1,396 ha of derived native grassland Box-Gum Woodland EEC as listed under the TSC Act.* *Additional targeted restoration of up to 58 ha of low diversity derived native grassland, pasture improved and cultivated land to provide buffer to offset and connectivity between remnant vegetation* *Note: the final area of restoration of low diversity derived native grassland, pasture improved and cultivated land is subject to completion of the revised offset strategy required in condition 45.*	*5,756*	
	Eastern Offset Area currently owned or under option by Proponent	*Existing native woodland/forest of 190 ha to be protected and enhanced.* *Additional targeted restoration of up to 319 ha of adjacent low diversity derived native grassland, pasture improved and cultivated land to provide buffer to offset and connectivity between remnant vegetation.* *Note: the final area of restoration of low diversity derived native grassland, pasture improved and cultivated land is subject to completion of the revised offset strategy required in condition 45.*	*190*	

[2] The term woodland/forest is used by Condition 44 of Schedule 3 to PA 10_0138 to describe all native vegetation communities (of varying structure) other than derived grassland.

Table 2-1 (Continued)
Project Approval 10_0138 Requirements

Condition Number	Condition			Relevant BMP Section
SCHEDULE 3: ENVIRONMENTAL PERFORMANCE CONDITIONS				
Biodiversity Offset Strategy (Continued)				
44 (Cont.)	*Area*	*Offset Type*	*Minimum Size (ha)*	Section 1.2.1 and Appendix A
	Western Offset Area including 50% joint Venture property currently owned by Proponent	*Existing native woodland/forest of 891 ha to be protected and enhanced.* *Additional native vegetation to be established with the restoration of at least 148 ha of derived native grassland including 90 ha of derived native grassland Box-Gum Woodland EEC as listed under the TSC Act and 7 ha of Belah Woodland on property 'Velyama' to be enhanced with restoration of at least 5 ha of surrounding derived native grassland Belah Woodland.* *Additional targeted restoration of up to 368 ha of adjacent low diversity derived native grassland, pasture improved and cultivated land to provide buffer to offset and connectivity between remnant vegetation.* *Note: the final area of restoration of low diversity derived native grassland, pasture improved and cultivated land is subject to completion of the revised offset strategy required in condition 45*	*1,039*	
	Eastern Offset Area identified in the zone of affectation	*Existing native woodland/forest of 336 ha to be protected and enhanced.* *Additional targeted restoration of up to 768 ha of adjacent low diversity derived native grassland, pasture improved and cultivated land to provide buffer to offset and connectivity between remnant vegetation.* *Note: the final area of restoration of low diversity derived native grassland, pasture improved and cultivated land is subject to completion of the revised offset strategy required in condition 45*	*336*	
	Western Offset Area identified in the zone of affectation	*Existing native woodland/forest of 343 ha to be protected and enhanced.* *Additional targeted restoration of up to 156 ha of adjacent low diversity derived native grassland, pasture improved and cultivated land to provide buffer to offset and connectivity between remnant vegetation.* *Note: the final area of restoration of low diversity derived native grassland, pasture improved and cultivated land is subject to completion of the revised offset strategy required in condition 45*	*343*	

Table 2-1 (Continued)
Project Approval 10_0138 Requirements

Condition Number	Condition			Relevant BMP Section
SCHEDULE 3: ENVIRONMENTAL PERFORMANCE CONDITIONS				
Biodiversity Offset Strategy (Continued)				
44 (Cont.)	*Area*	*Offset Type*	*Minimum Size (ha)*	Section 1.2.1 and Appendix A
	Additional Offset Areas required to be included by the Proponent-	*Additional remnant native vegetation of moderate to good condition native forest/woodland and derived native grassland to provide habitat for impacted threatened species, targeting EEC or highly cleared vegetation communities impacted by the project.* *Note: Location and type of offset subject to final approval as part of revised Biodiversity Strategy to be prepared by Proponent under condition 45.*	*1,000*	
	Rehabilitation Area	*Except for the area of the minimised final void, pre-mining native vegetation communities to be re-established (including 544 ha of Box-Gum Woodland EEC) for a biodiversity conservation land use objective, with the area subject to finalisation of the rehabilitation management plan as required under this approval.* *Note: the final mix and area of native vegetation communities is subject to the approved Biodiversity Management Plan.*	*2,078* *(less the area of minimised void approved under to closure plan required under this approval)*	
Agricultural Production in Offset Areas				
46	*offset areas are to be managed primarily for the purposes of compensating for biodiversity impacts of the project, and improving regional biodiversity outcomes. However, to the extent that limited agricultural production on the lots purchased for offsets is compatible with these objectives, the Biodiversity Management Plan and other conditions of this approval, the Proponent shall:*			Section 6.11
	(a) include in the Biodiversity Management Plan (see condition 52 below) an agricultural suitability assessment of surplus land on the offset areas, in particular for proposed corridor enhancement zones.			
	(b) maintain the agricultural productivity of the surplus areas.			
Vegetated Corridor between Boggabri Coal and Maules Creek Projects				
47	*For the vegetated buffer corridor required to be retained and protected under condition 7 of schedule 2 of this approval, the Proponent shall:*			Section 4, Figure 2
	(a) use its best endeavours to work cooperatively with the Proponent of the Boggabri Coal Project to enhance the functioning of the area as a biodiversity corridor.			
	(b) include in the Biodiversity Management Plan (see condition 52 below) the details as to how impacts on the corridor are to be minimised, *to the satisfaction of the Director-General.*			

Table 2-1 (Continued)
Project Approval 10_0138 Requirements

Condition Number	Condition	Relevant BMP Section
SCHEDULE 3: ENVIRONMENTAL PERFORMANCE CONDITIONS		
Threatened Species		
48	*For the White Box – Yellow Box – Blakely's Red Gum Grassy Woodland Endangered Ecological Community the Proponent shall:* *(d) incorporate the approved implementation plan into the revised Biodiversity Management Plan, required under condition 52.*	Section 2.3 and Appendix B
49	*For all threatened species on site, the Proponent shall ensure that the Biodiversity Offset Strategy and Rehabilitation Strategy are focused on protection, rehabilitation and long-term maintenance of viable stands of suitable habitat for these species.* *Note: the threatened fauna species on site include: Regent Honeyeater, Fork Tailed Swift, White Throated Needletail, Rainbow Bee-eater, Satin Flycatcher, Speckled Warbler, Swift Parrot, Brown Treecreeper, Diamond Firetail, Grey-crowned Babbler, Hooded Robin, Little Lorikeet, Varied Sittella, White-browed Woodswallow* [note: this species is not threatened]*, Black-chinned Honeyeater, Painted Honeyeater, Little Eagle, Spotted Harrier, Black-necked Stork, Square-tailed Kite, Turquoise Parrot, Barking Owl, Masked Owl, Eastern False Pipistrelle, Greater Long-eared Bat, Yellow-bellied Sheath-tail Bat, Eastern Cave Bat, Eastern Bent-wing Bat, Little Pied Bat and Koala.*	Sections 5.6 and 6.1
50	*The Proponent shall:* *(c) incorporate the approved implementation plan into the revised Biodiversity Management Plan, required under condition 52.* *Note: the species listed in (a) are those identified in the Director-General's Assessment Report as likely to be significantly impacted by the project.*	Sections 2.3 and 6, Appendix B
Biodiversity Management Plan		
52	*The Proponent shall prepare and implement a Biodiversity Management Plan for the project to the satisfaction of the Director-General. This plan must:*	
	(a) be prepared in consultation with OEH, SEWPaC (now DotE)*, CCC, and the Namoi CMA* (now North West Local Land Services)*, and be submitted to the Director-General for approval prior to commencement of construction;*	Section 1.4
	(b) describe how the implementation of the biodiversity offset strategy will be integrated with the overall rehabilitation of the site.	Section 5
	(c) describe the short, medium, and long term measures that will be implemented to: - *manage the remnant vegetation and habitat on the site and in the offset area/s (if and when applicable); and* - *implement the biodiversity offset strategy (if and when applicable), including detailed performance and completion criteria;*	Sections 4 and 6
	(d) include detailed performance and completion criteria for evaluating the performance of the biodiversity offset strategy, and triggering remedial action (if necessary);	Section 6.16

Table 2-1 (Continued)
Project Approval 10_0138 Requirements

Condition Number	Condition	Relevant BMP Section
SCHEDULE 3: ENVIRONMENTAL PERFORMANCE CONDITIONS		
Biodiversity Management Plan (Continued)		
52 (Cont.)	*(e) include a detailed description of the measures that will be implemented including the procedures to be implemented for:*	
	- *enhancing the quality of existing vegetation and fauna habitat;*	Section 6
	- *restoring native vegetation and fauna habitat on the biodiversity areas and rehabilitation area through focusing on assisted natural regeneration, targeted vegetation establishment and the introduction of naturally scarce fauna habitat features;*	
	- *maximising the salvage of resources within the approved disturbance area – including vegetative, top and sub-soils and cultural heritage resources – for beneficial reuse in the enhancement of the biodiversity areas or rehabilitation area;*	Sections 4.1.6 and 6.6
	- *collecting and propagating seed;*	Sections 4.3 and 6.4
	- *minimising the impacts on fauna on site, including undertaking pre-clearance surveys;*	Section 4.1
	- *improving the connectivity and corridor function of the offset areas to provide an east/west corridor to the Namoi River and demonstrating that this corridor is enhanced and maintained;*	Section 6.5
	- *managing any potential conflicts between the proposed restoration works in the biodiversity areas and any Aboriginal heritage values (both cultural and archaeological);*	Section 6.7
	- *managing salinity;*	Sections 4.4 and 6.10
	- *controlling weeds and feral pests;*	Sections 4.5, 4.6, 6.8 and 6.9
	- *controlling erosion;*	Sections 4.7 and 6.10
	- *managing grazing and agriculture on site, including detailed assessment of the suitability of grazing for conservation management outcomes;*	Sections 4.8 and 6.11
	- *controlling access; and*	Sections 4.9 and 6.12
	- *bushfire management.*	Sections 4.11 and 6.13
	(f) include a seasonally-based program to monitor and report on the effectiveness of these measures, and progress against the detailed performance and completion criteria.	Sections 4.13 and 6.17
	(g) identify the potential risks to the successful implementation of the biodiversity offset strategy, and include a description of the contingency measures that will be implemented to mitigate against these risks.	Section 6.18, Appendix F
	(h) include details of who will be responsible for monitoring, reviewing, and implementing the plan.	Section 1.5
	Note: The Biodiversity Management Plan and Rehabilitation Management Plan need to be substantially integrated for achieving biodiversity objectives for the rehabilitated mine-site.	

Table 2-1 (Continued)
Project Approval 10_0138 Requirements

Condition Number	Condition	Relevant BMP Section
SCHEDULE 3: ENVIRONMENTAL PERFORMANCE CONDITIONS		
Biodiversity Management Plan (Continued)		
53	*The Proponent shall revise the Biodiversity Management Plan within 30 months of the date of this approval or within 6 months after the completion of Stage 2 of the Leard Forest Mining Precinct Regional Biodiversity Strategy, whichever is sooner. The revised plan must:*	This BMP
	(a) be prepared in consultation with OEH, SEWPaC (now DotE)*, Forests NSW, DPI Catchments and Lands* (now DPI - Land and Natural Resources)*, the CCC and the Namoi CMA* (now North West Local Land Services)*;*	Section 1.4
	(b) demonstrate consistency with the findings of Leard Forest Mining Precinct Regional Biodiversity Strategy; and	Section 2.5
	(c) include any implementation plans arising from the studies required under conditions 48 and 50 of this approval. *to the satisfaction of the Director-General.*	Section 2.3, Appendix B
Long Term Security of the Offset		
54	*The Proponent shall make suitable arrangements to provide appropriate long-term security for the offset areas:*	Section 6.2.1
	(a) for the offsets in Table 16 that are not subject to final approval as part of the NSW Revised Biodiversity Offset Strategy, the long-term security shall be provided by way of: - *the Proponent entering into a conservation agreement or agreements pursuant to section 69B of the National Parks and Wildlife Act 1974, recording the obligations assumed by the Proponent under the conditions of this approval in relation to these offset areas, and registering the agreement(s) pursuant to section 69F of the National Parks and Wildlife Act 1974; or* - *a tenure of higher conservation status such as a National Park, or Nature Reserve, under the National Parks and Wildlife Act 1974.* *The conservation agreement(s) must be registered by December 2014 unless agreed otherwise by the Director-General after consultation with OEH. The conservation agreements must remain in force in perpetuity.*	
	(b) within 12 months of the approval of Stage 2 of the Leard Forest Mining Precinct Regional Biodiversity Strategy, unless otherwise agreed by the Director-General, for the offsets in Table 16 identified as subject to final approval as part of the NSW Revised Biodiversity Offset Strategy; and	
	(c) by the end of December 2034, unless otherwise agreed by the Director-General, for the Rehabilitation Area identified in Table 16, *to the satisfaction of the Director-General.*	Section 4.4

Table 2-1 (Continued)
Project Approval 10_0138 Requirements

Condition Number	Condition	Relevant BMP Section
SCHEDULE 3: ENVIRONMENTAL PERFORMANCE CONDITIONS		
Conservation Bond		
55	*Within 36 months of the date of this approval, or within 6 months of the approval of the revised Biodiversity Management Plan required under condition 52 above (whichever is sooner), the Proponent shall lodge a Conservation and Biodiversity Bond with the Department to ensure that the biodiversity offset strategy is implemented in accordance with the performance and completion criteria of the Biodiversity Management Plan. The sum of the bond shall be determined by:*	Section 6.2.2
	(a) calculating the full cost of implementing the biodiversity offset strategy (other than land acquisition costs); and	
	(b) employing a suitably qualified quantity surveyor to verify the calculated costs, *to the satisfaction of the Director-General.* *If the offset strategy is completed generally in accordance with the completion criteria in the Biodiversity Management Plan to the satisfaction of the Director-General, the Director-General will release the bond.* *If the offset strategy is not completed generally in accordance with the completion criteria in the Biodiversity Management Plan, the Director-General will call in all or part of the conservation bond, and arrange for the satisfactory completion of the relevant works.* *With the agreement of the Director-General, this bond may be combined with rehabilitation security deposit administered by DRE.* *Note: Alternative funding arrangements for long term management of the Biodiversity Offset Strategy, such as provision of capital and management funding as agreed by OEH as part of a Biobanking Agreement or transfer to conservation reserve estate can be used to reduce the liability of the conservation and biodiversity bond.*	
Biodiversity Audit		
56	*By the end of December 2017 and then every 5 years, unless the Director-General agrees otherwise, the Proponent shall commission suitably qualified, experienced and independent person/s, whose appointment was approved by the Director-General, to undertake an audit of the revegetation of the rehabilitation area, management and restoration within the Biodiversity Offset Strategy areas to the satisfaction of the Director-General. This audit must:*	Section 7.4.2
	(a) include consultation with OEH, Namoi CMA (now North West Local Land Services), *DPI Catchments and Lands* (now DPI - Land and Natural Resources), *SEWPaC* (now DotE), *CCC and DRE;*	
	(b) assess the performance of the revegetation in the rehabilitation area completed to date against the completion criteria in the Rehabilitation Management Plan;	
	(c) assess the performance of management and restoration in the off-site Biodiversity Offset Strategy areas completed to date against the completion criteria in the Biodiversity Management Plan;	
	(d) identify any measures that will be implemented to improve the performance of rehabilitation, management and restoration within the rehabilitation and offset areas;	

Table 2-1 (Continued)
Project Approval 10_0138 Requirements

Condition Number	Condition	Relevant BMP Section
SCHEDULE 3: ENVIRONMENTAL PERFORMANCE CONDITIONS		
Biodiversity Audit (Continued)		
	(e) if the completion criteria have not been met, or are not adequately trending towards being met, determine the likely ecological value of the rehabilitation and restoration once completed, and recommend additional measures to augment the Biodiversity Offset Strategy to ensure that it adequately offsets the project's impacts on biodiversity; and *If the audit recommends the implementation of additional measures to augment the Biodiversity Offset Strategy in accordance with (e) above, then within 6 months of the completion of the audit the Proponent shall revise the Biodiversity Offset Strategy, in consultation with the Department, OEH and SEWPaC* (now DotE)*, and to the satisfaction of the Director-General.*	Section 7.4.2

2.2 RELEVANT COMMONWEALTH APPROVAL CONDITIONS

The Commonwealth Minister for the Environment granted Approval Decision EPBC 2010/5566 for the MCCM under the EPBC Act on 11 February 2013. The conditions that are relevant to this BMP are presented in Table 2-2.

Table 2-2
Approval Decision EPBC 2010/5566 Requirements

Condition Number	Requirement	Relevant BMP Section
9	*The person taking the action must register a legally binding conservation covenant over offset areas of no less than* *(a) 9,334 ha of equivalent or better quality of habitat for the regent honeyeater, swift parrot and greater long-eared bat; and* *(b) 5,532 ha of an equivalent or better quality of the White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community.* *Note: the 5,532 ha of White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community may be included within the 9,334 ha of offset area for the threatened species if it meets the listing criteria for the EPBC-listed critically endangered ecological community as defined in the EPBC listing advice for that community and the requirements of condition 9.*	Section 1.2.2
13	*The mechanism/s for registering a legally binding covenant must provide protection for the offset areas in perpetuity and be registered within 5 years of the date of this approval.*	Section 6.2.1

Table 2-2 (Continued)
Approval Decision EPBC 2010/5566 Requirements

Condition Number	Requirement	Relevant BMP Section
17	*The person taking the action must submit to the Minister for approval, an Offset Management Plan for all the offset areas, specified in condition 9, within 12 months of the date of this approval. The approved Offset management plan must be implemented.* *Note: For consistency, the proponent may develop a Biodiversity Management Plan that includes the requirements set for managing offsets and set out in these conditions, to align with the requirements of the NSW State Government Project approval dated October 2012 (application number 10_0138) and this approval.*	Section 1
18	*The Offset Management Plan must include, but not be limited to, the following:*	
	(a) a text description and map which clearly defines the location and boundaries of the offset areas. This must be accompanied by the offset attributes and shapefiles.	Sections 1.2.1 and 5 and Figure 5
	(b) a description of the methodology and results of the surveys measuring the baseline ecological conditions in the offset areas. This must be consistent with the State and Transition Model and include but not be limited to:	
	i. the extent and condition of all vegetation communities, including a description of the structure, floristics and tree age class representation of each community.	Sections 5.3, 5.4, 5.9 and 6.17.1, Figures 8a to 8d, Appendix E
	ii. the extent and condition class of all areas of the White Box-Yellow Box -Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community;	Section 5.4, Figures 7, 9a to 9d
	iii. surveys targeting the Regent Honeyeater, Swift Parrot and Greater Long-eared Bat;	Sections 5.6 and 6.17
	iv. the extent and quality of all areas of habitat for the Regent Honeyeater, Swift Parrot and Greater Long-eared Bat;	Section 5.6, Figures 8a to 8d
	v. the location of all survey sites (including coordinates);	Section 5.6, Table 6-15 and Figures 14a to 14d
	vi. photo reference points at survey sites.	Section 6.17.1 and Figures 14a to 14d
	(c) clearly defined ecological management objectives for the offset areas;	Section 6.1 and Figures 12a to 12g
	(d) detailed description of all ecological management activities proposed to be undertaken, including maps and/or diagrams showing areas to be managed and the timing of proposed activities;	Section 6
	(e) details of ongoing ecological monitoring programs, performance criteria, targets and provisions for adaptive management, including but not limited to:	
	i. a set of measurable ecological indicators for detecting changes to the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community, including those that may be ascribed to ongoing water stress;	Section 6.17.1

Table 2-2 (Continued)
Approval Decision EPBC 2010/5566 Requirements

Condition Number	Requirement	Relevant BMP Section
18 (Cont.)	*ii. a monitoring plan to assess the success of the management activities measured against the baseline condition. The monitoring must be statistically robust and able to quantify change in the condition of the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community and habitat for the Regent Honeyeater, Swift Parrot and Greater Long-eared Bat. This should include the use of control sites and periodic ecological surveys to be undertaken by a qualified ecologist.*	Section 6.17.1
	iii. a list of performance criteria based on the ecological management objectives for the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland ecological community and habitat for the Regent Honeyeater, Swift Parrot and Greater Long-eared Bat;	Section 6.16
	iv. measures to exclude weeds from all offset areas for the period covered by this approval;	Section 6.8
	v. a description of the potential risks to successful management against the performance criteria, and a description of the contingency measures that will be implemented to mitigate against these risks;	Section 6.18
	vi. a process by which to report to the department the progress of management activities undertaken in the offset areas and the outcome of those activities, including identifying any need for improved management and activities to undertake such improvement.	Section 7.2.2
	(f) details of all parties responsible for management, monitoring and implementing the management activities, including their position or status as separate contractor.	Section 1.5
	(g) details of the funding requirements for the ongoing management activities, including an estimate of the costs of the activities and details of the parties responsible for funding the activities.	Section 6.2.2
19	*Unless otherwise agreed to in writing by the department, the baseline surveys for threatened species must be undertaken in accordance with the department's Survey Guidelines for Australia's Threatened Birds and the Survey Guidelines for Australian Threatened Bats. Subsequent monitoring must be carried out annually at the same time of year as the baseline surveys unless otherwise agreed to in writing by the department.*	Section 6.17.2
31	*All survey data collected for the project must be recorded so as to conform to data standards notified from time to time by the department. When requested by the department, the proponent must provide to the department all species and ecological survey data and related survey information from ecological surveys undertaken for matters of national environmental significance. This survey data must be provided within 30 business days of request, or in a timeframe agreed to by the department in writing. The department may use the survey data for other purposes.*	Section 7.1.1

Table 2-2 (Continued)
Approval Decision EPBC 2010/5566 Requirements

Condition Number	Requirement	Relevant BMP Section
34	*By the end of March of each year after the commencement of the action, the person taking the action must publish a report on their website addressing compliance with the conditions of this approval over the previous 12 months, including implementation of any management plans as specified in the conditions. Non-compliance with any of the conditions of this approval must be reported to the department at the same time as the compliance report is published.*	Section 7.2.3
35	*Upon the direction of the Minister, the person taking the action must ensure that an independent audit of compliance with the conditions of approval is conducted and a report submitted to the Minister. The independent auditor must be approved by the Minister prior to the commencement of the audit. Audit criteria must be agreed to by the Minister and the audit report must address the criteria to the satisfaction of the Minister.*	Section 7.4.1
36	*If the person taking the action wishes to carry out any activity otherwise than in accordance with the plans, as specified in the conditions; the person taking the action must submit to the department for the Minister's written approval a revised version of that plan. The varied activity shall not commence until the Minister has approved the revised plan in writing. The Minister will not approve a revised plan, unless the revised plan would result in an equivalent or improved environmental outcome. If the Minister approves the revised plan that plan must be implemented in place of the plan originally approved.*	Section 7.3
37	*If the Minister believes that it is necessary or convenient for the better protection of listed threatened species and communities or listed migratory species to do so, the Minister may request that the person taking the action make specified revisions to the management plan specified in the conditions and submit the revised plan for the Minister's written approval. The person taking the action must comply with any such request. The revised approved plan must be implemented. Unless the Minister has approved the revised plan then the person taking the action must continue to implement the originally approved plan, as specified in the conditions.*	Section 7.3
39	*The person taking the action must maintain accurate records substantiating all activities and outcomes associated with or relevant to the above conditions of approval, including measures taken to implement the management plans required by this approval, and make them available upon request to the department. Such records may be subject to audit by the department or an independent auditor in accordance with section 458 of the Environment Protection and Biodiversity Conservation Act 1999, or used to verify compliance with the conditions of approval. Summaries of audits will be posted on the department's website. The results of audits may also be publicised through the general media.*	Section 7.1.1
40	*Unless otherwise agreed to in writing by the Minister, the person taking the action must publish all management plans referred to in these conditions of approval on their website. Each management plan must be published on the website within 1 month of being approved*	Section 7.2.4

2.3 THREATENED SPECIES AND BOX-GUM WOODLAND IMPLEMENTATION PLANS

The *MCCM Threatened Fauna Implementation Plan* (Whitehaven, 2015a) and *MCCM Box-Gum Woodland Endangered Ecological Community Implementation Plan* (Whitehaven, 2015b) have been prepared by Whitehaven in accordance with Conditions 48 and 50 of Schedule 3 to PA 10_0138. These implementation plans were approved by DP&E on the 14 January 2015.

The *MCCM Threatened Fauna Implementation Plan* (Whitehaven, 2015a) was developed to maximise the likely prospects for the provision of suitable habitats for threatened fauna on the offset areas and on the post mining landform (including threatened species listed in Condition 49 of Schedule 3 to PA 10_0138). The implementation plan requires 21 individual actions relating to the Biodiversity Offset Strategy.

The *MCCM Box-Gum Woodland Endangered Ecological Community Implementation Plan* (Whitehaven, 2015b) was developed to maximise the prospects for rehabilitation and regeneration of the Box-Gum Woodland EEC/CEEC on the offset areas and the mine site. The implementation plan requires 52 individual actions relating to the Biodiversity Offset Strategy.

The approved implementation plans are incorporated into this BMP. Appendix B provides the individual actions of the implementation plans together with a reference to where the individual actions are addressed in this BMP.

2.4 REVISED BIODIVERSITY OFFSET STRATEGY

As described in Section 1.2.1, MCC formally submitted a revised NSW Biodiversity Offset Strategy to the NSW Secretary of the DP&E for approval in accordance with Condition 45 of Schedule 3 to PA 10_0138. The revised NSW Biodiversity Offset Strategy was endorsed by OEH and subsequently approved by DP&E on the 27 October 2015. This BMP incorporates the revised and approved NSW Biodiversity Offset Strategy (Whitehaven, 2015).

2.5 LEARD FOREST MINING PRECINCT REGIONAL BIODIVERSITY STRATEGY

It has not been possible to prepare this BMP in conjunction with Stage 2 of the Leard Forest Mining Precinct Regional Biodiversity Strategy being co-ordinated by the DP&E as it is yet to be developed. Nevertheless, this BMP is consistent with the intent of the Stage 2 of the Leard Forest Mining Precinct Regional Biodiversity Strategy in that the BMP seeks to improve the performance of the offset areas and has been prepared in consideration of the approved and draft *Tarrawonga Coal Mine Biodiversity Management Plan* (Whitehaven, 2015c and d) and *Boggabri Coal Mine Biodiversity Management Plan* (Boggabri Coal Pty Ltd, 2015).

2.6 OTHER RELEVANT PLANS AND GUIDELINES

The following plans and guidelines were considered in the preparation of this BMP:

- *National Recovery Plan for White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland* (Department of Environment, Climate Change and Water [DECCW], 2011);
- threatened species recovery plans (Menkhorst *et al.,* 1999; Saunders and Tzaros, 2011);
- *Namoi Catchment Action Plan 2010 – 2020* (Namoi CMA, 2011);
- *A Guide to Managing Box Gum Grassy Woodlands* (Rawlings *et al.,* 2010);
- approved and draft *Tarrawonga Coal Mine Biodiversity Management Plan* (Whitehaven, 2015c; 2015d);
- *Boggabri Coal Mine Biodiversity Management Plan* (Boggabri Coal Pty Ltd, 2015);
- various weed management techniques published by DPI Agriculture (e.g. *Noxious and Environmental Weed Control Handbook* [DPI, 2014a]);
- various feral animal control and monitoring techniques published by DPI Agriculture (e.g. *Vertebrate Pest Control Manual* [DPI, 2014b]);
- draft *Hunter Valley Coal Mines Best Practice Guidelines for Biodiversity Offset Management Plans* (Department of Planning and Infrastructure [DP&I], 2014); and
- scientific literature pertaining to rehabilitation and restoration (e.g. Noss, 1990; Prober and Thiele, 2005; Gibson-Roy, *et al.,* 2010; Tongway and Ludwig, 2011; Goldin and Brookhouse, 2014).

PART A
MINE SITE MANAGEMENT OF FLORA AND FAUNA

3 EXISTING ENVIRONMENT RELEVANT TO THE MINE SITE

This section briefly describes the existing environment relevant to the MCCM Project Boundary and management of flora and fauna at the mine site. The MCCM occurs partly within the Leard State Forest which is zoned for forestry and mining purposes under the NSW *Brigalow and Nandewar Community Conservation Area Act, 2005*.

3.1 VEGETATION COMMUNITIES

The Project Boundary is predominantly forested by a range of native vegetation communities, although the original character of the vegetation was altered as a result of previous land uses including agricultural and forestry activities. Vegetation communities in the MCCM Project Boundary are listed in Table 3-1 and shown on Figure 7.

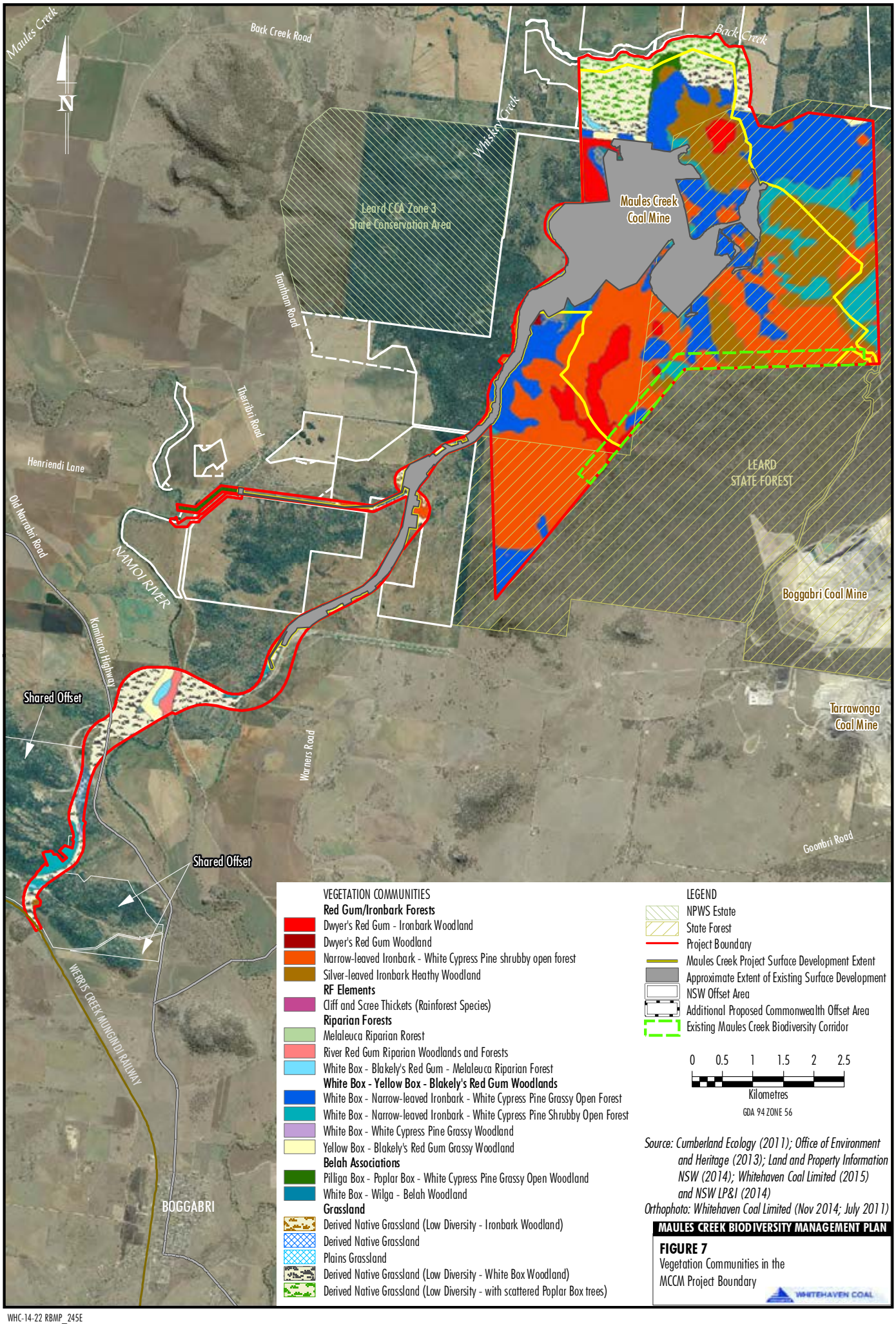
Table 3-1
Vegetation Communities in the MCCM Project Boundary

Vegetation Communities	
Dwyer's Red Gum Woodland	Pilliga Box – Poplar Box – White Cypress Pine Grassy Open Woodland
Dwyer's Red Gum – Ironbark Woodland	^White Box – Wilga – Belah Woodland
Narrow-Leaved Ironbark – White Cypress Pine Shrubby Open Forest	*Plains Grassland
Silver-Leaved Ironbark Heathy Woodland	^Derived Native Grassland
Cliff And Scree Thickets (Rainforest Species)	Derived Native Grassland (Low Diversity – Ironbark Woodland)
Melaleuca Riparian Forest	Derived Native Grassland (Low Diversity – White Box Woodland)
River Red Gum Riparian Woodlands And Forests	Derived Native Grassland (Low Diversity – With Scattered Poplar Box Trees)
^White Box – Blakely's Red Gum – Melaleuca Riparian Forest	Exotic Grassland
^White Box – Narrow-Leaved Ironbark – White Cypress Pine Grassy Open Forest	Wheat Field (With Scattered Ironbark Trees)
White Box – Narrow-Leaved Ironbark – White Cypress Pine Shrubby Open Forest	Wheat Field (With Scattered Poplar Box Trees)
^White Box – White Cypress Pine Grassy Woodland	Wheat Field (With Scattered White Box Trees)
^Yellow Box – Blakely's Red Gum Grassy Woodland	Crop Land On Basalt Soil (With Scattered White Box)
Belah Woodland	

Source: Cumberland Ecology (2011).

^ Conforms to Box-Gum Woodland EEC/CEEC.

* Conforms to EPBC Act listed *Natural Grasslands On Basalt And Fine-Textured Alluvial Plains Of Northern New South Wales And Southern Queensland* and NSW TSC Act *Native Vegetation On Cracking Clay Soils Of The Liverpool Plains*.



Source: Cumberland Ecology (2011); Office of Environment and Heritage (2013); Land and Property Information NSW (2014); Whitehaven Coal Limited (2015) and NSW LP&I (2014)

Orthophoto: Whitehaven Coal Limited (Nov 2014; July 2011)

MAULES CREEK BIODIVERSITY MANAGEMENT PLAN

FIGURE 7

Vegetation Communities in the MCCM Project Boundary

WHITEHAVEN COAL

WHC-14-22 RBMP_245E

The MCCM has approval to remove approximately 544 ha of native vegetation (458 ha of Woodland and 86 ha of Derived Native Grassland) conforming to the Box-Gum Woodland EEC/CEEC (Cumberland Ecology, 2011). The vegetation communities in the MCCM Project Boundary that equate to the Box-Gum Woodland EEC/CEEC are annotated in Table 3-1. These variants are:

- White Box - Narrow-Leaved Ironbark - White Cypress Pine Grassy Open Forest;
- White Box - White Cypress Pine Grassy Woodland;
- Yellow Box - Blakely's Red Gum Grassy Woodland;
- White Box - Wilga - Belah Woodland;
- White Box - Blakely's Red Gum - Melaleuca Riparian Forest; and
- Derived Native Grasslands.

3.2 THREATENED AND MIGRATORY SPECIES

The threatened and migratory species listed in Table 3-2 have been detected in the vicinity of the MCCM Project Boundary (in Leard State Forest and the immediate surrounds). The threatened and migratory species recorded in the MCCM Project Boundary are annotated.

Table 3-2
Threatened and Migratory Species Recorded in Leard State Forest and Immediate Surrounds

Common Name	Scientific Name	Conservation Status[1]		Recorded in the MCCM Project Boundary
		TSC Act	EPBC Act	
Flora				
Scant Pomaderris	*Pomaderris queenslandica*	V	-	✓
-	*Tylophora linearis*	V	E	✓
-	*Pultenaea setulosa*	V	-	-
Spiny Peppercress	*Lepidium aschersonii*	V	V	-
Reptiles				
Pale-headed Snake	*Hoplocephalus bitorquatus*	V	-	✓
Birds				
Black-necked Stork	*Ephippiorhynchus asiaticus*	E	-	-
Square-tailed Kite	*Lophoictinia isura*	V	-	-
Spotted Harrier	*Circus assimilis*	V	-	-
Little Eagle	*Hieraaetus morphnoides*	V	-	-
Little Lorikeet	*Glossopsitta pusilla*	V	-	✓
Turquoise Parrot	*Neophema pulchella*	V	-	✓

Table 3-2 (Continued)
Threatened and Migratory Species Recorded in Leard State Forest and Immediate Surrounds

Common Name	Scientific Name	Conservation Status[1]		Known to Occur in the MCCM Project Boundary
		TSC Act	EPBC Act	
Masked Owl	*Tyto novaehollandiae*	V	-	✓
Barking Owl	*Ninox connivens*	V	-	✓
Speckled Warbler	*Pyrrholaemus sagittatus*	V	-	✓
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis gularis*	V	-	-
Painted Honeyeater	*Grantiella picta*	V	-	✓
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	V	-	✓
Diamond Firetail	*Stagonopleura guttata*	V	-	✓
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis temporalis*	V	-	✓
Hooded Robin (south-eastern form)	*Melanodryas cucullata cucullata*	V	-	✓
Varied Sittella	*Daphoenositta chrysoptera*	V	-	✓
Fork-tailed Swift	*Apus pacificus*	-	M	-
Rainbow Bee-eater	*Merops ornatus*	-	M	✓
White-throated Needletail	*Hirundapus caudacutus*	-	M	-
Satin Flycatcher	*Myiagra cyanoleuca*	-	M	-
Mammals				
Koala	*Phascolarctos cinereus*	V	V	Anecdotal record
Squirrel Glider	*Petaurus norfolcensis*	V	-	✓
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	V	-	✓
Eastern Bentwing-bat	*Miniopterus schreibersii oceanensis*	V	-	-
South-eastern Long-eared Bat	*Nyctophilus corbeni*	V	V	✓
Little Pied Bat	*Chalinolobus picatus*	V	-	-
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	V	-	-
Eastern Cave Bat	*Vespadelus troughtoni*	V	-	✓

Current as of January 2016

Sources: Cumberland Ecology (2011, 2014, 2015) and Parsons Brinkerhoff (2010).

[1] Threatened species conservation status
V = Vulnerable, E = Endangered, M=Migratory.

Other species such as the Superb Parrot (*Polytelis swainsonii*), Swift Parrot (*Lathamus discolor*) and Regent Honeyeater (*Anthochaera phrygia*) have potential to occur in the MCCM Project Boundary and the surrounding area from time to time. The Large-eared Pied Bat (*Chalinolobus dwyeri*) has reportedly been located at the Boggabri mine by North West Ecological Services.

3.3 WEEDS

Noxious weeds are listed under the NSW *Noxious Weeds Act, 1993* for particular local control areas. The noxious weed declarations for Narrabri Shire Council are relevant to the MCCM Project Boundary. Noxious weeds relevant to the Narrabri Shire Council that have been recorded in the MCCM Project Boundary and Surrounds are listed in Table 3-3.

Table 3-3
Noxious Weeds Known to Occur in the MCCM Project Boundary and Surrounds

Common Name	Scientific Name	Status[1]
Devils Rope Pear	*Cylindropuntia imbricate*	Class 4
African Boxthorn	*Lycium ferocissimum*	Class 4
Blue Heliotrope	*Heliotropium amplexicaule*	Class 4
Mimosa	*Mimosa sp.*	Class 4
Tiger Pear	*Opuntia aurantiaca*	Class 4
Prickly Pear	*Opuntia* sp.	Class 4
Common Prickly Pear	*Opuntia stricta*	Class 4
Velvet Tree Pear	*Opuntia tomentose*	Class 4
Blackberry	*Rubus fruticosus aggregate species*	Class 4
Fireweed	*Senecio madagascariensis*	Class 4
Fireweed	*Senecio* spp.	Class 4
Glavanised Burr	*Sclerolaena birchii*	Class 4
Columbus Grass	*Sorghum sp.*	Class 4

Sources: Croft and Associates (1979); Dames and Moore (1983, 1984); Cumberland Ecology (2010 and 2014); Parsons Brinkerhoff (2010); EcoLogical Australia Pty Ltd (2010).

[1] Status under the *Noxious Weeds Act, 1993* for the Narrabri Shire Council Control Area. Class 4 weeds are 'Plants that pose a potentially serious threat to primary production, the environment or human health, are widely distributed in an area to which the order applies and are likely to spread in the area or to another area.

Also of note, Hemlock (*Conium maculatum*) and Bathurst Burr (*Xanthium spinosum*) were previously reported to occur in the MCCM Project Boundary but these species are not noxious weeds relevant to the Narrabri Shire Council.

3.4 FERAL ANIMALS

Feral animals that have been recorded in the MCCM Project Boundary are listed in Table 3-4. Feral Pigs and European Rabbits are Declared Pests under the *Local Land Services Act 2013*.

Table 3-4
Feral Animals Recorded in the MCCM Project Boundary

Common Name	Scientific Name	Status[1]
Feral Pig	*Sus scrofa*	Declared pest
European Red Fox	*Vulpes vulpes*	Declared pest
European Rabbit	*Oryctolagus cuniculus*	Declared pest
Brown Hare	*Lepus capensis*	-
Feral Cat	*Felis catus*	-
Black Rat	*Lepus capensis*	-
House Mouse	*Mus musculus*	-

[1] *Local Land Services Act 2013.*

4 MANAGEMENT OF BIODIVERSITY AT THE MINE SITE

This section outlines the actions to be taken to minimise the impact of the MCCM on native flora and fauna species and to manage the impacts of exotic flora and fauna. This includes activities to be undertaken on areas to be cleared, prior to the removal of trees in order to minimise the impact to fauna species, and it also includes measures to control the potential impact of weeds and feral animals on the remaining biodiversity within the MCCM Project Boundary and in nearby areas of the Leard State Forest.

Condition 7 (Schedule 2) and Condition 47 (Schedule 3) of PA 10_0138 require protection of the vegetated corridor between the MCCM Project Boundary and that of the Boggabri Coal Project (Figure 2). MCC will manage this area using methods outlined within this section including methods for marking the limits of clearing, feral animal control and weed control. MCC will work cooperatively with the Proponent of the Boggabri Coal Project to co-ordinate activities in this area. The weeds and feral animals within the corridor will also be monitored using methods as described in Sections 4.13.2 and 4.13.3.

4.1 PRE-CLEARANCE AND POST-CLEARANCE ACTIVITIES

Vegetation clearance will be staged over the life of the mine and therefore pre-clearance and clearance activities will be implemented for each stage of clearing. The following activities will take place prior to each stage of clearing to minimise adverse impacts to native wildlife and other environmental and regulatory issues.

A Land Disturbance Protocol (LDP) form was prepared to manage the clearance process and to document all licensing, safety and management requirements. The LDP form is an environmental checklist that must be completed for each stage of clearing by the person responsible for the clearing activities, the relevant technical expert (e.g. Electrical Engineer to confirm no presence of cables etc) and signed off by MCC's Environmental Officer or a delegate and final authorisation by the Environmental Superintendent or delegate.

4.1.1 Marking Limits of Clearing

Disturbance of vegetation will be limited to the minimum necessary for each stage of the clearing. Woodland clearance for mining will take place during the nominated clearing window, and will occur no more than 12 months in advance of the proposed mine plan during operations, excluding time allowed for progressive vegetation disturbance, mulching, topsoil recovery and stockpiling activities required to occur prior to mining activities being able to commence in a particular area.

The current limits of clearing will be marked either by high visibility tape at appropriate intervals, fencing or an equivalent boundary marker that will be installed any time prior to clearing. To avoid unnecessary or inadvertent vegetation and habitat removal, disturbance will be restricted to the delineated area and no stockpiling of equipment, machinery, soil or vegetation will occur beyond this boundary.

The person responsible for the clearance activities will be responsible for ensuring that the boundary markers are installed to enable the suitable environmental and technical inspections of the proposed disturbance can be undertaken, and ultimately that disturbance can be limited to the marked area approved for disturbance. The completion of this activity will be recorded and signed off in the LDP form.

In order to protect the vegetated corridor (as described in Section 4), this area will be marked in a similar way to the disturbance area where disturbance activity is within 10m of the corridor boundary. No disturbance will be permitted to occur within the vegetated corridor; that is, no vehicles or machinery will be permitted entry and general pedestrian traffic will be discouraged.

4.1.2 Pre-clearance Flora and Fauna Surveys

Initially, the environmental assessment will be reviewed to identify known locations of biodiversity features such as hollow bearing trees or bush rocks. These will be recorded on the LDP form.

During the pre-clearance process, threatened flora and fauna that have the potential to be disturbed as a result of clearing activities will be identified.

Flora Pre-clearing Surveys

Prior to clearing, a pre-clearing flora survey will be conducted to search for threatened plant species that have potential to occur, based on habitat available. These include (but are not limited to):

- *Pultenaea setulosa*;
- *Lepidium aschersonii*;
- *Tylophora linearis*; and
- *Pomaderris queenslandica*.

If a threatened plant species is identified, the numbers of plants will be counted and/or the population estimated/mapped. A review of translocation methods, collection of propagules, and propagation from seeds or cuttings from plants within the MCCM disturbance area and/or surrounds will be undertaken. Following this review, a translocation/propagation program will be developed and implemented where appropriate in consultation with OEH, DP&E and DotE (for Matters of National Environmental Significance [MNES]). The program will be documented in this BMP via an addendum or new revision (as part of the Annual Review process).

All threatened plant species identified during pre-clearing will be reported to OEH and to DotE (for relevant MNES species).

Tylophora linearis was identified during pre-clearing flora surveys during 2014 and 2015. Appendix C provides a propagation and translocation program for the species.

Pomaderris queenslandica was identified during pre-clearing flora surveys during 2015. Appendix D provides a propagation and translocation program for the species.

Fauna Pre-clearing Surveys

Habitat features that have a high potential to support native fauna species will be identified prior to any clearing activities. These include significant rock outcrops and crevices, large boulders, nests and in particular trees bearing hollows that have potential to contain species such as bats, gliders, possums, reptiles and birds. Trees containing hollows or nests that have a high potential to contain fauna will be identified, recorded, flagged with fluorescent marking tape, and marked with a large (>1 m) “H” (to indicate that it is a Habitat Tree) using spray paint on two sides of the tree.

The location of suitable nearby habitat for the release of fauna that may be encountered during the pre-clearing process will be identified and marked on a map. Wildlife relocation beyond the coal lease boundary within Leard State Forest will be done in accordance with a relevant permit from FCNSW.

Updated maps/plans, pre-determined habitat for the release of fauna, habitat features present in the site and recommended clearing procedures will be submitted to the Environmental Officer and shall be recorded and signed off in the LDP form.

Within one week prior to clearing trees, a pre-clearing fauna survey will be conducted by the suitably qualified ecologist for the presence of fauna species in order to identify and minimise impacts to resident fauna. Any fauna utilising the area will be recorded. Hollows will be watched in the early evening to see if any arboreal fauna (e.g. gliders [such as the Squirrel Glider], bats) are using them. The ground around each tree will be inspected for scats, and the trees for scratch marks. Spotlighting will be undertaken for arboreal animals. If necessary (to be recommended by the suitably qualified ecologist), a burrow scope will be used by the suitably qualified ecologist to ascertain whether a particular hollow is being used by native fauna.

Additional pre-clearance survey requirements relating to the timing of clearing are provided in Sections 4.1 and 4.2.

4.1.3 Clearing Activities

Before clearing woodland/forest native vegetation and isolated trees in grasslands, licensed wildlife carers and/or ecologists will attempt to capture and/or remove fauna that have the potential to be disturbed as a result of clearing activities. These fauna will be relocated into pre-determined habitat identified for fauna release. All fauna handling will be carried out by licensed wildlife carers and/or ecologists. Clearing contractors will then be informed of any changes to the sequence of clearing if required (see below).

The clearing of woodland/forest native vegetation and isolated trees in grasslands will be conducted using a two-stage clearing process:

1. Clearing will commence following the identification of potential habitat trees by the suitably qualified ecologist. Trees or other marked with an "H" will not be cleared during the first stage; however all vegetation around the tree will be so that the tree is isolated. Other habitat features marked with an "H", such as logs and log piles, will be supervised during clearing.

2. Identified habitat trees will be will be left to stand overnight after stage 1 clearing to allow resident fauna to voluntarily move from the area. Then, the habitat trees will be cleared using the following protocols:

    - If possible, trees marked as containing hollows will be shaken by machinery prior to clearing to encourage any animals remaining to leave the hollows and move on;
    - Use a bulldozer to start pushing the tree over. Move the bulldozer over the roots and continue *gently* pushing the tree over. The tree should not fall heavily to the ground;
    - Remove branches with hollows and sections of trunk and set aside for immediate transfer to a storage area for eventual placement within rehabilitation areas (once available);
    - The suitably qualified ecologist will investigate all hollows for the presence of fauna following felling of the tree; and
    - The felled habitat tree will be left overnight to allow any remaining fauna time to leave the hollows and move on.

Additional mitigation measures relating to the timing of clearing are provided in Section 4.2.

The two-stage clearing process allows fauna a chance to self-relocate upon nightfall, when foraging typically occurs. Fauna are not likely to re-inhabit trees, as they are not likely to feel secure in their tree with all trees around it cleared.

The suitably qualified ecologist will be present while clearing to rescue animals injured during the clearance operation. Any fauna found will be captured and relocated to nearby remnant vegetation and released after nightfall to minimise the risk of predation by diurnal predators. Any animals that are inadvertently injured will be taken to the nearest veterinary clinic for treatment, or if the animal is unlikely to survive, it will be humanely euthanized. The closest veterinary clinics to the MCCM Project Boundary are noted below:

Narrabri Veterinary Clinic

Martyn Powell and Michael Read
24 Francis Street
NARRABRI NSW 2390
Telephone: (02) 6792 4388

Gunnedah Veterinary Hospital

14-16 Barber Street
GUNNEDAH NSW 2380
Telephone: 02 6742 1834 (all hours)
Facsimile: 02 6742 4422
Email: gunvet@bigpond.com

Gunnedah Sale Yards Veterinary Clinic

Boggabri Road
GUNNEDAH NSW 2380
Telephone: (02) 6742 5175

One or more of the above clinics will be notified prior clearing of woodland/forest native vegetation and isolated trees in grasslands and prior to animal transportation to ensure they are willing to treat injured animals. A record of the contact will be documented.

All persons working on the vegetation clearing will be briefed about the possible fauna present at the time of construction, and what procedures will be undertaken in the event of an animal being injured or disturbed. A qualified animal rescue person (e.g. NSW Wildlife Information, Rescue and Education Service Inc [WIRES]) or the suitably qualified ecologist will be on call at all times during clearing.

If boulders are to be moved during clearing, the suitably qualified ecologist will catch any snakes or frogs that may be sheltering under them. These animals will be relocated to suitable habitat elsewhere in the Leard State Forest.

Results and outcomes of pre-clearance and clearance fauna surveys will be documented by the suitably qualified ecologist and submitted to MCC's Environmental Officer. This includes:

- species and numbers of individuals recorded;
- incidence of sick or injured animals and the actions taken to care for the fauna; and
- the species and numbers of individuals that were relocated.

If a new threatened species is identified that has not previously been identified as having potential to occur, the occurrence will be surveyed and fully documented. Results will be made available to OEH and to DotE (if it is a species that is a MNES).

4.1.4 Weed Management During Construction

Prior to clearance, infestations of significant weeds (noxious weeds or Weeds of National Significance [WONS][3]) will be recorded in the LDP and mapped. If recommended by MCC's Environmental Officer or suitably qualified ecologist, control of weeds will be undertaken to minimise the risk of spread of weeds during clearing. Weed control measures will be species specific and will be guided by published control measures (e.g. DPI, 2014a).

Prior to clearing, all plant equipment to be used on the clearing program will be inspected and recommended for wash down (in designated wash down areas) as required to ensure weed material from off-site locations do not establish or spread into native vegetation within the MCCM Project Boundary.

Any weed materials will need to be carefully removed off site in a manner appropriate to the species or at the direction of the suitably qualified ecologist so as to prevent the spread of propagules to uncleared areas of native vegetation.

Machinery involved in weed management will also be washed down prior to removal from site to prevent weeds from spreading into off site areas.

[3] A total of 32 introduced plants have been identified as Weeds of National Significance (WONS) under the National Weeds Strategy.

4.1.5 Management of Cultural Heritage Values

Aboriginal and cultural heritage values within the MCCM Project Boundary will be primarily managed under the MCCM *Aboriginal and Archaeological Cultural Heritage Management Plan*. To ensure that ecological pre-clearing and clearing works are consistent with the objectives of the *Aboriginal and Archaeological Cultural Heritage Management Plan*, the following will be undertaken by the suitably qualified specialist:

- Prior to commencement of pre-clearing and clearing works, the suitably qualified ecologists involved in the pre-clearing surveys will be briefed as part of the induction process on the identification of any Aboriginal culturally modified trees. Any suspected culturally modified trees identified by the suitably qualified specialist during pre-clearance surveys will be assessed by an archaeologist following the Procedure on the Discovery of Aboriginal Archaeological Objects (refer to the *Aboriginal and Archaeological Cultural Heritage Management Plan*).

- As part of the pre-clearing works, the suitably qualified ecologist will identify and tag (using flagging tape or an alternative method) cultural heritage resources under advisement from the Environmental Officer. The identified cultural heritage resources will be inspected by the archaeology team prior to clearing of these items to allow for the collection of seeds, fruits, bark, roots, or any other relevant material. Collection activities will be undertaken by the archaeology team. Cultural heritage items may include the following species:
  - Native Pear (*Marsdenia viridiflora*);
  - Quinine Bush (*Alstonia constricta*); and
  - Native Orange (*Capparis mitchellii*).

4.1.6 Maximising Salvage of Habitat Resources

A selection of hollow-bearing trees, hollow-bearing logs and rocks will be salvaged for reuse in rehabilitation areas and/or selected recipient sites within nearby offsets that require enhancements (Section 6.6). Such materials vary in quality and quantity among different parts of the MCCM Project Boundary. Whilst some woody materials provide a valuable habitat resource for native fauna, others are not suitable for salvage because they are structurally unsound and/or decayed to the extent that they may not survive felling, relocation and replacement on the recipient site.

The following method will be applied to rationalise the salvage of habitat resources and select key habitat resources to retain for re-use in mine site rehabilitation and offset areas (where appropriate).

Quantifying the Habitat Resource for Replication at Recipient Sites

Prior to clearing, 20 x 50 m plots will be surveyed in each vegetation type to quantify the habitat resource. The number of plots per vegetation type will be commensurate with the area of clearing to be undertaken. Within these plots the following information will be recorded as a minimum:

- photographs;
- GPS location;
- numbers of tree hollows;
- size class of tree hollows;
- species of trees;
- structural integrity of timber;
- percentage cover of bush rocks; and
- length of fallen logs (>200 mm diameter).

This data will document the types and densities of resources available to be relocated to recipient sites.

Selection Criteria for Salvage Material

Prior to clearing, suitable salvage items will be identified, recorded, flagged with fluorescent marking tape, and marked with a large (>1 m) "S" using spray paint on two sides of the tree. The following criteria will applied as part of the selection process:

- **Hollow trees** will be considered for salvage based on structural integrity, number and size of hollows. Hollows to be salvaged will include a range of diameter sizes. Ideally, hollows will be in trunks or solid living branches to maximise the chance that they would survive the felling process. Trees will be favoured if single stemmed to ensure that they would remain intact during felling. Stags (dead trees) will be selected if they appear solid and have good hollows in the trunk.
- **Woody ground debris** (fallen timber) will be selected based on size, structural integrity and presence of good hollows. Larger logs (in both length and girth) will be typically selected with large hollows (i.e. large diameter hollows through the length of the stem or at least a significant portion) through the stems. Logs that had been felled during past forestry activities will be selected rather than old naturally fallen logs because these are typically better preserved (having fallen prior to attack by insects etc).
- **Trees and fallen logs without hollows**. It is also intended that a number of trees without hollows, or large logs in good condition, will be collected for retention in addition to those marked by ecologists during pre-clearing. As these trees/logs do not require identification by ecologists, they can be selected at random during clearing and stock-piled to provide additional habitat features in rehabilitated land.
- **Large flat or creviced rocks** (>500 mm width) that appear solid enough to survive translocation will be considered for translocation to rehabilitation or offset sites.

In areas where few hollow trees or logs are present, most of the habitat features are likely to be marked for collection. In areas where hollows and logs were abundant, only those with significant value as habitat features (as described above) will be marked for retention as habitat. All habitat features selected for salvage will be fully itemised within the Habitat Resource Recovery Inventory.

Timing of Salvage Activities

Salvage of habitat features will take place during both Stage 1 and Stage 2 of clearing. The salvaged habitat features will be moved to a holding site for storage until a time that they can be emplaced in mine rehabilitation areas and in nearby offset areas to allow their continuation as potential fauna refuge sites. This will take place before and after clearing.

Some such materials may be transported to interim storage areas though such materials will be preferentially transported immediately to pre-identified sites if available. Vegetation that is not salvaged as a habitat feature will be mulched, and spread back over the topsoil. The topsoil and mulch will then be removed and transported to interim storage areas and applied to rehabilitation areas to provide additional organic matter.

A description of the salvage items and the recipient site(s) shall be recorded and signed off in the LDP form. Relocation of bush rocks within the Leard State Forest or beyond the forest boundary will be undertaken as agreed with FCNSW.

Section 6.6 describes the reuse of salvaged habitat resources in the offset areas. The Mining Operations Plan (MOP) will describe the reuse of salvaged habitat resources on the mine rehabilitation.

4.1.7 Fauna Radio-tracking Program

OEH has requested that radio-tracking be carried out for fauna captured during pre-clearing/clearing activities. A tracking program will be developed that considers (but are not limited to) the following:

- objectives of tracking program (survival rates; movements from point of release, etc.);
- duration of tracking at each session (one week, a few days);
- lag time between release and then tracking (immediate tracking or wait overnight);
- appropriate frequency of tracking (i.e. months, weeks, etc.);
- types/sizes of radio collars required and costs per unit;
- likely numbers and types required at each pre-clearing/clearing stage;
- types of radio receivers and costs; and
- potential requirement to construct radio towers in addition to the use of hand-held receivers in order to facilitate tracking over a large distance.

In the first few years of pre-clearing and clearing surveys, information (such as capture rates and types of fauna captured) will be collected to determine which species are most suitable for use in a tracking program. Fauna monitoring data from previous clearing surveys has been used to develop a fauna radio-tracking program in consultation with OEH and DP&E. The radio-tracking program was implemented during the 2017 clearing window. Wildlife tracking beyond the coal lease boundary within Leard State forest was undertaken in accordance with a relevant permit from FCNSW.

4.2 TIMING OF CLEARING

Subject to exceptional circumstances, clearing of woodland/forest native vegetation will be undertaken in late summer and early autumn (that is, between 15 February and 30 April of each year in which clearing is carried out) in order to avoid key breeding or hibernation seasons for threatened bat and bird species known to reside in the Leard State Forest. Also, if the temperature is predicted to exceed 35 degrees (^{o}), the temperature at the mine will be monitored and clearing of understorey and tree felling including habitat trees will be halted if the temperature exceeds 35^{o}.

Under exceptional circumstances, minor clearing of woodland/forest native vegetation is permissible outside of the period between 15 February and 30 April with the prior written consent of the Secretary of DP&E. The clearing that may be so approved is limited to minor clearing. Where clearing is carried out pursuant to this exception, additional mitigation measures (i.e. additional to those measures in Section 4.1.3) will be employed (refer Section 4.2iii).

Other land disturbance activities (such as clearing grasslands, racking of felled trees, mulching, topsoil removal and the removal of regrowth in previously cleared areas) may occur year round and are not subject to the above timing of clearing and/or temperature restrictions.

i. Pre-clearing Fauna Surveys

The below pre-clearing fauna survey measures were proposed in the event that clearing of woodland/forest native vegetation in spring or early summer was approved by the Secretary of DP&E, however, this BMP, other than in exceptional circumstances, does not propose or permit clearing of woodland/forest native vegetation to occur in spring or early summer (between 1 November and 15 February). The below pre-clearing fauna survey measures will apply to clearing of isolated trees in grassland between 1 May and 15 February.

As described in Section 4.1.3, within one week prior to clearing trees, a pre-clearing fauna survey will be conducted by the suitably qualified persons for the presence of fauna species in order to identify and minimise impacts to resident fauna. Any fauna using the area will be recorded.

Nesting Birds

For clearing of woodland/forest native vegetation between 1 November and 15 February, the following pre-clearing survey methods will be employed in relation to nesting birds (including threatened bird species):

- All trees will be circled by an observer to identify hollows and/or nests that may be used as nesting resource.
- Inspections and/or observations will be carried out to confirm that birds are using the hollow and/or nest as a nesting resource.
- Repeat observations will be carried out to determine the completion of nesting activities (i.e. young have left the nest and the hollow and/or nest is no longer used for nesting).

Nesting birds maybe identified either by sight, vocalisations, inspection cameras and/or a cherry picker. Where possible, the species using the nest will be identified to inform likely timing for completion of nesting activities.

Bat Roosts

For clearing of woodland/forest native vegetation between 1 November and 15 February, trees that contain hollows/fissures that are likely to be used by microbats (including threatened microbat species) will be surveyed prior to clearance by either hollow watching (Section 4.1.3) or using Anabat electronic detectors. Surveys would also be undertaken at any rock overhangings in the clearance area that are potentially suitable for cave-dwelling bats.

Pale-headed Snake

All trees will be circled by an observer to identify any tree-dwelling snakes (e.g. the Pale-headed Snake) that may be within the tree. Hollows identified as having potential to contain Pale-headed Snake will be checked with a burrow scope.

Squirrel Glider

Hollows will be watched in the early evening to see if any arboreal fauna (e.g. Squirrel Glider) are using them. Spotlighting will be undertaken for arboreal animals. If necessary, a burrow scope will be used by the suitably qualified ecologist to ascertain whether a particular hollow is being used by native fauna.

ii. Clearing Activities – Minimising the Impacts on Fauna

The below clearing measures were proposed in the event that clearing of woodland/forest native vegetation in spring or early summer was approved by the Secretary of DP&E, however, this BMP, other than in exceptional circumstances, does not propose or permit clearing to occur in spring or early summer (between 1 November and 15 February).

Nesting Birds

The following clearing strategies will be employed in relation to habitat trees with bird nests for clearing activities between 1 November and 15 February:

- If the nest is suspected to active (i.e. it suspected to contain eggs or young), the tree will not be cleared until after fledglings have left the nest or advanced fledglings are old enough to be cared for by a wildlife career for subsequent release; or
- if the nest is suspected to be inactive (i.e. not to contain eggs or young):
  - the tree will be cleared within two weeks following the confirmation that the nest is inactive; or
  - the nest will be removed from the tree to minimise the chance of the nest becoming active prior to clearance.

Bat Roosts

The following clearing strategies will be employed in relation to habitat trees with suspected bat roosts for clearing activities between 1 November and 15 February:

- Habitat trees with confirmed bat roosts will be managed by:
  - shaking the tree with machinery prior to clearing to encourage bats to move to an alternative roost site;
  - gently lowering the tree to the ground with the objective of causing minimal impact to the roost;
  - placing the tree on the ground so the entrance to the hollow faces upwards (i.e. so bats are able to exit);
  - inspecting the felled tree to confirm whether for bats have exited the tree; and
  - leaving the felled tree overnight to allow any remaining bats time to leave the hollow;
- If a bat roost containing a maternity colony (young bats) is found during inspection of the felled tree, the following will be undertaken:
  - If the roost is located in a portion of the tree that is not able to be relocated, the bat fauna will be collected and temporarily stored in a cool location for release at night.
  - If the roost is located in a portion of the tree able to be relocated:
    a. The cavity opening will be temporarily blocked with a piece of cloth.
    b. The section of the tree will be removed using a chainsaw (or a suitable alternative low-impact method) (noting that use of a chainsaw will be undertaken by a qualified chainsaw operator).
    c. Adults and young captured leaving the roost are to be placed within the roost.
    d. The ends of the extracted tree section and cavity openings will be temporarily blocked with a piece of cloth during transportation.
    e. Collected roost and bat fauna will be temporarily stored in a cool location.
    f. The roost will be returned to the location prior to dusk and positioned above the ground with a freefall of approximately 1-3 m.
    g. The pieces of cloth will be removed once the tree section is fixed in an undisturbed location to allow bats to leave.
    h. The roost to be checked the following morning for success of adult retrieval of young.
    i. In the case of unsuccessful adult retrieval of young then the juvenile bats will be assessed by a veterinarian or experienced wildlife carer.
- If habitat trees with suspected bat roosts are considered unlikely to contain bat roosts (following bat surveys), clearance will proceed. In consideration of the behaviour of many bat fauna species to use a number of roosts, trees containing potential bat habitat are to be felled, as soon as possible (ideally the following day) after a negative Anabat survey result.

If overhangings with suspected bat roosts are found during the pre-clearance surveys, the strategy may involve waiting until the bats have left the rock overhanging and block the entrance so they are unable to re-enter prior to clearance. Consideration will also be given to blocking tree hollows prior to clearance in the event that trees with empty hollows are left standing for more than 48 hours after checking the hollows.

Pale-headed Snake

Refer to the clearing process described in Section 4.1.3.

Squirrel Glider

Refer to the clearing process described in Section 4.1.3.

iii. Mitigation Measures - Minor Clearance

Under exceptional circumstances, minor clearing of woodland/forest native vegetation is permissible outside of the period between 15 February and 30 April with the prior written consent of the Secretary of DP&E.

Fauna mitigation measures will be developed and implemented as appropriate to minimise the impacts on fauna. The fauna mitigation measures for minor clearing will vary depending on the location of the proposed clearing, the time of year, susceptible threatened species, and habitat that is required to be cleared.

4.3 SEED COLLECTION AND PROPAGATION

Seed Collection, Management and Storage

Seed collection will be synchronised with clearing of vegetation where possible to optimise seed collection – particularly from trees and taller shrubs when the canopy seed bank is accessible from the ground. Collection of available seed will take place for shrubs and groundcover species independent of clearing. Seed collection may occur at any time of year to coincide with the optimal seed collection times for each target flora species.

Seed collection, management and storage will be undertaken in consideration of the following Florabank guidelines (http://www.florabank.org.au/):

- *Florabank Guideline 1 - Native seed storage for revegetation.*
- *Florabank Guideline 2 - Basic methods for drying, extraction and cleaning native plant seed.*
- *Florabank Guideline 3 - Improving on basic native seed storage.*
- *Florabank Guideline 4 - Keeping records on native seed.*
- *Florabank Guideline 5 - Seed collection from woody plants for local revegetation.*
- *Florabank Guideline 6 - Native seed collection methods.*
- *Florabank Guideline 10 - Seed collection ranges for revegetation.*

Currently accepted best practice, as described in Rawlings *et al.* (2010) for local provenance seed collection includes:

- collection of seed from several source sites with similar rainfall, soil, altitude, aspect and slope position to the revegetation site to ensure they are most adapted to the landscape and environmental conditions;
- collection of seed from between 20-50 plants of each species for genetic diversity; and
- collection of seed from plants spaced approximately three plant-heights apart to prevent collection of too many closely related seeds.

The seed species, location of collection, volume of seed and storage methods shall be documented appropriately as part of the reporting requirements for the MOP.

Propagation

Propagation of seedlings should be undertaken by nurseries that can effectively handle commercial quantities of seed, propagate and grow the seed and harden the seedlings.

Seedlings orders need to be placed well in advance of revegetation works to meet the demand for tubestock. The likely timeframes for plants to reach transplantable sizes will vary depending on the species and method of propagation (e.g. most species require one season to be of sufficient size, but other species such as *Xanthorrhoea*, *Callitris* and *Bursaria* can take two or more years).

In addition, or alternatively, direct seeding can be carried out by an appropriately qualified operator. Only those species that are locally known to establish reliably from sown seed should be included in direct seeding operations. Seed from species that are difficult to propagate, or when seed is rare (costly), seedling propagation in a nursery is preferable.

Records will include all source of propagation, species, quantities and dates.

4.4 REHABILITATION

The procedures, protocols and targets for revegetation of the post-mining rehabilitation areas are covered in the MOP that DRE and DP&E, as the primary regulators of rehabilitation, accept as meeting the requirement of a Rehabilitation Management Plan under the Project Approval, . An overview of some aspects of rehabilitation are provided below.

Revegetation

Overall, the key goal of the rehabilitation activities is to create landforms that are safe, stable, provide adequate post-mining drainage, and have a shape that is consistent with the types of naturally occurring landform features that occur in the region.

The key rehabilitation objective of the MCCM is the establishment of native forests and woodlands with a conservation final land use. Condition 25 of Approval Decision EPBC 2010/5566 requires rehabilitation within the MCCM Project Boundary to include no less than 1,665 ha of native forest and woodland in the project area, including 544 ha using species consistent with Box-Gum Woodland.

Salinity

In the event that the monitoring and rehabilitation research programs identify that rehabilitation results are sub-optimal and/or improvements can be made, further investigation to establish a cause and appropriate remediation management strategy(s) will be undertaken. Aspects that may be considered as part of the investigation may include, but are not necessarily limited to potential causes of salinity.

Reuse of Salvaged Habitat Resources

Timber and bush rocks piles will be relocated to rehabilitation areas before, during and after clearing as per the LDP. Hollow limbs salvaged during vegetation clearance at the mine will be installed in select trees without hollows (once the revegetation is sufficiently mature to hold the hollow limb).

Long-term Conservation Security

In accordance with Condition 54 of Schedule 3 to PA 10_0138, the by the end of December 2034, unless otherwise agreed by the NSW Secretary of the DP&E, appropriate long-term security will be provided for the (mine) Rehabilitation Area.

4.5 CONTROL OF WEEDS

Objective

Environmental and noxious weeds can have detrimental effects on native remnant vegetation and have the potential to compromise the establishment of native vegetation on the post-mine landforms. The objective of weed management in the MCCM Project Boundary is to control the occurrence and spread of weed species (e.g. WONS and noxious weeds). Landholders are obliged to control noxious weeds under the NSW *Noxious Weeds Act, 1993*.

Weed Prevention

Weed management will be undertaken during construction as described in Section 4.1.4 to minimise the risk of spread of weeds during clearing. The spread of weeds from disturbance areas will be minimised through inspections of and where required washing down vehicles and machinery as required.

Weed Control Program/Timing

The weed control program will involve:

- identifying weeds (Section 4.13.2);
- application of weed control techniques in areas requiring weed control; and
- follow-up inspection weed control as required.

Weed control will be undertaken for the targeted weed species based on seasonal conditions.

Follow-up weed control will be undertaken as required, in areas that have received past weeding treatments Follow-up treatments ensure pressure is maintained on weeds, assisting regenerating or planted native plants to out-compete weed species.

Weed Control Techniques

A number of noxious weeds are known to occur in the MCCM Project Boundary and surrounds. Initially weeding will take place targeting the noxious weeds and other environmental weeds present in the MCCM Project Boundary. However, if new weeds species are found those new weeds species will also be managed in accordance with this BMP.

Recommended techniques for removal of noxious weeds that have been published by DPI Agriculture will be consulted prior to weed control, e.g. *Noxious and Environmental Weed Control Handbook* (DPI, 2014a). Local weed management plans published by the Narrabri Shire Council (2014) also provide information on the control of noxious weeds. Relevant control methods for noxious weeds known to occur in the MCCM Project Boundary and surrounds are summarised in Table 4-1.

