VICKERY EXTENSION PROJECT

ENVIRONMENTAL IMPACT STATEMENT

APPENDIX F

BIODIVERSITY ASSESSMENT REPORT AND BIODIVERSITY OFFSET STRATEGY

WHITEHAVEN COAL

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 TABLES (Continued)

LIST OF FIGURES

TABLE OF CONTENTS (Continued)

LIST OF FIGURES (Continued)

LIST OF ATTACHMENTS

TABLE OF CONTENTS (Continued)

LIST OF PLATES

EXECUTIVE SUMMARY

The Vickery Coal Project (Approved Mine), owned by Whitehaven Coal Limited (Whitehaven) is an approved, but yet to be constructed, project involving the development of an open cut coal mine approximately 25 kilometres (km) north of Gunnedah, in New South Wales (NSW). Whitehaven is seeking NSW Government and Commonwealth Government approval for an extension of open cut mining operations at the Approved Mine, a project herein referred to as the Vickery Extension Project (the Project). Approval is being sought for the Project under Part 4 of the NSW *Environmental Planning and Assessment Act, 1979* and the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act).

The Project is located in a predominantly cleared landscape that has been subject to past and present agricultural land uses, mainly livestock grazing with some dry land cropping, hence the extant native woodland/forest is highly fragmented. The largest continuous patches of woodland/forest near the Project occur immediately to the east of the proposed mining area in Vickery State Forest and to the west along the Namoi River.

Summary of the NSW Assessment

This document was prepared in accordance with the NSW *Framework for Biodiversity Assessment* (FBA) and the NSW *Biodiversity Offset Policy for Major Projects* (the NSW Offset Policy), which commenced on 1 October 2014 for a transitional period. The FBA requires the use of an online program (the Office of Environment and Heritage [OEH] Credit Calculator *for Major Projects and BioBanking* [the OEH Credit Calculator]) to assess biodiversity impacts and determine the biodiversity offset requirements for those impacts.

This assessment uses the results of flora surveys undertaken by FloraSearch and fauna surveys undertaken by Future Ecology during 2015, 2016 and 2017. The surveys were conducted in consideration of the relevant State survey guidelines and included targeted searches for potentially occurring threatened species and communities listed under the NSW *Biodiversity Conservation Act, 2016* (BC Act) and EPBC Act.

Under the NSW assessment, the additional land disturbance footprint for the Project is 775.8 hectares (ha) in size (the Biodiversity Assessment Report Development Site Footprint [BAR Footprint] for the mining area and Project rail spur). Approximately 90 percent (%) of the BAR Footprint has been previously cleared and contains exotic grassland or land with no vegetation cover (196 ha), or is derived native grassland (some scattered trees) (502 ha). The remaining 10% (77.8 ha) contains fragmented patches of native woodland/forest in a number of scattered patches. Vegetation clearance would occur over the life of the mine (25 years).

All of the native vegetation in the BAR Footprint (derived native grassland [502 ha] and fragmented woodland/forest [77.8 ha]) has been modified/degraded. None of the native vegetation in the BAR Footprint is listed as threatened under the BC Act. Also, no threatened flora species listed under the BC Act are known to occur in the BAR Footprint.

The native woodland/forest in the BAR Footprint and surrounding area provides potential habitat resources for threatened woodland birds which persist in the fragmented landscape as well as some arboreal mammals (Squirrel Glider [*Petaurus norfolcensis*], Koala [*Phascolarctos cinereus*] and bats). Due to the degraded condition of the woodland/forest native vegetation, it does not contain any threatened amphibians, reptiles or ground-dwelling mammals.

Two species credit species (as defined by the FBA) have been recorded inside the BAR Footprint during previous surveys, namely, the Koala and Squirrel Glider. A third species credit species is included in the species credit calculation for the BAR Footprint, namely, the Regent Honeyeater (*Anthochaera phrygia*) as it was nominated in the Secretary's Environmental Assessment Requirements for the Project. The likely direct, indirect and cumulative impacts on biodiversity have been assessed within this report, and impact avoidance and mitigation measures have been identified and described. Mitigation measures include establishing native vegetation and fauna habitat on mine rehabilitation areas and minimising impacts on fauna during vegetation clearance, including pre-clearance surveys.

Summary of the Commonwealth Assessment

In addition to State approval, the Project will require approval under the EPBC Act as it was declared to be a 'controlled action' (the Action [EPBC 2016/7649]). The Action is to be assessed under the assessment bilateral agreement with NSW and, therefore, this document provides an assessment of those components of the Project which comprise the Action on the relevant threatened species and communities listed under the EPBC Act.

Although the Project was declared a controlled action under the EPBC Act, this assessment provides more detailed information than was available at the time the Project was referred to the Commonwealth Government (e.g. further flora survey work undertaken by FloraSearch, fauna survey work undertaken by Future Ecology and a refined disturbance footprint).

The NSW and Commonwealth assessment footprints/areas are slightly different because a portion of the Approved Mine (previously assessed under State legislation) is being assessed under Commonwealth legislation because it was not previously referred. The Commonwealth Assessment Footprint is approximately 984.4 ha in size (208.6 ha larger than the NSW Assessment Footprint [775.8 ha]).

Under the Commonwealth Assessment, the Project would involve clearing of approximately 728.4 ha of native vegetation (148.6 ha more than the NSW Assessment Footprint) comprising the following within the Commonwealth Assessment Footprint:

- approximately 620 ha of secondary/derived native grassland (118 ha more than the NSW Assessment Footprint); and.
- approximately 108.4 ha of native woodland/forest vegetation (comprising numerous fragmented patches) (30.6 ha more than the NSW Assessment Footprint).

No threatened ecological communities or flora species listed under the EPBC Act are known to occur in the Commonwealth Assessment Footprint.

Two confirmed records of threatened fauna species listed under the EPBC Act have been made in the Commonwealth Assessment Footprint, namely the Koala and Painted Honeyeater (*Grantiella picta)*. The Corben's Long-eared Bat (also commonly referred to as the South-eastern Long-eared Bat) (*Nyctophilus corbeni*) and Large-eared Pied Bat (*Chalinolobus dwyeri*) have been potentially recorded within the Commonwealth Assessment Footprint based on call recordings, although the records could not be confirmed. In addition to these two bats, there is potential habitat for the Swift Parrot (*Lathamus discolor*) and Regent Honeyeater in the Commonwealth Assessment Footprint.

Credit Requirements

The result of running the OEH Credit Calculator is that the Project requires a Biodiversity Offset Strategy which accounts for a total of 16,401 ecosystem credits and 6,654 species credits for the species listed in Table ES-1.

Table ES-1
Credit Requirements

Credit Type	BAR Footprint	Credit Requirement
Ecosystem Credits	579.8 ha of native vegetation (of which approximately 87% is secondary/derived native grassland)	16,401
Regent Honeyeater Species Credits	48.1 ha of potential habitat*	3,703
Squirrel Glider Species Credits	74.7 ha of potential habitat*	1,643
Koala Species Credits	50.3 ha of potential habitat*	1,308

* The species habitats overlap (i.e. the habitats are not mutually exclusive).

The approved Biodiversity Offset Strategy for the Approved Mine covers a total area of approximately 3,422.5 ha (2,062.5 ha of land-based offset areas on Whitehaven-owned land and 1,360 ha of mine rehabilitation to woodland/forest). The existing Biodiversity Offset Strategy for the Approved Mine would be revised and augmented for the Project, which would include additional mine rehabilitation to woodland/forest to be finalised post-approval.

Whitehaven commits to satisfying the remaining credit requirements using offset mechanisms allowed by the NSW Offset Policy (i.e. direct land-based offset [e.g additional offset areas], supplementary measures [e.g. funds to research] or contribution to an offset fund [e.g. the Biodiversity Conservation Fund]).

Conclusion

The impact avoidance, mitigation and offset hierarchy has been applied to the Project and the credit calculation has determined the offset requirement for clearance of native vegetation (woodland, forest and derived native grasslands) (ecosystem credit requirement) and the offset requirement for clearance of habitat for the Regent Honeyeater, Squirrel Glider and Koala (species credit requirements).

An offset strategy is described within this report that explains the ways in which the offset requirement can be met under the NSW Offset Policy (and the *EPBC Act Environmental Offsets Policy*). The NSW Office of Environment and Heritage describe an objective of the NSW Offset Policy is to provide greater flexibility for proponents to meet their offset requirements while ensuring that the best and most credible offsets are provided.

1 INTRODUCTION

1.1 PROJECT OVERVIEW

The former Vickery Coal Mine and the former Canyon Coal Mine are located approximately 25 kilometres (km) north of Gunnedah, in New South Wales (NSW) (Figure 1). Open cut and underground mining activities were conducted at the former Vickery Coal Mine between 1986 and 1998. Open cut mining activities at the former Canyon Coal Mine ceased in 2009. The former Vickery and Canyon Coal Mines have been rehabilitated following closure.

The Vickery Coal Project (herein referred to as the Approved Mine) is an approved, but yet to be constructed, project involving the development of an open cut coal mine and associated infrastructure and would facilitate a run-of-mine (ROM) coal production rate of up to approximately 4.5 million tonnes per annum (Mtpa) for a period of 30 years.

Whitehaven Coal Limited (Whitehaven) is seeking a new Development Consent for extension of open cut mining operations at the Approved Mine (herein referred to as the Vickery Extension Project [the Project]). This would include a physical extension to the Approved Mine footprint to gain access to additional ROM coal reserves, an increase in the footprint of waste rock emplacement areas, an increase in the approved ROM coal mining rate and construction and operation of a Project Coal Handling and Preparation Plant (CHPP), train load-out facility and rail spur. This infrastructure would be used for the handling, processing and transport of coal from the Project, as well as other Whitehaven mines.

The Project involves mining the coal reserves associated with the Approved Mine, as well as accessing additional coal reserves within the Project area. ROM coal would be mined by open cut methods at an average rate of 7.2 Mtpa over 25 years, with peak production up to approximately 10 Mtpa.

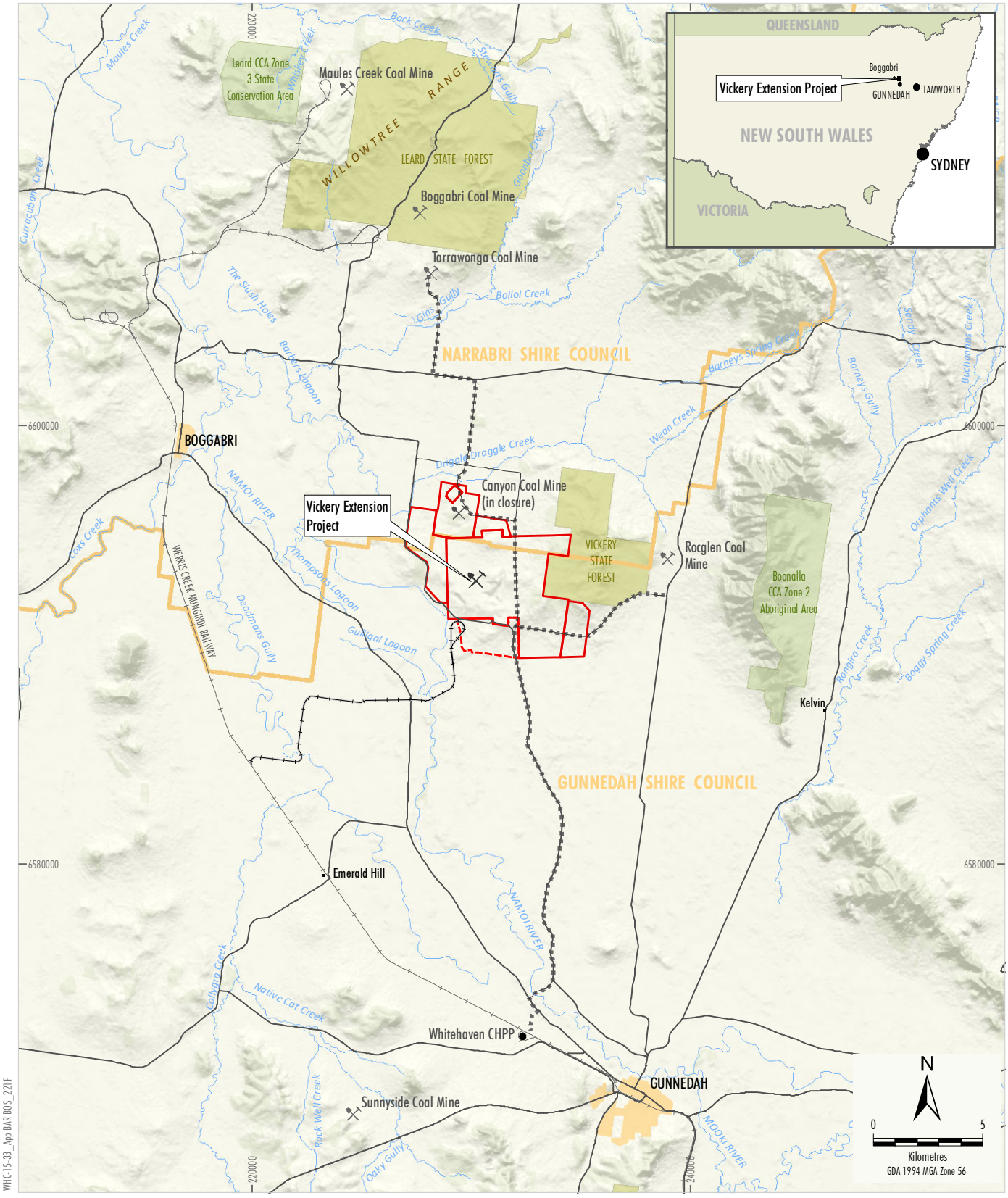
Figure 2 illustrates the general arrangement of the Project. A detailed description of the Project is provided in Section 2 in the Main Report of the Environmental Impact Statement (EIS).

This assessment forms part of an EIS which has been prepared to accompany a Development Application made for the Project in accordance with Part 4 of the NSW *Environmental Planning and Assessment Act, 1979* (EP&A Act).

On 12 February 2016, the Project was referred under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) (2016/7649). The referred action (the Action) does not include the components and operations of the Vickery Coal Project referral (EPBC 2012/6263). On 14 April 2016, a delegate of the Commonwealth Minister for the Environment declared the Action to be a 'controlled action' for the purpose of the EPBC Act due to potential adverse impacts on the following controlling provisions under Part 3 of the EPBC Act:

- sections 18 and 18A of the EPBC Act (listed threatened species and communities); and
- sections 24D and 24E of the EPBC Act (a water resource, in relation to coal seam gas development and large coal mining development).

In 2018, Whitehaven notified the Department of the Environment and Energy (DEE) of a variation to the Action, to reflect the final proposed approximate extent of the Vickery Extension Project (EPBC 2016/7649) (Figures 3a and 3b).



WHC-15-33_App BAR BOS_221F

LEGEND

- Mining Tenement Boundary (ML & CL)
- Mining Lease Application (MLA)
- Local Government Boundary
- State Forest
- State Conservation Area, Aboriginal Area
- Major Roads
- Railway
- Approved Road Transport Route
- Indicative Project Rail Spur

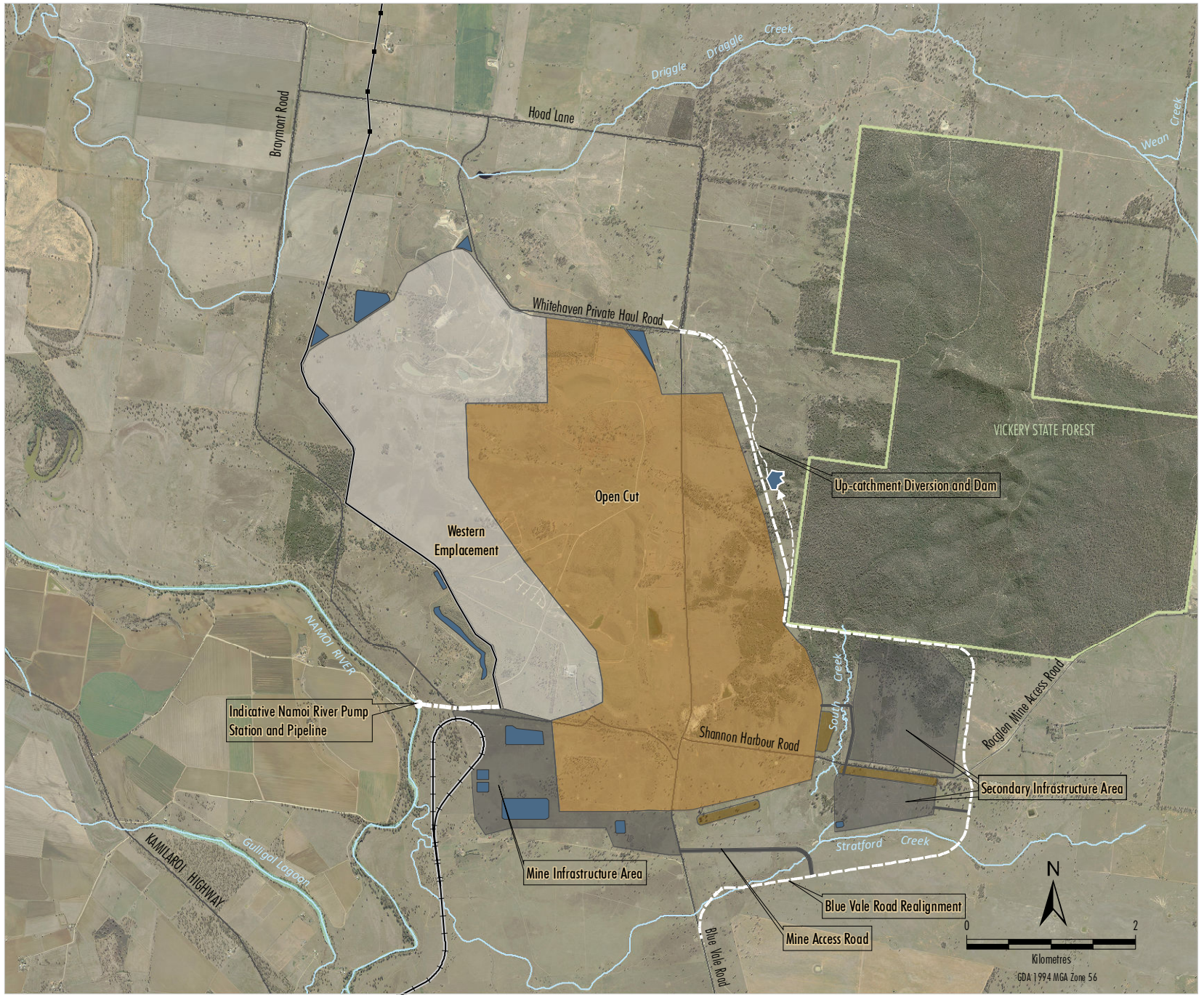
WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Project Location

Source: LPMA - Topographic Base (2010); NSW Department of Industry (2015)

Figure 1



LEGEND

State Forest

Project Components

- Indicative Extent of Open Cut
- Indicative Extent of Out of Pit Waste Rock Emplacement
- Indicative Extent of Infrastructure Area
- Indicative Extent of Soil Stockpile
- Indicative Extent of Water Storage
- Indicative Mine Access Road Alignment
- Indicative Namoi River Pump Station and Pipeline
- Indicative Road Realignment
- Indicative Up-catchment Diversion and Dam Location
- Indicative Rail Spur Alignment
- Indicative Location of Groundwater Bores and Pipeline

Source: Orthophoto - Department of Land and Property Information, Aerial Photography (July 2011); Department of Industry (2015); Essential Energy (2015)

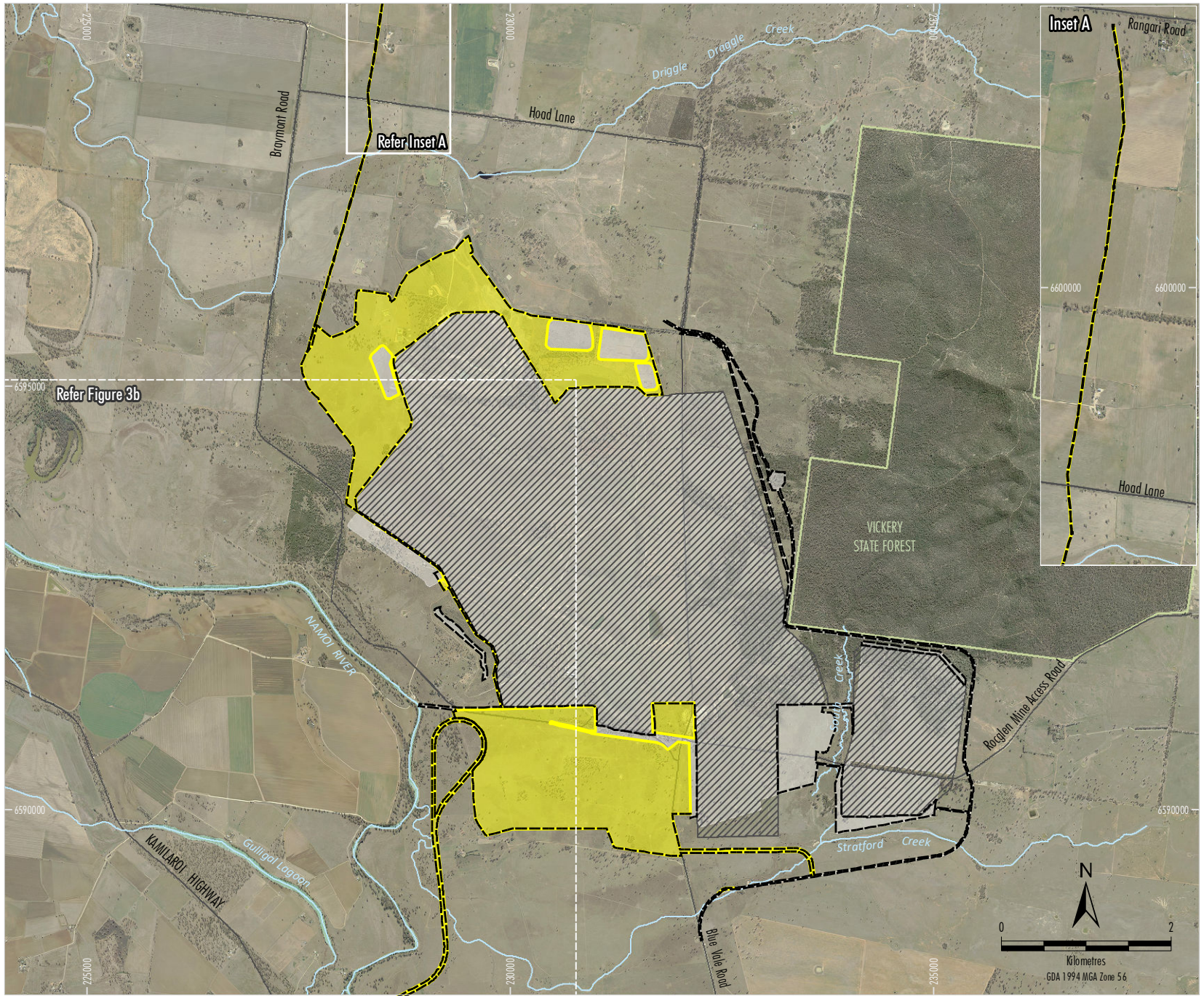
WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Project General Arrangement - Project Mining Area

Figure 2

WHC-15-33_App BAR BOS_222I



LEGEND

- State Forest
- Approximate Extent of Approved Mine
- Vickery Coal Project (EPBC 2012/6263) Footprint - Not a Controlled Action - Particular Manner
- Approximate Extent of Vickery Extension Project (EPBC 2016/7649) Footprint
- Biodiversity Assessment Report Development Site Footprint

Source: Orthophoto - Department of Land and Property Information, Aerial Photography (July 2011)

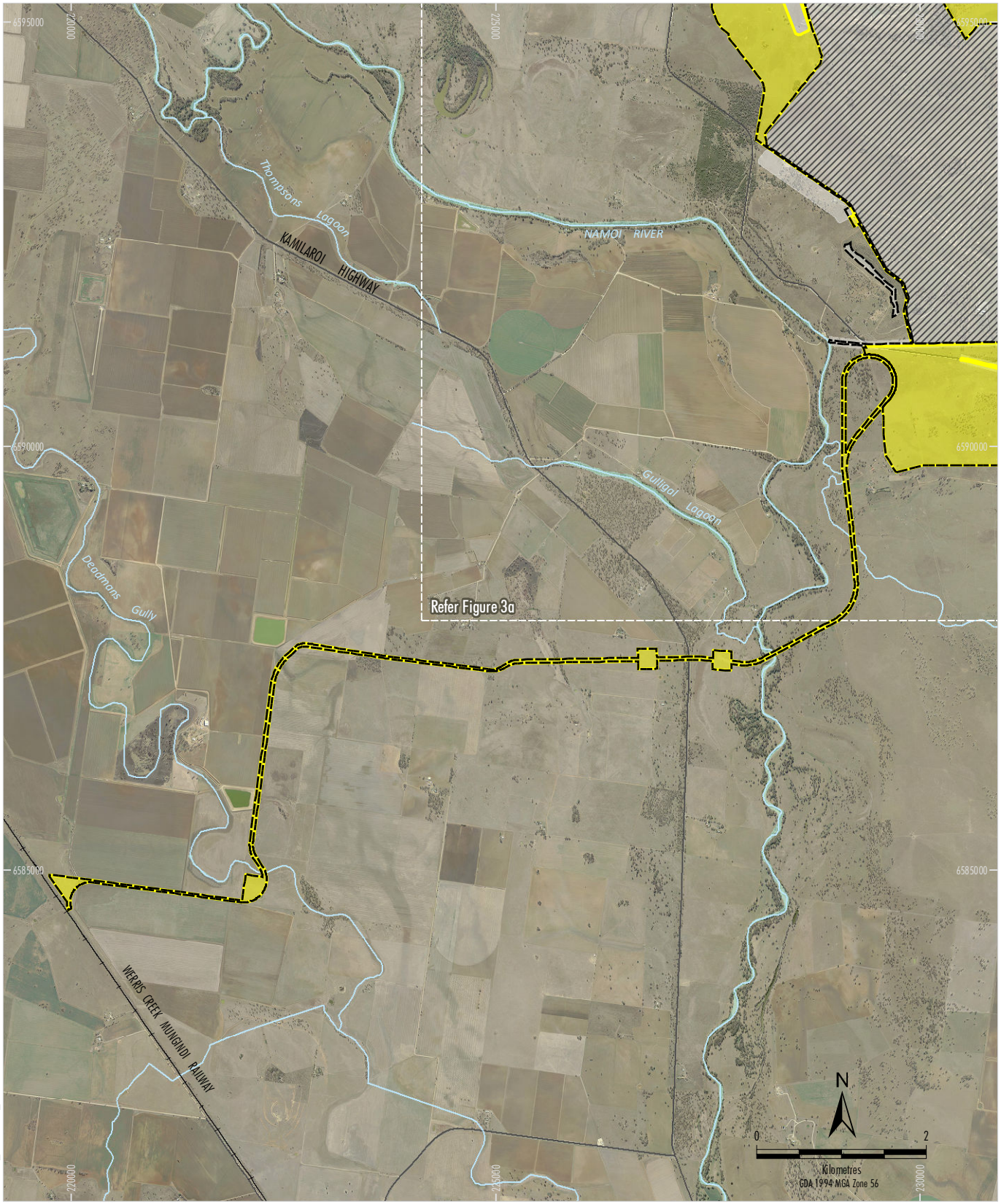
WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Vickery Extension Project Assessment Areas (Mining Area)

Figure 3a

WHC-15-33_App BAR BOS_207D



WHC-15-33_AppBAR BOS_237C

LEGEND

- Approximate Extent of Approved Mine
- Vickery Coal Project (EPBC 2012/6263) Footprint - Not a Controlled Action - Particular Manner
- Approximate Extent of Vickery Extension Project (EPBC 2016/7649) Footprint
- Biodiversity Assessment Report Development Site Footprint

Source: Orthophoto - Department of Land and Property Information, Aerial Photography (July 2011)

WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Vickery Extension Project Assessment Areas (Project Rail Spur)

Figure 3b

On 17 July 2018, the request to vary the referred action was accepted by the DEE.