Table 4-1
Control of Example Target Noxious Weeds

Common Name	Scientific Name	Status[1]	Control Methods (DPI, 2014a)
Devils Rope Pear	*Cylindropuntia imbricata*	Class 4	• physically remove • herbicide application
African Boxthorn	*Lycium ferocissimum*	Class 4	• physically remove • herbicide application
Blue Heliotrope	*Heliotropium amplexicaule*	Class 4	• physical removal • herbicide application
Mimosa	*Mimosa* sp.	Class 4	• physical removal • herbicide application
Tiger Pear	*Opuntia aurantiaca*	Class 4	• herbicide application
Prickly Pear	*Opuntia* sp.	Class 4	• herbicide application
Common Prickly Pear	*Opuntia stricta*	Class 4	• herbicide application
Velvet Tree Pear	*Opuntia tomentosa*	Class 4	• herbicide application
Blackberry	*Rubus fruticosus aggregate* sp.	Class 4	• herbicide application
Fireweed	*Senecio madagascariensis*	Class 4	• herbicide application
Fireweed	*Senecio* spp.	Class 4	• herbicide application
Galvanised Burr	*Sclerolaena birchii*	Class 4	• herbicide application
Columbus Grass	*Sorghum sp.*	Class 4	• herbicide application

Sources: Croft and Associates (1979); Dames and Moore (1983-1984); Cumberland Ecology (2010 and 2014); Parsons Brinkerhoff (2010); EcoLogical Australia Pty Ltd (2010).

[1] Status under the *Noxious Weeds Act, 1993* for the Narrabri Shire Council Control Area.

All personnel involved in weeding management will be required to hold relevant and valid licences/ permits for weeding works, including a chemical licence to use herbicides and a chainsaw certificate to operate chainsaws (where applicable).

Weed control techniques in Table 4-1 (i.e. physical removal and herbicide application) are described below. Additional techniques may be undertaken depending on the environmental (e.g. WONS) and noxious weeds present and the success of these control techniques.

Physical Removal

Physical removal of weeds will involve techniques such as but not limited to:

- selective hand removal of weeds; and
- wick wiping with herbicide of tall weeds in situations where damage to proximate, low growing native plants can be avoided.

After physical removal of any plant material, the plant material will be stockpiled well away from sensitive areas and disposed of in an environmentally sensitive manner to prevent the spread of propagules or further seed production on the cut plant material.

Herbicide Application

Removal of weeds with herbicide will involve techniques such as but not limited to:

- selective spraying of weeds, with selective and non-selective herbicide;
- cutting or scraping deep rooted woody weeds and climbers with hand tools, chainsaws and brush cutters, and painting cut stumps with herbicides; and
- target drilling and injecting large tree weeds with herbicides.

Herbicide sprays will only be used during suitable weather conditions (i.e. not during wet or windy conditions), and during appropriate seasons (e.g. during active plant growth).

Weed Monitoring, Record Keeping and Reporting

Weed monitoring is discussed in Section 4.13.2, record keeping is discussed in Section 7.1, and reporting requirements are discussed in Section 7.2.

4.6 CONTROL OF FERAL ANIMALS

Objectives

The goal of feral animal management will be to reduce the abundance of feral animals in the MCCM Project Boundary and maintain a low abundance of feral animals. Landholders are obliged to control declared pests under the NSW *Rural Lands Protection Act, 1998*.

Feral Animal Prevention

Feral animals congregate and breed in windrows of felled trees. For this reason, vegetation cleared from the MCCM Project Boundary will not be bulldozed into windrows where it may harbour feral animals. Instead felled trees will be wood chipped and stockpiled in a suitable area away from retained remnant vegetation until it can be used in rehabilitation. This will be done after all the salvageable logs with hollows have been removed. Any temporary piles of vegetation will be monitored to determine whether they are being used by feral animals (Section 4.13.3).

Controls will be placed on the disposal and handling of garbage in the MCCM Project Boundary. All garbage bins will be constructed from sturdy materials and will be closed at all times to avoid the smell attracting foxes and pigs. Garbage bins will be emptied regularly and the garbage appropriately disposed of offsite by a licensed waste contractor at a suitable facility.

Feral Animal Control Program/Timing

The feral animal program will involve:

- identifying feral animals through monitoring;
- application of feral animal control techniques in areas requiring control;
- follow-up monitoring of feral animal control areas; and
- follow-up feral animal control if required.

The program will also consider advice from neighbouring landowners regarding observations of target feral animals upon the mine site.

Feral animal monitoring is described in Section 4.13.3. Feral animal control will typically occur in autumn and spring each year (the period of time applicable to the survival of offspring of native fauna species).

Feral Animal Control Techniques

Feral animal management will focus on the main feral animals recorded from the MCCM Project Boundary (Tables 3-4 and 4-2). However, if new feral animals are found during monitoring those new feral animals will also be managed in accordance with this BMP. The control of feral animals is intended to be adaptive and will be informed/reviewed based on the findings from the Feral Animal Monitoring Program (Section 4.13.3).

Table 4-2
Control Methods for Target Feral Animals

Common Name	Scientific Name	Status[1]	Control Methods	Relevant Documents
Feral Pig	*Sus scrofa*	Declared pest	• ground shooting; and/or • ground baiting.	• *Threat Abatement Plan for Predation, Habitat Degradation, Competition and Disease Transmission by Feral Pigs* (Department of the Environment and Heritage, 2005); • *PestSmart Toolkit* (Invasive Animals Cooperative Research Centre, 2015); and • *Vertebrate Pest Control Manual* (DPI, 2014b).
European Red Fox	*Vulpes vulpes*	Declared pest	• ground shooting; and/or • ground baiting.	• *Threat Abatement Plan for Predation by European Red Fox* (Department of the Environment, Water, Heritage and the Arts [DEWHA], 2008a); • *NSW Threat Abatement Plan for Predation by The Red Fox (Vulpes vulpes)* (OEH, 2011); • *PestSmart Toolkit* (Invasive Animals Cooperative Research Centre, 2015); and • *Vertebrate Pest Control Manual* (DPI, 2014b).

Table 4-2 (Continued)
Control Methods for Target Feral Animals

Common Name	Scientific Name	Status[1]	Control Methods	Relevant Documents
European Rabbit	*Oryctolagus cuniculus*	Declared pest	• warren ripping/fumigation; • ground baiting; and/or • ground shooting.	• *Threat Abatement Plan for Competition and Land Degradation by Rabbits* (DEWHA, 2008b); • *PestSmart Toolkit* (Invasive Animals Cooperative Research Centre, 2015); and • *Vertebrate Pest Control Manual* (DPI, 2014b).
Brown Hare	*Lepus capensis*	-	• ground shooting.	• *Integrated Hare Control* (Department of Environment and Primary Industries, 2015); and • *Vertebrate Pest Control Manual* (DPI, 2014b).
Feral Cat	*Felis catus*	-	• ground baiting; and/or • ground shooting.	• *Threat Abatement Plan for Predation by Feral Cats* (DEWHA, 2008c); • *PestSmart Toolkit* (Invasive Animals Cooperative Research Centre, 2015); and • *Vertebrate Pest Control Manual* (DPI, 2014b).
Black Rat	*Rattus rattus*	-	• ground baiting.	• *Vertebrate Pest Control Manual* (DPI, 2014b).
House Mouse	*Mus musculus*	-	• ground baiting.	• *Vertebrate Pest Control Manual* (DPI, 2014b).

[1] NSW *Rural Lands Protection Act, 1998.*

Control measures will be implemented by mine staff or by an appropriate Pest Control Contractor(s) as required. All personnel involved in feral animal control will be required to hold relevant and valid licences/permits, including any relevant chemical licences for pesticide use or a firearms licence for shooting. The *Humane Pest Animal Control: Code of Practice and Standard Operating Procedures* (DPI, 2013, or its revision) will be followed.

MCC will seek to co-ordinate feral animal control around the Project with neighbouring landholders and other mine operators (i.e. to avoid duplication of feral animal control methods).

Examples of feral animal control techniques are described above in Table 4-2. A selection of these techniques or additional techniques may be undertaken depending on the feral animal species in an abundance which requires control (as determined through monitoring) and the success of these control techniques.

Ground Shooting

Ground shooting can be a useful technique for controlling small, isolated feral populations of large feral pests (http://www.feral.org.au/pestsmart/). Shooting by an experienced marksman is a target-specific and humane form of feral animal control (Gregory, 2003). Such shooting is usually done at night from a vehicle, with the aid of spotlights. The use of firearms will conform to relevant firearm legislation.

Ground Baiting

Ground baiting with licensed substances, such as 1080, is regulated in NSW by the NSW *Pesticides Act, 1999* and can be carried out only under the conditions specified in the Pesticide Control (1080 Liquid Concentrate and Bait products) Order. The use of poison baits requires a minimum chemical use accreditation at AQF3 level or training specified for the licensed substance.

In NSW, pest control baits to assist in the management of feral animals are available for purchase through the North-west Local Land Service. Signage will be erected in areas where baiting is taking place in accordance with the requirements of the *Pesticides Act 1999*, the *Pesticides Regulation 2009* and all relevant Pesticide Control Orders.

In summary, ground baiting the Feral Pig will involve:

- Construction of bait stations as described in DPI (2014b).
- Non-poisoned baits (for free-feeding) will be added to the bait stations as described in DPI (2014b).
- The period of free feeding will be between 3 days and 2 weeks.
- Toxic baits will be introduced to the bait stations once free-feed bait uptake levels off, and this is continued until toxic bait uptake ceases (1 to 3 nights).
- After a maximum of 3 consecutive nights, all remaining poisoned bait will be removed and, where possible, carcasses of poisoned pigs should be collected and disposed of to prevent poisoning of non-target wildlife or domestic animals.

In summary, common ground baiting of the European Red Fox will involve:

- Burying baits (10 cm deep) near fences and tracks and in former paddocks no closer than 200 to 500 m intervals (or 50 baits per 400 ha) (DPI, 2014b).
- Bait will be added at weekly intervals until bait uptake is minimal.
- After baiting is complete, all untaken baits and carcasses should be recovered and disposed of.

European Rabbit are the main prey of most foxes so a coordinated European Rabbit control program may assist to suppress the red fox population. In summary, ground baiting of the European Rabbit will involve:

- A minimum of three 'free' feeds (without toxin) at 2 to 3 day intervals will be provided.
- After baiting is complete, all untaken baits and carcasses should be recovered and disposed of in accordance with Condition 4.8 of Schedule 2 of the PCO 2010.

Warren Ripping/Fumigation

Warren ripping is highly target specific, and can be successfully employed during the breeding season (when poisoning programs are less effective). Mechanical rippers will be used to destroy the structure of the warren and kill rabbits.

Fumigation can be very effective for controlling rabbits where other methods are unsuitable. Fumigants are used to fill the warren with gas that is heavier than air. Phosphine may be used as rabbit fumigants (DPI, 2014b). When using fumigation, all burrow entrances must be closed to prevent the escape of rabbits. It is important to check treated warrens soon afterwards for new openings of burrows, and re-treat these (DPI, 2014b).

Ground Baiting Black Rat and Mice

Several poisons are marketed, including RATTOFF® Zinc Phosphide baits and MOUSEOFF® Bromadiolone Rodent Bait. If significant increases in Black Rat and Mice populations are observed during monitoring activities, a poisoning program will be implemented.

Feral Animal Monitoring and Reporting

Feral animal monitoring is discussed in Section 4.13.3, record keeping is discussed in Section 7.1, and reporting requirements are discussed in Section 7.2.

4.7 CONTROL OF EROSION

Erosion and sediment control measures are contained within the MCCM Water Management Plan. Sediment mobilisation and erosion will be minimised by:

- installing appropriate erosion and sediment controls prior to disturbance of any land;
- limiting the extent of the disturbance to the practical minimum;
- reducing the flow rate of water across the ground particularly on exposed surfaces and in areas where water concentrates;
- progressively rehabilitating disturbed land and constructing drainage controls to improve stability of rehabilitated land;
- treating rehabilitation areas to promote infiltration;

- protecting natural drainage lines and watercourses by the construction of erosion control devices such as diversion banks, channels and sediment retention dams;
- installing appropriate erosion and sediment controls around all soil stockpiling areas;
- installing suitable control measures in areas with steep gradients, as required (e.g. rock riprap, geotextile fabric); and
- restricting access to rehabilitated areas.

4.8 MANAGEMENT OF LIVESTOCK GRAZING AND AGRICULTURE

Livestock will be excluded from active mine areas. Livestock will be excluded from areas undergoing active revegetation (i.e. planting or seeding) and all those areas with a Land Capability Class unsuitable for grazing.

4.9 CONTROL OF ACCESS

Measures will be implemented to control public access to the MCCM Project Boundary and to regulate personnel access to areas of Leard State Forest during weed or feral control (e.g. signage, fencing, locked gates). This is important to:

- limit the disturbance to rehabilitation areas;
- limit disturbance and spread of seed propagules during weeding; and
- ensure the safety of mine staff during live baiting programs, when feral shooting is taking place or when feral animal traps are being used.

4.10 VEHICLE DRIVING AND SIGNAGE

A vehicle driving standard will be implemented with speed restrictions that will assist to minimise the risk to fauna, especially collision risks on internal roads due to the extent of woodland habitat. Speeds on internal roads within the MCCM Project Boundary should not exceed the sign-posted limits. Signs will be erected to remind drivers to be alert at known fauna crossings and to signal the speed limit.

4.11 BUSHFIRE MANAGEMENT

Condition 69 of Schedule 3 to PA 10_0138 requires MCC to ensure that the MCCM is suitability equipped to respond to any fires on site and assist the NSW Rural Fire Service, Forestry Corporation NSW, emergency services and National Parks and Wildlife Service as much as possible if there is a fire in the surrounding area. MCCM will assess each request from emergency services to consider the risk to people and plant that may be provided to assist. Bushfire management of the MCCM Project Boundary will be undertaken as part of the Project's Bushfire Management Plan and will include provisions for the following:

- perimeter asset protection zones; and
- maintaining perimeter tracks according to specifications.

The Bushfire Management Plan will describe the management measures to ensure that the mine site is protected safely.

4.12 INDUCTIONS AND STAFF EDUCATION

Inductions for staff, contractors and visitors to the site will be conducted to make them aware of the ecological issues present in the MCCM Project Boundary and their role and responsibilities for the protection and/or minimisation of impacts to all native biodiversity.

Inductions will address the location of sensitive flora and fauna and the mitigation measures being implemented to protect the biodiversity values present on the MCCM Project Boundary.

Additional targeted and specific inductions/ training will be provided for contract and operational staff directly involved in clearing of native vegetation in relation to the two-staged clearing protocols, exclusions zones, types of flora and fauna, in particular threatened species.

4.13 MONITORING PROGRAM

4.13.1 Rehabilitation Area

A description of rehabilitation monitoring is provided within the MOP.

4.13.2 Weed Monitoring

Purpose

Monitoring will be undertaken to document the change in the type, extent and density of major weed occurrences in the MCCM Project Boundary over time and provide recommendations about appropriate weed control required. Regular inspections will also facilitate detection of new infestations of weeds and enable assessment of the effectiveness of the weed management measures as outlined in Section 4.5.

Methodology

Environmental (e.g. WONS) and noxious weeds will be monitored via inspections in the MCCM Project Boundary by a suitably qualified person(s) with experience in identification of weeds. If major weed infestations are discovered in the MCCM Project Boundary, the coordinates will be recorded, including the boundaries of large populations and details recorded regarding the estimated density of the infestation and the number of plants. Mapping will be prepared showing the extent of weeds requiring control.

The weed monitoring program would target areas that are more susceptible to weeds (e.g. topsoil stockpiles, road sides, drainage areas and mine rehabilitation).

The weeds will be controlled as outlined in Section 4.5. Follow-up inspections will be undertaken to assess the effectiveness of the weed management measures implemented and the requirement for any additional management measures.

Frequency

Environmental (e.g. WONS) and noxious weeds will be monitored twice a year for the first five years (until May 2019). Each weed monitoring period will include primary monitoring and secondary monitoring after weed control (a total of four weed monitoring events per year). Review of the weed management measures will be completed based on the results of the first five years of monitoring and follow-up works will be developed and implemented as required.

Data Analysis and Storage

All weed monitoring data (all activities and their GPS locations) will be entered in a database and stored for later use and analysis. New species detected during surveys will be added to the database.

4.13.3 Feral Animal Monitoring

Purpose

The abundance and distribution of feral animals within the MCCM Project Boundary will be monitored to provide the necessary information to trigger management actions and determine the efficacy of control measures aimed at reducing feral animal abundance. The mine site monitoring program will be integrated with the offset area monitoring program to provide an ongoing collective management approach.

Methodology

Feral animal monitoring will adopt the relevant methodologies for specific feral animals, generally in accordance with the NSW DPI *Monitoring Techniques for Vertebrate Pests* (Mitchell and Balogh, 2007a to e) so that a range of methods may be used such as transects/spotlighting, sandpads, cameras, traps, etc. Table 4-3 provides a list of target feral animals. Data on feral animal population/abundance from monitoring and control outcomes (e.g. date, activity, location) will be recorded..

Table 4-3
Target Feral Animals

Common Name	Scientific Name	Status[1]
Feral Pig	*Sus scrofa*	Declared pest
European Red Fox	*Vulpes vulpes*	-
European Rabbit	*Oryctolagus cuniculus*	Declared pest
Brown Hare	*Lepus capensis*	-
Feral Cat	*Felis catus*	-

[1] *Local Land Services Act 2013*

Native grazers that potentially inhibit restoration/revegetation (e.g. kangaroos) will be recorded. If grazing kangaroos are determined to be overabundant, the need for kangaroo control measures will be reviewed (Section 6.18).

Frequency

In order to monitor population changes over time and efficacy of control measures, feral animals will be monitored. Feral animals will be monitored on a quarterly basis for three years (following State approval of BMP Edition 2) and thereafter the frequency of monitoring would be reviewed. Review of the feral animal control measures will be annually and follow-up works will be developed and implemented as required. Any proposed changes to frequency of monitoring will be discussed with OEH and formalised in a revision to the BMP.

Feral animals are known to congregate and breed in windrows of felled trees. Any temporary piles of vegetation will be monitored for feral animals as part of the monitoring program.

Data Analysis and Storage

After each monitoring event is complete, the feral animal abundance will be estimated in accordance with NSW DPI *Monitoring Techniques for Vertebrate Pests* (Mitchell and Balogh, 2007a to 2007e).

Data will be updated annually to analyse for trends and effectiveness of the control program.

PART B
OFFSET AREA MANAGEMENT OF FLORA AND FAUNA

5 EXISTING ENVIRONMENT RELEVANT TO THE OFFSET AREAS

An overview of the NSW Biodiversity Offset Strategy and Commonwealth offset areas subject to Approval Decision EPBC 2010/5566 is provided in Sections 1.2.1 and 1.2.2.

5.1 LAND TENURE

A list of all the offset properties associated with the NSW and Commonwealth Biodiversity Offset Strategy is provided in Table 5-1. The offset areas that form part of the revised and approved NSW Biodiversity Offset Strategy (Whitehaven, 2015) cover approximately 12,168 ha of land[4,5] (Appendix A), comprising:

- approximately 7,898.1 ha of Existing Woodland/Forest;
- approximately 2,306.2 ha Derived Native Grassland; and
- approximately 1,964.6 Low Diversity Native Grassland/Pasture Improved and Cultivated Land.

Appendix A provides a reconciliation of Condition 44 of Schedule 3 to PA 10_0138 against the revised and approved NSW Biodiversity Offset Strategy (Whitehaven, 2015).

The Commonwealth offset areas subject to Approval Decision EPBC 2010/5566 described in the table below and on Figure 4.

Table 5-1
Summary of Biodiversity Offset Strategy Properties

Property Name	Within the Revised NSW Biodiversity Offset Strategy	Within the Commonwealth Biodiversity Offset Strategy
Eastern and Western Offset		
Cattle Plain	No	Yes
Teston (north)	Yes	Yes
Tralee	Yes	Yes
Wollandilly	Yes	Yes
Warriahdool	Yes	Yes
Kelso	Yes	Yes
Louenville	Yes	Yes
Olivedeen	Yes	Yes
Teston (south)	Yes	Yes

[4] Based on Vegetation Mapping by Greenloaning Biostudies (2014b).

[5] As well as a total of 2,078 ha (less the area of the minimised void) of pre-mining native vegetation communities to be re-established on the post-mine landforms (544 ha of Box Gum Woodland EEC) for a biodiversity conservation land use objective (i.e. long-term security)

Table 5-1 (Continued)
Summary of Biodiversity Offset Strategy Properties

Property Name	Within the Revised NSW Biodiversity Offset Strategy	Within the Commonwealth Biodiversity Offset Strategy
Velyama	Yes	Yes
Oakleigh/Onavale	Yes	Proposed
*Shared Property	Yes	Yes
Southern Offset		
Roseglass	Yes	Proposed
Bimbooria	Yes	Proposed
Northern Offset		
Mt Lindesay	Yes	Yes
Wirradale	Yes	Yes
Wongala	Yes	Proposed

* MCC owns the Shared Offset Property under a joint venture ownership with Idemitsu Australia. A small proportion of this land will be utilised by MCC and Boggabri Coal for the proposed rail spur, of which the southern-most section will extend into this shared property. The remainder of the land will be contributed to offset land. MCC intends to dedicate its 50% of the property to the offset strategy and will contribute to the management of the area accordingly.

The offset area on the Teston (South) Property is immediately west of the MCCM and the management of this offset area will be integrated with the overall rehabilitation of the MCCM (as per Condition 52(b) of Schedule 3 to PA 10_0138).

5.2 LAND USE HISTORY

The Eastern and Western Offset properties were farming properties that occur mostly within the fertile Namoi valley floor (Figure 3). Parts of the Western Offset properties occur on the Namoi River floodplain. The properties were used for dryland cropping in combination with livestock grazing. As such, these properties have been cleared extensively in the past for agriculture.

The Bimbooria Property in the Southern Offset Area was partly cleared and modified for agriculture, but retains extensive areas of woodland, including Box-Gum Woodland EEC/CEEC. The Bimbooria Property was used in part for cropping as the lower areas have moderately fertile soils.

The Northern Offset is currently being used to graze Dorpa sheep and cattle. Historically, much of the forests and woodland on the Mt Lindesay and Wirradale properties would have been cleared. However, the properties are now well vegetated with mature regenerated forest and woodland but still contain some open grassland areas for pasture. The Northern Offset is currently grazed on occasion or is subject to low intensity but frequent grazing. As such, much of the grassland areas are dominated by native grass species and a high diversity of native forbs and graminoid species.

5.3 VEGETATION COMMUNITIES

In July 2014, Greenloaning Biostudies (independent reviewer approved by DotE) produced vegetation mapping for the Maules Creek offset areas as part of, and following, the independent review of the offset areas (Greenloaning Biostudies, 2013 and 2014a). The vegetation communities are listed in Table 5-2 and shown on Figures 8a to 8d. Vegetation descriptions and methods used by Greenloaning Biostudies (2015) are provided in Appendix E.

Table 5-2
Vegetation Communities

Vegetation Community		Offset Areas				
No.	Title	Eastern	Western	Southern	Northern	Shared
Forest And Woodland Communities						
2	Belah Woodland	✓	✓			
3	Bimble Box ± White Cypress Pine Grassy Woodland	✓				
4*	Blakely's Red Gum - White Box ± Yellow Box Melaleuca Riparian Forest	✓				
5*	Blakely's Red Gum - Yellow Box Grassy Woodland (± Stringybark)				✓	
7	Bracteate Honeymyrtle Low Riparian Forest - Semi-cleared (Regenerating)	✓		✓		
14	Dwyer's Red Gum - Ironbark Woodland	✓	✓			✓
16	Melaleuca Riparian Forest	✓				
19	Narrow-leaved Ironbark - White Cypress Pine Woodland (Semi-cleared)			✓		
20	Narrow-leaved Ironbark ± White/Black Cypress Pine Grassy Open Forest/Woodland	✓		✓		
23	Narrow-leaved Ironbark - White Cypress Pine Shrubby Open Forest		✓	✓	✓	
25	Pilliga Box - Poplar Box - White Cypress Pine Grassy Open Woodland	✓	✓			
27	River Red Gum Riparian Woodlands and Forests	✓	✓			
28*	Rough-barked Apple - Blakely's Red Gum Riparian Grassy Woodland				✓	
29	Semi-evergreen Vine Thicket		✓	✓		
30	Silver-leaved Ironbark Woodland			✓		✓
31	Silvertop Stringybark – Apple Box ± Shrubby Woodland/Open Forest				✓	
32	Silvertop Stringybark - Apple Box ± Manna Gum Grassy Woodland/Open Forest				✓	
33	Stringybark - Blakely's Red Gum - Yellow Box Shrubby Open Forest				✓	
34	Stringybark - Rough-barked Apple - Cypress Pine Grassy/Shrubby Open Forest				✓	
36	Tumbledown Red Gum ± Narrow-leaved Ironbark Woodland			✓		
37	Weeping Myall Grassy Open Woodland		✓			

Table 5-2 (Continued)
Vegetation Communities

Vegetation Community		Offset Areas				
No.	Title	Eastern	Western	Southern	Northern	Shared
Forest And Woodland Communities (Continued)						
38*	White Box ± Yellow Box ± Stringybark Grassy Woodland				✓	
39*	White Box (± Stringybark) Grassy Woodland				✓	
40	White Box - Stringybark Shrubby Woodland/ Open Forest				✓	
41	White Box - Tumbledown Gum (semi-cleared/on creek lines)			✓		
42*	White Box - White Cypress Pine ± Narrow-leaved Ironbark Grassy Open Forest		✓			
43*	White Box - White Cypress Pine ± Narrow-leaved Ironbark Grassy Woodland	✓	✓	✓	✓	✓
44*	White Box - White Cypress Pine ± Narrow-leaved Ironbark Grassy Woodland (semi-cleared)			✓		
45	White Box - White Cypress Pine ± Narrow-leaved Ironbark Shrubby Open Forest	✓	✓	✓	✓	✓
47*	White Box - Wilga - Belah Woodland		✓			
48*	White Box – Wilga ± Quinine semi-cleared Woodland			✓		
49*	White Box - Stringybark - ± Manna Gum Grassy Woodland				✓	
50	White Box Grassy Woodland (Low Condition)	✓				
51*	Yellow Box - Blakely's Red Gum ± Manna Gum Open Forest/ Woodland				✓	
52*	Yellow Box ± White Cypress Pine Grassy Woodland	✓				
Shrubland Communities						
1	Belah - Wilga - Rosewood Derived Budda Shrubland			✓		
9	Cypress Pine Low Forest/Shrubland (regenerating)	✓		✓	✓	✓
17	Metasediment Rock Outcrop Shrubland			✓		
18	Motherumbah - Narrow-leaved Ironbark Forest/Semi-cleared Low Woodland/Shrubland			✓		
22	Narrow-leaved Ironbark + White/Black Cypress Open Forest Regenerating (Shrubland)	Potential	Potential	✓		
35	Tea-tree in Drainage Lines				✓	
46	White Box - White Cypress Pine Derived Shrubland			✓		
Grassland Communities						
6	Bracteate Honeymyrtle Low Riparian Forest – Derived Native Grassland			✓		
8	Cultivation	✓	✓			
10	Derived Native Grassland (Box-Gum Woodland with low diversity and not conforming to EEC/CEEC)	✓	✓	✓	✓	✓
11*	Derived Native Grassland (Box-Gum Woodland)	✓	✓	✓	✓	
12	Derived Native Grassland (Low Diversity)			✓		
13	Derived Native Grassland – Non-threatened	✓			✓	
15	Exotic/Improved Pasture		✓		✓	

Table 5-2 (Continued)
Vegetation Communities

Vegetation Community		Offset Areas				
No.	Title	Eastern	Western	Southern	Northern	Shared
Grassland Communities (Continued)						
21	Narrow-leaved Ironbark - White Cypress Pine ± Tumbledown Gum Derived Native Grassland			✓		
24	Narrow-leaved Ironbark Derived Native Grassland (Low diversity)		✓			
26	Poplar Box Derived Native Grassland (Low diversity)	✓	✓			

Source: Greenloaning Biostudies (2014b) and Appendix E

* Conforms to Box-Gum Woodland EEC/CEEC.

As verified by Greenloaning Biostudies (independent reviewer approved by DotE) (2013, 2014a), and in accordance with Condition 9 of the Approval Decision EPBC 2010/5566, the Commonwealth Biodiversity Offset Strategy provides for the long-term security of no less than 9,334 ha of equivalent or better quality of habitat for the Regent Honeyeater (*Xanthomyza phrygia*), Swift Parrot (*Lathamus discolor*) and the South-eastern Long-eared Bat (*Nyctophilus corbeni*) (previously Greater Long-eared Bat). Most of the vegetation communities listed in Table 5-2 and mapped on Figures 8a to 8d represent habitat for these species.

5.4 BOX-GUM WOODLAND AND DERIVED GRASSLAND

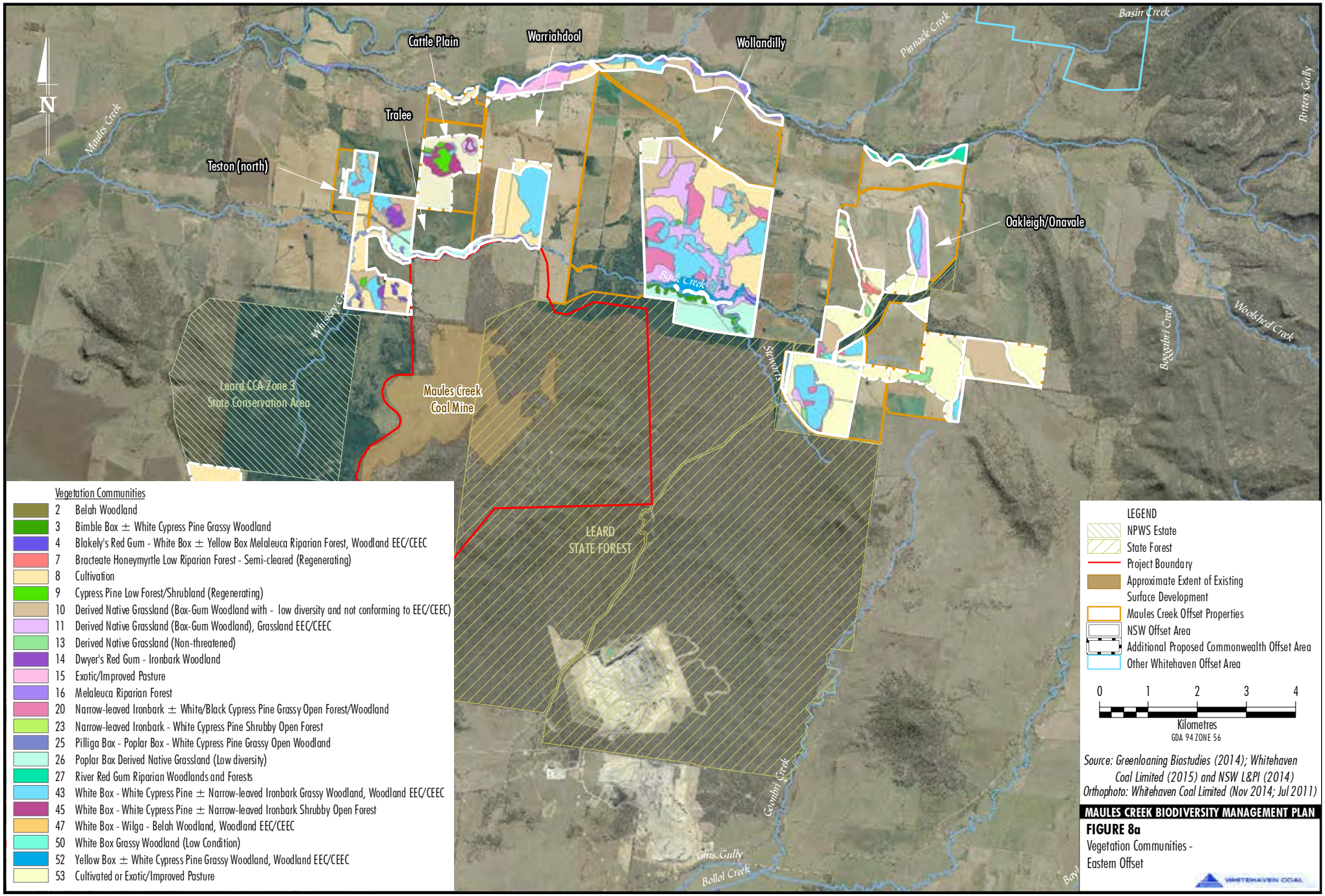
As described in Section 5.3, Greenloaning Biostudies (independent reviewer approved by DotE) has produced vegetation mapping for the Maules Creek offset areas as part of, and following, the independent review of the offset areas (Greenloaning Biostudies, 2013 and 2014a).

Methods by Greenloaning Biostudies (2013 and 2014a) included review of key definitions and criteria for the Box-Gum Woodland, field data collection (20m x 50m plots), data analysis and GIS mapping. The mapping of Box-Gum Woodland EEC/CEEC was undertaken by Greenloaning Biostudies (2013 and 2014a) in a manner consistent with the State and Transition Model described by Rawlings *et al.* (2010). The Box-Gum Woodland in the offset area varies in condition class (Table 5-3). Box-Gum Woodland EEC/CEEC is represented by Box-Gum Woodland in Condition State 1 and 2 (Table 5-3; Figures 6 and 9a to 9d).

Table 5-3
Box-Gum Woodland and Derived Grassland Condition State

Condition Class - State and Transition Model[1]	Description
State 1	Box-Gum Woodland EEC/CEEC – Woodland Form (Figures 6 and 9a to 9d)
State 2	Box-Gum Woodland EEC/CEEC – Derived Native Grassland Form (Figures 6 and 9a to 9d)
State 3	Derived Native Grassland (Box-Gum Woodland with low diversity and not conforming to EEC/CEEC) (Figures 8a to 8d)
State 4	Some cultivated land was once Box-Gum Woodland EEC/CEEC

[1] Rawlings *et al.* (2010).

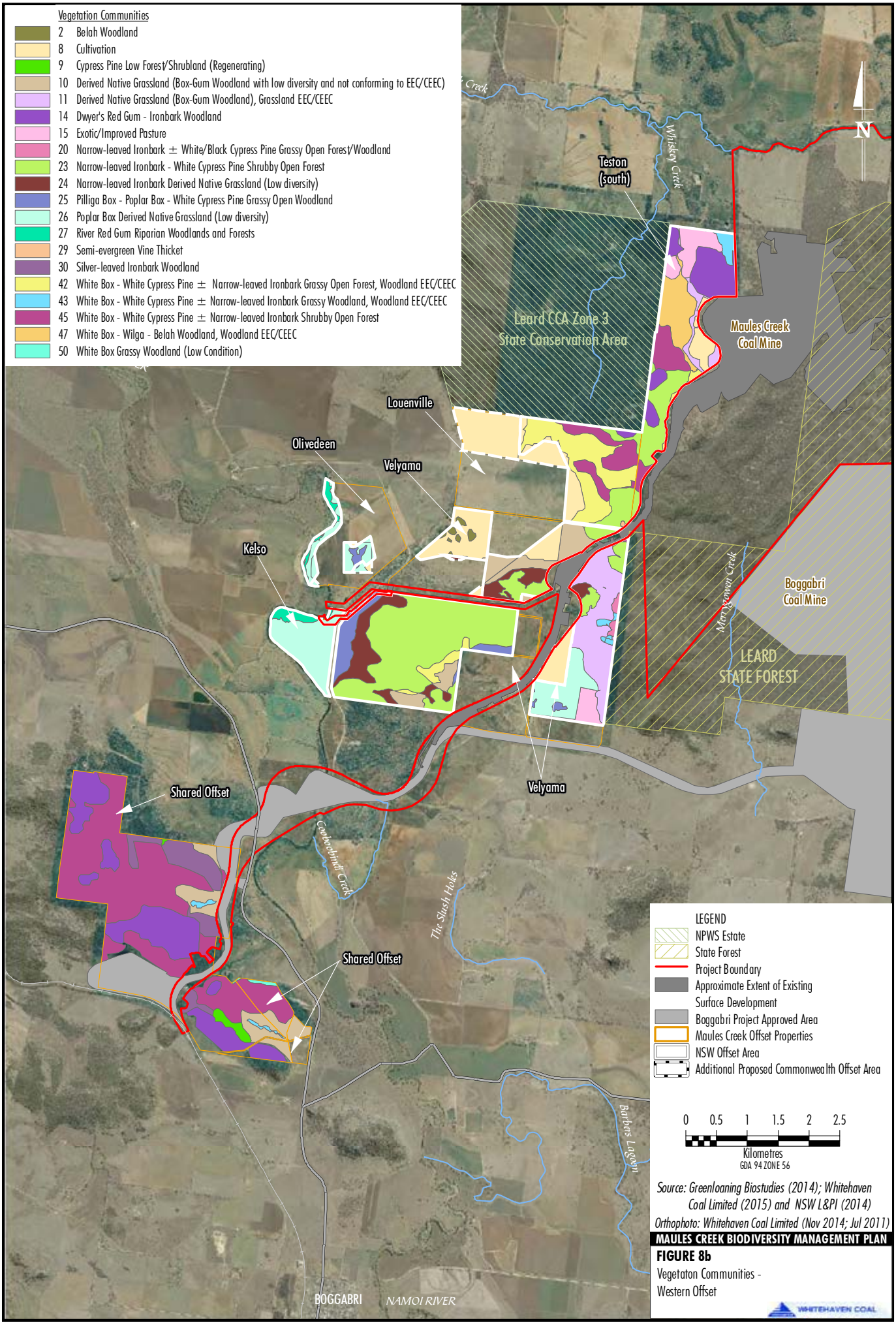


Source: Greenloaning Biostudies (2014); Whitehaven Coal Limited (2015) and NSW L&PI (2014)
Orthophoto: Whitehaven Coal Limited (Nov 2014; Jul 2011)

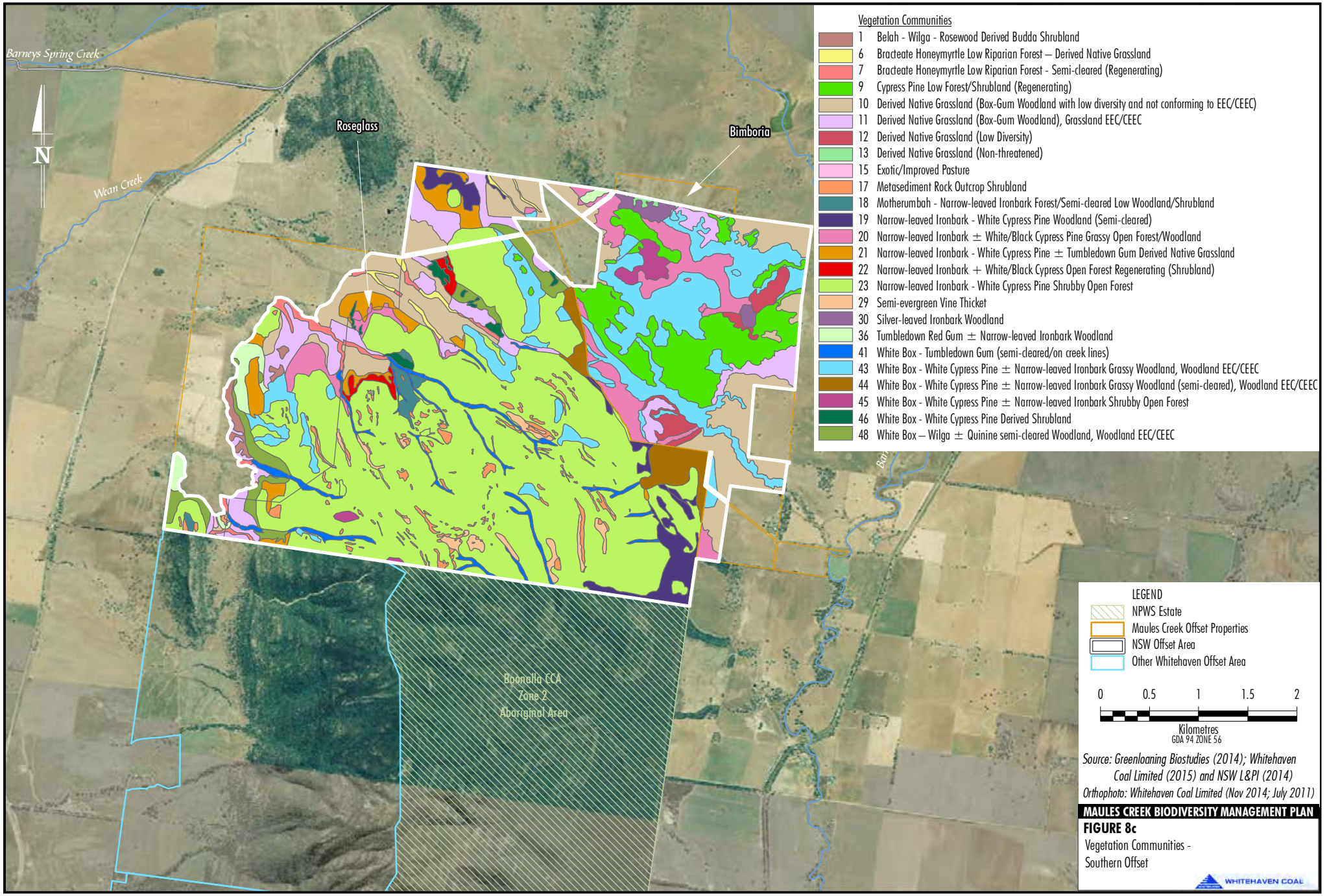
MAULES CREEK BIODIVERSITY MANAGEMENT PLAN

FIGURE 8a
Vegetation Communities - Eastern Offset

WHC-14-22 RBMP_2131



WHC-14-22 RBMP_214G



Source: Greenloaning Biostudies (2014); Whitehaven Coal Limited (2015) and NSW L&PI (2014)

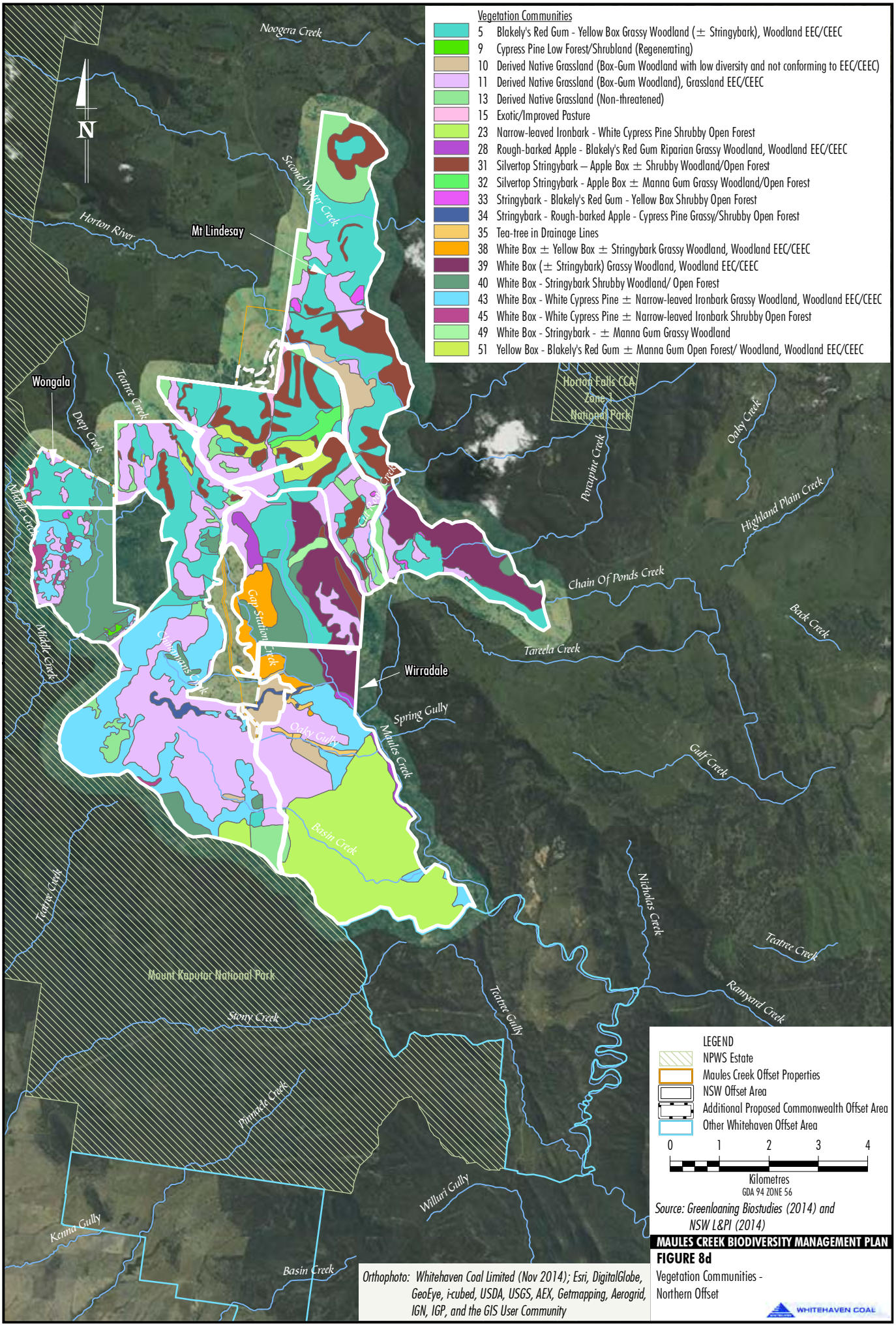
Orthophoto: Whitehaven Coal Limited (Nov 2014; July 2011)

MAULES CREEK BIODIVERSITY MANAGEMENT PLAN

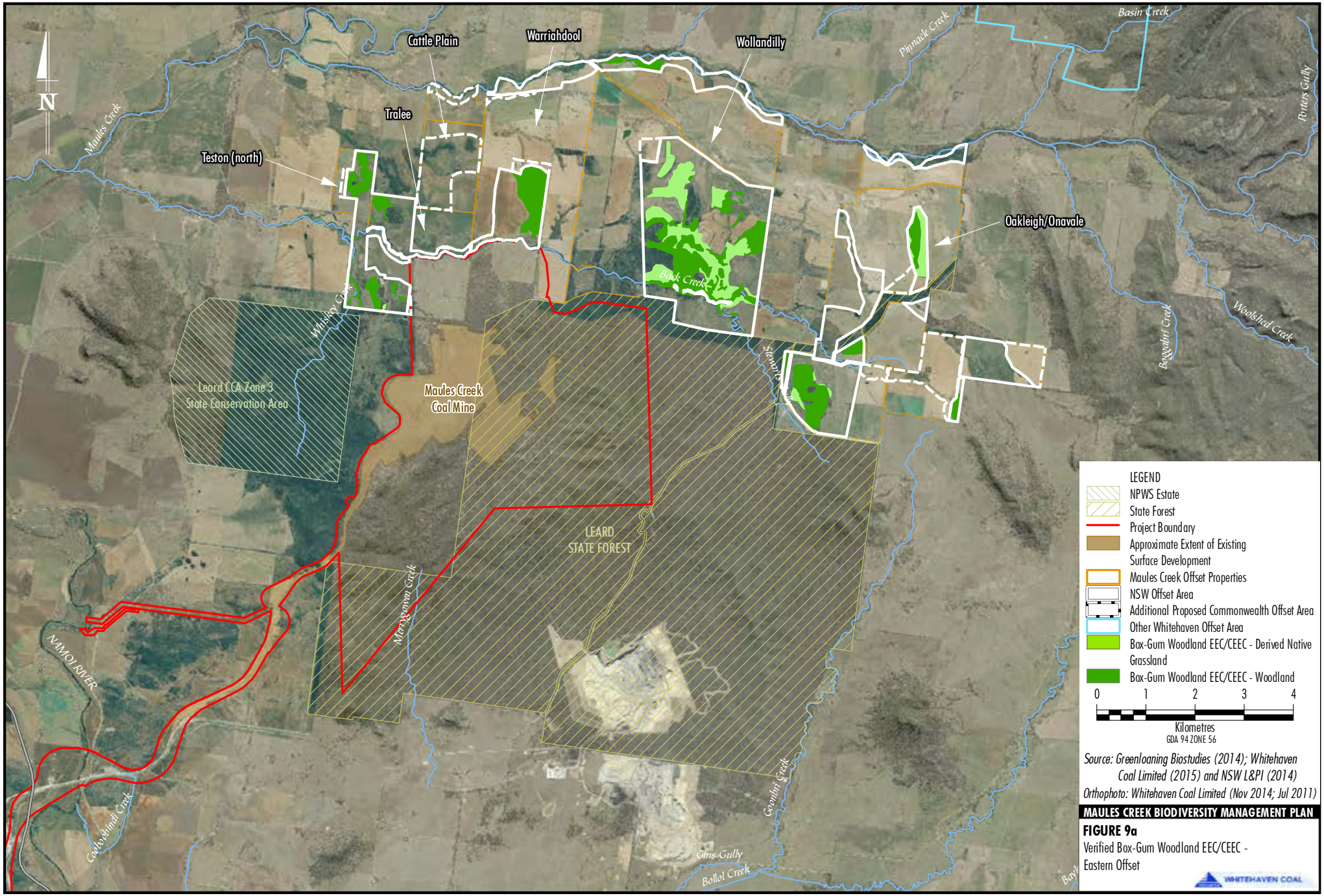
FIGURE 8c

Vegetation Communities - Southern Offset

WHITEHAVEN COAL



WHC-14-22 RBMP_216E



Source: Greenloaning Biostudies (2014); Whitehaven Coal Limited (2015) and NSW L&PI (2014)

Orthophoto: Whitehaven Coal Limited (Nov 2014; Jul 2011)

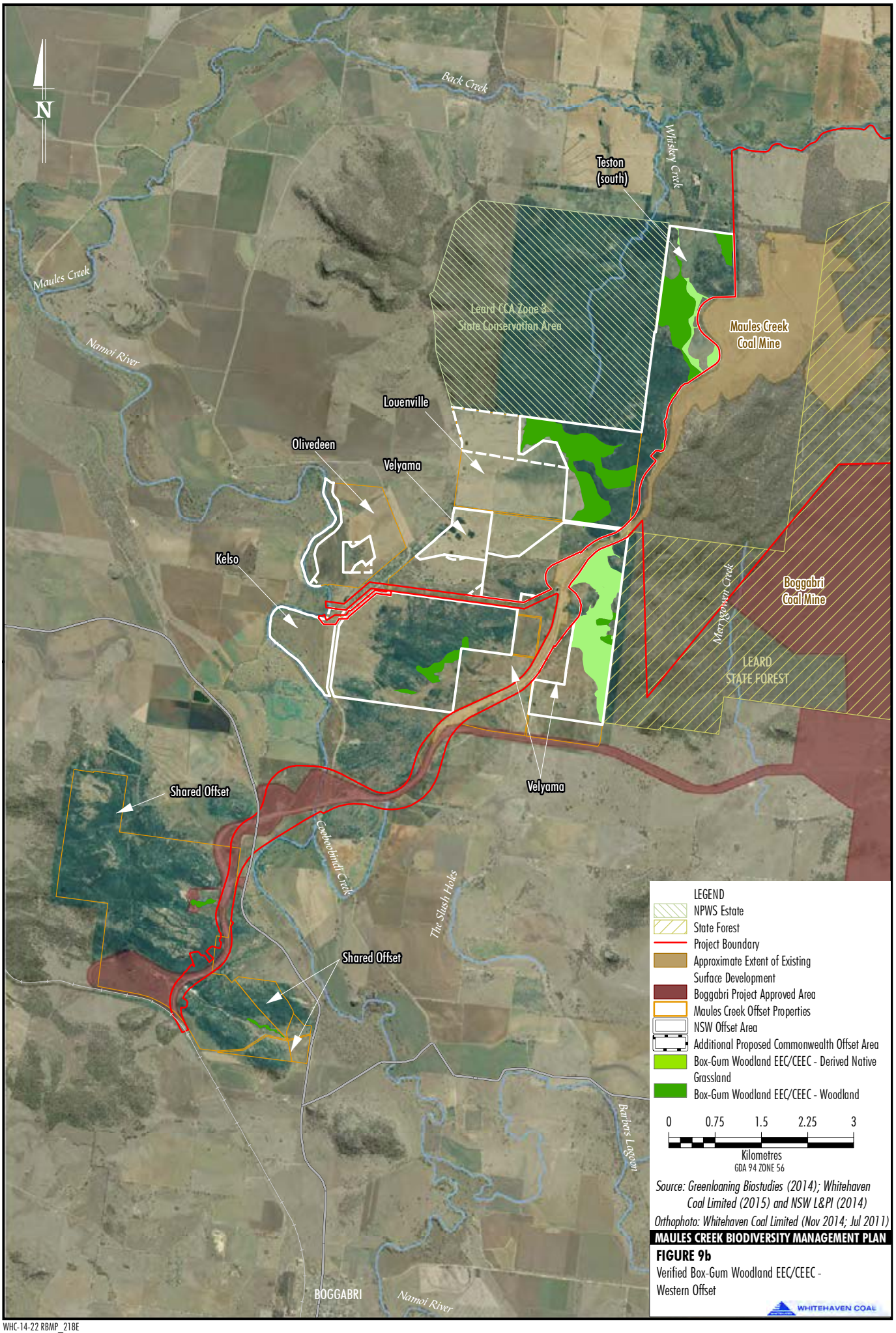
MAULES CREEK BIODIVERSITY MANAGEMENT PLAN

FIGURE 9a

Verified Box-Gum Woodland EEC/CEEC - Eastern Offset

WHITEHAVEN COAL

WHC-14-22 RBMP_217F



Source: Greenloaning Biostudies (2014); Whitehaven Coal Limited (2015) and NSW L&PI (2014)

Orthophoto: Whitehaven Coal Limited (Nov 2014; Jul 2011)

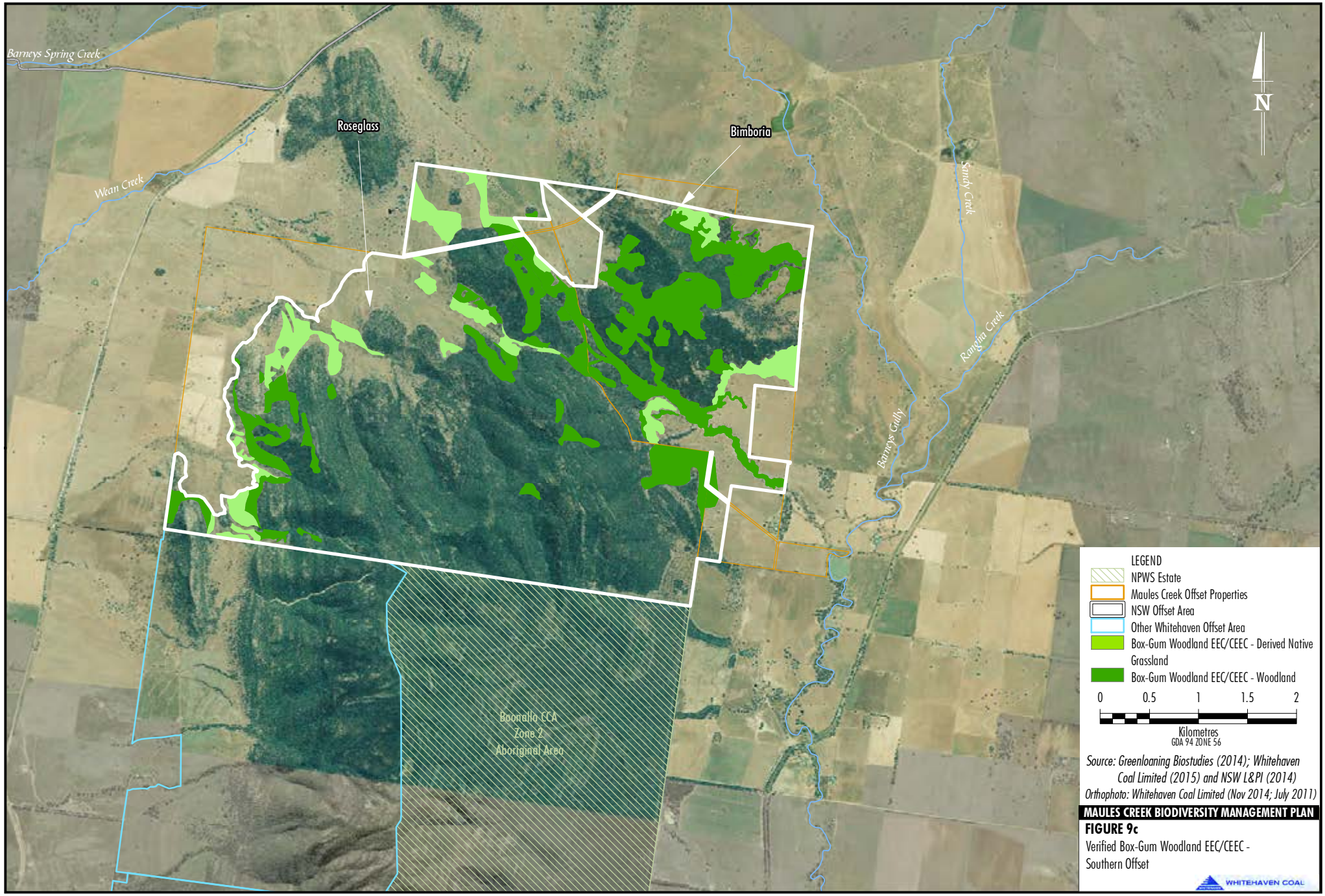
MAULES CREEK BIODIVERSITY MANAGEMENT PLAN

FIGURE 9b

Verified Box-Gum Woodland EEC/CEEC - Western Offset

WHITEHAVEN COAL

WHC-14-22 RBMP_218E



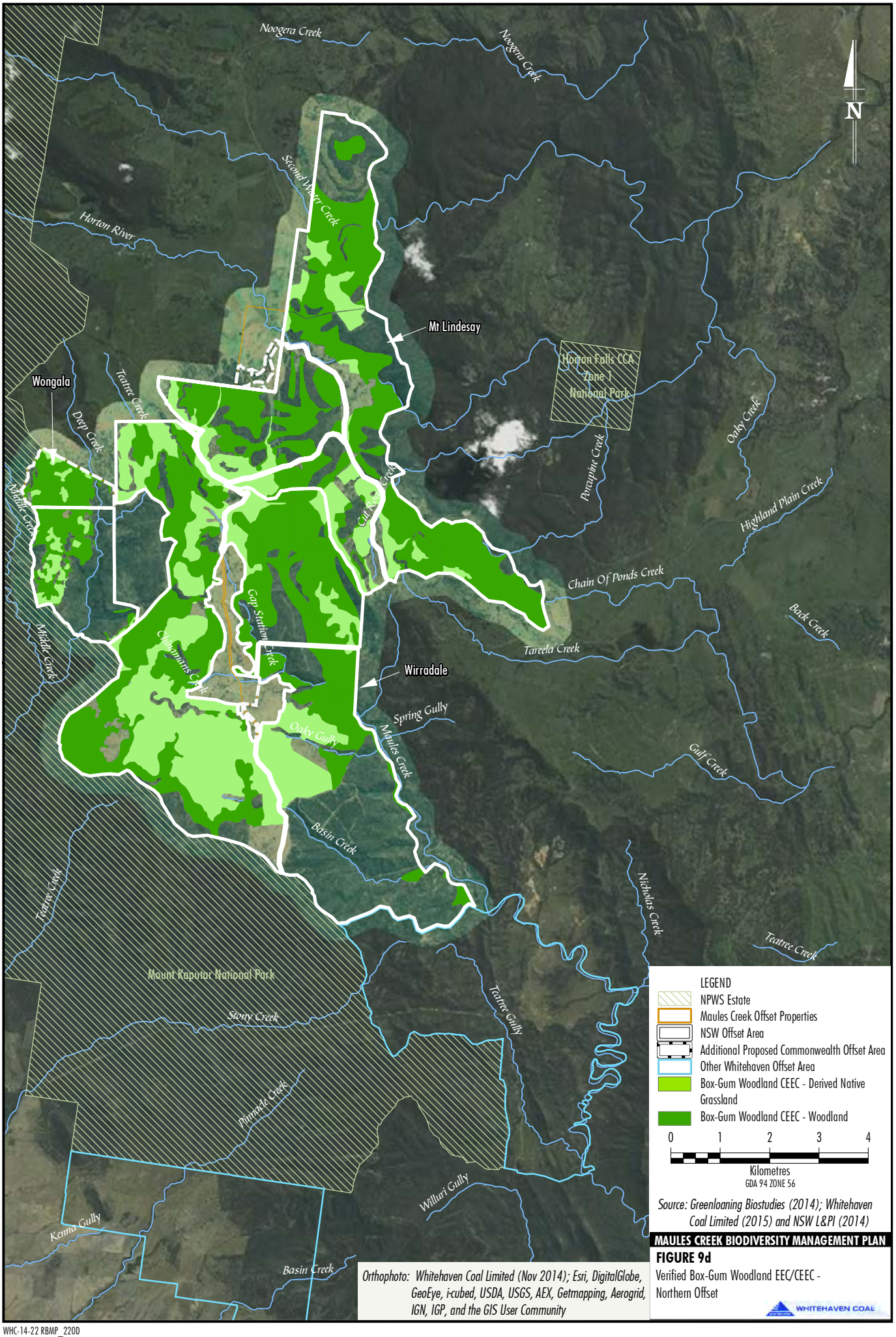
Source: Greenloaning Biostudies (2014); Whitehaven Coal Limited (2015) and NSW L&PI (2014)
Orthophoto: Whitehaven Coal Limited (Nov 2014; July 2011)

MAULES CREEK BIODIVERSITY MANAGEMENT PLAN

FIGURE 9c

Verified Box-Gum Woodland EEC/CEEC - Southern Offset

WHITEHAVEN COAL



MAULES CREEK BIODIVERSITY MANAGEMENT PLAN

FIGURE 9d

Verified Box-Gum Woodland EEC/CEEC - Northern Offset

WHITEHAVEN COAL

WHC-14-22 RBMP_220D

Box-Gum Woodland is represented by the following vegetation communities in the offset areas with differing structure and floristics (Greenloaning Biostudies, 2013 and 2014a):

- Blakely's Red Gum - White Box - ± Yellow Box - Melaleuca Riparian Forest;
- Blakely's Red Gum - Yellow Box Grassy Woodland (± Stringybark);
- Rough-Barked Apple - Blakely's Red Gum Riparian Grassy Woodland;
- White box - Stringybark - ± Manna Gum Grassy Woodland;
- White Box - ± Yellow Box ± Stringybark Grassy Woodland;
- White Box - White Cypress Pine ± Narrow-Leaved Ironbark Grassy Open Forest;
- White Box - White Cypress Pine ± Narrow-Leaved Ironbark Grassy Woodland;
- White Box - Wilga - Belah Woodland;
- White Box - Wilga ± Quinine Semi-Cleared Woodland;
- White Box (± Stringybark) Grassy Woodland;
- Yellow Box - Blakely's Red Gum - ± Manna Gum Open Forest/ Woodland; and
- Yellow Box ± White Cypress Pine Grassy Woodland.

The extent of the vegetation communities is shown on Figures 8a to 8d. A lower condition variant of White Box - White Cypress Pine ± Narrow-Leaved Ironbark Grassy Woodland which still represents Box-Gum Woodland EEC/CEEC was identified separately (i.e. White Box - White Cypress Pine ± Narrow-Leaved Ironbark Grassy Woodland [semi-cleared]) (Greenloaning Biostudies, 2013 and 2014a). Vegetation descriptions by Greenloaning Biostudies are provided in Appendix E.

Greenloaning Biostudies collected information on advanced tree regeneration in derived native grassland (moderate to good condition) (Box-Gum Woodland) according to tree age class representation in June 2014.

5.5 HABITAT/FEATURES

Regional Setting

The Northern Offset Properties (Mt Lindsey, Wirradale and Wongala) and the Southern Offset Properties (Roseglass and Bimbooria) are within recognised priority areas for climate change corridors and recognised key fauna habitats (Department of Environment and Climate Change [DECC], 2007).

State Forests and Protected Areas

Table 5-4 provides a summary of the State Forests and Protected Areas adjacent to the offset areas.

Table 5-4
State Forests and Protected Areas

State Forest or Protected Area	Relevance
Leard State Forest	Parts of the Eastern Offset Area and Western Offset Area are adjacent to Leard State Forest to the east, north and west (Figure 4).
Leard State Conservation Area	Parts of the Western Offset Area are adjacent to Leard State Conservation Area (Figure 4).
Mount Kaputar National Park	The Northern Offset Area is adjacent to Mount Kaputar National Park (Figure 4).
Boonalla CCA Zone 2 Aboriginal Area	The Southern Offset Area is adjacent to Boonalla CCA Zone 2 Aboriginal Area and an existing Whitehaven Offset Area (Figure 4).
Other Offset Areas	The Southern Offset Area is adjacent to an existing Whitehaven Offset Area and parts of the Western Offset Area are adjacent to offset areas held by Boggabri Coal Pty Ltd (Figure 4).

Broad Habitats

The offset areas contain large areas of existing native woodland, forest, shrublands and grasslands. Vegetation communities in offset areas are described in Sections 5.3 and 5.4.

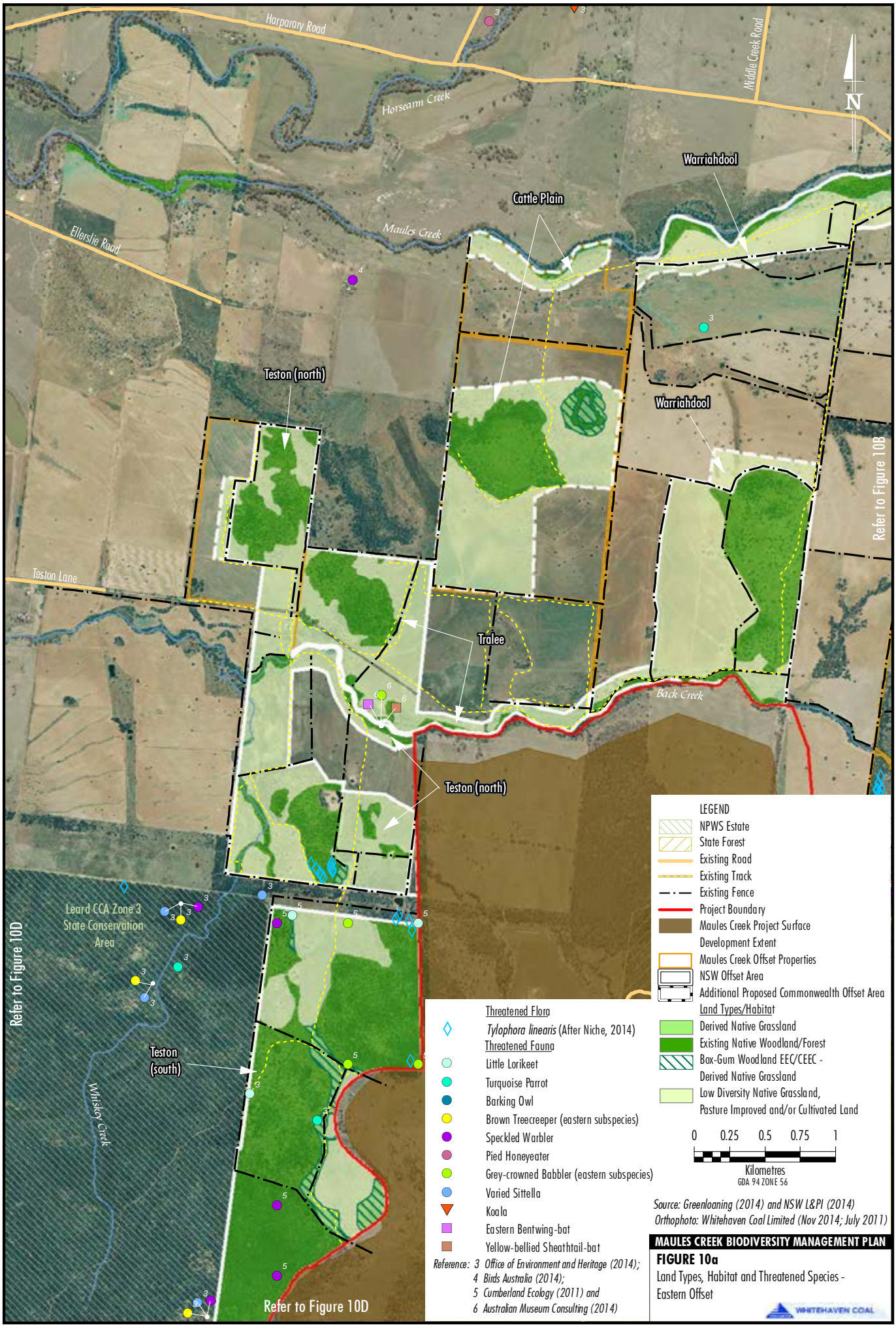
Land types/habitats in the offset areas are shown on Figures 10a to 10g. These land types/habitats those referenced in Condition 44 of Schedule 3 to PA 10_0138, namely:

- Existing Native Woodland/Forest (including Belah Woodland);
- Derived Native Grassland (moderate to good condition) (including Derived Native Grassland of Box-Gum Woodland EEC/CEEC); and
- Low Diversity Native Grassland, Pasture Improved and/or Cultivated Land.

The land types/habitat mapping is based on the vegetation mapping by Greenloaning Biostudies (2014b).

Hollow-Bearing Trees

Hollow-bearing trees are recorded in most areas of the offset areas, and predominantly within White Box trees (Australia Museum Consulting; 2014). Various threatened birds and mammals that use hollow-bearing trees have been recorded in the offset areas (e.g. parrots, owls, the Squirrel Glider, hollow-dwelling bats) (Section 5.6).