The Action is to be assessed under the assessment bilateral agreement with NSW (the NSW Assessment Bilateral Agreement – dated 26 February 2015). Accordingly, this document provides an assessment of those components of the Project which comprise the Action on the relevant threatened species and communities listed under the EPBC Act.

1.2 GENERAL DESCRIPTION OF THE DEVELOPMENT SITE

NSW Assessment Footprint

The NSW Assessment Footprint is the additional surface disturbance area outside of the Approved Mine under Development Consent (SSD-5000). The NSW Assessment Footprint is 775.8 hectares (ha) in size and comprises of two components, a Biodiversity Assessment Report Footprint (BAR Footprint) for the mining area and a BAR Footprint for the Project rail spur (Figures 3a and 3b). These two components are referred to separately in Sections 2 and 3 as separate credit calculations were required for each component.

It should also be noted that the BAR Footprint is indicative and may vary slightly following further detailed mine planning and particularly the detailed design of supporting infrastructure. While some changes to the BAR Footprint would be expected over the life of the Project, any such changes are expected to be minor and therefore would have no material impact on biodiversity values.

Commonwealth Assessment Footprint

The Vickery Coal Project (EPBC 2012/6263) was previously referred under the EPBC Act in January 2012 and was determined not to be a Controlled Action if implemented in a particular manner (EPBC 2012/6263). The decision stipulated measures to be undertaken to avoid significant impacts on the Winged Peppercress (*Lepidium monoplocoides*), a listed threatened flora species. The decision does not contain any measures relating to the management of threatened fauna.

The present referred action does not include the components and operations of the Vickery Coal Project (EPBC 2012/6263). Hence, the Commonwealth Assessment Footprint is the additional surface disturbance area outside of the Approved Mine (EPBC 2012/6263). The NSW and Commonwealth assessment footprints/areas are slightly different because a portion of the Approved Mine (previously assessed under the State) is being assessed as part of the Commonwealth Assessment because it was not previously referred.

The Commonwealth Assessment Footprint is approximately 984.4 ha in size (208.6 ha larger than the NSW Assessment Footprint [775.8 ha]), and comprises two components, a BAR Footprint for the mining area and a BAR Footprint for the Project rail spur (Figures 3a and 3b). These two components are referred to separately in Sections 3 and 4 as separate credit calculations were required for each component.

The Commonwealth Assessment Footprint is referred to in this document when discussing Matters of National Environmental Significance (MNES).

1.3 ASSESSMENT REQUIREMENTS/APPROACH

This document was prepared in accordance with the Secretary's Environmental Assessment Requirements (SEARs) for the EIS. In general, the objectives of this assessment were to:

- provide an assessment of the likely adverse impacts of the Project on terrestrial flora and fauna in accordance with the NSW *Framework for Biodiversity Assessment* (FBA) (NSW Office of Environment and Heritage [OEH], 2014a), having regard to the OEH comments in the SEARs; and
- describe an additional Biodiversity Offset Strategy in accordance with the NSW *Biodiversity Offsets Policy for Major Projects* (the NSW Offset Policy) (OEH, 2014b).

This Biodiversity Assessment Report and Biodiversity Offset Strategy has been prepared by Jamie Gleeson (Resource Strategies), who is an accredited assessor according to section 142B(1)(c) of the NSW *Threatened Species Conservation Act, 1995* (TSC Act) (assessor accreditation number 0056).

The FBA (OEH, 2014a) requires the use of an online program (calculator) to assess biodiversity impacts and determine the biodiversity offset requirements for those impacts. The OEH *Credit Calculator for Major Projects and BioBanking (Version 4.1)*[1] (the OEH Credit Calculator) was used as part of this assessment.

In March 2018, the NSW Department of Planning and Environment (DP&E) confirmed that the Project is a '*pending or interim planning application'* under the *Biodiversity Conservation (Savings and Transitional) Regulation, 2017.* Therefore, the relevant provisions of the EP&A Act that would be in force if that Act had not been amended (such as section 5A of the EP&A Act) apply to the Project. Assessments of Significance in accordance with section 5A of the EP&A Act and the *Threatened Species Assessment Guidelines: the Assessment of Significance* (Department of Environment and Climate Change [DECC], 2007) are also required under the EP&A Act (separate to the FBA [OEH, 2014a]) and are provided in Attachment A.

Attachment B provides assessments for threatened species and communities listed under the EPBC Act in consideration of the Department of the Environment's (DotE) (now the DEE) comments in the SEARs for the EIS and the NSW Assessment Bilateral Agreement (dated 26 February 2015).

In regard to aquatic ecology values, a separate report titled *Vickery Extension Project – Aquatic Ecology Assessment* has been prepared by Eco Logical Australia (2018) and deals with the potential impacts of the Project on the aquatic ecology values (including aquatic threatened species and communities). Eco Logical Australia (2018) concludes that the Project is unlikely to have a significant impact on the aquatic community of the Namoi River or associated drainage lines.

[1] According to the OEH website the OEH Credit Calculator is version 4.1, however, according to the OEH Biodiversity Credit Report attached to this report the Calculator was version 4.0.

1.4 STRUCTURE OF THIS ASSESSMENT

This document is structured as required by the FBA (OEH, 2014a). There are three stages described in this document:

- Stage 1 involves summarising the biodiversity values of the BAR Footprint that are inputs into the OEH Credit Calculator (e.g. landscape features, native vegetation and threatened species) (Sections 2, 3 and 4);
- Stage 2 involves assessing the potential impacts on biodiversity, describing impact avoidance and mitigation measures and determining the offset requirements (Section 5); and
- Stage 3 involves describing the Biodiversity Offset Strategy (Section 6).

1.5 INFORMATION SOURCES USED IN THIS ASSESSMENT

This assessment uses the results of detailed flora survey work undertaken by FloraSearch (2018) (Attachment C) and fauna survey work undertaken by Future Ecology (2018) (Attachment D). These and other information sources are referenced throughout the report. Dr Colin Bower (FloraSearch) and Garon Staines (Future Ecology) are both accredited assessors according to section 142B(1)(c) of the TSC Act. Dr Colin Driscoll (Hunter Eco) (also an accredited assessor) conducted floristic surveys within potential offset areas and the results from these surveys are presented in Attachments I and J.

2 STAGE 1 – BIODIVERSITY ASSESSMENT FOR THE MINING AREA

Stage 1 of the biodiversity assessment involves summarising the biodiversity values of the BAR Footprint that are inputs into the OEH Credit Calculator. In December 2016, OEH advised that the mining area and rail spur for the Project are required to be assessed via two different assessment methods, namely a site-based assessment for the mining area and a linear shaped development assessment for the rail spur.

This section provides information on the application of the site-based assessment on the mining area. Landscape features are described in Section 2.1, native vegetation is described in Section 2.2, and threatened species relevant to the BAR Footprint are described in Section 2.3.

2.1 LANDSCAPE FEATURES

Landscape features relevant to the Project (such as regional setting and Mitchell Landscapes) are described in this sub-section.

2.1.1 Regional Setting

The Project is located approximately 25 km north of Gunnedah and 12 km south-east of Boggabri, in north-eastern NSW (Figure 1). The BAR Footprint for the mining area is located within the following regions:

- North-west Local Land Service area (formerly the Namoi Catchment Management Authority [CMA], Liverpool Plains [Part B] CMA sub-region);
- the Brigalow Belt South Region Interim Biogeographic Regionalisation for Australia (IBRA) Bioregion and Liverpool Plains IBRA sub-region (Figure 4); and
- the Gunnedah and Narrabri Local Government Areas (LGAs) (60 and 40 percent [%] respectively) (Figure 4).

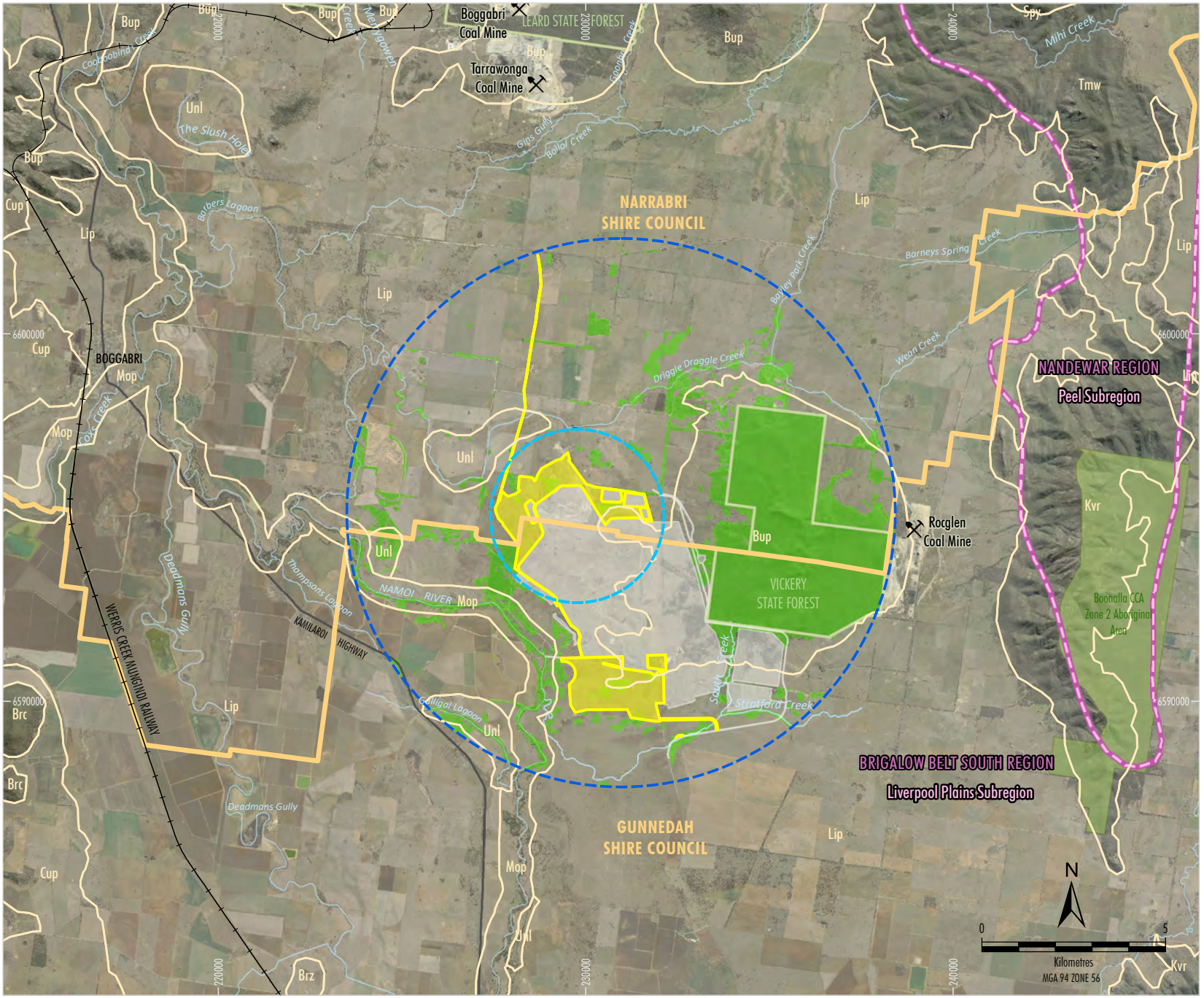
2.1.2 Mitchell Landscapes

Mitchell Landscapes (Mitchell, 2002) are mapped regions of NSW that collate areas having common attributes including an estimate of the amount of land cleared since 1750. Details of the Mitchell Landscapes (Mitchell, 2002) within the BAR Footprint are provided in Table 1 and shown on Figure 4. The mining area is predominantly within the Liverpool Alluvial Plains Mitchell Landscape (Patch Size greater than 1001 ha, resulting in the patch size score of 12) (Table 1).

Table 1
Mitchell Landscapes in the BAR Footprint Associated with the Mining Area

Landscape Name	Percentage Cleared Estimate[1]	Percentage of BAR Footprint associated with the Mining Area Covered by Landscape	Patch Size
Liverpool Alluvial Plains	84	87.2	>1,001 ha
Bugaldie Uplands	26	12.7	>1,001 ha
Upper Namoi Swamps and Lagoons	49	0.1	>1,001 ha

[1] Sourced from the 'Over-cleared Landscapes Database' within the NSW Vegetation Information System and Classification Database (OEH, 2017a).



LEGEND

- State Forest
- Aboriginal Area
- Local Government Boundary
- Approximate Extent of Approved Mine
- Biodiversity Assessment Report Development Site Footprint
- Native Vegetation Within Assessment Circles
- IBRA Region
- IBRA Subregion
- Outer Assesment Circle
- Inner Assessment Circle

Mitchell Landscapes

- Brc Breeza Hills Basalt Caps
- Brz Breeza Hills Sandstone-Shale Slopes
- Bup Bugaldie Uplands
- Cup Cubbo Uplands
- Kvr Kelvin Range
- Lip Liverpool Alluvial Plains
- Mop Mooki - Namoi Channels and Floodplains
- Spy Split Yard Plateau
- Tmw Tamworth - Keepit Slopes and Plains
- Unl Upper Namoi Swamps and Lagoons

Source: Office of Environment and Heritage NSW (2015 and 2017); Orthophoto - Department of Land and Property Information, Aerial Photography (July 2011); FloraSearch (2018)

WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Location Map - Mining Area

Figure 4

WHC-15-33_App BAR BOS_201K

2.1.3 Native Vegetation Extent

Under the FBA (OEH, 2014a), two circles are used for the purpose of the site-based assessment (an outer circle and inner circle). For the purpose of this assessment, a 17,500 ha outer circle and a 1,750 ha inner circle were adopted (based on standard circle sizes in the FBA [OEH, 2014a]).

The extent of native vegetation[2] in the outer circle was informed by FloraSearch (2018) and the *Border Rivers Gwydir/Namoi Regional Native Vegetation Mapping* (OEH, 2015b) (Figure 4). The area of Approved Mine within the circles was assumed cleared for the purpose of the assessment.

In summary, the outer circle contains approximately 16-20% of native vegetation cover[2] before development and 16-20% after development. The inner circle contains approximately 6-10% of native vegetation cover[2] before development and <5% after development.

2.1.4 Connectivity Value Score

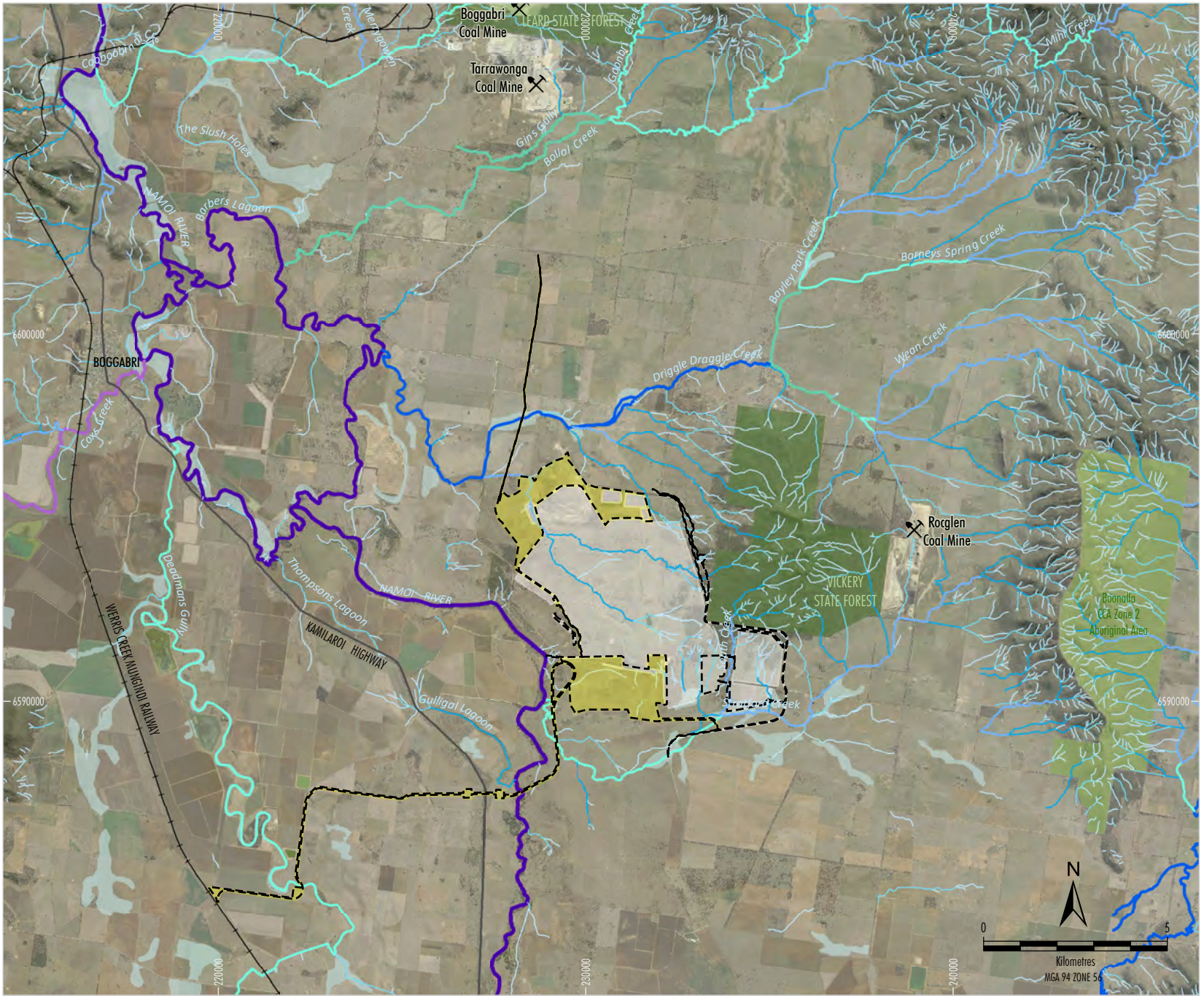
A connectivity value score is attributed to a development site to account for any removal in biodiversity links that may occur. The FBA (OEH, 2014a) defines state significant biodiversity links as:

- *An area identified by the assessor as being part of a state significant biodiversity link and in a plan approved by the Chief Executive, OEH; or*
- *A riparian buffer 50 m either side of a 6th order stream or higher; or*
- *A riparian buffer 50 m around an important wetland or an estuarine area.*

The BAR Footprint associated with the mining area intersects 6th order (or higher) streams, namely Driggle Draggle Creek (7th order stream) (intersects the Project borefield and pipeline). The BAR footprint associated with the mining area is not in a plan approved by the Chief Executive of the OEH, and does not contain an important wetland or estuarine area.

Figure 5 shows streams in the locality according to the Strahler stream ordering (DPI Water, 2017) in accordance with the FBA (OEH, 2014a). It should be noted that Driggle Draggle Creek, mapped as a 7th order stream, was found to be dry during the aquatic ecology surveys (Plates 1a and 1b) (Eco Logical, 2018). It was determined that Driggle Draggle Creek did not have any areas that are likely to create deep pools when surface water flows through the site (Eco Logical, 2018).

[2] Excludes derived native grassland.



LEGEND

- NSW State Forest
- State Conservation Area, Aboriginal Area
- Approximate Extent of Approved Mine
- Biodiversity Assessment Report Development Site Footprint
- Approximate Extent of Vickery Extension Project (EPBC 2016/7649) Footprint
- Land Subject to Inundation

Strahler Stream Order

- 1st Order (FBA Riparian Corridor Width 10m)
- 2nd Order (FBA Riparian Corridor Width 20m)
- 3rd Order (FBA Riparian Corridor Width 30m)
- 4th Order (FBA Riparian Corridor Width 40m)
- 5th Order (FBA Riparian Corridor Width 40m)
- 6th Order (FBA Riparian Corridor Width 50m)
- 7th Order (FBA Riparian Corridor Width 50m)
- 8th Order (FBA Riparian Corridor Width 50m)
- 9th Order (FBA Riparian Corridor Width 50m)

Source: Office of Environment and Heritage NSW (2016); Orthophoto - Department of Land and Property Information, Aerial Photography (July 2011); Department of Primary Industries Water (2017)

WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Site Map

Figure 5

WHC-15-33_App BAR BOS_209F

Source (Eco Logical, 2018)

Plate 1a Driggle Draggle Creek

Source (Eco Logical, 2018)

Plate 1b Driggle Draggle Creek

2.1.5 Impacts on Landscape Features that Require Further Consideration

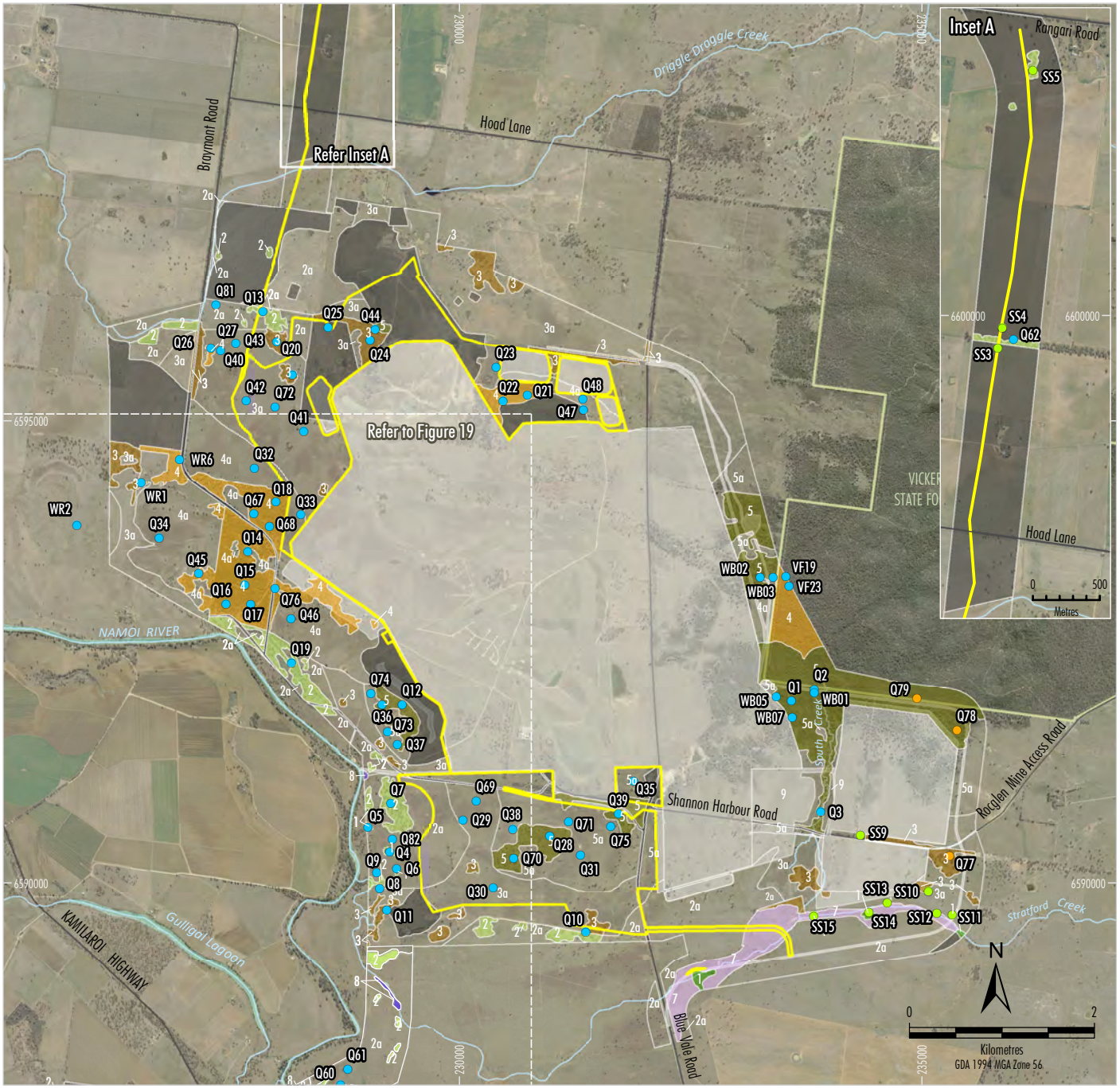
The BAR Footprint associated with the mining area intersects a 4th and 7th order stream (Section 2.1.4). Impacts on 4th, 5th and 6th (or higher) order streams requires further consideration as described in Section 5.2.

2.2 NATIVE VEGETATION

Native vegetation relevant to the BAR Footprint associated with the mining area is described in this sub-section based on detailed flora survey work undertaken by FloraSearch (2018) (Attachment C) and other relevant surveys.

2.2.1 Plant Community Types/Biometric Vegetation Types

FloraSearch (2018) (Attachment C) conducted flora surveys within the BAR Footprint associated with the mining area and surrounds and developed vegetation community mapping. Quadrats were sampled by FloraSearch (2018) (Attachment C) over a wider study area covering the BAR Footprint associated with the mining area (Figure 6). Vegetation communities were classified by FloraSearch (2018) (Attachment C) according to NSW BioMetric Vegetation Types (BVTs) and are shown on Figures 6 and 7. The area of each BVT and the percentage of the BVT cleared in NSW (from the NSW VIS Classification Database [OEH, 2017a]) are provided in Table 2.



LEGEND

- State Forest
- Approximate Extent of Approved Mine
- Biodiversity Assessment Report
- Development Site Footprint - for Mining Area
- FBA Plot
- Spot Sample
- Floristic Plot

Vegetation Communities

Semi-arid Woodlands (Grassy Sub-formation)

- 1 Weeping Myall Woodland (NA219)#
- 2 Poplar Box Woodland on Alluvial Clay Soils (NA185)
- 2a Poplar Box Woodland on Alluvial Clay Soils (Secondary/derived grassland)) (NA185)

Dry Sclerophyll Forests (Shrub/Grass Sub-formation)

- 3 Pilliga Box – Poplar Box Shrubby Woodland (NA324)
- 3a Pilliga Box – Poplar Box Shrubby Woodland (Secondary/derived grassland) (NA324)
- 4 White Box – Silver-leaved Ironbark Shrubby Open Forest (NA349)
- 4a White Box – Silver-leaved Ironbark Shrubby Open Forest (Secondary/derived grassland) (NA349)

Dry Sclerophyll Forests (Shrubby Sub-formation)

- 5 Narrow-leaved Ironbark – White Box Shrubby Forest (NA311)
- 5a Narrow-leaved Ironbark – White Box Shrubby Forest (Secondary/derived grassland) (NA311)

Freshwater Wetlands

- 7 Mixed Marsh Sedgeland (NA201)

Forested Wetlands

- 8 River Red Gum Riparian Tall Woodland (NA193)

Cleared Land

- 9 Exotic Dominant Grasslands
- DL Disturbed Land

Listed as the Weeping Myall Woodland EEC

Note: Vegetation communities 6 and 8a are not present within the mining area.

Source: Orthophoto - Department of Land and Property Information, Aerial Photography (July 2011); FloraSearch (2018)

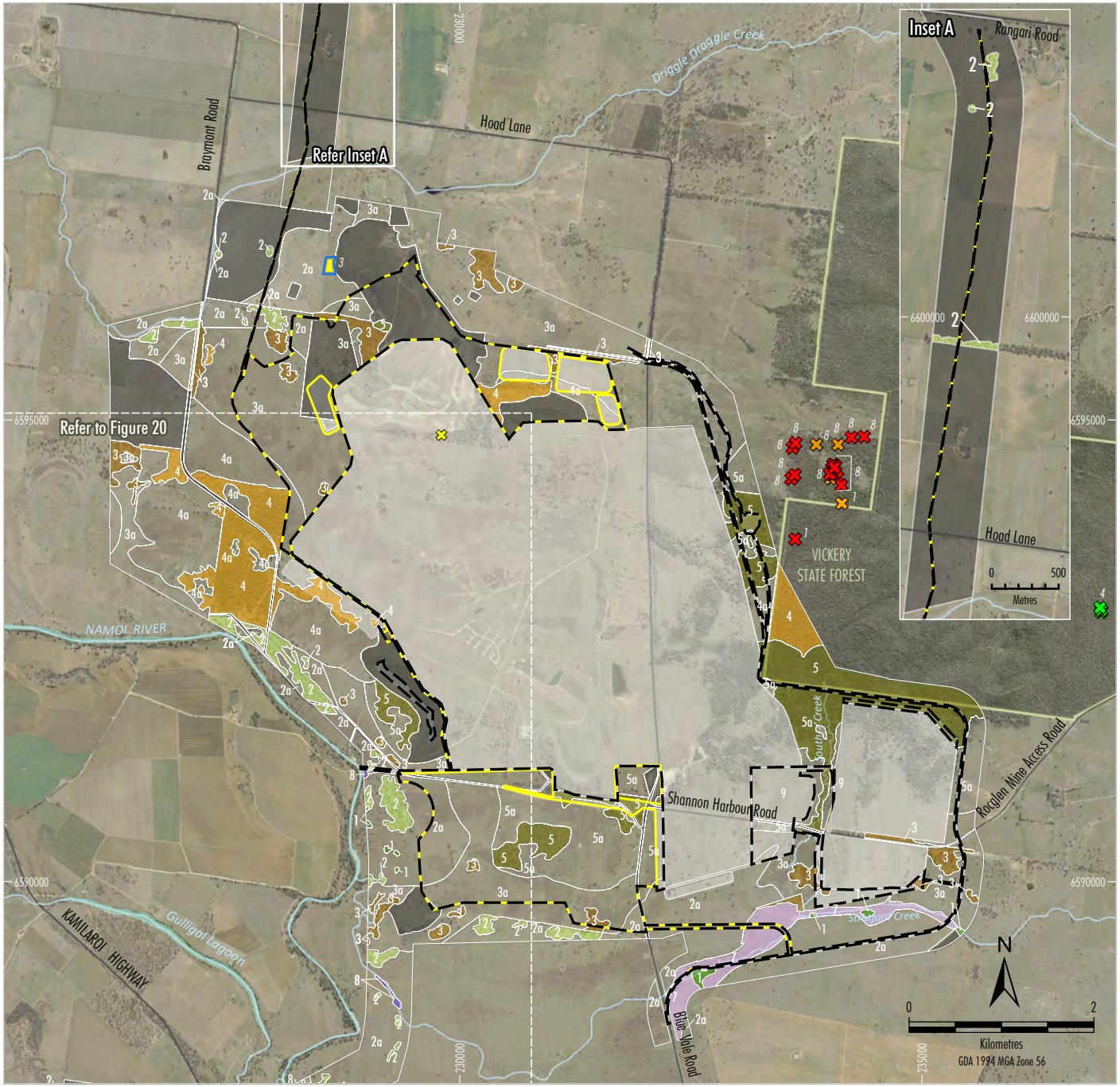
WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Flora Survey Sites - Mining Area

Figure 6

WHC-15-33_App BAR BOS_205G



LEGEND

State Forest

Approximate Extent of Approved Mine

Biodiversity Assessment Report Development Site Footprint - for Mining Area

Approximate Extent of Vickery Extension Project (EPBC 2016/7649) Footprint

Vegetation Communities

Semi-arid Woodlands (Grassy Sub-formation)

1 Weeping Myall Woodland (NA219)#

2 Poplar Box Woodland on Alluvial Clay Soils (NA185)

2a Poplar Box Woodland on Alluvial Clay Soils (Secondary/derived grassland)) (NA185)

Dry Sclerophyll Forests (Shrub/Grass Sub-formation)

3 Pilliga Box – Poplar Box Shrubby Woodland (NA324)

3a Pilliga Box – Poplar Box Shrubby Woodland (Secondary/derived grassland) (NA324)

4 White Box – Silver-leaved Ironbark Shrubby Open Forest (NA349)

4a White Box – Silver-leaved Ironbark Shrubby Open Forest (Secondary/derived grassland) (NA349)

Dry Sclerophyll Forests (Shrubby Sub-formation)

5 Narrow-leaved Ironbark – White Box Shrubby Forest (NA311)

5a Narrow-leaved Ironbark – White Box Shrubby Forest (Secondary/derived grassland) (NA311)

Freshwater Wetlands

7 Mixed Marsh Sedgeland (NA201)

Forested Wetlands

8 River Red Gum Riparian Tall Woodland (NA193)

Cleared Land

9 Exotic Dominant Grasslands

DL Disturbed Land

Listed as the Weeping Myall Woodland EEC

Note: Vegetation community 6 and 8a is not present within the mining area.

Threatened Flora

Belson's Panic (*Homopholis belsonii*)

Scant Pomaderris (*Pomaderris queenslandica*)

Tylophora linearis

Winged Peppercress (*Lepidium monoplocoides*)

Winged Peppercress Protection Area

Source

(1) FloraSearch (2018) (4) OEH (2017)

(3) Niche (2013) (8) Hunter Eco (2018)

Note: Sources 2 and 5 to 7 are not shown on this figure.

Source: Orthophoto - Department of Land and Property Information, Aerial Photography (July 2011); FloraSearch (2018)

WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Vegetation Communities and Threatened Flora Species - Mining Area

Figure 7

WHC-15-33_App BAR BOS_202H

Table 2
Vegetation Communities in the BAR Footprint Associated with the Mining Area

#	Vegetation Community	BVT	PCT	Vegetation Description	Area (ha)	% Cleared in Namoi*
Semi-arid Woodlands Formation (Grassy Sub-formation)						
2	Poplar Box Woodland on Alluvial Clay Soils	NA185	101	Poplar Box - Yellow Box - Western Grey Box grassy woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion	0.1	75
2a	Poplar Box Woodland on Alluvial Clay Soils (secondary/derived grassland)				61	
Dry Sclerophyll Forests Formation (Shrub/Grass Sub-formation)						
3	Pilliga Box – Poplar Box Shrubby Woodland	NA324	397	Poplar Box - White Cypress Pine shrub grass tall woodland of the Pilliga - Warialda region, Brigalow Belt South Bioregion	22	45
3a	Pilliga Box – Poplar Box Shrubby Woodland (secondary/derived grassland)				263	
4	White Box – Silver-leaved Ironbark Shrubby Open Forest	NA349	594	Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion	17	55
4a	White Box – Silver-leaved Ironbark Shrubby Open Forest (secondary/derived grassland)				23	
Dry Sclerophyll Forests Formation (Shrubby Sub-formation)						
5	Narrow-leaved Ironbark – White Box Shrubby Forest	NA311	459	Narrow-leaved Ironbark - Black Cypress Pine - White Box shrubby woodland in sedimentary hills of the Gunnedah region, Brigalow Belt South Bioregion	33	35
5a	Narrow-leaved Ironbark – White Box Shrubby Forest (secondary/derived grassland)				130	
Freshwater Wetlands						
7	Mixed Marsh Sedgeland	NA201	53	Shallow freshwater wetland sedgeland in depressions on floodplains on inland alluvial plains and floodplains	2	75
				Total	**551.1**	-
				Disturbed Land	**142**	-
				Overall Total BAR Footprint Associated with the Mining Area	**693.1**	-

Note: Numbering of vegetation communities as per Attachment C. Vegetation Communities 1 and 6 do not occur in the BAR Footprint associated with the mining area.

* OEH (2017a).

The vegetation communities are herein referred to using the BVT number as the inputs and outputs of the OEH Credit Calculator are required to be BVT rather than Plant Community Type (PCT) (although the FBA [OEH, 2014a] contains continuous references to PCTs). FloraSearch (2018) (Attachment C) provides detailed profiles of each vegetation community.

In summary, the BAR Footprint associated with the Mine Site is 693.1 ha in size comprising 72.1 ha of fragmented (i.e. not continuous) native woodland/forest vegetation and 479 ha of secondary/derived native grassland and sedgeland (Table 2; Figure 7). The remaining 142 ha consists of previously cleared land comprising exotic grassland or land with no vegetation cover. The BAR footprint associated with the Project rail spur is addressed in Section 3. Land without native vegetation is not required to be assessed (except in relation to threatened species habitat) (OEH, 2014a). Plates 2 to 7 show photos of the various vegetation communities.

Secondary/derived native grasslands are grasslands that have developed after clearing of the original vegetation (Keith, 2004; Benson, 1996). FloraSearch (2018) (Attachment C) describes that the secondary/derived native grasslands in the NSW Assessment Footprint occur as a result of native grassland species that have recolonised land which has been previously cultivated (e.g. via windblown or animal carried seed) or are native grasslands that remain after removal of the woody canopy vegetation (shrubs and trees).

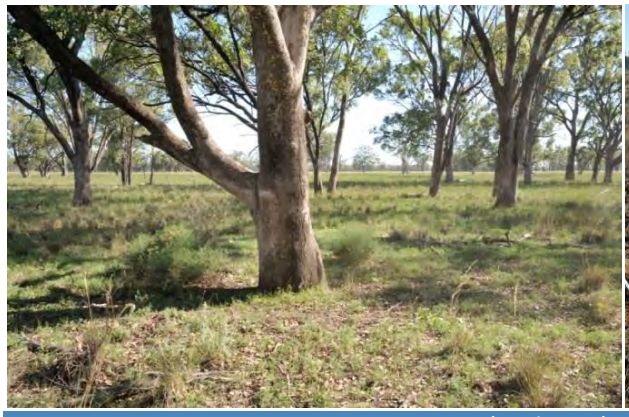
Section 5.2.1.11 of the FBA (OEH, 2014a) requires 'derived or secondary vegetation communities' to be assigned to the original PCT (i.e. the original woodland/forest that would have likely occurred prior to clearing) as done by FloraSearch (2018) (Attachment C). FloraSearch (2018) (Attachment C) describes that the secondary/derived native grasslands of a particular PCT in the study area are all in a similar condition (i.e. it was not possible to separate the secondary/derived native grasslands into separate vegetation zones based on condition).

2.2.2 Threatened Ecological Communities

FloraSearch (2018) (Attachment C) undertook targeted surveys for potentially occurring threatened ecological communities listed under the BC Act or EPBC Act. No threatened ecological communities listed under the BC Act or EPBC Act were mapped by FloraSearch (2018) (Attachment C) within the BAR Footprint. FloraSearch (2018) (Attachment C) provides a detailed justification for why no threatened ecological communities listed under the BC Act or EPBC Act occur in the BAR Footprint.

As part of the Approved Mine, Whitehaven committed to design the Blue Vale Road realignment to avoid impacts on the Weeping Myall Woodland EEC or offset the impact to the ecological community at a ratio of at least 1:5, 1 ha of clearance to 5 ha of offset (SSD-5000). The Weeping Myall Woodland EEC near the Blue Vale Road realignment has been specifically avoided as part of the Project (Figure 7).

The OEH Credit Calculator recognised Poplar Box Woodland on Alluvial Clay Soil (NA185) and Mixed Marsh Sedgeland (NA201) as potentially representing an occurrence of the Artesian Springs Ecological Community listed under the BC Act, however the occurrences of NA185 and NA201 in the BAR Footprint do not equate to this community as the Approved Mine and the Project lie outside of the Great Artesian Basin.



Source (Attachment C)

Plate 2 Vegetation Community 2 – Poplar Box Woodland on Alluvial Clay Soils

Source (Attachment C)

Plate 3 Vegetation Community 2a – Poplar Box Woodland on Alluvial Clay Soils (secondary/derived grassland)

Source (Attachment C)

Plate 4 Vegetation Community 3 – Pilliga Box – Poplar Box Shrubby Woodland

Source (Attachment C)

Plate 5 Vegetation Community 4 – White Box – Silver-leaved Ironbark Shrubby Open Forest

Source (Attachment C)

Plate 6 Vegetation Community 4a – White Box – Silver-leaved Ironbark Shrubby Open Forest (secondary/derived grassland)

Source (Attachment C)

Plate 7 Vegetation Community 5 – Narrow-leaved Ironbark – White Box Shrubby Forest

2.2.3 Vegetation Zones

The vegetation communities described in Section 2.2.1 were grouped into vegetation zones according to their condition. Table 3 outlines the vegetation zones present in the BAR Footprint associated with the mining area, the relevant BVT, condition, site value score (i.e. the quantitative measure of vegetation condition), area and patch size. The site value score is automatically calculated in the OEH Credit Calculator based on the floristic plot data.

Table 3
Vegetation Zones Associated with the Mining Area

Vegetation Zone Number*	Vegetation Community	BVT	Condition Class and Sub-category	Site Value Score	Area (ha)	Patch Size (ha)
Semi-arid Woodlands (Grassy Sub-formation)						
1	2 Poplar Box Woodland on Alluvial Clay Soils	NA185	Moderate/Good	75.41	0.1	>1,000
2	2a Poplar Box Woodland on Alluvial Clay Soils (secondary/derived grassland)		Moderate/Good_DNG	38.80	61	>1,000
Dry Sclerophyll Forests (Shrub/Grass Sub-formation)						
3	3 Pilliga Box – Poplar Box Shrubby Woodland	NA324	Moderate/Good	70.31	22	>1,000
4	3a Pilliga Box – Poplar Box Shrubby Woodland (secondary/derived grassland)		Moderate/Good_DNG	19.79	263	>1,000
5	4 White Box – Silver-leaved Ironbark Shrubby Open Forest	NA349	Moderate/Good	87.50	17	>1,000
6	4a White Box – Silver-leaved Ironbark Shrubby Open Forest (secondary/derived grassland)		Moderate/Good_DNG	25.00	23	>1,000
Dry Sclerophyll Forests (Shrubby Sub-formation)						
7	5 Narrow-leaved Ironbark – White Box Shrubby Forest	NA311	Moderate/Good	47.92	33	>1,000
8	5a Narrow-leaved Ironbark – White Box Shrubby Forest (secondary/derived grassland)		Moderate/Good_DNG	18.75	130	>1,000
Freshwater Wetlands						
9	7 Mixed Marsh Sedgelands	NA201	Moderate/Good	25.71	2	>1,000
				Total	**551.1**	

Note: Numbering of vegetation communities as per Attachment C. Vegetation Communities 1 and 6 do not occur in the BAR Footprint associated with the mining area.

* Vegetation zone number derived from credit report (Attachment E)

The patch size for each vegetation zone was greater than 1,000 ha (i.e. connecting with vegetation outside of the BAR Footprint associated with the mining area, mostly secondary/derived native grasslands in moderate to good condition) (Table 3). All vegetation zones are in moderate to good condition (according to the FBA definition) and there are no vegetation zones with a current site value score of less than 17 (Table 3).

2.2.4 Vegetation Condition

In addition to collecting floristic cover abundance data, biometric data were collected by FloraSearch (2018) (Attachment C) at each FBA quadrat location (Figure 6).

Collecting biometric data includes an extension to the 20 metre (m) x 20 m floristic plot to form a 20 m x 50 m plot. Data collected included:

- Total number of native plant species — 20 m x 20 m plot
- Native overstorey cover % — 50 m transect
- Native mid-storey cover % — 50 m transect
- Native ground cover grasses % — 50 m transect
- Native ground cover shrubs % — 50 m transect
- Native ground cover other % — 50 m transect
- Exotic plant cover % — 50 m transect
- Number of trees with hollows — 20 m x 50 m plot
- Overstorey regeneration % — entire stratified unit
- Length of fallen logs — 20 m x 50 m plot

The plot and transect data are provided in Attachment C.

2.2.5 Vegetation Impacts that Require Further Consideration

The FBA (OEH, 2014a) describes that some threatened ecological communities require further consideration (by the NSW Government) in addition to the OEH Credit Calculator. This includes communities potentially impacted by the Project which are either critically endangered (under the BC Act or EPBC Act) and/or are specifically nominated in the SEARs for the EIS.

The OEH's comments in the SEARs for the EIS requested further consideration on the following threatened ecological communities listed under the BC Act:

- Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions;
- Fuzzy Box Woodland on Alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions;
- Native Vegetation on Cracking Clay Soils of the Liverpool Plains;
- White Box Yellow Box Blakely's Red Gum Woodland; and
- Carbeen *Open Forest Community in the Darling Riverine Plans and Brigalow Belt South Bioregions*.

Each of the above threatened ecological communities listed under the BC Act were targeted during surveys (Attachment C) but none were recorded.

2.3 THREATENED SPECIES

Threatened species relevant to the Project are identified in this sub-section. This sub-section refers to threatened species that are:

- ecosystem credit species (i.e. species that can be predicted to be present based on a habitat assessment); and/or
- species credit species (i.e. species that cannot be predicted by habitat surrogates) (OEH, 2014a).

Threatened species that are ecosystem credit species and/or species credit species are pre-determined by OEH in the OEH Credit Calculator and *Archived BioMetric and Threatened Species Profiles Datasets* (OEH, 2017b).

2.3.1 Habitat Features for Particular Species Credit Species

The OEH Credit Calculator identifies specific habitat features for particular species credit species and the FBA (OEH, 2014a) requires the assessor to evaluate if any of those habitat features occur on site. Habitat features from the OEH Credit Calculator are listed in Table 4, along with the relevance of the habitat features to the BAR Footprint associated with the mining area.

Table 4
Threatened (Species Credit) Species Habitat Features Associated with the Mining Area

Common Name	Scientific Name	Conservation Status[1]		Habitat Feature	Relevance
		BC Act	EPBC Act		
Flora					
-	*Cyperus conicus*	E	-	Wetlands and wet run on areas.	**Not relevant.** FloraSearch (2018) (Attachment C) states that *Cyperus conicus* grows in sandy soils which are not present.
Belson's Panic	*Homopholis belsonii*	E	V	Dry woodland on poor soils or areas of basalt capping over sandstone.	Potentially relevant.
Austral Toadflax	*Thesium australe*	V	V	Coastal headlands, grassland, grassy open forest or woodland on fertile or moderately fertile soils.	**Not relevant.** FloraSearch (2018) (Attachment C) states that the Austral Toad-flax is highly unlikely to occur on the study area as Kangaroo Grass is very uncommon.
Spiny Peppercress	*Lepidium aschersonii*	V	V	On ridges of gilgai clays	**Not relevant.** No gilgai clays.
Reptiles					
Border Thick-tailed Gecko	*Underwoodisaurus sphyrurus*	V	V	Land within 100 m of rocky areas.	**Not relevant.** There are no notable rocky areas within 100 m of the BAR Footprint associated with the mining area which provide potential habitat for this species. Future Ecology (2018) (Attachment D) did not record this species during the fauna surveys.