Reference: 3 Office of Environment and Heritage (2014); 4 Birds Australia (2014); 5 Cumberland Ecology (2011) and 6 Australian Museum Consulting (2014)

Source: Greenloaning (2014) and NSW L&PI (2014)
Orthophoto: Whitehaven Coal Limited (Nov 2014; July 2011)

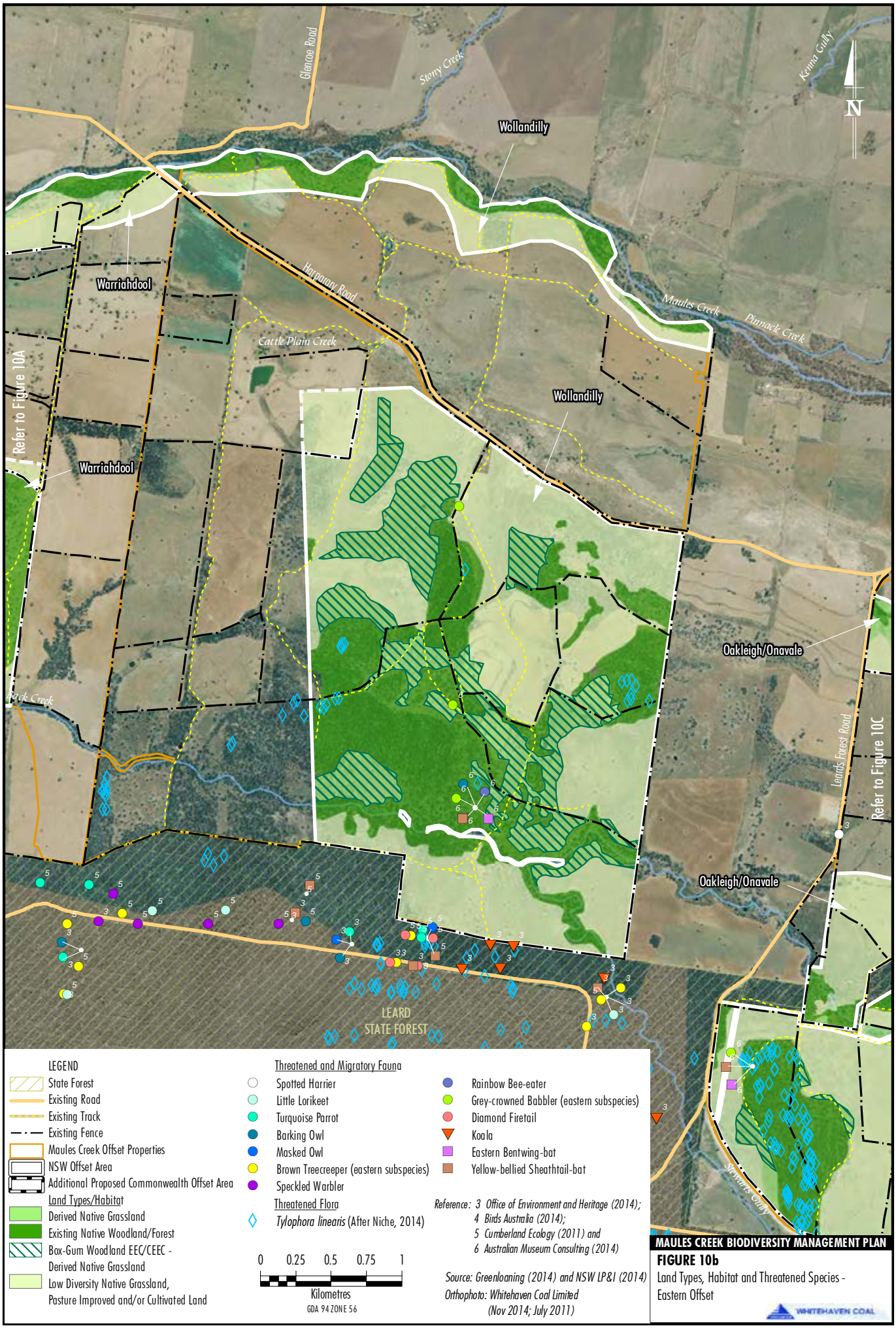
MAULES CREEK BIODIVERSITY MANAGEMENT PLAN

FIGURE 10a

Land Types, Habitat and Threatened Species - Eastern Offset

WHITEHAVEN COAL

WHC-14-22 RBMP_221E



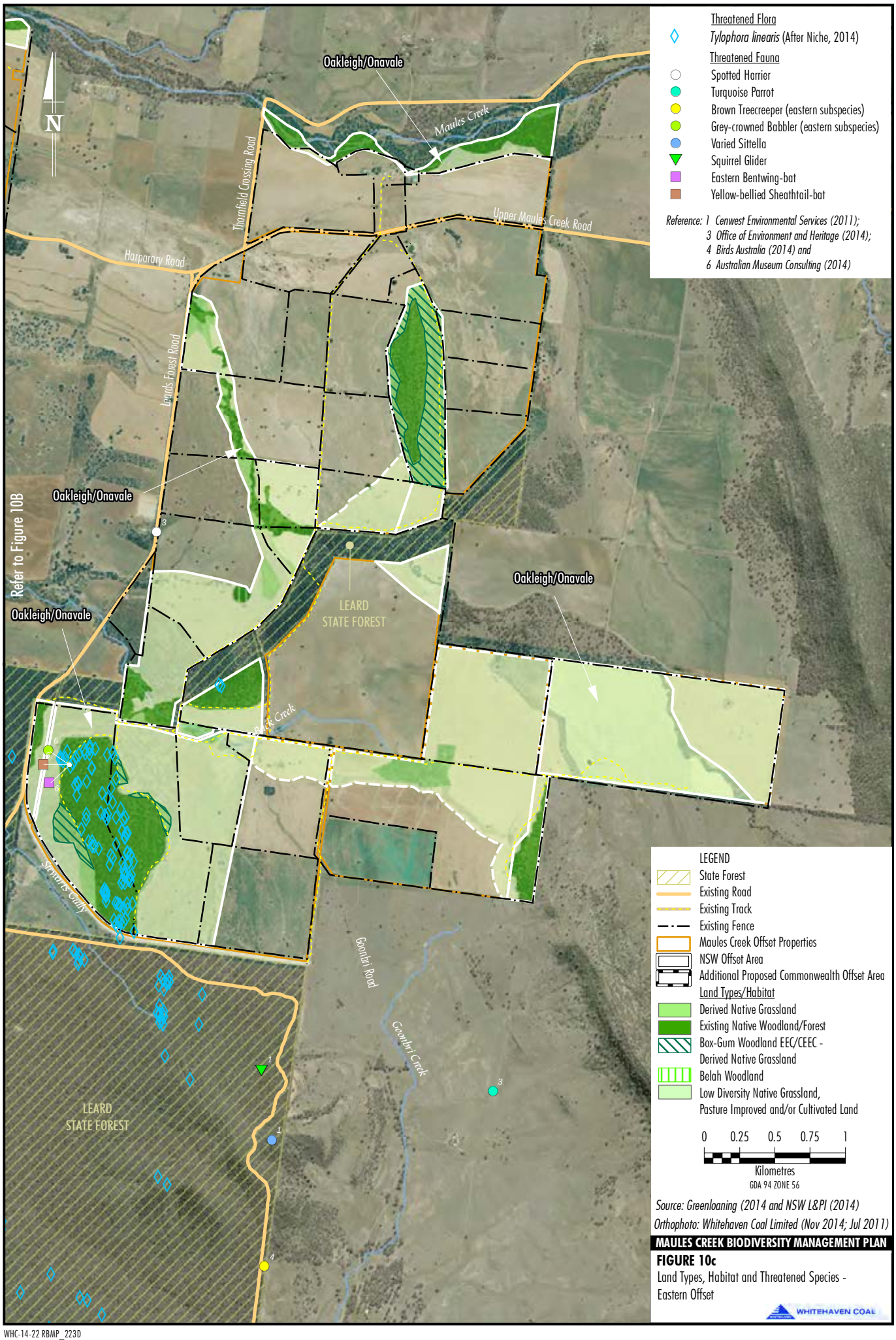
MAULES CREEK BIODIVERSITY MANAGEMENT PLAN

FIGURE 10b

Land Types, Habitat and Threatened Species - Eastern Offset

WHITEHAVEN COAL

WHC-14-22 RBMP_222E



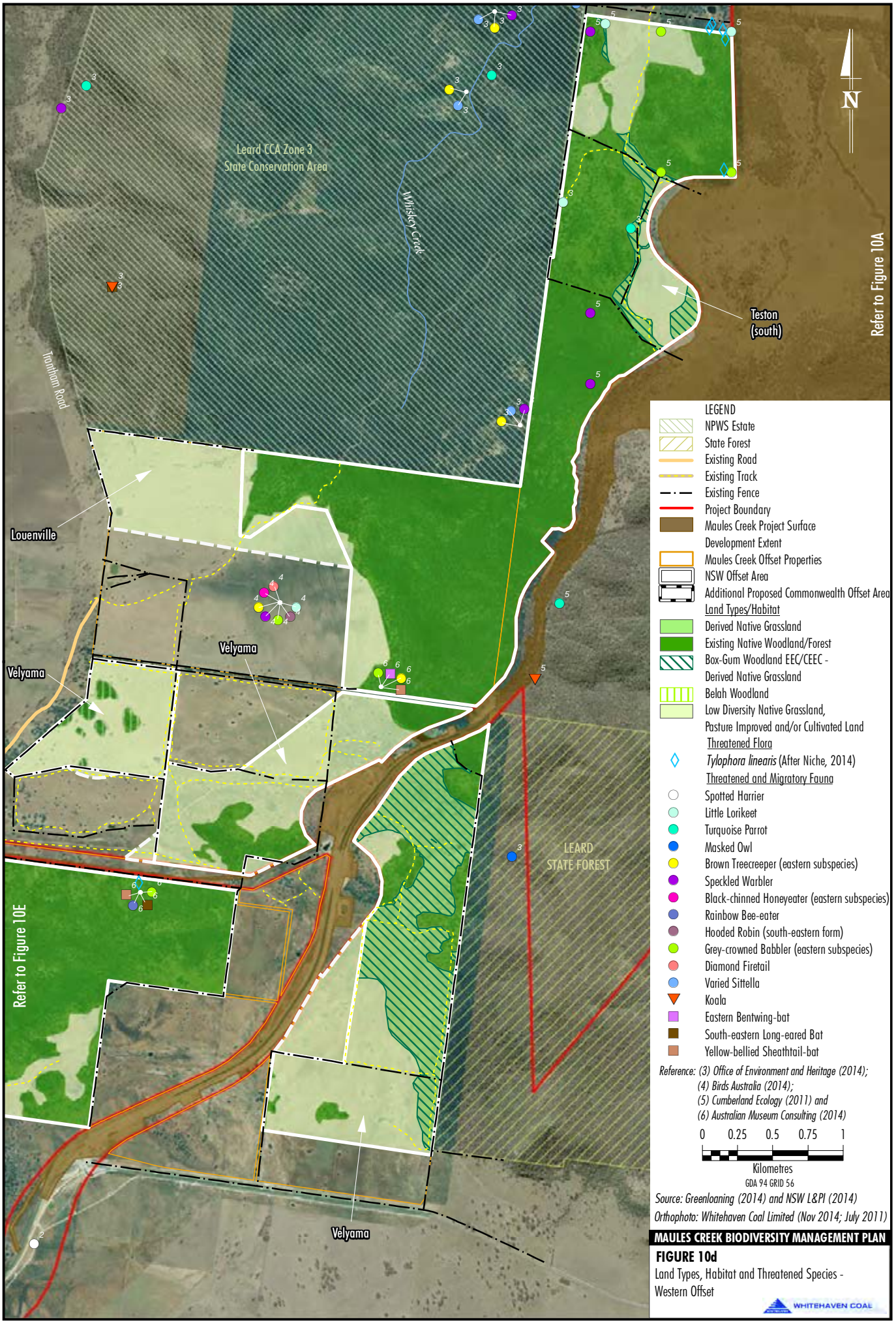
MAULES CREEK BIODIVERSITY MANAGEMENT PLAN

FIGURE 10c

Land Types, Habitat and Threatened Species - Eastern Offset

WHITEHAVEN COAL

WHC-14-22 RBMP_223D



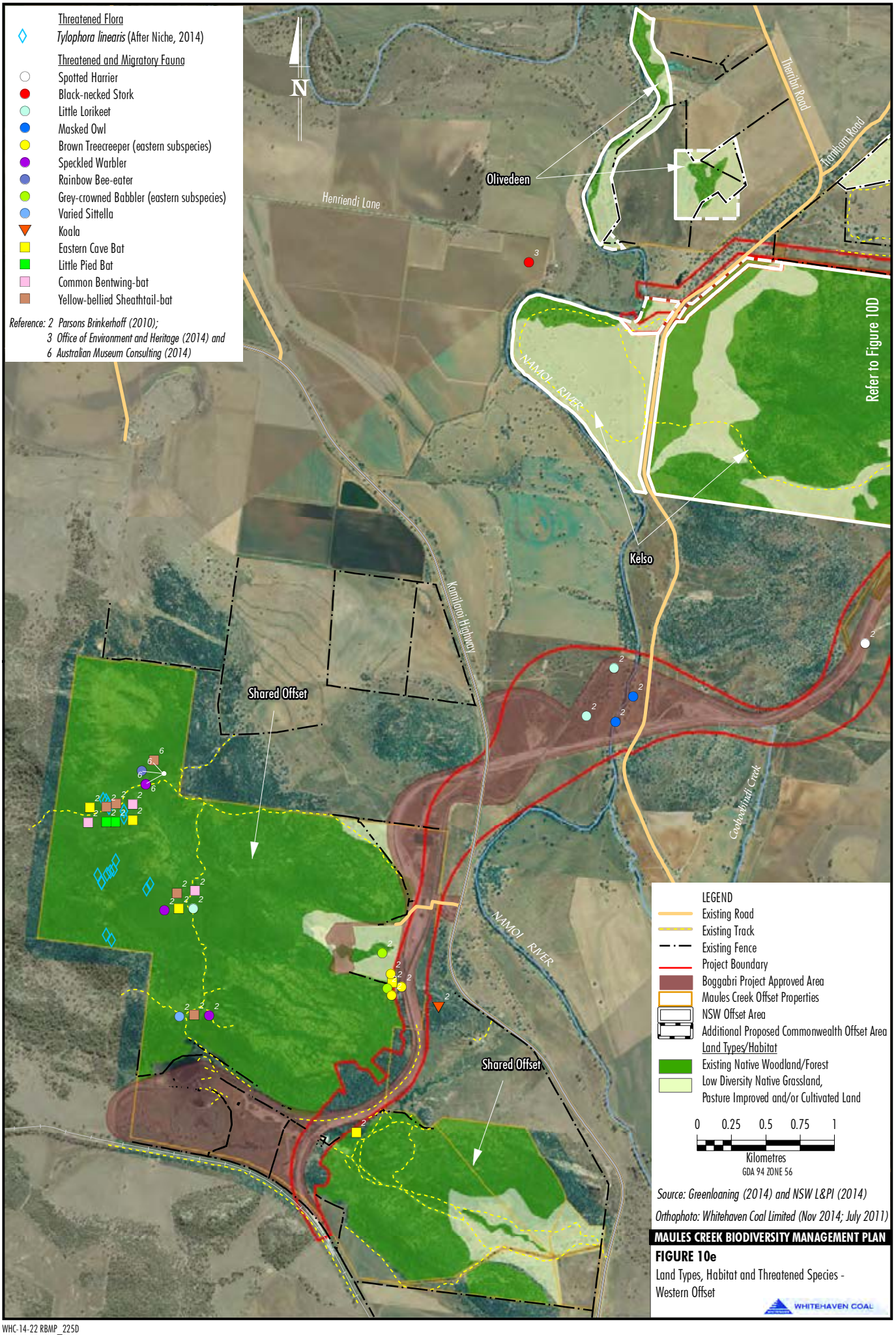
MAULES CREEK BIODIVERSITY MANAGEMENT PLAN

FIGURE 10d

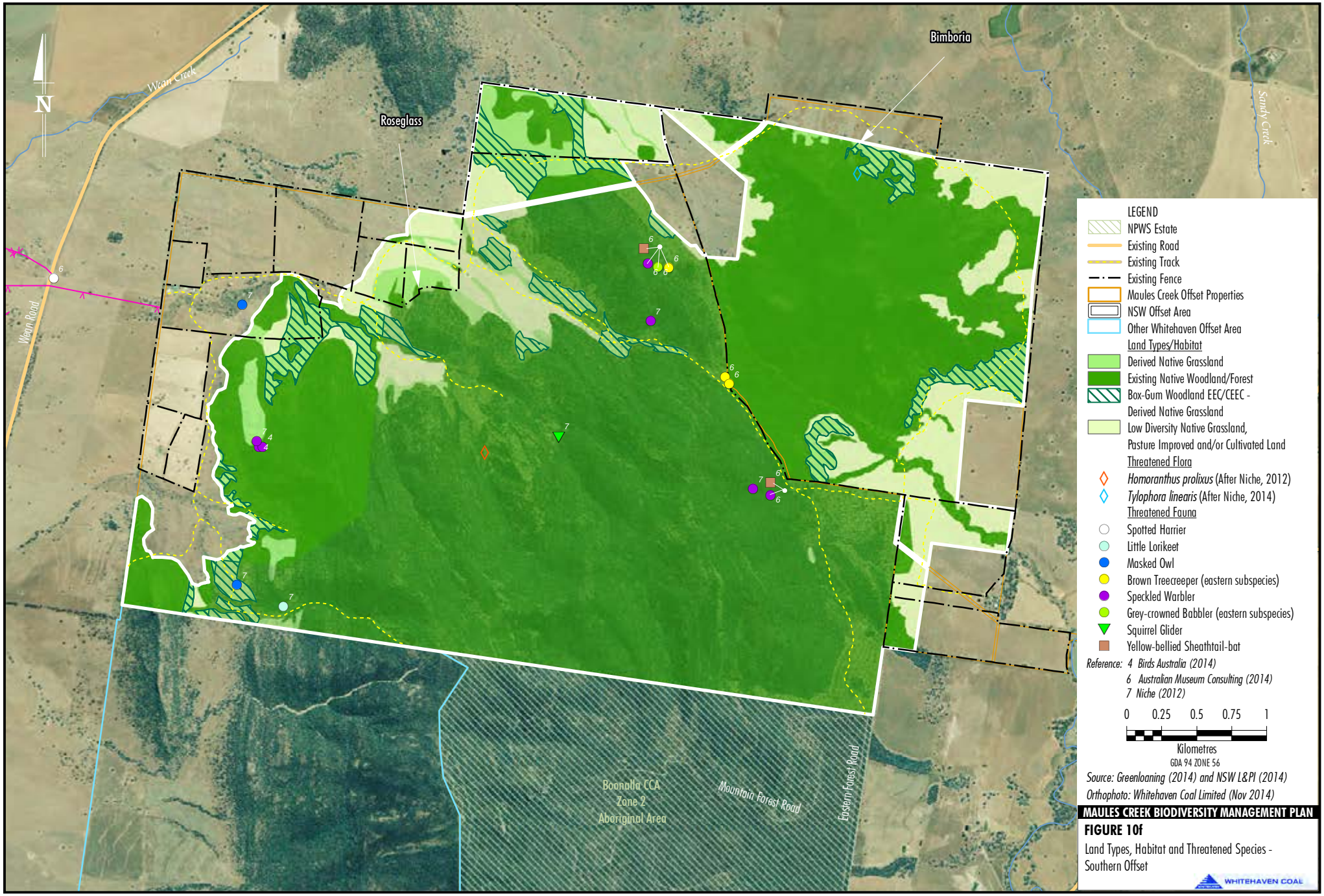
Land Types, Habitat and Threatened Species - Western Offset

WHITEHAVEN COAL

WHC-14-22 RBMP_224F



WHC-14-22 RBMP_225D



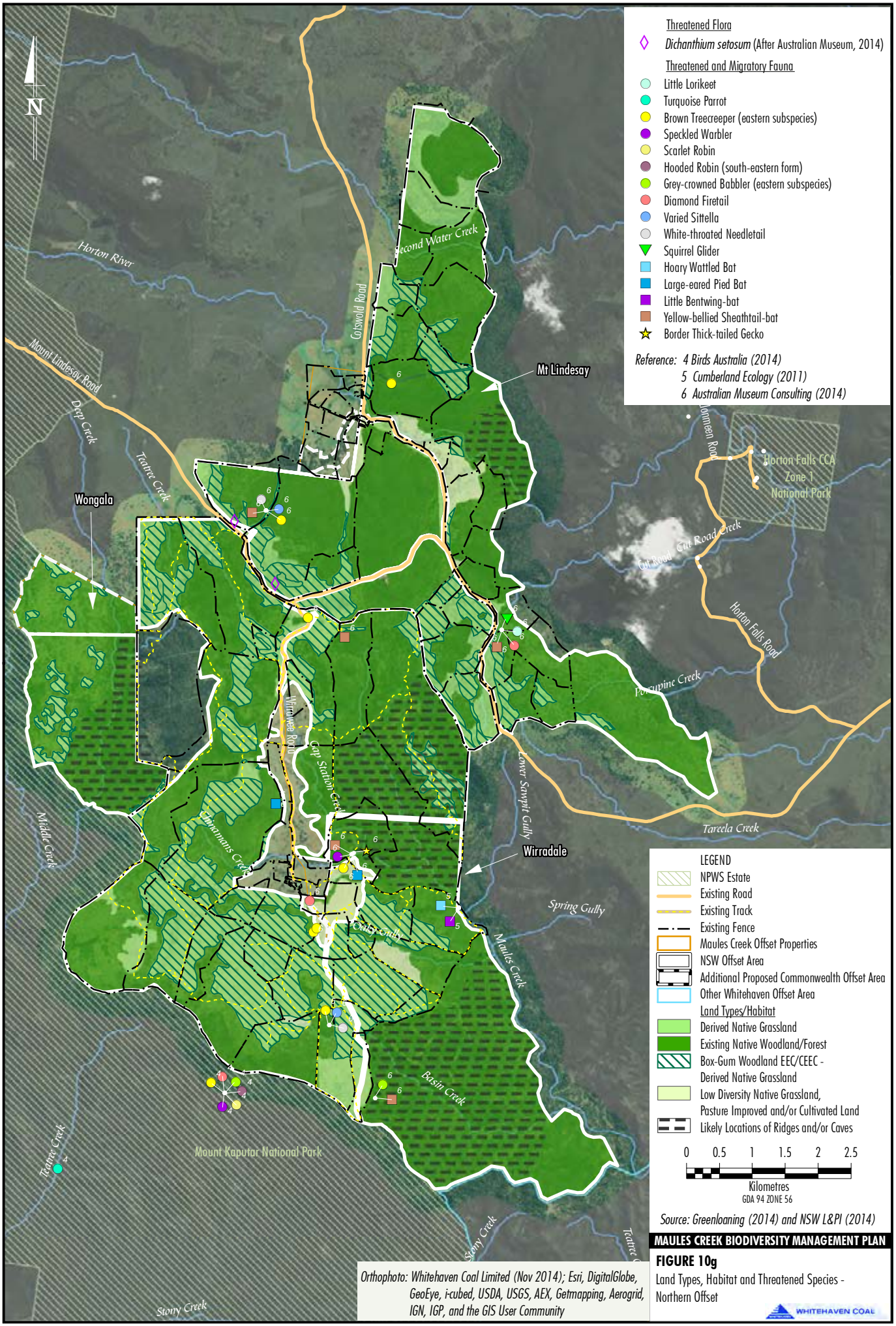
MAULES CREEK BIODIVERSITY MANAGEMENT PLAN

FIGURE 10f

Land Types, Habitat and Threatened Species - Southern Offset

WHITEHAVEN COAL

WHC-14-22 RBMP_226D



MAULES CREEK BIODIVERSITY MANAGEMENT PLAN

FIGURE 10g

Land Types, Habitat and Threatened Species - Northern Offset

WHITEHAVEN COAL

WHC-14-22 RBMP_227C

Groundcover

As described previously, the offset properties were previously used for agricultural purposes, mainly grazing livestock. Improvement in groundcover and diversity will be monitored as part of the Vegetation and Habitat Monitoring Program (Section 6.17.1).

Key Flora Species for Fauna

Key flora species for fauna are considered to be those that provide habitat resources for shelter, breeding and foraging.

Many of the threatened fauna species recorded in the offset areas (Section 5.6) use Box-Gum Woodland EEC/CEEC as habitat (Whitehaven, 2015a) (Figures 10a to 10g). Remnants of Box-Gum Woodland EEC/CEEC generally occur on fertile soils where resources such as water and nutrients are more abundant and as such they are often cleared for agriculture. Flora species associated with Box-Gum Woodland EEC/CEEC provide a good source of habitat resources for fauna (e.g. nectar, tree hollows).

River Red Gum (*Eucalyptus camaldulensis*) forests lining watercourses in the offset area (e.g. along the Namoi River) also provide highly productive habitat for a range of species (Figures 8a and 8b).

Creeks

Rivers, streams and creeks within or adjacent to the offset areas are listed in Table 5-5 and shown on Figures 10a to 10g.

Table 5-5
Rivers, Streams and Creeks within or Adjacent to the Offset Areas

Offset Area	Rivers, Streams and Creeks
Eastern	Maules Creek (Figures 10a-10c) – ephemeral creek (with permanent/semi-permanent pools around Elfin Crossing) Back Creek (Figures 10a-10c) – ephemeral creek Whiskey Creek (Figure 10a) – ephemeral creek Horsearm Creek (Figure 10a) – ephemeral creek Cattle Plain Creek (Figure 10b) – ephemeral creek
Western	Namoi River (Figure 10e) – permanent river

Table 5-5 (Continued)
Rivers, Streams and Creeks within or Adjacent to the Offset Areas

Offset Area	Rivers, Streams and Creeks
Northern	Second Water Creek (Figure 10g) – permanent stream
	Maules Creek (Figure 10g) – permanent stream
	Horton River (Figure 10g) – permanent stream
	Gap Station Creek (Figure 10g) – ephemeral creek
	Chinamans Creek (Figure 10g) – ephemeral creek
	Teatree Creek (Figure 10g) – ephemeral creek
	Deep Creek (Figure 10g) – ephemeral creek
	Cut Road Creek (Figure 10g) – ephemeral creek
	Oaky Gully (Figure 10g) – ephemeral creek
	Basin Creek (Figure 10g) – ephemeral creek
	Porcupine Creek (Figure 10g) – ephemeral creek
	Tareela Creek (Figure 10g) – ephemeral creek
	Stony Creek (Figure 10g) – ephemeral creek

Caves and Cliff Lines

The Northern Offset Area contains cliffs and rock outcrops that provide habitat for cave-dwelling animals, including bats. The indicative locations of caves are shown on Figure 10g.

5.6 THREATENED AND MIGRATORY SPECIES

Threatened and migratory species listed under the TSC Act and EPBC Act and/or their habitat that have been recorded in the offset areas are listed in Table 5-6 and shown on Figures 10a to 10g[6].

Australia Museum Consulting commenced the monitoring program in the offset areas in October and November (spring) 2014 and February 2015. The methods used are consistent with those outlined in Sections 6.17.1 and 6.17.2. The location of survey sites are shown in Section 6.17. The surveys included diurnal bird census for the Regent Honeyeater (*Xanthomyza phrygia*) and bat surveys for the South-eastern Long-eared Bat (*Nyctophilus corbeni*) (previously Greater Long-eared Bat). The results are presented in Table 5-6. Additional surveys were undertaken in winter 2015 to target the Swift Parrot (*Lathamus discolor*) however this species was not recorded.

[6] Note: some records cannot be shown on the figures as the exact co-ordinates of the records were not recorded by the original source.

In addition to the recent surveys by Australia Museum Consulting (2014), past surveys were undertaken by Cumberland Ecology (2011) (i.e. diurnal bird census which could detect the Regent Honeyeater (*Xanthomyza phrygia*) [if present] and bat surveys which could detect the South-eastern Long-eared Bat (*Nyctophilus corbeni*) [if present] in the Northern, Eastern and Western Offset Areas) and Niche Environment and Heritage (2012) (i.e. bat surveys which could detect the South-eastern Long-eared Bat [if present] in the Roseglass Property in the Southern Offset Area). The results are presented in Table 5-6.

To date, a total of 20 threatened species have been recorded within the offset areas (Table 5-6) comprising:

- three threatened flora species (all of which are listed under the TSC Act and EPBC Act);
- two threatened reptile species (one under the TSC Act, the other listed under the TSC Act and EPBC Act);
- eleven threatened woodland bird species (all listed under the TSC Act);
- one threatened arboreal mammal (listed under the TSC Act); and
- three confirmed threatened bat species (two of which are listed under the EPBC Act) (and one probable listed under the TSC Act).

The offset areas provide potential habitat for a further 12 threatened species (overall a total of 32 threatened species) (Table 5-6).

Two migratory terrestrial birds listed under the EPBC Act have also been recorded in the offset areas (Table 5-6).

Table 5-6
Threatened and Migratory Species and/or their Habitat in the Offset Areas

Common Name	Scientific Name	Conservation Status[1]		Occurrence
		TSC Act	EPBC Act	
Flora				
Bluegrass	*Dichanthium setosum*	V	V	This species was recorded within the Northern Offset Area by Australian Museum Consulting (2014) (Figure 10g).
-	*Tylophora linearis*	V	E	This species was recorded within the Eastern, Western and Southern Offset Areas by Niche Environment and Heritage (2014) (Figures 10a to 10f).
Granite Homoranthus	*Homoranthus prolixus*	V	V	This species was recorded within the Southern Offset Area by Niche Environment and Heritage (2012) (Figure 10f).
Reptiles				
Border Thick-tailed Gecko	*Uvidicolus sphyrurus*	V	V	This species was recorded within the Northern Offset Area by Australian Museum Consulting (2014) (Figure 10g).
Pale-headed Snake	*Hoplocephalus bitorquatus*	V	-	Preliminary monitoring results indicate that this species was recorded in the offset areas during February 2015 (Australian Museum Consulting pers. comm., 2015).

Table 5-6 (Continued)
Threatened and Migratory Species and/or their Habitat in the Offset Areas

Common Name	Scientific Name	Conservation Status[1]		Occurrence
		TSC Act	EPBC Act	
Birds				
Black-necked Stork	*Ephippiorhynchus asiaticus*	E	-	Potential habitat.
Square-tailed Kite	*Lophoictinia isura*	V	-	Potential habitat.
Spotted Harrier	*Circus assimilis*	V	-	Preliminary monitoring results indicate that this species was recorded nearby the offset areas during February 2015 (Australian Museum Consulting pers. comm., 2015).
Little Eagle	*Hieraaetus morphnoides*	V	-	Potential habitat.
Little Lorikeet	*Glossopsitta pusilla*	V	-	This species was recorded within the Northern Offset Area by Australian Museum Consulting (2014) (Figure 10g) and Cumberland Ecology (2011). It was also recorded in the Southern Offset Area by Niche Environment and Heritage (2012) (Figure 10f) and in the Western Offset Area by Cumberland Ecology (2011) (Figures 10d and 10e).
Turquoise Parrot	*Neophema pulchella*	V	-	This species was recorded within the Northern Offset Area and Western Offset Area by Cumberland Ecology (2011). Database records of this species in the Western Offset Area are shown on Figures 10a and 10d.
Swift Parrot	*Lathamus discolour*	E	E	Potential habitat.
Masked Owl	*Tyto novaehollandiae*	V	-	This species was recorded within the Southern Offset Area by Niche Environment and Heritage (2012) (Figure 10f).
Barking Owl	*Ninox connivens*	V	-	This species was recorded multiple times at one location within the Eastern Offset Area by Australian Museum Consulting (2014) (Figure 10b).
Speckled Warbler	*Pyrrholaemus sagittatus*	V	-	This species was recorded within the Western, Southern and Northern Offset Areas by Australian Museum Consulting (2014) (Figure 10e to 10g), Parsons Brinkerhoff (2010) (Figure 10e) and Cumberland Ecology (2011) (Figures 10a and 10d). It was also recorded in the Southern Offset Area by Niche Environment and Heritage (2012) (Figure 10f).
Regent Honeyeater	*Anthochaera phrygia*	CE	E	Potential habitat.
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis gularis*	V	-	This species was recorded within the Northern Offset Area by Cumberland Ecology (2011).
Painted Honeyeater	*Grantiella picta*	V	-	Potential habitat.
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	V	-	This species was recorded within the Western Offset Area by Parsons Brinkerhoff (2010) (Figure 10e) and in the Western and Southern Offset Areas by Australian Museum Consulting (2014) (Figures 10d and 10f). It was also recorded in the Western and Northern Offset Areas by Cumberland Ecology (2011).

Table 5-6 (Continued)
Threatened and Migratory Species and/or their Habitat in the Offset Areas

Common Name	Scientific Name	Conservation Status[1]		Occurrence
		TSC Act	EPBC Act	
Birds (Cont.)				
Diamond Firetail	*Stagonopleura guttata*	V	-	This species was recorded within the Northern Offset Area by Australian Museum Consulting (2014) (Figure 10g).
Scarlet Robin	*Petroica boodang*	V	-	Preliminary monitoring results indicate that this species was recorded in the offset areas during February 2015 (Australian Museum Consulting pers. comm., 2015).
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis temporalis*	V	-	This species was recorded within all of the Northern, Eastern, Western and Southern Offset Areas by Australian Museum Consulting (2014) (Figures 10a to 10d, 10f and 10g). Cumberland Ecology (2011) recorded this species in the Eastern and Western Offset Areas.
Hooded Robin (south-eastern form)	*Melanodryas cucullata cucullata*	V	-	Potential habitat.
Varied Sittella	*Daphoenositta chrysoptera*	V	-	This species was recorded within the Northern Offset Area by Australian Museum Consulting (2014) (Figure 10g). Cumberland Ecology (2011) also recorded this species in the Northern Offset Area as well as the Western Offset Area.
Fork-tailed Swift	*Apus pacificus*	-	M	Potential habitat.
Rainbow Bee-eater	*Merops ornatus*	-	M	This species was recorded within the Western and Eastern Offset Areas by Australian Museum Consulting (2014) (Figures 10b, 10d and 10e).
White-throated Needletail	*Hirundapus caudacutus*	-	M	This species was recorded within the Northern Offset Area by Australian Museum Consulting (2014) (Figure 10g).
Satin Flycatcher	*Myiagra cyanoleuca*	-	M	Potential habitat.
Mammals				
Koala	*Phascolarctos cinereus*	V	V	Potential habitat.
Squirrel Glider	*Petaurus norfolcensis*	V	-	This species was recorded within the Northern Offset Area by Australian Museum Consulting (2014) (Figure 10g). It was also recorded in the Southern Offset Area by Niche Environment and Heritage (2012) (Figure 10f).
South-eastern Long-eared Bat	*Nyctophilus corbeni*	V	V	This species was recorded within the Western Offset Area by Australian Museum Consulting (2014) (Figure 10d).
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	V	This species was recorded within the Northern Offset Area by Australian Museum Consulting (2014) (Figure 10g).
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	V	-	This species was recorded within all of the Northern, Eastern, Western and Southern Offset Areas by Australian Museum Consulting (2014) (Figures 10a to 10g). This species was also recorded within the Western Offset Area by Parsons Brinkerhoff (2010) (Figure 10e).
Eastern Bentwing-bat	*Miniopterus schreibersii oceanensis*	V	-	Probable records of this species were obtained from within the Western and Eastern Offset Areas by Australian Museum Consulting (2014) (Figures 10a to 10d).

Table 5-6 (Continued)
Threatened and Migratory Species and/or their Habitat in the Offset Areas

Common Name	Scientific Name	Conservation Status[1]		Occurrence
		TSC Act	EPBC Act	
Mammals (Cont.)				
Little Pied Bat	*Chalinolobus picatus*	V	-	Potential habitat.
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	V	-	Potential habitat.
Eastern Cave Bat	*Vespadelus troughtoni*	V	-	Potential habitat.

Current as of February 2015

[1] Threatened species conservation status V = Vulnerable, E = Endangered, CE = Critically Endangered, M=Migratory.

In accordance with Condition 49 of Schedule 3 to PA 10_0138, the Biodiversity Offset Strategy is focused on protection, enhancement, revegetation and long-term maintenance of viable stands of suitable habitat for threatened species within the MCCM Project Boundary and surrounds.

As verified by Greenloaning Biostudies (independent reviewer approved by DotE) (2013, 2014a), and in accordance with Condition 9 of the Approval Decision EPBC 2010/5566, the Commonwealth Biodiversity Offset Strategy provides for the long-term security of no less than 9,334 ha of equivalent or better quality of habitat for the Regent Honeyeater (*Xanthomyza phrygia*), Swift Parrot (*Lathamus discolor*) and the South-eastern Long-eared Bat (*Nyctophilus corbeni*) (previously Greater Long-eared Bat). Most of the vegetation communities listed in Table 5-2 and mapped on Figures 8a to 8d represent habitat for these species.

5.7 WEEDS

Noxious weeds listed under the NSW *Noxious Weeds Act, 1993* for particular local control areas. The noxious weed declarations for the following council areas are relevant to the offset areas:

- Narrabri Shire Council (Eastern and Western Offset);
- Tamworth Regional Council (Northern Offset); and
- Gunnedah Shire Council (Southern Offset).

Noxious weeds listed under the NSW *Noxious Weeds Act, 1993* that have been recorded in the offset areas are listed in Table 5-7. Noxious weeds recorded by Australian Museum Consulting (2014) are shown on Figures 11a to 11d.

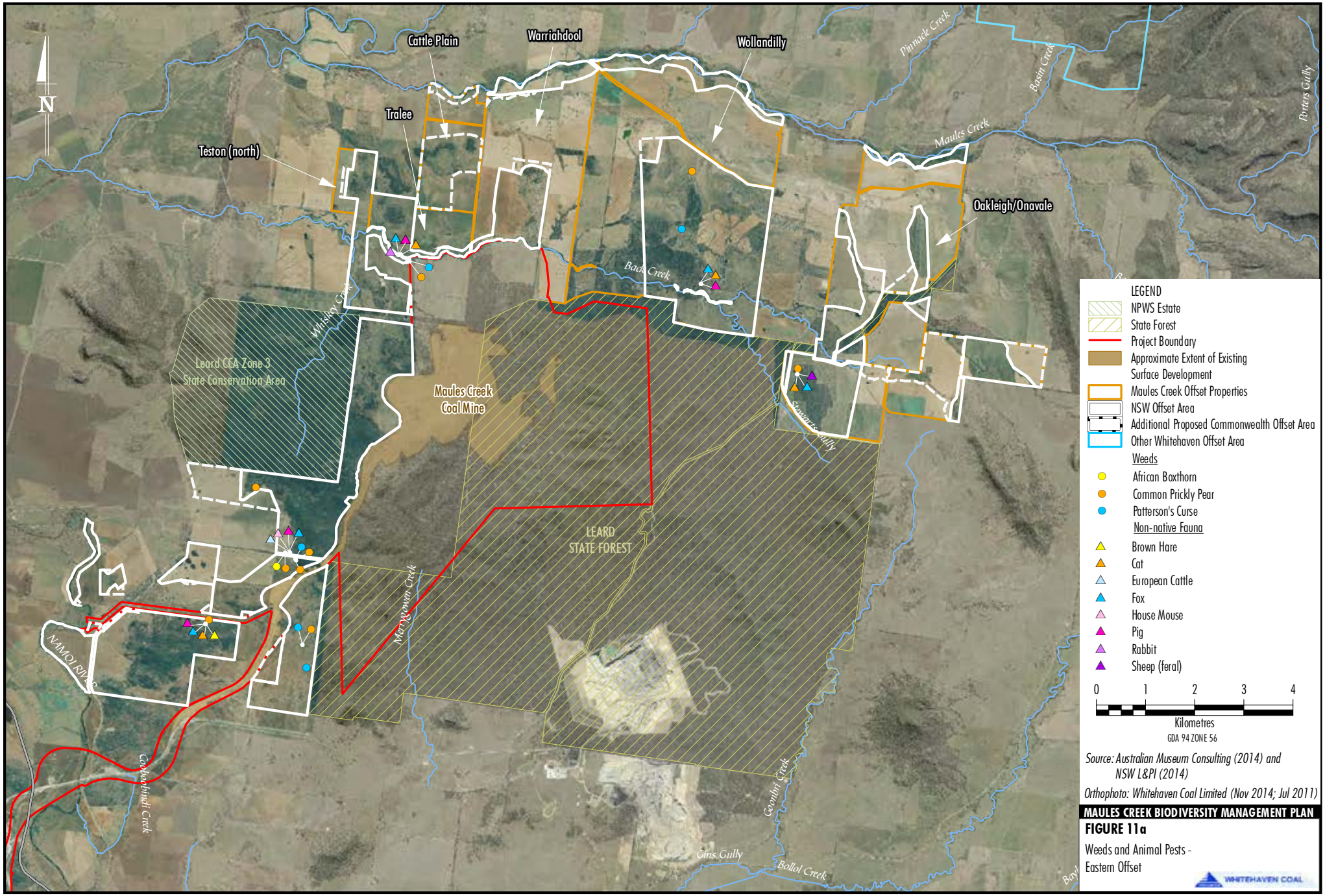
Table 5-7
Environmental and Noxious Weeds in the Offset Areas

Common Name	Scientific Name	Status[1]	Occurrence
Mother of Millions	*Bryophyllum delagoense*	Class 4	Recorded within the Southern Offset in the Roseglass property (Niche Environment and Heritage, 2012).
Paterson's Curse	*Echium platagineum*	Class 4	Recorded within the Eastern and Western Offset in the Teston (north) property (Cumberland Ecology, 2011), and in the Wollandilly and Velyama properties (Australian Museum Consulting, 2014). Although this species is not considered a Noxious weed within the Narrabri Shire Council area, it is listed as Noxious within the Gunnedah Shire Council area (relevant to the Southern Offset), and will therefore be managed accordingly.
African Boxthorn	*Lycium ferocissimum*	Class 4	Recorded within the Eastern and Western Offset Areas (Australian Museum Consulting, 2014), and within the Southern Offset in the Roseglass property (Niche Environment and Heritage, 2012).
Common Prickly Pear	*Optuntia stricta*	Class 4	Common in the Eastern and Western Offset, recorded in the Wollandilly, Oakleigh/Onavale, Teston (north), Louinville, Velyama and Kelso properties. Also recorded in the Northern Offset (Australian Museum Consulting, 2014) and the Southern Offset in the Roseglass property (Niche Environment and Heritage, 2012).
Prickly Pear	*Opuntia* sp.	Class 4	Recorded within the Northern Offset in the Wirradale property, and within the Eastern and Western Offset in the Louenville, Tralee and Teston (south) properties (Cumberland Ecology 2011).
Tiger Pear	*Optuntia aurantiaca*	Class 4	Recorded within the Southern Offset in the Roseglass property (Australian Museum Consulting, 2014; Niche Environment and Heritage, 2012) and Eastern and Western Offset (Australian Museum Consulting, 2014).
Sweet Briar	*Rosa rubiginosa*	Class 4	Common in the Northern Offset Area in the Mt Lindsay and Wirradale properties (Cumberland Ecology, 2011; Australian Museum Consulting, 2014). Also recorded within the Eastern and Western offset area in the Louenville property (Cumberland Ecology, 2011). This species is not considered a Noxious weed within the Tamworth Regional Council area, but is listed as Noxious within the Narrabri Shire Council area.
Fireweed	*Senecio* spp.	Class 4	Recorded within the Eastern and Western Offset in the Louenville property (Cumberland Ecology, 2011).
Cockle Burr	*Xanthium occidentale*	Class 4	Recorded within the Southern Offset in the Roseglass property (Niche Environment and Heritage, 2012).
Bathurst Burr	*Xanthium spinosum*	Class 4	Recorded within the Southern Offset in the Roseglass property (Niche Environment and Heritage, 2012).

Sources: Australian Museum Consulting (2014); Cumberland Ecology (2011) and Niche Environment and Heritage (2012).

[1] *Noxious Weeds Act, 1993* for the Narrabri Shire Council; Tamworth Regional Council; and Gunnedah Shire Council.

Exotic trees, namely Elms (*Ulmus* sp) and Weeping Willows (*Salix babylonica*), occur along Horton Creek in the Northern Offset Area.



Source: Australian Museum Consulting (2014) and NSW L&PI (2014)

Orthophoto: Whitehaven Coal Limited (Nov 2014; Jul 2011)

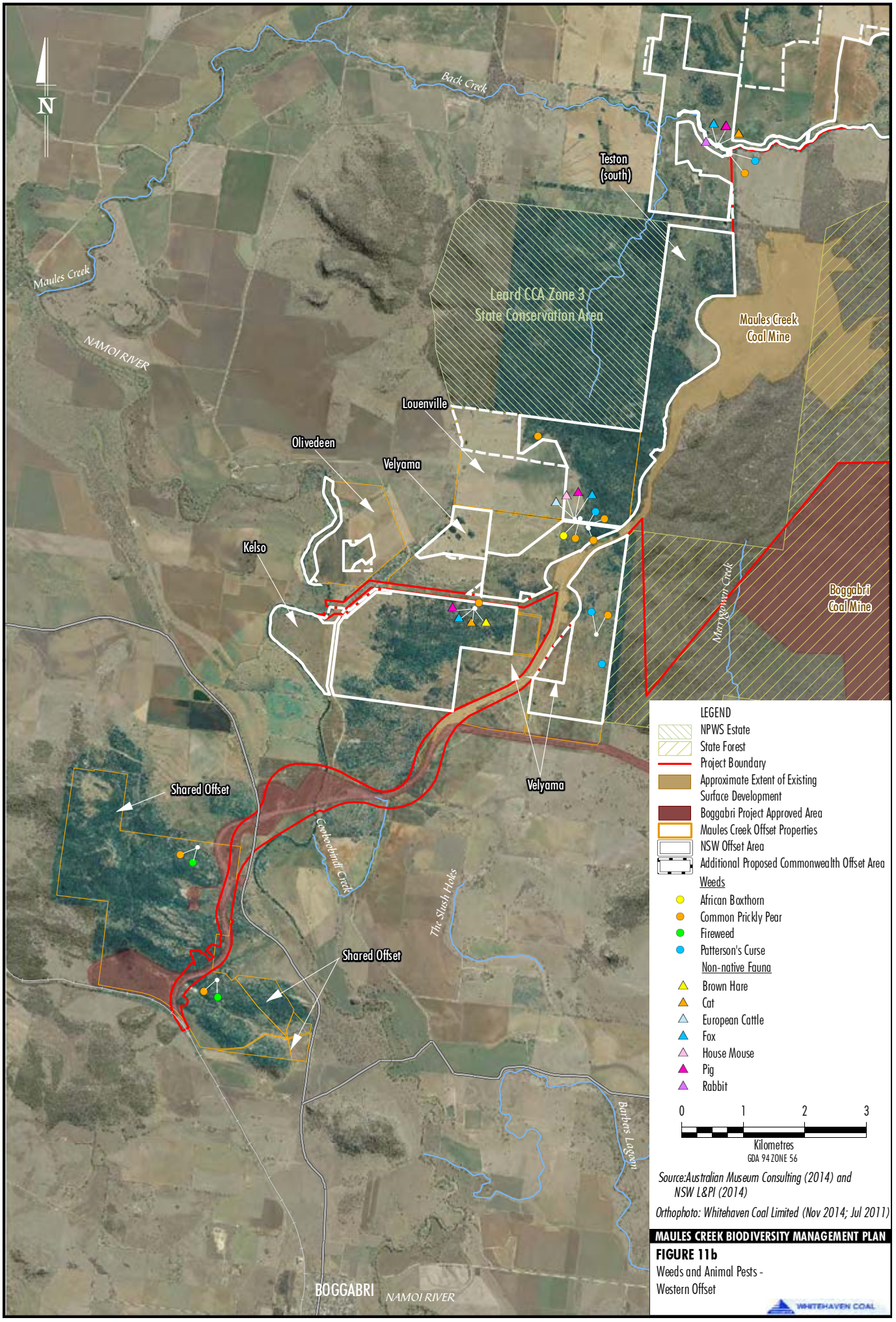
MAULES CREEK BIODIVERSITY MANAGEMENT PLAN

FIGURE 11a

Weeds and Animal Pests - Eastern Offset

WHITEHAVEN COAL

WHC-14-22 RBMP_205E



Source:Australian Museum Consulting (2014) and NSW L&PI (2014)

Orthophoto: Whitehaven Coal Limited (Nov 2014; Jul 2011)

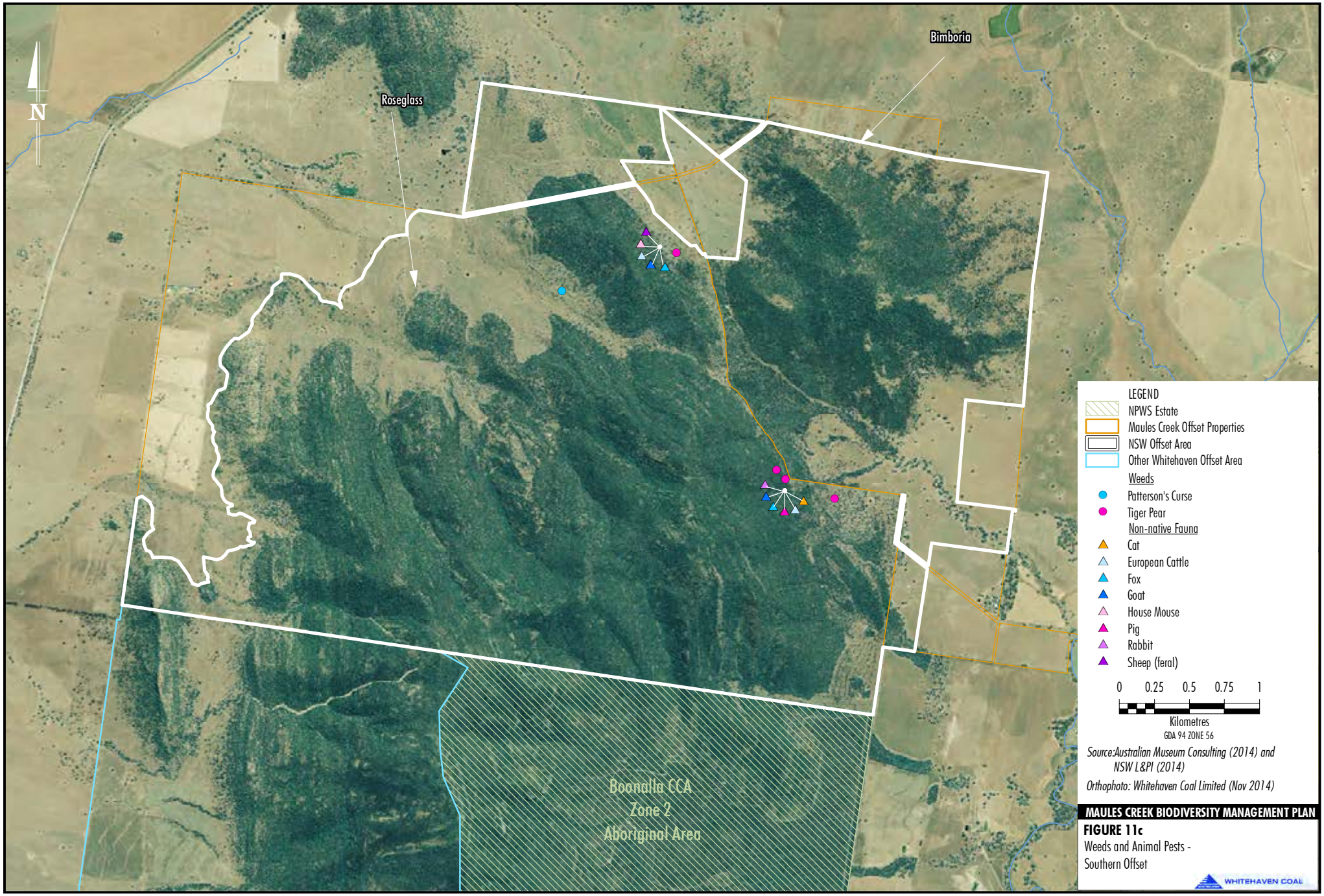
MAULES CREEK BIODIVERSITY MANAGEMENT PLAN

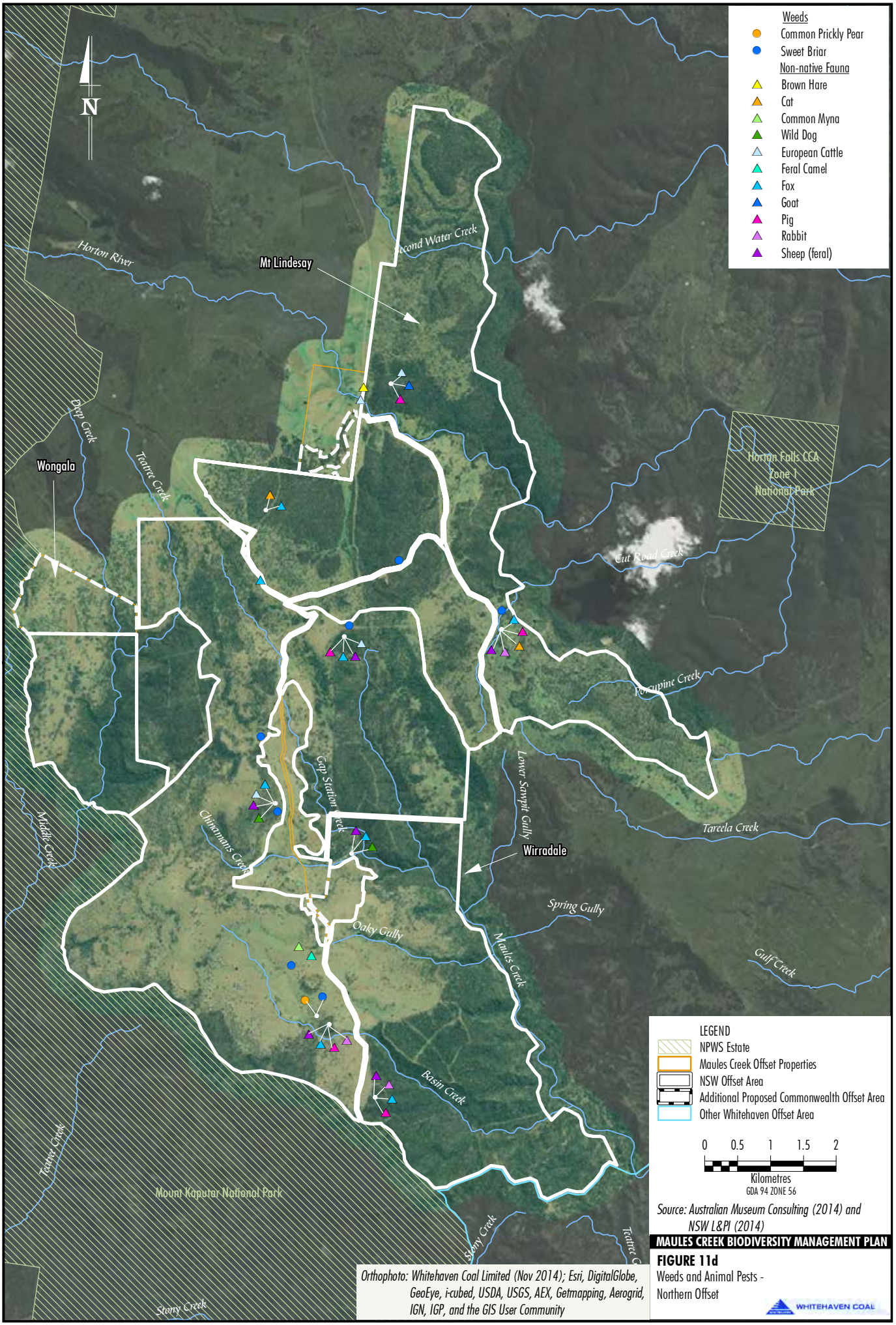
FIGURE 11b

Weeds and Animal Pests - Western Offset

WHITEHAVEN COAL

WHC-14-22 RBMP_206E


N
Roseglass
Bimboria
Boonalla CCA
Zone 2
Aboriginal Area
LEGEND
NPWS Estate
Maules Creek Offset Properties
NSW Offset Area
Other Whitehaven Offset Area
Weeds
Patterson's Curse
Tiger Pear
Non-native Fauna
Cat
European Cattle
Fox
Goat
House Mouse
Pig
Rabbit
Sheep (feral)
0 0.25 0.5 0.75 1
Kilometres
GDA 94 ZONE 56
Source:Australian Museum Consulting (2014) and NSW L&PI (2014)
Orthophoto: Whitehaven Coal Limited (Nov 2014)
MAULES CREEK BIODIVERSITY MANAGEMENT PLAN
FIGURE 11c
Weeds and Animal Pests - Southern Offset
WHITEHAVEN COAL



Source: Australian Museum Consulting (2014) and NSW L&PI (2014)

Orthophoto: Whitehaven Coal Limited (Nov 2014); Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

MAULES CREEK BIODIVERSITY MANAGEMENT PLAN

FIGURE 11d

Weeds and Animal Pests - Northern Offset

WHITEHAVEN COAL

WHC-14-22 RBMP_208C

5.8 FERAL ANIMALS

Feral animals that have been recorded in the offset areas are listed in Table 5-8. Feral animals recorded by Australian Museum Consulting (2014) are shown on Figures 11a to 11d.

Table 5-8
Feral Animals in the Offset Areas

Common Name	Scientific Name	Status[1]	Occurrence
Birds			
Common Myna	*Acridotheres tristis*	-	This species was recorded by Australian Museum Consulting (2014).
Mammals			
Feral Pigs	*Sus scrofa*	Declared pest	Feral Pigs are currently abundant in the offset areas (Australian Museum Consulting, 2014). This species was recorded in the Northern Offset Area (Cumberland Ecology, 2014) and the Southern Offset Area (Niche Environment and Heritage, 2012).
Feral Goats	*Capra hircus*	-	Feral Goats are currently abundant in the offset areas (Australian Museum Consulting, 2014). This species was recorded in the Northern Offset Area (Cumberland Ecology, 2014) and the Southern Offset Area (Niche Environment and Heritage, 2012).
European Red Fox	*Vulpes vulpes*	Declared pest	Foxes are currently abundant in the offset areas (Australian Museum Consulting, 2014).
European Rabbits	*Oryctolagus cuniculus*	Declared pest	European Rabbits are currently moderately common in the offset areas (Australian Museum Consulting, 2014).
Brown Hare	*Lepus capensis*	-	This species was recorded by Australian Museum Consulting (2014).
Feral Deer	*Cervus* spp., *Axis* spp., or *Dama* spp.	-	Deer have not been recorded in the offset areas by Australian Museum Consulting, 2014; Niche Environment and Heritage, 2012 or Cumberland Ecology, 2014. Deer are considered uncommon or rare.
Feral Cats	*Felis catus*	-	Feral Cats are currently moderately common in the offset areas (Australian Museum Consulting, 2014). This species was recorded in the Southern Offset Area (Niche Environment and Heritage, 2012).
Wild Dog	*Canis familiaris*	Declared pest	This species was recorded in the Southern Offset Area (Niche Environment and Heritage, 2012). Dogs are considered uncommon or rare.
Black Rat	*Lepus capensis*	-	This species was recorded by Australian Museum Consulting (2014).
House Mouse	*Mus musculus*	-	This species was recorded by Australian Museum Consulting (2014).
Feral Camel	*Camelus dromedarius*	-	This species was recorded by Australian Museum Consulting (2014).

[1] *Rural Lands Protection Act, 1998.*

5.9 THREATS

Current threats relevant to the condition of the native vegetation and habitats in the offset areas are:

- weeds;
- land clearance and fragmentation;
- feral animals;
- erosion;
- grazing livestock; and
- bushfire risk.

The above threats will be managed as described in Section 6.

The offset areas contain large areas of existing native woodland, forest, shrublands and grasslands. Some 1,964.6 ha of low diversity derived native grassland, pasture improved and cultivated land also occurs in the offset areas. Revegetation will occur within these cleared areas (except in cleared areas with constraints such as existing infrastructure) to lessen fragmentation and provide greater resilience to existing habitats surrounding these cleared areas.

6 MANAGEMENT OF THE OFFSET AREAS

This section provides short, medium and long-term measures that will be used to manage the vegetation and habitat in the offset areas and to implement the biodiversity offset strategy. The management regime in the offset areas will be adaptive over time to achieve the ecological management objectives.

6.1 ECOLOGICAL MANAGEMENT OBJECTIVES

The objectives of the offset areas are to:

- protect and enhance existing native woodland/forest (including areas of Box-Gum Woodland EEC/CEEC in woodland form and habitat for threatened species listed under the TSC Act, namely those listed in Conditions 49 and 50 of Schedule 3 to PA 10_0138, and threatened species listed under the EPBC Act, namely, the Regent Honeyeater [*Xanthomyza phrygia*], Swift Parrot [*Lathamus discolor*] and the South-eastern Long-eared Bat [*Nyctophilus corbeni*]);
- protect and enhance areas of semi-cleared woodland/forest;
- restore self-sustaining vegetation communities within derived native grassland;
- restore the woodland form of Box-Gum Woodland within existing areas of Box-Gum Woodland EEC/CEEC (derived native grassland); and
- restore self-sustaining vegetation communities within areas of low diversity derived native grassland, pasture improved and cultivated land.

These objectives are linked to the proposed management domains/units (Section 6.3), management performance criteria (Section 6.16), completion criteria (Section 6.16) and monitoring program (Section 6.17). Performance criteria are interim targets and completion criteria are the final targets representing achievement of the objectives.

6.2 SETTING UP THE OFFSET AREAS

6.2.1 Long-term Conservation Security

The offset areas will be conserved long term by an appropriate mechanism as set out in Condition 54 of Schedule 3 to PA 10_0138 and Condition 13 of the Approval Decision EPBC 2010/5566. In accordance with Condition 54 of Schedule 3 to PA 10_0138, the long-term security shall be provided by way of:

- entering into a conservation agreement or agreements pursuant to section 69B of the *National Parks and Wildlife Act 1974*, recording the obligations assumed by the Proponent under the conditions of this approval in relation to these offset areas, and registering the agreement(s) pursuant to section 69F of the *National Parks and Wildlife Act 1974*; or
- a tenure of higher conservation status such as a National Park, or Nature Reserve, under the *National Parks and Wildlife Act 1974*.

The conservation agreements will remain in perpetuity for all lands that cannot be transferred to National Parks estate.

Some of the management areas contain high quality forest and woodland that adjoins Mount Kaputar National Park, or is close to it. Ongoing discussions will be held with the OEH and the NSW National Parks and Wildlife Service (NPWS) to investigate the potential to add areas to National Parks estate. Preliminary discussions with these agencies have already commenced.

For all lands that cannot be transferred to National Parks estate, MCC intend to secure the offset areas by the provision of a Voluntary Conservation Agreement (VCA). The VCA will be registered on the title and will provide for long term conservation outcomes on this land.

Condition 54 of Schedule 3 to PA 10_0138 requires the conservation agreements to be registered by December 2014 for the offsets in Condition 44 of Schedule 3 to PA 10_0138 (i.e. the NSW offset areas located on the Teston [north], Tralee, Wollandilly, Warriahdool, Kelso, Louenville, Olivedeen, Teston [south], Velyama, Shared Offset, Mt Lindesay and Wirradale as per the revised NSW Biodiversity Offset Strategy), unless agreed otherwise by the NSW Secretary of the DP&E after consultation with OEH. The NSW Secretary of the DP&E granted an extension of timing for commencement of securing the offset areas within 3 months of the approval of this BMP (version 2).

The registration of conservation agreements over the additional offset areas identified in the revised and approved NSW Biodiversity Offset Strategy (Whitehaven, 2015) (in accordance with Condition 45 of PA 10_0138) will commence within 12 months of the approval of Stage 2 of the Leard Forest Mining Precinct Regional Biodiversity Strategy, unless otherwise agreed by the NSW Secretary of the DP&E. The additional NSW offset areas are those located on the Oakleigh/Onavale, Roseglass, Bimboria and Wongala properties.

Condition 13 of the Approval Decision EPBC 2010/5566 requires legally binding covenant(s) to be registered over the Commonwealth offset areas by 11 February 2018. As stated in Section 1.2, the additional proposed Commonwealth offset areas shown on Figure 4 will not be subject to the management measures described in this BMP until a legally binding covenant is in place for these additional Commonwealth offset areas.

6.2.2 Offset Implementation Costs and Conservation Bond

In accordance with Condition 55 of Schedule 3 to PA 10_0138, the offset implementation costs will be calculated and a Conservation and Biodiversity Bond will be lodged with the DP&E to ensure that the biodiversity offset strategy is implemented in accordance with the performance and completion criteria (i.e. if MCC were unable to continue management of the offset). The NSW Secretary of the DP&E granted an extension of timing for submission of the conservation and biodiversity bond to within 6 months of the approval of this BMP (version 2).

The sum of the bond shall be determined by calculating the cost of implementing the biodiversity offset strategy (other than land acquisition costs) in perpetuity . The sum of the bond will include all offset area management measures prescribed within this BMP and include staff costs, fencing, fire management, weed management, feral animal control, seed collection, replanting/revegetation, monitoring, auditing and reporting. A suitably qualified quantity surveyor will be employed to verify the calculated costs.

Once the Conservation and Biodiversity Bond has been calculated, verified and lodged, this BMP will be revised to provide an estimate of the costs of the activities in accordance with Condition 18(g) of the Approval Decision EPBC 2010/5566. MCC will be responsible for funding the activities described in this BMP.

6.2.3 Infrastructure

The offset areas will be set-up on the ground by:

- using existing fencing (where practicable and required) to demarcate the perimeter around the offset areas, to manage grazing livestock and avoid accidental clearance (Section 6.12);
- installing gates into the offset areas (Section 6.12); and
- installing signage on gates into the offset areas which recognises that the area is protected for conservation purposes (Section 6.12).

Existing infrastructure in the offset areas (e.g. access tracks/fire trails and fences) is shown on Figures 13a to 13g. The re-use of existing infrastructure in the offset areas will be maximised where practicable. If new infrastructure (e.g. access tracks/fire trails and fences) is required, it will be located in stable locations with vegetation clearing minimised where possible by using already cleared land and/or in accordance with the limits specified for Routine Agricultural Management Activities for the Central Region under the NSW *Native Vegetation Act, 2003* (or it's latest equivalent) and the 10/50 Vegetation Clearing rules under the NSW *Rural Fire Act, 1997*. The design of any new infrastructure will consider the location of threatened flora and communities.

Existing infrastructure wholly or partly within the offset areas (e.g. electricity transmission lines, access tracks, water bores and pipes, homesteads and sheds) will be retained and managed as required by the relevant owners and/or managers/licencees. The revised NSW Biodiversity Strategy (Whitehaven, 2015) includes 1,835.9 ha of additional offset land above that required under Condition 44 of Schedule 3 to PA 10_0138[7].

[7] The additional offset land comprised approximately 965.8 ha of Existing Woodland/Forest, approximately 574.5 ha Derived Native Grassland (of which 280.2 ha meets the criteria for the Box-Gum Woodland EEC) and 295.6 ha of low diversity derived native grassland, cultivated land and pasture improved land.

Where ever practical and the need is not apparent to restricting livestock, new fencing will be mostly plain strand wire fencing (minimising the use of barbed wire). New fencing will be installed in a way to avoid, or minimise clearing of any native trees or shrubs. The boundaries of the offset areas that adjoin Leard State Forest, Leard State Conservation Area, Boonalla Aboriginal Area and Mount Kaputar National Park will not be fenced or existing fencing will not be replaced unless grazing livestock can access the offset areas through these protected areas and as agreed to with NPWS and State Forests.

Fencing, gates, access tracks/fire trails and signage will be routinely inspected (annually) for maintenance issues, and at other times during management and monitoring activities.

6.3 MANAGEMENT DOMAINS

Management domains for each offset area have also been prepared in consideration of the State and Transition Model for Box-Gum Woodland (Rawlings *et al.,* 2010) which recognises different ecosystem states based on their condition (and the transition between states). For the purpose of this BMP, semi-cleared native woodland/forest has been identified separately to intact native woodland/forest in recognition that it would be in a stable degraded state, or a downwards trajectory towards a derived native grassland, without the offset (Plate 1).

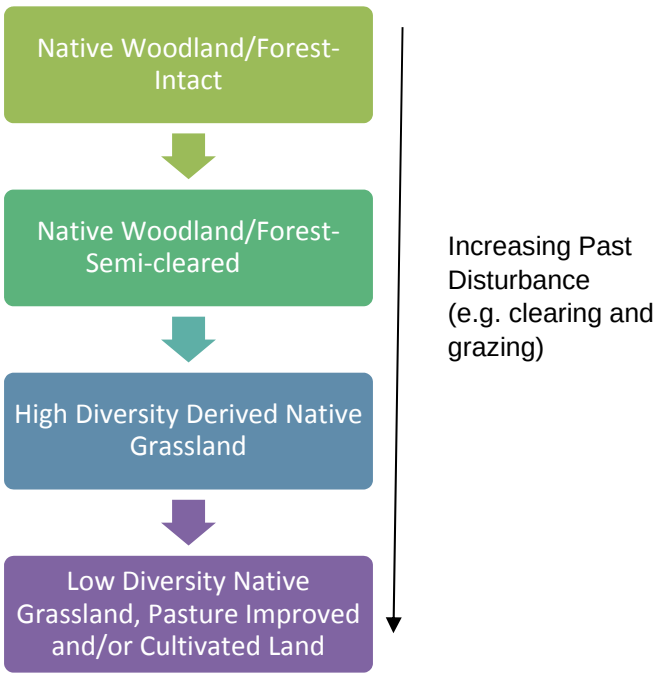


Plate 1 Different Ecosystem States as a Basis for the Management Domains

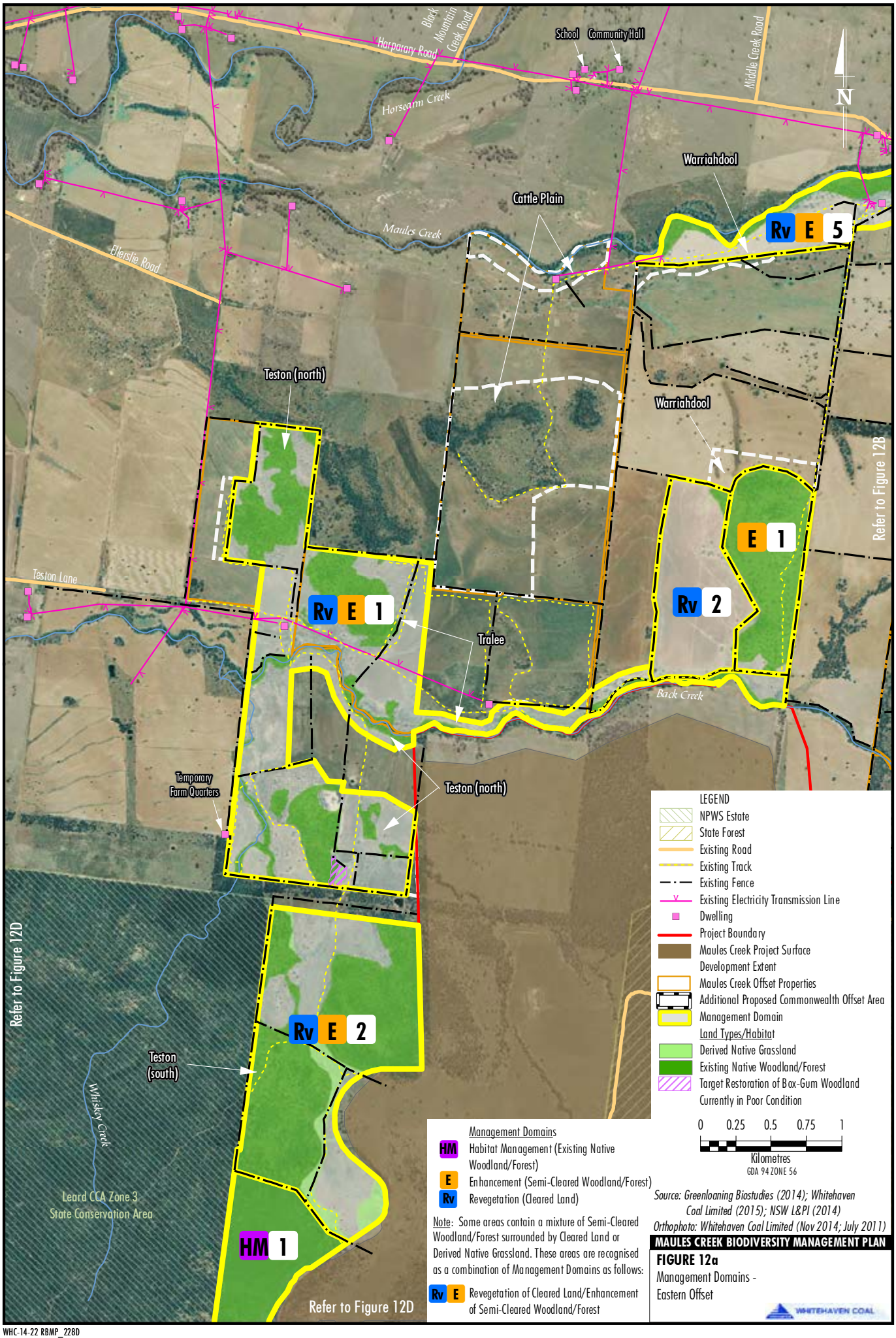
The management domains and their land management objectives are defined in Table 6-1 and management units are shown on Figures 12a to 12g.

Table 6-1
Management Domains

Management Domains	Habitat Management	Enhancement	Restoration	Revegetation
				
Ecosystem States (Plate 1)	Native Woodland/Forest-Intact	Native Woodland/Forest-Semi-cleared	Derived Native Grassland	Cleared Land
Objective	Existing native woodland/forest* to be protected and enhanced	Semi-cleared woodland/forest to be protected and enhanced	Additional native vegetation to be established with the restoration of self-sustaining woodland vegetation communities within derived native grassland (moderate to good condition)	Additional native vegetation to be established in low diversity native grassland, pasture improved and/or cultivated land
Main Management Actions	• Exclusion of livestock grazing to promote natural regeneration (Section 6.11). • Weed and feral animal control (Sections 6.8 and 6.9). • Access control (Section 6.12). • Bushfire management (Section 6.13).	• Exclusion of livestock grazing to promote natural regeneration (Section 6.11). • Active revegetation (planting or direct seeding) depending on the success of natural regeneration. • Weed and feral animal control (Sections 6.8 and 6.9). • Access control (Section 6.12). • Bushfire management (Section 6.13).	• Light rotational livestock grazing progressing towards removal of livestock grazing (Section 6.11). • Active revegetation (planting or direct seeding) depending on the success of natural regeneration. • Weed and feral animal control (Sections 6.8 and 6.9). • Access control (Section 6.12). • Bushfire management (Section 6.13).	• Active revegetation (planting or direct seeding). • Weed and feral animal control (Sections 6.8 and 6.9). • Access control (Section 6.12). • Bushfire management (Section 6.13).