Table 4 (Continued)
Threatened (Species Credit) Species Habitat Features Associated with the Mining Area

Common Name	Scientific Name	Conservation Status[1]		Habitat Feature	Relevance
		BC Act	EPBC Act		
Reptiles (Continued)					
Pale-headed Snake	*Hoplocephalus bitorquatus*	V	-	Land within 40 m of watercourses, containing hollow-bearing trees, loose bark and/or fallen timber.	Potentially relevant.
Pink-tailed Legless Lizard	*Aprasia parapulchella*	V	V	Land containing surface rocks (embedded or loose).	**Not relevant.** There are no notable areas of surface rocks in the BAR Footprint associated with the mining area which provide potential habitat for this species. Future Ecology (2018) (Attachment D) did not record this species during the fauna surveys.
Birds					
Australasian Bittern	*Botaurus poiciloptilus*	E	E	Land containing brackish or freshwater wetlands	Potentially relevant.
Black-breasted Buzzard	*Hamirostra melanosternon*	V	-	Land within 40 m of riparian woodland on inland watercourses/waterholes containing dead or dying eucalypts.	Potentially relevant.
Black-necked Stork	*Ephippiorhynchus asiaticus*	E	-	Land within 40 m of freshwater or saline wetlands (e.g. saltmarsh, mangroves, mudflats, swamps, billabongs, floodplains, watercourse pools, wet heathland and/or farm dams)	Potentially relevant.
Grey Falcon	*Falco hypoleucos*	E	-	Land within 100 m of riparian woodland on inland rivers containing mature living eucalypts or isolated paddock trees overhanging water or dry watercourses.	Potentially relevant.
Mammals					
Brush-tailed Rock-wallaby	*Petrogale penicillata*	E	V	Land within 1 km of rock outcrops or clifflines	**Not relevant.** No rocky outcrops/cliffs occur within the BAR Footprint associated with the mining area. Future Ecology (2018) (Attachment D) did not record this species during the fauna surveys.
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	V	Land containing escarpments, cliffs, caves, deep crevices, old mine shafts or tunnels.	**Habitat feature not relevant.** There is no breeding habitat for the Large-eared Pied Bat within the BAR Footprint associated with the mining area.

[1] Threatened fauna species status under the BC Act and/or EPBC Act (current as at July 2018).

V = Vulnerable; E = Endangered.

2.3.2 Targeted Surveys for Threatened Species

The FBA (OEH, 2014a) only requires targeted surveys for threatened fauna species which are species credit species because ecosystem credit species are predicted to occur solely based on habitat. All threatened flora species are species credit species; therefore, targeted surveys are required. A list of candidate species credit species requiring survey has been determined by the OEH Credit Calculator (Table 5).

All potentially occurring threatened species listed under the EPBC Act were also targeted during the surveys as described further below as well as in Attachments C and D.

2.3.2.1 *Targeted Surveys for Threatened Flora Species*

The potential presence of threatened flora species within the BAR Footprint associated with the mining area was determined by recent surveys during 2015, 2016 and 2017, a review of previous surveys and a review of database records.

Recent Flora Surveys during 2015, 2016 and 2017

FloraSearch (2018) (Attachment C) undertook targeted surveys for threatened flora species requiring surveys as determined by the OEH Credit Calculator (Table 5) which also included flora species listed as threatened under the EPBC Act.

The targeted surveys by FloraSearch (2018) (Attachment C) were undertaken in accordance with the FBA (OEH, 2014a) and the *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft* (DEC, 2004).

It is noted that the OEH Credit Calculator does not require targeted surveys for the Winged Peppercress (*Lepidium monoplocoides*), which is a threatened flora species listed as 'Endangered' under the BC and EPBC Act, and has been previously recorded at the Approved Mine (Niche, 2013). Despite this, FloraSearch (2018) (Attachment C) undertook targeted surveys for Winged Peppercress (though it was not found in the BAR Footprint associated with the mining area).

No threatened flora species were recorded during these surveys by FloraSearch (2018) (Attachment C).

Previous Flora Surveys

The following previous flora surveys are described below:

- surveys undertaken for the Approved Mine;
- surveys undertaken for the Canyon Coal Mine;
- monitoring reports undertaken for the Canyon Coal Mine;
- surveys undertaken for the Rocglen Coal Mine;
- monitoring reports undertaken for the Rocglen Coal Mine;
- monitoring reports undertaken for the Tarrawonga Coal Mine; and
- surveys undertaken for the Proposed Additional Offset Areas (Section 6.2.2.2).

Table 5
Threatened (Species Credit) Species Requiring Survey within the Mining Area and Timing

Common Name	Scientific Name	Conservation Status[1]		Survey Timing											
		BC Act	EPBC Act	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flora															
Native Milkwort	*Polygala linariifolia*	E	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bluegrass	*Dichanthium setosum*	V	V	Yes	Yes	Yes	Yes	Yes							Yes
Scant Pomaderris	*Pomaderris queenslandica*	E	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Belson's Panic	*Homopholis belsonii*	E	V	Yes	Yes	Yes	Yes								Yes
Slender Darling Pea	*Swainsona murrayana*	V	V	Yes	Yes							Yes	Yes	Yes	Yes
Tylophora linearis	*Tylophora linearis*	V	E	Yes	Yes	Yes	Yes	Yes				Yes	Yes	Yes	Yes
Finger Panic Grass	*Digitaria porrecta*	E	-	Yes	Yes	Yes	Yes	Yes							Yes
Reptiles															
Pale-headed Snake	*Hoplocephalus bitorquatus*	V	-	Yes	Yes	Yes	Yes						Yes	Yes	Yes
Birds															
Australasian Bittern	*Botaurus poiciloptilus*	E	E	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Black-breasted Buzzard	*Hamirostra melanosternon*	V	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Grey Falcon	*Falco hypoleucos*	E	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regent Honeyeater	*Anthochaera phrygia*	CE	CE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 5 (Continued)
Threatened (Species Credit) Species Requiring Survey within the Mining Area and Timing

Common Name	Scientific Name	Conservation Status[1]		Survey Timing											
		BC Act	EPBC Act	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mammals															
Koala	*Phascolarctos cinereus*	V	V	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Squirrel Glider	*Petaurus norfolcensis*	V	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rufous Bettong	*Aepyprymnus rufescens*	V	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Black-striped Wallaby	*Macropus dorsalis*	E	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Eastern Pygmy-possum	*Cercartetus nanus*	V	-	Yes	Yes	Yes	Yes					Yes	Yes	Yes	Yes
Brush-tailed Phascogale	*Phascogale tapoatafa*	V	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

LEGEND | | Surveyed during the investigation in the vicinity of the Mine Site by FloraSearch (2018) (Attachment C) and Future Ecology (2018) (Attachment D).

Note: The Highlighted month is the month in which targeted surveys were undertaken for the relevant species.

[1] Threatened fauna species status under the BC Act and/or EPBC Act (current as at July 2018).

V = Vulnerable; E = Endangered; CE = Critically Endangered.

Flora Surveys undertaken for the Approved Mine

Niche (2013) undertook a flora survey of the Approved Mine area from 14 to 19 November 2011. The scope of works included vegetation mapping, compiling an inventory of native and introduced species and searches for threatened flora species. Additional threatened flora population counts and off-site surveys, targeting the Winged Peppercress (*Lepidium monoplocoides*), were conducted on 16 to 20 December 2011 and 13 to 16 January 2012.

As mentioned above, the Winged Peppercress, a threatened flora species listed under the BC Act and EPBC Act, was recorded by Niche (2013) (Figure 7). Niche (2013) recorded the Winged Peppercress in two patches. These consist of one patch of approximately 20 m x 20 m containing approximately 50 plants located within the Approved Mine area, and one patch within an area of approximately 50 m x 10 m containing approximately 418 individual plants located to the north-west outside the Approved Mine area (near the former Canyon Coal Mine waste rock emplacement area). This species is further discussed in Section 5.1.1.

Flora Surveys undertaken for the Canyon Coal Mine

Geoff Cunningham Natural Resource Consultants Pty Ltd (2004) undertook a flora survey of the Canyon Coal Mine extension area (within the Approved Mine boundary) on 25 September 2003 and 18 April 2004. The scope of works included vegetation mapping, compiling an inventory of native and introduced species and searches for threatened flora species. The survey was based on 18 survey sites throughout the Canyon Coal Mine extension area. No threatened flora species were recorded by Geoff Cunningham Natural Resource Consultants Pty Ltd (2004).

Flora Monitoring reports undertaken for the Canyon Coal Mine

Geoff Cunningham Natural Resource Consultants Pty Ltd (2006; 2007; 2008; 2009; 2010) and Countrywide Ecological Service (2006; 2007a; 2008, 2009a, 2010) have undertaken annual flora and fauna monitoring of the Canyon Coal Mine rehabilitation area (within the Approved Mine boundary). Flora monitoring was undertaken at six permanent quadrats, where tree and shrub counts were conducted, along with vegetation condition monitoring. No threatened flora species were recorded during these surveys.

Flora Surveys undertaken for the Rocglen Coal Mine

Flora surveys of the Rocglen Coal Mine (formerly known as the Belmont Coal Project) were conducted by Countrywide Ecological Service (2007b) from 23 to 24 February 2002, 22 to 24 July 2002, 17 to 18 August 2002, and 15 to 16 December 2006. In addition, RPS Harper Somers O'Sullivan (2010) conducted flora and fauna surveys of the Rocglen Coal Mine area from 8 to 12 February 2010. No threatened flora species were recorded during these surveys.

Flora Monitoring Reports Undertaken for the Rocglen Coal Mine

Eco Logical Australia (2017a) has undertaken annual flora and fauna monitoring of the Rocglen Coal Mine rehabilitation area since 2009. Flora monitoring was undertaken in the rehabilitation area, along with control sites, where tree and shrub counts were conducted, along with vegetation condition and erosion monitoring. Remote sensing surveys were also conducted to evaluate vegetation cover. No threatened flora species were recorded during these surveys.

Flora Monitoring Reports Undertaken for the Tarrawonga Coal Mine

Eco Logical Australia (2017b) has undertaken annual flora and fauna monitoring of the Tarrawonga Coal Mine rehabilitation area in 2016. Flora monitoring was undertaken in the rehabilitation area, where flora species and vegetation cover and coarse woody debris data was collected. Remote sensing surveys were also conducted to evaluate vegetation cover. No threatened flora species were recorded during these surveys.

Flora Surveys undertaken for the Proposed Additional Offset Areas

Dr Colin Driscoll (Hunter Eco) conducted flora surveys over Proposed Additional Offset Areas 7 and 8 (adjacent to the Vickery State Forest) over several days in May 2016, and January and May 2017. Hunter Eco (2018a) collected biometric data (in accordance with the FBA), produced vegetation mapping, and compiled a flora inventory for Proposed Additional Offset Areas 7 and 8.

Hunter Eco (2018a) recorded threatened *Tylophora linearis* and *Pomaderris queenslandica* within Proposed Additional Offset Area 7 (outside the BAR Footprint associated with the mining area) during the survey.

Flora Database Records

The *BioNet Atlas of NSW Wildlife* (OEH, 2017c) was reviewed for nearby threatened flora species records. In addition, a Protected Matters Search was undertaken for threatened flora species listed under the EPBC Act that are predicted to occur (DEE, 2017).

Results - Threatened Flora Species Records

No threatened flora species have been recorded within the BAR Footprint associated with the mining area within recent surveys, previous surveys or databases.

2.3.2.2 *Targeted Surveys for Threatened Fauna Species*

The potential presence of threatened terrestrial fauna species within the BAR Footprint associated with the mining area was determined by recent surveys during 2015, 2016 and 2017, a review of previous surveys and a review of database records.

Recent Fauna Surveys during 2015, 2016 and 2017

Future Ecology (2018) (Attachment D) undertook targeted surveys for threatened fauna species requiring surveys as determined by the OEH Credit Calculator (Table 5). Future Ecology (2018) (Attachment D) also undertook targeted surveys for potentially occurring threatened fauna species listed under the EPBC Act (in addition to those requiring survey by the OEH Credit Calculator [Table 5]). The fauna surveys for the Project did not occur within a season likely to detect the Swift Parrot (winter). However, since this species is migratory a site survey could not rule out the potential for this species to use the potential habitat in the Commonwealth Assessment Footprint in any year.

The targeted surveys by Future Ecology (2018) (Attachment D) were undertaken in accordance with the FBA (OEH, 2014a) and the following guidelines:

- *Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna – Amphibians* (DECC, 2009);

- *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft* (DEC, 2004);
- *Survey Guidelines for Australia's Threatened Bats* (Commonwealth Department of the Environment, Heritage, Water and the Arts [DEWHA], 2010a);
- *Survey Guidelines for Australia's Threatened Birds* (DEWHA, 2010b);
- *Survey Guidelines for Australia's Threatened Frogs* (DEWHA, 2010c);
- *EPBC Act Referral Guidelines for the Vulnerable Koala (Combined Populations of Queensland, New South Wales and the Australian Capital Territory)* (DotE, 2014b);
- *Survey Guidelines for Australia's Threatened Reptiles* (Commonwealth Department of Sustainability, Environment, Water, Population and Communities [SEWPaC], 2011a);
- *Survey Guidelines for Australia's Threatened Mammals* (SEWPaC, 2011b); and
- *The Spot Assessment Technique: A Tool for Determining Localised Levels of Habitat Use by Koalas Phascolarctos cinereus* (Phillips, and Callaghan, 2011).

A total of 14 threatened fauna species listed under the BC Act (all listed as vulnerable) were recorded by Future Ecology (2018), namely:

- Spotted Harrier (*Circus assimilis*) (outside the BAR Footprint associated with the mining area);
- Turquoise Parrot (*Neophema pulchella*) (outside the BAR Footprint associated with the mining area);
- Brown Treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*) (outside the BAR Footprint associated with the mining area);
- Speckled Warbler (*Chthonicola sagittata*) (inside and outside the BAR Footprint associated with the mining area);
- Hooded Robin (south-eastern form) (*Melanodryas cucullata cucullata*) (inside and outside the BAR Footprint associated with the mining area);
- Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*) (inside and outside the BAR Footprint associated with the mining area);
- Dusky Woodswallow (*Artamus cyanopterus cyanopterus*) (outside the BAR Footprint associated with the mining area);
- Gilbert's Whistler (*Pachycephala inornata*) (outside the BAR Footprint associated with the mining area);
- Diamond Firetail (*Stagonopleura guttata*) (outside the BAR Footprint associated with the mining area);
- Koala (*Phascolarctos cinereus*) (also listed under the EPBC Act) (outside the BAR Footprint associated with the mining area);
- Squirrel Glider (*Petaurus norfolcensis*) (outside the BAR Footprint associated with the mining area);
- Yellow-bellied Sheath-tailed Bat (*Saccolaimus flaviventris*) (inside and outside the BAR Footprint associated with the mining area);
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) (inside and outside the BAR Footprint associated with the mining area); and
- Eastern Cave Bat (*Vespadelus troughtoni*) (outside the BAR Footprint associated with the mining area).

Calls of the following two threatened bat species were also possibly detected, however, the calls could not be distinguished from other non-threatened bat species:

- Corben's Long-eared Bat (also commonly referred to as the South-eastern Long-eared Bat) (*Nyctophilus corbeni*); and
- Large-eared Pied Bat (*Chalinolobus dwyeri*).

Previous Fauna Surveys

The following previous fauna surveys are described below:

- surveys undertaken for the Approved Mine;
- surveys undertaken for the Canyon Coal Mine;
- monitoring reports undertaken for the Canyon Coal Mine;
- surveys undertaken for the Rocglen Coal Mine;
- monitoring reports undertaken for the Rocglen Coal Mine;
- monitoring reports undertaken for the Tarrawonga Coal Mine; and
- other reports.

Fauna Surveys undertaken for the Approved Mine

Cenwest Environmental Services (2011) undertook fauna surveys of the Approved Mine area from 28 March to 2 April 2011, which were complemented by additional fauna surveys conducted by Niche (2013) from 12 to 26 November 2011. Survey techniques included: bird surveys, herpetological surveys, pitfall traps, call playback, camera traps, Elliott traps, hair tubes, diurnal and nocturnal ground searches, targeted area searches, bat surveys, spotlighting surveys and secondary evidence.

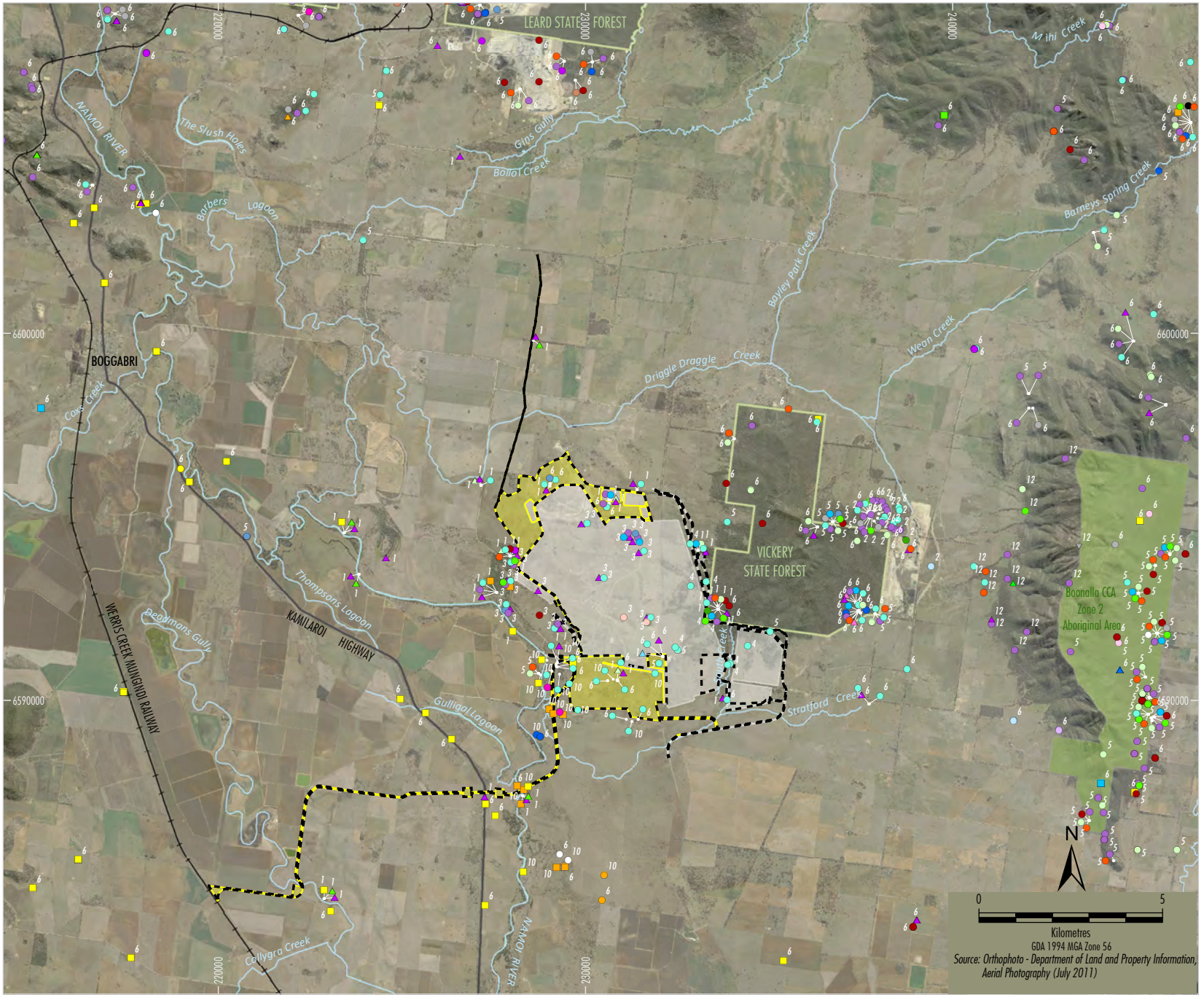
Cenwest Environmental Services (2011) and Niche (2013) recorded the Blue-billed Duck (*Oxyura australis*), Little Eagle (*Hieraaetus morphnoides*), Turquoise Parrot (*Neophema pulchella*), Speckled Warbler (*Chthonicola sagittata*), Hooded Robin (south-eastern form) (*Melanodryas cucullata cucullata*), Grey-crowned Babbler, Varied Sittella (*Daphoenositta chrysoptera*), Diamond Firetail (*Stagonopleura guttata*), Squirrel Glider (*Petaurus norfolcensis*), Yellow-bellied Sheathtail-bat and the Large-eared Pied Bat (*Chalinolobus dwyeri*)[3] (Figures 8 and 9). These are all ecosystem credit species except for the Squirrel Glider.

Fauna Surveys undertaken for the Canyon Coal Mine

Countrywide Ecological Service (2004) undertook a fauna survey of the Canyon Coal Mine extension area from 15 to 16 July 2003, and 17 to 20 April 2004. Survey techniques included: bird surveys, pitfall traps, call playback, Elliott traps, hair tubes, diurnal and nocturnal ground searches, targeted area searches, bat surveys, driving spotlighting surveys and secondary evidence.

Countrywide Ecological Service (2004) recorded the Spotted Harrier (*Circus assimilis*), Glossy Black-Cockatoo (*Calyptorhynchus lathami*), Grey-crowned Babbler (*Pomatostomus temporalis temporalis*), Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*) and Little Pied Bat (*Chalinolobus picatus*) (Figures 8 and 9); all are ecosystem credit species.

[3] Foraging habitat only.



LEGEND

- State Forest
- Aboriginal Area
- Approximate Extent of Approved Mine
- Biodiversity Assessment Report Development Site Footprint
- Approximate Extent of Vickery Extension Project (EPBC 2016/7649) Footprint

Threatened Fauna

- Blue-billed Duck
- Grey Falcon
- Black Falcon
- Square-tailed Kite
- Spotted Harrier
- Little Eagle
- Brolga
- Little Lorikeet
- Turquoise Parrot
- Masked Owl
- Barking Owl
- Brown Treecreeper (eastern subspecies)
- Speckled Warbler
- Regent Honeyeater
- Painted Honeyeater
- Hooded Robin (south-eastern form)
- Grey-crowned Babbler (eastern subspecies)
- Varied Sittella
- Gilbert's Whistler
- Dusky Woodswallow
- Diamond Firetail
- Black-chinned Honeyeater (eastern subspecies)
- Spotted-tailed Quoll
- Koala
- Squirrel Glider
- Brush-tailed Rock-wallaby
- Yellow-bellied Sheathtail-bat
- Eastern Freetail-bat
- Eastern Bentwing-bat
- Corben's Long-eared Bat
- Large-eared Pied Bat
- Little Pied Bat
- Eastern Cave Bat

Note: The Masked Owl, Black Falcon, Little Lorikeet, Brown Treecreeper, Diamond Firetail and Yellow-bellied Sheathtail-bat were also recorded within the locality however coordinates were not provided.

Source

(1) Future Ecology (2018)
(2) RPS (2010)
(3) Cenwest (2011)
(4) Niche (2013)
(5) Birdlife (2016)
(6) OEH (2017)
(10) Kendall&Kendall Ecological Services (2011)
(12) AMBS (2017)

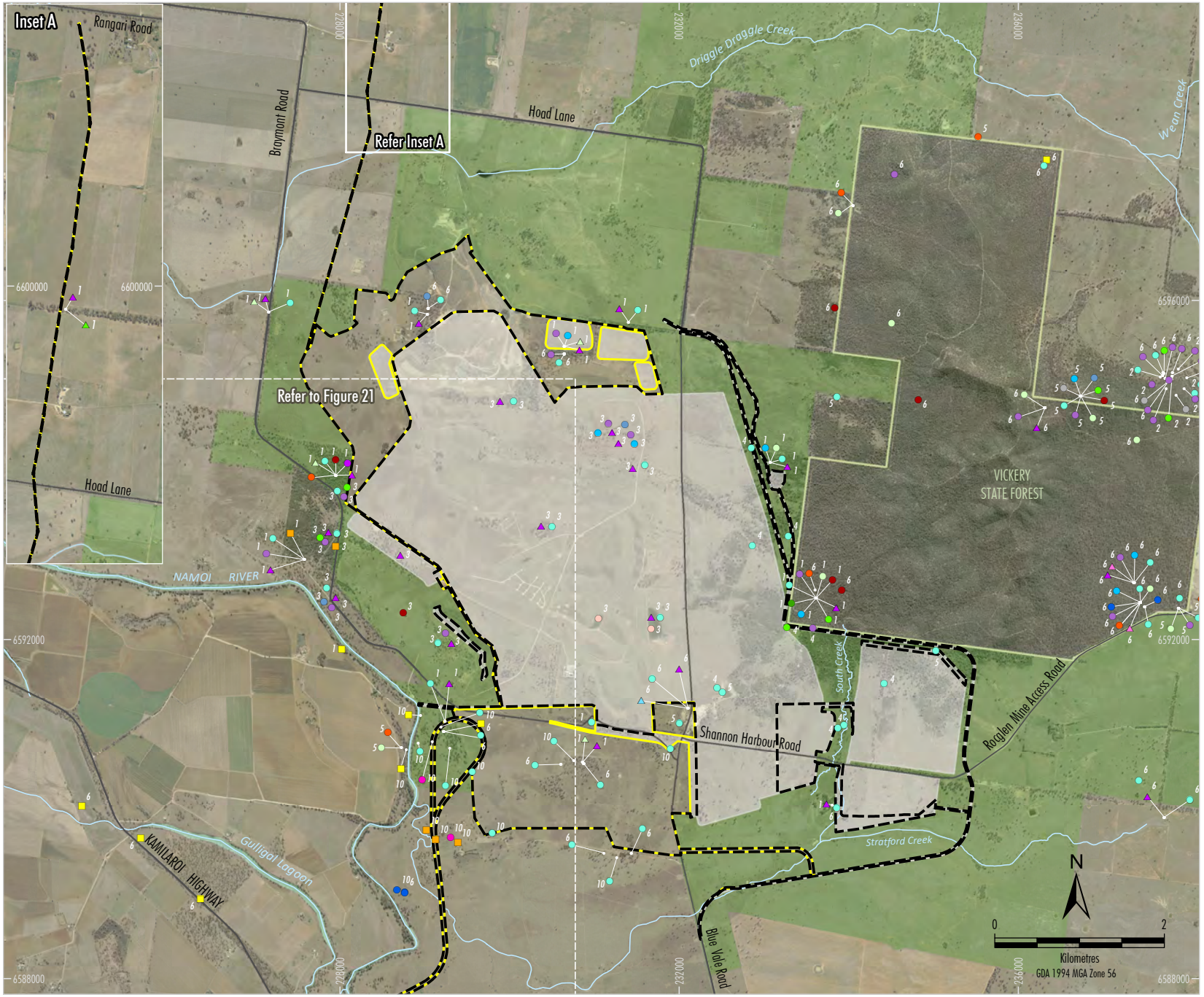
Note: Sources 7, 8 ,9 and 11 are not shown on this figure

WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Threatened Fauna Records - Wider Locality

Figure 8



LEGEND

- State Forest
- Approximate Extent of Approved Mine
- Biodiversity Assessment Report
- Development Site Footprint - for Mining Area
- Approximate Extent of Vickery Extension Project (EPBC 2016/7649) Footprint
- Local Biodiversity Enhancement Measures

Threatened Fauna

- Blue-billed Duck
- Spotted Harrier
- Little Eagle
- Little Lorikeet
- Turquoise Parrot
- Brown Treecreeper (eastern subspecies)
- Speckled Warbler
- Painted Honeyeater
- Hooded Robin (south-eastern form)
- Grey-crowned Babbler (eastern subspecies)
- Varied Sittella
- Dusky Woodswallow
- Gilbert's Whistler
- Diamond Firetail
- Koala
- Squirrel Glider
- Yellow-bellied Sheathtail-bat
- Eastern Freetail-bat
- Eastern Bentwing-bat
- Little Pied Bat
- Eastern Cave Bat

Note: The Black Falcon and Dusky Woodswallow were also recorded within the locality however coordinates were not provided.

Source
(1) Future Ecology (2018)
(2) RPS (2010)
(3) Cenwest (2011)
(4) Niche (2013)
(5) Birdlife (2016)
(6) OEH (2017)
(10) Kendall&Kendall Ecological Services (2011)

Note: Sources 7, 8, 9 and 12 are not shown on this figure.

Source: Orthophoto - Department of Land and Property Information, Aerial Photography (July 2011)

WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Threatened Fauna Records - Mining Area

Figure 9

Ten permanent fauna survey plots were established and monitored annually for signs of fauna activity. Survey methods included: area searches, spotlighting transects, bat surveys, reptile surveys and recording of secondary evidence. Threatened fauna species recorded during the monitoring period included the Grey-crowned Babbler and the Yellow-bellied Sheathtail-bat. These are both ecosystem credit species (Figures 8 and 9).

Fauna Surveys undertaken for the Rocglen Coal Mine

Countrywide Ecological Service (2007c) also conducted fauna surveys for the Rocglen Coal Mine (5 km east of the BAR Footprint associated with the mining area) from 10 to 14 December 2001, 11 to 14 July 2002, 19 to 22 September 2002, 28 October to 2 November 2006, and 21 to 22 March 2007. In addition, RPS Harper Somers O'Sullivan (2010) conducted flora and fauna surveys of the Rocglen Coal Mine area from 8 to 12 February 2010.

Vegetation mapping and targeted threatened flora surveys were conducted, along with bird surveys, herpetological surveys, pitfall traps, call playback, camera traps, Elliott traps, hair tubes, diurnal and nocturnal ground searches, targeted area searches, bat surveys, spotlighting surveys and secondary evidence (Countrywide Ecological Service, 2007c; RPS Harper Somers O'Sullivan, 2010).

Countrywide Ecological Service (2007a; 2007c) and RPS Harper Somers O'Sullivan (2010) recorded the Grey Falcon (*Falco subniger*), Turquoise Parrot, Speckled Warbler, Grey-crowned Babbler, Varied Sittella, Gilbert's Whistler (*Pachycephala inornata*), Diamond Firetail, Hooded Robin and Yellow-bellied Sheathtail-bat (Figures 8 and 9). These are all ecosystem credit species except for the Grey Falcon (which is a species credit species).

Fauna Monitoring Reports Undertaken for the Rocglen Coal Mine

Eco Logical Australia (2017a) has undertaken annual flora and fauna monitoring of the Rocglen Coal Mine rehabilitation area since 2009. Fauna monitoring was undertaken in the rehabilitation area, along with control sites, where bird surveys, Anabat surveys and area searches were undertaken. No threatened fauna species were recorded during these surveys.

Fauna Monitoring Reports Undertaken for the Tarrawonga Coal Mine

Eco Logical Australia (2017b) has undertaken annual flora and fauna monitoring of the Tarrawonga Coal Mine rehabilitation area in 2016. Fauna monitoring was undertaken in the rehabilitation area, where bird surveys and area searches were undertaken. The Grey-crowned Babbler was recorded in the rehabilitation areas during these surveys.

Unpublished Fauna Reports

Kendall and Kendall (2011) conducted fauna surveys to the south of the study area from 3 to 4 February 2011, 9 to 14 March 2011 and 19 to 26 October 2011. A range of survey techniques were implemented to survey for threatened fauna species with the report concluding that the survey techniques implemented, along with opportunistic observations, provide a comprehensive effort enabling achievement of a general baseline terrestrial fauna survey.

Threatened fauna species recorded by Kendall and Kendall (2011) include the Barking Owl (*Ninox connivens*), Brolga (*Grus rubicunda*), Grey-crowned Babbler, Painted Honeyeater (*Grantiella picta*), Little Lorikeet (*Glossopsitta pusilla*), Koala (*Phascolarctos cinereus*) and Squirrel Glider. These are all ecosystem credit species except for the Koala and Squirrel Glider (which are species credit species).

Fauna Database Records

The following databases were reviewed for nearby threatened fauna species records:

- *BioNet Atlas of NSW Wildlife* (OEH, 2017c); and
- *Birdlife Australia database search* (Birdlife Australia, 2017).

In addition, a Protected Matters Search was undertaken for threatened fauna species listed under the EPBC Act that are predicted to occur (DEE, 2017).

Results - Threatened Fauna Species Records

Table 6 provides a summary of the threatened fauna species records in the locality from survey records or database records. As shown on Figure 9, seven threatened fauna species (all ecosystem credit species) have been recorded within the BAR Footprint associated with the mining area, namely:

- Little Eagle (*Hieraaetus morphnoides*);
- Speckled Warbler *(Chthonicola sagittata*);
- Hooded Robin (south-eastern form) (*Melanodryas cucullata* subsp. *cucullata*);
- Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis* subsp. *temporalis*);
- Diamond Firetail (*Stagonopleura guttata*);
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*);
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*); and
- Eastern Freetail-bat (*Mormopterus norfolkensis*)

In addition, two threatened Bat species were possibly recorded in the BAR area associated with the mining area, however were unable to be identified to a species level based on call data alone, namely:

- Corben's Long-eared Bat (*Nyctophilus corbeni); and*
- Large-eared Pied Bat *(Chalinolobus dwyeri).*

An additional three species have not been recorded in the BAR Footprint associated with the mining area but have been recorded within patches of vegetation which continue into the BAR Footprint associated with the mining area. These include (Figure 9):

- Koala (*Phascolarctos cinereus*);
- Squirrel Glider (*Petaurus norfolcensis*); and
- Eastern Cave Bat (*Vespadelus troughtoni*).

Table 6
Threatened Fauna Species Records in the Locality

Scientific Name	Common Name	Conservation Status		Database Records			Survey Records[6]	Credit Type*
		BC Act[1]	EPBC Act[2]	EPBC Act Protected Matters Search[3]	OEH Atlas of NSW Wildlife[4]	Birdlife Australia[5]		
Frogs								
Litoria booroolongensis	Booroolong Frog	E	E	Predicted	-	-	-	Species – N/A
Reptiles								
Uvidicolus sphyrurus	Border Thick-tailed Gecko	V	V	Predicted	-	-	-	Species (Table 4)
Aprasia parapulchella	Pink-tailed Legless Lizard	V	V	Predicted	-	-	-	Species (Table 4)
Hoplocephalus bitorquatus	Pale-headed Snake	V	-	-	●	-	-	Species – N/A
Birds								
Leipoa ocellata	Malleefowl	E	V	Predicted	-	-	-	Ecosystem (Table 7)
Oxyura australis	Blue-billed Duck	V	-	-	-	-	I	Ecosystem - not in Credit Calculator
Calidris ferruginea	Curlew Sandpiper	-	CE	Predicted	-	-	-	Ecosystem - not in Credit Calculator
Falco hypoleucos	Grey Falcon	E	-	-	●	-	B, C	Species (Table 4)
Falco subniger	Black Falcon	V	-	-	●	-	-	Species – N/A
Erythrotriorchis radiatus	Red Goshawk	CE	V	Predicted	-	-	-	Ecosystem - not in Credit Calculator
Lophoictinia isura	Square-tailed Kite	V	-	-	●	-	-	Ecosystem (Table 7)
Circus assimilis	Spotted Harrier	V	-	-	●	-	A, H	Ecosystem (Table 7)
Hieraaetus morphnoides	Little Eagle	V	-	-	●	●	I	Ecosystem (Table 7)
Grus rubicunda	Brolga	V	-	-	●	-	K	Ecosystem - not in Credit Calculator
Rostratula australis	Australian Painted Snipe	E	E	Predicted	●	-	L	Ecosystem - not in Credit Calculator
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	-	-	●	-	A	Ecosystem (Table 7)
Glossopsitta pusilla	Little Lorikeet	V	-	-	●	-	K, L	Ecosystem (Table 7)

Table 6 (Continued)
Threatened Fauna Species Records in the Locality

Scientific Name	Common Name	Conservation Status		Database Records			Survey Records[6]	Credit Type*
		BC Act[1]	EPBC Act[2]	EPBC Act Protected Matters Search[3]	OEH Atlas of NSW Wildlife[4]	Birdlife Australia[5]		
Neophema pulchella	Turquoise Parrot	V	-	-	●	●	B, H, I	Ecosystem (Table 7)
Lathamus discolor	Swift Parrot	E	CE	Predicted	●	-	-	Ecosystem (Table 7)
Tyto novaehollandiae	Masked Owl	V	-	-	●	-	L	Ecosystem (Table 7)
Ninox connivens	Barking Owl	V	-	-	●	-	K	Ecosystem (Table 7)
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V	-	-	●	●	H, L	Ecosystem (Table 7)
Chthonicola sagittata	Speckled Warbler	V	-	-	●	-	C, H, I, J	Ecosystem (Table 7)
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	V	-	-	●	-	-	Ecosystem (Table 7)
Anthochaera phrygia	Regent Honeyeater	CE	CE	Predicted	●	-	-	Species (Table 5)
Grantiella picta	Painted Honeyeater	V	V	Predicted	●	-	K	Ecosystem (Table 7)
Artamus cyanopterus	Dusky Woodswallow	V	-	-	●	●	C, I, H	Ecosystem - not in Credit Calculator
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	V	-	-	●	-	B, I, H	Ecosystem (Table 7)
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V	-	-	●	●	A, B, C, D, E, F, G, H, I, J, K	Ecosystem (Table 7)
Daphoenositta chrysoptera	Varied Sittella	V	-	-	●	-	C, I	Ecosystem (Table 7)
Pachycephala inornata	Gilbert's Whistler	V	-	-	-	-	C, H	Ecosystem - not in Credit Calculator
Stagonopleura guttata	Diamond Firetail	V	-	-	●	-	C, H, I, J, L	Ecosystem (Table 7)

Table 6 (Continued)
Threatened Fauna Species Records in the Locality

Scientific Name	Common Name	Conservation Status		Database Records			Survey Records[6]	Credit Type*
		BC Act[1]	EPBC Act[2]	EPBC Act Protected Matters Search[3]	OEH Atlas of NSW Wildlife[4]	Birdlife Australia[5]		
Mammals								
Dasyurus maculatus maculatus	Spotted-tailed Quoll (south-eastern mainland population)	V	E	-	●	-	-	Ecosystem - not in Credit Calculator
Phascolarctos cinereus	Koala	V	V	Predicted	●	-	H, K	Species (Table 5)
Petauroides volans	Greater Glider	-	V	Predicted	-	-	-	Ecosystem - not in Credit Calculator
Petaurus norfolcensis	Squirrel Glider	V	-	-	●	-	H, I, K	Species (Table 5)
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V	Predicted	●	-	-	Species (Table 4)
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Predicted	-	-	-	Ecosystem or Species – N/A
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-	-	●	-	A, B, C, D, E, F, G, H, I, J*, L	Ecosystem (Table 7)
Mormopterus beccarii	Beccari's Freetail-bat#	V	-	-	-	-	B, C, J*	Ecosystem - not in Credit Calculator
Mormopterus norfolkensis	Eastern Freetail-bat	V	-	-	●	-	-	Ecosystem - not in Credit Calculator
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	-	-	●	-	H, J*	Ecosystem or Species – N/A
Nyctophilus corbeni	Corben's Long-eared Bat	V	V	Predicted	●	-	B^, D^, E^, G^, H^	Ecosystem (Table 7)
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Predicted	●	-	H*, J*	Species (Table 4)

Table 6 (Continued)
Threatened Fauna Species Records in the Locality

Scientific Name	Common Name	Conservation Status		Database Records			Survey Records[6]	Credit Type*
		BC Act[1]	EPBC Act[2]	EPBC Act Protected Matters Search[3]	OEH Atlas of NSW Wildlife[4]	Birdlife Australia[5]		
Chalinolobus picatus	Little Pied Bat	V	-	-	●	-	A	Ecosystem (Table 7)
Vespadelus troughtoni	Eastern Cave Bat	V	-	-	●	-	H	Ecosystem or Species – N/A

Notes:

Highlighted species have been recorded in the BAR Footprint associated with the mining area. Records shown on Figures 8 and 9.

The Beccari's Free-tailed Bat (*Mormopterus beccarii*) is unlikely to occur as the known distribution of this species in NSW does not overlap with the BAR Footprint associated with the mining area (OEH, 2017b). The survey records are from call recordings not sightings.

^ Bat calls recorded via bat recording devices and this species cannot be identified to species level based on call data alone.

* Bat calls recorded via bat recording devices identified to genus level only and calls could not be distinguished from other potential occurring bat species.

1 Threatened species status under the BC Act (current as at July 2018).

2 Threatened species status under the EPBC Act (current as at July 2018).

3 DEE (2017).

4 OEH (2017c).

5 Birdlife Australia (2017).

6 Relevant references:

A = Countrywide Ecological Service (2004).

B = Countrywide Ecological Service (2007c).

C = RPS Harper Somers O'Sullivan (2010).

D = Countrywide Ecological Service (2009a).

E = Countrywide Ecological Service (2009b).

F = Countrywide Ecological Service (2007a).

G = Countrywide Ecological Service (2006).

H = Future Ecology (2018).

I = Cenwest Environmental Services (2011).

J = Niche Environment and Heritage (2013).

K = Kendall & Kendall (2011).

L = Parsons Brinckerhoff (2010).

Further to the above, the Corben's Long-eared Bat has been potentially recorded within the BAR Footprint associated with the mining area (Future Ecology, 2018) (Attachment D), although this species cannot be identified to species level based on call data alone. As these potential records could not be confirmed, they are not shown on Figures 8 and 9. The nearest confirmed record of this species is located within the southern extent of the Leard State Forest, approximately 8 km to the north of the Project mining area (OEH, 2017c).

2.3.3 Ecosystem Credit Species

A total of 34 ecosystem credit species are listed in Table 7 from the OEH Credit Calculator, eight of which have been recorded within the BAR Footprint associated with the mining area (highlighted species) (Figures 8 and 9). No ecosystem credit species were removed from (turned off in) the OEH Credit Calculator.

Table 7
Ecosystem Species from the OEH Credit Calculator (Mining Area)

Common Name	Scientific Name	Conservation Status[1]		TS Offset Multiplier	T_G Value*	Presence in the BAR Footprint
		BC Act	EPBC Act			
Birds						
Australian Bustard	*Ardeotis australis*	E	-	2.6	0.375	No records in the locality
Australian Painted Snipe	*Rostratula australis*	E	E	1.3	0.75	No records in the locality
Black-tailed Godwit	*Limosa limosa*	V	-	2.6	0.375	No records in the locality
Magpie Goose	*Anseranas semipalmata*	V	-	1.3	0.75	No records in the locality
Blue-billed Duck	*Oxyura australis*	V	-	1.3	0.75	Recorded in the locality (Table 6)
Freckled Duck	*Stictonetta naevosa*	V	-	1.3	0.75	No records in the locality
Brolga	*Grus rubicund*	V	-	1.3	0.75	Recorded in the locality (Table 6)
White-fronted Chat	*Epthianura albifrons*	V	-	0.8	0.75	No records in the locality
Malleefowl	*Leipoa ocellata*	E	V	2.6	0.375	No records in the locality
Square-tailed Kite	*Lophoictinia isura*	V	-	1.4	0.725	Recorded in the locality (Table 6)
Spotted Harrier	*Circus assimilis*	V	-	1.4	0.725	Recorded in the locality (Project rail spur) (Table 6)
Little Eagle	*Hieraaetus morphnoides*	V	-	1.4	0.725	Recorded in the BAR Footprint associated with the mining area (Table 6)
Bush Stone-curlew	Burhinus grallarius	E	-	2.6	0.375	No records in the locality
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	V	-	1.8	0.55	No records in the locality
Little Lorikeet	*Glossopsitta pusilla*	V	-	1.8	0.575	Recorded in the locality (Table 6)
Turquoise Parrot	*Neophema pulchella*	V	-	1.8	0.55	Recorded in the locality (Table 6)
Swift Parrot	*Lathamus discolor*	E	CE	1.3	0.75	No records in the locality.
Masked Owl	*Tyto novaehollandiae*	V	-	3.0	0.325	Recorded in the locality (Table 6)
Barking Owl	*Ninox connivens*	V	-	3.0	0.325	Recorded in the locality (Table 6)
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	V	-	2.0	0.5	Recorded in the locality (Table 6)

Table 7 (Continued)
Ecosystem Species from the OEH Credit Calculator (Mining Area)

Common Name	Scientific Name	Conservation Status[1]		TS Offset Multiplier	T_G Value*	Presence in the BAR Footprint
		BC Act	EPBC Act			
Speckled Warbler	*Chthonicola sagittate*	V	-	2.6	0.375	Recorded in the BAR Footprint associated with the mining area (Table 6)
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis gularis*	V	-	1.3	0.75	Recorded in the locality (Table 6)
Painted Honeyeater	*Grantiella picta*	V	V	1.3	0.75	Recorded in the locality (Project rail spur)(Table 6)
Flame Robin	*Petroica phoenicea*	V	-	1.3	0.75	No records in the locality
Scarlet Robin	*Petroica boodang*	V	-	1.3	0.75	No records in the locality
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis temporalis*	V	-	1.3	0.75	Recorded in the BAR Footprint associated with the mining area (Table 6)
Varied Sittella	*Daphoenositta chrysoptera*	V	-	1.3	0.75	Recorded in the locality (Table 6)
Diamond Firetail	*Stagonopleura guttata*	V	-	1.3	0.75	Recorded in the BAR Footprint associated with the mining area (Table 6)
Mammals						
Spotted-tailed Quoll (south-eastern mainland population)	*Dasyurus maculatus maculatus*	V	E	2.6	0.375	Recorded in the locality (Table 6)
Pilliga Mouse	*Pseudomys pilligaensis*	V	V	2.6	0.375	No records in the locality
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	V	-	2.2	0.45	Recorded in the BAR Footprint associated with the mining area (Table 6)
Corben's Long-eared Bat	*Nyctophilus corbeni*	V	V	2.1	0.475	No records in the locality
Little Pied Bat	*Chalinolobus picatus*	V	-	2.1	0.475	Recorded in the locality (Table 6)

Highlighted species have been recorded in the BAR Footprint associated with the mining area.

TS Offset Multiplier = a species-specific multiplier used to determine the extent of habitat required to be located within the offset area.

T_G Value = the ability of a species to respond to improvement in site value or other habitat improvement at an offset site with management actions (OEH, 2016a).

* *Archived BioMetric and Threatened Species Profiles Datasets* (OEH, 2017b).

[1] Threatened fauna species status under the BC Act and/or EPBC Act (current as at July 2018).

V = Vulnerable; E = Endangered, CE = Critically Endangered

Dusky Woodswallow (*Artamus cyanopterus cyanopterus*)

The Dusky Woodswallow was listed as Vulnerable under the BC Act in August 2016. Given the recent listing of this species, a BioBanking profile identifying a T_G score and credit type (i.e. species or ecosystem) has not been completed by OEH. This species was recorded within the BAR Footprint associated with the mining area by Future Ecology (2018). Potential habitat for this species includes all woodland/forest habitats located within the BAR Footprint associated with the mining area.

Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*)

The Eastern Bentwing-bat is an ecosystem species (for foraging habitat – T_G 0.75 [OEH, 2017b]) which was not predicted in the OEH Credit Calculator to occur in the habitat within the BAR Footprint associated with the mining area. A possible recording of this species has, however, been made by Niche (2013) and Future Ecology (2018) (Attachment D).

No potential breeding habitat for this cave-dwelling bat occurs in the BAR Footprint associated with the mining area or nearby surrounds, however impacts to potential foraging habitat for this species has been considered in this report.

Large-eared Pied Bat (*Chalinolobus dwyeri*)

The Large-eared Pied Bat (*Chalinolobus dwyeri*) is an ecosystem species (for foraging habitat – T_G 0.75 [OEH, 2017b]) but was not predicted in the OEH Credit Calculator to occur in the habitat within the BAR Footprint associated with the mining area. A possible recording of this species has, however, been made by Niche (2013) and Future Ecology (2018) (Attachment D) (the bat calls recorded via bat recording devices identified to genus level only and calls could not be distinguished from other potential occurring bat species). No potential breeding habitat for this cave-dwelling bat occurs in the BAR Footprint associated with the mining area or nearby surrounds, however impacts to potential foraging habitat for this species have been considered in this report.

The OEH Credit Calculator does not allow additional ecosystem species to be added. Despite the above omissions in the OEH Credit Calculator, in this instance, these species would not influence the ecosystem credit amount as there are other species with lower T_G scores, the Masked Owl and Barking Owl (that drive the offset requirement). The Masked Owl (*Tyto novaehollandiae*) and Barking Owl both have potential habitat in the BAR Footprint associated with the mining area, although neither has been recorded in the potential habitat. As shown in Table 8, the OEH Credit Calculator also predicts that the owls use the secondary/derived native grasslands. There is no function in the OEH Credit Calculator to switch off the species driving the credit requirements for secondary habitat, such as derived grassland, which is widespread and not a limiting habitat for the species.