* The term woodland/forest is used by Condition 44 of Schedule 3 to PA 10_0138 to describe all native vegetation communities (of varying structure) other than derived grassland.

Note: The Enhancement Domain may contain small areas of Derived Native Grassland.



Source: Greenloaning Biostudies (2014); Whitehaven Coal Limited (2015); NSW L&PI (2014)

Orthophoto: Whitehaven Coal Limited (Nov 2014; July 2011)

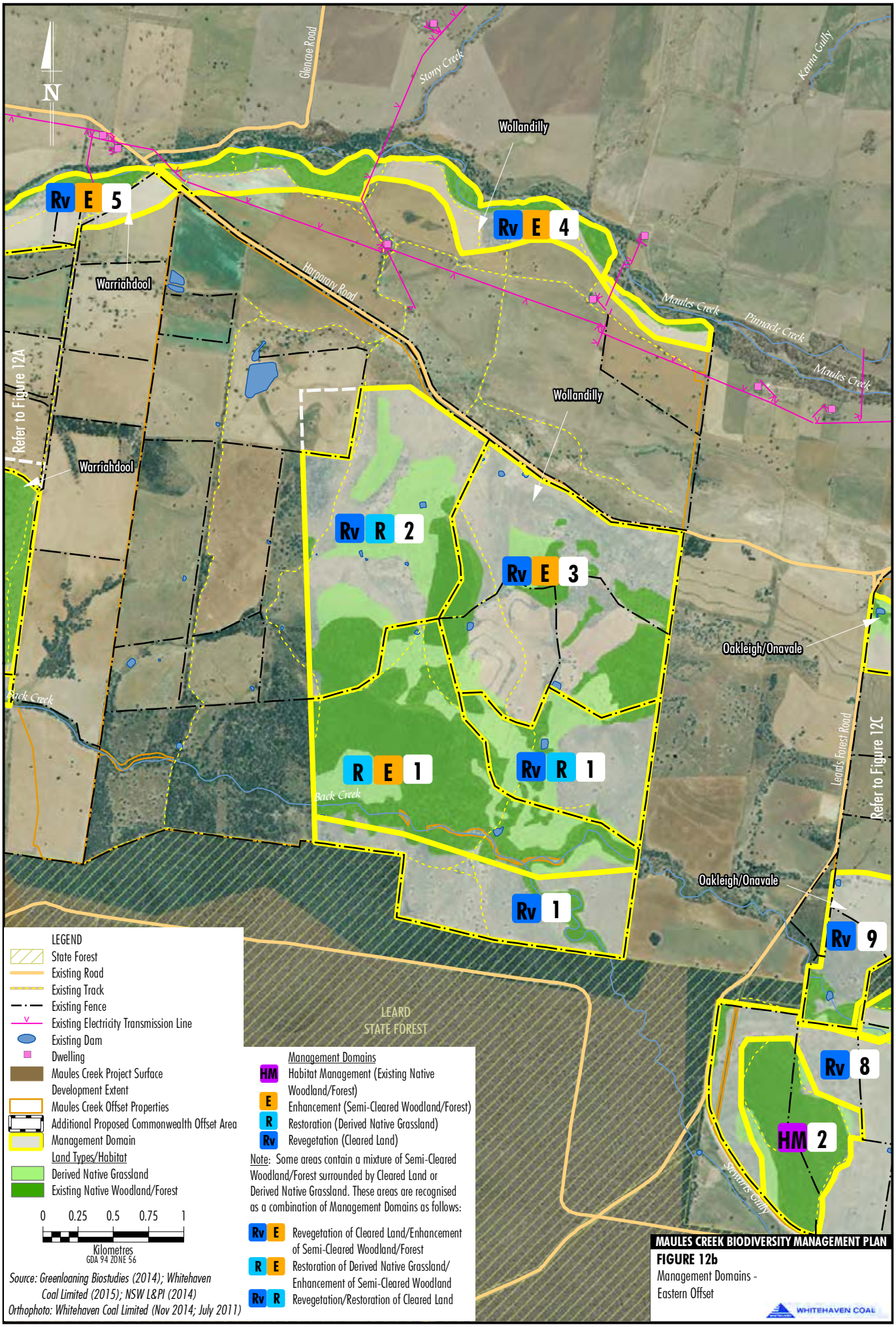
MAULES CREEK BIODIVERSITY MANAGEMENT PLAN

FIGURE 12a

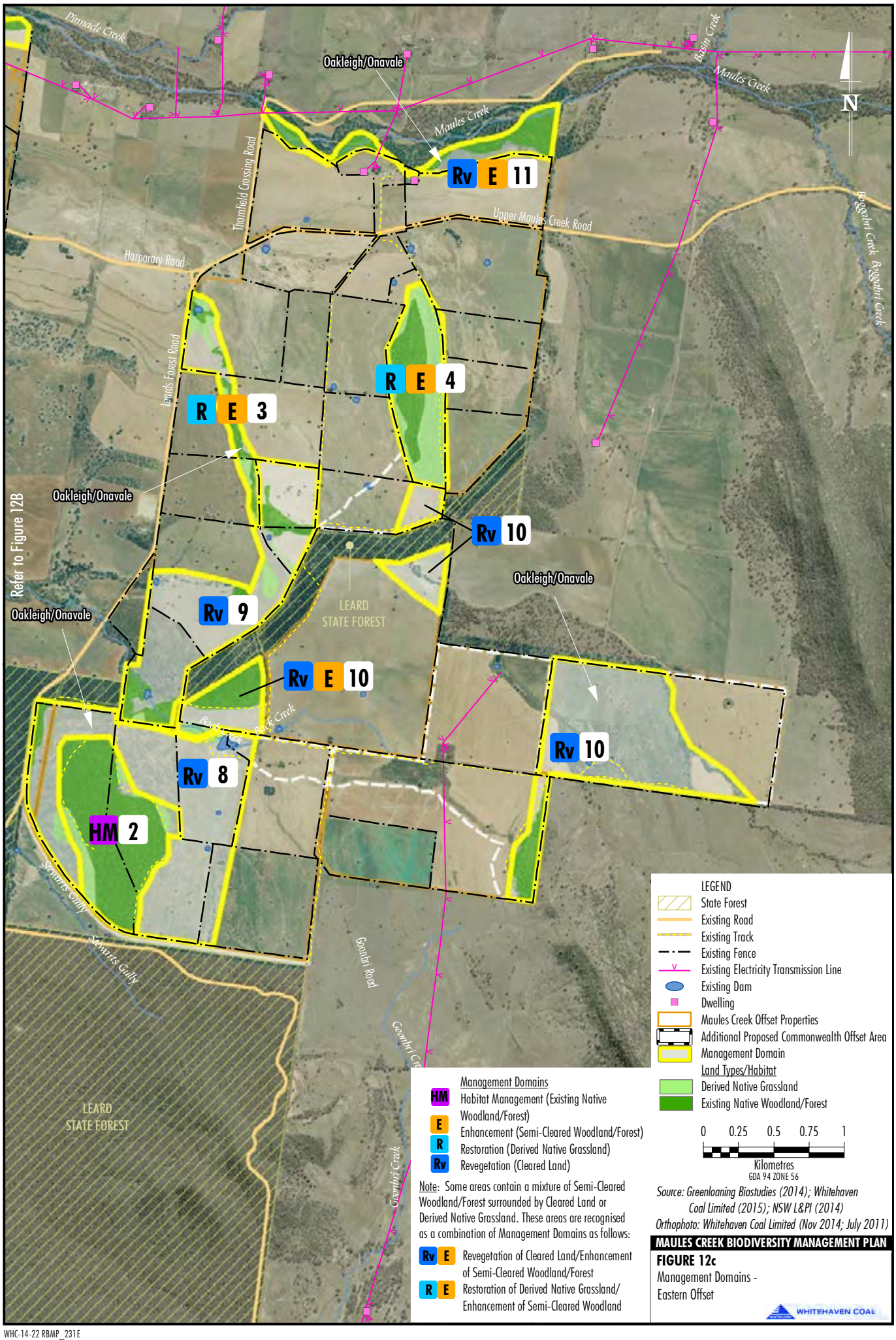
Management Domains - Eastern Offset

WHITEHAVEN COAL

WHC-14-22 RBMP_228D



WHC-14-22 RBMP_230D



Source: Greenloaning Biostudies (2014); Whitehaven Coal Limited (2015); NSW L&PI (2014)

Orthophoto: Whitehaven Coal Limited (Nov 2014; July 2011)

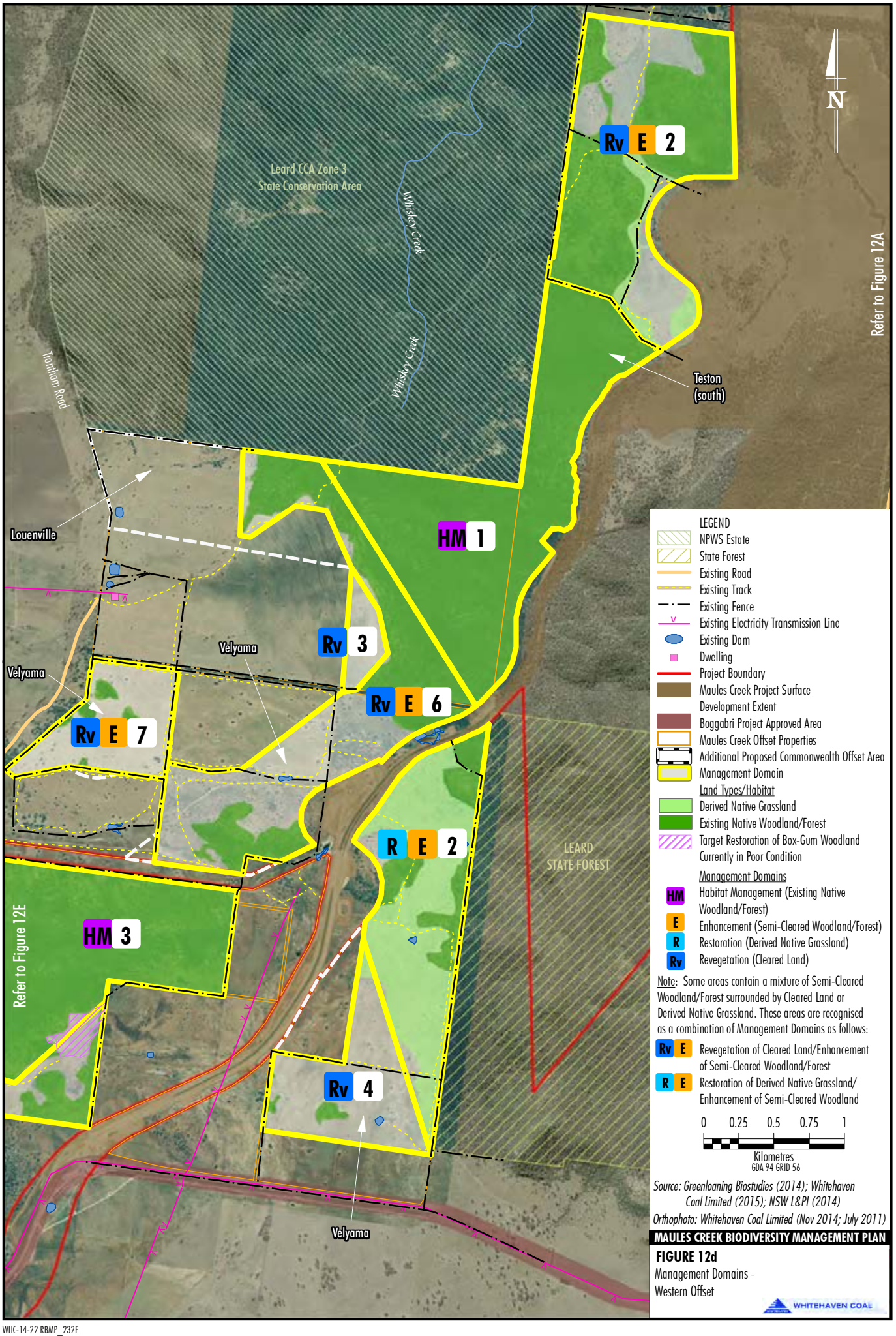
MAULES CREEK BIODIVERSITY MANAGEMENT PLAN

FIGURE 12c

Management Domains - Eastern Offset

WHITEHAVEN COAL

WHC-14-22 RBMP_231E



Source: Greenloaning Biostudies (2014); Whitehaven Coal Limited (2015); NSW L&PI (2014)

Orthophoto: Whitehaven Coal Limited (Nov 2014; July 2011)

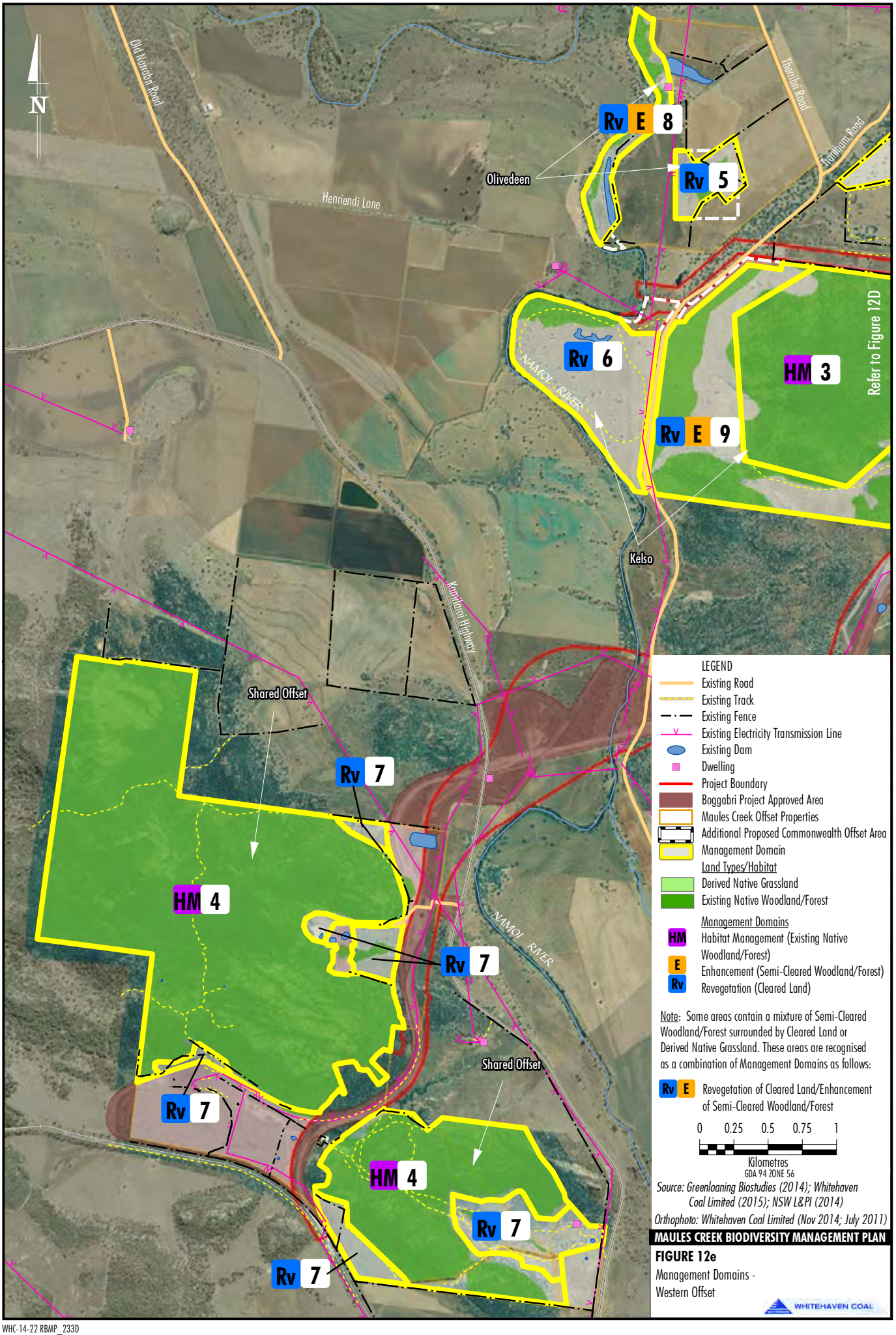
MAULES CREEK BIODIVERSITY MANAGEMENT PLAN

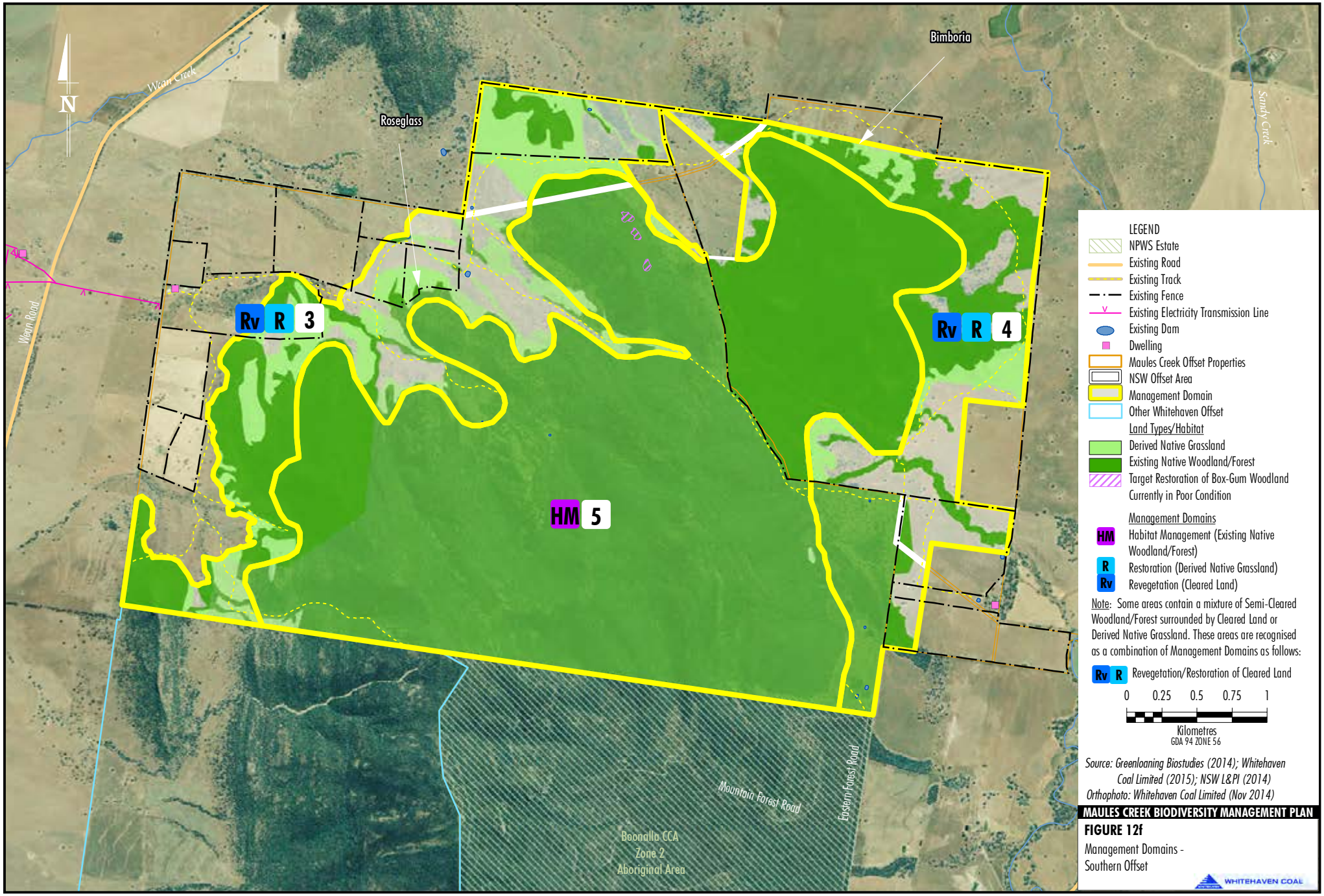
FIGURE 12d

Management Domains - Western Offset

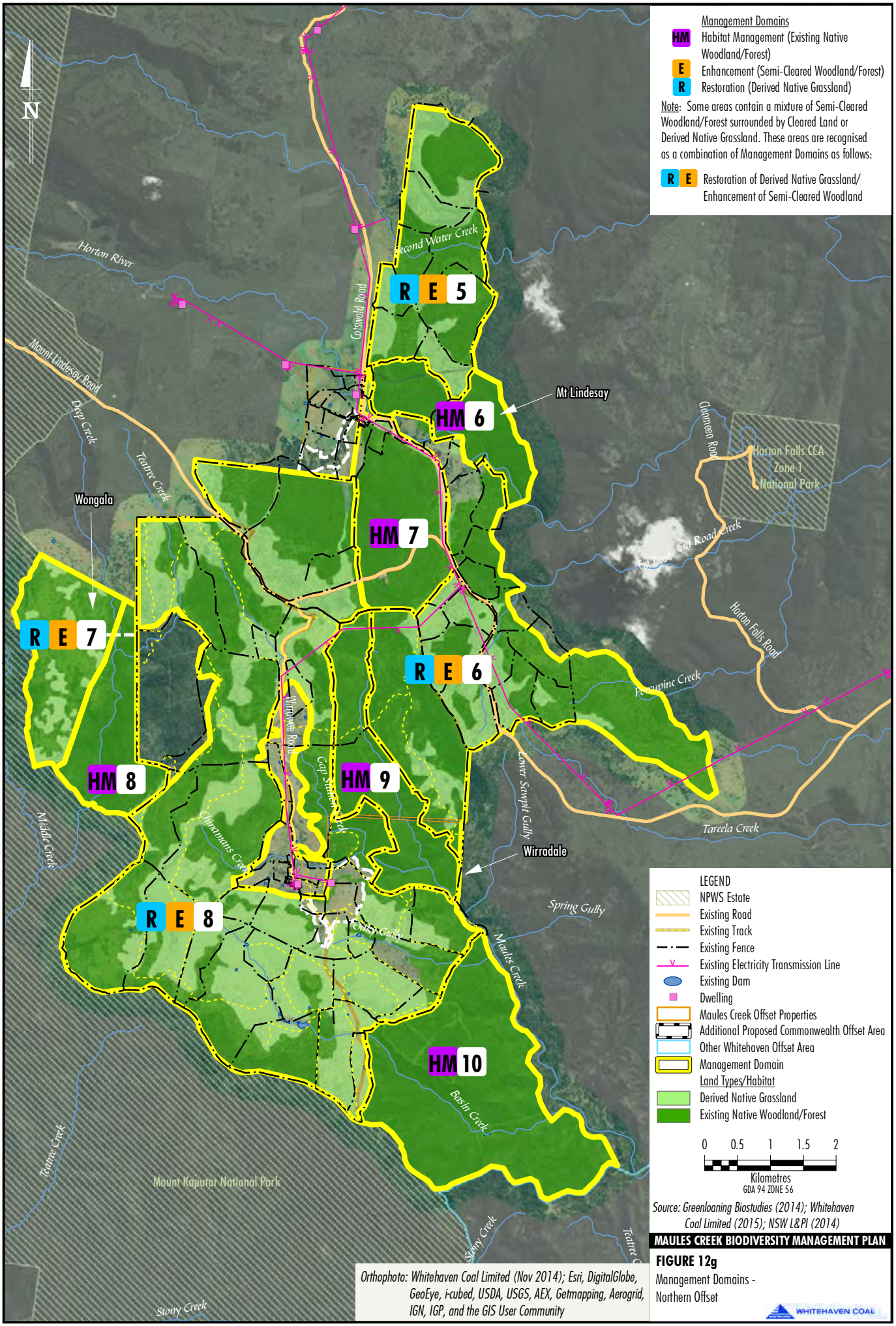
WHITEHAVEN COAL

WHC-14-22 RBMP_232E


N
Old Narrabri Road
Henriendi Lane
Olivedeen
Rv E 8
Rv 5
Therribri Road
Tranmkam Road
Refer to Figure 12D
Rv 6
NAMOI RIVER
HM 3
Rv E 9
Kelso
Kamilaroi Highway
Shared Offset
Rv 7
HM 4
Rv 7
NAMOI RIVER
Shared Offset
Rv 7
HM 4
Rv 7
Rv 7
LEGEND
Existing Road
Existing Track
Existing Fence
Existing Electricity Transmission Line
Existing Dam
Dwelling
Project Boundary
Boggabri Project Approved Area
Maules Creek Offset Properties
Additional Proposed Commonwealth Offset Area
Management Domain
Land Types/Habitat
Derived Native Grassland
Existing Native Woodland/Forest
Management Domains
HM Habitat Management (Existing Native Woodland/Forest)
E Enhancement (Semi-Cleared Woodland/Forest)
Rv Revegetation (Cleared Land)
Note: Some areas contain a mixture of Semi-Cleared Woodland/Forest surrounded by Cleared Land or Derived Native Grassland. These areas are recognised as a combination of Management Domains as follows:
Rv E Revegetation of Cleared Land/Enhancement of Semi-Cleared Woodland/Forest
0 0.25 0.5 0.75 1
Kilometres
GDA 94 ZONE 56
Source: Greenloaning Biostudies (2014); Whitehaven Coal Limited (2015); NSW L&PI (2014)
Orthophoto: Whitehaven Coal Limited (Nov 2014; July 2011)
MAULES CREEK BIODIVERSITY MANAGEMENT PLAN
FIGURE 12e
Management Domains - Western Offset
WHITEHAVEN COAL



WHC-14-22 RBMP_234F



Source: Greenloaning Biostudies (2014); Whitehaven Coal Limited (2015); NSW L&PI (2014)

Orthophoto: Whitehaven Coal Limited (Nov 2014); Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community

MAULES CREEK BIODIVERSITY MANAGEMENT PLAN

FIGURE 12g

Management Domains - Northern Offset

WHITEHAVEN COAL

WHC-14-22 RBMP_235D

The offset areas have been divided into a number of management units based on a combination of the following factors:

- dominant management domains;
- existing fence lines and ease in establishing new fencing;
- connectivity to adjacent areas of bushland;
- agricultural suitability/grazing management (Section 6.11); and
- landscape position and topography.

The management units shown on Figures 12a to 12g were assigned a management domain or combination of management domains based on the most prominent land types (Figures 10a to 10g) within each unit. Some management units contain a mixture of semi-cleared native woodland/forest surrounded by cleared land or derived native grassland (moderate to good condition). These management units are recognised as a combination of management domains as follows:

Restoration/Enhancement (R/E)	Restoration of derived native grassland/enhancement of semi-cleared woodland
Revegetation/Enhancement (Rv/E)	Revegetation of cleared land/enhancement of semi-cleared woodland/forest
Revegetation/Restoration (Rv/R)	Revegetation of cleared land and restoration of derived native grassland.

There are a total of seven management domain combinations and a total of 44 individual management units (distinct management areas) across the entire offset areas. Table 6-2 provides a list of each management unit including information on:

- vegetation communities;
- presence of the Box-Gum Woodland EEC/CEEC;
- threatened species; and
- watercourses.

The management units are likely to change over time as the habitats in the offset areas improve (e.g. a management unit which is currently assigned an Enhancement Domain may change to a Habitat Management Domain once vegetation improves). However, any of these changes MCC propose to the management units would be incorporated into a revised BMP in accordance with Section 7.3.

The boundaries of the management units shown on Figures 12a to 12g may change so as to avoid, or minimise the need to clear native trees or shrubs during installation of additional fencing.

Table 6-2
Management Domains and Units

Management Units	Location	Figure Reference	Threatened Community Present (Figure 9a to 9d)	Threatened Species Recorded (Figures 10a to 10g and Table 5-6)	Watercourses (Figure 10a to 10g)
Habitat Management					
HM1	Teston (south)	Figures 12a and 12d	✓	Speckled Warbler, Grey-crowned Babbler (eastern subspecies), Eastern Bentwing-bat, Brown Treecreeper (eastern subspecies), Yellow-bellied Sheathtail-bat.	Nil
HM2	Oakleigh/Onavale	Figures 12b and 12c	✓	*Tylophora linearis,* Grey-crowned Babbler (eastern subspecies), Eastern Bentwing-bat, Yellow-bellied Sheathtail-bat.	Nil
HM3	Kelso	Figures 12d and 12e	✓	*Tylophora linearis,* Grey-crowned Babbler (eastern subspecies), South-eastern Long-eared Bat, Yellow-bellied Sheathtail-bat, Rainbow Bee-eater.	Nil
HM4	Shared Offset	Figure 12e	Nil	*Tylophora linearis,* Little Lorikeet, Brown Treecreeper (eastern subspecies), Speckled Warbler, Rainbow Bee-eater, Grey-crowned Babbler (eastern subspecies), Varied Sittella, Little Pied Bat, Common Bentwing-bat, Eastern Cave Bat, Yellow-bellied Sheathtail Bat.	Nil
HM5	Roseglass, Bimbooria	Figure 12f	✓	*Homoranthus prolixus,* Little Lorikeet, Masked Owl, Brown Treecreeper (eastern subspecies), Speckled Warbler, Grey-crowned Babbler (eastern subspecies), Squirrel Glider, Yellow-bellied Sheathtail-bat.	Nil
HM6	Mt Lindesay	Figure 12g	✓	Brown Treecreeper (eastern subspecies).	Horton River
HM7	Mt Lindesay	Figure 12g	✓	Nil	Nil
HM8	Wongala	Figure 12g	✓	Nil	Deep Creek, Teatree Creek
HM9	Wirradale	Figure 12g	✓	Yellow-bellied Sheathtail-bat.	Maules Creek
HM10	Wirradale	Figure 12g	✓	Grey-crowned Babbler (eastern subspecies), Yellow-bellied Sheathtail-bat.	Maules Creek, Basin Creek
Enhancement					
E1	Warriahdool	Figure 12a	✓	Nil	Nil

Table 6-2 (Continued)
Management Domains and Units

Management Units	Location	Figure Reference	Threatened Community Present (Figure 9a to 9d)	Threatened Species Recorded (Figures 10a to 10g and Table 5-6)	Watercourses (Figure 10a to 10g)
Restoration Enhancement					
R/E1	Wollandilly	Figure 12b	✓	*Tylophora linearis*, Grey-crowned Babbler (eastern subspecies), Barking Owl, Rainbow Bee-eater, Eastern Bentwing-bat, Yellow-bellied Sheathtail-bat.	Nil
R/E2	Velyama	Figure 12d	✓	Nil	Nil
R/E3	Oakleigh/Onavale	Figure 12c	Nil	Nil	Nil
R/E4	Oakleigh/Onavale	Figure 12c	✓	Nil	Nil
R/E5	Mt Lindesay	Figure 12g	✓	Nil	Second Water Creek
R/E6	Wirradale	Figure 12g	✓	Little Lorikeet, Diamond Firetail, Squirrel Glider, Yellow-bellied Sheathtail-bat.	Maules Creek, Tareela Creek, Porcupine Creek, Cut Road Creek, Horton River
R/E7	Wongala	Figure 12g	✓	Nil	Deep Creek
R/E8	Wirradale	Figure 12g	✓	Brown Treecreeper (eastern subspecies), Speckled Warbler, Diamond Firetail, Varied Sittella, White-throated Needletail, Hoary Wattled Bat, Large-eared Pied Bat, Little Bentwing-bat, Yellow-bellied Sheathtail-bat, Border Thick-tailed Gecko.	Basin Creek, Oaky Gully, Chinamans Creek, Gap Station Creek, Teatree Creek
Revegetation					
Rv1	Wollandilly	Figure 12b	✓	Nil	Nil
Rv2	Warriahdool	Figure 12a	✓	Nil	Back Creek
Rv3	Louenville	Figure 12d	Nil	Nil	Nil
Rv4	Velyama	Figure 12d	✓	Nil	Nil
Rv5	Olivedeen	Figure 12e	Nil	Nil	Nil
Rv6	Kelso	Figure 12e	Nil	Nil	Namoi River

Table 6-2 (Continued)
Management Domains and Units

Management Units	Location	Figure Reference	Threatened Community Present[1] (Figure 9a to 9d)	Threatened Species Recorded (Figures 10a to 10g and Table 5-6)	Watercourses (Figure 10a to 10g)
Restoration/Enhancement					
Rv7	Shared Offset	Figure 12e	✓	Grey-crowned Babbler (eastern subspecies), Brown Treecreeper (eastern subspecies), Eastern Cave Bat.	Nil
Rv8	Oakleigh/Onavale	Figure 12c	✓	*Tylophora linearis*.	Nil
Rv9	Oakleigh/Onavale	Figure 12c	Nil	Spotted Harrier.	Nil
Rv10	Oakleigh/Onavale	Figure 12c	Nil	Nil	Nil
Revegetation/Enhancement					
Rv/E1	Tralee and Teston (north)	Figure 12a	✓	*Tylophora linearis,* Grey-crowned Babbler (eastern subspecies), Eastern Bentwing-bat, Yellow-bellied Sheathtail-bat.	Whiskey Creek, Back Creek.
Rv/E2	Teston (south)	Figure 12a	✓	*Tylophora linearis,* Grey-crowned Babbler (eastern subspecies), Little Lorikeet, Turquoise Parrot, Speckled Warbler.	Nil
Rv/E3	Wollandilly	Figure 12b	✓	*Tylophora linearis,* Grey-crowned Babbler (eastern subspecies).	Nil
Rv/E4	Wollandilly	Figure 12b	✓	Nil	Maules Creek
Rv/E5	Warriahdool	Figures 12a and 12b	Nil	Nil	Maules Creek.
Rv/E6	Velyama	Figure 12d	Nil	Nil	Nil
Rv/E7	Velyama	Figure 12d	Nil	Nil	Nil
Rv/E8	Olivedeen	Figure 12e	Nil	Nil	Namoi River.
Rv/E9	Kelso	Figure 12e	✓	Nil	Nil
Rv/E10	Oakleigh/Onavale	Figure 12c	✓	*Tylophora linearis*.	Nil
Rv/E11	Oakleigh/Onavale	Figure 12c	Nil	Nil	Maules Creek.
Revegetation/Restoration					
Rv/R1	Wollandilly	Figure 12b	✓	Nil	Nil
Rv/R2	Wollandilly	Figure 12b	✓	*Tylophora linearis.*	Nil
Rv/R3	Roseglass	Figure 12f	✓	Masked Owl, Speckled Warbler.	Nil
Rv/R4	Bimbooria	Figure 12f	✓	*Tylophora linearis.*	Nil

[1] Based on Vegetation Mapping by Greenloaning Biostudies (2014b).

6.4 SEED COLLECTION AND PROPAGATION

Seed Collection, Management and Storage

Seed collection, management and storage will be undertaken in consideration of Florabank guidelines (http://www.florabank.org.au/) (as listed in Section 4.3). Currently accepted best practice, as described in Rawlings *et al.* (2010) for local provenance seed collection includes:

- Collection of seed from several source sites with similar rainfall, soil, altitude, aspect and slope position to the revegetation site to ensure they are most adapted to the landscape and environmental conditions;
- Collection of seed from between 20-50 plants of each species for genetic diversity; and
- Collection of seed from plants spaced approximately three plant-heights apart to prevent collection of too many closely related seeds.

Records will include all seed collected, species, quantities, dates and locations as per the seed collection protocols (Section 7.1.1).

Propagation

A seed and tubestock supply strategy is described in Section 6.5. Revegetation by seedlings of the scale required will be undertaken by nurseries that can effectively collect commercial quantities of seed, propagate and grow the seed and harden the seedlings.

Orders will need to be placed well in advance of revegetation works to meet the demand for tubestock. The likely time frames for plants to reach transplantable sizes will vary depending on the species and method of propagation (e.g. most species require one season to be of sufficient size, but other species such as *Xanthorrhoea*, *Callitris* and *Bursaria* can take two or more years).

Records will include all sources of propagation, species, quantities and dates (Section 7.1.1).

6.5 REVEGETATION

6.5.1 Revegetation Program

Objectives

The objective of the revegetation program is to increase the area, quality and connectivity of native vegetation and habitats. This revegetation program was developed in consideration of revegetation guidelines such as the Florabank *Native Vegetation Management Tool* (Carr *et al.*, 2010) and *A Guide to Managing Box Gum Grassy Woodlands* (Rawlings *et al.,* 2010).

This revegetation program also reflects the outcomes of the *MCCM Box-Gum Woodland Endangered Ecological Community Implementation Plan* (Whitehaven, 2015b) which was developed to maximise the prospects for regeneration of the Box-Gum Woodland EEC/CEEC on the offset areas (Appendix B).

This revegetation program provides information on the revegetation design, techniques, site preparation and maintenance. Revegetation steps are summarised in Plate 2.

Plate 2 Steps to Active Revegetation

Design

These factors will be considered in the design of the revegetation activities:

- revegetation targets;
- management domains;
- a revegetation schedule;
- site planning;
- species and provenance selection; and
- seed and tube stock supply strategy.

Revegetation Targets

Native vegetation and fauna habitat in the offset areas will be restored focusing on assisted natural regeneration and targeted vegetation establishment. This revegetation program will target:

- restoration of Box-Gum Woodland EEC/CEEC;
- expansion of patches of existing native vegetation;
- creation of buffer zones along watercourses and high value conservation areas (e.g. Leard State Forest);
- creation of corridors that link two or more areas of native vegetation, particularly an east/west corridor to the Namoi River (Condition 54[e] of Schedule 3 to PA 10_0138); and
- restoration of Belah Woodland on property 'Velyama' (Condition 44 of Schedule 3 to PA 10_0138).

The objectives of the offset areas include restoration of self-sustaining vegetation communities within previously cleared areas (i.e. derived native grassland [low to good condition], pasture improved and cultivated land). Successful restoration of previously cleared areas with native vegetation will expand patches of existing native vegetation, increase connectivity and result in an improvement in biodiversity values. For example, the total area of derived native grassland (low to good condition) pasture improved and cultivated land in the revised and approved NSW Biodiversity Offset Strategy (Whitehaven, 2015) is approximately 4,270.8 ha (almost double the area of native vegetation that will be cleared for the MCCM).

Management Domains and Units

Table 6-1 provides a summary of the revegetation actions for each management domain described in Section 6.3. Natural regeneration will be favoured over planting or direct seeding in areas of native woodland/forest and derived native grassland (moderate to good condition) because natural regeneration conserves the natural genetic diversity of the local vegetation. Revegetation (planting or direct seeding) will be undertaken primarily in areas of low diversity derived native grassland, pasture improved and cultivated land. Revegetation Areas are those outside of existing native forest/woodland and derived native grasslands areas identified on Figures 10a to 10g. The revegetation schedule in Table 6-3 will be subject to site planning as discussed further below.

Revegetation Schedule

The provisional revegetation schedule is provided in Table 6-3. There are a number of management units which are likely to receive active revegetation (subject to site planning). Priority will be given to those offset areas that adjoin or are nearby the MCCM and Leard State Forest. The revegetation schedule in Table 6-3 will be subject to site planning as discussed further below.

Planting season depends largely on germination conditions including stored moisture, soil temperature, humidity and rainfall. Local conditions will be considered before planting; however, general planting seasons for Central Western NSW are at autumn break through to the beginning of spring (Rawlings *et al*., 2010).

The revegetation schedule is based on staged revegetation over a number of years in consideration of an adaptive management framework. Revegetation areas will be progressively planned, established, monitored and evaluated. If required, management will be modified to improve the prospects for the next planned revegetation area based on progressive learning.

Table 6-3 provides an indicative schedule of revegetation (revegetation schedule is not limited to those listed and may include other areas depending on revegetation site planning). Follow-up planting may be required to replace lost plants or improve diversity of the revegetation.

Site Planning

The revegetation schedule in Table 6-3 and area to be revegetated will be subject to site planning. Site planning will be undertaken prior to revegetation within a Revegetation Area and would include a site inspection by a suitability qualified person(s) (e.g. restoration ecologist[s]) to provide direction and assist MCC with:

- site preparation requirements (e.g. weed control and nutrient reduction);
- constraints (e.g. infrastructure such as powerlines, access tracks and sheds[8]);
- target vegetation community or combination of vegetation communities for the Revegetation Area (considering factors such as soil, aspect, topography, altitude and pre-clearing vegetation types in order to match species to their preferred soil-landscape);
- flora species to be sown/planted (a list for each target vegetation community);
- application rates for seeds as well as planting densities (spacings) for tube stock to help avoid excessive competition and better mimic natural community structure;
- specific revegetation methods/treatments or research trials; and
- ecological resilience and the dominance of native species (e.g. livestock grazing management outlined in Section 6.11 may result in greater dominance of native species negating or reducing the need for active revegetation [planting and/or seeding]).

[8] Existing infrastructure wholly or partly within the offset areas (e.g. electricity transmission lines, access tracks, water bores and pipes, homesteads and sheds) will be retained and managed as required by the relevant owners and/or managers/licencees.

Table 6-3
Indicative[#] Revegetation Schedule

Management Units	Location	Figure (Figures 12a to 12g)	Year 1 (May 2014 to end of June 2015)	Year 2 (July 2015 to end of June 2016)	Year 3 (July 2016 to end of June 2017)	Year 4 (July 2017 to end of June 2018)
Revegetation						
Rv1	Wollandilly	Figure 12b	-	Design, site preparation and commence revegetation	Maintenance	Maintenance
Rv3	Louenville	Figure 12d	-	Design	Site preparation and commence revegetation	Maintenance
Rv4	Velyama	Figure 12d	-	Design	Site preparation and commence revegetation	Maintenance
Rv6	Kelso	Figure 12e	-	Design	Site preparation and commence revegetation	Maintenance
Revegetation/Enhancement						
Rv/E1	Tralee and Teston (north)	Figure 12a	-	Design, site preparation and commence revegetation	Maintenance	Maintenance
Rv/E2	Teston (south)	Figure 12a	-	Design, site preparation and commence revegetation	Maintenance	Maintenance
Rv/E3	Wollandilly	Figure 12b	-	Design, site preparation and commence revegetation	Maintenance	Maintenance

Table 6-3 (Continued)
Indicative# Revegetation Schedule

Management Units	Location	Figure (Figures 12a to 12g)	Priority Area	Year 1 (May 2014 to end of June 2015)	Year 2 (July 2015 to end of June 2016)	Year 3 (July 2016 to end of June 2017)	Year 4 (July 2017 to end of June 2018)
Revegetation/Enhancement (Continued)							
Rv/E6	Velyama	Figure 12d	2	-	Design	Site preparation and commence revegetation	Maintenance
Rv/E7	Velyama	Figure 12d	2	-	Design	Site preparation and commence revegetation	Maintenance
Rv/E9	Kelso	Figure 12e	2	-	Design	Site preparation and commence revegetation	Maintenance
Revegetation/Restoration							
Rv/R1	Wollandilly	Figure 12b	1	-	Design, site preparation and commence revegetation	Maintenance	Maintenance
Rv/R2	Wollandilly	Figure 12b	1	-	Design, site preparation and commence revegetation	Maintenance	Maintenance

* The actual area of revegetation may be less in a management zone due to specific site constraints; # revegetation schedule is not limited to those listed and may include other areas depending on revegetation site planning.

Light blue highlight — These management units provide for an east/west corridor to the Namoi River by improving connectivity and corridor function in accordance with Condition 54(e) of Schedule 3 to PA 10_0138.

Orange highlight — This management unit contains Belah Woodland on property 'Velyama' that will be enhanced with restoration of at least 5 ha of additional Belah Woodland.

Species and Provenance Selection

Revegetation in the offset areas would preferentially use local endemic (adapted) species (Rawlings *et al.,* 2010), however consideration will be given to the use of a high quality seed sourced further from the site over a low quality more local seed source (Broadhurst *et al.,* 2008 in DECCW, 2011). Seed collection is described in Section 6.4.

Flora species used in this revegetation program will include a variety of grasses, low shrubs, mid-sized shrubs and tall trees to create structurally diverse habitat. A provisional species list is provided in Table 6-4 (including species specifically associated with the Box-Gum Woodland EEC/CEEC).

Table 6-4
Provisional Revegetation Species List

Common Name	Scientific Name	Common Name	Scientific Name
Overstorey		**Understorey**	
* White Box	*Eucalyptus albens*	*Smooth Darling Pea	*Swainsona galegifolia*
* Yellow Box	*Eucalyptus melliodora*	*Barb-wire Grass	*Cymbopogon refractus*
* Blakely's Red Gum	*Eucalyptus blakelyi*	*Silky Blue-grass	*Dichanthium sericeum*
Narrow-leaved Ironbark	*Eucalyptus crebra*	*Daises	*Brachyscome spp.*
Narrow-leaved Grey Box	*Eucalyptus pilligaensis*	*Everlasting Daises	*Chrysocephalum spp.*
Inland Grey Box	*Eucalyptus microcarpa*	*Kangaroo Grass	*Themeda triandra*
Dwyer's Red Gum	*Eucalyptus dwyeri*	*Wallaby Grass	*Austrodanthonia induta*
Midstorey		*Winter Apple	*Eremophila debilis*
*Sticky Hop-Bush	*Dodonaea viscosa ssp. angustifolia*	Blue Trumpet	*Brunoniella australis*
*Wilga	*Geijera parviflora*	Three-awn Speargrass	*Aristida vagans*
Belah	*Casuarina cristata*	Slender Stackhousia	*Stackhousia viminea*
-	*Allocasuarina spp.*	Yellow Burr-daisy	*Calotis lappulacea*
Black Tea-tree	*Melaleuca bracteata*	-	*Rostellularia adscendens var. adscendens*
Silver Wattle	*Acacia dealbata*	Plains Grass	*Austrostipa aristiglumis*
Hickory Wattle	*Acacia implexa*	-	*Panicum spp.*
White Cypress Pine	*Callitris glaucophylla*	-	*Austrodanthonia spp.*
Scant Pomaderris	*Pomaderris queenslandica*	-	*Bothriochloa spp.*
Buloke	*Allocasuarina leuhmanii*	-	*Chloris spp.*
Scant Pomaderris	*Pomaderris queenslandica*	-	*Tylophora linearis*

* Specifically associated with the Box-Gum Woodland EEC/CEEC.

The *MCCM Threatened Fauna Implementation Plan* (Whitehaven, 2015a) was developed to maximise the likely prospects of providing suitable habitats for threatened fauna within the offset areas (including those species listed in Condition 49 of Schedule 3 to PA 10_0138). Table 6-4 includes flora species known to be used as habitat resources for threatened fauna that were identified in the *MCCM Threatened Fauna Implementation Plan* (Whitehaven, 2015a).

The Regent Honeyeater (*Xanthomyza phrygia*) and Swift Parrot (*Lathamus discolor*) may potentially use Box-Gum Woodland EEC/CEEC in the offset areas as a foraging resource (although neither species was recorded in the offset areas or in Leard State Forest). In consideration of the potential foraging habitat requirements of the Regent Honeyeater (*Xanthomyza phrygia*), a variety of box, ironbark and gum eucalypt species will be established, including, but not limited to, White Box (*Eucalyptus albens*), Yellow Box (*E. melliodora*), Blakely's Red Gum (*E. blakelyi*), Allocasuarina and Casuarina species (Table 6-4). In consideration of the potential habitat requirements of the Swift Parrot (*Lathamus discolor*), a variety of winter-flowering box, ironbark and gum eucalypt species will be established, including, but not limited to, White Box (*E. albens*) (Table 6-4).

The proposed revegetation of box, ironbark and gum eucalypt species (Table 6-4) can provide habitat for potential sources of prey for the South-eastern Long-eared Bat (*Nyctophilus corbeni*).

Box-Gum Woodland

Box-Gum Woodland is dominated or co-dominated by White Box, Yellow Box or Blakely's Red Gum trees, however, the species composition of Box-Gum Woodland varies across its range in NSW, Queensland and Victoria depending on local conditions (e.g. slope, aspect, soil type). The revegetation program will focus on establishing Box-Gum Woodland with a similar composition of flora species to the existing vegetation communities which represent the Box-Gum Woodland EEC/CEEC. In other words a patch will be expanded using species which occur [or likely to have formerly occurred] in that patch. This will also mimic the variation (patchiness) of the Box-Gum Woodland within the landscape. Box-Gum Woodland is represented by the following vegetation communities in the offset areas (Greenloaning Biostudies, 2014b):

- Blakely's Red Gum - White Box - ± Yellow Box - Melaleuca Riparian Forest;
- Blakely's Red Gum - Yellow Box Grassy Woodland (± Stringybark);
- Rough-Barked Apple - Blakely's Red Gum Riparian Grassy Woodland;
- White Box - Stringybark - ± Manna Gum Grassy Woodland;
- White Box - ± Yellow Box ± Stringybark Grassy Woodland;
- White Box - White Cypress Pine ± Narrow-Leaved Ironbark Grassy Open Forest;
- White Box - White Cypress Pine ± Narrow-Leaved Ironbark Grassy Woodland;
- White Box - Wilga - Belah Woodland;
- White Box - Wilga ± Quinine Semi-Cleared Woodland;
- White Box (± Stringybark) Grassy Woodland;
- Yellow Box - Blakely's Red Gum - ± Manna Gum Open Forest/Woodland; and
- Yellow Box ± White Cypress Pine Grassy Woodland.

Active revegetation of Box-Gum Woodland will prioritise areas of Derived Native Grassland (Box-Gum Woodland -low diversity and not conforming to the EEC/CEEC) shown on Figures 8a to 8d; but other areas of Derived Native Grassland will also be assessment through site planning processes to determine if active revegetation is required where natural regeneration has been limited or non-existent.

Local native perennial grasses, e.g. Kangaroo Grass (*Themeda triandra*), will be sown in revegetation areas targeting Box-Gum Woodland as these species are known to out-compete annual grass weeds and provide inter tussock spaces for a diversity of ground cover species (e.g. wildflowers). Additional information on species to include in revegetation of Box-Gum Woodland can be found in the Florabase (2014) *Box-Gum Grassy Woodland Species - Species Navigator Fact Sheets*.

Seed and Tube Stock Supply Strategy

The seed and tube stock supply strategy involves:

- calculation of the amount and species of seed and tube stock required each year;
- review of the amount and species of seed collected locally (e.g. at the mine site and offset areas);
- identifying the gaps and constraints to meeting the demand;
- handling and storage requirements;
- pre-planting treatments; and
- review of how additional seed and/or tube stock will be sourced to meet the demand.

Revegetation Techniques

Revegetation techniques (natural regeneration, direct seeding and tubestock planting) are described below. A combination of revegetation techniques may be used in a revegetation area.

Passive Revegetation - Natural Regeneration

As described above, natural regeneration will be favoured over planting or direct seeding in areas of native woodland/forest and derived native grassland (moderate to good condition) because natural regeneration conserves the natural genetic diversity of the local vegetation. For example, the condition of the Box-Gum Woodland in the offset areas range from good to degraded condition mainly due to past clearing, grazing, weeds and pests. Natural regeneration in semi-cleared woodland or derived grasslands of Box-Gum Woodland will be promoted through reduced grazing pressure and management of threatening processes to Box-Gum Woodland. Grazing management is discussed in Section 6.11. Controlled burns to stimulate natural regeneration should be examined on an experimental basis (Section 6.13).

Natural regeneration is not likely to occur in pasture improved and cultivated land due to an absence or deficiency of native seed causing low resilience. Active revegetation is therefore discussed below.

Active Revegetation - Direct Seeding and Tubestock Planting

Direct seeding and/or tubestock planting will be undertaken primarily in areas of low diversity derived native grassland, pasture improved and cultivated land (Figures 9a to 9c). A combination of direct seeding and tubestock planting may be used to increase the diversity of species, as some species are better suited to direct seeding, and other species are better established by tubestock.

Direct seed and tubestock planting will be undertaken in consideration of the Florabank *Native Vegetation Management Tool* (http://www.florabank.org.au/) (Carr *et al.*, 2010) and *A Guide to Managing Box Gum Grassy Woodlands* (Rawlings *et al.,* 2010).

As described above, the site planning will be undertaken prior to revegetation to provide direction and assist MCC with application rates for seeds as well as planting densities for tube stock to help avoid excessive shading better mimic natural communities (species relative abundance and community structure). Box-Gum Woodlands typically have widely spaced trees (30–40 trees/ha) with a ground cover of grasses and a sparse or patchy shrub layer (Rawlings *et al.,* 2010; DEH, 2006). In an ideal patch of Box-Gum Woodland, the groundcover is a mixture of tussock grasses (i.e. grasses in clumps or bunches, rather than a lawn), bare ground, leaf litter, fallen timber, rocks and forbs (Rawlings *et al.,* 2010).

Large areas can be seeded quickly using mechanical seeders (e.g. up to 50 ha/day) and mechanical planters can be used to plant tubestock (Greening Australia, 2015).

Slow-release native plant fertiliser may be selectively used to promote plant growth (if required).

Site Preparation

Site preparation involves consideration of soil testing, grazing protection, weed control and ground preparation as discussed below.

Soil Testing

Elevated soil nutrients (such as nitrogen) can inhibit revegetation efforts and favour the growth of weeds (Prober *et al.,* 2002; Rawlings *et al.,* 2010; DECCW, 2011). Where necessary, soil testing will be undertaken on soils in previously cultivated land (within the Revegetation Domain) to identify issues with physical and chemical characteristics as well as determine the need for nutrient reduction. Nutrient reduction options in these low diversity native grasslands/pasture improved and/or cultivated land are as follows:

- crash grazing periodically to remove nutrients locked in weeds;
- restriction of livestock access to limit further nutrient enrichment and waiting for the soil fertility levels to drop prior to revegetation activities (Dorrough *et al*., 2008) (Section 6.11);
- controlled burns (Section 6.13);
- soil scalping (Gibson-Roy *et al.,* 2010); and/or
- planting crops, including all related activities to allow such, which will take up the elevated soil nutrients and harvesting the plants to remove the nutrients, including all related activities to all such (Rawlings *et al.*, 2010).

Grazing Protection

Livestock will be excluded from areas undergoing active revegetation (i.e. planting or seeding) (Section 6.11). High fertility cultivated paddocks can be rapidly dominated by exotic perennial grasses once grazing is removed (Dorrough *et al.,* 2008), hence the importance of soil testing (above).

Weed Control

Weed control is described in Section 6.8 and weed monitoring is discussed in Section 6.17.3. There will be a higher need for weed control in cleared land and along waterways compared to existing intact native woodland/forest. Controlling weeds prior to active revegetation can reduce competition and improve the success of revegetation. Cultivation or targeted scalping may be required to remove weeds and nutrients prior to seeding/planting.

Ground Preparation

Soil compaction inhibits germination of seeds or growth of seedlings (Eddy, 2002; Department of Sustainability and the Environment, 2005; Rawlings *et al.,* 2010; DECCW, 2011). Ground preparation will be undertaken as required to reduce soil compaction and improve infiltration which can affect the success of the revegetation.

Cultural heritage considerations are discussed in Section 6.7.

Improving Habitat Values

Section 4.1.6 describes the salvage of habitat resources (bush rocks, timber/hollow logs) during vegetation clearance at the MCCM. Section 6.6 describes the reuse of salvaged habitat resources.

Maintenance

The revegetation areas will be maintained through a variety of activities, including weed control (Section 6.8) and feral animal control (particularly grazing herbivores) (Section 6.9).

Contingency measures to address potential issues with the revegetation areas (e.g. poor understorey diversity, plant growth or grazing kangaroos) are provided in Section 6.18.

Revegetation Monitoring and Reporting

Monitoring of the revegetation areas is discussed in Section 6.17, record keeping is discussed in Section 7.1, and reporting requirements are discussed in Section 7.2.

6.5.2 Ecological Thinning

Sometimes regeneration is too successful and trees may compete with each other for light, water and nutrients (Rawlings *et al.,* 2010; DECCW, 2011). Dense overstorey and midstorey revegetation may require ecological thinning (through selective clearing).

Ecological thinning can increase floristic diversity and structural complexity within a revegetated area and prevent poor or stunted growth of established plants (Bauhus *et al*., 2001). It also promotes greater access of understorey species, typically herbaceous groundcovers, to resources such as space, light, and nutrients that may otherwise have been restricted by high tree densities. Thinning also increases the amount of woody debris in an area which can provide suitable habitat for ground-dwelling fauna and create microhabitats for flora.

Ecological thinning will be undertaken in an adaptive fashion in select areas where necessary to promote the floristic diversity and structural complexity within the areas undergoing revegetation (the Enhancement, Restoration and Revegetation Domains). Thinning density will be consistent with the species relative abundance and community structure of the target vegetation community (see specific information on Box-Gum Woodland below).

Trees will be felled using a chainsaw or brush cutter to minimise the potential for disturbance to non-target vegetation. Targeted weed monitoring and control will be undertaken (if necessary) in disturbed areas subject to ecological thinning.

Native vegetation clearing in the offset areas will not be undertaken unless for ecological thinning, infrastructure related to the offset areas, maintenance or access for monitoring and bushfire management.

Box-Gum Woodland

Box-Gum Woodland tree density of 30-40 mature trees per hectare is considered ecologically optimal (Rawlings *et al.,* 2010; McIntyre *et al.,* 2002), with spacing (between mature trees) of half to two crown widths. During 2014, Greenloaning Biostudies identified some areas of Box-Gum Woodland with dense Cypress Pine regeneration (Figures 12a, 12d and 12f). These areas do not meet the condition criteria for the Box-Gum Woodland EEC/CEEC, but could do so with ecological thinning.

Thinning methods will be consistent with *A Guide to Managing Box Gum Grassy Woodlands* (Rawlings *et al.,* 2010). Smaller trees (less than 10 cm diameter at breast height) will be thinned to 400 stems/ha (approximately 5 x 5 m spacing). Larger trees (greater than 10 cm diameter at breast height) will be thinned to 250 stems/ha (approximately 6 x 7 m spacing). Smaller trees will be preferentially removed.

Targeted revegetation may also be undertaken in these areas to increase the condition of the vegetation above the criteria for the Box-Gum Woodland EEC/CEEC.

6.6 REUSE OF SALVAGED HABITAT RESOURCES

Section 4.1.6 describes the salvage of naturally scarce fauna habitat features (bush rocks, timber/hollow logs) during vegetation clearance at the MCCM for beneficial reuse. These habitat resources will be used in rehabilitation of the post-mine landforms and in select management units in the offset areas near the MCCM (Table 6-5).

Table 6-5
Reuse of Salvaged Habitat Resources

Management Units	Location	Figure Reference
Revegetation		
Rv1	Wollandilly	Figure 12b
Rv2	Warriahdool	Figure 12a
Revegetation/Enhancement		
Rv/E1	Tralee and Teston (north)	Figure 12a
Rv/E2	Teston (south)	Figure 12a
Rv/E3	Wollandilly	Figure 12b
Rv/E4	Wollandilly	Figure 12b
Rv/E5	Warriahdool	Figures 12a and 12b
Revegetation/Restoration		
Rv/R1	Wollandilly	Figure 12b
Rv/R2	Wollandilly	Figure 12b

As described in Section 4.1.6, the salvaged habitat features will be moved to interim storage areas at the mine site until a time that they can be relocated or preferably transported immediately to pre-identified sites if available either on mine rehabilitation [commencing in 2018] or the offset areas[9].

The number of bush rocks added to the offset areas, amount of timber/logs and number of salvaged hollow logs installed in trees will depend on the results of the salvage program at the mine site and use on mine rehabilitation areas. Machinery may be required to transport salvaged habitat features across the offset areas.

Relocation of Bush Rocks

Relocation of bush rocks within the Leard State Forest or beyond the forest boundary will be undertaken as agreed with FCNSW. Bush rocks will be used in cleared areas within a selection of the management units in Table 6-5 to increase the structural complexity of the management units once they undergo revegetation. Bush rocks provide habitat for some invertebrates and reptiles. Bush rocks will be placed either in piles or scattered.

[9] Salvaged habitat features may be held in interim storage areas for up to five years.

Relocation of Timber/Hollow Logs

Timber/logs will also be used in cleared areas within a selection of the management units in Table 6-5 to increase the structural complexity of the management units once they undergo revegetation. Timber/logs will be placed to avoid piles that could harbour feral animals.

Provision of Nesting Habitat for Hollow-dwelling Fauna

Salvaged hollow logs (as specified in Section 4.1.6) will be installed in select trees within a selection of the management units in Table 6-5 to provide nesting habitat for arboreal mammals (bats) and birds. Healthy living trees without existing hollows would be selected for placement of the hollow logs. The hollow logs for nesting habitat will be suspended off the ground, with consideration of the aspect of the placement. Co-ordinate locations of installed hollow logs will be recorded using a GPS.

6.7 MANAGEMENT OF CULTURAL HERITAGE VALUES

There is not expected to be any conflict between the proposed restoration works in the offset areas and any Aboriginal heritage values (both cultural and archaeological). However, it is noted that:

- Any disturbance works in the offsets will consider potential impacts to heritage values.
- This BMP will need to consider the outcomes of the Aboriginal Heritage Conservation Strategy required by Condition 57, Schedule 3 to PA 10_0138.
- If any artefacts are found or known to occur, then consultation will be undertaken with qualified heritage consultants and an appropriate course of action identified. Offset areas outside of the approved Project Boundary will need to meet all statutory requirements under the *National Parks and Wildlife Act 1974* (NP&W Act).

6.8 CONTROL OF WEEDS

Objectives

Environmental and noxious weeds can have detrimental effects on native remnant vegetation and have the potential to compromise revegetation efforts. Weed management of the offset areas will be aimed at controlling the occurrence and spread of environmental (e.g. WONS) and noxious weeds whilst encouraging native species. The long term objective is to reach a stage where the offset areas only require a low level of weed control and where the native vegetation is not inhibited by the presence of weeds.

Weed Prevention

The spread and introduction of weeds can be prevented by minimising disturbances that result in bare soil. Access tracks/fire trails will be maintained and preferentially used to provide access within the offset areas (Section 6.2.3). Access to the offset areas will also be controlled as described in Section 6.12.

The spread of weeds from infested areas will be minimised through washing down vehicles and machinery as required.

The implementation of measures that favour the restoration of healthy native vegetation that outcompetes weed species can also be an effective method of weed management. Revegetation is discussed in Section 6.5.

Weed Control Program/Timing

The weed control program will involve:

- identifying weeds (Section 4.13.2);
- application of weed control techniques in areas requiring weed control;
- follow-up monitoring of weed control; and
- follow-up inspection weed control as required.

Weed control will be undertaken for the targeted weed species based on seasonal conditions.

Follow-up weed control will be undertaken, as required, in areas that have received past primary weeding treatments. Follow-up treatments ensure pressure is maintained on weeds assisting regenerating or planted native plants to out-compete weed species.

Weed Control Techniques

A number of environmental and noxious weeds are known to occur in the offset areas as listed in Table 6-6. Initially weeding will take place targeting the noxious weeds (Table 6-6) and as well as any other environmental weeds present in the offset areas. However, if new weeds species are found, those new weeds species will also be managed in accordance with this BMP.

Recommended techniques for removal of noxious weeds that have been published by DPI Agriculture will be consulted prior to weed control, e.g. *Noxious and Environmental Weed Control Handbook* (DPI, 2014a). Local weed management plans published by the Local Councils (Narrabri Shire Council, 2014; Tamworth Regional Council, 2014 and Gunnedah Shire Council, 2014) also provide information on the control of noxious weeds. Relevant methods for controlling noxious weeds known to occur in the offset areas are summarised in Table 6-6.

Table 6-6
Control of Example Target Noxious Weeds

Common Name	Scientific Name	Status[1]	Example Control Methods (DPI, 2014a)[2]
Mother of Millions	*Bryophyllum delagoense*	Class 4	• herbicide application
Paterson's Curse	*Echium plantagineum*	Class 4	• grazing management practices • herbicide application
African Boxthorn	*Lycium ferocissimum*	Class 4	• physically remove • herbicide application
Common Prickly Pear	*Opuntia stricta*	Class 4	• herbicide application
Prickly Pear	*Opuntia* sp.	Class 4	• herbicide application
Tiger Pear	*Opuntia aurantiaca*	Class 4	• herbicide application
Sweet Briar	*Rosa rubiginosa*	Class 4	• physical removal • herbicide application
Fireweed	*Senecio* spp.	Class 4	• grazing management practices • herbicide application
Cockle Burr	*Xanthium occidentale*	Class 4	• physical removal • herbicide application
Bathurst Burr	*Xanthium spinosum*	Class 4	• physical removal • herbicide application

Sources: Australian Museum Consulting (2014); Cumberland Ecology (2011) and Niche Environment and Heritage (2012).

[1] *Noxious Weeds Act, 1993* for the Narrabri Shire Council; Tamworth Regional Council; and Gunnedah Shire Council.

[2] An alternative published method may be used as required.

In addition to species listed in Table 6-6, Coolatai Grass (*Hyparrhenia hirta*) is particularly invasive and is a recognised threat to Box-Gum Woodland EEC/CEEC (DECCW, 2011), although it is not noxious in the control areas relevant to the offset areas. In the event that Coolatai Grass is found in the offset areas, individual plants can be pulled by hand or treated with herbicide (DPI, 2014a).

All personnel involved in weeding management will be required to hold relevant and valid licences/ permits for weeding works, including a chemical licence to use herbicides and a chainsaw certificate to operate chainsaws (where applicable).

Weed control techniques in Table 6-6 (i.e. physical removal, herbicide application and grazing management practices) are described below. Nutrient management by removal of grazing livestock and controlled burns to reduce annual and perennial grass weeds are also described below. Additional techniques may be undertaken depending on the weed species present and the success of these control techniques.

Physical Removal

Some woody weeds (e.g. African Boxthorn and Sweet Briar) may be physically removed. After physical removal of any plant material, the plant material will be stockpiled (for no more than 1 week) away (>200 m) from sensitive areas (i.e. creeks or Box-Gum Woodland CEEC/EEC) that avoids further spread of the woody weed and disposed of appropriately.

In addition to species listed in Table 6-6, exotic trees such as Elms (*Ulmus* sp.) and Weeping Willows (*Salix babylonica*) will be controlled and removed from areas of occurrence along Horton Creek. This is intended to promote regeneration of native riparian vegetation.

Herbicide Application

The application and concentration of herbicides will be in consideration of the *Noxious and Environmental Weed Control Handbook* (DPI, 2014a). Removal of weeds with a herbicide will involve techniques such as but not limited to:

- selective spraying of weeds, with selective and non-selective herbicide;
- cutting or scraping deep rooted woody weeds and climbers with hand tools, chainsaws and brush cutters, and painting cut stumps with herbicides; and
- target drilling and injecting large tree weeds with herbicides.

Herbicide sprays will only occur during suitable weather conditions (i.e. not during wet or windy conditions), and during appropriate seasons.

Crash Grazing Periodically to Reduce Annual and Perennial Grass Weeds

Crash grazing is the practice of allowing high densities of livestock to graze targeted areas for short periods of time, and is aimed at breaking up mats of perennial grass species to allow room for natural regeneration of trees and shrubs to take place. Crash grazing can also assist with the prevention or reduction of weedy annual or perennial grass seed production.

Management of livestock grazing is described in Section 6.11.

Nutrient Management – Removal of Grazing Livestock

Grazing livestock add nutrients into the soil and disturb groundcover which can promote the growth of weeds. Management of livestock grazing is described in Section 6.11.

Controlled Burns to Reduce Annual and Perennial Grass Weeds

Controlled burns may be undertaken in Revegetation and Restoration Domains to reduce weeds and/or promote the biodiversity. Spring burns can be useful for reducing the mass of exotic annual grasses (Rawlings *et al.,* 2010) which occur in the Revegetation and Restoration Domains. Bushfire management is described in Section 6.13. Autumn burns may be useful to assist with natural tree and shrub regeneration and to assist with ecological thinning. Controlled burns will be conducted on an adaptive (experimental) basis.

Weed Monitoring and Reporting

Weed monitoring is discussed in Section 6.17.3, record keeping is discussed in Section 7.1, and reporting requirements are discussed in Section 7.2.

6.9 CONTROL OF FERAL ANIMALS

Objectives

The goal of feral animal management in the Offset Areas will be to ensure that impacts to native species, existing vegetation and rehabilitation efforts caused by feral animals are minimised and managed. Feral animals will be controlled within all offset areas with the long term objective being to reach a stage where the conservation management areas only require a low level of feral animal control and where the biodiversity value of native vegetation and rehabilitation efforts and restorations areas are not at high risk from feral animal.

Feral Animal Control Techniques

Feral animal management will focus on the main feral animals recorded from the offset areas (Table 6-7). However, if new feral animals are found during monitoring those new feral animals will also be managed in accordance with this BMP. The control of feral animals is intended to be adaptive and will be informed/reviewed based on the findings from the Feral Animal Monitoring Program (Section 6.17.4). The control program will also consider advice from neighbouring landowners regarding observations of target feral animals upon offset areas.

Control measures will be implemented by mine staff or by an appropriate Pest Control Contractor(s) as required. All personnel involved in feral animal control will be required to hold relevant and valid licences/permits, including any relevant chemical licences for pesticide use or a firearms licence for shooting. The *Humane Pest Animal Control: Code of Practice and Standard Operating Procedures* (DPI, 2013, or its revision) will be followed.

Table 6-7
Control Methods for Target Feral Animals

Common Name	Scientific Name	Status[1]	Example Control Method	Relevant Documents[2]
Birds				
Common Myna	*Acridotheres tristis*	-	• trapping.	-
Mammals				
Feral Pig	*Sus scrofa*	Declared pest	• trapping/ground shooting; and/or • ground baiting (using 1080 poison).	• *Threat Abatement Plan for Predation, Habitat Degradation, Competition and Disease Transmission by Feral Pigs* (Department of the Environment and Heritage, 2005); • *PestSmart Toolkit* (Invasive Animals Cooperative Research Centre, 2015); and • *Vertebrate Pest Control Manual* (DPI, 2014b).
Feral Goat	*Capra hircus*	-	• ground shooting.	• *Threat Abatement Plan for Competition and Land Degradation by Unmanaged Goats* (DEWHA, 2008d); and • *PestSmart Toolkit* (Invasive Animals Cooperative Research Centre, 2015).
European Red Fox	*Vulpes vulpes*	Declared pest	• trapping; and/or • ground baiting (using 1080 poison).	• *Threat Abatement Plan for Predation by European Red Fox* (DEWHA, 2008a); • *NSW Threat Abatement Plan For Predation by The Red Fox (Vulpes vulpes)* (OEH, 2011); • *PestSmart Toolkit* (Invasive Animals Cooperative Research Centre, 2015); and • *Vertebrate Pest Control Manual* (DPI, 2014b).
European Rabbit	*Oryctolagus cuniculus*	Declared pest	• warren ripping/fumigation; • ground shooting; and/or • ground baiting (using 1080 poison).	• *Threat Abatement Plan for Competition and Land Degradation by Rabbits* (DEWHA, 2008b); • *PestSmart Toolkit* (Invasive Animals Cooperative Research Centre, 2015); and • *Vertebrate Pest Control Manual* (DPI, 2014b).
Brown Hare	*Lepus capensis*	-	• ground shooting.	• *Integrated Hare Control* (Department of Environment and Primary Industries [VIC], 2015); and • *Vertebrate Pest Control Manual* (DPI, 2014b).
Feral Deer	*Cervus spp., Axis spp., or Dama spp.*	-	• ground shooting.	• *Feral Fallow Deer Dama dama Fact Sheet* (Department of Agriculture, Fisheries, Forestry and Biosecurity Queensland, 2013); • *Feral Deer* (DotE, 2011); and • *Vertebrate Pest Control Manual* (DPI, 2014b).
Feral Cat	*Felis catus*	-	• ground baiting; and/or • shooting.	• *Threat Abatement Plan for Predation by Feral Cats* (DEWHA, 2008c); • *PestSmart Toolkit* (Invasive Animals Cooperative Research Centre, 2015); and • *Vertebrate Pest Control Manual* (DPI, 2014b).