Table 8 identifies the vegetation zones along with the associated ecosystem credit species that have been identified as having the lowest T_G value for that zone (for all zones the lowest T_G is 0.325, with the exception of zone 9, which has a T_G value of 0.375). The species with the lowest T_G value influences the offset multiplier designated to each vegetation zone.

Table 8
Vegetation Zones and Predicted Threatened Species which Influence the Offset Required for Each Vegetation Zone Associated with the Mining Area

Vegetation Zone Number	Vegetation Community	BVT	Predicted Threatened Species with Lowest T_G Value	Species T_G Value
Semi-arid Woodlands (Grassy Sub-formation)				
1	2 Poplar Box Woodland on Alluvial Clay Soils	NA185	Masked Owl	0.325
2	2a Poplar Box Woodland on Alluvial Clay Soils (secondary/derived grassland)		Masked Owl	0.325
Dry Sclerophyll Forests (Shrub/Grass Sub-formation)				
3	3 Pilliga Box – Poplar Box Shrubby Woodland	NA324	Barking Owl	0.325
4	3a Pilliga Box – Poplar Box Shrubby Woodland (secondary/derived grassland)		Barking Owl	0.325
5	4 White Box – Silver-leaved Ironbark Shrubby Open Forest	NA349	Barking Owl	0.325
6	4a White Box – Silver-leaved Ironbark Shrubby Open Forest (secondary/derived grassland)		Barking Owl	0.325
Dry Sclerophyll Forests (Shrubby Sub-formation)				
7	5 Narrow-leaved Ironbark – White Box Shrubby Forest	NA311	Barking Owl	0.325
8	5a Narrow-leaved Ironbark – White Box Shrubby Forest (secondary/derived grassland)		Barking Owl	0.325
Freshwater Sedgeland Marshes				
9	7 Mixed March Sedgeland	NA201	Australian Bustard	0.375

Note: Numbering of vegetation communities as per Attachment C. Vegetation Communities 1 and 6 do not occur in the BAR Footprint associated with the mining area.

2.3.4 Species Credit Species

Species credits are generated by species credit species determined to be present or likely to use the habitat present on a development site (OEH, 2014a). As described in Section 2.3.2 targeted surveys were undertaken for species credit species and no species credit species have been recorded within the BAR Footprint associated with the mining area. There are, however, three species credit species that are in the credit calculation for the BAR Footprint associated with the mining area (Table 9). Of these, the Koala and Squirrel Glider were recorded in the BAR Footprint associated with the Project rail spur (Section 3.3.4).

Table 9
Species Credit Species in the Credit Calculation for the BAR Footprint Associated with the Mining Area

Species	Conservation Status[1]		Loss of Potential Habitat (ha) (Table 10)
	BC Act	EPBC Act	
Regent Honeyeater	CE	CE	43.6
Squirrel Glider	V	-	72.5
Koala	V	V	44.6

[1] Threatened fauna species status under the BC Act and/or EPBC Act (current as at July 2018).

V = Vulnerable; CE = Critically Endangered

Species polygons (i.e. potential habitat extent) for the species credit species listed in Table 9 have been prepared in accordance with the FBA (OEH, 2014a). The potential habitat for each species is based on a review of:

- the *Archived BioMetric and Threatened Species Profiles Datasets* (OEH, 2017b);
- recovery plans and guidance (e.g. DotE, 2016; DECC, 2008); and
- suitability of the vegetation in the BAR Footprint associated with the mining area to provide habitat resources for the three species.

Table 10 details the area of habitat for the fauna species in the BAR Footprint associated with the mining area based on vegetation communities.

Table 10
Vegetation Types Representing Potential Habitat for Species Credit Species in the BAR Footprint Associated with the Mining Area

#	Community	BVT	Regent Honeyeater Potential Habitat (ha)	Squirrel Glider Potential Habitat (ha)	Koala Potential Habitat (ha)
2	Poplar Box Woodland on Alluvial Clay Soils	NA185	0.1	N/A	0.1
3	Pilliga Box – Poplar Box Shrubby Woodland	NA324	N/A	22	18 [B]
4	White Box – Silver-leaved Ironbark Shrubby Open Forest	NA349	17	17	0.5 [C]
5	Narrow-leaved Ironbark – White Box Shrubby Forest	NA311	26 [A]	33	26 [D]
-	Scattered paddock trees in secondary/derived native grassland	-	0.5	0.5	N/A
		Total	**43.6**	**72.5**	**44.6**
		Credit Requirement	**3,357**	**1,595**	**1,160**

[A] 33 ha of this BVT occurs in the BAR Footprint associated with the mining area, however, 7 ha does not contain potential habitat resources for the Regent Honeyeater.

[B] 22 ha of this BVT occurs in the BAR Footprint associated with the mining area, however, 4 ha does not contain potential habitat resources for the Koala.

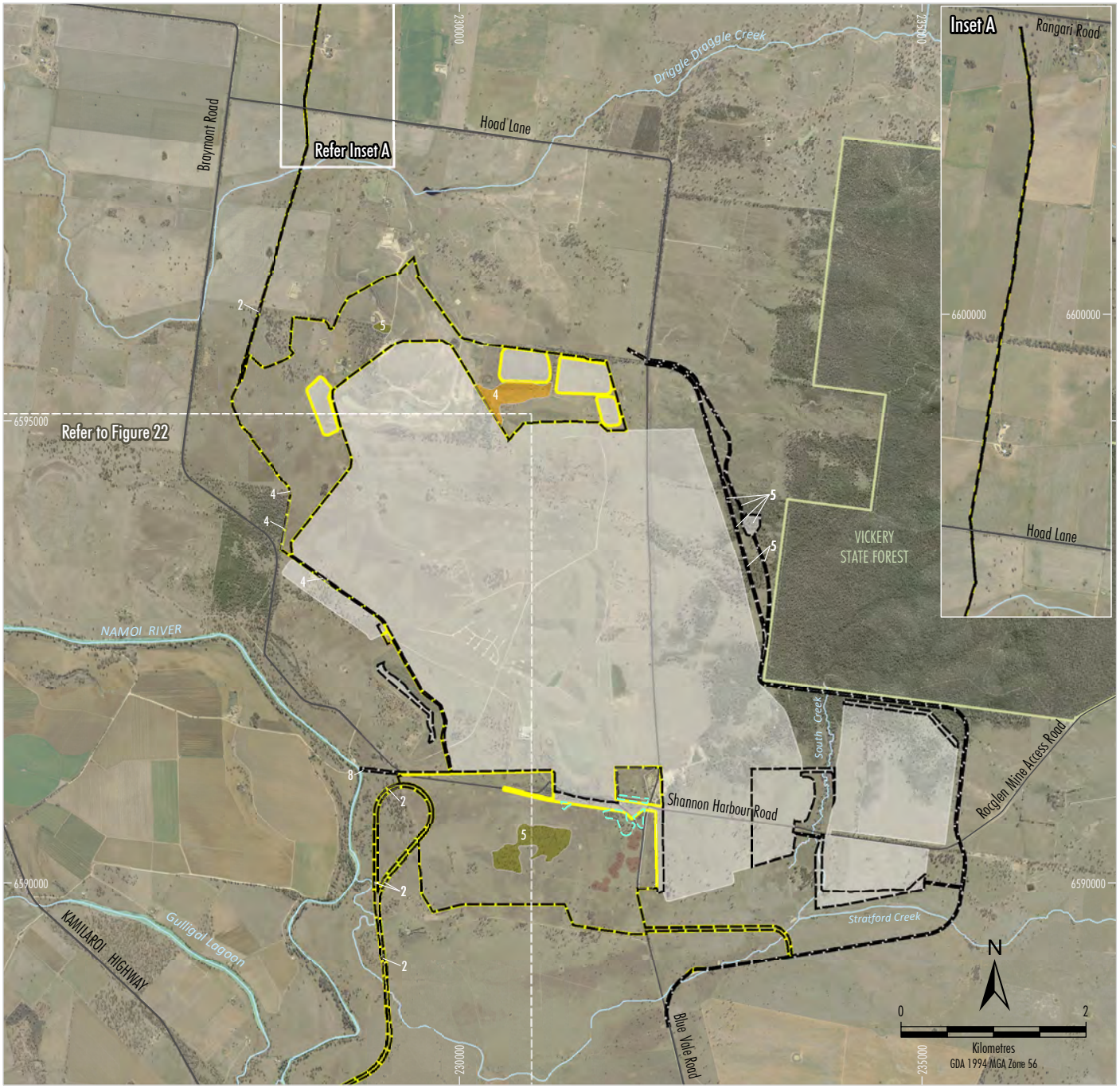
[C] 17 ha of this BVT occurs in the BAR Footprint associated with the mining area, however, 16.5 ha does not contain potential habitat resources for the Koala.

[D] 33 ha of this BVT occurs in the BAR Footprint associated with the mining area, however, 7 ha does not contain potential habitat resources for the Koala.

Regent Honeyeater (Anthochaera phrygia)

This species has not been recorded in the BAR footprint (Figure 11). The extent of potential habitat (species polygons) for the Regent Honeyeater in the BAR Footprint associated with the mining area (and Vickery Extension Project [EPBC 2016/7649] Footprint) is shown on Figure 10. There are no records of the Regent Honeyeater in the BAR Footprint or immediate surrounds. The landscape distribution of Regent Honeyeater records in the *BioNet Atlas of NSW Wildlife* (OEH, 2017c) are shown on Figure 11. The closest Regent Honeyeater record is approximately 7.5 km to the south-east of the Project from 1998 and has an accuracy of 1 km (OEH, 2017c) (Figure 11).

In addition, the closest key breeding area for the Regent Honeyeater is located 40 km north-east of the BAR Footprint associated with the mining area (DotE, 2016) (Figure 12) and this species has few records in the landscape surrounding the Project (Figure 11).



LEGEND

- State Forest
- Approximate Extent of Approved Mine
- Biodiversity Assessment Report Development Site Footprint
- Approximate Extent of Vickery Extension Project (EPBC 2016/7649) Footprint

Potential Habitat

- 2 Poplar Box Woodland on Alluvial Clay Soils (NA185)
- 4 White Box – Silver-leaved Ironbark Shrubby Open Forest (NA349)
- 5 Narrow-leaved Ironbark – White Box Shrubby Forest (NA311)
- Scattered Trees
- NA311 that does not Provide Habitat for the Regent Honeyeater

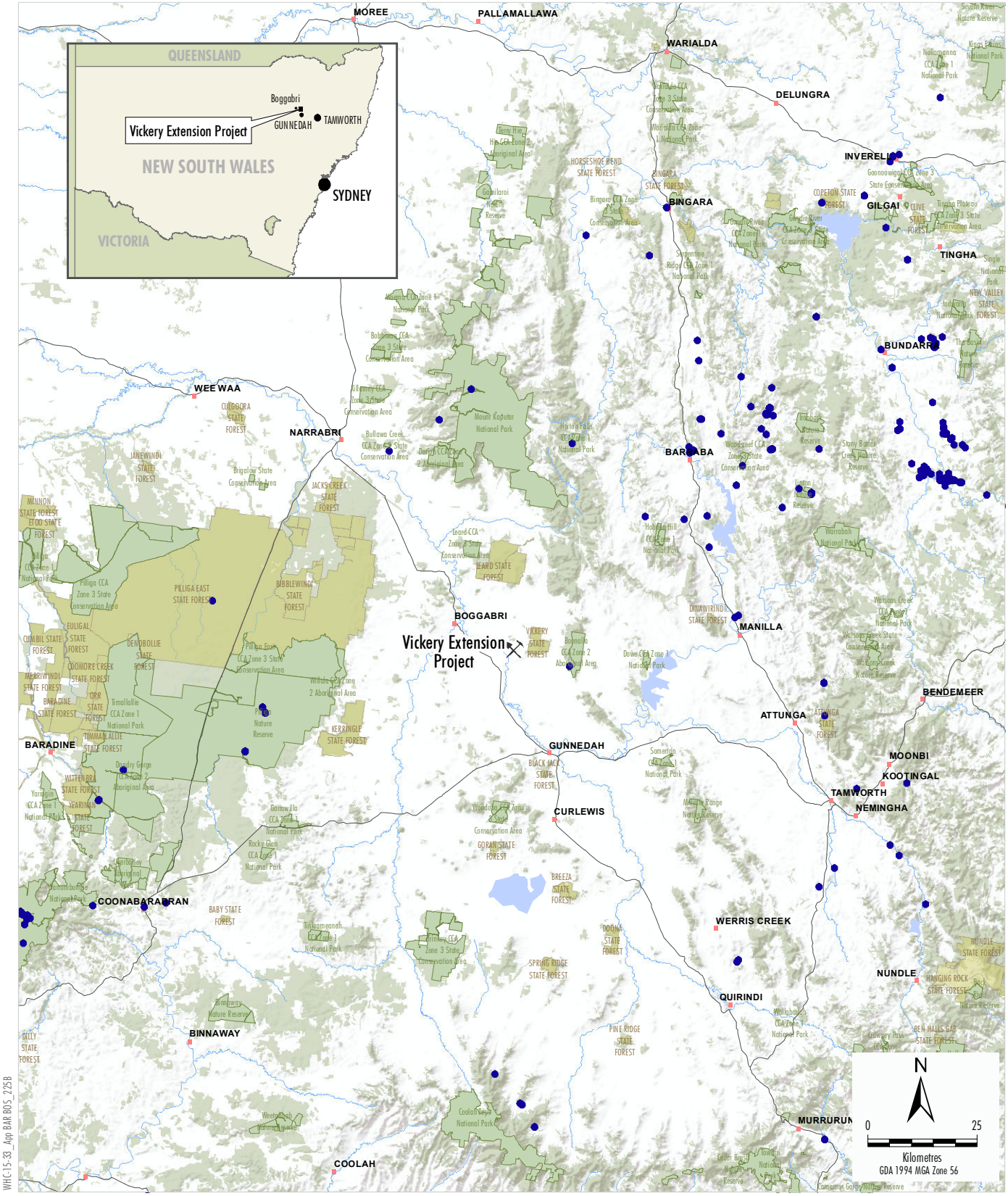
Source: Orthophoto - Department of Land and Property Information, Aerial Photography (July 2011); FloraSearch (2018)

WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Regent Honeyeater Potential Habitat - Mining Area

Figure 10



WHC-15-33_App BAR BOS_225B

LEGEND

- NSW Protected Area (NP&W Act)
- State Forest (Forestry Act)
- Regional Regent Honeyeater Record
- Major Road

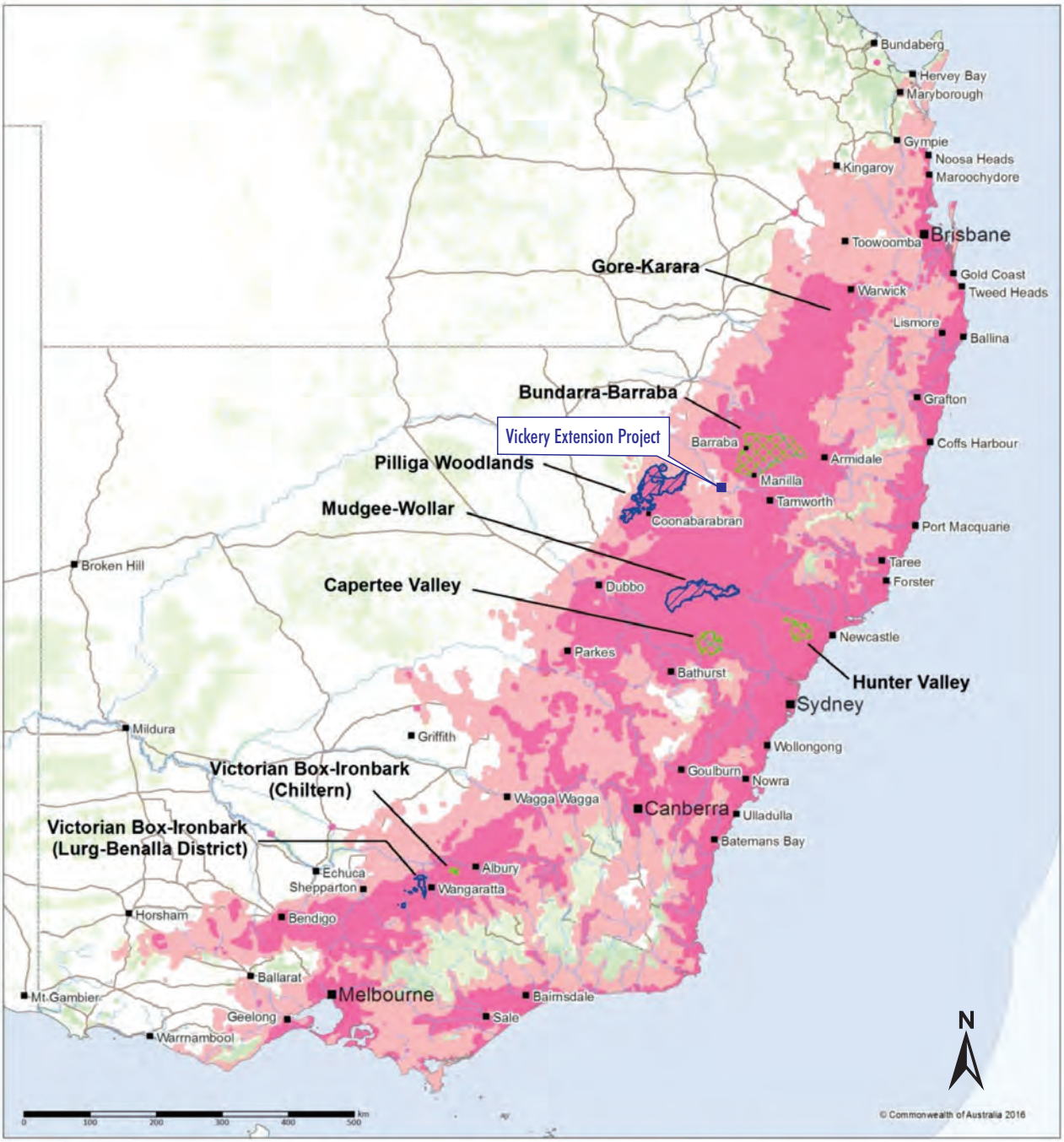
Source: Base Map - Esri, USGS, NOAA (2016);
Geoscience Australia - Topographic Data (2011); OEH (2016)

WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Regent Honeyeater - Landscape Distribution

Figure 11



Map description: The presence categories in the indicative species distribution mapping capture: the specific habitat type or geographic feature that represents the recent observed locations of the species, as well as, suitable or preferred habitat occurring in close proximity to these locations (Likely to Occur); and, the broad environmental envelope or geographic region that encompasses all areas that could provide habitat for the species (May Occur). These presence categories are created using an extensive database of species observation records, national and regional-scale environmental data, environmental modelling techniques, documented scientific research, and, where possible, expert review. Breeding areas within the likely distribution are indicated as per Garnett, S., J. Szabo and G. Dutson (2011). The Action Plan for Australian Birds 2010 and the Birds Australia (2009) Important Bird Areas of Australia dataset.

Produced by: Environmental Resources Information Network (2016)

Contextual data source: Geoscience Australia (2006), Geodata Topo 250K Topographic Data

Indicative Map Only: This map has been compiled from datasets with a range of geographic scales and quality. Species distributions are indicative only and not to be used for local assessment. Local knowledge and information should be sought to confirm the presence of the species, or it's habitat, at the location of interest.

Caveat: The information presented in this map has been provided by a range of groups and agencies. While every effort has been made to ensure accuracy and completeness, no guarantee is given, nor responsibility taken by the Commonwealth for errors or omissions, and the Commonwealth does not accept responsibility in respect of any information or advice given in relation to, or as a consequence of, anything containing herein.

Important Bird Areas for the Species

- Key breeding areas
- Other breeding areas

Presence Category

- Species may occur
- Species likely to occur
- Major rivers
- Major Roads
- Closed Forest
- Open Woodland

11/03/2016

WHC-15-33_AppBARBOS_001B

WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Regent Honeyeater Distribution

Figure 12

The Project is located in an area where the species 'may occur' according to the *National Recovery Plan for the Regent Honeyeater (Anthochaera phrygia)* (DotE, 2016) (Figure 12). In addition, there is no evidence to demonstrate that the potential habitat within the NSW Assessment Footprint provides connectivity for movement between any important population areas (i.e. critical habitat) for the Regent Honeyeater.

Key tree species for the Regent Honeyeater that occur within the BAR Footprint associated with the mining area include Yellow Box (*Eucalyptus melliodora*) and White Box (*E. albens*) (DotE, 2016). Consistent with the *Archived BioMetric and Threatened Species Profiles Datasets* (OEH, 2017b), these trees are generally associated with the following vegetation communities which have been recorded in the BAR Footprint associated with the mining area (Figure 10):

- Poplar Box Woodland on Alluvial Clay Soils (NA185) (which contains Yellow Box);
- White Box – Silver-leaved Ironbark Shrubby Open Forest (NA349); and
- Narrow-leaved Ironbark – White Box Shrubby Forest (NA311).

Some occurrences of these vegetation communities in the BAR Footprint associated with the mining area do not contain Yellow Box or White Box and therefore those occurrences are not potential habitat for the Regent Honeyeater. Dr Colin Bower (FloraSearch) assisted with reviewing which patches in the BAR Footprint associated with the mining area provide potential habitat for the Regent Honeyeater. The justification for excluding some patches is provided below.

The Narrow-leaved Ironbark – White Box Shrubby Forest (NA311) has been identified as potential habitat for the Regent Honeyeater based on the presence of White Box trees. Small patches of this BVT (totalling 7 ha) were identified as not containing any White Box (Figure 10).

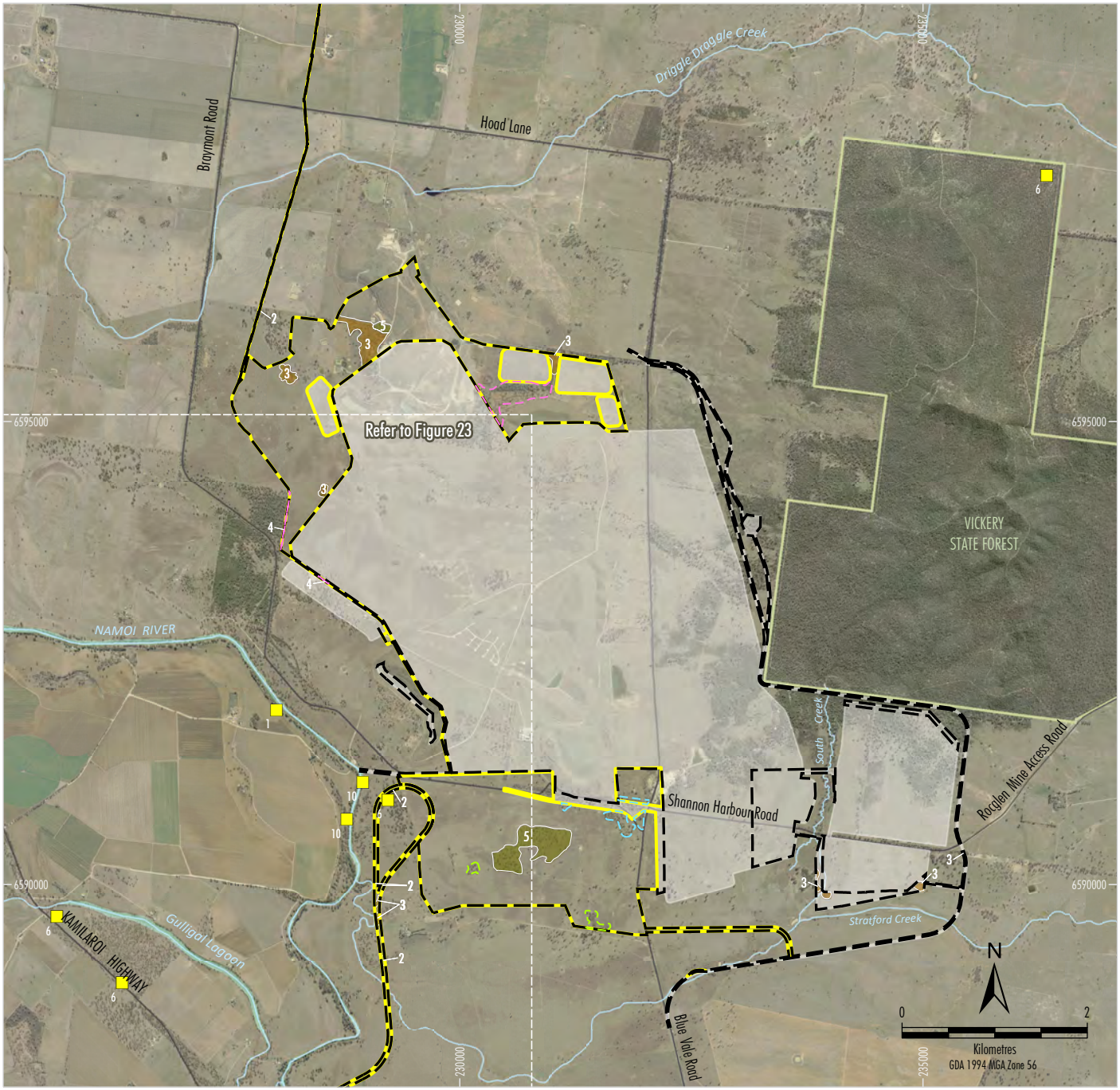
In addition to the woodland/forest vegetation communities, scattered paddock trees that would provide some potential foraging habitat for the Regent Honeyeater have been identified. As such, these have been included in the area of potential Regent Honeyeater habitat and are shown on Figure 10.

Based on the above, there are approximately 43.6 ha of potential habitat for the Regent Honeyeater in the BAR Footprint associated with the mining area (Table 10; Figure 10). None of the cleared land in the BAR Footprint associated with the mining area provides potential habitat for the Regent Honeyeater.

Koala (Phascolarctos cinereus)

This species has not been recorded in the BAR Footprint associated with the mining area (Figure 13). The extent of potential habitat (species polygons) for the Koala in the BAR Footprint associated with the mining area (and Vickery Extension Project [EPBC 2016/7649] Footprint) is shown on Figure 13, along with records of the species. Koala records in the Project locality include one record within the footprint of the Project rail spur, one record within 500 m of the Project rail spur and two records within 1 km of the Project mining area (within vegetation along the Namoi River) (Figure 13).

These three records are all dated from 2011/2012. The landscape distribution of Koala records in the *BioNet Atlas of NSW Wildlife* (OEH, 2017c) are shown on Figure 14.



LEGEND

- State Forest
- Approximate Extent of Approved Mine
- Approximate Extent of Vickery Extension Project (EPBC 2016/7649) Footprint
- Biodiversity Assessment Report Development Site Footprint
- Koala

Potential Habitat

- 2 Poplar Box Woodland on Alluvial Clay Soils (NA185)
- 3 Pilliga Box – Poplar Box Shrubby Woodland (NA324)
- 4 White Box – Silver-leaved Ironbark Shrubby Open Forest (NA349)
- 5 Narrow-leaved Ironbark – White Box Shrubby Forest (NA311)
- NA311 that does not Provide Habitat for Koala
- NA324 that does not Provide Habitat for Koala
- NA349 that does not Provide Habitat for Koala

Source: (1) Future Ecology (2018)
(6) OEH (2017)
(10) Kendall&Kendall Ecological Services (2011)

Note: Sources 2 to 5 and 7 to 9 are not shown on this figure.

Source: Orthophoto - Department of Land and Property Information, Aerial Photography (July 2011); Flora Search (2018)

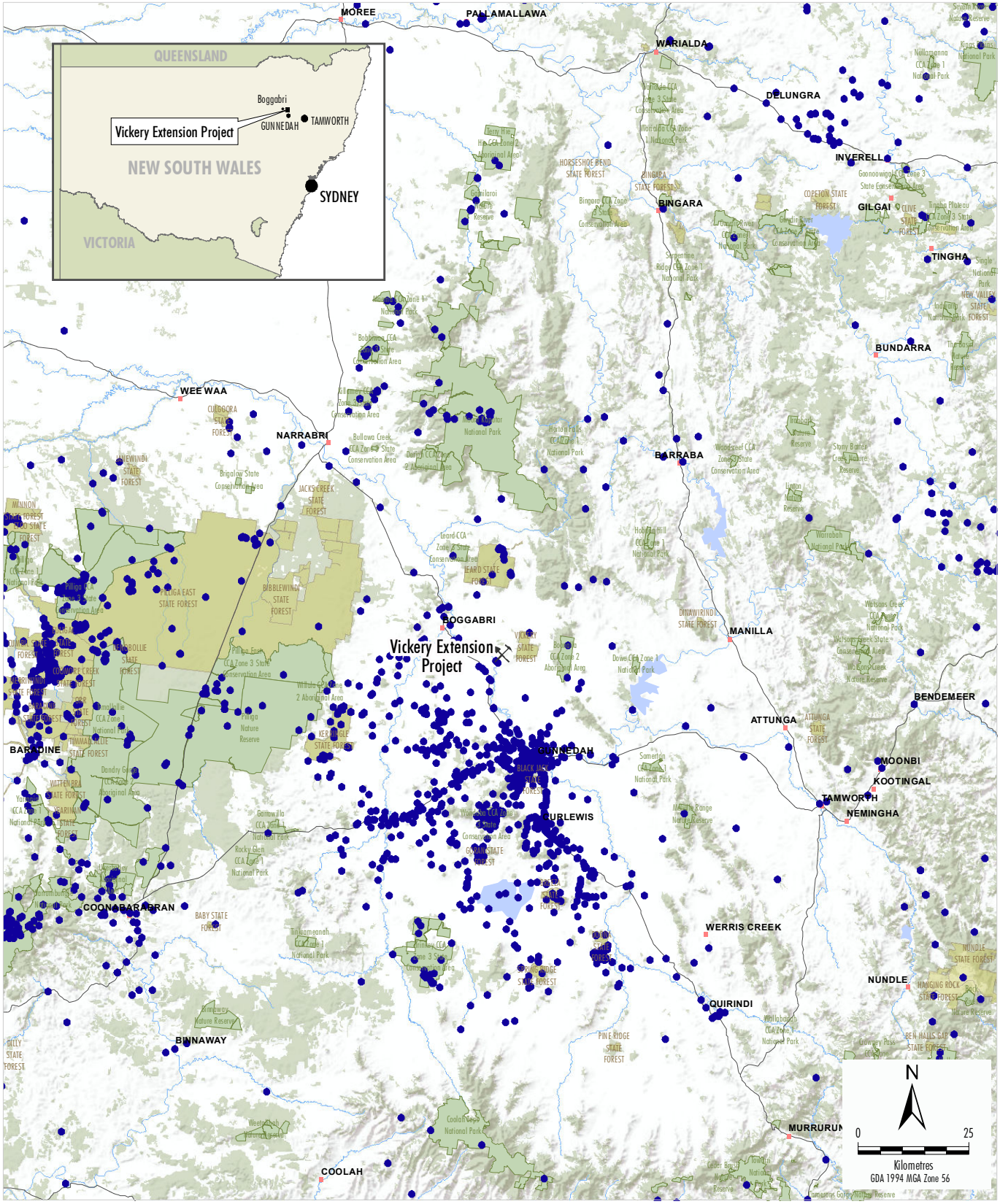
WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Koala Potential Habitat - Mining Area

Figure 13

WHC-15-33_App BAR BOS_212E



WHC-15-33_App BAR BOS_227B

LEGEND

- NSW Protected Area (NP&W Act)
- State Forest (Forestry Act)
- Regional Koala Record
- Major Road

Source: Base Map - Esri, USGS, NOAA (2016);
Geoscience Australia - Topographic Data (2011); OEH (2017)

WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Koala - Landscape Distribution

Figure 14

Consistent with the *Archived BioMetric and Threatened Species Profiles Datasets* (OEH, 2017b), recovery plan (DECC, 2008) and State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44), the following vegetation communities would provide potential habitat for the Koala in the BAR Footprint associated with the mining area (Figure 13):

- Poplar Box Woodland on Alluvial Clay Soils (NA185);
- Pilliga Box – Poplar Box Shrubby Woodland (NA324);
- White Box – Silver-leaved Ironbark Shrubby Open Forest (NA349); and
- Narrow-leaved Ironbark – White Box Shrubby Forest (NA311).

Dr Colin Bower (FloraSearch) assisted with reviewing which patches in the BAR Footprint associated with the mining area provide potential habitat for the Koala. Consistent with SEPP 44 potential habitat for the Koala was mapped based on the occurrence of preferred feed trees in the BAR Footprint associated with the mining area, White Box (*E. albens*) and Poplar Box (*E. populnea*), at a density of at least 15% of the total number of trees in the upper or lower strata of the tree component. The estimate of potential Koala habitat also considered that in addition to the preferred tree species listed in SEPP 44, FloraSearch (2018) (Attachment C) recorded Pilliga Box (*E. pilligaensis*), Yellow Box (*E. melliodora*) and Blakely's Red Gum (*E. blakelyi*), which are all secondary food trees for the Koala (DECC, 2008).

Based on the above, there are approximately 44.6 ha of potential habitat for the Koala in the BAR Footprint associated with the mining area (Table 10; Figure 13). None of the cleared land in the BAR Footprint associated with the mining area provides potential habitat for the Koala.

Squirrel Glider (Petaurus norfolcensis)

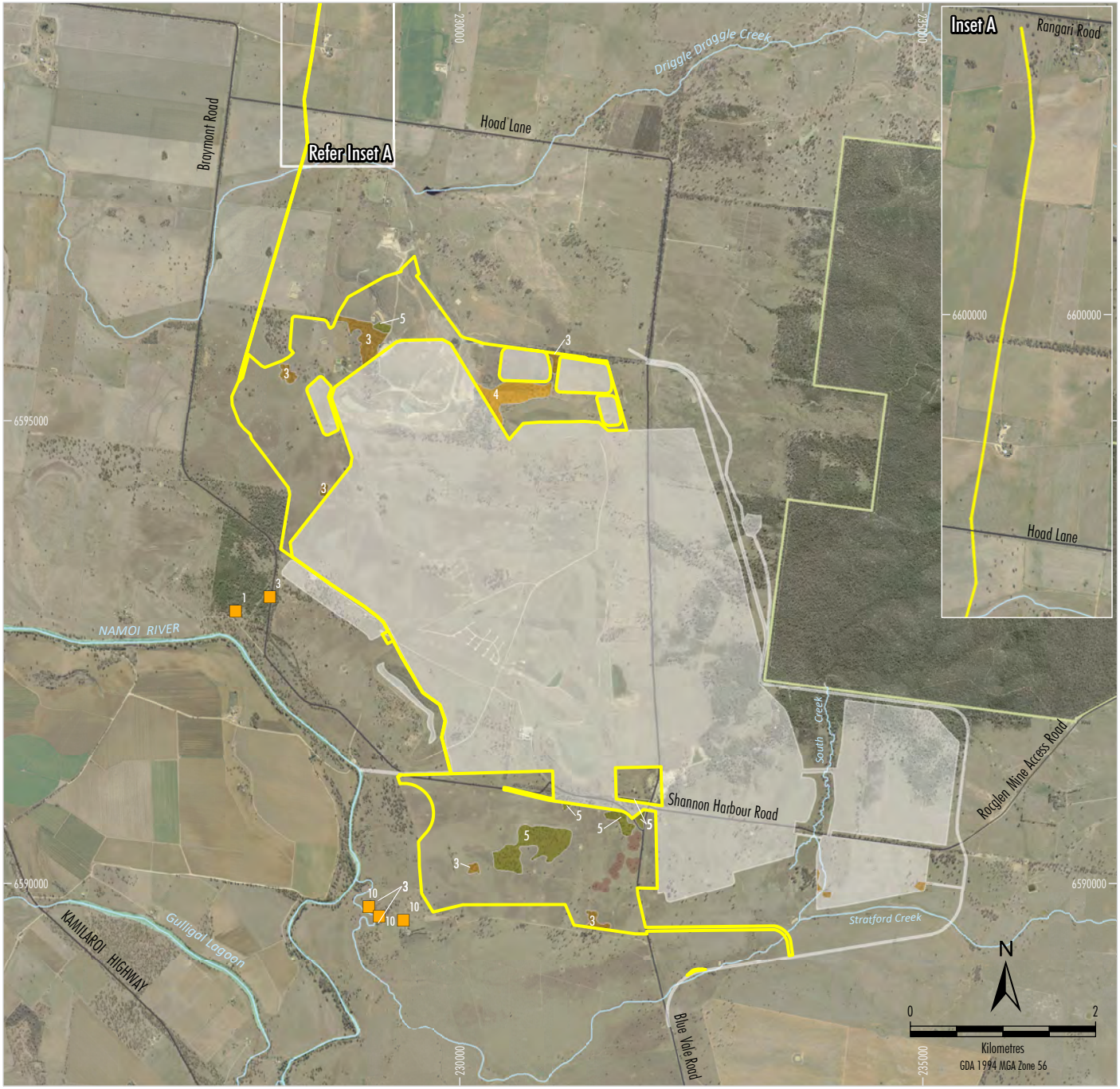
This species has not been recorded within the BAR Footprint associated with the mining area (Figure 15). The extent of potential habitat (species polygons) for the Squirrel Glider in the BAR Footprint associated with the mining area is shown on Figure 15, along with records of the species. The wider landscape distribution of the *BioNet Atlas of NSW Wildlife* (OEH, 2017c) records for the Squirrel Glider are shown on Figure 16. Figure 16 shows many Squirrel Glider records in State Forests, Nature Reserves and National Parks in the wider landscape.

Consistent with the *Archived BioMetric and Threatened Species Profiles Datasets* (OEH, 2017b), the following vegetation communities would provide habitat for the Squirrel Glider (Figure 15):

- Pilliga Box – Poplar Box Shrubby Woodland (NA324);
- White Box – Silver-leaved Ironbark Shrubby Open Forest (NA349); and
- Narrow-leaved Ironbark – White Box Shrubby Forest (NA311).

In addition to the woodland/forest vegetation communities, scattered paddock trees that would provide some potential habitat for the Squirrel Glider have been identified. As such, these have been included in the area of potential Squirrel Glider habitat and are shown on Figure 15.

Poplar Box Woodland on Alluvial Clay Soils (NA185) is not considered potential habitat for the Squirrel Glider in the *Archived BioMetric and Threatened Species Profiles Datasets* (OEH, 2017b).



LEGEND

- State Forest
- Approximate Extent of Approved Mine
- Biodiversity Assessment Report
- Development Site Footprint
- Squirrel Glider

Potential Habitat

- 3 Pilliga Box – Poplar Box Shrubby Woodland (NA324)
- 4 White Box – Silver-leaved Ironbark Shrubby Open Forest (NA349)
- 5 Narrow-leaved Ironbark – White Box Shrubby Forest (NA311)
- Scattered Trees

Source: (1) Future Ecology (2018)
(3) Cenwest (2011)
(10) Kendall & Kendall Ecological Services (2011)

Note: Sources 2 and 4 to 9 are not shown on this figure.

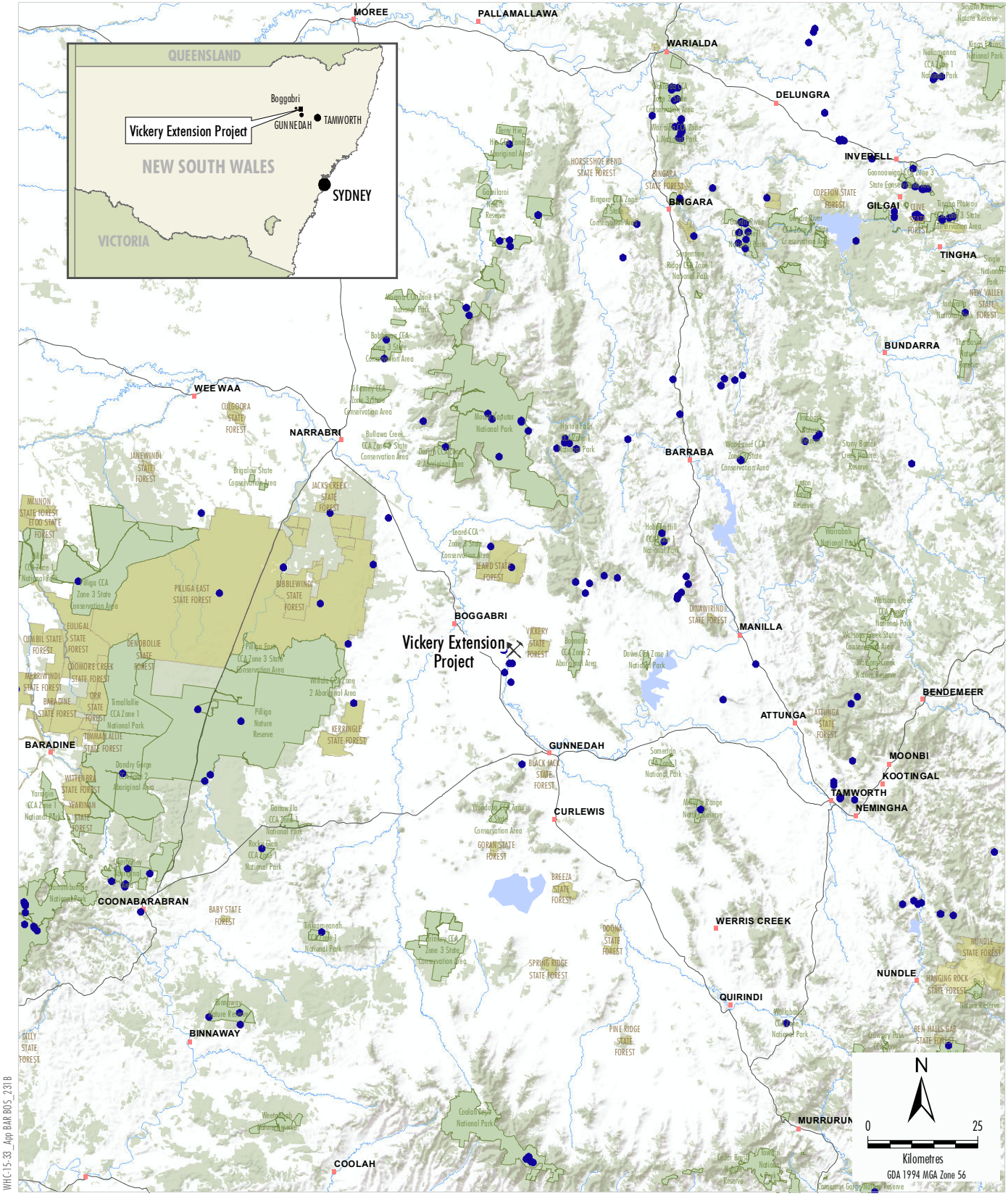
Source: Orthophoto - Department of Land and Property Information, Aerial Photography (July 2011); FloraSearch (2018)

WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Squirrel Glider Potential Habitat - Mining Area

Figure 15



WHC-15-33_App BAR BOS_231B

LEGEND

- NSW Protected Area (NP&W Act)
- State Forest (Forestry Act)
- Regional Squirrel Glider Record
- Major Road

Source: Base Map - Esri, USGS, NOAA (2016);
Geoscience Australia - Topographic Data (2011); OEH (2016)

WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Squirrel Glider -
Landscape Distribution

Figure 16

Based on the above, there are approximately 72.5 ha of potential habitat for the Squirrel Glider in the BAR Footprint associated with the mining area (Table 10; Figure 15). None of the cleared land in the BAR Footprint associated with the mining area provides potential habitat for the Squirrel Glider.

2.3.5 Species That Cannot Withstand Loss

The Threatened Species Profile Database identifies species that cannot withstand further loss in the major catchment area in which the species occurs because of one or more of the following (OEH, 2014a):

- *the species is naturally very rare, has few populations or a restricted distribution.*
- *the species or population is critically endangered.*
- *the species has threats that are beyond control (of the management actions undertaken on an offset site).*
- *the species or its habitat's needs/response to management are poorly known.*

None of the species credit species considered to be present in the BAR Footprint associated with the mining area (Section 2.3.4) are species that cannot withstand loss as classified by OEH (2016a). It is noted that species that cannot withstand further loss are not used in the decision making threshold for Major Projects being assessed in accordance with the FBA (OEH, 2014a), including this Project.

2.3.6 Impacts on Species That Require Further Consideration

The OEH's comments in the SEARs for the EIS requested further consideration of the impacts on threatened species listed in Table 11. None of the species listed in the table have been confirmed within the BAR Footprint associated with the mining area and none of the species listed in Table 11 are species credit species discussed in Section 2.3.4.

A possible recording of the Large-eared Pied Bat has been made by Niche (2013) and Future Ecology (2018) (Attachment D). It is possible that potential foraging habitat for this species occurs in the BAR Footprint associated with the mining area and wider landscape, however, no potential breeding habitat for this cave-dwelling bat occurs in the BAR Footprint associated with the mining area or nearby surrounds. The Large-eared Pied Bat is an ecosystem credit species for foraging habitat as discussed in Section 2.3.3. Further consideration on the Large-eared Pied Bat is provided in Section 5.2 and Attachment A.

The DotE's comments in the SEARs for the EIS include the following additional species not listed in Table 11:

- Swift Parrot (*Lathamus discolor*);
- Regent Honeyeater (*Anthochaera phrygia*);
- Koala (*Phascolarctos cinereus*); and
- Corben's Long eared Bat (*Nyctophilus corbeni*)

The Koala and Painted Honeyeater have both been recorded in the BAR footprint associated with the mining area (Figure 17). Further consideration on the above EPBC Act listed species is provided in Section 5.2 and Attachments A and B.

Table 11
Threatened Species Which May Require Further Consideration

Scientific Name	Common Name	Conservation Status[1]		Relevance to the BAR Footprint associated with the mining area
		BC Act	EPBC Act	
Flora				
Tylophora linearis	-	V	E	Not present.
Dichanthium setosum	Bluegrass	V	V	Not present.
Digitaria porrecta	Finger Panic Grass	E	-	Not present.
Homopholis belsonii	Belson's Panic	E	V	Not present.
Polygala linariifolia	Native Milkwort	E	-	Not present.
Pomaderris queenslandica	Scant Pomaderris	E	-	Not present.
Thesium australe	Austral Toadflax	V	V	Not present.
Cadellia pentastylis	Ooline	V	V	Not present.
Birds				
Ephippiorhynchus asiaticus	Black-necked Stork	E	-	Not present.
Mammals				
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V	Not present.
Chalinolobus dwyeri	Large-eared Pied Bat^	V	V	Not relevant. No breeding habitat for this cave-dwelling bat occurs in the BAR Footprint*.
Vespadelus troughtoni	Eastern Cave Bat^	V	-	Not relevant. No breeding habitat for this cave-dwelling bat occurs in the BAR Footprint.

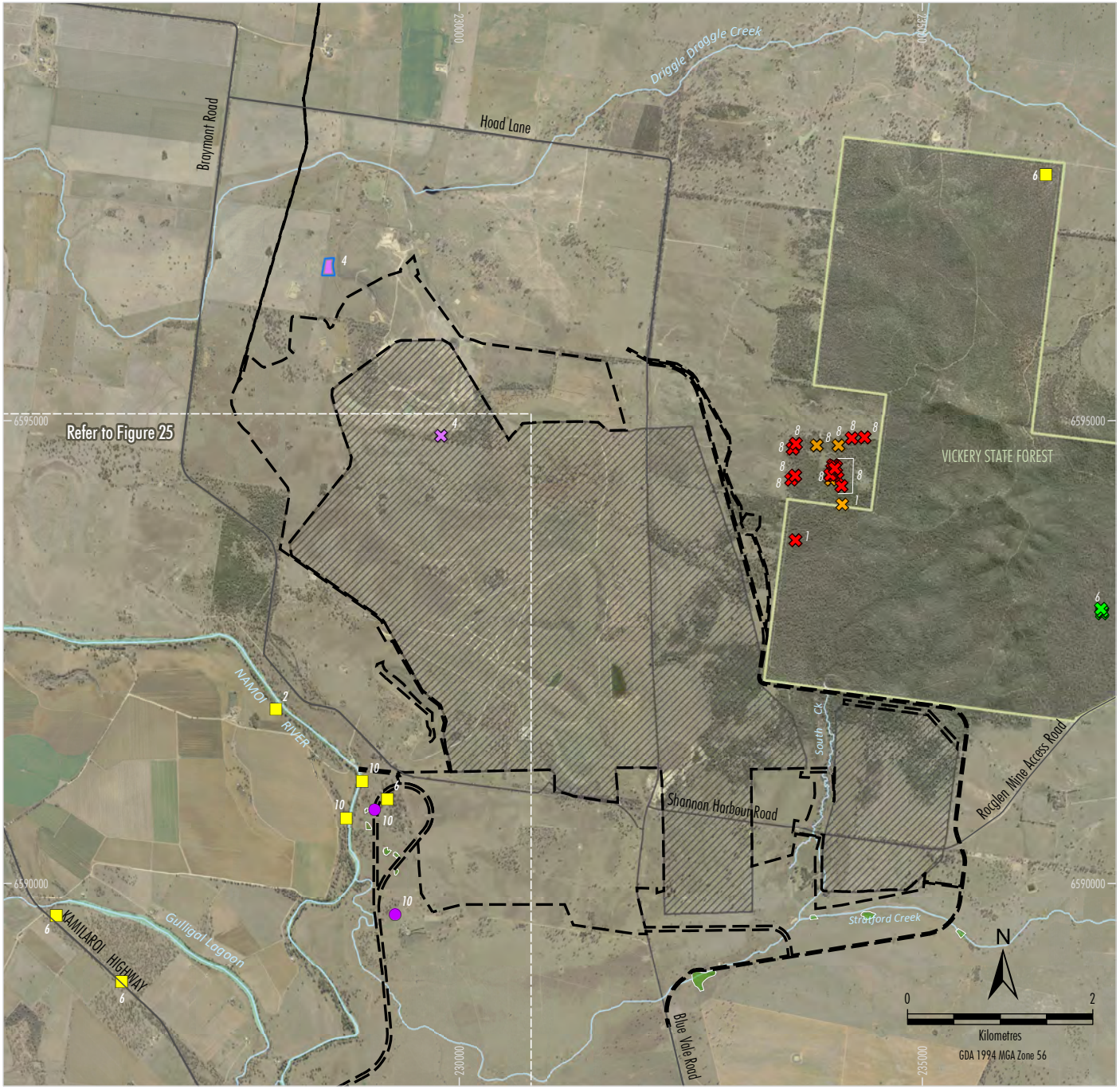
Source: OEH's comments in the SEARs for the EIS

* Bat calls recorded via bat recording devices identified to genus level only and calls could not be distinguished from other potential occurring bat species.