Table 6-7 (Continued)
Control Methods for Target Feral Animals

Common Name	Scientific Name	Status[1]	Example Control Method	Relevant Documents[2]
Wild Dog	*Canis familiaris*	Declared pest	• ground baiting (using 1080 poison); and/or • ground shooting.	• *New South Wales Wild Dog Management Strategy 2012-2015* (DPI, 2012); • *Wild Dog Policy* (DECC, 2005); • *PestSmart Toolkit* (Invasive Animals Cooperative Research Centre, 2015); and • *Vertebrate Pest Control Manual* (DPI, 2014b).
Black Rat	*Rattus rattus*	-	• ground baiting.	• *Vertebrate Pest Control Manual* (DPI, 2014b).
House Mouse	*Mus musculus*	-	• ground baiting.	• *Vertebrate Pest Control Manual* (DPI, 2014b).
Feral Camel	*Camelus dromedarius*	-	• ground shooting.	• *National Feral Camel Action Plan* (DotE, 2010).

[1] *Local Land Services Act 2013*

[2] An alternative published method may be used as required.

Feral animal control techniques in Table 6-7 are described in Section 4.6 and below. A selection of these techniques or additional techniques may be undertaken depending on the feral animal species which is in an abundance that requires control (as determined through monitoring) and the success of these control techniques.

Common Myna

Although poisoning and shooting have been used to control small numbers of Mynas, neither method is considered to be effective, and safe for humans and non-target animals in broad-scale use. One avenue for safe, humane and effective control of Mynas is selective trapping (Tideman, 2005). Mynas can be trapped selectively with nest-box traps during the breeding season (Austral spring), and with valve traps at feeding areas. Mynas captured in traps can be euthanased whilst held within the trap by immersing the capsule of the trap in a gassing sleeve (Tideman, 2005).

Feral Animal Monitoring and Reporting

Feral animal monitoring is discussed in Section 6.17.4, record keeping is discussed in Section 7.1, and reporting requirements are discussed in Section 7.2.

6.10 CONTROL OF EROSION AND SOIL

Erosion

Livestock grazing has the potential to cause erosion, particularly along watercourses. Grazing livestock will be excluded from various management domains that contain watercourses (Habitat Management Domain, Enhancement Management Domain, Restoration/Enhancement Management Domain) and riparian zones within management unit Rv2 (Back Creek), Rv/E1 (Back Creek and Whiskey Creek), Rv/E4 and Rv/E11 (Maules Creek) as well as management unit Rv6 and Rv/E8 (Namoi River). Further, drainage areas in paddocks subject to grazing will generally be well grassed (with high ground cover) or fenced off from livestock grazing.

The proposed revegetation program (that aims to restore native vegetation cover) and livestock grazing management program (that will lessen grazing pressures) will likely reduce the potential of erosion issues developing in the offset areas.

An existing area of erosion occurs in Rv/E1. This area will be remediated as part of the revegetation program.

Soil Salinity

Salinity is not known to be an issue for the offset areas (after McKenzie Soil Management, 2015), and the actions specified in this BMP are not likely to increase the level of salinity, and therefore no salinity management measures are proposed to be undertaken in this BMP.

6.11 MANAGEMENT OF LIVESTOCK GRAZING

Objectives

The offset areas will be managed primarily for the purposes of compensating for biodiversity impacts from the MCCM and improving regional biodiversity outcomes. If required, the objectives of controlled livestock grazing are to protect existing intact bushland areas and riparian areas whilst stimulating natural regeneration of native vegetation and/or controlling weeds.

Agricultural Suitability Assessment

In January 2015, McKenzie Soil Management Pty Ltd (Dr David McKenzie) undertook an Agricultural Suitability Assessment in accordance with Condition 46 of Schedule 3 to PA 10_0138. In relation to the offset areas, the objectives of the agricultural suitability assessment were to:

- undertake a review of the suitability of grazing livestock within the offset areas (in low diversity derived grassland, cultivated land and pasture improved land) to assist natural regeneration.
- provide recommendations of agricultural-related management measures for maintaining or enhancing the lands within the offset areas for conservation and corridor enhancement purposes.

In summary, the recommendations were to:

- to restrict livestock grazing in existing intact bushland areas, riparian areas and areas undergoing active planting/seeding;
- use strategic livestock grazing (if required) prior to revegetation in the additional low diversity derived grassland, cultivated land and pasture improved land to control weeds and carry out the grazing in a way that minimises damage to soil structure;
- strategic livestock grazing may be used in derived native grasslands to promote diversity and control weeds (e.g. a controlled regime with crash grazing, resting, light grazing and rotational grazing); and
- gradually de-stock the offset areas once native vegetation is dominant.

The management of livestock grazing in the offset areas is described below based on these recommendations and consideration of *A Guide to Managing Box Gum Grassy Woodlands* (Rawlings *et al.,* 2010); *Biodiversity in the Paddock: a Land Managers Guide* (Dorrough *et al.,* 2008) and *Sustainable Land Management Practices for Graziers* (Stein *et al.,* 2009).

Grazing Management

Grazing will be managed as outlined below.

Short Term (3 year period of this BMP)

Agriculture/grazing will be removed from offset areas as existing licence/agistment agreements expire. The offset areas will be rested to allow natural and active revegetation to commence with the exclusion of grazing continued until such time as revegetation can survive browsing. The following offset areas specifically will have grazing excluded:

- Habitat Management Domain;
- Enhancement Management Domain;
- Restoration/Enhancement Management Domain;
- riparian zones within Rv2 (Back Creek), Rv/E1 (Back Creek and Whiskey Creek), Rv/E4 and Rv/E11 (Maules Creek) as well as Rv6 and Rv/E8 (Namoi River); and
- existing native woodland/forest containing *Tylophora linearis* within Rv/E1, Rv/E2 and Rv/R1.

Medium Term

Grazing could be used in accordance with the agricultural suitability assessment for biodiversity management to protect existing intact bushland areas and riparian areas whilst stimulating natural regeneration of native vegetation and/or controlling weeds until such time as the native vegetation condition improves to the Enhancement Ecosystem State (see Table 6-1).

Long Term

All agriculture/grazing will be excluded from the offset area.

6.12 CONTROL OF ACCESS

As described in Section 6.2.3, the offset areas will be set-up on the ground by:

- using existing fencing (where practicable and required) to demarcate the perimeter around the offset areas to manage grazing livestock and avoid accidental clearance;
- installing gates into the offset areas; and
- installing signage on gates into the offset areas which recognised that the area is protected for conservation purposes and to deter third party access into the area.

Vehicle access will be predominantly restricted to designated tracks to minimise ground disturbance (e.g. compaction); with the exception for biodiversity management actions and inspections which unavoidably result in vehicles and machinery travelling off-tracks within the offset area. Maintenance of all access tracks, fire trails, fences and gates to be undertaken as required.

6.13 BUSHFIRE MANAGEMENT

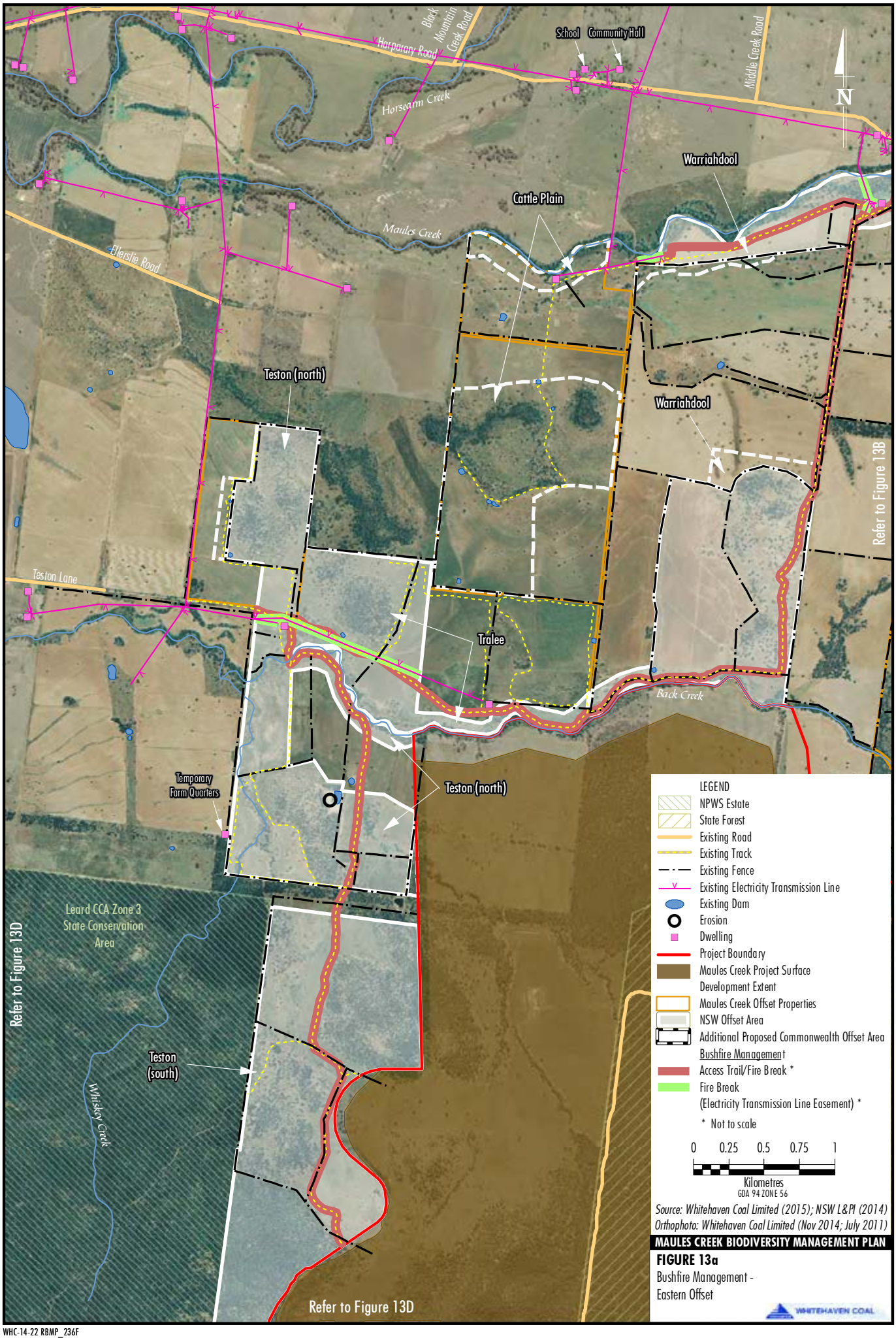
Objectives

The objective of fire management for the offset areas is to:

- appropriately manage the risk of unplanned bushfire occurring;
- respond to an unplanned bushfire were it to occur; and
- use fire to reduce weeds and/or promote the biodiversity of the offset areas.

Maintaining Fire Breaks and Access Trails

Infrastructure in the offset areas is shown in Figures 13a to 13g and includes dwellings, fence lines and power lines. Fire access trails identified in Figures 13a to 13g are indicative only. Final locations of fire breaks will be assessed based on routine fuel load and fire hazard assessments. In general, fire breaks will be periodically maintained as zero fuel barriers acknowledging that in between maintenance that some fuel accumulation will occur. Fire breaks are to be located along the perimeter of property/offset boundaries to mitigate fire spreading onto or off the site; as well as fire breaks established strategically within the properties/offsets utilising internal infrastructure boundaries, access trails and fence lines for controlled or back burn ignition sites in case of bush fires.



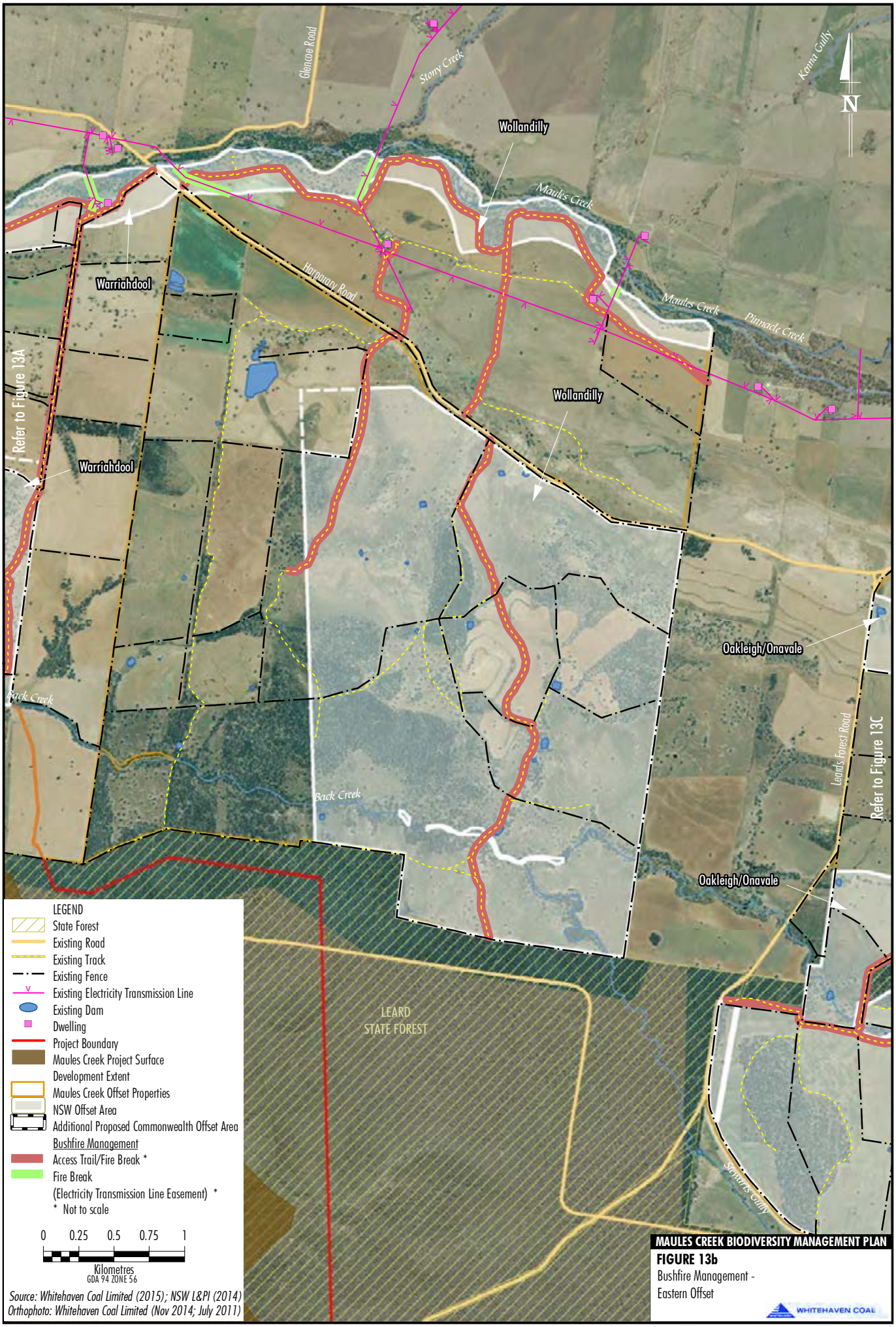
Source: Whitehaven Coal Limited (2015); NSW L&PI (2014)
Orthophoto: Whitehaven Coal Limited (Nov 2014; July 2011)

MAULES CREEK BIODIVERSITY MANAGEMENT PLAN

FIGURE 13a
Bushfire Management - Eastern Offset

WHITEHAVEN COAL

WHC-14-22 RBMP_236F

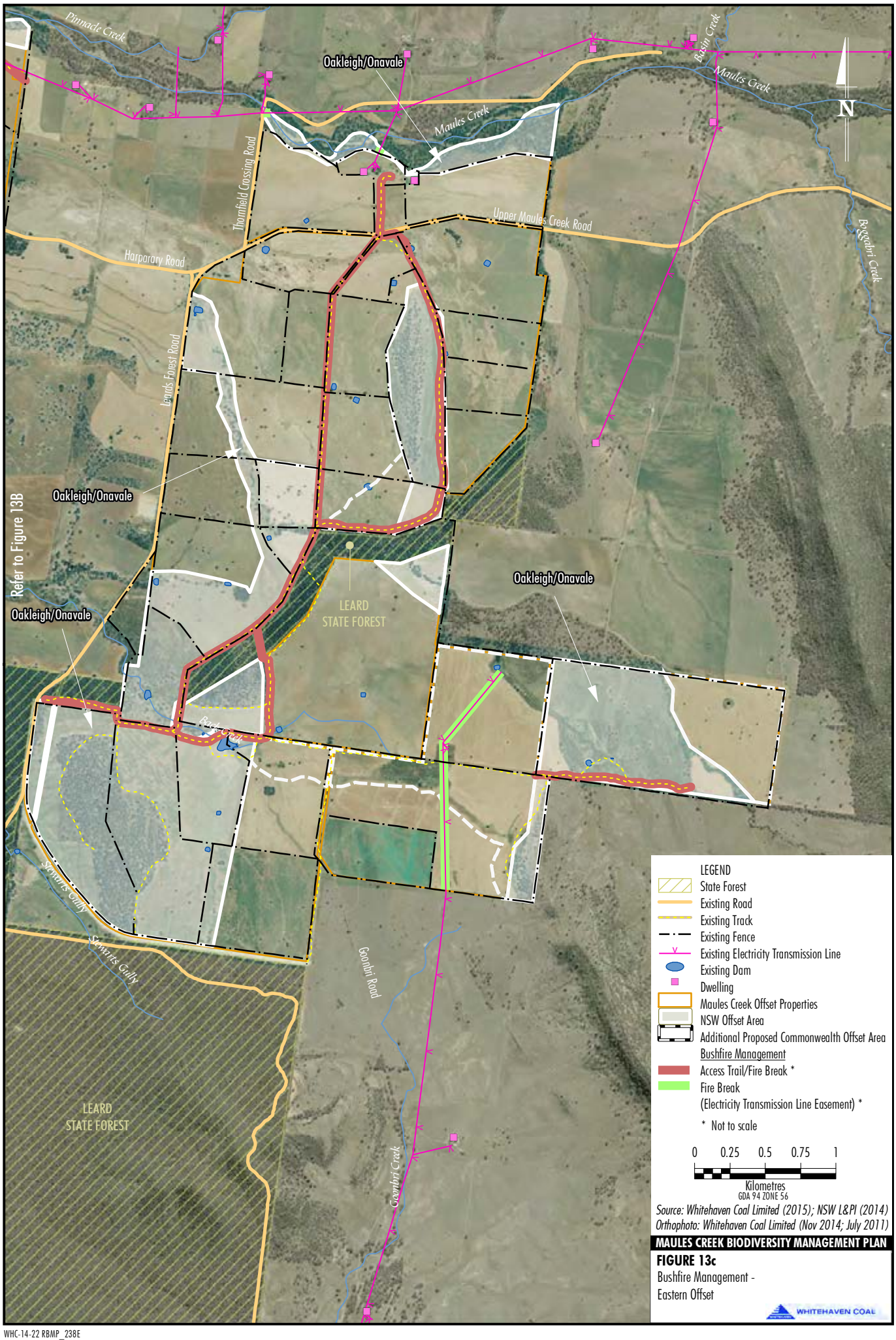


MAULES CREEK BIODIVERSITY MANAGEMENT PLAN

FIGURE 13b
Bushfire Management - Eastern Offset

WHITEHAVEN COAL

WHC-14-22 RBMP_237E



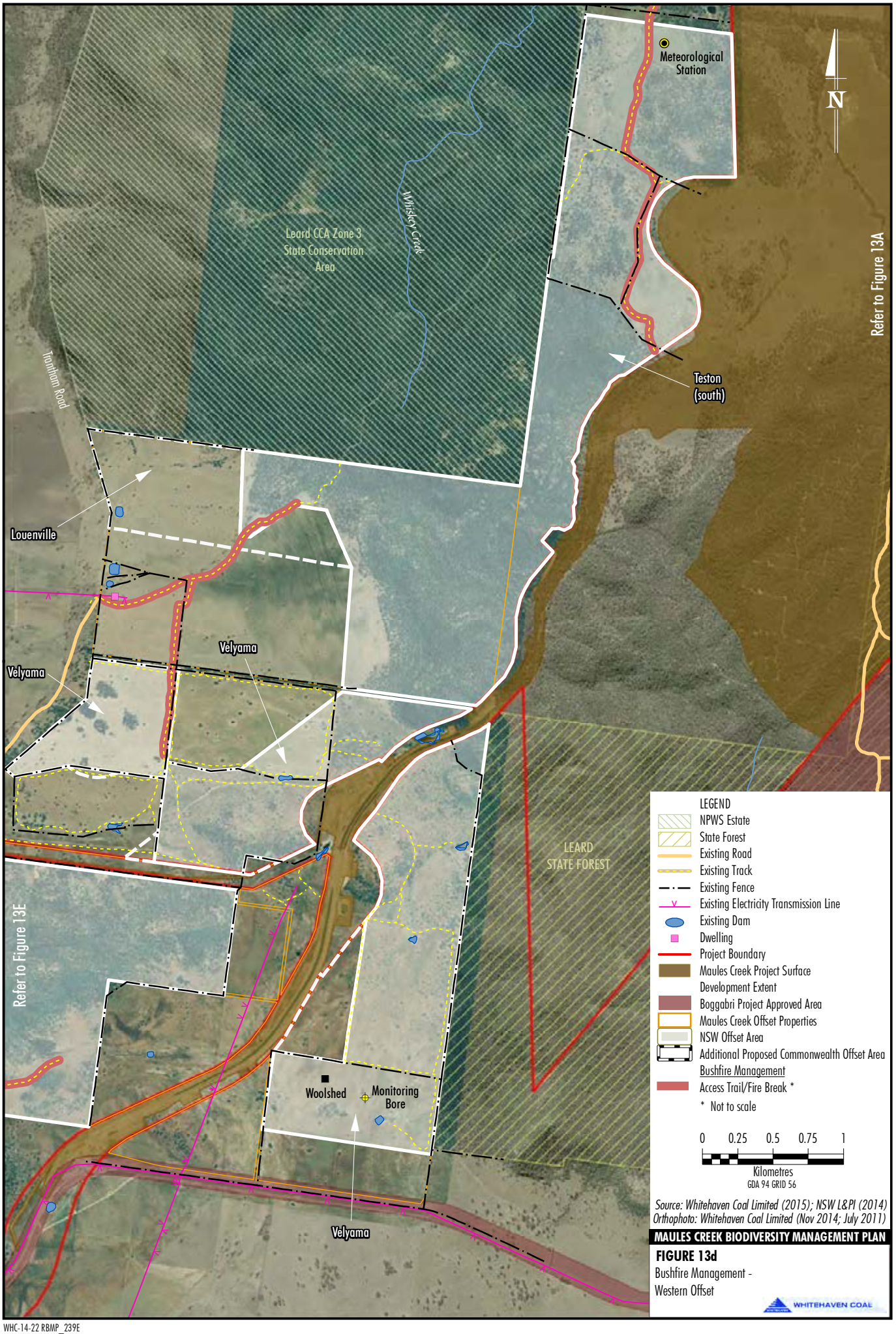
Source: Whitehaven Coal Limited (2015); NSW L&PI (2014)
Orthophoto: Whitehaven Coal Limited (Nov 2014; July 2011)

MAULES CREEK BIODIVERSITY MANAGEMENT PLAN

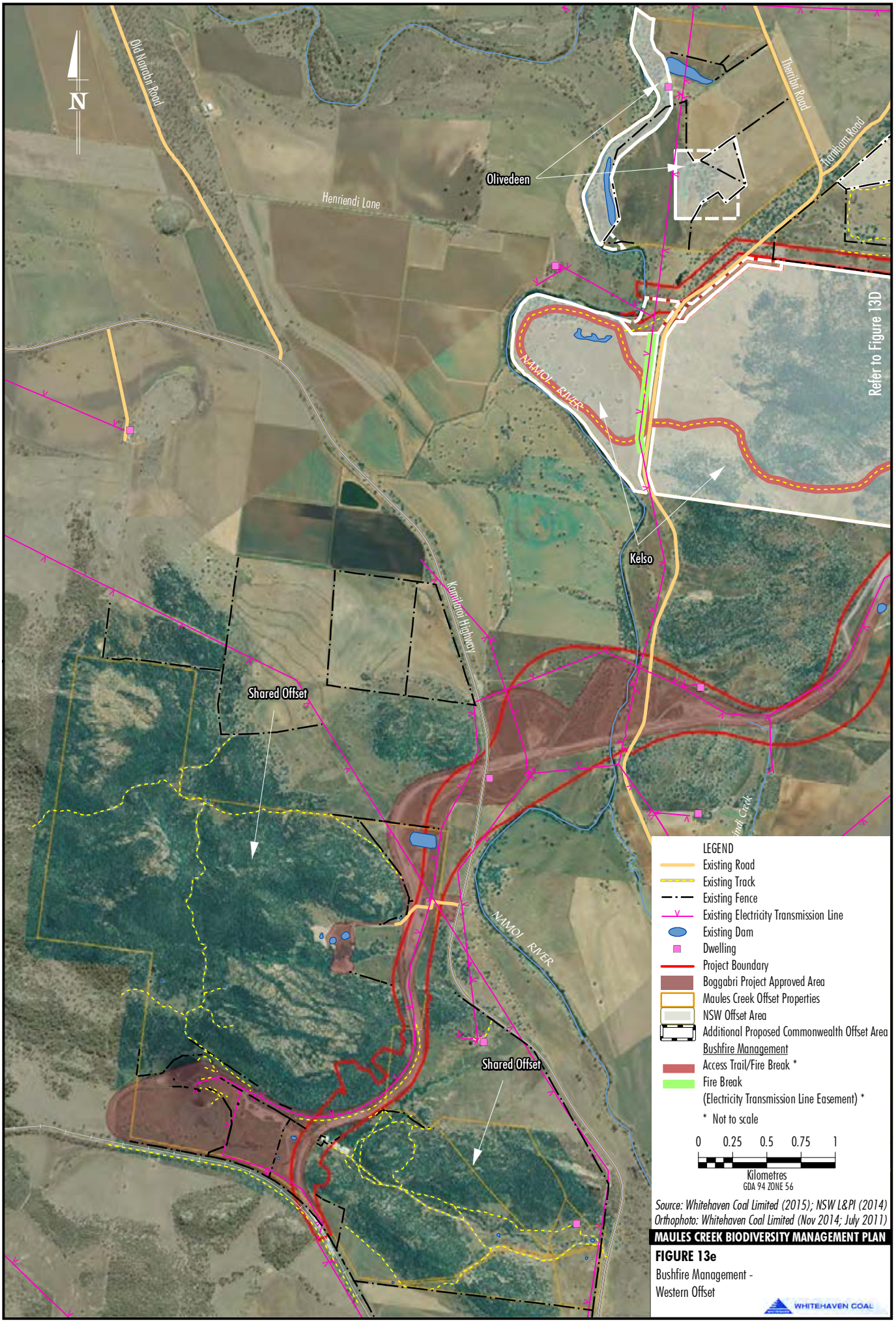
FIGURE 13c
Bushfire Management -
Eastern Offset

WHITEHAVEN COAL

WHC-14-22 RBMP_238E



WHC-14-22 RBMP_239E



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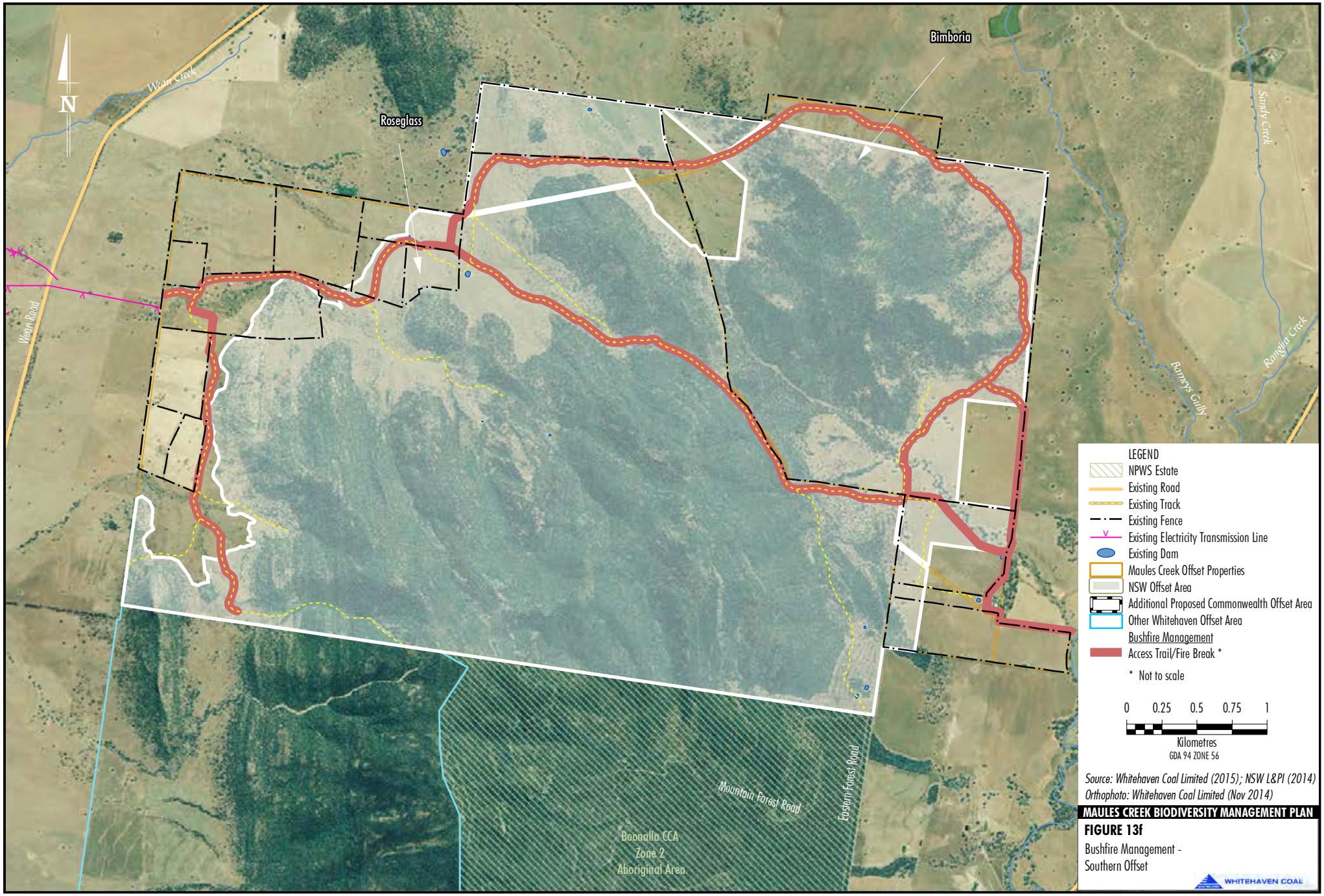

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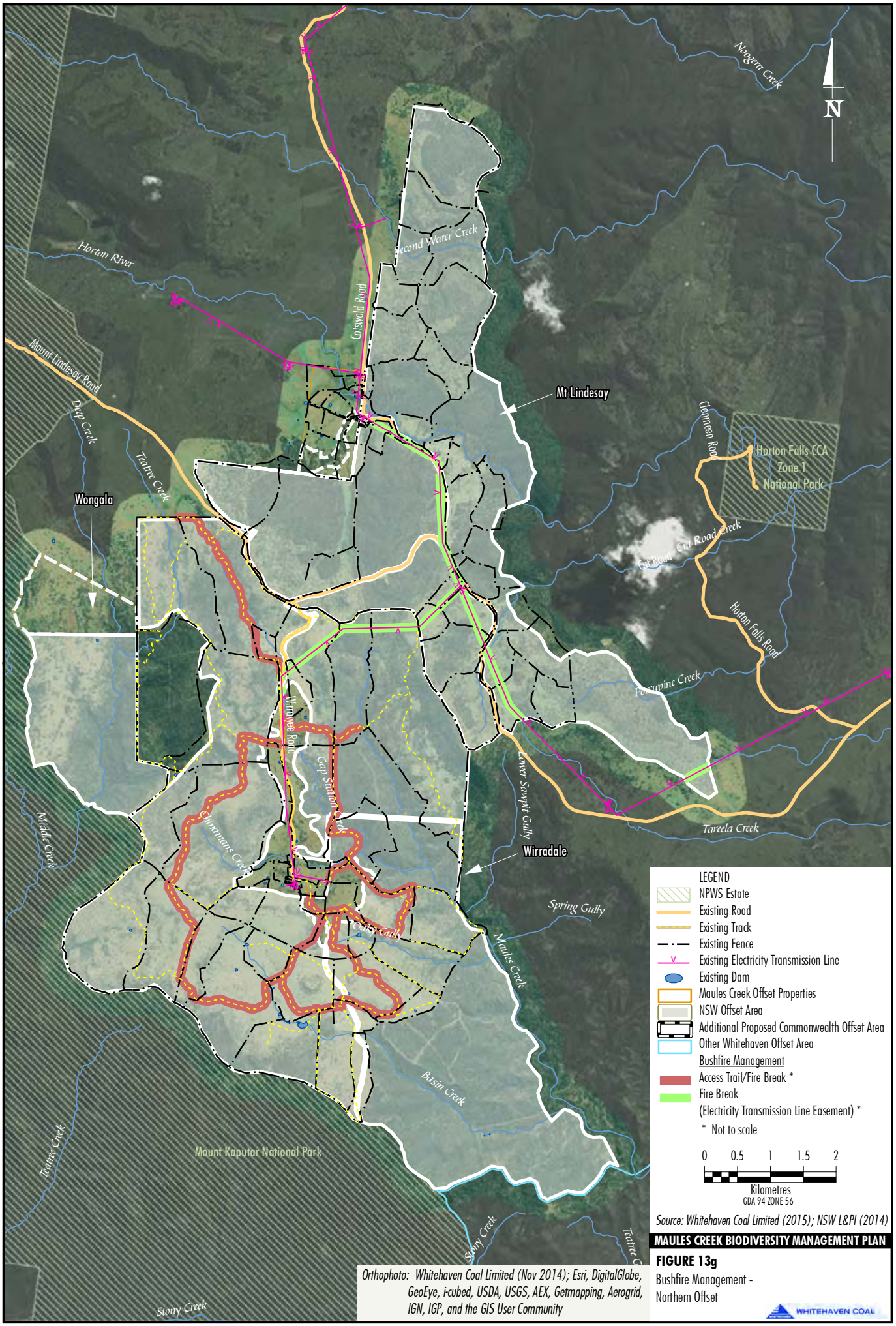


MAULES CREEK BIODIVERSITY MANAGEMENT PLAN

FIGURE 13g

Bushfire Management - Northern Offset

WHITEHAVEN COAL

WHC-14-22 RBMP_242E

All fire breaks and access trails identified will be inspected at least once a year for maintenance requirements prior to the fire season. However, maintenance issues may also be noted during other routine management and monitoring activities undertaken in the offset areas. Maintenance of fire breaks and access trails will be scheduled as and when required in accordance with Section 6.2.3.

Emergency Bushfire Response

If a bushfire was to occur within or move towards the offset areas, the local NSW Rural Fire Service will be called for assistance. MCCM will assist the Rural Fire Service, Forestry Corporation NSW, emergency services and National Parks and Wildlife Services as much as possible if there is a fire in the surrounding area. However, the assistance provided will be based on the nature of the request from emergency services and is subject to the legal and statutory obligation held by MCCM for its people and or plant. The Rural Fire Service, if required, could be assisted by personnel and/or resources located on the mine, (for fires in the offset areas near the mine) this would occur following assessment and consultation between the mine and the emergency services. Dams (some of which may provide a source of water for fire fighting) are shown on Figures 13a to 13g.

After a bushfire, a record will be made of the timing, intensity and extent of each fire.

Assessing Fuel Loads

Monitoring fuel levels will take place as part of the annual inspection. Where fuel loads are considered to pose a threat and fuel loads are required to be reduced, the method to reduce fuel loads may involve one or more of the following and could involve consultation with the NSW Rural Fire Services.

Controlled Grazing to Reduce Fuel Loads

Fuel within the offset areas will be controlled to manage fire risk, whilst not inhibiting regeneration of native plants. Fuel reduction may be undertaken through crash grazing (where this does not impact significantly on plant growth or habitat). Grazing management is described in Section 6.11.

Controlled (Ecological) Burns to Reduce Fuel Loads

Fuel reduction can also be undertaken through controlled burns (or ecological burns). Controlled burns will be coordinated with the NSW Rural Fire Service. The use of fire in each management domain is discussed below.

Revegetation and Restoration Domains

Controlled burns may be undertaken in Revegetation and Restoration Domains to reduce weeds and/or promote the biodiversity. Spring burns can be useful for reducing the mass of exotic annual grasses (Rawlings *et al.,* 2010) which occur in the Revegetation and Restoration Domains.

No controlled burns will be undertaken in these zones if native vegetation is establishing (e.g. if planting or seeding has occurred) until the revegetation is sufficiently mature to withstand controlled burns.

Habitat Management and Enhancement Domains

Controlled burns may occur in existing woodland/forest within the Habitat Management and Enhancement Domains in consultation with the NSW Rural Fire Service. The relevant Bush Fire Risk Management Plans to the offset areas provide fire frequency intervals for vegetation forms (Table 6-8).

Table 6-8
Fire Frequency Intervals for Vegetation Forms

Vegetation Type	Fire Frequency Intervals (Years)	
	Minimum	Maximum
Grassland	3 Years	10 Years
Grassy Woodland	8 Years	40 Years
Dry Sclerophyll Forest (Shrub/Grass Subformation)	8 Years	50 Years
Dry Sclerophyll Forest (Shrub Subformation)	10 Years	30 Years
Semi-Arid Woodlands (Grassy Subformation)	9 Years	No Maximum
Semi-Arid Woodlands (Shrubby Subformation)	15 Years	No Maximum

Modified Source: Narrabri/Moree Bush Fire Management Committee (2010); Liverpool Range Bush Fire Management Committee (2010); Tamworth Bush Fire Management Committee (2011).

Further to the intervals in Table 6-8, the fire frequency interval of controlled burns in patches of Box-Gum Woodland EEC/CEEC (existing grassy woodland) will be no less than five years. DECCW (2011) suggests fire frequency in Box-Gum Woodland EEC/CEEC will be a minimum interval of five years and a maximum interval of 40 years. Rawlings *et al.* (2010) recommends fire frequency in Box-Gum Woodland EEC/CEEC will be every four to eight years.

Prior to controlled burns, consideration will be given to known occurrences of threatened flora species and their sensitivities to fire.

Autumn burns can be useful for reducing biomass and increasing native species diversity (Rawlings *et al.,* 2010). If controlled burns are to occur, low intensity prescribed burning is recommended for all vegetation types in the offset areas (after NSW Rural Fire Services, 2006). As defined by the NSW Rural Fire Services (2006) low intensity prescribed burning means:

> *the use of fire intended to result in the removal of the leaf litter, grass and shrub layer with minimal canopy scorching. Fires will be patchy and the actual area burnt may vary between 40% and 80%. The average flame height will be less than one metre. This can be achieved by lighting under conditions where a combination of some or all of following factors influence fire behaviour – low fuel loads, moist fuels, low temperatures, high humidity, low wind speeds and fire lighting patterns.*

The timing, intensity and extent of each fire will be recorded so that the fire frequency intervals can be managed over time. After an uncontrolled wildfire, the fire frequency interval may need to increase depending on the intensity of the wildfire.

Communication with Adjacent Landholders

Landholders adjacent to the offset areas will be contacted before controlled burns occur to notify them of the controlled burn as well as to discuss burning programs on the adjacent properties and possibilities of co-ordinating controlled burns.

6.14 TRANSLOCATION OF *TYLOPHORA LINEARIS*

Tylophora linearis (a threatened flora species listed under the TSC Act and EPBC Act) was identified in the MCCM Project Boundary during pre-clearing flora surveys during 2014. It was also found in the offset areas, Leard State Forest and in other local conservation reserves.

Following the identification of *Tylophora linearis* in the MCCM Project Boundary, a propagation and translocation program was prepared for the species in consultation with Dr Colin Driscoll (Hunter Eco), OEH, DP&E and DotE. The propagation and translocation program is provided in Appendix C.

There are multiple stages to the propagation and translocation program:

- Stage 1 - Root Architecture and Growth Study;
- Stage 2 - Seed Production Monitoring;
- Stage 3 - Seed Collection and Storage;
- Stage 4 - Seed Propagation; and
- Stage 5 - Translocation Trials.

Stages 1 to 4 were undertaken in the second half of 2014 (Plate 3). This research approach has resulted in the first documented examination of *Tylophora linearis* root architecture and growth and the first documented collection of seed pods from *Tylophora linearis*.

From the seeds collected, *Tylophora linearis* plants were propagated (Plate 3). Approximately 80 seedlings were planted in the Eastern Offset in December 2015. Depending on the success of the planting, other *Tylophora linearis* plants could be translocated into the offset areas (e.g. within the offset areas on the Wollandilly Property) or in mine rehabilitation (e.g. on the overburden emplacement areas). Suitable recipient sites would be selected through a site inspection by a suitability qualified person and based on the following criteria:

- within or near modelled suitable habitat;
- within vegetation having a similar structure to that in which the species is commonly found locally i.e. woodland with a moderate shrub layer and grassy ground cover; and
- within a locality accessible for exclusion fencing, planting, watering and monitoring.

Each recipient site will be fenced to keep out mammal herbivores and fencing will be installed without clearing any native trees or shrubs.

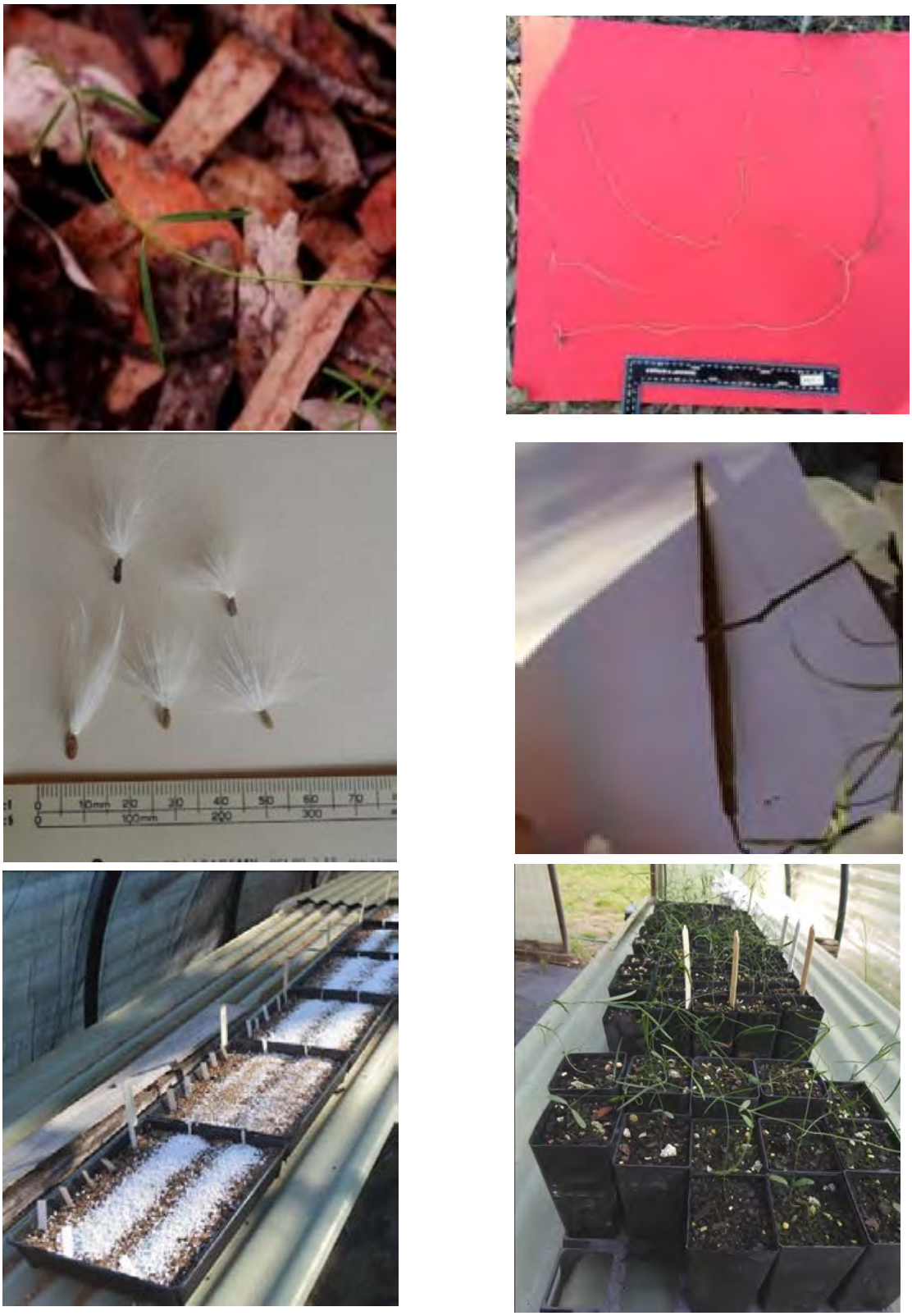


Plate 3 *Tylophora linearis* (Note: above ground [top left], root system [top right], seeds [middle left], seed pod [middle right], germination trial [bottom left] and propagated plants [bottom right])

Seedlings will be planted beside a small shrub that the plant can climb with the seedling being planted at the centre of a patch of loosened soil to allow the roots to spread. Each plant will be numbered for monitoring purposes.

Seedlings will be watered when planted with subsequent watering dependent on rainfall.

The translocated plants will be monitored weekly as the plants become established and monthly thereafter until established. The following will be recorded:

- presence/absence of plant;
- general health of plant: height, stem branching;
- presence of reproductive material (e.g. buds, flowers, fruit);
- development of suckers (if visible);
- presence of insect herbivores; and
- integrity of fencing.

A successful translocation program may reduce residual impacts on *Tylophora linearis* from the MCC.

A report will be compiled annually which documents the implementation of the Propagation and Translocation Program for *Tylophora linearis* as described in Section 7.2.5.

6.15 TRANSLOCATION OF *POMADERRIS QUEENSLANDICA*

Scant Pomaderris (*Pomaderris queenslandica*) (a threatened flora species listed under the TSC Act) was identified in the MCCM Project Boundary during pre-clearing flora surveys during 2015.

Following the identification of Scant Pomaderris in the MCCM Project Boundary, a propagation and translocation program was prepared for the species in consultation with Dr Colin Driscoll (Hunter Eco), OEH and DP&E. The propagation and translocation program is provided in Appendix D.

There are multiple stages to the propagation and translocation program:

- Stage 1 – Scant Pomaderris Root Architecture Study;
- Stage 2 – Scant Pomaderris Seed Collection;
- Stage 3 – Scant Pomaderris Cuttings Propagation;
- Stage 4 – Scant Pomaderris Seed Germination; and
- Stage 5 – Scant Pomaderris Translocation Trials.

The Scant Pomaderris root architecture study was undertaken during the mine clearing activities in 2015. All Scant Pomaderris plants excavated were found to have a relatively shallow root system, potentially influenced by the rocky substrate.

The Scant Pomaderris seed collection component began with collection of racemes (Plate 4), monitoring and bagging of racemes and sieving of seed from the soil seedbank. Further, topsoil was collected from around the populations inside the 2015 disturbance area and stockpiled separately. This stockpile will be moved to a suitable location in the offset areas and spread out. From the seeds collected, Scant Pomaderris plants are being propagated (Plate 4).

The Scant Pomaderris cuttings propagation component began with the collection of 10 cuttings followed by a larger collection of 200 cuttings (Plate 4).

A report will be compiled annually which documents the implementation of the Propagation and Translocation Program for Scant Pomaderris as described in Section 7.2.6.

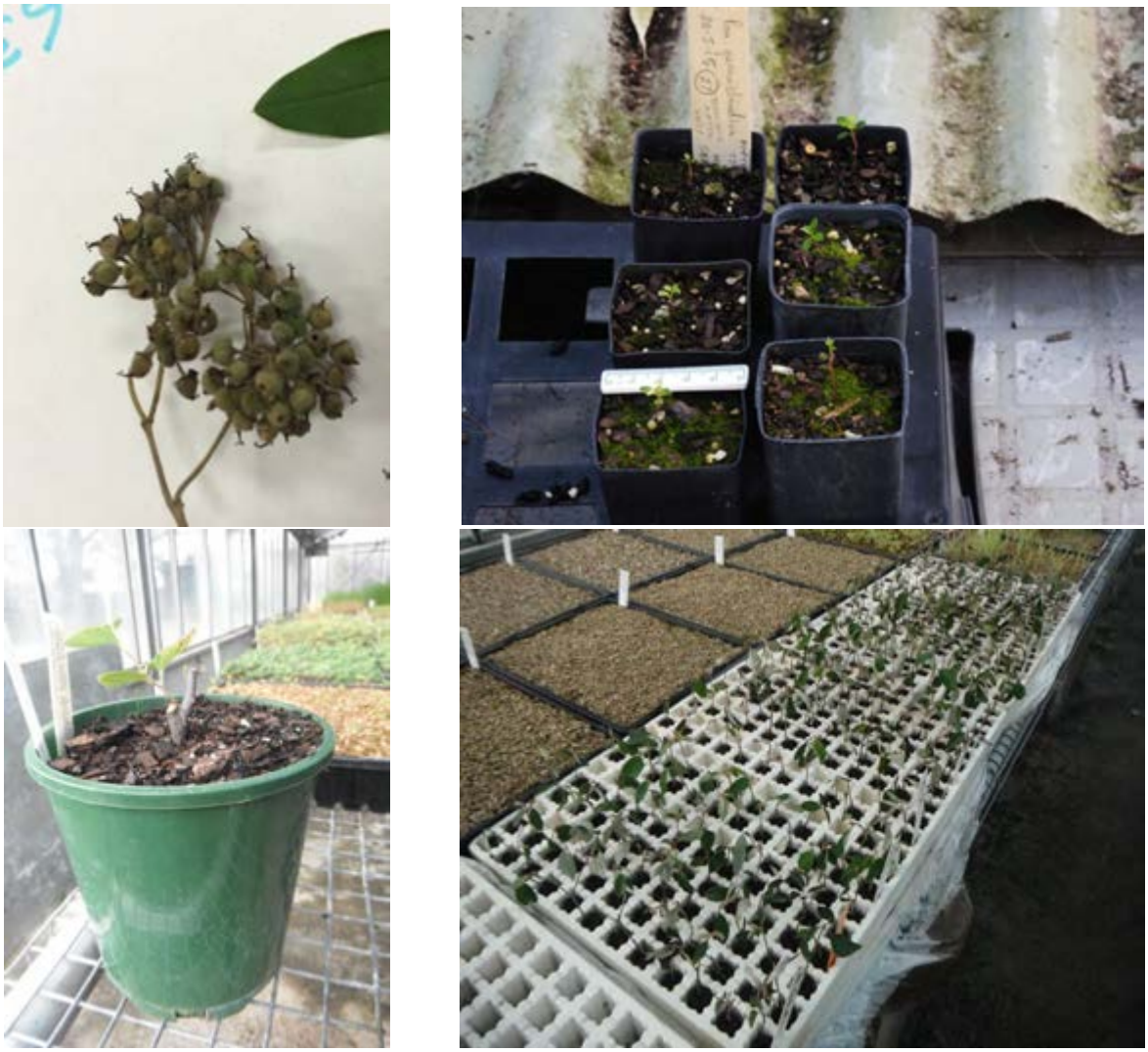


Plate 4 *Pomaderris queenslandica* (Note: raceme [top left], seedlings from seeds [top right], propagated plant from first cuttings [bottom left] and second cuttings [bottom right])

6.16 PERFORMANCE AND COMPLETION CRITERIA

Performance criteria are interim targets for the management activities. The performance criteria in Table 6-9 has been developed in consideration of the Draft *Hunter Valley Coal Mines Best Practice Guidelines for Biodiversity Offset Management Plans* (DP&I, 2014), approved and draft *Tarrawonga Coal Mine Biodiversity Management Plan* (Whitehaven, 2015c, 2015d) and *Boggabri Coal Mine Biodiversity Management Plan* (Boggabri Coal Pty Ltd, 2015).

The performance of the offset areas will be monitored against the performance criteria provided in Table 6-9. The aim is for all performance criteria to be met within each period. If performance criteria are not being met, contingency measures will be considered (Section 6.18).

Table 6-9
Performance and Completion Criteria

Action	Performance Criteria				Completion Criteria
	Year 1 (May 2014 to end of June 2015)	Year 2 (July 2015 to end of June 2016)	Year 3 (July 2016 to end of June 2017)	Year 4 to 21 (July 2017 to meeting the Completion Criteria)	
Setting Up the Offset Areas (Section 6.2)					
Long-term Conservation Security [A, B, C, D]	-	Commence long-term security of the offset areas (all offset areas except Wongala, Roseglass, Bimbooria and Oakleigh/Onavale) **Target Date – Commencement within 3 months of the approval of this BMP (version 2)** (extension in timing approved by DP&E). Security of the offset areas is subject to OEH timing for establishing a VCA.	-	Long-term security of the offset areas that are subject to the approval of the revised offset strategy to be registered (Wongala, Roseglass, Bimbooria and Oakleigh/Onavale) **Target Date – within 12 month of approval of the Stage 2 LFMPRRA.** Long-term security of offset areas required by Approval Decision EPBC 2010/5566 to be secured by 11 February 2018.	All offset areas are secured
Offset Implementation Costs and Conservation Bond [A, B, C, D]	-	Calculate Offset Implementation Costs and Lodge Conservation Bond **Target Date – Within 3 months of the approval of this BMP (version 2)**	-	-	N/A

Table 6-9 (Continued)
Performance and Completion Criteria

Action	Performance Criteria				Completion Criteria
	Year 1 (May 2014 to end of June 2015)	Year 2 (July 2015 to end of June 2016)	Year 3 (July 2016 to end of June 2017)	Year 4 to 21 (July 2017 to meeting the Completion Criteria)	
Setting Up the Offset Areas (Section 6.2) (Cont.)					
Mapping of Fences	Complete (refer Figures 12a to 12g)	-	-	-	N/A
Gate and Fence Installation (Perimeter of the offset areas as necessary to exclude livestock, except where adjacent to existing state forests or protected areas)	-	Complete **Target Timing - June 2016**	-	-	Gates and fences installed around the perimeter of the offset areas (except where adjacent to existing state forests or protected areas)
Inspection of Fences for Maintenance Purposes	-	Annually and as required at other times	Annually and as required at other times	Annually and as required at other times	N/A
Removal of Redundant Fences	-	Commence	-	Complete	No redundant fencing
Signage Installation	-	Commence	-	Complete	Signs installed
Mapping of Access Tracks	Complete (refer Figures 12a to12g)	-	-	-	N/A
Inspection of Access Tracks for Maintenance Purposes	-	Annually and as required at other times	Annually and as required at other times	Annually and as required at other times	N/A
Seed Collection and Propagation (Section 6.4)					
Seed Collection	-	Commence	To be completed annually	To be completed annually as required	N/A
Seed Collection Propagation	-	Commence	To be completed annually	To be completed annually as required	N/A

Table 6-9 (Continued)
Performance and Completion Criteria

Action	Performance Criteria				Completion Criteria
	Year 1 (May 2014 to end of June 2015)	Year 2 (July 2015 to end of June 2016)	Year 3 (July 2016 to end of June 2017)	Year 4 to 21 (July 2017 to meeting the Completion Criteria)	
Revegetation (Section 6.5)					
Identification Of Revegetation Areas [A, B, C, D]	Complete – Figures 12a to 12g	-	-	-	N/A
Revegetation of Year 2 Areas (as listed in Table 6-3) [A, B, C, D]	-	Completed design, site preparation and initial seeding/planting	Maintenance as required.	Maintenance as required.	Refer to the completion criteria below this table.
Revegetation of Year 3 Areas (as listed in Table 6-3) [A, B, C, D]	-	Completed design	Completed site preparation and initial seeding/planting	Maintenance as required.	
Reuse of Salvaged Habitat Resources (Section 6.6)					
Relocation of salvaged habitat resources [D]	-	Commence	Continue	Continue	Complete
Management of Cultural Heritage (Section 6.7)					
Comply with Cultural Heritage Requirements	Continue	Continue	Continue	Continue	N/A
Weed Management (Section 6.8)					
Control of Major Weed Occurrences (noxious and WONS) [A]	Commence	Continue across all offset areas that require weed control as indicated through monitoring.	Continue across all offset areas that require weed control as indicated through monitoring.	Continue across all offset areas that require weed control as indicated through monitoring.	-
Weed extent (noxious and WONS)	-	Establish baseline cover of weeds (noxious and WONS).	-	50 % reduction in the cover of weeds (noxious and WONS) in the offset areas compared to baseline cover.	80 % reduction in the cover of weeds (noxious and WONS) in the offset areas.
Note: Weed species/coverage can vary substantially between seasons/years beyond the control of Whitehaven.					

Table 6-9 (Continued)
Performance and Completion Criteria

Action	Performance Criteria				Completion Criteria
	Year 1 (May 2014 to end of June 2015)	Year 2 (July 2015 to end of June 2016)	Year 3 (July 2016 to end of June 2017)	Year 4 to 21 (July 2017 to meeting the Completion Criteria)	
Feral Animal Management (Section 6.9)					
Control of Feral Animals	Commence	Continue across all offset areas that require feral animal control as indicated through monitoring.	Continue across all offset areas that require feral animal control as indicated through monitoring.	Continue across all offset areas that require feral animal control as indicated through monitoring.	Minimal feral animals as evidenced through monitoring data.
Feral Animal Abundance	-	Establish abundance of feral animals.	Stable or downward trend in feral animal abundance compared to previous year.	Stable or downward trend in feral animal abundance compared to previous year.	50 % reduction in feral animal abundance compared to baseline.
Note: the movement patterns of some feral animals mean that some aspects of the feral population such as immigration of animals from outside the offset area are beyond the control of Whitehaven.					
Control of Erosion (Section 6.10)					
Inspection of Offset Areas for Major Erosion and (if required) Control of Erosion	-	Annually and as required at other times	Annually and as required at other times	Annually and as required at other times	Areas of active erosion reduced.
Management of Livestock (Section 6.11)					
Agricultural Suitability Assessment	Complete	-	-	-	N/A
Grazing Management [A, B, C, D]	Commence	Continue	Continue	Continue	Livestock absent from Grazing Exclusion Areas

Table 6-9 (Continued)
Performance and Completion Criteria

Action	Performance Criteria				Completion Criteria
	Year 1 (May 2014 to end of June 2015)	Year 2 (July 2015 to end of June 2016)	Year 3 (July 2016 to end of June 2017)	Year 4 to 21 (July 2017 to meeting the Completion Criteria)	
Management of Livestock (Section 6.11)					
Inspection of Fences for Maintenance Purposes	-	Annually and as required at other times	Annually and as required at other times	Annually and as required at other times	N/A
Bushfire Management (Section 6.13)					
Establish Bushfire Management Measures	Complete	Reviewed and updated as required	Reviewed and updated as required	Reviewed and updated as required	N/A
Mapping of Fire Breaks and Trails	Commence	Complete	-	-	N/A
Monitoring of Fuel Loads	-	Continue	Continue	Continue	N/A
Controlled Burning	-	Fuel load reduction was undertaken (where required) without substantially damaging the integrity of the vegetation communities	Fuel load reduction was undertaken (where required) without substantially damaging the integrity of the vegetation communities	Fuel load reduction was undertaken (where required) without substantially damaging the integrity of the vegetation communities	Fuel load reduction activities have not damaged integrity of the vegetation communities (e.g. no species lost)
Translocation of Tylophora linearis (Section 6.14)					
Procedures for Translocation	Complete	-	-	-	N/A
Translocation to be undertaken	-	Complete	-	-	Translocations are undertaken and the success reported
Monitoring	-	Commence	Continue	Continue	N/A

Table 6-9 (Continued)
Performance and Completion Criteria

Action	Performance Criteria				Completion Criteria
	Year 1 (May 2014 to end of June 2015)	Year 2 (July 2015 to end of June 2016)	Year 3 (July 2016 to end of June 2017)	Year 4 to 21 (July 2017 to meeting the Completion Criteria)	
Translocation of Pomaderris queenslandica (Section 6.15)					
Procedures for Translocation	-	Complete	-	-	N/A
Translocation to be undertaken	-	-	Complete	-	Translocations are undertaken and the success reported
Monitoring	-	-	Commence	Continue	N/A
Monitoring (Section 6.17)					
Vegetation and Habitat Monitoring (A, B, C, D)	Commence **Spring 2014**	Continue **Target Timing - Spring 2015**	Continue **Target Timing - Spring 2016**	Continue **Target Timing - Spring**	N/A
Fauna Monitoring	Commence **Spring and summer before May 2015**	Continue **Target Timing - Winter 2015**	-	Continue **Target Timing - Spring, summer, winter every three years**	N/A
Monitoring for Regent Honeyeater, Swift Parrot and Southern Long-eared Bat (B, C, D)	Commence	Continue	Continue	Continue	N/A
Weed Monitoring	Commence	Continue **Indicative Timing** – August, November, February, May	Continue **Indicative Timing** – August, November, February, May	Continue **Indicative Timing** – August, November, February, May	N/A
Feral Animal Monitoring	Commence	Continue **Indicative Timing** – August, November, February, May	Continue **Indicative Timing** – August, November, February, May	Continue **Indicative Timing** – August, November, February, May	N/A
Recording *(Section 7.1)*					
Recording information summarised in Section 7.1	-	Annually	Annually	Annually	N/A

Table 6-9 (Continued)
Performance and Completion Criteria

Action	Performance Criteria				Completion Criteria
	Year 1 (May 2014 to end of June 2015)	Year 2 (July 2015 to end of June 2016)	Year 3 (July 2016 to end of June 2017)	Year 4 to 21 (July 2017 to meeting the Completion Criteria)	
Reporting (Section 7.2)					
Box-Gum Woodland EEC/CEEC and threatened species investigation reports and implementation plans	Complete	-	-	-	N/A
MCCM Annual Review	Annually	Annually	Annually	Annually	N/A
BMP Annual Report	Annually (A, B, C, D)	Annually	Annually	Annually	N/A
Commonwealth Approval Compliance Reports	Annually (A, B, C, D)	Annually **Target Timing -** March	Annually **Target Timing -** March	Annually **Target Timing -** March	N/A
Tylophora linearis Propagation and Translocation Program	Annually	Annually **Target Translocation Timing -** September - December	Annually	Annually	N/A

A Performance criteria relevant to the Box-Gum Woodland EEC/CEEC.

B Performance criteria relevant to potential habitat for the Regent Honeyeater (*Xanthomyza phrygia*).

C Performance criteria relevant to potential habitat for the *Swift Parrot* (*Lathamus discolor*).

D Performance criteria relevant to potential habitat for the South-eastern Long-eared Bat (*Nyctophilus corbeni*).

Interim and quantitative performance criteria for habitat complexity are provided for domains that require revegetation (natural regeneration or active planting/seeding) in Table 6-10. The offset areas will be reviewed against quantitative performance criteria for habitat complexity at five and ten year increments. The interim performance criteria for habitat complexity will be further refined based on reference site data (discussed further below) by 2018 prior to the first performance review which is due in 2020.

Table 6-10
Interim Performance Criteria for Habitat Complexity

Condition Variable	Specific Performance Criteria for Enhancement Domain		Specific Performance Criteria for Revegetation and Restoration Domains	
	Performance Criteria at 5 years (2020)	Performance Criteria at 10 years (2025)	Performance Criteria at 5 years (2020)	Performance Criteria at 10 years (2025)
Native Plant Species Richness	Increase to at least 50% of lower benchmark.	Increase to at least 80% of lower benchmark.	Increase to at least 10% of lower benchmark.	Increase to at least 30% of lower benchmark.
Native Overstorey Cover	No change expected in 5 years.	Increase to at least 20% of lower benchmark.	Increase to at least 10% of lower benchmark.	Increase to at least 30% of lower benchmark. No more than 100% of upper benchmark.
Native Mid-storey Cover	Increase to at least 50% of lower benchmark.	Increase to at least 80% of lower benchmark.	Increase to at least 10% of lower benchmark.	Increase to at least 30% of lower benchmark. No more than 100% of upper benchmark.
Native Groundcover (Grasses)	Increase to at least 50% of lower benchmark.	Increase to at least 80% of lower benchmark.	Increase to at least 10% of lower benchmark.	Increase to at least 30% of lower benchmark.
Native Groundcover (Shrubs)	Increase to at least 50% of lower benchmark.	Increase to at least 80% of lower benchmark.	Increase to at least 10% of lower benchmark.	Increase to at least 30% of lower benchmark.
Native Groundcover (Other)	Increase to at least 50% of lower benchmark.	Increase to at least 80% of lower benchmark.	Increase to at least 10% of lower benchmark.	Increase to at least 30% of lower benchmark.
Exotic Plant Cover	Decreasing number and cover of exotic species	Less than 5% of domain area	Decreasing number and cover of exotic species	Less than 10% of domain area
Number of Trees with Hollows	No change expected in 5 years	No significant increase expected in 10 years.	None expected after 5 years.	None expected after 10 years.
% Canopy Recruitment	Increase to at least 50% of lower benchmark.	Increase to at least 80% of lower benchmark.	None expected after 5 years.	None expected after 10 years.
Total Length (m) Of Fallen Logs	No change expected in 5 years	No significant increase expected in 10 years.	None expected after 5 years.	None expected after 10 years (except salvaged).

Reference Sites

Reference sites will be located in areas that comprise a quality of vegetation that is aspired to and feasible to achieve within 21 years after commencement of management activities. Reference sites are used within the performance and completion criteria.

The benchmark values from reference sites will be established in consultation with OEH and then included in this BMP by 2018 prior to the first performance review which is due in 2020.

In November 2013, OEH suggested that MCC determine reference sites (local benchmarks) for completion criteria which represent what is aspired to be achieved in 21 years. OEH explained that the Biometric benchmarks will be inappropriate as they are meant to be quantitative measures of the range of variability in condition in vegetation with relatively little evidence of alteration, disturbance or modification by humans since European settlement and recovery to this level is unlikely to be achieved in 21 years.

Completion Criteria

The completion criterion represents achievement of the offset area objectives. In accordance with Condition 52 of Schedule 3 to PA 10_0138, if the Biodiversity Offset Strategy is completed generally in accordance with the completion criteria in this BMP to the satisfaction of the NSW Secretary of the DP&E, the NSW Secretary of the DP&E will release the conservation bond (Section 6.2.2). If the Biodiversity Offset Strategy is not completed generally in accordance with the completion criteria in this BMP, the NSW Secretary of the DP&E will call in all or part of the conservation bond, and arrange for the satisfactory completion of the relevant works.

The completion criteria in Table 6-9 has been developed in consideration of the Draft *Hunter Valley Coal Mines Best Practice Guidelines for Biodiversity Offset Management Plans* (DP&I, 2014).

Additional completion criteria are provided in Table 6-11 for each land type directly relating to the objectives of the offset areas. OEH requested the completion criteria for population trends of reptiles, nectarivorous woodland birds, arboreal insectivorous woodland birds, ground-dwelling insectivorous woodland birds, bark-gleaning woodland birds and ground-dwelling mammals (Table 6-11). However, it is acknowledged that population trends of these faunal groups may vary due to reasons unrelated to the offset areas.

Table 6-11
Completion Criteria

Aspect	Completion Criteria
Long-term Security	Long-term security was provided for the offset areas (Section 6.2.1).
Existing native woodland/forest (Habitat Management and Enhancement)	Areas of existing remnant vegetation have been conserved and maintained. Areas of existing remnant vegetation have been managed to reach the lower benchmark[1] condition for that community. Refer to Table 6-12 for specific completion criteria for habitat complexity.
Derived Native Grassland (Restoration)	Areas of derived native grassland have been revegetated with self-sustaining vegetation communities that are trending towards benchmark[1] condition. Refer to Table 6-12 for specific completion criteria for habitat complexity.
Box-Gum Woodland EEC/CEEC (Derived Native Grassland) (Restoration)	Areas of Box-Gum Woodland EEC/CEEC (Derived Native Grassland) have been revegetated with self-sustaining vegetation communities that are trending towards benchmark[1] condition. Refer to Table 6-12 for specific completion criteria for habitat complexity.
Low Diversity Derived Native Grassland, Pasture Improved And Cultivated Land (Revegetation)	Areas of Low Diversity Derived Native Grassland, Pasture Improved and Cultivated Land have been revegetated with self-sustaining vegetation communities that are trending towards benchmark[1] condition. Refer to Table 6-12 for specific completion criteria for habitat complexity.
Native Fauna Population Trends	
Reptiles	A consistently observed increase in reptile species richness and/or abundance within each offset domain across at least half of the monitoring sites in that domain.
Nectarivorous Woodland Birds	A consistently observed increase in nectarivorous woodland bird species richness and/or abundance within each offset domain across at least half of the monitoring sites in that domain.
Arboreal Insectivorous Woodland Birds	A consistently observed increase in arboreal insectivorous woodland bird species richness and/or abundance within each offset domain across at least half of the monitoring sites in that domain.
Ground-Dwelling Insectivorous Woodland Birds	Ground-dwelling insectivorous woodland birds persisting in areas maintained as open grassland.
Bark-gleaning Woodland Birds	A consistently observed increase in bark-gleaning woodland bird species richness and/or abundance within each offset domain across at least half of the monitoring sites in that domain.
Ground-dwelling Mammals	A consistently observed increase in ground-dwelling mammal species richness and/or abundance within each offset domain across at least half of the monitoring sites in that domain.

[1] Local benchmarks will be developed for the purpose of the completion criteria. The benchmark values will be determined in consultation with OEH.

Interim and quantitative completion criteria for habitat complexity are provided for domains that require revegetation (natural regeneration or active planting/seeding) in Table 6-12. Completion criteria are aimed to be met after 21 years (2036). The interim completion criteria for habitat complexity will be further refined based on reference site data (discussed further below) by 2018 prior to the first performance review which is due in 2020.

Table 6-12
Interim Completion Criteria for Habitat Complexity at 21 Years

Condition Variable	Specific Performance Criteria for Enhancement Domain	Specific Performance Criteria for Revegetation and Restoration Domains
Native Species Richness	Increase to at least lower benchmark.	Increase to at least 80% of lower benchmark.
Native Overstorey Cover	Increase to at least lower benchmark.	Increase to at least 80% of lower benchmark.
Native Mid-storey Cover	Increase to at least lower benchmark.	Increase to at least 80% of lower benchmark.
Native Groundcover (Grasses)	Increase to at least lower benchmark.	Increase to at least 80% of lower benchmark.
Native Groundcover (Shrubs)	Increase to at least lower benchmark.	Increase to at least 80% of lower benchmark.
Native Groundcover (Other)	Increase to at least lower benchmark.	Increase to at least 80% of lower benchmark.
Exotic Plant Cover	Less than 5% of domain area	Less than 10% of domain area
Number of Trees with Hollows	No change.	No change.
% Canopy Recruitment	Increase to at least lower benchmark.	Some natural regeneration of Eucalypt canopy species present.
Total Length (m) Of Fallen Logs	No change.	No change.

6.17 MONITORING PROGRAM

There are four components to the monitoring program:

- vegetation and habitat monitoring (Section 6.17.1);
- fauna monitoring (Section 6.17.2);
- weed monitoring (Section 6.17.3); and
- feral animal monitoring (Section 6.17.4).

Suitably qualified and licence personnel will be engaged to undertake the monitoring program. Australia Museum Consulting commenced the monitoring program in October and November (spring) 2014 and February 2015.

6.17.1 Vegetation and Habitat Monitoring

Purpose

Monitoring will be undertaken to track changes in vegetation and habitat in the offset areas in response to management measures. The data collected will be used to evaluate the progress of habitat re-establishment, restoration and enhancement towards meeting the performance and completion criteria (Section 6.16).

Vegetation and habitat monitoring will include documentation of native and introduced (including noxious weed) flora species. Weed monitoring is also outlined in Section 6.17.3.

Monitoring Design

The monitoring includes detailed systematic sampling:

- in degraded native vegetation which will be subject to restoration and enhancement through predominantly natural regeneration (i.e. the Restoration and Enhancement Domains); and
- in cleared areas subject to active revegetation (i.e. the Revegetation Domain).

The vegetation and habitat monitoring program also includes observational and photo monitoring through-out the offset areas (including the Habitat Management Domain and along watercourses).

A number of plots will be established at each monitoring site and two types of monitoring plot will be used to monitor vegetation and habitat (Table 6-13).

Table 6-13
Types of Monitoring Sites

Types of Monitoring Plots	Definition
Action Plots	Action plots will be located in areas that are subject to management activities.
Control Plots	Control plots will be located in areas that are not subject to management activities.

The number of initial Vegetation and Habitat Monitoring Sites and plots per restoration and enhancement domains are listed in Table 6-14. In revegetation domains, additional monitoring sites will be progressively established to monitor the progress of active revegetation. Additional monitoring sites may also be progressively established for testing specific management techniques in an adaptive management framework (e.g. testing a management technique and revising the technique based on a monitoring outcome).

Table 6-14
Number of Vegetation and Habitat Monitoring Sites per Domain

Domain	General Description	Objective	Northern	Eastern	Western	Southern	Total Number of Sites
Revegetation	Low Diversity Native Grassland, Pasture Improved and/or Cultivated Land	Additional native vegetation to be established targeted restoration of self-sustaining vegetation communities in low diversity derived native grassland, pasture improved and cultivated land.	Note 1	Note 1	Note 1	Note 1	Note 1
Restoration	Derived Native Grassland	Additional native vegetation to be established with the restoration of self-sustaining vegetation communities within derived native grassland.	4(3)	2(3)	2(3)	2(3)	10(3)
Enhancement	Semi-cleared Woodland/Forest	Semi-cleared woodland/forest to be protected and enhanced.	4(3)	2(3)	2(3)	2(3)	10(3)
		Total Sites (replicates)	**8**	**4**	**4***	**4**	**20**
		Total Plots	24	12	12	12	60

Numbers within brackets denotes number of plots at each site.

Note 1 Monitoring sites will be progressively established in the Revegetation Domain to monitor the progress of active revegetation.

* Two additional plots will be located in the Shared Offset Property.

Location of Monitoring Sites

Vegetation and Habitat Monitoring Sites will be located across all of the offset areas (Northern, Eastern, Western and Southern Areas). The aim is not to sample every vegetation community, but to adequately sample each domain, to detect trends and changes in the vegetation condition within each domain. Monitoring sites are mostly located in Box-Gum Woodland EEC/CEEC (Table 6-15).

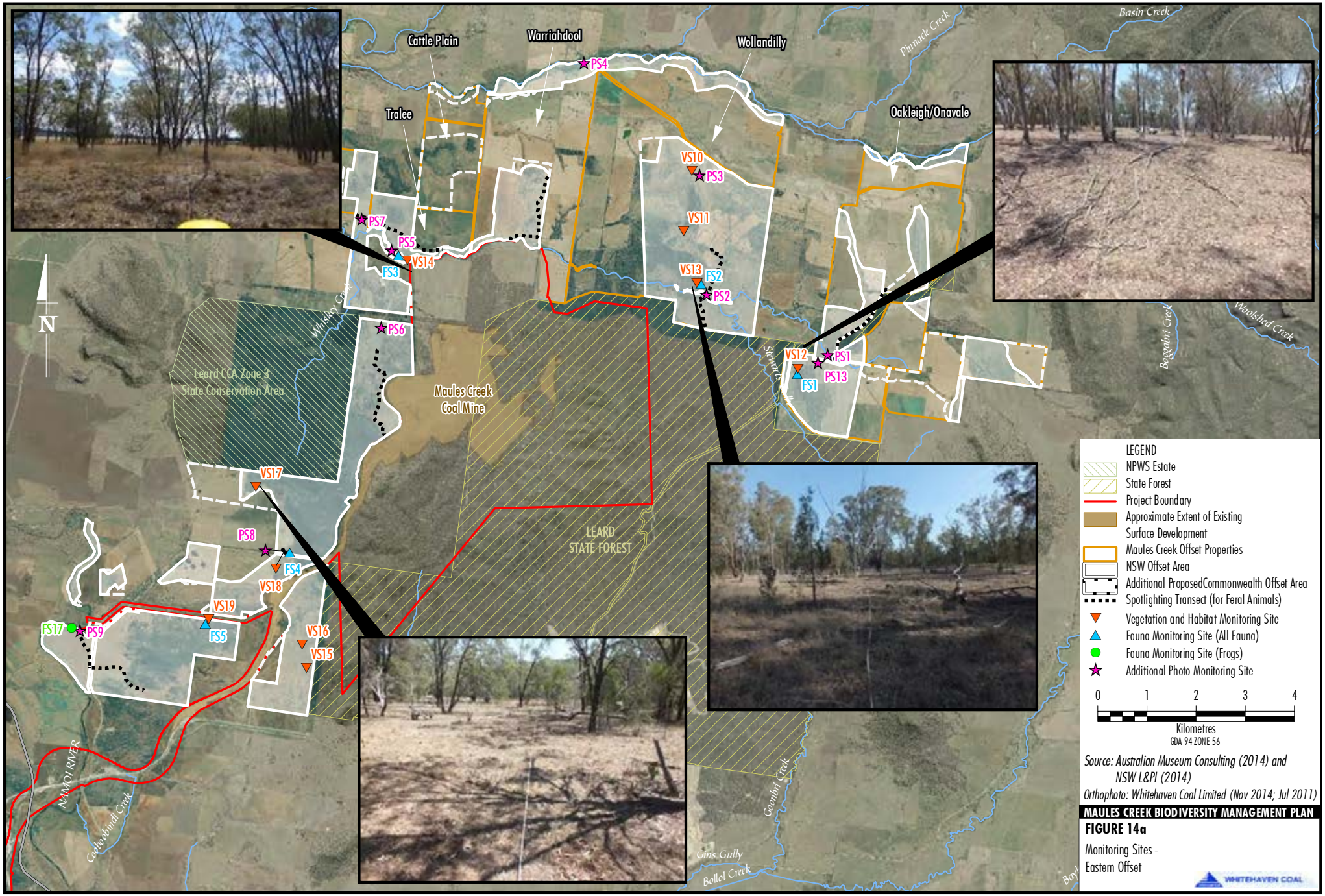
The preliminary location of monitoring sites is shown on Figures 14a to 14d. These monitoring site locations have been selected following commencement of the pilot monitoring study in 2014.

Table 6-15
Schedule of Vegetation and Habitat Monitoring Sites

Area	Site No.	Management Unit	Domain	Approximate Co-ordinates	
				Latitude	Longitude
Northern	VS1*	R/E6	Restoration	-30.35	150.29
	VS2*	R/E8	Restoration	-30.34	150.25
	VS3*	R/E8	Restoration	-30.35	150.26
	VS4*	R/E8	Restoration	-30.40	150.26
	VS5*	R/E6	Enhancement	-30.35	150.30
	VS6*^	HM6	Habitat Management	-30.32	150.28
	VS7*	R/E8	Enhancement	-30.38	150.26
	VS8*	R/E8	Enhancement	-30.41	150.26
	VS9*	R/E8	Enhancement	-30.37	150.26
Eastern	VS10*	Rv/R2	Restoration	-30.52	150.18
	VS11*	R/E1	Restoration	-30.53	150.18
	VS12*^	HM2	Habitat Management	-30.56	150.20
	VS13*	R/E1	Enhancement	-30.54	150.18
	VS14	Rv/E1	Enhancement	-30.54	150.12
Western	VS15*	R/E2	Restoration	-30.61	150.09
	VS16*	R/E2	Restoration	-30.61	150.09
	VS17*	Rv/E6	Enhancement	-30.58	150.08
	VS18*	Rv/E6	Enhancement	-30.59	150.09
	VS19^	HM3	Habitat Management	-30.60	150.07
	VS20[x]	HM4	Habitat Management	-30.66	150.03
	VS21[x]	HM4	Habitat Management	-30.64	150.02
Southern	VS22*	Rv/R4	Restoration	-30.72	150.35
	VS23*	Rv/R3	Restoration	-30.71	150.33
	VS24*	Rv/R4	Enhancement	-30.72	150.35
	VS25*	Rv/R3	Enhancement	-30.71	150.34

* This site is located within Box-Gum Woodland EEC/CEEC as mapped by Greenloaning Biostudies (2014b).

^ This is an additional site to compliment a fauna monitoring site.
[x] additional plots in the Shared Offset Property.



Source: Australian Museum Consulting (2014) and NSW L&PI (2014)

Orthophoto: Whitehaven Coal Limited (Nov 2014; Jul 2011)

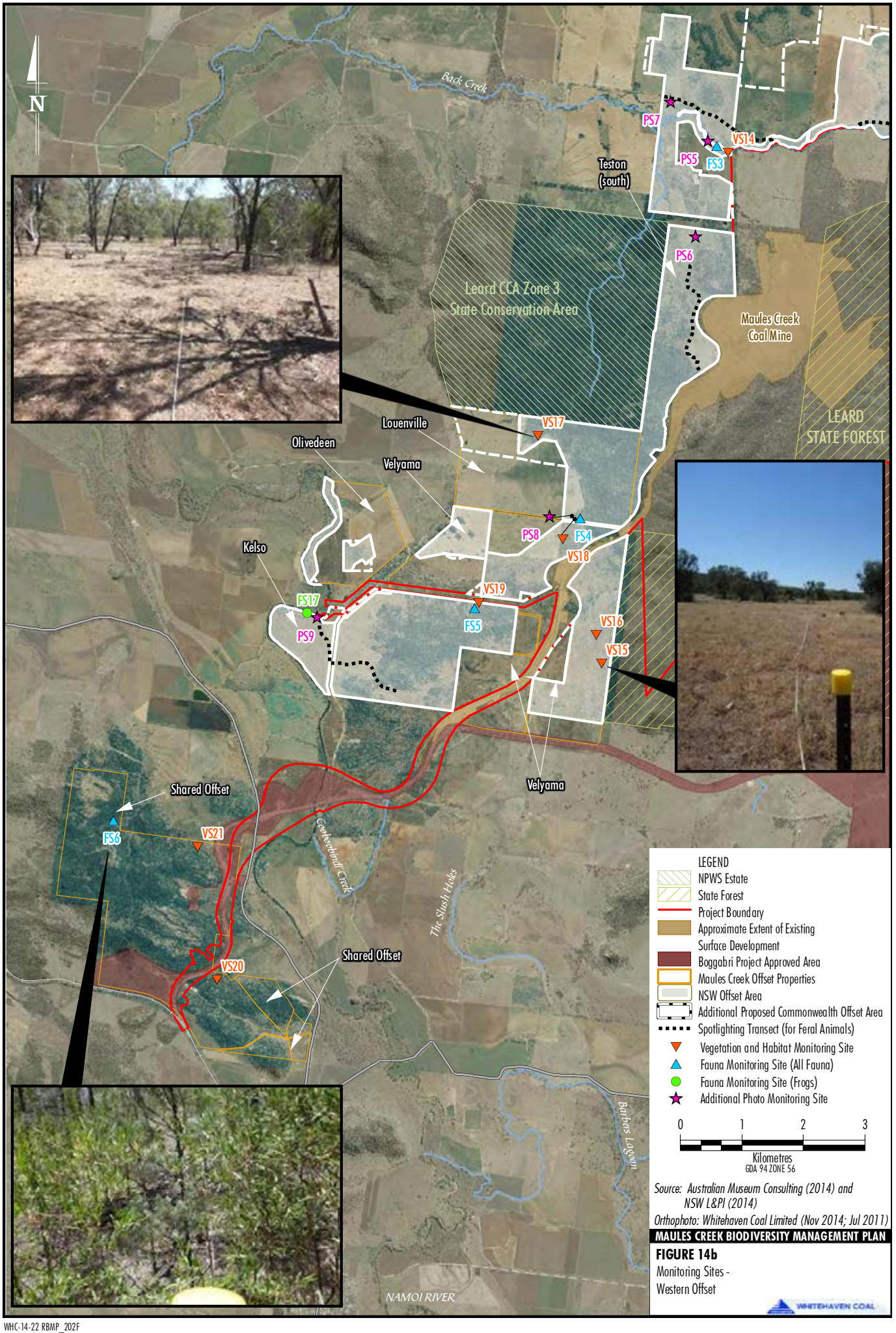
MAULES CREEK BIODIVERSITY MANAGEMENT PLAN

FIGURE 14a

Monitoring Sites - Eastern Offset

WHITEHAVEN COAL

WHC-14-22 RBMP_201F



Source: Australian Museum Consulting (2014) and NSW L&PI (2014)

Orthophoto: Whitehaven Coal Limited (Nov 2014; Jul 2011)

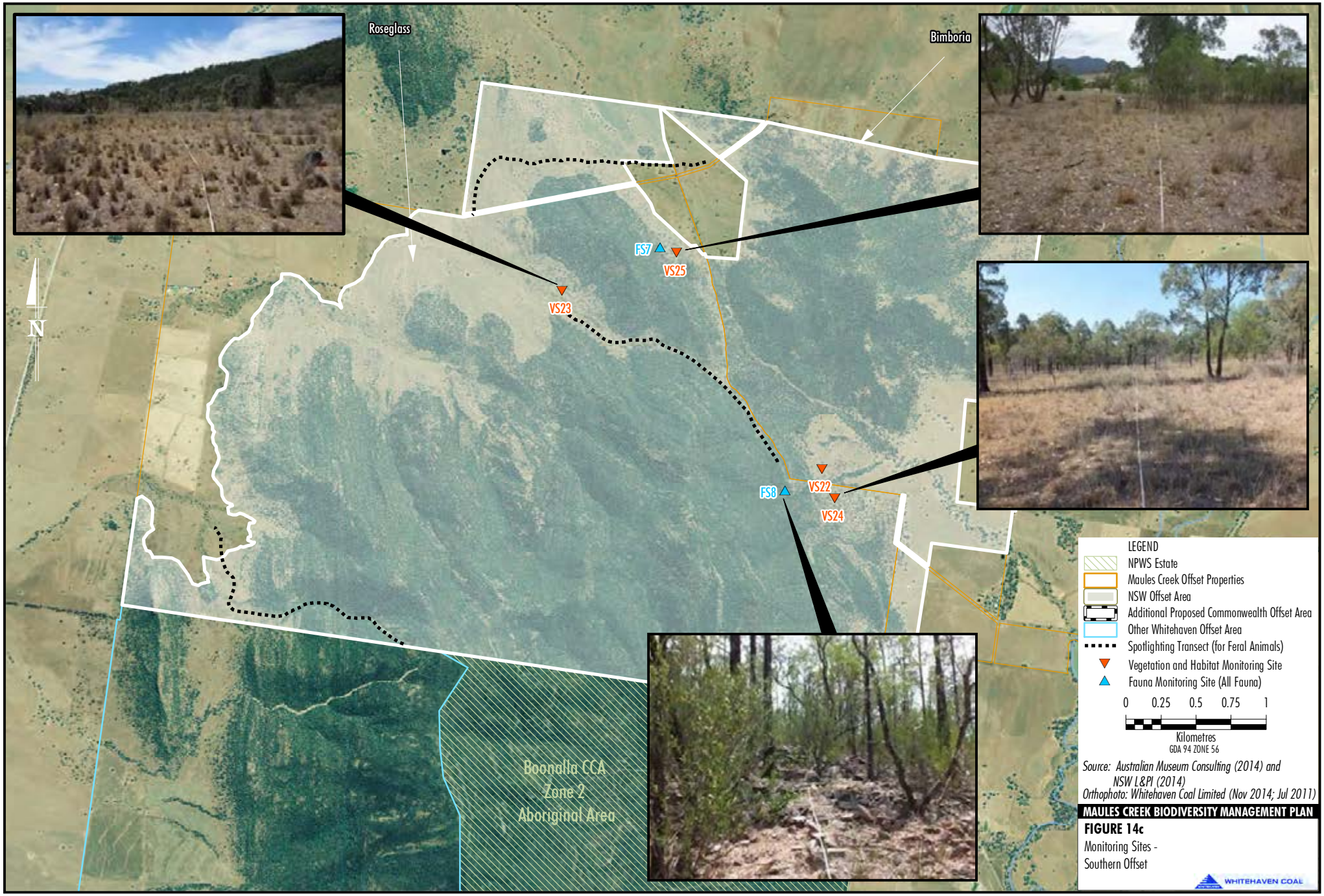
MAULES CREEK BIODIVERSITY MANAGEMENT PLAN

FIGURE 14b

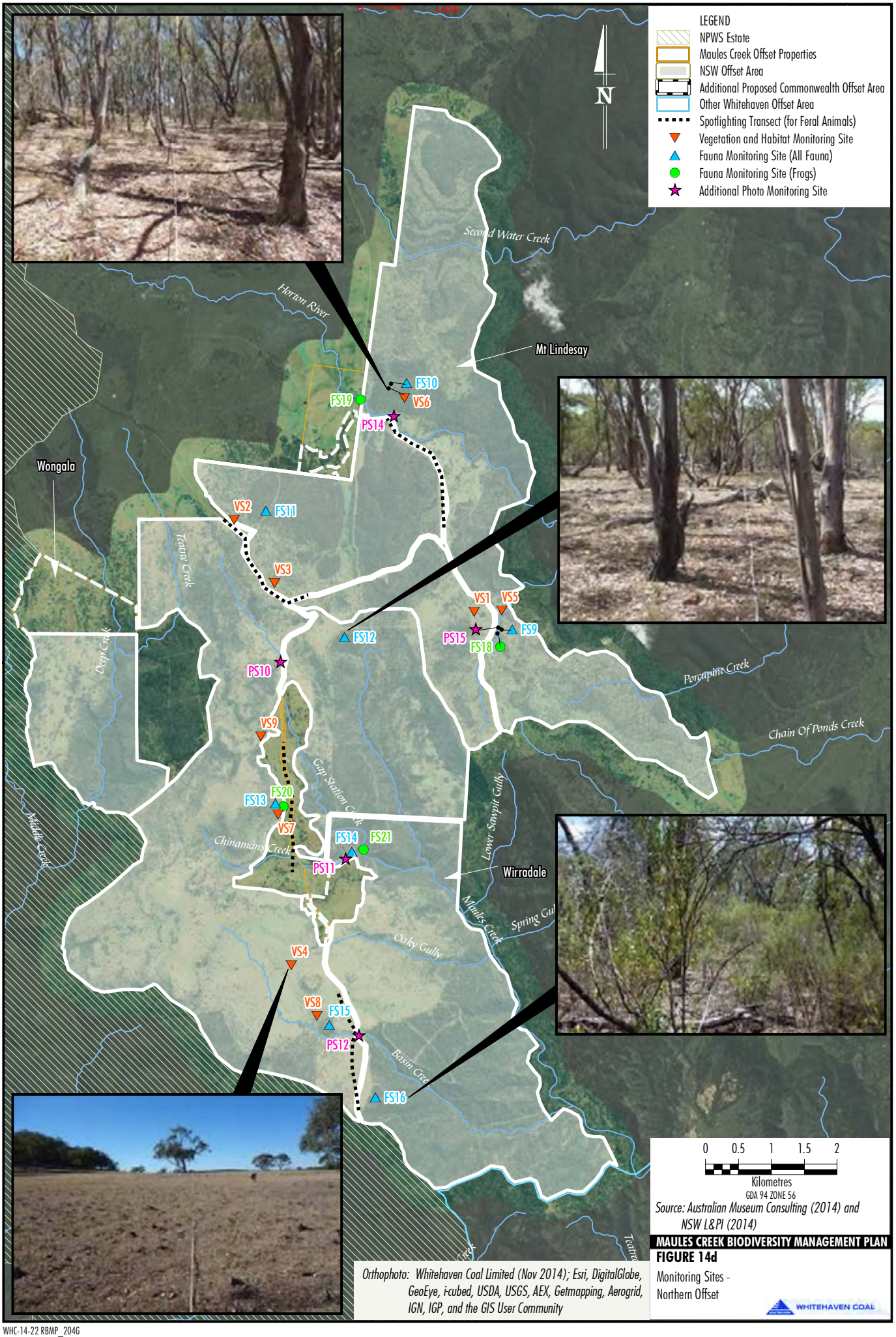
Monitoring Sites - Western Offset

WHITEHAVEN COAL

WHC-14-22 RBMP_202F



WHC-14-22 RBMP_246B



WHC-14-22 RBMP_204G

Timing and Frequency

Vegetation and habitat will be monitored on an annual basis in spring, when the highest diversity of plants is expected to be present (after Rawlings *et al.,* 2010).

Methodology

The vegetation and habitat monitoring methodology will include:

- detailed records of all management activities (e.g. date, location, on-ground works);
- fixed monitoring plots;
- photographic monitoring; and
- general observations;

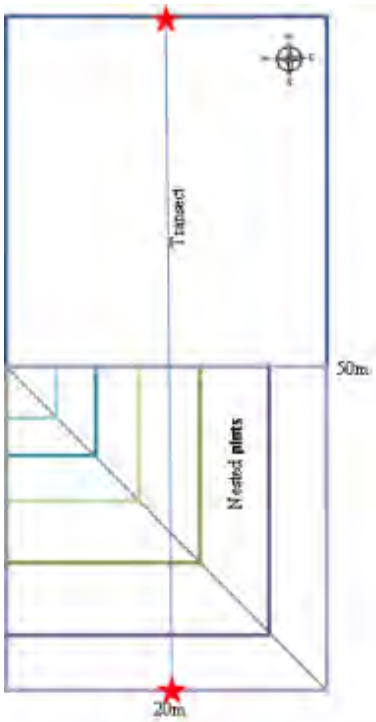
The methodology is detailed below.

Monitoring of *Tylophora linearis* and *Pomerderis queenslandica* in the offset areas will also occur as part of the translocation program as described in Sections 6.14 and 6.15.

Fixed Monitoring Plots

Fixed monitoring plots measuring 20 x 50 m will be established at each Vegetation and Habitat Monitoring Site to gather habitat data. Within each plot, a 20 x 20 m quadrat will be established to sample flora. The 20 x 20 m quadrat will be sampled using a nested method (which segments the quadrat) as described by Morrison *et al.* (1995) and Lewis *et al.* (2008). Figure 15 shows the layout of a plot and quadrat.

Plots will be permanently marked by placement of star pickets as recommended by Rawlings *et al.* (2010) at the northern and southern end of the midline of each plot. The location of the pickets will be recorded using a GPS. As a result of pilot surveys (Australia Museum Consulting, 2014) one plot at each survey site has already been marked.



Source: Australian Museum Consulting (2014)

Figure 15 Layout of the Vegetation and Habitat Monitoring Plot

The methodology includes monitoring vegetation structural parameters and flora species (Table 6-16) and a range of parameters such as habitat, management issues/response and vegetation cover (Table 6-17). Parameters 1 to 4 in Table 6-17 will be recorded every 10 years.

Table 6-16
Field Survey Parameters to be Recorded in Each 20 x 20 m Quadrat

	Parameter	Assessment Technique	Activity
1	Overall site cover: Cryptogam cover	Average within 20 x 20 m quadrat	Record cryptogam as a percentage of the site. Record in 5% increments. Cryptogams occurring on soil and rocks are included in the assessment.
2	Overall site cover: Rock Cover	Average within 20 x 20 m quadrat	Record rock cover as a percentage of the site. Record in 5% increments.
3	Overall site cover: Bare ground	Average within 20 x 20 m quadrat	Record bare ground as a percentage of the site. Record in 5% increments. Bare ground excludes rocks.
4	Structural Assessment: Canopy	Average within 20 x 20 m quadrat	Record percentage cover of canopy species. Canopy species are classified as vegetation >8 m. Record the height range of canopy species in metres.
5	Structural Assessment: Midstorey 1	Average within 20 x 20 m quadrat	Record percentage cover of Mid 1 species. Mid 1 is classified as vegetation <8 m and >5 m. Record the height range of Mid 1 species in metres.
6	Structural Assessment: Midstorey 2	Average within 20 x 20 m quadrat	Record percentage cover of Mid 2 species. Mid 2 is classified as vegetation <5 m and >1 m. Record the height range of Mid 2 species in metres.
7	Structural Assessment: Ground layer	Average within 20 x 20 m quadrat	Record percentage cover of living ground layer species. The ground layer is classified as vegetation <1 m. Record the height range of ground layer species in centimetres
8	Tree Species Size Classing	Count within 20 x 20 m quadrat	Record height classes of all tree species present. The classes include <1m, 1-2m,2-5m,5-10m,10-15m,15-20m,20-25m,25-30m,>30m Count the number of each species which occurs within each class. Record the total number of each species as the sum of all records.
9	Flora Species Richness	Six nested subplots within 20 x 20 m quadrat	Record presence of all flora species within subplots. Record with sample identification and field name where applicable. Identify specimens using floristic keys. Canopy species richness should be recorded across the whole plot

Source: Australian Museum Consulting (2014)

Table 6-17
Field Survey Parameters Recorded during the Pilot Survey in 20 x 50 m Plot

	Factor assessed	Assessment Technique	Activity
Habitat			
1	Habitat Feature Tree Hollows	Count 20 x 50 m plot	Count all hollows >10 cm occurring in plot. Consistent with BioBanking methodology. Record comments where applicable. If absent record as zero.
2	Habitat Feature: Fallen logs	Count 20 x 50 m plot	Count all fallen logs >10 cm diameter and >50 cm in length occurring in plot. Record comments where applicable. If absent record as zero.
3	Proximity to water	Observation General area	Record in meters type and distance of standing and ephemeral water occurring <500 m from the site. This includes dams, streams and drainage lines. Record comments where applicable. If absent record as zero.
4	Proximity to rocks, caves and over hangs	Observation General area	Record in meters distance to large habitat rocks, caves or overhangs occurring <300 m from the site. Record comments where applicable. If absent record as zero.
5	Presence of flowering Eucalypts	Observation 20 x 50 m plot	Record presence or absence of flowering Eucalypts. Where flowering occurs record species and proportion of site containing the flowering species (e.g. *Eucalyptus crebra* <5%). Record comments where applicable. If absent record as zero.
Management Issues/Response			
6	Evidence of extensive erosion or waterlogging disturbing native vegetation	Observation General area	Record in meters distance to erosion or waterlogging occurring <300 m from the site. Record comments where applicable. If absent record as zero.
7	Dense stands of regeneration (*Callitris glaucophylla*) that may require thinning	Observation General area	Record presence or absence of dense stands of *Callitris glaucophylla* occurring within or directly adjacent to the plot. Record comments where applicable. If absent record as zero.
8	Evidence of past disturbance	Observation 20 x 50 m plot	Record presence or absence of disturbance and document disturbance type. This include, but is not limited to, fire, logging, tree thinning, roads/tracks, grazing. If absent record as zero.
9	Dieback of Eucalypts that could be due to water stress	Observation 20 x 50 m plot	Record presence or absence of Eucalypt dieback and description of site topography. Record comments where applicable. If absent record as zero.
10	Presence/absence of Noisy Mynas	Observations/Call Identification General area	Record presence or absence of Noisy Mynas and/or Yellow-eared Mynas if not distinguishable. Record comments where applicable. If absent record as zero.
11	Presence/absence of other Honeyeaters	Observation/Call Identification General area	Record presence or absence of other Honeyeaters. Record habitat and comments where applicable. If absent record as zero.
12	Evidence of disturbance by pest animals.	Observation 20 x 50 m plot	Record presence or absence of pest animals. Evidence includes sighting, scats, tracks or obvious grazing. This includes but is not limited to livestock, fox, rabbit, deer, pigs, goats. Record comments where applicable. If absent record as zero.

Table 6-17 (Continued)
Field Survey Parameters Recorded during the Pilot Survey in 20 x 50 m Plot

	Factor assessed	Assessment Technique	Activity
Management Issues and Responses (Cont.)			
13	Regeneration of canopy species	Observation 20 x 50 m plot	Record presence or absence of canopy species regeneration. Where possible record species and proportion of site containing the regenerating species (i.e. *Eucalyptus crebra* 5 to 15%). Record comments where applicable. If absent record as zero.
14	Overall vegetation condition (Resilience)	Observation 20 x 50 m plot	Record vegetation condition on a scale of 1-4, where 1 is Very Poor and 4 is Good. Classify based on modified BioBanking descriptions (e.g. Good: <10% weed and/or healthy strata and high assemblage diversity. Moderate: 10 to 30% weed and/or minor stratum dieback and moderate assemblage diversity. Poor: 30 to 80% weed and/or moderate stratum dieback and low assemblage diversity. Very Poor: >80% weed and/or extensive stratum dieback/extremely reduced diversity)
Vegetation Cover			
15	Native overstorey cover (NOS)	At 10 points along a 50 m transect	Record height of highest layer in metres. Record health of overstorey (on a 1-3 scale in which 1 is poor and 3 is good). Record projected foliage cover directly over the selected point and within the boundaries of a confined shape (e.g. 5 cm tube).
16	Native midstorey cover (NMS)	At 10 points along a 50 m transect	Record height of highest layer in metres. Record health of midstorey (on a 1-3 scale in which 1 is poor and 3 is good). Record projected foliage cover directly over the selected point and within the boundaries of a confined shape (e.g. 5 cm tube).
17	Exotic overstorey and midstorey cover	At 10 points along a 50 m transect	Record height of highest layer in metres. Record health of midstorey (on a 1-3 scale in which 1 is poor and 3 is good). Record projected foliage cover directly over the selected point and within the boundaries of a confined shape (e.g. 5 cm tube).
18	Native ground cover (grasses)	At 50 points along a 50 m transect	Record occurrences or hit at each point. Record only occurrence, even if multiple “hits” of native grasses occur at the point. Consistent with BioBanking methodology.
19	Native ground cover (forb)	At 50 points along a 50 m transect	Record occurrences or hit at each point. Record only occurrence, even if multiple “hits” of native forbs occur at the point. Consistent with Biobanking methodology.
20	Native ground cover (other)	At 50 points along a 50 m transect	Record occurrences or hit at each point. Record only occurrence, even if multiple “hits” of native ground covers occur at the point. Include cryptogams. Consistent with Biobanking methodology.
21	Exotic ground cover	At 50 points along a 50 m transect	Record occurrences or hit at each point. Record only occurrence, even if multiple “hits” of exotic species occur at the point. Consistent with Biobanking methodology.
22	Overall site cover: Litter cover	Average within 20 x 20 m quadrat	Record litter cover as a percentage of the site. Record in 5% increments. Litter cover includes all dead material but excludes cryptogams and rocks. Litter depth is captured in the fire fuel hazard assessment.

Source: Australian Museum Consulting (2014)

Photographic Monitoring

Photo monitoring will be undertaken at the following fixed sites in the offset areas:

- VS1-25 (Vegetation and Habitat Monitoring Sites);
- PS1-15 (Additional Photo Monitoring Sites); and
- Any additional Vegetation and Habitat Monitoring Sites established over time (including at least one Photo Monitoring Site per Management Domain, particularly in areas undergoing active management).

Photos will be taken in a consistent direction, location (at global positioning system [GPS] points), height above the ground and time of day. These aspects and the date will be recorded for each photo taken (north, south, east and west). Aerial photographs will also be used (e.g. every three years) to show enhancement of vegetation connectivity.

General Observations

General observations outside monitoring sites will also be made during monitoring activities.

Data Analysis and Storage

The monitoring program includes measurement of a number of indicators (parameters) that will enable changes to the Box-Gum Woodland EEC/CEEC to be detected (e.g. floristics, recruitment), including changes that may be ascribed to water stress (e.g. visual dieback).

The monitoring program also includes measurement of a number of indicators (parameters) that will enable changes to the habitat (for the Regent Honeyeater, Swift Parrot and South-eastern Long-eared Bat) to be detected.

All quadrat data will be entered in databases and stored for later use and analysis. Data will be added to annually so that it will form a data matrix that is amenable to analysis using classification and ordination techniques, and parametric statistics.

Data collected will be analysed and compared with the performance criteria (Section 6.16).

After the photographic monitoring event the photos will be compared to the photos from the previous monitoring periods. Natural regeneration of native understorey and overstorey species, the occurrence of habitat complexity (e.g. logs, litter), plant establishment and the status of weeds will all be noted.

6.17.2 Fauna Monitoring

Purpose

Monitoring will be undertaken to document the fauna species response to improvement in vegetation and habitat in the offset areas and to demonstrate progress towards completion criteria (Table 6-11 and 6-12). Generally an increase in the species richness and/or abundance is anticipated as the quantity and/or quality of habitat resources increases over time.

Fauna monitoring will include documentation of native and introduced (including feral) animals. Feral animal monitoring is also outlined in Section 6.17.4.

Monitoring Design

The numbers of Fauna Monitoring Sites per domain are listed in Table 6-18. Monitoring sites will be progressively established in the Revegetation Domain monitor cleared areas subject to active revegetation. Similarly, monitoring sites will be progressively established in the Restoration Domains to monitor derived grassland areas subject to natural regeneration.

Table 6-18
Number of Fauna Monitoring Sites per Domain

Domain	General Description	Objective	Northern	Eastern	Western	Southern	Total Number of Sites
Revegetation	Low Diversity Native Grassland, Pasture Improved and/or Cultivated Land	Additional native vegetation to be established targeted restoration of self-sustaining vegetation communities in low diversity derived native grassland, pasture improved and cultivated land.	Note 1	Note 1	Note 1	Note 1	Note 1
Restoration	Derived Native Grassland	Additional native vegetation to be established with the restoration of self-sustaining vegetation communities within derived native grassland.	Note 1	Note 1	Note 1	Note 1	Note 1
Enhancement	Semi-cleared Woodland/Forest	Semi-cleared woodland/forest to be protected and enhanced.	4	2	0	0	6
Habitat Management	Existing Native Woodland/Forest	Existing woodland/forest to be protected and enhanced.	4	1	3	2	10
		Total Sites	**8**	**3**	**3**	**2**	**16**

Note 1 Monitoring sites will be progressively established in the Revegetation and Restoration Domains to monitor the fauna usage of revegetation.

Location of Monitoring Sites

Monitoring sites are located across all of the offset areas (Northern, Eastern, Western and Southern Areas). The location of monitoring sites is shown on Figures 14a to 14d. The monitoring site locations have been selected following commencement of the pilot monitoring study in 2014.

Frequency

Seasonal fauna surveys will be undertaken in spring, summer and winter every three years. This frequency is appropriate to detect species changes due to improvement in vegetation and habitat in the offset areas. Habitat monitoring will occur yearly as described in Section 6.17.1.

In accordance with Condition 19 of the Approval Decision EPBC 2010/5566, monitoring for the Regent Honeyeater (*Xanthomyza phrygia*), Swift Parrot (*Lathamus discolor*) and the South-eastern Long-eared Bat (*Nyctophilus corbeni*) will be carried out annually unless otherwise agreed to in writing by DotE. Surveys will occur between March and July for the Swift Parrot (*Lathamus discolor*), between September and November for the Regent Honeyeater (*Xanthomyza phrygia*) and October to April for the South-eastern Long-eared Bat (*Nyctophilus corbeni*).

Target Fauna

All native and introduced vertebrate fauna groups will be targeted, including:

- frogs;
- reptiles;
- birds (including nectarivorous woodland birds, arboreal insectivorous woodland birds, ground-dwelling insectivorous woodland birds and bark-gleaning woodland birds);
- bats;
- other arboreal mammals; and
- ground-dwelling mammals.

Methodology

Fauna monitoring methods are outlined in Table 6-19.

Table 6-19
Fauna Monitoring Methods

Group	Location	Method	Description	Relevant Survey Period	Method Source
Amphibians	Monitoring Sites in the Riparian Domain	Nocturnal Searches	Searches for 30-60 person minutes at each site and all species observed or heard were identified. Each site will be surveyed on 2 separate nights.	Spring and Summer	DECC (2009)
	Monitoring Sites in the Riparian Domain	Call Playback	Broadcast call for amphibians if suitable habitat exists.	Spring and Summer	DECC (2009)
	Monitoring Sites in the Riparian Domain	Tadpole Surveys	Searches for 30-60 minutes in suitable habitat.	Spring and Summer	DECC (2009)
Reptiles	All monitoring sites.	Habitat Search	Active search of potential reptile habitats performed for 60 person minutes at each site.	Spring and Summer	Department of Environment and Conservation (DEC) (2004)
	All monitoring sites.	Spotlighting	Active searches for nocturnal species, including nocturnal reptiles will be performed for 60 person minutes at each site.	Spring and Summer	DEC (2004)
Diurnal Birds	All monitoring sites.	Area Search	20 minute standard search within 3 hours of dawn, each site will surveyed twice times. All birds observed or heard will be recorded.	Spring, Summer and Winter	DEC (2004)
Nocturnal Birds	All monitoring sites.	Call Playback (Owls)	Targeting Masked Owl and Barking broadcast for 5 minutes followed by 5 minutes of listening then a 10 minute spotlighting session following the final listening period.	Spring, Summer and Winter	DEC (2004)
	All monitoring sites.	Habitat Search	Opportunistic observations of signs of nocturnal birds throughout the study area.	Spring, Summer and Winter	DEC (2004)
	All monitoring sites.	Spotlighting	Active searches for nocturnal species, including nocturnal birds will be performed for 60 person minutes at each site, twice.	Spring, Summer and Winter	DEC (2004)

Table 6-19 (Continued)
Fauna Monitoring Methods

Group	Location	Method	Description	Relevant Survey Period	Method Source
Terrestrial Mammals	All monitoring sites.	Camera Traps	Each camera left *in-situ* for a minimum of 10 days with a bait chamber positioned between 1 to 3 m from the camera.	Spring, Summer and Winter	Eyre *et al.* (2012)
	All monitoring sites.	Secondary Evidence	Opportunistic observations of fauna signs throughout the study area.	Spring, Summer and Winter	DEC (2004)
	All monitoring sites.	Spotlighting	Active searches for nocturnal species, including nocturnal mammals will be performed for 60 person minutes at each site.	Spring, Summer and Winter	DEC (2004)
Bats (including the Southern Long-eared Bat)	All monitoring sites.	Anabat Detectors	Two Anabat units left overnight for 2 nights at each site.	Spring and Summer	DEC (2004); DEWHA (2010a)
	Monitoring sites in flyways.	Harp-trapping	Two Harp traps per site left *in situ* for 2 nights.	Spring and Summer	DEC (2004); DEWHA (2010a)

The methodology outlined in Table 6-19 will enable detection of threatened fauna species. The target threatened fauna are listed below in Table 6-20. These are species that have been recorded in the offset areas and surrounding areas. Although not all of these species have been recorded on the offset areas, potential habitat for these species occurs, and therefore they will be surveyed for using the methods in Table 6-19.

Table 6-20
Threatened and Migratory Species

Common Name	Scientific Name	Conservation Status[1]		Known to Occur in the Offset Areas (Table 5-6)
		TSC Act	EPBC Act	
Reptiles				
Border Thick-tailed Gecko	*Uvidicolus sphyrurus*	V	V	✓
Pale-headed Snake	*Hoplocephalus bitorquatus*	V	-	Potential
Birds				
Black-necked Stork	*Ephippiorhynchus asiaticus*	E	-	Potential
Square-tailed Kite	*Lophoictinia isura*	V	-	Potential
Spotted Harrier	*Circus assimilis*	V	-	Potential
Little Eagle	*Hieraaetus morphnoides*	V	-	Potential
Little Lorikeet	*Glossopsitta pusilla*	V	-	✓
Turquoise Parrot	*Neophema pulchella*	V	-	✓
Swift Parrot	*Lathamus discolour*	E	E	Potential
Masked Owl	*Tyto novaehollandiae*	V	-	✓
Barking Owl	*Ninox connivens*	V	-	✓
Speckled Warbler	*Pyrrholaemus sagittatus*	V	-	✓
Regent Honeyeater	*Anthochaera Phrygia*	CE	E	Potential
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis gularis*	V	-	✓
Painted Honeyeater	*Grantiella picta*	V	-	Potential
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	V	-	✓
Diamond Firetail	*Stagonopleura guttata*	V	-	✓
Scarlet Robin	*Petroica boodang*	V	-	✓
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis temporalis*	V	-	✓
Hooded Robin (south-eastern form)	*Melanodryas cucullata cucullata*	V	-	✓
Varied Sittella	*Daphoenositta chrysoptera*	V	-	✓
Fork-tailed Swift	*Apus pacificus*	-	M	Potential
Rainbow Bee-eater	*Merops ornatus*	-	M	✓
White-throated Needletail	*Hirundapus caudacutus*	-	M	✓
Satin Flycatcher	*Myiagra cyanoleuca*	-	M	Potential

Table 6-20 (Continued)
Threatened and Migratory Species

Common Name	Scientific Name	Conservation Status[1]		Known to Occur in the Offset Areas (Table 5-6)
		TSC Act	EPBC Act	
Mammals				
Koala	*Phascolarctos cinereus*	V	V	Potential
Squirrel Glider	*Petaurus norfolcensis*	V	-	✓
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	V	-	✓
Eastern Bentwing-bat	*Miniopterus schreibersii oceanensis*	V	-	✓
South-eastern Long-eared Bat	*Nyctophilus corbeni*	V	V	✓
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	V	✓
Little Pied Bat	*Chalinolobus picatus*	V	-	Potential
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	V	-	Potential
Eastern Cave Bat	*Vespadelus troughtoni*	V	-	Potential

Threatened Fauna Listed Under the EPBC Act

In accordance with Condition 19 of the Approval Decision EPBC 2010/5566, baseline surveys of the offset areas and subsequent monitoring will be undertaken for the Regent Honeyeater (*Xanthomyza phrygia*), Swift Parrot (*Lathamus discolor*) and the South-eastern Long-eared Bat (*Nyctophilus corbeni*) in accordance with the *Survey Guidelines for Australia's Threatened Birds* (DEWHA, 2010b) and the *Survey Guidelines for Australian Threatened Bats* (DEWHA, 2010a), unless otherwise agreed to in writing by DotE.

Data Analysis and Storage

All fauna data will be entered in a database and stored for later use and analysis. Data will be added to annually so that it will form a data matrix that is amenable to analysis using classification and ordination techniques, and parametric statistics.

6.17.3 Weed Monitoring

Purpose

Monitoring will be undertaken to document the change in the type, extent and density of major environmental (e.g. WONS) and noxious weed occurrences in the offset areas over time. Regular inspections will also facilitate detection of new infestations of weeds and enable assessment of the effectiveness of the weed management measures as outlined in Section 6.8.

Methodology

As described in Section 6.17.1, the vegetation and habitat monitoring methodology will include documentation of native and introduced (including noxious weed) flora species. However, additional methodology to specifically monitoring weeds is outlined below.

Environmental (e.g. WONS) and noxious weeds will be monitored via inspections of the offset areas by a suitably qualified person(s) with experience in identification of weeds. If major weed infestations are discovered in the offset areas, the coordinates will be recorded, including the boundaries of large populations and details recorded regarding the estimated density of the infestation and the number of plants. Mapping will be prepared showing the extent of weeds requiring control.

The weeds will be controlled as outlined in Section 6.8. Follow-up inspections will be undertaken to assess the effectiveness of the weed management measures implemented and the requirement for any additional management measures.

Frequency

Environmental (e.g. WONS) and noxious weeds will be monitored twice a year for three years (following State approval of BMP Edition 2) and thereafter the frequency of monitoring would be reviewed. Each weed monitoring period will include primary monitoring and secondary monitoring after weed control (a total of four weed monitoring events per year). Review of the weed management measures will be completed based on the results of the first five years of monitoring and follow-up works will be developed and implemented as required.

Data Analysis and Storage

All weed monitoring data will be entered in a database and stored for later use and analysis. Data should include control measures (e.g. date, activity, location). New species detected during surveys will be added to the database and reported on within the BMP Annual Report (Section 7.2.2).

6.17.4 Feral Animal Monitoring

Purpose

The abundance and distribution of feral animals within the offset areas will be monitored to:

- provide the necessary information to trigger management actions; and
- determine the efficacy of control measures aimed at reducing feral animal abundance.

Methodology

As described in Section 6.17.2, the fauna monitoring methodology will include documentation of native and introduced (including feral) animal species. Feral animal monitoring will adopt the relevant methodologies for specific feral animals generally in accordance with the NSW DPI *Monitoring Techniques for Vertebrate Pests* (Mitchell and Balogh, 2007a to e) so that a range of methods can/cannot be used such as transects/spotlighting, sandpads, cameras traps, etc. that will be determined where practicable and relevant to the specific offset areas/properties. Table 6-21 provides a list of target feral animals. Data on feral animal population/abundance from monitoring and control outcomes (e.g. date, activity, location) will be recorded.

Table 6-21
Target Feral Animals

Common Name	Scientific Name	Status[1]
Feral Pig	*Sus scrofa*	Declared pest
Feral Goat	*Capra hircus*	-
European Red Fox	*Vulpes vulpes*	Declared pest
European Rabbit	*Oryctolagus cuniculus*	Declared pest
Feral Deer	*Cervus* spp., *Axis* spp., or *Dama* spp.	-
Feral Cat	*Felis catus*	-
Wild Dog	*Canis familiaris*	Declared pest

Frequency

In order to monitor population changes over time and determine the efficacy of control measures, feral animals will be monitored. Feral animals will be monitored on a quarterly basis for three years (following State approval of BMP Edition 2) and thereafter the frequency of monitoring would be reviewed. Review of the feral animal control measures and follow-up works will be developed and implemented as required, and no later than 5 years after commencement of monitoring under this BMP. Any proposed changes to frequency of monitoring will be discussed with OEH and formalised in a revision to the BMP.

Data Analysis and Storage

After each monitoring event is complete, an estimate of feral animal abundance will be estimated in accordance with NSW DPI *Monitoring Techniques for Vertebrate Pests* (Mitchell and Balogh, 2007a to e).

Data will be updated annually to analyse for trends and effectiveness of control program.

Native grazers that potentially inhibit restoration/revegetation (e.g. kangaroos) will be recorded. If grazing kangaroos are determined to be overabundant, the need for kangaroo control measures will be reviewed (Section 6.18).

6.18 POTENTIAL RISKS AND CONTINGENCY MEASURES

Threatened Species and Box-Gum Woodland Implementation Plans

As described in Section 2.3, the *MCCM Threatened Fauna Implementation Plan* (Whitehaven, 2015a) and *MCCM Box-Gum Woodland Endangered Ecological Community Implementation Plan* (Whitehaven, 2015b) were prepared by Whitehaven in accordance with Conditions 48 and 50 of Schedule 3 to PA 10_0138. These implementation plans were approved by DP&E on the 14 January 2015.

The *MCCM Threatened Fauna Implementation Plan* (Whitehaven, 2015a) was developed to maximise the likely prospects for the provision of suitable habitats for threatened fauna on the offset areas and on the post mining landform. This investigation involved identification of all factors likely to enhance or impede the effective long term provision of suitable habitat(s) for threatened species. The investigation has resulted in the identification of 21 individual actions relating to the Biodiversity Offset Strategy.

The *MCCM Box-Gum Woodland Endangered Ecological Community Implementation Plan* (Whitehaven, 2015b) was developed to maximise the prospects for rehabilitation and regeneration of the Box-Gum Woodland EEC/CEEC on the offset areas and the mine site. This investigation involved identification of all factors likely to enhance or impede the effective long term restoration of degraded remnants of Box-Gum Woodland in offset areas or regeneration of Box-Gum Woodland on disturbed areas. The investigation resulted in the identification of 52 individual actions relating to the Biodiversity Offset Strategy.

The approved implementation plans are incorporated into this BMP. Appendix B provides the individual actions of the implementation plans together with a reference to where the individual actions are addressed in this BMP.

Risk Assessment

Following preparation of the *MCCM Threatened Fauna Implementation Plan* (Whitehaven, 2015a) and *MCCM Box-Gum Woodland Endangered Ecological Community Implementation Plan* (Whitehaven, 2015b), a risk assessment was undertaken to confirm that appropriate measures are included in the BMP to management risks (impediments) to achieving the objectives of the offset areas. The risk assessment is provided in Appendix F.

Contingency Measures

Table 6-22 provides trigger points for contingency measures (corrective actions) to be implemented if the monitoring program identifies that the performance criteria are not being met. Contingency measures may not be limited to those listed in Table 6-22.

Table 6-22
Contingency Measures

Aspect	Section	Trigger Point	Contingency Measures
Revegetation	Section 6.5	Poor understorey diversity.	• Consider replanting, causing disturbance through fire or grazing.
		Dense grass cover.	• Consider ecological thinning, causing disturbance through fire or grazing.
		Poor native plant growth/germination.	• Additional planting or sowing to replace lost recruits or seedlings if the rate of loss is higher than the rate of establishment. • Consider the benefits and practicality of applying soil ameliorants.
		Dense overstorey and midstorey revegetation.	• Ecological thinning.
		Grazing kangaroos is significantly damaging young seedlings.	• If grazing kangaroos is significantly damaging young seedlings, the need for kangaroo control measures will be reviewed. Options for managing the issue include controlling kangaroo numbers or use of tree guards to protect young seedlings.
		Insect pests significantly damaging young seedlings.	• Pesticide will be used safely according to the safety data sheets.
		Presence of Myrtle Rust or Phytophthora	• Establish hygiene protocols (e.g. avoiding infected areas, vehicle wash down).
Control of Weeds	Section 6.8	Weed invasion – perennial and annual grasses, perennial herbs, annual and biennial herbs and woody weeds.	• Review additional strategies to control target weed species. • Increase the frequency of weed control and monitoring. • Re-evaluate the grazing strategy.
Control of Feral Animals	Section 6.9	Sustained increase in feral animal numbers despite control measures.	• Review additional strategies to control target feral animals. • Increase the frequency of feral animal control and monitoring. • Consider the practicality of installing temporary fencing around plantings (effective against feral pigs).
Management of Livestock Grazing	Section 6.11	Too frequent grazing management, impacting on native fauna habitat, removing or destroying plantings (potentially due to drought etc.).	• Re-evaluate the grazing strategy. • Lower the grazing pressure as required and preferentially rotate stock out of stressed paddocks to prevent overgrazing of native pastures. • Fence off sensitive areas to exclude or control grazing.
Access Control	Section 6.12	Illegal access and vandalism.	• Inspect and remedy issue. • Report illegal access and vandalism to relevant authorities.

Table 6-22 (Continued)
Contingency Measures

Aspect	Section	Trigger Point	Contingency Measures
Bushfire Management	Section 6.13	Unplanned bushfire over greater than 20% of the offset areas.	• Inspect and remedy issues with fences, gates or access. • Re-evaluate the required management in the affected portions of the offset areas and revise the BMP (if required).
Translocation of *Tylophora linearis*	Section 6.14	Translocation unsuccessful.	• Recommence implementation of Stages 2 to 5 of the *Tylophora linearis Propagation and Translocation Program* (Appendix C).
Translocation of *Pomaderis queenslandica*	Section 6.15	Translocation unsuccessful.	• Recommence implementation of Stages 2 to 5 of the *Pomaderis queenslandica Propagation and Translocation Program* (Appendix D).

7 REPORTING AND REVIEW

7.1 DOCUMENTATION

7.1.1 Recording Survey Data and Other Information

A summary of documentation requirements is provided in Table 7-1.

Table 7-1
Documentation

Aspect	Section	Recording Requirements	Frequency/Timing
Mine Site			
Marking Limits of Clearing	Section 4.1.1	Documented in LDP form and signed off.	Following vegetation clearing.
Pre-clearance Flora and Fauna Surveys	Section 4.1.2	Documented in LDP form and signed off.	Following vegetation clearing.
Weed Management During Construction	Section 4.1.4	Documented in LDP form and signed off.	Following vegetation clearing.
Maximising Salvage of Habitat Resources	Section 4.1.6	Documented in LDP form and signed off.	Following vegetation clearing.
Seed Collection	Section 4.3	To be documented as part of the Mine Operations Plan reporting.	Ongoing.
Control of Weeds	Section 4.5	This will include documentation of locations and dates subject to weeding, weeding techniques used, target species controlled, new species identified (if any) and chemicals used. Where necessary, management actions will be summarised on maps of the relevant management areas.	Ongoing.
Control of Feral Animals	Section 4.6	This will include documentation of the techniques used for each feral species, the quantity of bait material purchased and locations deployed, the areas subject to control, estimates of the numbers of animals culled, new species identified (if any) and any other chemicals used. Where necessary, management actions will be summarised on maps of the relevant management areas.	Ongoing.
Monitoring Program	Section 4.13	Methods and results.	After monitoring events.
Offset Areas			
Seed Collection and Propagation	Section 6.4	Record all seed collected, species, quantities, dates and locations as per the seed collection protocols.	Ongoing.
Revegetation	Section 6.5	Results of site planning, site preparation, species and quantities planted/seeded, location of revegetation, dates of revegetation, and maintenance undertaken.	Ongoing.

Table 7-1 (Continued)
Documentation

Aspect	Section	Recording Requirements	Frequency/Timing
Reuse of Salvaged Habitat Resources	Section 6.6	Type, location and quantity of habitat resources relocated.	Following relocation.
Management of Cultural Heritage	Section 6.7	Any known or potential heritage finds are to be recorded, placed on the heritage database and added to the GIS mapping file.	Ongoing.
Control of Weeds	Section 6.8	Record information on areas worked, timing of works, techniques used, any issues encountered, recommendations and the control program for the subsequent year. Every second reporting year, a map of weed extents and densities is to be included in the records.	Ongoing.
Control of Feral Animals	Section 6.9	Report documenting timing of works, techniques used, data on kills or bait update, any issues encountered, maps and data on the areas of impact and population estimates per species, recommendations and the control program for the subsequent year/s. Records to include monitoring results and population size estimates compared to previous years of monitoring to identify any trends in vertebrate pest control performance.	Ongoing.
Control of Erosion	Section 6.10	Remediation techniques, dates and locations.	Ongoing – following remediation.
Management of Livestock Grazing	Section 6.11	An inventory of livestock stocking rates per management unit (Figures 12a to 12g) prior to introduction of livestock into different paddocks. If multiple paddocks are used in a management unit, the livestock stocking rates per paddock will be recorded.	Annually.
Control of Access	Section 6.12	Inspect and record fencing and gates.	Annually.
Bushfire Management	Section 6.13	Inspect and record access tracks.	Annually.
Translocation of *Tylophora linearis*	Section 6.14	Document the implementation of the translocation program (dates, locations, number of plants).	Annually, end of March.
Translocation of *Pomaderris queenslandica*	Section 6.15	Document the implementation of the translocation program (dates, locations, number of plants).	Annually, end of March.
Monitoring Program	Section 6.17	Monitoring results.	Following monitoring.

7.1.2 Reporting Survey Data

In accordance with Condition 31 of the Approval Decision EPBC 2010/5566, survey data will be recorded so as to conform to data standards notified from time to time by DotE. When requested by the DotE, MCC will provide all species and ecological survey data and related survey information from ecological surveys undertaken for MNES. This survey data will be provided within 30 business days of request, or in a timeframe agreed to by DotE in writing.

In accordance with Condition 39 of the Approval Decision EPBC 2010/5566, MCC will maintain accurate records substantiating all activities and outcomes associated with or relevant to Approval Decision EPBC 2010/5566, including measures taken to implement BMP, and make them available upon request to the DotE.

7.2 REPORTING REQUIREMENTS

The following reporting and auditing protocols will take place to assess the quality and compliance of the management of the offset areas.

7.2.1 MCCM Annual Review

An Annual Review will be submitted by the end of March each year under Condition 4, Schedule 5 of PA 10_0138, which outlines the environmental performance of the MCCM over the previous calendar year.

The Annual Review will include:

- a comprehensive review of the monitoring results and complaints records of the development over the previous calendar year, which includes a comparison of these results against the:
  - the relevant statutory requirements, limits or performance measures/criteria;
  - the monitoring results of previous years; and
  - the relevant predictions in the EIS;
- identification of any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;
- identification of any trends in the monitoring data over the life of the development;
- identification of any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and
- a description of what measures will be implemented over the next year to improve the environmental performance of the MCCM.

The Annual Review will include a review of the actions undertaken against the performance criteria relevant to the previous calendar year (Table 6-9).This BMP may be reviewed and revised as a result of the compilation of the Annual Review to improve environmental performance as per Condition 5 in Schedule 5 of PA 10_0138. This review will be conducted within three months of submission of the Annual Review.

MCC will liaise with Forestry Corporation of NSW of feral animal and weed control efforts and population observations in Leard State Forest to assist Forestry Corporation of NSW in scheduling feral animal control in the adjacent forest.

7.2.2 BMP Annual Report

Condition 18(vi) of Approval Decision EPBC 2010/5566 requires a process by which to report to DotE:

- the progress of management activities undertaken in the offset areas;
- the outcome of those management activities;
- any need for improved management; and
- activities to undertake such improved management.

Following approval of the BMP by DotE, MCC will prepare a report annually (by the end of March each year) addressing the above.

7.2.3 Commonwealth Approval Compliance Reports

A report pertaining to the annual compliance with Approval Decision EPBC 2010/5566 will be published on the MCC website by the end of March each year after the commencement of the MCCM in accordance with Condition 34 of the Approval Decision EPBC 2010/5566. Non-compliance with any of the conditions will be reported to DotE at the same time as the compliance report is published.

7.2.4 BMP Publishing

The BMP will be published on the MCC website. Any revisions to this BMP will be published on the MCC website within one month of being approved.

7.2.5 *Tylophora linearis* Propagation and Translocation Program

A report will be compiled annually (by the end of March each year) which documents the implementation of the Propagation and Translocation Program for *Tylophora linearis*. This report will report on each of the five stages of the program until the completion criteria have been met (i.e. the study was completed). The report will be sent to OEH, DP&E, DotE and Forestry Corporation of NSW. A summary will also be provided within the Annual Review.

7.2.6 *Pomaderris queenslandica* Propagation and Translocation Program

A report will be compiled annually (by the end of March each year) which documents the implementation of the Propagation and Translocation Program for *Pomaderris queenslandica*. This report will report on each of the five stages of the program until the completion criteria have been met (i.e. the study was completed). The report will be sent to OEH, DP&E and Forestry Corporation of NSW. A summary will also be provided within the Annual Review.

7.3 REVISION OF THE BIODIVERSITY MANAGEMENT PLAN

The BMP will be reviewed and revised from time to time. An overview of the Commonwealth and NSW triggers are provided below.

Commonwealth Requirements

In accordance with Condition 36 of the Approval Decision EPBC 2010/5566, if MCC wishes to carry out any activity otherwise than in accordance with this BMP (as it pertains to Approval Decision EPBC 2010/5566), MCC will submit a revised BMP to DotE for the Minister's written approval. The varied activity shall not commence until the Minister has approved the revised plan in writing. The Minister will not approve a revised plan, unless the revised plan would result in an equivalent or improved environmental outcome.

In accordance with Condition 37 of the Approval Decision EPBC 2010/5566, if the Commonwealth Minister believes that it is necessary or convenient for the better protection of listed threatened species and communities or listed migratory species to do so, the Minister may request MCC to make specified revisions to this BMP and submit the revised plan for the Minister's written approval. MCC must comply with any such request. The revised approved plan must be implemented. Unless the Minister has approved the revised plan then MCC must continue to implement the originally approved plan, as specified in the conditions.

As described in Section 6.2.2, once the Conservation and Biodiversity Bond has been calculated, verified and lodged, this BMP will be revised to provide an estimate of the costs of the activities in accordance with Condition 18(g) of the Approval Decision EPBC 2010/5566.

NSW Requirements

In accordance with Condition 5 of Schedule 5 to PA 10_0138, the BMP will be reviewed, and revised if necessary to the satisfaction of the NSW Secretary of DP&E, within three months of:

- the submission of an annual review (Section 7.2.1);
- the submission of an incident report (Condition 7 of Schedule 5 to PA 10_0138);
- the submission of an audit report (Section 7.4.2); or
- any modification to the conditions of this consent, (unless the conditions require otherwise).

Further, under Condition 4 in Schedule 2 to PA 10_0138, MCC must comply with reasonable requirements of the Secretary of DP&E in respect of DP&E's assessment of this BMP or the implementation of actions or measures under this BMP, including any reasonable request to amend this BMP.

Under Condition 16 in Schedule 2 to PA 10_0138, MCC may progressively submit a BMP with the approval of the Secretary of the DP&E.

7.4 BIODIVERSITY AUDIT

7.4.1 Commonwealth Audit

In accordance with Condition 35 of the Approval Decision EPBC 2010/5566, upon the direction of the Commonwealth Minister, MCC will ensure that an independent audit of compliance with the conditions of approval is conducted and a report submitted to the Commonwealth Minister. The independent auditor will be approved by the Commonwealth Minister prior to the commencement of the audit. Audit criteria will be agreed to by the Commonwealth Minister and the audit report will address the criteria to the satisfaction of the Commonwealth Minister.

7.4.2 NSW Audits

Independent Environmental Audit

By the end of June 2015, and every three years after, an Independent Environmental Audit will be conducted in accordance with Condition 10, Schedule 5 of PA 10_0138. This Environmental Audit will be conducted by a suitably qualified, experienced and independent team of experts whose appointment was endorsed by the NSW Secretary of the DP&E. The Independent Environmental Audit will assess the environmental performance of the MCCM and the MCCM's compliance to the conditions of PA 10_0138.

Biodiversity Audit

In accordance with Condition 56 of Schedule 3 to PA 10_0138, by the end of December 2017 and then every five years MCC will commission suitably qualified, experienced and independent person/s, whose appointment was approved by the NSW Secretary of the DP&E, to undertake an audit of the revegetation of the rehabilitation area, management and restoration within the Biodiversity Offset Strategy areas.

7.5 COMMUNITY CONSULTATIVE COMMITTEE

MCC has established a Community Consultative Committee (CCC) for the MCCM in accordance with Condition 7 of Schedule 5 to PA 10_0138. The condition is reproduced below:

> *The Applicant shall establish and operate a Community Consultative Committee (CCC) for the project to the satisfaction of the Director-General. This CCC must be operated in general accordance with the Guidelines for Establishing and Operating Community Consultative Committees for Mining Projects (Department of Planning, 2007, or its latest version), and be operating within 6 months of the date of this approval.*
>
> *The CCC must include at least one member representing the Maules Creek community, one member from Aboriginal stakeholder groups, and seek to include some joint membership with CCCs for other operating coal mines within the Leard State Forest Mining Precinct, unless otherwise agreed by the Director-General.*

Notes:

- *The CCC is an advisory committee. The Department and other relevant agencies are responsible for ensuring that the Applicant complies with this approval; and*
- *In accordance with the Department's guideline, the CCC should be comprised of an independent chair and appropriate representation from the Proponent, Council, recognised environmental groups and the local community.*

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APPENDIX A

RECONCILIATION OF THE NSW BIODIVERSITY OFFSET STRATEGY AGAINST THE OFFSET AREAS

Table A-1
Reconciliation of the Revised Biodiversity Offset Strategy against Condition 44#

NSW Requirement (Condition 44)				NSW Revised Biodiversity Offset Strategy		Difference	
Area	Offset Type	Area (ha)	Minimum Size (Based on Existing Woodland/Forest and Derived Native Grassland) (ha)	Area (ha)	Size Based on Existing Woodland/Forest and Derived Native Grassland (ha)	Difference Area (ha)	Difference Minimum Size (ha)
Northern Offset Area currently owned or under option by Proponent (Mt Lindesay and Wirradale)	Existing Woodland/Forest*	4,286	5,756	4,604.9	6,403.4	318.9	647.4
	Derived Native Grassland	1,470		1,798.5		328.5	
	Subset of Derived Native Grassland comprising Box-Gum Woodland EEC	1,396		1,444.1		48.1	
	Low Diversity Native Grassland/Pasture Improved and Cultivated Land	58		99.7		41.7	
Eastern Offset Area currently owned or under option by Proponent (Teston North, Tralee and Warriahdool)	Existing Woodland/Forest*	190	190	190[A]	190.8	Equal	0.8
	Derived Native Grassland	0		0.8		0.8	
	Subset of Derived Native Grassland comprising Box-Gum Woodland EEC	0		0.8		0.8	
	Low Diversity Native Grassland/Pasture Improved and Cultivated Land	319		335.9		16.9	
Western Offset Area including 50% Joint Venture property currently owned or under option by Proponent (Shared Offset, Louenville, Olivedeen, Teston South and Velyama)	Existing Woodland/Forest* (including 7 ha of Belah)	891	1,039	891[B]	1,039	Equal	Equal
	Derived Native Grassland	148		148[C]		Equal	
	Subset of Derived Native Grassland comprising Box-Gum Woodland EEC	90		132[D]		42	
	Low Diversity Native Grassland/Pasture Improved and Cultivated Land	368		377.4		9.4	

Table A-1 (Continued)
Reconciliation of the Revised Biodiversity Offset Strategy against Condition 44#

NSW Requirement (Condition 44)				NSW Revised Biodiversity Offset Strategy		Difference	
Area	Offset Type	Area (ha)	Minimum Size (Based on Existing Woodland/Forest and Derived Native Grassland) (ha)	Area (ha)	Size Based on Existing Woodland/Forest and Derived Native Grassland (ha)	Difference Area (ha)	Difference Minimum Size (ha)
Eastern Offset Area identified in the zone of affectation (Cattle Plain^ and Wollandilly)	Existing Woodland/Forest*	336	336	343.9[E]	533	7.9	197
	Derived Native Grassland	0		189.1[F]		189.1	
	Subset of Derived Native Grassland comprising Box-Gum Woodland EEC	0		189.1 [F]		189.1	
	Low Diversity Native Grassland/Pasture Improved and Cultivated Land	768		768[G]		Equal	
Western Offset Area identified in the zone of affectation (Kelso)	Existing Woodland/Forest*	343	343	343[H]	343	Equal	Equal
	Derived Native Grassland	0		0		0	
	Subset of Derived Native Grassland comprising Box-Gum Woodland EEC	0		0		0	
	Low Diversity Native Grassland/Pasture Improved and Cultivated Land	156		159[I]		3	
Additional Offset areas required to be included by the Proponent	Existing Woodland/Forest*	1,000		1,525.3	1,695	695	
	Derived Native Grassland			169.7			
	Subset of Derived Native Grassland comprising Box-Gum Woodland EEC			113.7			

Table A-1 (Continued)
Reconciliation of the Revised Biodiversity Offset Strategy against Condition 44[#]

NSW Requirement (Condition 44)				NSW Revised Biodiversity Offset Strategy		Difference	
Area	**Offset Type**	**Area (ha)**	**Minimum Size (Based on Existing Woodland/Forest and Derived Native Grassland) (ha)**	**Area (ha)**	**Size Based on Existing Woodland/Forest and Derived Native Grassland (ha)**	**Difference Area (ha)**	**Difference Minimum Size (ha)**
Additional Offset areas required to be included by the Proponent	Low Diversity Native Grassland/Pasture Improved and Cultivated Land	-		224.7	-	224.7	
	Overall Total Area	10,333	8,664	12,168.9	10,204.3	1,835.9	1,540.3
Total Existing Woodland/Forest*		6,046 + additional offset		7,898.1 (includes 886.3 ha of required additional offset)		965.8	
Total Derived Native Grassland		1,618 + additional offset		2,306.2 (includes 113.7 ha of required additional offset)		574.5	
Total Derived Native Grassland Comprising Box-Gum Woodland EEC		1,486 + additional offset		1,879.9 (includes 113.7 ha of additional)		280.2	
Total Low Diversity Native Grassland/Pasture Improved and Cultivated Land		1,669		1,964.6		295.6	

* The term woodland/forest is used by Condition 44 of Schedule 3 to PA 10_0138 to describe all native vegetation communities (of varying structure) other than derived grassland.

^ Substituted with Oakleigh/Onavale.

[#] The Biodiversity Offset Strategy also includes the Rehabilitation Area required under Condition 44 of Schedule 3 to PA 10_0138 (Table 2-1)

A Includes 7.4 ha of Existing Woodland/Forest from Oakleigh/Onavale.

B Includes 73 ha of Existing Woodland/Forest from Oakleigh/Onavale.

C Includes 22 ha of Derived Native Grassland from Oakleigh/Onavale.

D Includes 5.6 ha of Derived Native Grassland from Oakleigh/Onavale.

E Includes 54.6 ha of Existing Woodland/Forest from Oakleigh/Onavale.

F Includes 30 ha of Derived Native Grassland from Oakleigh/Onavale.

G Includes 330 ha of Low Diversity Native Grassland/Pasture Improved and Cultivated Land from Oakleigh/Onavale.

H Includes 5.3 ha of Existing Woodland/Forest from Oakleigh/Onavale.

I Includes 8.2 ha of Low Diversity Native Grassland/Pasture Improved and Cultivated Land from Oakleigh/Onavale.

APPENDIX B

RECONCILIATION OF THE BIODIVERSITY MANAGEMENT PLAN AGAINST THE MCCM THREATENED FAUNA IMPLEMENTATION PLAN AND MCCM BOX-GUM WOODLAND ENDANGERED ECOLOGICAL COMMUNITY IMPLEMENTATION PLAN

Table B-1
Implementation Plan for the Provision of Habitat for Threatened Fauna in the Offset Areas

Actions for Implementing the Biodiversity Offset Strategy in this BMP	Section of this BMP
Revegetation , Seeds and Tube Stock	
1. The BMP will describe that seed and tube stock used in revegetation will include a variety of grasses, low shrubs, mid-sized shrubs and tall trees to create structurally diverse habitat.	Section 6.5.1
2. The BMP will aim to include a wide diversity of species in the seed mix.	Section 6.5.1
3. The BMP will include the planting of *Allocasuarina* or *Casuarina* species.	Section 6.5.1
4. The BMP will include the planting of *Acacia* species, including both tree and shrub varieties.	Section 6.5.1
5. The BMP will include the planting of a variety of box, ironbark and gum eucalypt species including: - White Box (*Eucalyptus albens*); - Yellow Box (*E. melliodora*); - *Angophora* species; - Apple Box (*E. bridgesiana*); - River Red Gum (*E. camaldulensis*); - Blakely's Red Gum (*E. blakelyi*); - Red Stringybark (*E. macrorhyncha*); and - Inland Grey Box (*E. microcarpa*).	Section 6.5.1
6. The BMP will include the planting of *Melaleuca* species.	Section 6.5.1
7. The BMP will include the planting of a variety of native shrubs.	Section 6.5.1
8. The BMP will include the planting of a variety of native grasses, including tussock grass species.	Section 6.5.1
9. The BMP will include the planting of a variety of native herbs.	Section 6.5.1
10. The BMP will include the planting of a variety of native forbs.	Section 6.5.1
11. The BMP will focus on increasing woodland patch size within the offset area and aim to enhance ecological connectivity.	Section 6.5.1
Habitat Features	
12. The BMP will describe procedures to reuse of bush rocks salvaged during vegetation clearance (consistent with Condition 39[b] Schedule 3 of Project Approval 10_0138).	Section 6.6
13. The BMP will describe procedures to reuse of timber/hollow logs salvaged during vegetation clearance (consistent with Condition 39[b] Schedule 3 of Project Approval 10_0138), including placement of hollow limbs or artificial hollows in some select trees without hollows.	Section 6.6
14. The BMP will not permit firewood collection.	Section 6.6
Grazing Management	
15. The BMP will describe how livestock will be excluded from areas undergoing active revegetation (i.e. planting or seeding).	Sections 6.5.1 and 6.11
16. The BMP will describe management of livestock to maintain ground cover and diversity of native plants.	Section 6.11

Table B-1 (Continued)
Implementation Plan for the Provision of Habitat for Threatened Fauna in the Offset Areas

Actions for Implementing the Biodiversity Offset Strategy in this BMP	Section of this BMP
Weed Management	
17. The BMP will provide methods for the use of herbicides (minimised through spot-spraying, basal spraying, stem injection or cut and paint application methods).	Section 6.8
Feral Animal Management	
18. The BMP will provide methods for the safe use of pesticide.	Section 6.18
19. The BMP will describe procedures to prevent, monitor and control feral animals (including feral pigs, goats, rabbits and foxes).	Section 6.9
Fire Management	
20. The BMP will describe measures to prevent fires, such as maintaining fire breaks and access (i.e. no controlled burns will be undertaken whilst vegetation is establishing).	Section 6.13
21. The BMP will prescribe any controlled burns in patches of Box-Gum Woodland EEC (existing woodland or derived grasslands) to be no less than 5 years and then to occur in spring or autumn burns depending on a range of factors (except in revegetation areas).	Section 6.13

[1] This species will be planted as a dominant species within woodland habitat.

Table B-2
Implementation Plan for the Box-Gum Woodland in the Offset Areas

Actions for Implementing the Biodiversity Offset Strategy in this BMP	
Planning	
1. The BMP will define the objectives for the Box-Gum Woodland EEC.	Section 6.1
2. The BMP will discuss an adaptive management framework and monitoring program for the management of the Box-Gum Woodland EEC.	Section 6.17
3. The BMP will include a visual inspection of each mapped vegetation management unit in each offset area to identify constraints and requirements for specific management measures.	Sections 6.3 and 6.5.1
4. The BMP will describe targeted revegetation along drainage lines and scalded areas to minimise risk of erosion.	Section 6.5
5. The BMP will aim to maximise the re-use of existing infrastructure (e.g. access roads) instead of creating new infrastructure.	Section 6.2.3
6. The BMP will aim to locate new offset area management infrastructure (e.g. access roads) preferentially in cleared land.	Section 6.2.3
7. The BMP will aim to locate new offset area management infrastructure (e.g. access roads) in stable locations.	Section 6.2.3
8. The BMP will describe provision of fencing and signage around the perimeter of the offset areas to manage livestock and avoid accidental clearance.	Section 6.2.3
9. The BMP will describe roles for suitability qualified personnel (e.g. restoration ecologist to provide direction about the rehabilitation and restoration of the Box-Gum Woodland EEC).	Section 6.5.1

Table B-2 (Continued)
Implementation Plan for the Box-Gum Woodland in the Offset Areas

Actions for Implementing the Biodiversity Offset Strategy in this BMP		
Soil Testing and Nutrient Management		
10.	The BMP will provide for soil testing to be undertaken on soils in revegetation areas to identify issues with physical and chemical characteristics as well as determine amelioration requirements and rates.	Section 6.5.1
11.	The BMP will describe the following nutrient reduction options and the relevant situations where they will be applied: - crash grazing periodically to remove nutrients locked in weeds; - restriction of livestock access to limit further nutrient enrichment; and - controlled burns.	Section 6.5.1
Surface Preparation		
12.	The BMP will describe site preparation in cleared land (e.g. ripping or use of spiked rollers) and (where relevant) in derived grassland (e.g. use of spiked rollers) to reduce soil compaction impacting the success of the revegetation.	Section 6.5.1
13.	The BMP will restrict the use of revegetation techniques that involve high level of physical disturbance in existing Box-Gum Woodland and derived grasslands.	Section 6.5.1
Revegetation, Seeds and Tube Stock		
14.	The BMP will describe a seed and tube stock supply strategy including calculation of the amount and species of seed and tube stock required each year and how the seed and tube stock will be sourced and managed to meet the demand.	Section 6.5.1
15.	The BMP will describe procedures for strategic and long term seed collection, management (including pre-treatment) and storage following the relevant Florabank guidelines. The BMP will describe procedures for sowing seed (e.g. appropriate sowing depths).	Sections 6.4 and 6.5.1
16.	The BMP will favour natural regeneration in the derived grasslands and woodland areas over seeding or planting in the first instance followed by seeding or planting if required.	Section 6.5.1
17.	The RMP will provide for the preferential use of local endemic (adapted) species, however consideration will be given to the use of a high quality seed source further from the site over a low quality more local seed source.	Section 6.5.1
18.	The BMP will provide application rates for seeds as well as planting densities for tube stock to avoid excessive shading.	Section 6.5.1
19.	The BMP will focus on increasing woodland patch size within the offset area and aim to enhance ecological connectivity.	Section 6.5.1
20.	The BMP will describe that seed and tube stock used in revegetation will include a variety of grasses, low shrubs, mid-sized shrubs and tall trees to create structurally diverse habitat.	Section 6.5.1
21.	The BMP include sowing of Kangaroo Grass (as this species is known to out-compete annual grass weeds and provide inter tussock spaces for a diversity of ground cover species [e.g. wildflowers]).	Section 6.5.1
22.	The BMP will aim to include a wide diversity of species in the seed mix.	Section 6.5.1
23.	The BMP will include provision to review the need for kangaroo control measures.	Section 6.18

Table B-2 (Continued)
Implementation Plan for the Box-Gum Woodland in the Offset Areas

Actions for Implementing the Biodiversity Offset Strategy in this BMP		
Maintenance		
24.	The BMP will include provision to assess vegetation density and undertake ecological thinning (e.g. through selective clearance or fire) if necessary.	Sections 6.5.1, 6.5.2 and 6.18
25.	The BMP will provide measures to improve understorey diversity (e.g. replanting, causing disturbance through fire or grazing).	Section 6.18
26.	The BMP will provide for selective use of slow-release native plant fertiliser to promote plant growth (if required).	Section 6.5.1
27.	The RMP will provide an option for using tree guards to protect young seedlings from browsing or grazing native animals.	Table 6-22
28.	The BMP will describe how the growth and survival of the vegetation sown or planted will be monitored.	Section 6.17
29.	The BMP will include hygiene protocols to minimise the risk of plant diseases (i.e. restricting site access).	Section 6.18
30.	The BMP will describe a restriction of clearing (unless for ecological thinning, maintenance or access for monitoring).	Section 6.5.2
Habitat Features		
31.	The BMP will describe procedures to reuse bush rocks salvaged during vegetation clearance (consistent with Condition 39[b] Schedule 3 of Project Approval 10_0138).	Section 6.6
32.	The BMP will describe procedures to reuse timber/hollow logs salvaged during vegetation clearance (consistent with Condition 39[b] Schedule 3 of Project Approval 10_0138), including placement of hollow limbs or artificial hollows in select trees without hollows.	Section 6.6
33.	The BMP will not permit firewood collection.	Section 6.6
Grazing Management		
34.	The BMP will describe restriction of livestock access to erosion prone areas (e.g. along watercourses).	Section 6.11
35.	The BMP will describe how livestock will be excluded from areas undergoing active revegetation (i.e. planting or seeding).	Section 6.11
36.	The BMP will describe restriction of livestock access to areas not already subject to grazing.	Section 6.11
37.	The BMP will describe management of livestock to maintain ground cover and diversity of native plants.	Section 6.11
38.	The BMP will describe restriction of livestock access to protect plants that are known to be sensitive to grazing.	Section 6.11
39.	The BMP will include provision to lightly graze derived grasslands in times of suitable climatic conditions for weed growth (e.g. autumn and/or winter) to reduce vigour of annual grass weeds.	Section 6.11
40.	The BMP will provide a mechanism to reduce livestock grazing during drought periods.	Section 6.11
41.	The BMP will describe the following controlled grazing management options and the relevant situations where they will be applied: - Rotational grazing system to promote and maintain native plant diversity and cover. - Removal of grazing livestock.	Section 6.11

Table B-2 (Continued)
Implementation Plan for the Box-Gum Woodland in the Offset Areas

Actions for Implementing the Biodiversity Offset Strategy in this BMP	
Weed Management	
42. The BMP will provide the following weed management options and the relevant situations where they will be applied: - Crash grazing periodically to reduce annual and perennial grass weeds. - Nutrient management (e.g. exclusion of grazing livestock which add nutrients). - Controlled burns during spring to reduce annual and perennial grass weeds (not broadleaf exotics). - Physical removal (e.g. removing weeds by felling or pulling). - Targeted and timely herbicide application.	Section 6.8
43. The BMP will provide methods for the use of herbicides (minimised through spot-spraying, basal spraying, stem injection or cut and paint application methods).	Section 6.8
Feral Animal Management	
44. The BMP will describe procedures to prevent, monitor and control feral animals (including feral pigs, goats, rabbits and foxes).	Section 6.9
45. The BMP will provide monitoring of deer and feral cats and control (if required).	Section 6.9
Fire Management	
46. The BMP will describe measures to prevent fires such as maintaining fire breaks and access (i.e. no controlled burns will be undertaken whilst vegetation is establishing).	Section 6.13
47. The BMP will prescribe any controlled burns in patches of Box-Gum Woodland EEC (existing woodland) to be no less than 5 years and then to occur in spring or autumn burns depending on a range of factors.	Section 6.13
48. The BMP will schedule for maintenance of fire breaks and fire trails.	Section 6.13
49. The BMP will provide a schedule for assessing fuel loads.	Section 6.13
50. The BMP will provide an option for using controlled grazing to reduce biomass or controlled burns of derived grasslands.	Section 6.13
General	
51. The BMP will describe that vehicle access will be predominantly restricted to designated tracks to minimise ground disturbance (e.g. compaction).	Section 6.12
52. The BMP will include a description of the Community Consultative Committee.	Section 7.5

APPENDIX C

TYLOPHORA LINEARIS PROPAGATION AND TRANSLOCATION PROGRAM

1. PURPOSE

This addendum to the *Maules Creek Biodiversity Management Plan* (BMP) was prepared to document propagation and translocation program for *Tylophora linearis* (a threatened flora species listed under the New South Wales (NSW) *Threatened Species Conservation Act, 1995* (TSC Act) and Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act). This addendum was prepared in consultation with Dr Colin Driscoll (Hunter Eco), Office of the Environment (OEH), Department of Planning and Environment (DP&E) and Department of the Environment (DotE).

Requirements

Section 4.1 of this BMP requires pre-clearing surveys for *Tylophora linearis* and states:

> *If a threatened plant species is identified, the numbers of plants will be counted and/or the population estimated/mapped. A review of translocation methods, collection of propagules, and propagation from seeds or cuttings from plants within the MCCM disturbance area and/or surrounds will be undertaken. Following this review, a translocation/propagation program will be developed and implemented where appropriate in consultation with OEH, DP&E and DoE (for MNES). The program will be documented in this BMP* [Biodiversity Management Plan] *via an addendum or new revision.*

Tylophora linearis was identified during the flora pre-clearing surveys undertaken by Niche Environment and Heritage (Niche). In accordance with this BMP the numbers of plants were counted by Niche and a population estimate was calculated by Dr Colin Driscoll (Hunter Eco). On 14 May 2014, the DP&E requested this addendum to the Maules Creek BMP to document a propagation and translocation program for *Tylophora linearis*.

On 26 August 2014, DotE confirmed that they were satisfied with the adequacy of this propagation and translocation program for *Tylophora linearis.* OEH (8 September 2014) had no comments on the program.

2. PROPAGATION AND TRANSLOCATION PROGRAM

There are multiple stages to the propagation and translocation program:

- Stage 1 - Root Architecture and Growth Study;
- Stage 2 - Seed Production Monitoring;
- Stage 3 - Seed Collection and Storage;
- Stage 4 – Seed Propagation; and
- Stage 5 –Translocation Trials.

These stages are documented below. A staged approach is required as the success of each stage has bearing on the next stage (e.g. fruiting needs to be observed before seed collection and seed collection is required before seed propagation).

3. STAGE 1 - TYLOPHORA LINEARIS ROOT ARCHITECTURE AND GROWTH STUDY

Objective

Tylophora linearis is a small terrestrial twining plant observable as groups of stems, often spread over several square metres, that twine around grasses and small shrubs. Forster *et al.* (2004) describes that the species has an underground rhizome from which more than one aerial stem can emerge, but the extent of the underground rhizome is not currently known. There is a distinct possibility that the species is clonal and that groups of stems could be composed of a number of clones. The objective of the *Tylophora linearis* root architecture and growth study is to document the underground and aboveground growth of the species. This study will provide information relevant to translocating whole plants (in the event whole plants are to be translocated) (Section 7).

Timing

During mine clearing activities in 2014, a selection of *Tylophora linearis* within the area to be cleared will be excavated to document their root architecture and growth.

Procedure

A minimum of 20 *Tylophora linearis* plants from within the Maules Creek Project Surface Development Extent will be selected. The following data will be collected for the *Tylophora linearis* plants:

- photograph of the *Tylophora linearis* plants and root architecture;
- note the general vegetative condition of the entire plant;
- number and length of stems;
- length and depth of roots; and
- maturity of the plant (i.e. whether reproductive material is present).

Reporting procedures are described in Section 8.

4. STAGE 2 - TYLOPHORA LINEARIS SEED PRODUCTION MONITORING

Objective

The objective of the *Tylophora linearis* seed production study is to monitor flowering *Tylophora linearis* plants for the development of fruit for the ultimate purpose of collecting seed.

If seed is observed in 2014, the seed collection activities will be initiated (Section 5). If no seed is observed, the seed collection activities will not occur in 2014 and the seed production study will be modified and implemented in 2014/2015.

Timing

Flowering is reported as during November, and several weeks after at least 20 mm of rain following a lengthy dry period (Forster *et al*., 2004). However, *Tylophora linearis* was observed flowering in March, April and May 2014 by Niche. The *Tylophora linearis* seed production study will commence in May 2014 and be undertaken fortnightly until flowering/fruiting has ended.

Procedure

A minimum of 20 flowering *Tylophora linearis* plants (ten flowering plants from within the Maules Creek Project Surface Development Extent and ten flowering plants outside of the Maules Creek Project Surface Development Extent) will be selected. The plants selected will be spread widely across these areas so as to maximise genetic variation as part of the seed collection and storage activities (Section 5).

These 20 plants will be assigned an individual number/code and visually monitored *in situ* for signs of fruit.

The following data will be collected for plants bearing fruit:

- photographs of the flowering portion of each monitored plant each monitoring occasion;
- notes of the general vegetative condition of the entire plant on each monitoring occasion;
- a count of the total number of open plus dead flowers on each plant on each monitoring occasion;
- the date when a new fruit is observed for each plant;
- the length and widest diameter of each fruit at each monitoring occasion; and
- where multiple fruit develop on the one plant, each fruit will be tagged and coded.

The following data will be collected for plants not bearing fruit:

- a count of the total number of open plus dead flowers on each plant on each monitoring occasion; and
- the length and widest diameter of each fruit at each monitoring occasion.

Reporting procedures are described in Section 8.

5. STAGE 3 - TYLOPHORA LINEARIS SEED COLLECTION AND STORAGE

Objective

The objective of the *Tylophora linearis* seed collection and storage activities is to obtain seed for propagation (Section 6) and storage in the Australian PlantBank.

Timing

Seed collection will occur concurrently with and immediately following the seed production monitoring (Section 4).

Procedure

Seed collection will be undertaken by personnel with the appropriate NSW Scientific Licence.

Seed collection steps will include:

1. bagging fruit (Suitable bagging material can be made from old nylon stockings that are fine enough to keep out pest insects while allowing light and air in) when they are around 2 centimetres (cm) in length with a bag of sufficient size to allow for fruit to develop inside the bag;
2. when fruit has fully opened to shed seed, the fruit will be snipped off at the main stem, complete with bag, and placed in a paper bag with fresh silica gel;
3. the fruit will be stored in a dark cool dry place; and
4. as soon as practicable after collection, the fruit will be send by priority mail to the Australian PlantBank.

The Australian PlantBank is a science and research facility of the Royal Botanic Gardens and Domain Trust and is located at the Australian Botanic Garden, Mount Annan. Seed will be stored in the Australian PlantBank and/or used as part of a propagation program (Section 6).

Reporting procedures are described in Section 8.

6. STAGE 4 - TYLOPHORA LINEARIS SEED PROPAGATION

Objective

If sufficient seed is collected from *Tylophora linearis* as part of the procedure described in Section 3.3, all or some of the seed will be propagated to create an *ex situ* supply of seedlings suitable for translocation.

If sufficient seed is not collected from *Tylophora linearis* as part of the procedure described in Section 3.3, consideration will be given to production of seedlings from tissue culture using either germinated seedlings or mature plant material. Tissue culture is a well-established technique for producing plants *en masse* for horticultural or native plant translocation and habitat regeneration purposes. There are reports of the technique having been successfully applied to Indian *Tylophora indica* (Faisal *et al*., 2007).

Timing

Seed propagation will occur following the collection of sufficient seed (Section 5) or mature plant material (if insufficient seed is collected).

Procedure

Plant propagation will be undertaken in an appropriate tissue culture laboratory that will germinate the seed or use plant tissue in sterile conditions to provide a source of fresh plant material.

Reporting procedures are described in Section 8.

7. STAGE 5 – TYLOPHORA LINEARIS TRANSLOCATION TRIALS

Objective

If a sufficient supply of seedlings is propagated (Section 6), a translocation proposal will be prepared in accordance with national translocation protocols (Vallee *et al*., 2004). The translocation proposal will outline research trials to inform potential techniques for establishing *Tylophora linearis.*

Translocation can involve using propagules to create an *ex situ* supply of seedlings suitable for translocation (Section 6) or moving whole plants from a disturbance area to an appropriate recipient area.

Timing

The translocation proposal will be prepared once an *ex situ* supply of seedlings suitable for translocation is established as described in Section 8.

Procedure

The translocation procedure will be described within the translocation proposal. If a sufficient supply of seedlings is propagated (Section 6), consideration will be given to translocating cultured plants into suitable recipient sites within the Maules Creek offset areas. If a sufficient supply of seedlings is not propagated, consideration will be given to translocating whole plants where this can be planned in advance of the clearing program.

In accordance with national translocation protocols (Vallee *et al*., 2004), the translocation proposal will include details such as:

- who is undertaking the translocation;
- recipient sites (with a justification as to why the site is appropriate and not likely to significantly impact the natural environment);
- information on the number of individuals to be translocated;
- on-going management; and
- funding.

Reporting procedures are described in Section 8.

8. REPORTING

A report will be compiled annually which documents the implementation of the Propagation and Translocation Program for *Tylophora linearis*. This report will report on each of the five stages of the program until the completion criteria have been met (i.e. the study was completed). The report will be sent to OEH, DP&E and DotE. A summary will also be provided within the Annual Review.

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APPENDIX D

POMADERRIS QUEENSLANDICA PROPAGATION AND TRANSLOCATION PROGRAM

1. PURPOSE

This addendum to the *Maules Creek Coal Mine* (MCCM) *Biodiversity Management Plan* (BMP) was prepared to document a propagation and translocation program for Scant Pomaderris (*Pomaderris queenslandica*), a threatened flora species listed under the New South Wales (NSW) *Threatened Species Conservation Act, 1995.* Scant Pomaderris was identified during the pre-clearing flora surveys undertaken by Cumberland Ecology and Niche Environment and Heritage (Niche) from February to April 2015. This addendum was prepared in consultation with Dr Colin Driscoll (Hunter Eco) and is consistent with the *Tylophora linearis* Propagation and Translocation Program.

Requirements

Whitehaven Coal Limited (Whitehaven) has received advice to the effect that it would not be an offence to clear the Scant Pomaderris from an area which is approved for development under the Part 3A approval for the MCCM. However, the Part 3A approval requires compliance with 5.1.3(i) of the BMP, which relevantly provides as follows:

> *If a threatened plant species is identified, the numbers of plants will be counted and/or the population estimated/mapped. A review of translocation methods, collection of propagules, and propagation from seeds or cuttings from plants within the Project disturbance area and/or surrounds will be undertaken. Following this review, a translocation/propagation program will be developed and implemented where appropriate in consultation with OEH, DP&E and DotE (for MNES). The program will be documented in the BMP via an addendum or new revision (as part of the Annual Review process).*

Because the BMP also prescribes that vegetation clearance may only occur in the period from 15 February to 30 April each year, field collection of propagules and other field related investigations were commenced immediately in 2015 before the resource was lost. Propagation from cuttings was also expedited, initially to determine its feasibility. This program was developed in consultation with Office of Environment and Heritage (OEH) and the Department of Planning and Environment (DP&E).

2. THE PLANT

Scant Pomaderris (*Pomaderris queenslandica*) is a woody shrub to 3 metres tall. Leaves are ovate/elliptic, generally around 3 centimetres (cm) long and 1.5 cm wide, hairless and dark green on the upper surface and white and hairy on the lower surface. Flowers, and subsequently fruit, occur in dense racemes (clusters) at the end of branchlets. The maximum number of seeds per individual fruit is three. Harden (2000) noted that the plant was rare in NSW not having been collected since 1904, but more widespread in Queensland (QLD). However, typical of many listed threatened plants, subsequent surveys associated with environmental assessments have resulted in a substantial increase in known occurrences in NSW. To the extent now that the Atlas of Living Australia (2015) shows more records for NSW (135) than QLD (100) (**Figure 1**).

Distribution is from the coast to inland slopes and plains. There is little information on habitat preferences other than that the species can be found in moist eucalypt forest, shrubby sheltered woodlands and along creeklines (OEH, 2014).

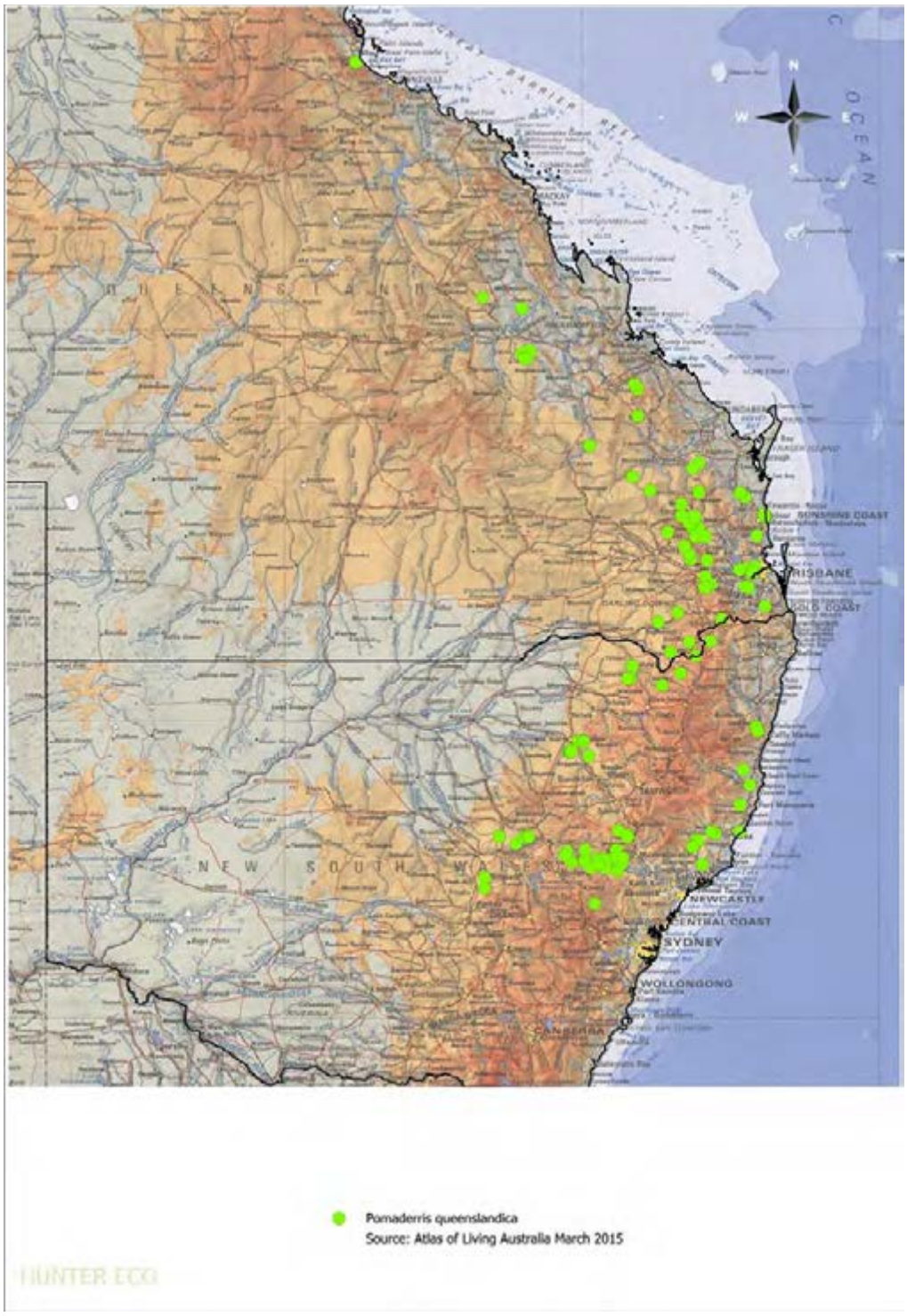

Figure 1. *Pomaderris queenslandica* distribution

Figure 2 shows the location of *Pomaderris queenslandica* initially recorded by Cumberland Ecology and subsequently confirmed by Niche during pre-clearance surveys between February and April 2015. The entire population consisted of 463 plants, 323 of which were within the approved 2015 clearing boundary and 140 outside. The plants were growing in Narrow-leaved Ironbark – White Cypress Pine Woodland, mostly along a sheltered ephemeral drainage line. The majority of plants were mature with no evidence of succession and considerable evidence of senescence. In fact, at some locations there were a number of dead plants likely due to natural causes.

Pomaderris species are reported to have a natural lifespan of 10 to 30 years (Patykowski *et al*. 2014) with some documented individuals living much longer. Flowering and subsequent pollination results in production of small (approximately 1 millimetre [mm] diameter) seeds that are hard coated and have been shown to germinate following bushfire (Zukerman 2011). There is no direct dispersal mechanism so upon release from the fruit, seed fall to the ground. The seed have a small elaiosome indicating dispersal by ants and Berg (1975) notes that this is the case for all Australian *Pomaderris* species. Being hard coated the seed are expected to remain viable in the soil for up to 20 years in the absence of fire (Patykowski *et al*. 2014).

There was no evidence of recent fire in the area in which the *Pomaderris queenslandica* were found, and there is no anecdotal evidence of recent fire other than contained local events. The fact that many plants were senescent or dead suggests that the last fire would have been well over 20 years ago given the expected natural lifespan of the species.

3. PROPAGATION AND TRANSLOCATION PROGRAM

Species of *Pomaderris* have been successfully propagated from cutting and seed (e.g. Australian Native Plant Society, 2014; Healesville Environment Watch Inc., 2014; Richardson, 2013; Haines *et al.,* 2007; Gardiner, 2003). Gardiner (2003) reported a low strike rate for cuttings of Hazel Pomaderris (*Pomaderris aspera*) while the Australian National Botanic Gardens (2004) report that cuttings from *Pomaderris intermedia* (very similar to *Pomaderris queenslandica*) strike readily.

There are multiple stages to the propagation and translocation program which are summarised as follows and detailed below:

- Stage 1 – Scant Pomaderris Root Architecture Study (Section 4);
- Stage 2 – Scant Pomaderris Seed Collection (Section 5);
- Stage 3 – Scant Pomaderris Cuttings Propagation (Section 6);
- Stage 4 – Scant Pomaderris Seed Germination (Section 7); and
- Stage 5 – Scant Pomaderris Translocation Trials (Section 8).

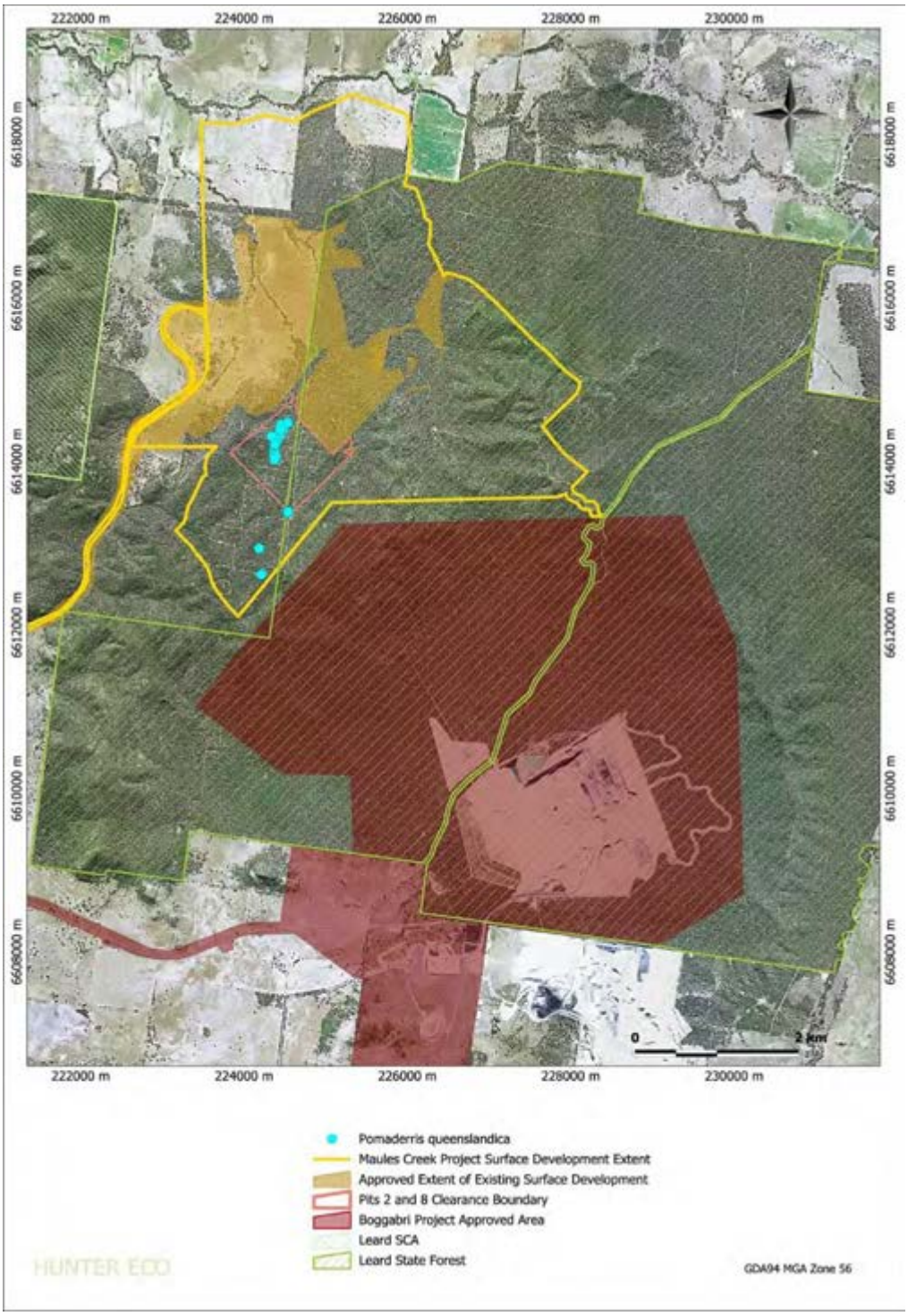

Figure 2. The location of *Pomaderris queenslandica* within the Maules Creek Project Surface Development Extent.

The order of preference for translocating Scant Pomaderris is:

1. translocation of tube stock seedlings germinated from seed collected directly from plants or from the seed bank;
2. translocation of tube stock generated from cuttings;
3. direct germination of seed in topsoil collected from around the cleared plants; and
4. direct translocation of mature plants.

4 STAGE 1 – SCANT POMADERRIS ROOT ARCHITECTURE STUDY

Objective

The objective of the Scant Pomaderris root architecture study is to document the underground growth of the species. This study will provide information relevant to translocating whole plants (in the event whole plants are to be translocated) (Section 8).

Timing

During mine clearing activities in 2015, a selection of Scant Pomaderris plants within the area to be cleared were excavated to document their root architecture.

Procedure

A minimum of 15 Scant Pomaderris plants from within the MCCM 2015 clearance area were selected for the root architecture study. The following data were collected for the plants:

- photograph of the plant and root architecture;
- note of the general vegetative condition of the entire plant;
- length and depth of roots; and
- maturity of the plant.

A combination of manual and machine excavation were used.

Reporting procedures are described in Section 9.

5 STAGE 2 – SCANT POMADERRIS SEED COLLECTION

Objective

There are two components to Scant Pomaderris seed collection procedure with the objective of collecting sufficient seed for germination and ultimately translocation purposes:

- collection of seed from fruit, and
- collection of seed from the soil seed bank.

Timing

At the time of the discovery of Scant Pomaderris, flowering had ceased and early fruit development was underway. The seed production study was undertaken between March and September 2015. Additional collection of seed or cuttings may occur as part of the revegetation programme.

Procedure for Seed Collection from Fruit

Approximately 40 Scant Pomaderris plants were selected for seed collection from fruit (20 each from plants outside and inside the 2015 disturbance area). The plants selected will be spread widely across the population, so as to maximise genetic variation. These 40 plants will be assigned an individual number/code and visually monitored *in situ*. The fruiting racemes from 20 plants inside the 2015 disturbance area were collected prior to clearing the disturbance area.

Seed collection from fruit included:

1. Fruiting racemes on plants inside and outside the disturbance area were bagged (suitable bagging material can be made from old nylon stockings that are fine enough to keep out pest insects while allowing light and air in, and most importantly, to capture any released seed).
2. Bags remained in place on plants inside the disturbance area until immediately prior to final clearing so as to maximise fruit ripening and seed release. Bags on plants outside of the disturbance area remained in place until fruit was developed). Collection of racemes occurred by snipping the stem, leaving the bag unopened and placing it in a paper bag. A tag with date of sampling and location coordinates were attached to each.
3. The fruit was stored in a dark, cool and dry place.
4. As soon as practicable after collection, the fruit was sent for seed extraction.

Procedure for Seed Collection from Soil Seed Bank

This procedure is for investigating the density of seed in the soil around the plants from within the MCCM 2015 clearance area. Collection of seed from the soil seed bank involves passing the soil through increasingly smaller mesh screens. The following steps were completed inside the 2015 disturbance area:

1. At a suitable location beside Scant Pomaderris plants, 1 square metre (m^2) was marked out.
2. Within the 1 m^2, large stones were removed.
3. Loose surface soil was passed through an approximately 10 mm screen, discarding the captured material.
4. The material that passes through the 10 mm screen was passed through subsequent screens of approximately 5, 3, and 2 mm onto a 1 mm screen where Scant Pomaderris seeds would have been captured.
5. The material captured by the 1 mm screen was bagged (in 1 m^2 lots) for later collection of Scant Pomaderris seeds.
6. This process was repeated at five different groups of Scant Pomaderris plants.

Procedure for Removal of Topsoil

Topsoil was collected from around the populations inside the 2015 disturbance area and stockpiled using the following methods:

1. Loose topsoil was scraped off the surface from an area bounded by approximately 1 metre outside of the drip line of the outer plants of a population.
2. Topsoil was stored in piles no greater than 1 metre deep.
3. The stockpile was separately demarcated and the GPS location recorded.

If viable seed are sufficiently abundant in the soil samples (from step 5 above), then indirect translocation of Scant Pomaderris (by spreading topsoil in suitable offset area and/or rehabilitation locations for germinating seed *in situ*) may be considered as part of the translocation trials (Section 8) depending on the success of propagation via cuttings and seed collection from fruit.

6. STAGE 3 – SCANT POMADERRIS CUTTINGS PROPAGATION

Objective

The objective of Stage 3 is to determine whether, and under what conditions, Scant Pomaderris can be propagated by cuttings.

Timing

A total of 10 cuttings of Scant Pomaderris plants were collected inside the 2015 disturbance area. Following the initial collection of ten cuttings, an additional 100 cuttings were collected from plants outside the disturbance area. Additional collection of seed or cuttings may occur as part of the revegetation programme.

Procedure

Cuttings of Scant Pomaderris plants were collected using the following procedure:

1. Ten large cuttings approximately 40 cm long were taken, one each from different groups of plants. The cuttings were healthy with good leaf condition, particularly at the tips.
2. At each location from where the large cuttings were collected, five small hardened branchlets from low on the main stem were collected, cut against the main stem. These were bundled into one moisture bag.
3. A plastic bag of wet paper towelling was tied firmly around the cut stem immediately after removal from the main plant.
4. The cuttings were sent for propagation on the same day as their collection.

Following the initial collection of ten cuttings, an additional 100 cuttings were collected from plants outside the disturbance area.

Plant propagation will be undertaken in an appropriate nursery that will strike the cuttings under experimental trials. If successful, additional cuttings may be taken to produce a source of fresh plant material for translocation (depending on the success of seed germination [Section 7]).

7 STAGE 4 – SCANT POMADERRIS SEED GERMINATION

Objective

If sufficient seed is collected from Scant Pomaderris, all or some of the seed will be germinated to create an *ex situ* supply of seedlings suitable for translocation.

Timing

Being hard coated Scant Pomaderris seed can be stored for some time. Seed propagation will occur following the collection of sufficient seed.

Procedure

Plant propagation will be undertaken in an appropriate nursery that will germinate the seed in sterile conditions to provide a source of fresh plant material. As noted in Section 3, *Pomaderris* species grow readily from seed following heat treatment that simulates bushfire. Max Elliot (Grow Local, Ellalong) has successfully germinated other *Pomaderris* species using this method.

8 STAGE 5 – SCANT POMADERRIS TRANSLOCATION TRIALS

Objective

Translocation can involve using propagules to create an *ex situ* supply of seedlings suitable for translocation or moving whole plants from a disturbance area to an appropriate recipient area. A translocation proposal will be prepared in accordance with national translocation protocols (Vallee *et al*. 2004). The translocation proposal will outline research trials to inform potential techniques for translocating the Scant Pomaderris.

Timing

The translocation proposal will be prepared once an *ex situ* supply of seedlings suitable for translocation is established (either through cuttings [Section 6] and/or seeds [Section 7]).

Procedure

If a sufficient supply of seedlings is propagated, these would be translocated into suitable recipient sites within offset areas and/or rehabilitation areas.

As stated in Section 5, if viable seed are sufficiently abundant in the soil samples (from step 5 above), then indirect translocation of Scant Pomaderris (by spreading topsoil in suitable offset area and/or rehabilitation locations for germinating seed *in situ*) may be considered as part of the translocation trials depending on the success of propagation via cuttings and seed collection from fruit.

In accordance with national translocation protocols (Vallee *et al*., 2004), the translocation proposal will include details such as:

- who is undertaking the translocation;
- recipient sites (with a justification as to why the site is appropriate and not likely to significantly impact the natural environment);
- information on the number of individuals to be translocated;
- ongoing management (e.g. contingency measures); and

A monitoring programme would be undertaken to assess the success of the translocation.

9 REPORTING

A report will be compiled annually which documents the implementation of the Propagation and Translocation Program for the Scant Pomaderris. This report will provide results for each of the five stages of the program until the completion criteria have been met (i.e. the study has been completed). The report will be sent to OEH and DP&E. A summary will also be provided within the Annual Review.

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APPENDIX E

OFFSET AREA - VEGETATION DESCRIPTIONS
(Source: Greenloaning Biostudies, 2015)

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Ecological and Environmental Consultants

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Maules Creek Coal Mine

Biodiversity Offset Areas - Vegetation Descriptions

Greenloaning Biostudies Pty Ltd (Greenloaning) was requested to prepare vegetation descriptions for all vegetation communities mapped as occurring in Maules Creek offset areas and provided as maps and GIS layers to Whitehaven Coal Ltd in July 2014. The maps represented a combination of the following:

- Vegetation mapping conducted by Cumberland Ecology for the majority of the offset areas (Cumberland Ecology, 2013a, 2013b, 2013c).
- Vegetation mapping conducted by Niche Environment and Heritage for the Roseglass property (Niche Environment and Heritage, 2012).
- Vegetation mapping conducted by Parsons Brinkerhoff for the Shared Offset (Parsons Brinckerhoff Australia Pty Ltd 2010).
- A range of amendments to the original mapping boundaries and/or communities based on field surveys and inspections conducted by Greenloaning during September to December 2013 and January to May 2014. These surveys and inspections focussed on assessing areas mapped as White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box-Gum Woodland) Endangered Ecological Community (EEC) and Critically Endangered Ecological Community (CEEC) as listed under the *Threatened Species Conservation Act 1995* (TSC Act) and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), respectively. The surveys also encompassed assessments of threatened fauna species' habitat.
- Information on soils from GIS data of the Great Soils Group and the estimated inherent fertility of soils in the New England/North West Strategic Regional Landuse area (Office of Environment and Heritage [OEH] 2012, 2014).

The following points should be noted in relation to the vegetation descriptions provided in Section 2 below:

- A large number of the descriptions are drawn from the original descriptions prepared by Cumberland Ecology and Niche Environment and Heritage.
- The level of detail for each community varies, depending on the detail provided in the original descriptions, whether Greenloaning had made any additional observations on a specific community during field surveys and the level of detail on vegetation structure and floristics documented for a specific community.
- The terminology used in the naming of each community, for the sake of consistency, follows the original terminology used, with some additions or minor variations based on any additional data collected by Greenloaning. As much as possible, the community names reflect the occurrence of the dominant species for each community, or originally occurring species in the case of grasslands or regenerating vegetation.

The vegetation descriptions following have been subdivided into three main groups: Forest/Woodland Communities; Shrublands; and Grasslands.

2.1 FOREST AND WOODLAND COMMUNITIES

2.1.1 Community 2 – Belah Woodland

This community occurs on valley flats and gentle lower slopes on solodic and non-calcic brown soils with moderately low to moderate fertility. It is known to be present to varying extents on the following offset properties, although some occurrences are too small to map accurately:

- **Western Offsets** – Velyama and Louenville.
- **Eastern Offsets** – Warriahdool and Oakleigh.

In the Western Offsets, this community is restricted to the flats of Velyama approaching the Namoi River. It also is possible that other very small pockets may occur, particularly in the Western and Eastern Offsets.

The main overstorey species is *Casuarina cristata* (Belah), and midstorey and understorey species are often lacking. In less modified areas, there is up to 25% cover of patchily distributed shrubs, including *Geijera parviflora* (Wilga) and juvenile *C. cristata*.

This woodland community occurs on heavier soils that are suitable for cropping and has been heavily cleared in the past. It is poorly represented in conservation reserves. Owing to the extensive agricultural activities, the understorey of poorer condition representations of the community is now largely part of the crop field matrix, with a high proportion of weeds in the ground stratum.

This community is not listed as a threatened ecological community.

2.1.2 Community 3 – Bimble Box ± White Cypress Pine Grassy Woodland

This community is associated with a drainage line and occurs on solodic soils of moderately low fertility. It was recorded along part of a tributary of Back Creek, a small tributary of Maules Creek to the north of the Leard State Forest, within the Eastern Offsets in the south-eastern sector of the Wallandilly property.

The woodland is dominated by *Eucalyptus populnea* (Poplar Box), with *Callitris glaucophylla* (White Cypress Pine) or *C. endlicheri* (Black Cypress Pine) occurring at times as a co-dominant or subdominant. There is a variable midstorey of juvenile tree species and other small tree/tall shrubs such as *Melaleuca bracteata* (Bracteate/Black Tea-tree) and *Notelaea microcarpa* (Native Olive). Understorey species tend to be scattered and the groundcover is dominated by grass species such as *Austrostipa* sp. (Spear Grass) and *Aristida* sp. (Wiregrass). Herbs and other groundcover species occurring include *Lomandra longifolia* (Spiny-headed Mat-rush), *L. multiflora* (Many-flowered Mat-rush) and *Dichondra repens* (Kidney Weed).

This community is generally in moderate to good condition with a high proportion of mature trees and a preponderance of native plant species. The location however, has been subject to long term grazing pressures, although stocking rates appear to have been lower than in some other areas.

This community is not listed as a threatened ecological community listed under the TSC and EPBC Act

2.1.3 Community 4 – Blakely's Red Gum - White Box ± Yellow Box Melaleuca Riparian Forest, Woodland EEC/CEEC

This community was found predominantly on solodic soils with moderately low fertility. It was recorded along Back Creek, occurring to varying extents on the following offset properties:

- **Eastern Offsets –** Blue Range, Teston North and Wallandilly**.**

This community supports *Eucalyptus albens* (White Box) and *Melaleuca bracteata* (Bracteate/Black Tea-tree) in the overstorey, with occasional occurrences of *E. blakelyi* (Blakely's Red Gum), *E. melliodora* (Yellow Box) and *Callitris glaucophylla* (White Cypress Pine). There is a sparse midstorey stratum of primarily *Geijera parviflora* (Wilga), whilst the understorey stratum tends to be absent or comprise occasional specimens of *Sclerolaena muricata var. semiglabra* (Black Rolypoly), *Abutilon oxycarpum var. subsagittatum* (Lantern Bush) and *Einadia hastata* (Berry Saltbush). The groundcover is predominantly grassy, although is largely influenced by surrounding agricultural activities. Grass species present include *Austrostipa verticillata* (Slender Bamboo Grass), *Elymus scaber* (Common Wheatgrass), and *Digitaria* sp. Other native species occurring in the groundstorey include *Brunoniella australis* (Blue Trumpet), *Calotis lappulacea* (Yellow Burr-daisy), *Sisymbrium orientale* (Indian Hedge Mustard), *Wahlenbergia planiflora, Sida corrugatae* (Corrugated Sida) and *Uncus* sp.

This community is consistent with the EEC/CEEC Box-Gum Woodland listed under the EPBC Act and TSC Act.

2.1.4 Community 5 – Blakely's Red Gum - Yellow Box Grassy Woodland (± Stringybark), Woodland EEC/CEEC

Community 5 is found on a wide variety of soil types including chocolate soils, prairie soils, lithosols, yellow podzolic soils, euchrozems, non-calcic brown soils, brown podzolic soils, kraznozems and black earth soils, ranging from low to moderately high fertility. This community was recorded in the areas of higher elevation in the Northern Offsets, at locations ranging from approximately 830m to 1,065m). This community occurs to varying extents on the following offset properties:

- **Northern Offsets** – Wongala, Mount Lindesay and Wirradale**.**

It is dominated by *E. blakelyi* (Blakely's Red Gum) and/or *E. melliodora* (Yellow Box), in association with a combination of any of the following species: *E. bridgesiana* (Apple Box), *Angophora floribunda* (Rough-barked Apple) and *E. dalrympleana* (Mountain Gum). The midstorey tends to comprise predominantly juvenile tree species, with some scattered occurrences of small trees/tall shrubs such as *Brachychiton populneus* (Kurrajong), *Exocarpus cupressiformis* (Native Cherry) and *Notelaea microcarpa* (Native Olive). Understorey species may be sparse, or occur in clumps, common species including *Cassinia quadrifaria, Olearia elliptica* (Sticky Daisy-bush), *Pimelea neo-anglica* (Poison Pimelea) and *Gompholobuim hueglii* (Pale Wedge-pea). The groundstorey is rich in herbs and grassy areas are dominated by *Bothriochloa macra* (Red-leg Grass) and *Aristida ramosa* (Purpletop Wiregrass). In less heavily grazed areas, *Poa sieberiana* (Snowgrass) can dominate and

Themeda australis (Kangaroo Grass) also can occur. Other groundcover species include *Hydrocotyle laxiflora* (Stinking Pennywort), *Cymbonotus lawsonianus* (Bears-ear), *Wahlenbergia gracilis* (Australian Bluebell) and *Desmodium varians* (Slender Tick-trefoil).

This community is similar to Community 33 - *Stringybark - Blakely's Red Gum - Yellow Box Shrubby Open Forest*, however differs in the absence of a more consistently shrubby understorey, the variable occurrence of Stringybark in the overstorey and the structural composition of the overstorey, making this community more typically a woodland rather than an open forest.

This community is consistent with the definition of the EEC/CEEC Box-Gum Woodland as listed under the EPBC Act and TSC Act.

2.1.5 Community 7 – Bracteate Honeymyrtle Low Riparian Forest - Semi-cleared (Regenerating)

This community was recorded along drainage lines and creek lines on solodic and grey/brown/red clay soils of moderately low to moderate fertility respectively. This community has been identified as occurring to varying extents on the following offset properties (Niche Environment and Heritage, 2012; Cumberland Ecology, 2013b):

- **Southern Offsets** – Roseglass.
- **Eastern Offsets** – Oakleigh/Onavale.

The semi-cleared, regenerating low riparian forest supports low forms of *Brachychiton populneus* (Kurrajong), *Callitris glaucophylla* (White Cypress Pine), *Eucalyptus albens* (White Box), *E. crebra* (Narrow-leaved Ironbark), and *E. dealbata* (Tumbledown Red Gum) as a sparse overstorey. Midstorey species include *Acacia excelsa* (Ironwood) and *A. salicina* (Cooba), while the understorey is dominated by such species as *A. decora* (Western Golden Wattle), *Maireana microphylla* (Small-leaved Bluebush) and *Olearia elliptica* (Sticky Daisy-bush). Grass species present within the groundcover stratum include *Aristida personata* (Purple Wiregrass), *Austrodanthonia racemosa* (Wallaby Grass), *Austrostipa scabra* (Speargrass), *Cymbopogon refractus* (Barbed Wiregrass) and *Cynodon dactylon* (Common Couch). Other groundcover species include *Calotis cuneifolia* (Purple Burr-daisy), *C. lappulacea* (Yellow Burr-daisy), *Cyperus eragrostis* (Umbrella Sedge), *Lactuca saligna* (Willow-leaved Lettuce) and *Vittadinia muelleri.*

Bracteate Honeymyrtle Low Riparian Forest is similar to Community 16 – *Melaleuca Riparian Forest*, particularly in the overstorey and groundcover species representations, the two communities differing overall in overstorey structure. This would be expected given the status of Community 7 as a semi-cleared and regenerating community. Community 7, as described for the occurrence on the Roseglass property however, lacks the species that would appear, from the community name assigned, to be the diagnostic species for the community, i.e. *Melaleuca bracteata* (Bracteate or Black Tea-tree). Nor has this species been listed as occurring on the Roseglass property (Niche Environment and Heritage, 2012). From the species listed as occurring in this community, Community 7 on the Roseglass property appears to represent a form of Community 41 - *White Box – Tumbledown Gum (semi-cleared/on creek lines)*.

The condition of this community ranged from poor to moderate in the offsets.

This community is not listed as a threatened ecological community listed under the TSC and EPBC Act.

2.1.6 Community 14 – Dwyer's Red Gum - Ironbark Woodland

Community 14 was recorded in variable densities as an open woodland on fairly skeletal soils of low to moderately low fertility. This community occurs to varying extents on the following offset properties:

- **Eastern Offsets –** Teston North and Tralee**.**
- **Shared Offset.**
- **Western Offsets** – Teston and Louenville**.**

The overstorey comprises a mixture of *Eucalyptus crebra* (Narrow-leaved Ironbark)*, E. dwyeri* (Dwyer's Red Gum), with some possible occurrences of *E. dealbata* (Tumbledown Red Gum). The midstorey ranges from scattered specimens or localised groups of *Acacia cheelii* (Motherumba)*, Brachychiton populneus* (Kurrajong) and regenerating canopy trees, to dense stands of *Acacia cheelii* and *Dodonaea viscosa* (Sticky Hop-bush). In some areas there was locally dense regeneration of *E. crebra* and scattered occurrences of *Alphitonia excela* (Red Ash), particularly on the volcanics along ridgetops in the south-west of the Project Boundary. Understorey representation typically was low, with occasional specimens of such species as *Notelaea microcarpa var. microcarpa* (Native Olive) and *Breynia oblongifolia* (Coffee Bush)*.*

Groundcover density also was variable, grass species occurring including *Cymbopogon refractus* (Barbed Wiregrass), *Enneapogon* sp., *Eragrostis* sp. (Lovegrass) and *Paspalidium distans.* Other groundcover species recorded included *Alternanthera denticulata* (Lesser Joyweed), *Daucus glochidiatus* (Native Carrot), *Vittadinia dissecta var. hirta* (Dissected New Holland Daisy) and *Glycine tabacina.*

This community appears to be intermediate between Community 23 - *Narrow-leaved Ironbark – White Cypress Pine Shrubby Open Forest* and areas of Dwyer's Red Gum Woodland

This community is not listed as a threatened ecological community under the TSC Act or EPBC Act.

2.1.7 Community 16 – Melaleuca Riparian Forest

Community 16 is associated with drainage lines on predominantly grey/brown/red clays, which have a moderate level of fertility. A small representation of this community was found on solodic soils of moderately low fertility. This community occurs within the riparian areas of Back Creek and its tributaries in the following offset properties:

- **Eastern Offset** - Blue Range, Teston North, Tralee, Cattle Plains, Warriahdool and Wallandilly.

The community is dominated by *Melaleuca bracteata* (Bracteate/Black Tea-tree) over a grassy understorey that is contiguous with the surrounding vegetation communities. This riparian (stream bank) vegetation occurs where the Melaleuca can be sustained by extra water from ephemeral flows within these creeks. Midstorey species present include *Geijera parviflora* (Wilga), *Notelaea microcarpa* (Native Olive) and understorey species include *Pimelea linifolia* (Slender Riceflower). Common grasses recorded were *Austrodanthonia racemosa* (Wallaby Grass), *Austrostipa scabra* (Speargrass), *Austrostipa verticillata* (Slender Bamboo Grass),

Cymbopogon refractus (Barbed Wiregrass), and *Microlaena stipoides* (Weeping Meadow Grass). Common groundcover species include *Daucus glochidiatus* (Native Carrot), *Calotis lappulacea* (Yellow Burr-daisy), *Vittadinia sulcata, Xerochrysum viscosum* (Sticky Everlasting), and *Wahlenbergia communis* (Tufted Bluebell).

The condition of Community 16 is variable, depending in part on the extent of access by grazing stock.

This community is not listed as a threatened ecological community under the TSC Act or EPBC Act.

2.1.8 Community 19 –Narrow-leaved Ironbark - White Cypress Pine Woodland (Semi-cleared)

Community 19 occurs primarily on grey/brown/red clays of moderate fertility on lower slopes and flats. It was recorded in the Southern Offsets on the eastern boundary of the Roseglass property. The sparse overstorey comprises *Eucalyptus crebra* (Narrow-leaved Ironbark), *Callitris glaucophylla* (White Cypress Pine) and *E. albens* (White Box). The midstorey is dominated by *Notelaea microcarpa* (Native Olive) and *C. glaucophylla*. The understorey is characterized by the dominance of *Olearia elliptica* (Sticky Daisy-bush), *Cassinia quinquefaria* and *Dodonaea viscosa (Sticky Hopbush). Dominant species in the groundstorey include Desmodium brachypodum* (Large Tick-trefoil), *Dichondra* sp. A, *Austrodanthonia monticola* (Wallaby Grass), *Cymbopogon refractus* (Barbed Wiregrass)*, Eragrostis leptostachya* (Paddock Lovegrass), *Bothriochloa macra* (Red-leg Grass) and *Austrostipa scabra* (Speargrass)*.*

Similar to Community 23 - *Narrow-leaved Ironbark - White Cypress Pine Shrubby Open Forest* in species composition, this community is distinguished from the aforementioned community due to partial historical clearing of the overstorey vegetation.

This community is not listed as a threatened ecological community.

2.1.9 Community 20 – Narrow-leaved Ironbark ± White/Black Cypress Pine Grassy Open Forest/Woodland

This community is typically an open grassy woodland that generally occurs on mid to lower valley slopes or ridges, and more commonly at lower altitudes (300m - 400m). It is associated primarily with lithosols and solodic soils, but also occurs on grey/brown and red clays, with the fertility of these soils ranging from low to moderate fertility. It is present on the following offset properties:

- **Eastern Offsets –** Teston North, Tralee, Wallandilly and Oakleigh/Onavale.
- **Southern Offsets –** Roseglass and Bimbooria.

The overstorey is dominated by *Eucalyptus crebra* (Narrow-leaved Ironbark), with *Callitris endlicheri* (Black Cypress Pine) and/or *C. glaucophylla* (White Cypress Pine) occurring in some areas as a co-dominant or subdominant species. *E. albens* (White Box) may occur in some areas as a scattered component, particularly on the edges of the community, but does not occur as a co-dominant species.

Midstorey representation tends to be very minor, but scattered specimens of Cypress Pine, *Geijera parviflora* (Wilga) and *Notelaea microcarpa var. microcarpa* (Native Olive) may occur. The understorey also tends to be very sparse, with only occasional specimens of shrub species,

such as *Melichrus urceolatus* (Urn-heath), *Dodonaea viscosa* (Sticky Hopbush) and *Bursaria spinosa* (Native Blackthorn) occurring. The groundcover is dominated by grass species such as *Austrostipa* scabra (Speargrass), *Aristida* spp. (Wiregrass) and *Bothriochloa* sp., with other groundcover species including *Desmodium brachypodum* (Large Tick-trefoil), *Sida corrugata* (Corrugated Sida) and *Geranium solanderi* var. *solanderi* (Native Geranium).

Narrow-leaved Ironbark ± White/Black Cypress Pine Grassy Open Forest/Woodland within the offsets typically comprises a semi-mature community that has been subject to previous clearing and ongoing heavy grazing pressures. Mature trees are commonly represented but old growth trees tend to be scarce and a number of weed species also occur. Community 20 has many features in common with Community 19 - *Narrow-leaved Ironbark - White Cypress Pine Woodland (Semi-cleared)* and Community 23 - *Narrow-leaved Ironbark - White Cypress Pine Shrubby Open Forest*, but differs from the former in the density of tree cover and from the latter in the density of shrub cover.

This community does not conform to the description of EEC/CEEC Box-Gum Woodland Grasslands as listed under the TSC and EPBC Act.

2.1.10 Community 23 – Narrow-leaved Ironbark - White Cypress Pine Shrubby Open Forest

This community generally occurs on upper slopes on skeletal soils over conglomerate, with this soil type typically of low fertility. This community occurs to varying extents on the following offset properties:

- **Southern Offsets –** Roseglass.
- **Northern Offsets –** Wirradale.
- **Western Offsets –** Teston, Louenville, Kelso and Velyama.

The dominant overstorey species of this community is *Eucalyptus crebra* (Narrow-leaved Ironbark). Generally, the subdominant species recorded were *Callitris endlicheri* (Black Cypress Pine) and/or *C. glaucophylla* (White Cypress Pine), although *E. albens* (White Box) was recorded in low densities in areas such as drainage heads with locally deeper soils. Generally however, *E. albens is* absent. At points of higher relief, the community becomes very shrubby (above 35% projective foliage cover), however can be quite open and grassy on gentler grades. Common midstorey species include *Acacia cheelii* (Motherumba), *Melichrus urceolatus* (Urn-heath), *Canthium odoratum* (Shiny-leaved Canthium), *Dodonaea viscosa* (Sticky Hopbush) and *Bursaria spinosa* (Native Blackthorn). The understorey is characterized by the dominance of *Olearia elliptica* (Sticky Daisy-bush), *Cassinia quinquefaria* and *Dodonaea viscosa*. Grass species include *Austrodanthonia monticola* (Wallaby Grass), *Cymbopogon refractus* (Barbed Wiregrass), *Eragrostis leptostachya* (Paddock Lovegrass), *Bothriochloa macra* (Red-leg Grass) and *Austrostipa scabra* (Speargrass). Other native species in the groundstorey include *Desmodium brachypodum* (Large Tick-trefoil) and *Dichondra* sp. A.

The general condition of this community is variable, ranging from poor to good, with the majority of areas being of moderate to good condition.

Community 23 is similar to Community 19 – *Narrow-leaved Ironbark – White Cypress Pine Woodland (Semi-cleared)* in species composition, but the former exhibits a predominately intact overstorey and a dense midstorey layer. This community is also floristically similar to Community 42 - *White Box - White Cypress Pine ± Narrow-leaved Ironbark Grassy Open Forest, Woodland EEC/CEEC*) and Community 45 - *White Box - White Cypress Pine ± Narrow-leaved*

Ironbark Shrubby Open Forest however, differs in that the dominant species of this community is *Eucalyptus crebra* (Narrow-leaved Ironbark).

This community is not listed as a threatened ecological community. This community does not conform to the description of EEC/CEEC Box-Gum Woodland Grasslands since *E. albens* occurs as a scattered component and not as a co-dominant species.

2.1.11 Community 25 – Pilliga Box - Poplar Box - White Cypress Pine Grassy Open Woodland

This community is associated with alluvial flats and occurs in the Western Offset in low-lying areas at the south-western margins of Leard State Forest. It occurs to varying extents on the following offset properties:

- **Eastern Offsets –** Tralee and Wallandilly.
- **Western Offsets –** Olivedeen, Kelso and Velyama.

This is a variable community that occurs as tall woodland to open forests and is co-dominated by *Eucalyptus populnea* (Poplar Box/Bimble Box) and *E. pilligaensis* (Narrow-leaved Grey Box). On better drained red-brown soils, *Callitris glaucophylla* (White Cypress Pine) is usually present as a subdominant tree species along with *Geijera parviflora* (Wilga). On heavy dark soils, the community exhibits a distinctive assemblage of supporting shrub and small tree species, including *Casuarina cristata* (Belah)*, Allocasuarina luehmanii* (Bulloak), *Capparis mitchellii* (Native Orange), *Eremophila mitchellii* (Budda), *Alectryon oleifolius* (Western Rosewood) and *Ventilago viminalis* (Supple Jack), which are characteristic species found on basaltic or rich alluvial cracking clays (Cumberland Ecology, 2013a).

Occurrences of this community are generally in good condition with a high proportion of native plant species and few weeds, although most occurrences are relatively small and isolated. Many trees within the canopy were found to be young, although substantial numbers of trees with hollows still remain.

This community is not listed as a threatened ecological community under the TSC Act or the EPBC Act.

2.1.12 Community 27 – River Red Gum Riparian Woodlands and Forests

Eucalyptus camaldulensis (River Red Gum) forms riverine woodland on floodplains and around billabongs in association with the Namoi River. This community occurs to varying extents on the following offset properties:

- **Eastern Offsets –** Oakleigh/Onavale.
- **Western Offsets –** Olivedeen and Kelso.

The community occurs in the Western Offsets along the Namoi River frontage and in the lower floodplain areas near the River. It occurs along the northern boundary of the Oakleigh/Onavale property in association with Maules Creek. *Eucalyptus camaldulensis* dominates the overstorey and some areas support a sparse midstorey of juvenile *E. camaldulensis*, but generally a midstorey is lacking. This community usually suffers from degradation due to trampling and erosion of watercourse banks by livestock and hence, the understorey is largely comprised of a mixture of native and exotic sedges and rushes, pasture weeds and other exotics imported either by livestock or on the water. Very few shrubs are present in this community.

This community is not listed as a threatened ecological community under the TSC Act or the EPBC Act.

2.1.13 Community 28 – Rough-barked Apple - Blakely's Red Gum Riparian Grassy Woodland, Woodland EEC/CEEC

This community is predominantly associated with low fertility soils, namely lithosols and forms a grassy riparian woodland or open forest in association with upper Maules Creek and its tributaries in the Northern Offsets (on the Wirradale property). Dominant overstorey species include *Eucalyptus blakelyi* (Blakely's Red Gum)*, Angophora floribunda* (Rough-barked Apple) and *Casuarina cunninghamii* (River Oak), the latter species occurring as a gallery forest. *E. bridgesiana* (Apple Box) may also occur. The midstorey includes *Notelaea microcarpa* (Native Olive), *Dodonaea viscosa var. angustifolia* (Sticky Hop-bush) and *Callistemon sieberi* (River Bottlebrush). The groundcover is species rich, although can be degraded by weeds carried by stock to the creek. The dominant grass recorded is *Microlaena stipoides* (Weeping Meadow Grass).

This community is consistent with the EEC/CEEC Box-Gum Woodland listed under the EPBC Act and TSC Act.

2.1.14 Community 29 – Semi-evergreen Vine Thicket

Community 29 occurs primarily on lithosols of low fertility often within deeper gullies. This community occurs to varying extents on the following offset properties:

- **Southern Offsets –** Roseglass.
- **Western Offsets** – Louenville.

It occurs predominantly within the deeper gully sections of the Roseglass property, with a small patch of this community located on the Louenville property in the Western Offsets area.

Dominant species of the overstorey include *Angophora floribunda* (Rough-barked Apple)*, Eucalyptus albens* (White Box), *Ficus rubiginosa* (Port Jackson Fig) and *Brachychiton populneus* (Kurrajong). The midstorey layer is dominated by *Acacia implexa* (Hickory Wattle)*, Bursaria spinosa* (Native Blackthorn)*, Cassinia quinquefaria, Dodonaea viscosa* (Sticky Hopbush) and *Notelaea microcarpa* (Native Olive). Understorey species are typically sparse and generally comprise occasional specimens of the midstorey species. Groundcover species also can be sparse, with characteristic grass species including *Aristida personata* (Purple Wiregrass)*, Austrodanthonia monticola* (Wallaby Grass)*, Cymbopogon refractus* (Barbed Wiregrass)*, Dichanthium sericeum* (Silky Bluegrass) and *Microlaena stipoides* (Weeping Meadow Grass). Common groundcover species include *Adiantum aethiopicum* (Common Maidenhair)*, Carex incomitata, Cheilanthes sieberi* (Poison Rock Fern)*, Commelina cyanea* (Native Wandering Jew)*, Desmodium gunnii* (Slender Tick-trefoil) and *Plectranthus graveolens.* Scrambling vines, such as *Clematis glycinoides* (Headache Vine)*, Clematis microphylla* (Small-leaved Clematis)*, Pandorea pandorana* (Wonga Wonga Vine) and *Eustrephus latifolius* (Wombat Berry) tend to be a feature of this community.

Vegetation condition of this community was rated as moderate, with feral goats likely to be impacting adversely on all strata of the community.

This vegetation community is consistent with the southern form of the EPBC Act listed Threatened Ecological Community, Semi-evergreen Vine Thicket in the Brigalow Belt (North and South) and Nandewar Bioregions (McDonald 2010) and the TSC listed Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions (NSW Scientific Committee 2011).

2.1.15 Community 30 – Silver-leaved Ironbark Woodland

This community, as it occurs within the Maules Creek Offsets, is a woodland on mid to lower valley slopes on lithosol soils of low fertility. It occurs within the following offset properties:

- **Shared Offset.**
- **Southern Offsets –** Bimbooria.

It was identified in two locations within the Bimbooria property, and one small pocket and a larger expanse within the Shared Offset area. There is some potential however, for small pockets of Silver-leaved Ironbark Woodland to occur within the more rugged areas of the Roseglass property adjoining Bimbooria, as not all of these areas have been subject to specific field inspections (Niche Environment and Heritage, 2012; Greenloaning, 2014).

The overstorey is dominated by *Eucalyptus melanophloia* (Silver-leaved Ironbark), with *Callitris endlicheri* (Black Cypress Pine) and/or *C. glaucophylla* (White Cypress Pine) potentially occurring in some areas as a subdominant species. Midstorey representation, if present, tends to comprise primarily juvenile specimens of *E. melanophloia* and/or *Callitris* spp. The understorey also tends to be very sparse, with only occasional specimens of shrub species, such as *Melichrus urceolatus* (Urn-heath)*, Dodonaea viscosa* (Sticky Hopbush) and *Bursaria spinosa* (Native Blackthorn) occurring. The groundcover is dominated by grass species such as *Austrostipa* spp., *Aristida* spp. (Wiregrass) and *Bothriochloa* sp. with other groundcover species likely to include species such as *Desmodium brachypodum* (Large Tick-trefoil) and *Portulacca oleracea* (Pigweed).

Silver-leaved Ironbark Woodland within the offsets typically comprises a semi-mature community that has been subject to previous clearing and ongoing heavy grazing pressures. Structurally, Community 30 has many features in common with Community 19 - *Narrow-leaved Ironbark - White Cypress Pine Woodland (Semi-cleared)* and Community 23 - *Narrow-leaved Ironbark - White Cypress Pine Shrubby Open Forest,* but differs from both in the clear dominance of *E. melanophloia* in all locations and from Community 23 in the density of shrub cover, particularly in relation to the occurrences on the Bimbooria property.

This community does not conform to the description of EEC/CEEC Box-Gum Woodland Grasslands as listed under the EPBC Act and TSC Act.

2.1.16 Community 31 – Silvertop Stringybark – Apple Box ± Shrubby Woodland/Open Forest

This community tends to be associated with steep slopes at higher elevations (1,060m), although occurrences may also extend to more moderate terrain at slightly lower elevations (935m). It occurs primarily on prairie soils, lithosols, brown podzolic soils, chocolate soils, kraznozems and euchrozems with low to moderately high fertility. The community was recorded in the Northern Offsets on both the Mt Lindesay and Wirradale properties.

The structure of the community is typically either a grassy or shrubby tall open forest or woodland, dominated by *Eucalyptus laevopinea* (Silvertop Stringybark), with varying

representation of *E. bridgesiana* (Apple Box), *E. melliodora* (Yellow Box) and *Angophora floribunda* (Rough-barked Apple). The midstorey comprises varying densities of regenerating tree species, particularly *E. laevopinea*, with some areas supporting very dense stands of this species regenerating. The understorey varies from very sparse to moderately dense shrub growth, comprising clumps of such species as *Olearia elliptica* (Sticky Daisy-bush), *Olearia stellulata* (Snow Daisy-bush) and Cassinia quinquefaria. Groundcover may comprise patches of dense leaf litter, with some herbs and grasses or moderate to dense grass cover, the latter being more typical of locations on lower moderate slopes. Common groundcover grasses include *Echinopogon* sp. (Hedgehog Grass), *Aristida* sp. (Wiregrass) and *Poa labillardiera* (Tussock Grass). Non-grassy native groundcover species occurring include *Desmodium brachypodum* (Large Tick-trefoil) and *Acaena novae-zelandiae* (Bidgee-widgee).

Within the Northern Offsets, the *Silvertop Stringybark – Apple Box Woodland/Open Forest* occurs as a mature community with numerous mature and large mature trees. The community has been logged heavily in the past however, and old growth trees are very sparse.

This community does not conform to the definition of the Box-Gum Woodland EEC/CEEC listed under the EPBC Act and TSC Act.

2.1.17 Community 32 – Silvertop Stringybark - Apple Box ± Manna Gum Grassy Woodland/Open Forest

This community definition has been applied to two areas of vegetation associated with drainage lines and adjoining flats and lower slopes of these drainage lines, primarily on soils with low fertility (i.e. lithosols), but also partially on black earths, of high fertility. It occurs in two main locations in the Northern Offsets on the Mt Lindesay property, although there are other more minor occurrences along drainage lines that have been included in derived grassland communities. The structure of the community varies from a grassy woodland/open forest to a grassy or shrubby tall open forest or woodland, dominated by *Eucalyptus laevopinea* (Silvertop Stringybark), or *E. bridgesiana* (Apple Box), with *E. viminalis* (Manna Gum) co-dominant in the eastern sector. *E. melliodora* (Yellow Box) and *Angophora floribunda* (Rough-barked Apple) may also be present.

The overall structural and floristic characteristics of this community differ between the two areas of occurrence, with the western occurrence supporting primarily old growth *E. bridgesiana*, with midstorey and understorey elements largely cleared. Occasional understorey elements include *Pimelea neo-anglica* (Poison Pimelea), and *Swainsona galegifolia* (Smooth Darling Pea). The groundcover comprises dense grass cover, with non-grassy groundcover species including *Dichondra repens* (Kidney Weed), *Geranium solanderi* (Native Geranium), *Glycine tabacina* and *Desmodium brachypodium* (Large Tick-trefoil). The eastern occurrence has a more complex structure with a midstorey largely comprising varying densities of regenerating tree species. The understorey varies from sparse to moderate shrub growth, comprising clumps of such species as *Brachyloma daphnoides* (Daphne Heath) *Melichrus urceolatus* (Urn Heath) *Olearia elliptica* (Sticky Daisy Bush) and *Pultenaea* sp. In the more eastern occurrence of the community, where grasses and other groundcover species are more prolific, *Poa* spp. may dominate, with other groundcover species including *Goodenia* sp. and *D. repens*.

Community 32 has similarities to Community 31, but differs in structure and the presence to varying degrees of *E. viminalis* in the overstorey.

The condition of the Silvertop Stringybark – Apple Box ± Manna Gum Grassy Woodland is highly variable, with the north-western location of the community being highly modified and previously subject to extensive selective clearing. The eastern sector has been logged heavily in the past but has regenerated extensively and now represents a mature forest form, with mature and large mature trees common, although old growth trees are rare.

This community does not conform to the definition of the Box-Gum Woodland EEC/CEEC listed under the EPBC Act and TSC Act.

2.1.18 Community 33 – Stringybark - Blakely's Red Gum - Yellow Box Shrubby Open Forest

Community 33 occurs primarily as scattered patches in areas of higher (900->1,000m) and is generally associated with lithosols, chocolate soils, and euchrozems, which exhibit fertility levels ranging from low to moderately high. It occurs to varying extents on the following offset properties:

- **Northern Offsets** – Mount Lindesay and Wongala.

The primary occurrence is in the northern sectors of the Mt Lindesay property, with only one small patch occurring on the Wongala property. Community 33 is characterized by the dominance of *Eucalyptus macrorhyncha* (Red Stringybark) and *E. blakelyi* (Blakely's Red Gum) in the overstorey in association with a combination of any of the following species: *E. melliodora,* (Yellow Box) *E. bridgesiana* (Apple Box)*, Angophora floribunda* (Rough-barked Apple) and *E. dalrympleana* (Mountain Gum). The understorey is dominated by a small number of species, including *Olearia elliptica* (Sticky Daisy-bush), *Olearia stellulata* (Snow Daisy-bush) and *Pultenaea* sp. G. The groundstorey is rich in herbs and grassy areas are dominated by *Bothriochlora macra* (Red-leg Grass) and *Aristida ramosa*. (Purple Wiregrass). In less heavily grazed areas, *Poa sieberiana* (Snowgrass) can dominate.

The condition of Community 33 is moderate to good.

This community is not consistent with the definition of the Box-Gum Woodland EEC/CEEC listed under the EPBC Act and TSC Act.

2.1.19 Community 34 – Stringybark - Rough-barked Apple - Cypress Pine Grassy/Shrubby Open Forest

This community has been identified along drainage lines bordering moderately highly fertile (i.e. euchrozems) and low fertility soils (lithosols) in the southern portion of Northern Offsets on the Wirradale property. Dominant overstorey species observed comprised Stringybark sp., *Angophora floribunda* (Rough-barked Apple), *Callitris glaucophylla* (White Cypress Pine) and *C. endlicheri* (Black Cypress Pine). The extent of midstorey and understorey development varied, with some areas observed supporting dense clumps of shrub species such as *Cassinia* sp. Groundcover development also varied, with more open areas supporting moderately dense grass cover. Species occurrence would be expected to be similar to the surrounding grassland communities (refer to descriptions for Communities 10 and 11).

The condition of this community appears to be variable, with some sectors in deeper gully situations supporting more dense vegetation growth and natural regeneration. Other sectors in more open situations, and presumably facilitating a greater level of access by sheep and cattle, appear to be highly modified and are more lacking in midstorey/understorey elements.

The *Stringybark - Rough-barked Apple – Cypress Pine Grassy/Shrubby Open Forest* has some similarities with Community 28 – *Rough-barked Apple – Blakely's Red Gum Riparian Grassy Woodland, Woodland EEC/CEEC*, but appears to feature key differences in the occurrence of dominant species, which could be related to differences in elevation.

This community does not conform to the definition of the Box-Gum Woodland EEC/CEEC listed under the EPBC Act and TSC Act.

2.1.20 Community 36 – Tumbledown Red Gum ± Narrow-leaved Ironbark Woodland

Community 36 occurs predominantly on steep to moderate slopes associated with moderately fertile, non-calcic brown soils or low fertility lithosols. The nature of the community and terrain in the field however, suggests a closer alignment with the latter low fertility soils. This community occurs to varying extents on the following offset properties:

- **Southern Offsets** – Bimbooria and Roseglass.

It occurs mainly in the western section of the Roseglass property, with a patch also occurring towards the northern boundary of the Bimbooria property. The dominance of *E. dealbata* (Tumbledown Red Gum) in the overstorey is characteristic of this vegetation community. Other tree species occurring in the overstorey in some locations include *E. crebra* (Narrow-leaved Ironbark), *Acacia cheelii* (Motherumba), *Callitris glaucophylla,* (White Cypress Pine), and *Geijera parviflora* (Wilga).

Dominant midstorey species include *Beyeria viscosa* (Pinkwood), *Myoporum montanum* (Western Boobialla) and *Notelaea microcarpa* (Native Olive), with *Aristida calycina, Aristida personata* (Purple Wiregrass), *Austrostipa scabra* (Speargrass), *Austrostipa verticillata* (Slender Bamboo Grass), *Chloris truncata* (Windmill Grass), *Cymbopogon refractus* (Barbed Wiregrass), *Paspalidium constrictum* (Knottybutt Grass), *Paspalidium gracile* (Slender Panic), and *Sporobolus creber* (Western Rats Tail Grass) dominating the groundstorey.

Vegetation condition is moderate to good, although adversely affected by feral goats and intensive sheep grazing on both the Roseglass and Bimbooria properties.

This community is not listed as a threatened ecological community under the TSC Act or EPBC Act.

2.1.21 Community 37 – Weeping Myall Grassy Open Woodland

Community 37 occurs on black, brown or red clay soils on flat alluvial plains, the soils being of moderate fertility. It has been identified in only two small patches on the Western Offsets properties, on the Kelso and Velyama properties.

Community 37 is generally dominated by *Acacia pendula* (Weeping Myall). It is present in the Western Offsets as small stands of *A. pendula* in cultivated fields. As these patches are not equal to or greater than 0.5 ha in area, they are not considered to conform to the EPBC Act listing of Weeping Myall Woodlands.

2.1.22 Community 38 – White Box ± Yellow Box ± Stringybark Grassy Woodland, Woodland EEC/CEEC

This grassy woodland is typically found on moderate to gentle slopes and ridgetops at moderately high elevations on lithosol and euchrozem soils with low to moderately high levels of fertility. It is present in the Northern Offset area on the Wirradale property

Community 38 is dominated by *Eucalyptus albens* (White Box), with varying occurrences of *E. macrorhyncha* (Red Stringybark) and *Angophora floribunda* (Rough-barked Apple).

Other stringybark species may also be present, including *E. laevopinea* (Silvertop Stringybark). Co-dominant species were variable across the Northern Offset properties and included *E. melliodora* (Yellow Box), *E. blakelyi* (Blakely's Red Gum) and *Callitris glaucophylla* (White Cypress Pine). The understorey of this community is very similar to that of other White Box open forest and woodland communities in the wider locality. Shrub species present include *Olearia elliptica* (Sticky Daisy-bush), *Notelaea microcarpa* (Native Olive) and *Pimelea linifolia* (Slender Rice Flower). Common grasses occurring are *Austrodanthonia racemosa* (Wallaby Grass), *Austrostipa verticillata* (Slender Bamboo Grass), *Cymbopogon refractus* (Barbed Wiregrass), *Microlaena stipoides* (Weeping Meadow Grass) and *Poa sieberiana* (Snowgrass), whilst common non-grassy groundcover species include *Daucus glochidiatus* (Native Carrot), *Calotis lappulacea* (Yellow Burr-daisy), *Vittadinia sulcata* and *Xerochrysum viscosum* (Sticky Everlasting).

The community supports numerous mature trees and overall condition is relatively good.

While this community is similar floristically to Community 39 – *White Box (± Stringybark) Grassy Woodland, Woodland EEC/CEEC* and Community 40 – *White Box Stringybark Shrubby Woodland/Open Forest*, Community 38 is distinguished from these communities through the presence of a dense groundcover comprising native grass species and the co-dominance of *E. melliodora* in the overstorey in some locations. The community as such probably represents a transitional community grading between the *E. melliodora* dominated communities at higher elevations and the *E. albens* dominated communities at lower elevations. This transition is much more abrupt on the Wongala property to the west, where the two types of communities do not appear to overlap.

This community is consistent with the Box-Gum Woodland EEC/CEEC as listed under the EPBC Act and TSC Act.

2.1.23 Community 39 – White Box (± Stringybark) Grassy Woodland, Woodland EEC/CEEC

This grassy woodland is found at elevations of approximately 800m - 990m, on a wide variety of soil types including chocolate soils, brown earths, non-calcic brown soils, lithosols and euchrozems, of low to high levels of fertility. The community is present in the Northern Offset area on the Mount Lindesay and Wirradale properties.

Community 39 is typically dominated by *Eucalyptus albens* (White Box) with *E. macrorhyncha* (Red Stringybark) at times being co-dominant and associated species including *Angophora floribunda* (Rough-barked Apple) and *E. laevopinea* (Silvertop Stringybark). Other co-dominant species were variable across the Northern Offset properties and included *E. blakelyi* (Blakely's Red Gum) and *Callitris glaucophylla* (White Cypress Pine). The understorey of this community is very similar to that of other White Box Open Forest and

woodland communities in the wider locality. Shrub species present include *Olearia elliptica* (Sticky Daisy-bush), *Notelaea microcarpa* (Native Olive) and *Pimelea linifolia* (Slender Rice Flower), whilst common grasses dominate the ground stratum and include *Aristida ramosa* (Purple Wiregrass), *Bothriochloa decipiens* (Pitted Bluegrass) and *Poa* spp. Other native groundcover species included *Glycine tabacina, Mentha satureioides* (Native Pennyroyal) and *Geranium solanderi* (Native Geranium).

The *White Box (±Stringybark) Grassy Woodland* community supports numerous mature and large mature trees, with old growth trees well represented in a number of areas. The community's overall condition is relatively good, with a low incidence of .weed species

With a similar species composition to Community 38 – *White Box ± Yellow Box ± Stringybark Grassy Woodland, Woodland EEC/CEEC* and Community 40 – *White Box – Stringybark Shrubby Woodland/Open Forest*, this community differs from Community 38 in the absence of *E. melliodora* (Yellow Box) in the overstorey and from Community 40 in the absence of a dense shrub layer.

This community is consistent with the EEC/CEEC Box-Gum Woodland listed under the EPBC Act and TSC Act.

2.1.24 Community 40 – White Box - Stringybark Shrubby Woodland/ Open Forest

This shrubby woodland is found at higher elevations on predominantly low fertile lithosol soils, but was also found associated with high to moderate fertility euchrozems and non-calcic brown soils. The community occurs to varying extents on the following offset properties:

- **Northern Offsets** – Wongala, Mount Lindesay and Wirradale.

Community 40 is dominated by *Eucalyptus albens* (White Box)*, E. macrorhyncha* (Red Stringybark) and *Angophora floribunda* (Rough-barked Apple). Other Stringybark species may also be present or co-dominant, including *E. laevopinea* (Silvertop Stringybark). The understorey of this community is very similar to that of other White Box open forest and woodland communities in the wider locality. Shrub species present include *Olearia elliptica* (Sticky Daisy-bush), *Notelaea (Native Olive)* and *Pimelea linifolia* (Slender Rice Flower), whilst common grasses include*, Cymbopogon refractus* (Barbed Wiregrass)*, Bothriochloa macra* (Red-leg Grass)*, Chloris truncata* (Windmill Grass)*, Microlaena stipoides* (Weeping Meadow Grass) and *Poa sieberiana* (Snowgrass). Other native groundcover species include *Daucus glochidiatus* (Native Carrot), *Xerochrysum viscosum* (Sticky Everlasting), *Dichondra repens* (Kidney Weed) and *Geranium solanderi (*Native Geranium*).*

The community supports numerous mature trees and overall condition is relatively good.

Similar in floristic composition to Community 38 – *White Box ± Yellow Box ± Stringybark Grassy Woodland, Woodland EEC/CEEC* and Community 39 – *White Box (± Stringybark) Grassy Woodland, Woodland EEC/CEEC*, Community 40 can be distinguished from these communities due to the presence of a denser shrub layer.

The Box-Gum Woodland EEC/CEEC as listed under the EPBC Act and TSC Act is characterized by a sparse or patchy shrub layer, and, as such, this community is not consider to be consistent with this listed threatened community as it exhibits a moderately dense shrub layer.

2.1.25 Community 41 – White Box - Tumbledown Gum (semi-cleared/on creek lines)

Community 41 generally occurs along the steeper drainage lines and creek lines on low fertility lithosols. It has been identified only with the Southern Offsets area on the Roseglass property. The overstorey of this community is dominated by *Alphitonia excelsa* (Red Ash)*, Callitris glaucophylla* (White Cypress Pine)*, Eucalyptus albens* (White Box)*, Eucalyptus crebra* (Narrow-leaved Ironbark)*, Eucalyptus dealbata* (Tumbledown Red Gum) and *Geijera parviflora* (Wilga). Dominant midstorey species found within this community include *Asterolasia* sp. Kelvin, *Beyeria viscosa* (Pinkwood)*, Dodonaea viscosa* (Sticky Hopbush) and *Notelaea microcarpa* (Native Olive).

The groundstorey grasses occurring include *Aristida leptopoda* (White Speargrass)*, Aristida personata* (Purple Wiregrass)*, Austrostipa scabra* (Speargrass)*, Bothriochloa macra* (Red-leg Grass) and *Digitaria brownii* (Cotton Panic Grass).

White Box - Tumbledown Gum (semi-cleared/on creek lines) is very similar in overstorey and groundcover floristics to Community 7 – *Bracteate Honeymyrtle Low Riparian Forest - Semi-cleared (Regenerating)* and on the Roseglass property, the two communities are considered likely to be variations of Community 41.

Vegetation condition is moderate to good.

This community is not listed as a threatened ecological community under the TSC Act or EPBC Act.

2.1.26 Community 42 – White Box - White Cypress Pine ± Narrow-leaved Ironbark Grassy Open Forest, Woodland EEC/CEEC

This community is generally recorded on mid to lower valley slopes on sedimentary or basaltic soils. It is present in association with upslope ironbark communities. This community occurs to varying extents on the following offset properties:

- **Western Offsets** – Teston, Louenville, Kelso and Velyama.

In the offset areas, it comprises semi-mature grassy woodlands as a result of ongoing agricultural activities. It tends to be dominated by *Eucalyptus albens* (White Box) and *Callitris glaucophylla* (White Cypress Pine), particularly in areas of regrowth, with *E. crebra* (Narrow-leaved Ironbark) also a co-dominant at times. The community has a predominantly grassy understorey with localised patches of shrubs, comprising *Geijera parviflora* (Wilga), *Notelaea microcarpa var. microcarpa* (Native Olive) and *C. glaucophylla* representing the midstratum.

Community 42 is similar to Community 43 – *White Box – White Cypress Pine ± Narrow-leaved Ironbark Grassy Woodland, Woodland EEC/CEEC*, Community 44 – *White Box – White Cypress Pine ± Narrow-leaved Ironbark Grassy Woodland (semi-cleared), EEC/CEEC* and Community 45 – *White Box – White Cypress Pine ± Narrow-leaved Ironbark Shrubby Open Forest*, with all these communities being dominated by *E. albens* and *C. glaucophylla* with or without associated species *E. crebra*. However, Community 42 differs in that the overstorey forms an open forest and the groundstorey consists of dense grass cover. This grassy woodland is generally located downslope from Community 45 and is likely to represent and elevational gradient in tree species occurrence.

The overall condition of Community 42 within the Western Offsets is moderate.

This community is consistent with the Box-Gum Woodland EEC/CEEC as listed under the EPBC Act and TSC Act.

2.1.27 Community 43 – White Box - White Cypress Pine ± Narrow-leaved Ironbark Grassy Woodland, Woodland EEC/CEEC

This grassy woodland is largely restricted to valley floors and floodplain flats, where soils are relatively more fertile. It is present in the Eastern Offset properties on flat country where the majority of the intensive farming occurs, in the south west paddocks of the Northern Offset in the lower-lying areas of the property. This community is widespread throughout the offset properties, occurring on the following:

- **Western Offsets** – Teston.
- **Eastern Offsets** – Wallandilly, Warriahdool, Cattle Plains, Tralee, Oakleigh, Blue Range and Teston North.
- **Southern Offsets** – Bimbooria and Roseglass.
- **Shared Offset.**
- **Northern Offsets** – Wongala and Wirradale.

This community comprises semi-mature woodlands as a result of ongoing agricultural activities. It is dominated by *Eucalyptus albens* (White Box) and supported by a sub canopy of *Callitris glaucophylla* (White Cypress Pine). In areas adjoining Mount Kaputar National Park, the understorey is quite species rich. It supports a sparse midstorey of *Geijera parviflora* (Wilga)*, Notelaea microcarpa var. microcarpa* (Native Olive) and *Acacia decora* (Western Golden Wattle).

The condition of this community is variable, but the majority of areas are in good condition, with moderate to good representation of old growth trees and low incidence of weeds. Feral pigs however, have had adverse effects on understorey elements on parts of the Wongala property.

Community 43 is similar to Community 42 – *White Box - White Cypress Pine ± Narrow-leaved Ironbark Grassy Open Forest, Woodland EEC/CEEC*, Community 44 – *White Box – White Cypress Pine ± Narrow-leaved Ironbark Grassy Woodland (Semi-cleared), Woodland EEC/CEEC* and Community 45 – *White Box – White Cypress Pine ± Narrow-leaved Ironbark Shrubby Open Forest*, with all these communities being dominated by *E. albens* and *C. glaucophylla,* with or without the associated species, *E. crebra* (Narrow-leaved Ironbark). However, Community 43 is structurally consistent with a woodland and has a grassy understorey

This community is consistent with the Box-Gum Woodland EEC/CEEC as listed under the EPBC Act and TSC Act. It occurs at lower elevations then other forms of the Box-Gum Woodland occurring in the Northern Offsets.

2.1.28 Community 44 – White Box - White Cypress Pine ± Narrow-leaved Ironbark Grassy Woodland (semi-cleared), Woodland EEC/CEEC

Community 44 occurs on lower slopes and flats on grey/brown/red clays of moderate fertility. It is represented in the Southern Offsets on the eastern boundary of the Roseglass property. The overstorey of this community is dominated by *Eucalyptus albens* (White Box)*, E. crebra*

(Narrow-leaved Ironbark), *Callitris glaucophylla* (White Cypress Pine) and *Brachychiton populneus* (Kurrajong). The midstorey predominantly consists of *Acacia decora* (Western Golden Wattle).

The groundstorey is dominated by *Austrostipa scabra* (Speargrass), *Austrostipa verticillata* (Slender Bamboo Grass), *Bothriochloa macra* (Red-leg Grass), *Chloris truncata* (Windmill Grass), *Desmodium varians* (Tick-trefoil) and *Einadia hastata* (Berry Saltbush).

Community 44 is similar to Community 42 – *White Box - White Cypress Pine ± Narrow-leaved Ironbark Grassy Open Forest, Woodland EEC/CEEC*, Community 43 – *White Box – White Cypress Pine ± Narrow-leaved Ironbark Grassy Woodland, Woodland EEC/CEEC* and Community 45 – *White Box – White Cypress Pine ± Narrow-leaved Ironbark Shrubby Open Forest*, with all these communities being dominated by *E. albens* and *C. glaucophylla* with or without associated species *E. crebra*. Community 44 has a less dense overstorey however, due to historical clearing than is seen in Community 43. Community 42 however, has a taller and higher density overstorey, providing an open forest structure, whilst Community 45 has a higher density shrub layer than Community 44.

This community is consistent with the EEC/CEEC Box-Gum Woodland listed under the EPBC Act and TSC Act.

2.1.29 Community 45 – White Box - White Cypress Pine ± Narrow-leaved Ironbark Shrubby Open Forest

This community is generally recorded on mid to lower valley slopes on sedimentary or basaltic soils. Soil types commonly associated with this community include grey, brown and red clays, lithosols and euchrozems, which have a low to moderately high fertility respectively. The community is present in the western offset properties in association with upslope ironbark communities. This community occurs to varying extents primarily on the following offset properties:

- **Eastern Offsets** – Cattle Plains.
- **Southern Offsets** – Bimbooria and Roseglass.
- **Shared Offset.**
- **Northern Offsets** – Wongala and Wirradale; and
- **Western Offsets** – Teston, Louenville and Velyama.

This community is dominated by *Eucalyptus albens* (White Box) and *E. crebra* (Narrow-leaved Ironbark) and co-dominated by *Callitris glaucophylla* (White Cypress Pine), particularly in areas of regrowth. The community has a shrubby midstorey comprising *Geijera parviflora* (Wilga), *Notelaea microcarpa var. microcarpa* (Native Olive) and *C. glaucophylla*.

Community 45 is similar to Community 42 – *White Box - White Cypress Pine ± Narrow-leaved Ironbark Grassy Open Forest, Woodland EEC/CEEC*, Community 43 – *White Box – White Cypress Pine ± Narrow-leaved Ironbark Grassy Woodland, Woodland EEC/CEEC* and Community 44 – *White Box – White Cypress Pine ± Narrow-leaved Ironbark Grassy Woodland (Semi-cleared), Woodland EEC/CEEC*, with all these communities being dominated by *E, albens* and *C. glaucophylla*, with or without the associated species, *E. crebra*. However, Community 45 is characterized by an open forest, rather than woodland structure, with a mid-dense shrub layer, Community 45 thus representing the shrubby form of the community and generally located upslope from Community 42.

The EEC/CEEC Box-Gum Woodland listed under the EPBC Act and TSC Act is characterized by a patchy or sparse shrub layer. As such, Community 45 is not consistent with this listed threatened community due to the presence of a moderately-dense shrub layer.

2.1.30 Community 47 – White Box - Wilga - Belah Woodland, Woodland EEC/CEEC

This community is found on heavy black soils on the plains and is associated with moderately fertile alluvial flats. It occurs within the Western Offsets on the Teston property in low-lying areas west of the Leard State Forest. *Eucalyptus albens* (White Box) dominates the overstorey and is supported by a number of shrub and small tree species. On better drained red-brown soils, *Callitris glaucophylla* (White Cypress Pine) is usually present as a subdominant tree species along with *Geijera parviflora* (Wilga). On heavy dark soils, the community exhibits a distinctive assemblage of supporting shrub and small tree species, including *Casuarina cristata* (Belah), *Allocasuarina luehmanii* (Bulloak), *Capparis mitchellii* (Native Orange), *Eremophila mitchellii* (Budda), *Alectryon oleifolius* (Western Rosewood) and *Ventilago viminalis* (Supple Jack), which are characteristic species found on the basaltic soils or rich alluvial cracking clays.

This community is floristically very similar to Community 25 - *Pilliga Box - Poplar Box - White Cypress Pine Grassy Open Woodland* where the latter occurs on heavy basalt soils. However, this community is dominated by *E. albens* rather than *E. pilligaensis* (Pilliga Box) and *E. populnea* (Poplar Box).

As with other communities that occur on fertile heavy soils, this community has been extensively cleared for agricultural uses in the past and current occurrences consist of young trees, largely without tree hollows.

This community is consistent with the EEC/CEEC Box-Gum Woodland listed under the EPBC Act and TSC Act.

2.1.31 Community 48 – White Box – Wilga ± Quinine semi-cleared Woodland, Woodland EEC/CEEC

Community 48 occupies lower slopes near the boundary of low fertility lithosols and moderately fertile grey/brown/red clays in the Southern Offsets. The community occurs towards the west of the Roseglass property.

Dominant overstorey species include *Eucalyptus albens* (White Box), *Alstonia constricta* (Quinine) and *Geijera parviflora* (Wilga). Understorey species include *Einadia hastate* (Berry Saltbush), *Malvastrum coromandelianum* and Sclerolaena *birchii* (Galvinized Burr). Grass species present include species present include *Austrostipa scabra* (Speargrass), *Digitaria brownii* (Cotton Panic Grass), *Enteropogon acicularis, Eragrostis elongata* (Clustered Lovegrass), and *Sporobolus creber* (Western Rat-tail Grass), *whilst other native groundcover species include Calotis lappulacea* (Yellow Burr-daisy), *Carex inversa, Calotis lappulacea* (Yellow Burr-daisy), *Carex inversa,* and *Vittadinia cuneata*.

Vegetation condition is moderate, with previous clearing substantially affecting the age of the majority of trees. Intensive grazing pressure from sheep and cattle also has affected the lower strata elements of the community but natural regeneration is also occurring.

This community is consistent with the Box-Gum Woodland EEC/CEEC as listed under the EPBC Act and TSC Act.

2.1.32 Community 49 – White Box - Stringybark - ± Manna Gum Grassy Woodland, Woodland EEC/CEEC

This community was recorded on soils with low fertility (i.e. lithosols). Only one occurrence of this community was recorded in association with a drainage line within the surrounding Community 39 - *White Box ± Stringybark Grassy Woodland, Woodland EEC/CEEC*. The occurrence is within the north-eastern sector of the Wirradale property, within the Northern Offsets, although there may be other minor occurrences in other drainage lines not subject to specific field inspections.

Dominant overstorey species comprise *Eucalyptus albens* (White Box), *E. laevopinea* (Silvertop Stringybark) and *E. viminalis* (Manna Gum) co-dominant or subdominant in some sectors. The midstorey and understorey elements are similar to those in surrounding woodland, with some increases in density of shrub cover in patches. The groundcover is dominated by grass species and herbs similar to those in the surrounding Community 39, with some additional occurrences of sedges associated with the drainage line.

Observed occurrences of the *White Box - Stringybark ± Manna Gum Grassy Woodland, Woodland EEC/CEEC* typically represent a mature community with large numbers of mature and large mature trees. The community generally is in good condition with few weed elements observed. It has strong similarities to the surrounding Community 39, but differs in the occurrence of *E. viminalis* (Manna Gum), and could be considered a variation of Community 39 if a broader community definition is adopted.

This community conforms to the definition of the Box-Gum Woodland EEC/CEEC listed under the EPBC Act and TSC Act.

2.1.33 Community 50 - White Box Grassy Woodland (Low Condition)

Only one occurrence of this community was recorded in the offset areas, in association with a drainage line on moderately fertile soils at low elevations (approximately 330m). This occurrence is within the Eastern Offsets within the Oakleigh/Onavale property. The dominant overstorey species is *Eucalyptus albens* (White Box), with large mature trees forming a woodland structure. *E. populnea* (Bimble Box) and a Red Gum sp. (likely to be *E. blakelyi*) also are present. Midstorey and understorey elements are generally lacking and the ground cover is patchy and dominated by grasses and sedges, such as *Austrostipa* sp. Herbs and other groundcover species are poorly represented and only one native herb species (taxonomy unconfirmed) was recorded at the time of field inspections.

This *White Box Grassy Woodland (Low Condition)* community generally is in poor condition, considering the low incidence of understorey and non-grassy groundcover species and presence of weed species, including thistles and *Opuntia stricta* (Prickly Pear). Although Community 50 has strong similarities to other White Box Communities (Community 42 – *White Box - White Cypress Pine ± Narrow-leaved Ironbark Grassy Open Forest, Woodland EEC/CEEC*, Community 43 – *White Box – White Cypress Pine ± Narrow-leaved Ironbark Grassy Woodland, Woodland EEC/CEEC* and Community 44 – *White Box – White Cypress Pine ± Narrow-leaved Ironbark Grassy Woodland (Semi-cleared), Woodland EEC/CEEC*) in the dominance of *E. albens*

in the overstorey in combination with a grassy understorey, it differs substantially in the level of modification to the original community and associated low diversity of groundcover species.

This community does not conform to the definition of the Box-Gum Woodland EEC/CEEC listed under the EPBC Act and TSC Act, owing to insufficient representation of non-grassy forbs in the groundcover stratum.

2.1.34 Community 51 – Yellow Box - Blakely's Red Gum ± Manna Gum Open Forest/ Woodland, Woodland CEEC

This community generally is found on gentle slopes, flats and flat to moderately undulating ridges/plateaux. It occurs on lithosols, chocolate soils, brown earths, and euchrozems with corresponding low to moderately high levels of fertility. This community was recorded in the Northern Offsets on the Mount Lindesay and Wirradale properties and can be an open forest or woodland.

It is dominated by *Eucalyptus viminalis* (Manna Gum) and *E. blakelyi* (Blakely's Red Gum). *E. melliodora* (Yellow Box) co-dominates in some areas and *Angophora floribunda* (Rough-barked Apple) occurs as a sub dominant. There is a sparse midstorey of juvenile tree species and *Notelaea microcarpa* (Native Olive). Understorey density also is very sparse, with occasional specimens of such species as *Melichrus urceolatus* (Urn-heath), *Pimelea neo-anglica* (Poison Pimelea) and *Swainsona galegifolia* (Smooth Darling-pea). The ground layer is dominated by tussock grasses such as *Austrostipa* sp. (Spear Grass) and *Austrodanthonia* sp. (Wallaby Grass). *Desmodium varians* (Slender Tick-trefoil), *Ranunculus lappaceus* (Common Buttercup). Other groundcover species occurring include *Lomandra longifolia* (Spiny-headed Mat-rush), *L. multiflora* (Many-flowered Mat-rush), *Dichondra repens* (Kidney Weed) and *Rumex brownii* (Swamp Dock).

The condition of this community is variable, depending on the level of past clearing and extent of regeneration, but overall is generally good, with mature trees well represented and good level of species diversity in the groundcover.

This community is consistent with the Box-Gum Woodland EEC/CEEC as listed under the EPBC Act and TSC Act.

2.1.35 Community 52 – Yellow Box ± White Cypress Pine Grassy Woodland, Woodland EEC/CEEC

This community was recorded on valley flats and adjoining gentle lower slopes, primarily on non-calcic brown soils of moderate fertility. The occurrence of the community is associated with a drainage line (Back Creek) and the higher fertility soils on the northern side of this creek. Community 52 was identified only within the Eastern Offsets, in the southern sector of the Wallandilly property.

This community generally occurs as a woodland, although some sectors may exhibit a structure more representative of open forest. The community is dominated by *Eucalyptus melliodora* (Yellow Box), with *Callitris glaucophylla* (White Cypress Pine) and/or *C. endlicheri* (Black Cypress Pine) as co-dominants or subdominants. There is a sparse midstorey of juvenile trees species and occasional specimens of tall shrubs/small trees such as *Notelaea microcarpa* (Native Olive) and *Psydrax odorata* (Shiny-leaved Canthium). The understorey density also is

very sparse, with some juvenile Cypress Pine and small shrub species such as *Gompholobium* sp. and *Pimelea neo-anglica* (Poison Pimelea).

The groundcover stratum is dominated by grasses, such as *Austrostipa* sp. (Spear Grass), *Chloris* sp. (Windmill Grass) and *Elymus* sp. (Wheat Grass), whilst other common groundcover species include *Dianella* sp., *Lomandra multiflora* (Many-flowered Mat-rush), *Dichondra repens* (Kidney Weed) and *Convolvulus graminetinus*.

The overall condition of the *Yellow Box ± White Cypress Pine Grassy Woodland* is good, with a high proportion of mature and large mature trees, with old growth trees also well represented. All structural elements also are represented and there is a good diversity of native non-grassy groundcover species. Natural recruitment of tree species also is occurring.

This community is similar, in both structure and the dominance of *E. melliodora* in the overstorey, to Community 5 - *Blakely's Red Gum - Yellow Box Grassy Woodland (± Stringybark) Woodland EEC/CEEC*, and Community 51 – *Yellow Box - Blakely's Red Gum ± Manna Gum Open Forest/Woodland, Woodland EEC/CEEC*. Community 52 differs however in the lack of occurrence of *E. blakelyi* and the co-dominance or subdominance of *Callitris*.

This community conforms to the definition of the Box-Gum Woodland EEC/CEEC as listed under the EPBC Act and TSC Act.

2.2 SHRUBLAND COMMUNITIES

2.2.1 Community 1 – Belah - Wilga - Rosewood Derived Budda Shrubland

This community was recorded on lower slopes with gentle topography on grey, brown and red clay soils of moderate fertility. It was identified in the Southern Offsets, towards the western boundary of the Roseglass property (Niche Environment and Heritage 2012).

This shrubland community is characterized by dense patches of *Eremophila mitchellii* (Budda). Associated species of the dominant midstorey include *Casuarina cristata* (Belah) and *Geijera parviflora* (Wilga). The lower understorey is very sparse, but scattered specimens of *Einadia hastata* (Berry Saltbush), *Sclerolaena birchii* (Galvinized Burr). The groundcover stratum also tends to be sparse, owing to the dense midstorey cover of *E. mitchellii,* but a number of grass and herb species occur. Dominant grasses present within this community include *Aristida personata* (Purple Wiregrass), *Austrodanthonia caespitosa* (Ringed Wallaby Grass), *Austrostipa scabra* (Speargrass), *Austrostipa verticillata* (Slender Bamboo Grass), *Bothriochloa macra* (Red-leg Grass) and *Chloris truncata* (Windmill Grass). Herb species recorded include *Atriplex semibaccata* (Creeping Saltbush), *Calotis lappulacea* (Yellow Burr-Daisy), *Dichondra repens* (Kidney Weed), *Einadia nutans* (Climbing Saltbush) and *Solanum esuriale* (Quena).

Vegetation condition recorded within this community was low to moderate, with areas subject to heavy grazing pressures from sheep and cattle.

This community is not listed as a threatened ecological community under the TSC or EPBC Act.

2.2.2 Community 9– Cypress Pine Low Forest/Shrubland (regenerating)

Topographical occurrences of this community vary from gentle lower slopes and flats, as on the north-eastern perimeter of Bimbooria and the Shared Offset, to more rugged steeper slopes in the north-west of Bimbooria. Soil types thus also vary, with this community found on non-calcic brown soils, lithosols and brown earths ranging from low to high fertility.

This community occurs to varying extents primarily on the following offset properties:

- **Eastern Offsets –** Teston North and Cattle Plains.
- **Southern Offsets –** Bimbooria.
- **Shared Offset**.
- **Northern Offsets –** Wongala.

The greatest representation occurs on the Bimbooria property, particularly through the central sector.

The community is characterised by the dense growth of Cypress Pines (*Callitris glaucophylla* [White Cypress Pine] and/or C. *endlicheri* [Black Cypress Pine]) forming a midstorey shrubland or low forest, depending on the age of the regeneration. Occasional other small tree/tall shrub species may occur, such species observed including *Atalaya hemiglauca* (Whitewood), *Geijera parviflora* (Wilga) and *Dodonaea viscosa* (Sticky Hop Bush). Occasional eucalypt emergents occur in some areas, with very large old growth White Box evident in parts of the Bimbooria property. The understorey and ground cover tends to be fairly sparse overall, reflecting the inhibiting nature of dense cypress pine to development of understorey components (Lacey, 1972). Occasional understorey species include juvenile *Callitris* species and *Notelaea microcarpa* (Native Olive). Understorey species are sparse, with only occasional specimens of such species as *Pimelea neo-anglica* (Poison Pimelea) occurring. Where ground cover is present, characteristic grass species include *Aristida* sp. (Wire Grass) and *Elymus* (Wheat Grass). Other groundcover species recorded include *Cheilanthes sieberi* (Rock Fern) and *Desmodium brachypodum* (Large Tick-trefoil) as well as the introduced *Opuntia stricta* (Prickly Pear).

This community generally comprises moderately dense to dense stands of healthy *Callitris* species that are indicative of previous clearing and low incidence or lack of fire, *Callitris* species typically being more sensitive to fire. The dense monocultural stands of *Callitris* species developing after clearing of eucalypts on parts of the offset properties are subsequently likely to inhibit ground-cover species' germination, suggested to be owing to the pine's expansive root morphology and resultant high below-ground resource competition (Harris *et al.*, 2003). This factor encourages the continuing development of dense stands of *Callitris* species with diminishing occurrence of any eucalypts over time.

This community in its current form, does not represent a threatened community under the TSC Act or EPBC Act. At least some areas however, are indicative of the previous occurrence of White Box Grassy Woodland, which is a threatened community under both the TSC and EPBC Act. Positive management of such areas to encourage eucalypt regeneration would be expected to facilitate the restoration of White Box Grassy Woodland.

2.2.3 Community 17 – Metasediment Rock Outcrop Shrubland

Community 17 is a shrubland occurring on low fertility lithothsols and rock outcrops, generally along ridgetops and the upper slopes of steep gullies. It was identified in the Southern Offsets on the higher elevations of the Roseglass property (Niche Environment and Heritage, 2012).

This community is dominated by *Acacia cheelii* (Motherumbah) in the midstorey, which forms the dominant stratum. *Callitris glaucophylla* (White Cypress Pine)*, Eucalyptus crebra* (Narrow-leaved Ironbark) and *Geijera parviflora* (Wilga) may also occur as very sparsely scattered trees and predominantly associated with adjoining habitat. Other shrub species

associated with *A. cheelii* include *Beyeria viscosa* (Pinkwood) and *Notelaea microcarpa* (Native Olive). The understorey supports such species as *Abutilon tubulosum*, and there is a good diversity in grass species present, including *Bothriochloa macra* (Red-leg Grass)*, Aristida calycina, Austrostipa verticillata* (Slender Bamboo Grass)*, Paspalidium constrictum* (Knottybutt Grass) and *Tripogon loliiformis* (Fiveminute Grass). Non-grassy groundcover species include*, Ajuga australis* (Austral Bugle)*, Boerhavia dominii* (Tarvine), and *Calotis lappulacea* (Yellow Burr-daisy).

The vegetation condition of this community is generally good, although fire has affected some sectors severely and these areas are still recovering. Feral goats also would be expected to be affecting the vegetation and natural regeneration processes adversely.

This community is not listed as a threatened ecological community.

2.2.4 Community 18 – Motherumbah - Narrow-leaved Ironbark Forest/Semi-cleared Low Woodland/Shrubland

This community occurs primarily on low fertility lithosols. It was identified in the Southern Offsets, toward the centre of the Roseglass property (Niche Environment and Heritage, 2012).

The community is characterized by the dominance of *Acacia cheelii* (Motherumba) in the overstorey and midstorey. Disturbance is evident within this community due to partial historical clearing of the overstorey. Associated native species present in the overstorey and midstorey include *Alstonia constricta* (Quinine Tree)*, Eucalyptus crebra* (Narrow-leaved Ironbark) and *E. dealbata* (Tumbledown Red Gum). Understorey species include *Bursaria spinosa* (Native Blackthorn). Grass species recorded for this community include *Aristida calycina* (Wiregrass)*, Aristida personata* (Purple Wiregrass)*, Austrostipa scabra* (Speargrass)*, Digitaria brownii* (Cotton Panic Grass) and *Themeda triandra* (Kangaroo Grass).

Other species occurring in the groundstorey include *Calotis lappulacea* (Yellow Burr-daisy)*, Cheilanthes sieberi* (Poison Rock Fern)*, Chenopodium carinatum* (Keeled Goosefoot)*, Cyperus fulvus* (Sticky Sedge)*, and Dichondra* sp. A

This community is not listed as a threatened ecological community under the TSC Act or EPBC Act.

2.2.5 Community 22 - Narrow-leaved Ironbark + White/Black Cypress Open Forest Regenerating (Shrubland)

This community represents a regenerating shrubland form of Community 20 – *Narrow-leaved Ironbark – White Cypress Pine Woodland (Semi-cleared)* and is restricted to lower valley slopes on lithosols of low fertility, adjoining areas of the parent Community 20. It has been identified as occurring only in the Southern Offsets on the Roseglass property, but small areas may also occur on other properties in the Western Eastern and Southern Offsets, wherever Community 20 occurs.

Owing to previous clearing activities, an overstorey is lacking, with the community characterised by a midstorey dominated by *Eucalyptus crebra* (Narrow-leaved Ironbark), with *Callitris endlicheri* (Black Cypress Pine) and/or *C. glaucophylla* (White Cypress Pine) also occurring in some areas as a co-dominant or subdominant species. Scattered specimens of taller shrub species, such as *Notelaea microcarpa var. microcarpa* (Native Olive), *Acacia cheelii*

(Motherumbah) and *Alstonia constricta* (Quinine) may also occur. The understorey tends to be very sparse, primarily represented by young specimens of the midstorey species, but occasional specimens of shrub species, such as *Sclerolaena birchii* (Galvanised Burr) and *Maireana microphylla* (Small-leaf Bluebush) may occur. The groundcover is dominated by grass species such as *Austrostipa* spp., *Aristida* spp. (Wiregrass) and *Bothriochloa macra* (Red-leg Grass), with other groundcover species including *Boerhavia dominii* (Tarvine), *Sida* sp. and *Calotis lappulacea* (Yellow Burr Daisy).

The structure of this regenerating community varies but areas observed tended to be relatively open. All areas have been subject to previous clearing and ongoing heavy grazing pressures from sheep and cattle, which would be expected to inhibit the rate and condition of regeneration. Community 20 has many features in common with Community 18 – *Motherumbah - Narrow-leaved Ironbark Forest/Semi-cleared Low Woodland/Shrubland* but differs in the extent of occurrence of *A. cheelii*. In some small sectors, the characteristics of these two communities could overlap

This community does not conform to the description of Box-Gum Woodland EEC/CEEC as listed under the TSC Act and EPBC Act.

2.2.6 Community 35 – Tea-tree in Drainage Lines

This shrubland community is found in association with lithosol and euchrozem soils, which have low to moderately high levels of fertility respectively. The community occurs in the small drainage lines on the Wirradale property in the Northern Offsets.

The shrub assemblage is dominated by Tea-Tree (*Leptospermum* spp.) and Paperbark species (*Melaleuca* spp.) and forms a dense shrubby corridor through native pastures. Tree species generally are absent. Dominant species likely to occur include *Melaleuca bracteata* (Bracteate or Black Tea-tree).

The condition of this community is variable, depending on the level of access by livestock to specific areas.

This community is not listed as a threatened ecological community under the TSC Act or the EPBC Act.

2.2.7 Community 46 – White Box - White Cypress Pine Derived Shrubland

Community 46 typically occurs mainly on lithosols of low fertility, with some extension onto grey/brown/red clays of moderate fertility. It occupies small sections of gentle lower slopes in the Southern Offsets, in the central northern sector of the Roseglass property.

This community is characterized by the absence of a developed tree overstorey and the dominance of a mid-dense midstorey. Midstorey species of this community include *Eucalyptus albens* (White Box), *E. crebra* (Narrow-leaved Ironbark), *E. dealbata* (Tumbledown Red Gum), *Callitris glaucophylla* (White Cypress Pine), *Acacia decora* (Western Golden Wattle) and *Cassinia quinquefaria*. The understorey is dominated by *Olearia elliptica* (Sticky Daisy-bush) and *Pimelea neo-anglica* (Poison Pimelea). Dominant grasses present in the groundstorey include *Aristida jerichoensis* (Jericho Wiregrass), *Aristida personata* (Purple Wiregrass), *Bothriochloa macra* (Red-leg Grass), *Chloris truncata* (Windmill Grass), and *Cymbopogon refractus* (Barbed Wiregrass). Other non-grassy groundcover species include *Cheilanthes*

sieberi (Poison Rock Fern)*, Chrysocephalum semipapposum* (Clustered Everlasting)*, Lomandra longifolia* (Spiny-headed Mat-rush) and *Wahlenbergia communis* (Tufted Bluebell)*.*

The condition of this community is moderate, with all areas of occurrence subject to heavy grazing pressures from sheep and cattle.

This community does not conform to the definition of the Box-Gum Woodland EEC or CEEC, as listed under the TSC Act or EPBC Act as it lacks the required structural characteristics and the species dominance is mixed.

2.3 GRASSLAND COMMUNITIES

2.3.1 Community 6 – Bracteate Honeymyrtle Low Riparian Forest – Derived Native Grassland

Community 6 occurs mainly on moderately fertile grey/brown/red clays, extending onto low fertility lithosols in some parts. It was identified along drainage lines and creek lines in the Southern Offsets in the western and north-western sectors of the Roseglass property where it is associated with the mapped occurrence of the parent community – Community 7 (Niche Environment and Heritage, 2012).

The community is a grassland that supports very sparsely scattered trees including such species as *Brachychiton populneus* (Kurrajong), *Callitris glaucophylla* (White Cypress Pine), *Eucalyptus albens (White Box), E. crebra* (Narrow-leaved Ironbark), and *E. dealbata* (Tumbledown Red Gum)*.* The midstorey also may be represented by such species as *Acacia excelsa* (Ironwood) and *A. salicina* (Cooba) while understorey species include *A. decora* (Western Golden Wattle), *Maireana microphylla* (Small-leaved Bluebush) and *Olearia elliptica* (Sticky Daisy-bush)*.* The dominant grassy groundcover comprises species such as *Austrodanthonia racemosa* (Wallaby Grass)*, Austrostipa scabra* (Speargrass)*, A. verticillata* (Slender Bamboo Grass)*, Bothriochloa macra* (Red-leg Grass) and *Cynodon dactylon* (Common Couch). Non-grassy groundcover species may include *Calotis cuneifolia* (Purple Burr-daisy)*, C. lappulacea* (Yellow Burr-daisy)*, Cyperus eragrostis* (Umbrella Sedge)*, Desmodium varians* (Tick-trefoil) and *Einadia nutans* (Climbing Saltbush)*.*

The condition of this community ranges from poor to moderate, with most areas subject to heavy grazing pressures from sheep and cattle, as well as feral goats.

Community 6 has obvious similarities with Community 7 - *Bracteate Honeymyrtle Low Riparian Forest – Semi-cleared (Regenerating)*, from which it is derived, but generally lacks the upper strata features and species composition of Community 7, which is a regenerating low forest, except as scattered occurrences. Community 6 however, as for Community 7, also lacks the species that would appear, from the community name assigned, to be the diagnostic species for the community, i.e. *Melaleuca bracteata* (Bracteate or Black Tea-tree). Nor has this species been listed as occurring on the Roseglass property (Niche Environment and Heritage, 2012). From the species listed as occurring in this community, Community 6 appears to represent a grassland form of Community 41- *White Box – Tumbledown Gum (semi-cleared/on creek lines)*.

This community is not listed as a threatened ecological community under the TSC Act or the EPBC Act.

2.3.2 Community 8 – Cultivation

This highly man-modified communities is widespread on moderately low to highly fertile soils (solodic soils, brown podzolic soils, grey/brown/red clays and black earths) throughout the offset areas, although cultivated land is mostly excluded from the offsets per se. It is represented, in one form or another, on the following properties:

- **Western Offsets** – Teston, Louenville, Olivedeen, Kelso and Velyama**.**
- **Eastern Offsets** – Blue Range, Teston North, Cattle Plains, Warriahdool and Wallandilly.
- **Southern Offsets** – Roseglass.
- **Community 7.**

The condition of this community, in terms of the relationship to naturally occurring vegetation types, is very poor as could be expected. In some locations there may be scattered paddock trees, indicating the former occurrence of forest or woodland communities, and such trees can be of some value to fauna species. The overall value of cultivated land however, is very low, with fallow areas also tending to be dominated by weed species.

Community 8 - *Cultivation*, does not conform to the definition of the Box-Gum Woodland EEC/CEEC, or any other threatened community as listed under the TSC Act or EPBC Act.

2.3.3 Community 10 – Derived Native Grassland (Box-Gum Woodland - low diversity and not conforming to EEC/CEEC)

This community typically is found on gentle lower slopes and flats on a wide variety of soil types including non-calcic brown soils, lithosols, red brown earths, grey/brown/red clays and solodic soils with the fertility varying from moderately low to moderate. This community occurs to varying extents primarily on the following offset properties:

- **Western Offsets** – Kelso and Velyama.
- **Eastern Offsets** – Oakleigh/Onavale, Teston, Tralee, Cattle Plains, Wallandilly and Warriahdool.
- **Shared Offset.**
- **Southern Offsets** – Bimbooria and Roseglass.
- **Northern Offsets** – Mount Lindsay and Wirradale.

Native pastures that have been pasture improved or have had superphosphate fertilisers applied to improve grazing conditions for livestock were generally found to be species poor. Heavily grazed areas, even without pasture improvement, were also found to be species poor. Where present, a very sparse overstorey is formed by various species including *Alphitonia excelsa* (Red Ash)*, Callitris glaucophylla* (White Cypress Pine)*, E. albens* (White Box)*, E. crebra* (Narrow-leaved Ironbark) *and/or E. dealbata* (Tumbledown Red Gum). Scattered mid-storey species also may be present, or may be the only upper stratum represented, species occurring including *Geijera parviflora* (Wilga)*, Alstonia constricta* (Quinine), *Asterolasia* sp. Kelvin, *Dodonaea viscosa* (Sticky Hopbush) and/or *Notelaea microcarpa* (Native Olive). Occasional understorey species commonly occurring include *Einadia hastate* (Berry Saltbush)*, Malvastrum coromandelianum* (Prickly Malvastrum)*, Sclerolaena birchii* (Galvinized Burr). Community 10 is dominated by grazing resistant native grasses that form low tussocks, such as *Eragrostis brownii* (Lovegrass)*, Chloris truncata* (Windmill Grass) and *Bothriochloa macra* (Red-leg Grass).

Where present, other native groundstorey occurring include *Calotis lappulacea* (Yellow Burr-daisy)*, Carex inversa,* and *Vittadinia cuneata*.

The condition of this community is highly variable, and vigorous grass growth may be the key feature. However, in terms of diversity of native species, the community is generally in poor condition, having been heavily cleared and subject to long term grazing pressures. Positive management measures however, would be expected to improve the condition of most areas.

This community of native pastures (i.e. pastures dominated by native grasses), where the native forb and herb diversity is less than 12 species per 0.1 ha area, are not considered to be consistent with the Box-Gum Woodland and Derived Grasslands EEC/CEEC as listed under the EPBC Act and TSC Act (DEH, 2006).

2.3.4 Community 11 – Derived Native Grassland (Box-Gum Woodland), Grassland EEC/CEEC

Community 11 typically occurs on gentle lower slopes and flats on a variety of soil types including non-calcic brown soils, solodic soils, lithosols, grey/brow/ red clays, brown earths, euchrozems, brown podzolic soils, chocolate soils and kraznozems. Soil fertility supporting this community thus varies from low to moderately highly fertility. Most occurrences are in the Northern Offsets, within pasture areas that have been less subject to agricultural impacts and grazing pressures. This community occurs to varying extents on the following offset properties:

- **Western Offsets –** Velyama and Teston.
- **Eastern Offsets –**Cattle Plains, Wallandilly and Oakleigh/Onavale**.**
- **Southern Offsets –** Bimbooria and Roseglass**.**
- **Northern Offsets** – Wongala, Mount Lindsay and Wirradale.

In the Eastern and Western Offset areas, Community 11 is restricted to the fringes of extant woodland and forest vegetation; the diversity of the grassland decreasing quite quickly with distance from the forest and woodland margins.

Derived grassland (also known as secondary grassland or understorey) can remain relatively intact, however by nature, the floristic composition of these grasslands vary according to the forest or woodland community from which it originated. As a result, this community can be distinguished from other derived native grassland communities by its origins from the Box-Gum Woodland EEC/CEEC. As such, scattered dominant overstorey species include species characteristic of the Box-Gum Woodland EEC/CEEC including *E. albens* (White Box)*, E. melliodora* (Yellow Box) and *E. blakelyi* (Blakely's Red Gum)*.*

Native pastures that have not been pasture improved recently or have had little fertiliser applied tend to be rich in forb species and dominated by native large tussock-forming grass species, such as *Poa* spp., *Themeda australis* (Kangaroo Grass) and *Cymbopogon refractus* (Barbed Wiregrass). Areas of native pasture that have been lightly to moderately grazed, are typically species rich, even if subject to some fertiliser application in the past (Cumberland Ecology, 2013a). Commonly occurring non-grassy groundcover species include *Chrysocephalum apiculatum* (Common Everlasting), *Rostellularia adscendens, Calotis lappulacea* (Yellow Burr-daisy), *Cotula australis* (Common Cotula) and Daucus glochidiatus (Native Carrot).

Community 11 overall, is in moderate to good condition, depending on the location, and supports sufficient diversity, i.e. at least 12 native forbs with one being a recognized grazing sensitive species present within a 0.1 ha area, to be recognized as being consistent with the Box-Gum Woodland EEC/CEEC, as listed under the EPBC Act and TSC Act (DEH, 2006).

2.3.5 Community 12 – Derived Native Grassland (Low Diversity)

This represents a general low diversity grassland community definition for areas previously supporting eucalypt forest or woodland but for which the original communities were not readily identifiable with certainty. The unit occurs primarily on lower slopes and flats on soils with low to moderate fertility (i.e. lithosols, non-calcic brown soils and grey/brown/red clays) in the Southern Offsets, in the northern and south-eastern sectors of the Bimbooria property.

Scattered understorey species, particularly *Maireana microphylla* (Small-leaved Bluebush) and *Sclerolaena birchii* (Galvanized Burr), occur as a feature of Community 12. Common grasses occurring comprise species that are highly tolerant to heavy grazing pressures, including *Aristida* sp. (Wiregrass), *Bothriochloa* macra (Red-leg Grass) and *Austrostipa* sp. (Spear Grass). Other native ground cover species occurring include *Tribulus* sp., *Boerhavia dominii* (Tarvine) and *Portulaca oleracea* (Pigweed).

Sectors included in Community 12 have undergone extensive clearing of tree and understorey species, such that the remnant paddock tree or regenerating specimens are lacking. As such, these areas could not be confirmed to represent previous occurrences of the Box-Gum Woodland EEC/CEEC, although the topographical locations and soil types suggest the likelihood of at least some such previous occurrences of the Box-Gum Woodland EEC/CEEC. Weed species, such as thistles and *Opuntia stricta* (Prickly Pear), are also common.

The community has similarities to other low diversity grassland communities (*Community 10 – Derived Native Grassland [Box-Gum Woodland - low diversity and not conforming to EEC/CEEC], Community 13 – Derived Native Grassland [Non-threatened], Community 24 – Narrow-leaved Ironbark Derived Native Grassland [Low diversity] and Community 26 – Poplar Box [Bimble Box] Derived Native Grassland [Low diversity]*) and based on the adjoining vegetation communities, most likely represents combinations of primarily Communities 10 and 24.

More detailed site inspections in the future, particularly if some regeneration has been allowed to occur, could be expected to refine mapping of this unit to identify the originally occurring vegetation community.

The low diversity of ground cover species in this community, precludes conformance with the definition of Box-Gum Woodland EEC/CEEC as listed under the TSC Act and EPBC Act.

2.3.6 Community 13 – Derived Native Grassland (Non-threatened)

This community definition applies mainly to areas of grassland supporting sufficient representation of paddock trees and/or regeneration to provide a level of certainty that the original community did not represent the Box-Gum Woodland threatened community. Such areas however, were not subject to detailed surveys and mapping of specific vegetation

association[1] boundaries. Some grassland areas not subject to specific inspections but not considered likely to have represented Box-Gum Woodland, based on adjoining/surrounding vegetation and aerial photographic interpretation, also have been included in this category.

This grassland unit occurs primarily on lower slopes and flats that have been subject to extensive clearing and most areas also have been heavily grazed. However, the definition also has been applied to upper slope high elevation locations in the Northern Offsets. The unit tends to be associated with soils with low to moderately high fertility (including solodic soils, non-calcic brown soils, lithosols, grey, brown and red clays, euchrozems, chocolate soils, brown podzolic soils and kraznozems) and occurs on the following offset properties:

- **Eastern Offsets** – Oakleigh/Onavale, Warriahdool and Wallandilly.
- **Northern Offsets** – Mt Lindesay and Wallandilly.

In the far north of the Mt Lindesay property, this unit appears to represent, in part, a natural grassland community associated with the Mt Lindesay lava flows, with stepped grassland areas bounded by narrow bands of trees.

Tree species associated with this grassland unit vary with offset location and include *Eucalyptus laevopinea* (Silvertop Stringybark), *E. bridgesiana* (Apple Box), *Angophora* spp. and Red Gum sp. One small stand of *E. albens* (White Box) also is included within this unit on the Mt Lindesay property owing to its small size in terms of mapping scales and the low condition of the understorey/groundcover. For the community overall, mid-understorey and understorey species, if present, tend to comprise juvenile tree species, but common shrub species, such as *Cassinia sp., Olearia elliptica* (Sticky Daisy Bush) and *Dodonaea viscosa* (Sticky Hop Bush) may be present, often in dense clumps, in some areas. Groundcover species also vary with location and altitude and include an often dense cover of grasses such as *Aristida ramose* (Purple Wiregrass), *Austrodanthonia* spp. (Wallaby Grass), *Bothriochloa* sp., *Poa sieberiana* (Snowgrass) and *Poa* sp. and scattered herbs such as *Wahlenbergia* spp. (Native Bluebells), *Chrysocephalum apiculatum* (Common Everlasting), *Asperula conferta* (Native Woodruff) and *Acaena novae-zelandiae* (Bidgee Widgee).

More detailed site inspections in the future could be expected to refine mapping of this unit to confirm the originally occurring vegetation communities and boundaries of these communities.

2.3.7 Community 15 – Exotic/Improved Pasture

Community 15 occurs on lower slopes and flats on a range of soil types including chocolate soils, yellow podzolic soils, brown earths and lithosols, with levels of fertility ranging from low to high. The community is characterized by the dominance of exotic grass species associated with pasture improvement practices. It occurs to varying extents on the following offset properties:

- **Western Offsets** – Teston and Velyama.
- **Southern Offsets** – Roseglass.
- **Northern Offsets** – Mount Lindsay.

[1] Association refers to the definition of a community according to the dominant species present and not related to broader vegetation classification systems.

This community comprises areas of improved grazing pastures and is characterized by the dominance of exotic grass and forb species in the groundstorey. Some occurrences of this community on the Roseglass property have a very scattered overstorey dominated by *Casuarina cristata* (Belah) and *Geijera parviflora* (Wilga) and occasional occurrence of *Eremophila mitchellii* (Budda) as a midstorey species. Scattered native understorey species may also occur, including *Einadia hastate* (Berry Saltbush) and *Sclerolaena birchii* (Galvinized Burr). Native grass species present to varying extents comprise *Aristida personata* (Purple Wiregrass), *Austrodanthonia caespitosa* (Ringed Wallaby Grass), *Austrostipa* spp., *Eragrostis* spp., *Panicum simile* (Two-colour Panic) and *Sporobolus creber* (Western Rat-tail Grass). Other native groundcover species present include *Atriplex semibaccata* (Creeping Saltbush), *Calotis lappulacea* (Yellow Burr-daisy), *Solanum esuriale* (Quena), *Dichondra repens* (Kidney Weed), *Einadia nutans* (Climbing Saltbush), *Vittadinia cuneata*, *Zaleya galericulata* (Hogweed) (Niche Environment and Heritage, 2012).

Vegetation condition within this community is low.

This community does not represent a threatened ecological community listed under the TSC Act or EPBC Act.

2.3.8 Community 21 – Narrow-leaved Ironbark - White Cypress Pine ± Tumbledown Gum Derived Native Grassland

Community 21 predominantly occurs on lower slopes associated with low fertility lithosols, with potentially some extensions onto moderately fertile, non-calcic brown soils. This community occurs to varying extents on the following offset properties:

- **Southern Offsets** –Roseglass.

The previous dominance *E. crebra* (Narrow-leaved Ironbark) and *Callitris glaucophylla* (White Cypress Pine, with variable occurrences of *E. dealbata* (Tumbledown Red Gum) characterise this community. Occasional midstorey species include *Myoporum montanum* (Western Boobialla) and *Notelaea microcarpa* (Native Olive). Grass species dominate the groundstorey, with common species including *Aristida* spp. (Wiregrass), *Austrostipa* spp. (Speargrass), *Chloris truncata* (Windmill Grass) and *Cymbopogon refractus* (Barbed Wiregrass).

Vegetation condition is typically low to moderate, with adversely affected by feral goats and intensive sheep grazing.

Community 21 has many features in common with *Community 10 – Derived Native Grassland [Box-Gum Woodland - low diversity and not conforming to EEC/CEEC], Community 12 – Derived Native Grassland (Low Diversity), Community 13 – Derived Native Grassland [Non-threatened], Community 24 – Narrow-leaved Ironbark Derived Native Grassland [Low diversity] and Community 26 – Poplar Box [Bimble Box] Derived Native Grassland [Low diversity]*, but differs from Communities 10, 12 13 and 26 in the known occurrence of *E. crebra* as the previously dominant overstorey species. It differs from Community 24 in the variable occurrence of *E. dealbata* (Tumbledown Gum) in the original community.

This community is not listed as a threatened ecological community under the TSC Act or EPBC Act.

2.3.9 Community 24 – Narrow-leaved Ironbark Derived Native Grassland (Low diversity)

This community occurs on lower slopes and flats, primarily on moderately fertile grey/brown/red clays or on the edges of low fertility lithosols in the Western Offsets. It has been identified on the Kelso and Velyama properties, in the eastern and central sectors respectively of these property. Scattered occurrences of large mature or old growth *Eucalyptus crebra* (Narrow-leaved Ironbark) occur as remnant overstorey specimens and occasional *Notelaea microcarpa* (Native Olive) specimens represent the previous midstorey. The native pastures that characterize this community have been subject to pasture improvement, or have had superphosphate fertilisers applied to improve grazing conditions for livestock, resulting in poor species diversity. Heavily grazed areas, even without pasture improvement, also are species poor. These areas are dominated by grazing resistant native grasses that form low tussocks, such as *Eragrostis brownii* (Lovegrass)*, Chloris truncata* (Windmill Grass) and *Bothriochloa macra* (Red-leg Grass).

Community 24 has many features in common with Communities 10, 12, 13, 21 and 26, but differs from Communities 10, 12 13 and 26 in the known occurrence of *E. crebra* as the previously dominant overstorey species. It differs from Community 21 in the absence of *E. dealbata* (Tumbledown Gum).

Native pastures such as this Community 24 (i.e. pastures dominated by native grasses), where the previous overstorey species do not reflect previous occurrence of *E. albens, E. melliodora* and/or *E. blakelyi,* do not conform to definition of the Box-Gum Woodland EEC/CEEC and Derived Grasslands as listed under the EPBC Act and TSC Act.

2.3.10 Community 26 – Poplar Box Derived Native Grassland (Low diversity)

This community occurs on alluvial flats, primarily on moderately fertile grey/brown/red clays or non-calcic brown soils, or on the edges of low fertility lithosols. It occurs on the following offset properties:

- **Western Offsets** – Olivedeen, Kelso and Velyama.
- **Eastern Offsets** – Tralee, Cattle Plains and Wallandilly.

Scattered large mature or old growth *E. populnea* (Poplar Box) occur as remnant overstorey specimens in a grassland community. The native pastures that characterize this community have been subject to various agricultural practices and are generally low in species diversity. Heavily grazed areas, even without pasture improvement, also are species poor. These areas tend to be dominated by grazing resistant native grasses, such as *Austrostipa* spp.

Owing to the intensive grazing and/or agricultural activities to which areas of Community 26 have been subject, the overall condition of the community tends to be poor.

Community 26 has many features in common with *Community 10 – Derived Native Grassland [Box-Gum Woodland - low diversity and not conforming to EEC/CEEC], Community 12 – Derived Native Grassland (Low Diversity), Community 13 – Derived Native Grassland [Non-threatened], Community 21 - Narrow-leaved Ironbark – White Cypress Pine ± Tumbledown Gum Derived Native Grassland and Community 24 – Narrow-leaved Ironbark Derived Native Grassland [Low diversity],* but differs from Communities 10, 12 13 and 24 in the known occurrence of *E. populnea* as the previously dominant overstorey species.

Native pastures such as this Community 26 where the previous overstorey species do not reflect bprevious occurrence of *E. albens, E. melliodora* and/or *E. blakelyi*, do not conform to definition of the Box-Gum Woodland EEC/CEEC and Derived Grasslands as listed under the EPBC Act and TSC Act.

2.3.11 Community 53 – Cultivated or Exotic/Improved Pasture

This community definition has been applied to areas that, based on aerial photographic interpretation, obviously have been subject to intensive agricultural practices, but the definition between exotic pasture areas and areas of cultivation could not be distinguished with certainty. These areas thus are similar to either Community 8 – *Cultivation*, or Community 15 – *Exotic/Improved Pasture.*

All such areas are in low condition in terms of representation of naturally occurring communities.

Community 53 does not conform to the definition of Box-Gum Woodland Derived Native Grassland EEC/CEEC as listed under the TSC Act and EPBC Act.

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APPENDIX F

OFFSET AREA RISK ASSESSMENT

Table F1
Risk Assessment

Risk Factor (Hazard)	Impact (Risk)	Before Management			Action/Control/Risk Mitigation Measure	After Management		
		Likelihood	Consequence	Risk		Likelihood	Consequence	Risk Level
Substrate	Poor soil chemistry – depleted soil nutrients	B	4	M	• soil testing to be undertaken on soils in revegetation areas; • selective use of slow-release fertiliser to promote plant growth (if required); and • reuse timber/hollow logs salvaged during vegetation clearance.	C	4	L
	Poor soil chemistry - elevated soil nutrients	B	4	M	• soil testing to be undertaken on soils in revegetation areas; • nutrient reduction options (e.g. crash grazing periodically to remove nutrients locked in weeds)	C	4	L
	Erosion and sedimentation	B	4	M	• targeted revegetation along drainage lines and scalded areas to minimise risk of erosion; • restriction of livestock access to erosion prone areas (e.g. along watercourses); • locate new offset area management infrastructure (e.g. access roads) in stable locations; and • maximise the re-use of existing infrastructure (e.g. access roads).	C	4	L
	Soil compaction - inhibits germination of seeds or growth of seedlings	B	4	M	• vehicle access will be predominantly restricted to designated tracks; • livestock will be excluded from areas undergoing active revegetation; and • site preparation in cleared land (e.g. ripping or use of spiked rollers) and (where relevant) in derived grassland (e.g. use of spiked rollers).	C	4	L
	Ground disturbance	C	4	L	• vehicle access will be predominantly restricted to designated tracks; • fencing and signage around the perimeter of the offset areas; and • low disturbance revegetation techniques in existing Box-Gum Woodland and derived grasslands.	D	4	L
Clearing	Incidental clearing, fragmentation and fire wood collection	C	4	L	• restriction of clearing; • firewood collection not permitted; • fencing and signage around the perimeter of the offset areas; • locate new offset area management infrastructure (e.g. access roads) preferentially in cleared land; and • maximise the re-use of existing infrastructure (e.g. access roads).	D	4	L

Table F1 (Continued)
Risk Assessment

Risk Factor (Hazard)	Impact (Risk)	Before Management			Action/Control/Risk Mitigation Measure	After Management		
		Likelihood	Consequence	Risk		Likelihood	Consequence	Risk Level
Livestock	Grazing by cattle – ground disturbance, remove or destroy seeds, seedlings or plantings	C	2	H	• restrict livestock access to erosion prone areas (e.g. along watercourses); • livestock will be excluded from areas undergoing active revegetation; • restrict livestock access to areas not already subject to grazing; • management of livestock to maintain ground cover and diversity of native plants; • restrict livestock access to protect plants that are known to be sensitive to grazing; and • controlled grazing management.	D	3	L
	Too frequent grazing management, impacting on native fauna habitat	C	2	H	• livestock will be excluded from areas undergoing active revegetation; and • describe management of livestock to maintain ground cover and diversity of native plants.	D	3	L
Introduced flora species (weeds)	Weed invasion – perennial and annual grasses, perennial herbs, annual and biennial herbs and woody weeds	C	2	H	• provide application rates for seeds as well as planting densities for tube stock to avoid excessive shading; • weed management; • sowing of Kangaroo Grass; and • lightly graze derived grasslands in times of suitable climatic conditions for weed growth.	D	3	L
Herbicide	Excessive herbicides – may have a negative effects on native species	C	4	L	• herbicides minimised through spot-spraying, basal spraying, stem injection or cut and paint application methods.	C	4	L
Impacts from Animals (exotics and grazing native animals)	Grazing by feral pigs and goats	B	3	H	• procedures to prevent, monitor and control feral animals; and • option for using tree guards to protect young seedlings.	B	5	L
	Rabbits and hares	B	3	H	• procedures to prevent, monitor and control feral animals.	B	5	L
	Grazing native fauna species (e.g. kangaroos)	B	4	M	• option for using tree guards to protect young seedlings. • provision to review the need for kangaroo control measures.	B	5	L

Table F1 (Continued)
Risk Assessment

Risk Factor (Hazard)	Impact (Risk)	Before Management			Action/Control/Risk Mitigation Measure	After Management		
		Likelihood	Consequence	Risk		Likelihood	Consequence	Risk Level
	Feral foxes	B	3	H	• procedures to prevent, monitor and control feral animals.	B	5	L
	Deer	C	4	L	• provide monitoring of deer and feral cats and control (if required).	B	5	L
	Feral Cat	B	4	M	• provide monitoring of deer and feral cats and control (if required).	B	5	L
Fire	Uncontrolled bushfire	B	2	H	• maintaining fire breaks and access; • schedule for maintenance of fire breaks and fire trails; • schedule for assessing fuel loads; and • option for using controlled grazing to reduce biomass.	D	3	L
Floristics	Poor diversity in the seed mix or tube stock	C	3	M	• procedures for strategic and long term seed collection, management and storage ; • procedures for sowing seed (e.g. appropriate sowing depths); and • favour natural regeneration in the derived grasslands and woodland areas over seeding or planting in the first instance followed by seeding or planting if required.	D	3	L
	Unsuitable species in the seed mix or tube stock	C	3	M	• preferential use of local endemic (adapted) species, or the use of a high quality seed source further from the site over a low quality more local seed source; and • favour natural regeneration in the derived grasslands and woodland areas over seeding or planting in the first instance followed by seeding or planting if required.	D	3	L
	Shortage of sufficient seed or tube stock	C	3	M	• a seed and tube stock supply strategy to meet demand.	D	3	L

Table F1 (Continued)
Risk Assessment

Risk Factor (Hazard)	Impact (Risk)	Before Management			Action/Control/Risk Mitigation Measure	After Management		
		Likelihood	Consequence	Risk		Likelihood	Consequence	Risk Level
	Poor understorey diversity	C	3	M	• application rates for seeds as well as planting densities for tube stock; • preferential use of local endemic (adapted) species, or the use of a high quality seed source further from the site over a low quality more local seed source; • provision to assess vegetation density and undertake ecological thinning (e.g. through selective clearance or fire) if necessary; • measures to improve understorey diversity (e.g. replanting, causing disturbance through fire or grazing); and • wide diversity of species in the seed mix.	D	3	L
	Over-collection of seed for revegetation purposes	C	3	M	• a seed and tube stock supply strategy to meet demand; and • provide for the preferential use of local endemic (adapted) species, or the use of a high quality seed source further from the site over a low quality more local seed source.	D	3	L
Native plant growth	Poor native plant growth/germination	C	3	M	• describe procedures for strategic and long term seed collection, management and storage ; • describe procedures for sowing seed (e.g. appropriate sowing depths); • describe how livestock will be excluded from areas undergoing active revegetation; • provide application rates for seeds as well as planting densities for tube stock to avoid excessive shading; • favour natural regeneration in the derived grasslands and woodland areas over seeding or planting in the first instance followed by seeding or planting if required; and • preferential use of local endemic (adapted) species, or the use of a high quality seed source further from the site over a low quality more local seed source.	C	4	L
	Dense overstorey and midstorey revegetation	C	3	M	• include provision to assess vegetation density and undertake ecological thinning (e.g. through selective clearance or fire) if necessary.	C	4	L
	Dense grass cover	C	3	M	• provide measures to improve understorey diversity (e.g. replanting, causing disturbance through fire or grazing).	C	4	L

Table F1 (Continued)
Risk Assessment

Risk Factor (Hazard)	Impact (Risk)	Before Management			Action/Control/Risk Mitigation Measure	After Management		
		Likelihood	Consequence	Risk		Likelihood	Consequence	Risk Level
	Disease (e.g. *Phytophthora cinnamomi*)	C	4	L	• include hygiene protocols to minimise the risk of plant diseases (i.e. restricting site access).	C	4	L
	Fungi or pathogens – may cause germination failure (seeds)	C	4	L	• provide for the preferential use of local endemic (adapted) species, or the use of a high quality seed source further from the site over a low quality more local seed source.	C	4	L
Fauna habitat	Lack of bush rocks	C	4	L	• describe procedures to reuse bush rocks salvaged during vegetation clearance.	C	4	L
	Lack of fallen timber/hollow logs	C	4	L	• describe procedures to reuse timber/hollow logs salvaged during vegetation clearance; • not permit firewood collection.	C	4	L
	Lack of structural diversity (including lack of tree hollows)	C	4	L	• describe procedures to reuse bush rocks salvaged during vegetation clearance; • describe procedures to reuse timber/hollow logs salvaged during vegetation clearance; • focus on increasing woodland patch size within the offset area.	C	4	L
	Lack of suitable vegetation for foraging and/or roosting	C	4	L	• include the planting (in appropriate soil landscapes) of a variety of box, ironbark and gum eucalypt species which are all known to occur in the Leard State Forest or offset areas • planting of Acacia species, including both tree and shrub varieties including shrub varieties; • planting of a variety of native shrubs; and • describe that seed and tube stock used in revegetation will include a variety of grasses, low shrubs, mid-sized shrubs and tall trees to create structurally diverse habitat.	C	4	L
Weather	Drought	C	3	M	• growth and survival of the vegetation sown or planted will be monitored; • provide a mechanism to reduce livestock grazing during drought periods; • include provision to review the need for kangaroo control measures; and • describe procedures to prevent, monitor and control feral animals.	C	4	L
	Wind	C	4	L	• option for using tree guards to protect young seedlings from browsing or grazing native animals.	C	4	L