^ Species credit species for breeding habitat only.

[1] Threatened fauna species status under the BC Act and/or EPBC Act (current as at July 2018).

V = Vulnerable; E = Endangered; CE = Critically Endangered.



LEGEND

- State Forest
- Vickery Coal Project (EPBC 2012/6263) Footprint - Not a Controlled Action - Particular Manner
- Approximate Extent of Vickery Extension Project (EPBC 2016/7649) Footprint

Fauna

- Painted Honeyeater
- Koala

Flora

- Belson's Panic (*Homopholis belsonii*)
- Scant Pomaderris (*Pomaderris Queenslandica*)
- *Tylophora linearis*
- Winged Peppercress (*Lepidium monoplocoides*)
- Winged Peppercress Protection Area

Threatened Ecological Communities

- Weeping Myall Woodland

Source
(1) FloraSearch (2018)
(2) Future Ecology (2018)
(4) Niche (2013)
(6) OEH (2017)
(8) Hunter Eco (2018)
(10) Kendall & Kendall Ecological Services (2011)

Note: Sources 5 to 7 and 9 are not shown on this figure

Source: Orthophoto - Department of Land and Property Information, Aerial Photography (July 2011); Niche (2013)

WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Threatened Species and Communities under the EPBC Act - Mining Area

Figure 17

3 STAGE 1 – BIODIVERSITY ASSESSMENT FOR THE PROJECT RAIL SPUR

Landscape features are described in Section 3.1, native vegetation is described in Section 3.2, and threatened species relevant to the BAR Footprint are described in Section 3.3.

3.1 LANDSCAPE FEATURES

Landscape features relevant to the Project (such as regional setting and Mitchell Landscapes) are described in this sub-section (and previously in Section 2.1).

3.1.1 Regional Setting

The rail spur is wholly within the Gunnedah LGA.

3.1.2 Mitchell Landscapes

Details of the Mitchell Landscapes (Mitchell, 2002) within the BAR Footprint associated with the Project Rail Spur are provided in Table 12 and shown on Figure 18. The BAR Footprint associated with the Project rail spur is predominantly (89%) within the Liverpool Alluvial Plains Mitchell Landscape (Table 12).

Table 12
Mitchell Landscapes in the BAR Footprint Associated with the Project Rail Spur

Landscape Name	Percentage Cleared Estimate[1]	Patch Size	Patch Size Score
Liverpool Alluvial Plains	84	90 ha	10
Mooki - Namoi Channels and Floodplains	75	46.4 ha	7.5
Upper Namoi Swamps and Lagoons	49	14 ha	2.5

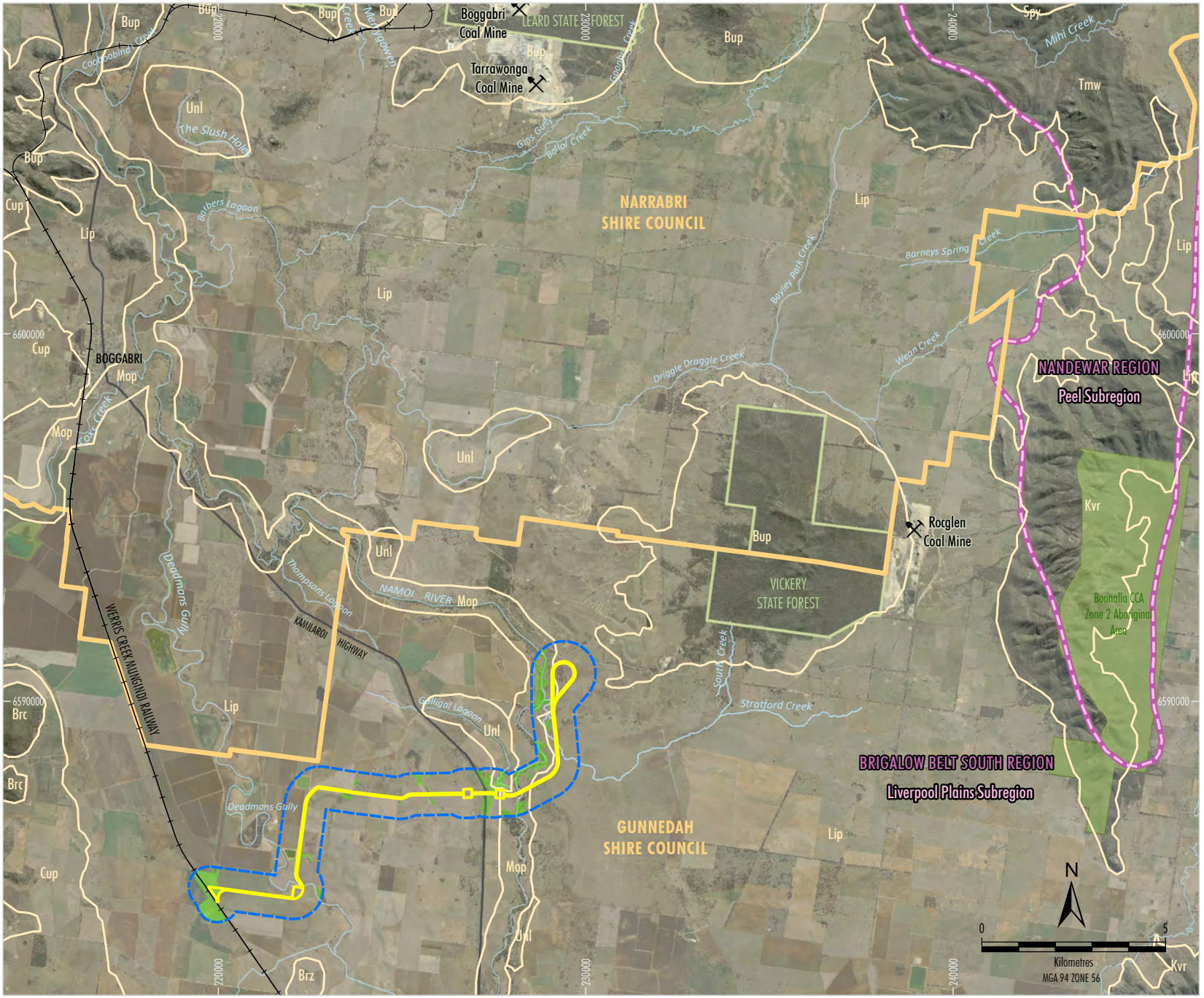
[1] Sourced from the 'Over-cleared Landscapes Database' within the NSW Vegetation Information System and Classification Database (OEH, 2017a).

3.1.3 Connectivity Value Score

Based on advice from OEH, the 'linear shaped developments or multiple fragmentation impacts (Major Project module)' in the OEH Credit Calculator was used to assess the landscape value score for the Project in consideration of the FBA (OEH, 2014a), *Framework for Biodiversity Assessment – Linear Module* (OEH, 2015a) and *Credit Calculator for Major Projects and BioBanking Operational Manual* (OEH, 2016a).

A connectivity value score is attributed to a development site to account for any removal in biodiversity links that may occur. Under the FBA (OEH, 2014a) connectivity is rated according to whether the Project impacts the following (in order of priority):

- a state significant biodiversity link;
- a regionally significant biodiversity link;
- very large area biodiversity link;
- large area biodiversity link; or
- local area biodiversity link.



LEGEND

- State Forest
- Aboriginal Area
- Local Government Boundary
- Biodiversity Assessment Report Development Site Footprint
- 550 m Assessment Buffer
- Native Vegetation Within Buffer
- IBRA Region
- IBRA Subregion

Mitchell Landscapes

- Brc Breeza Hills Basalt Caps
- Brz Breeza Hills Sandstone-Shale Slopes
- Bup Bugaldie Uplands
- Cup Cubbo Uplands
- Kvr Kelvin Range
- Lip Liverpool Alluvial Plains
- Mop Mooki - Namoi Channels and Floodplains
- Spy Split Yard Plateau
- Tmw Tamworth - Keepit Slopes and Plains
- Unl Upper Namoi Swamps and Lagoons

Source: Office of Environment and Heritage NSW (2015 and 2016); Orthophoto - Department of Land and Property Information, Aerial Photography (July 2011); FloraSearch (2018)

WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Location Map - Project Rail Spur

Figure 18

The FBA (OEH, 2014a) does defines State significant biodiversity links as:

- *a riparian buffer 50 metres (m) either side of a 6th order stream or higher; or*
- *a riparian buffer 50 m around an important wetland or an estuarine area.*

The BAR Footprint associated with the Project rail spur traverses (Figure 5).

- Namoi River (9th order stream);
- Deadmans Gully (5th order stream); and
- Stratford Creek (5th order stream).

Given the State significant biodiversity link category is triggered, assessments on lesser links (regionally significant biodiversity link, very large area biodiversity link, large area biodiversity link or local area biodiversity link) are not required.

3.1.4 Landscape Value Score

A 550 m assessment buffer from the outer edge of the BAR Footprint associated with the Project rail spur was created and changes due to the Project were assessed on the combined buffer and footprint areas (Figure 18). Figure 18 shows the extent of native vegetation in the buffer area, informed by FloraSearch (2018) and the *Border Rivers Gwydir/Namoi Regional Native Vegetation Mapping* (OEH, 2015b).

In order to determine the landscape value score for the BAR Footprint associated with the Project rail spur, the following landscape attributes were entered into the OEH Credit Calculator:

- percentage of native vegetation cover (6-10% before and 6-10% after);
- connectivity value (the connectivity value score is 12.5);
- patch size (Table 12); and
- area to perimeter ratio (38 before and 38 after).

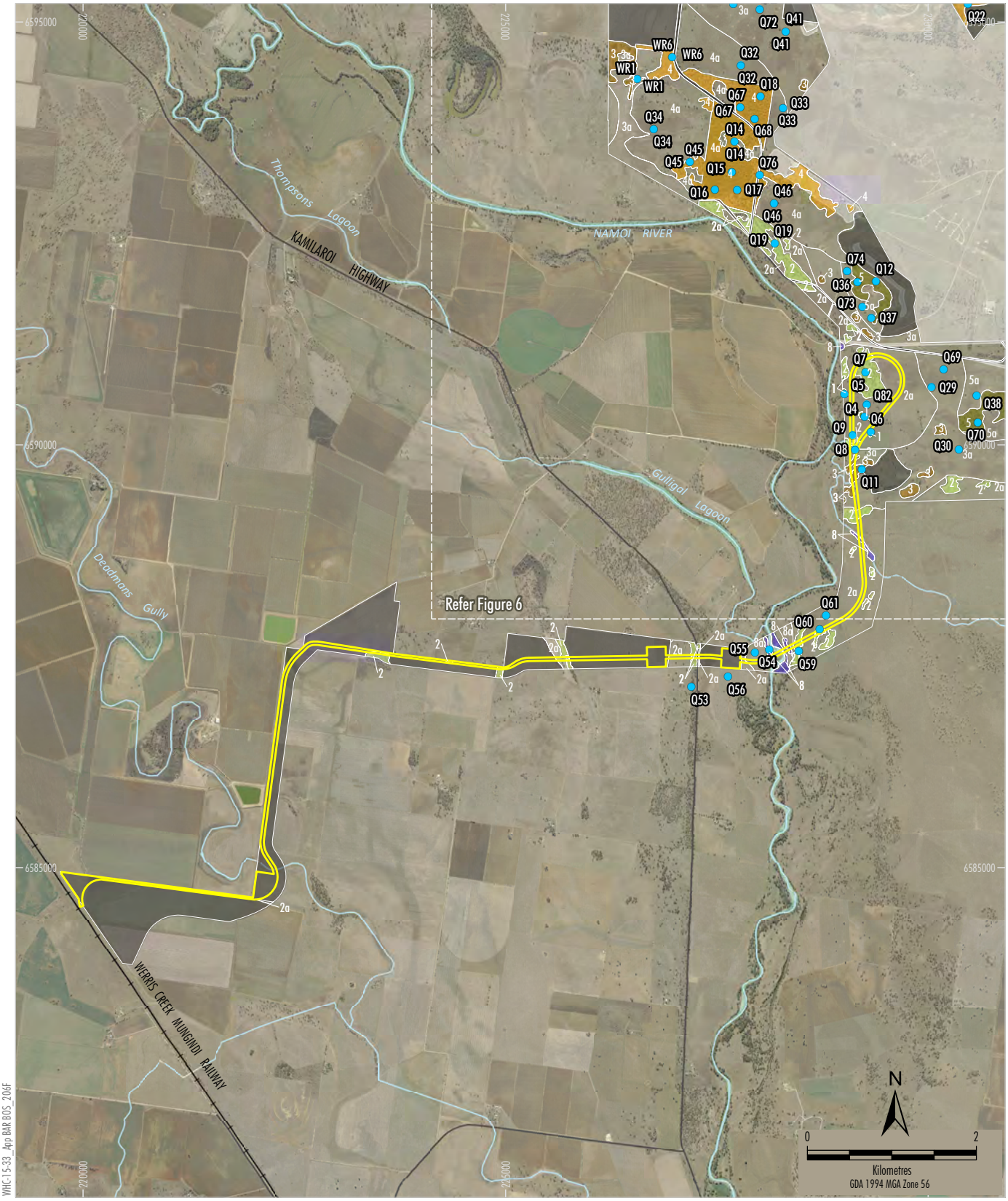
3.2 NATIVE VEGETATION

Native vegetation relevant to the BAR Footprint associated with the Project rail spur is described in this sub-section based on detailed flora survey work undertaken by FloraSearch (2018) (Attachment C).

3.2.1 Plant Community Types/Biometric Vegetation Types

FloraSearch (2018) (Attachment C) conducted flora surveys within the BAR Footprint associated with the Project rail spur and surrounds and developed vegetation community mapping. Quadrats were sampled by FloraSearch (2018) (Attachment C) over a wider study area covering the BAR Footprint associated with the Project rail spur (Figure 19). The locations of sample sites are given on Figure 19.

Vegetation communities were classified by FloraSearch (2018) (Attachment C) according to NSW BioMetric Vegetation Types (BVTs) and are shown on Figure 20. FloraSearch (2018) (Attachment C) provides detailed profiles of each vegetation community.



WHC-15-33_App BAR BOS_206F

LEGEND

- Approximate Extent of Approved Mine
- Biodiversity Assessment Report Development Site Footprint
- FBA Plot

Vegetation Communities

Semi-arid Woodlands (Grassy Sub-formation)
- 1 Weeping Myall Woodland (NA219)
- 2 Poplar Box Woodland on Alluvial Clay Soils (NA185)
- 2a Poplar Box Woodland on Alluvial Clay Soils (Secondary/derived grassland) (NA185)

Dry Sclerophyll Forests (Shrub/Grass Sub-formation)
- 3 Pilliga Box – Poplar Box Shrubby Woodland (NA324)
- 3a Pilliga Box – Poplar Box Shrubby Woodland (Secondary/derived grassland) (NA324)

Dry Sclerophyll Forests (Shrub/Grass Sub-formation)
- 4 White Box – Silver-leaved Ironbark Shrubby Open Forest (NA349)
- 4a White Box – Silver-leaved Ironbark Shrubby Open Forest (Secondary/derived grassland) (NA349)

Dry Sclerophyll Forests (Shrubby Sub-formation)
- 5 Narrow-leaved Ironbark – White Box Shrubby Forest (NA311)
- 5a Narrow-leaved Ironbark – White Box Shrubby Forest | (derived grassland) (NA311)

Forested Wetlands
- 8 River Red Gum Riparian Tall Woodland (NA193)
- 8a River Red Gum Riparian Tall Woodland (Secondary/derived grassland) (NA193)

Cleared Land
- DL Disturbed Land
- ^ Listed as Box Gum Woodland EEC/CEEC

Note: Vegetation communities 1, 5, 6 and 7 are not present in the Project Rail Spur.

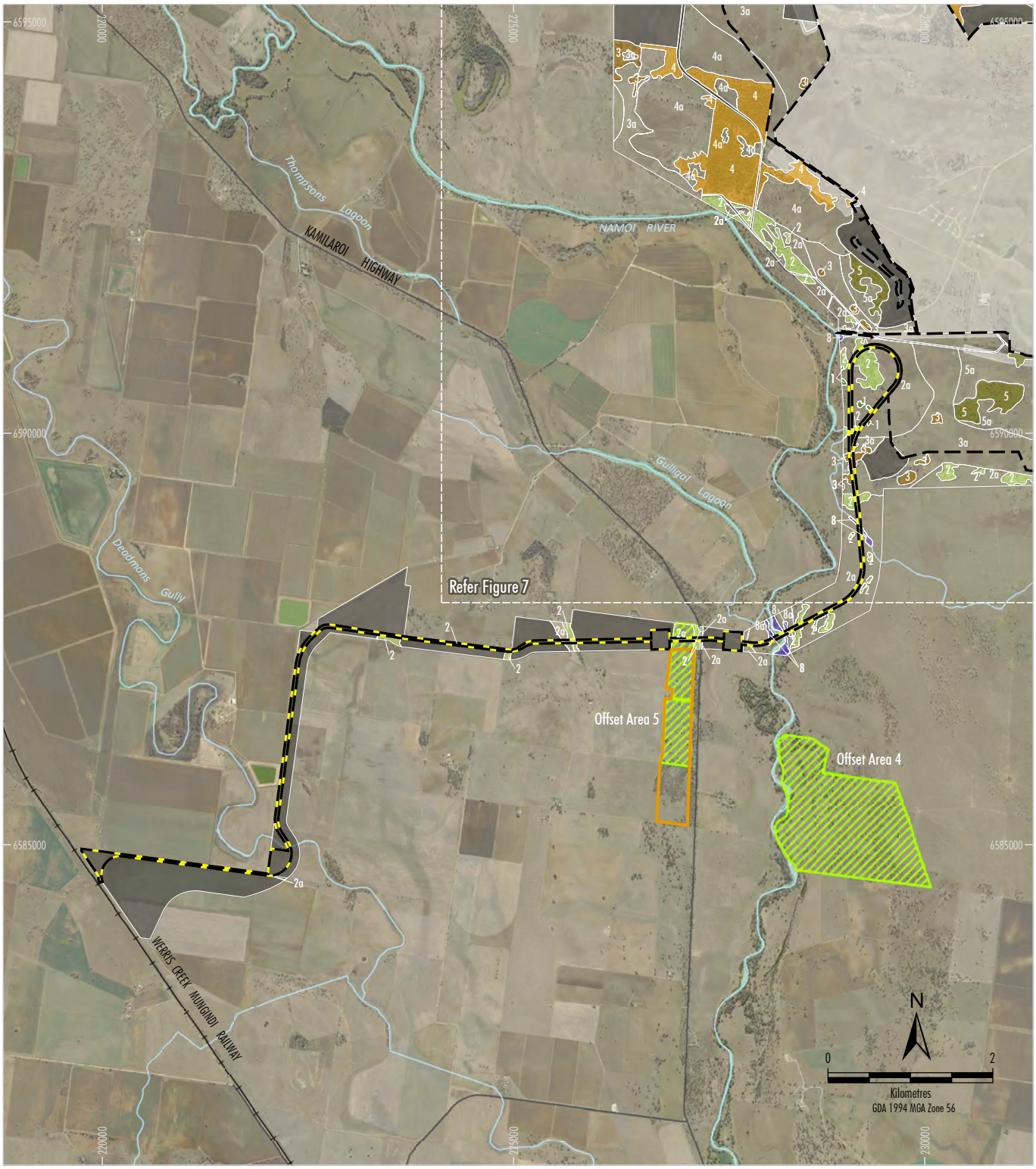
Source: Orthophoto - Department of Land and Property Information, Aerial Photography (July 2011); FloraSearch, (2018)

WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Flora Survey Sites - Project Rail Spur

Figure 19



WHC-15-33_App BAR BOS_2036

LEGEND

- Approximate Extent of Approved Mine
- Biodiversity Assessment Report Development Site Footprint
- Approximate Extent of Vickery Extension Project (EPBC 2016/7649) Footprint
- Existing Approved Offset Area for the Vickery Coal Mine
- Modified Offset Area 5

Vegetation Communities

Semi-arid Woodlands (Grassy Sub-formation)

- 1 Weeping Myall Woodland (NA219)
- 2 Poplar Box Woodland on Alluvial Clay Soils (NA185)
- 2a Poplar Box Woodland on Alluvial Clay Soils (Secondary/derived grassland) (NA185)

Dry Sclerophyll Forests (Shrub/Grass Sub-formation)

- 3 Pilliga Box – Poplar Box Shrubby Woodland (NA324)
- 3a Pilliga Box – Poplar Box Shrubby Woodland (Secondary/derived grassland) (NA324)

Dry Sclerophyll Forests (Shrub/Grass Sub-formation)

- 4 White Box – Silver-leaved Ironbark Shrubby Open Forest (NA349)
- 4a White Box – Silver-leaved Ironbark Shrubby Open Forest (Secondary/derived grassland) (NA349)

Dry Sclerophyll Forests (Shrubby Sub-formation)

- 5 Narrow-leaved Ironbark – White Box Shrubby Forest (NA311)
- 5a Narrow-leaved Ironbark – White Box Shrubby Forest (Secondary/derived grassland) (NA311)

Forested Wetlands

- 8 River Red Gum Riparian Tall Woodland (NA193)
- 8a River Red Gum Riparian Tall Woodland (Secondary/derived grassland) (NA193)

Cleared Land

- DL Disturbed Land

Note: Vegetation communities 1, 5, 6 and 7 are not present in the Project Rail Spur

Source: Orthophoto - Department of Land and Property Information, Aerial Photography (July 2011); FloraSearch (2018)

WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Vegetation Communities - Project Rail Spur

Figure 20

The area of each BVT and the percentage of the BVT cleared in NSW (from the NSW VIS Classification Database [OEH, 2017a]) are provided in Table 13. In summary, the BAR Footprint associated with the Project rail spur is 82.7 ha in size comprising 5.7 ha of generally fragmented native woodland/forest vegetation and 23 ha of secondary/derived native grassland (Table 13; Figure 20). The remaining 54 ha consists of previously cleared land comprising exotic grassland or land with no vegetation cover.

Table 13
Vegetation Communities in the BAR Footprint Associated with the Project Rail Spur

#	Vegetation Community	BVT	PCT		Area (ha)	% Cleared in Namoi*
Semi-arid Woodlands Formation (Grassy Sub-formation)						
2	Poplar Box Woodland on Alluvial Clay Soils	NA185	101	Poplar Box - Yellow Box - Western Grey Box grassy woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion	3.5	75
2a	Poplar Box Woodland on Alluvial Clay Soils (secondary/derived grassland)				18.5	
Dry Sclerophyll Forests Formation (Shrub/Grass Sub-formation)						
3	Pilliga Box – Poplar Box Shrubby Woodland	NA324	397	Poplar Box - White Cypress Pine shrub grass tall woodland of the Pilliga - Warialda region, Brigalow Belt South Bioregion	1.2	45
3a	Pilliga Box – Poplar Box Shrubby Woodland (secondary/derived grassland)				2.8	
Forested Wetlands Formation						
8	River Red Gum Riparian Tall Woodland	NA193	78	River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	1	75
8a	River Red Gum Riparian Tall Woodland (secondary/derived grassland)				1.7	
				Total	**28.7**	-
				Disturbed Land	**54**	
				Overall Total BAR Footprint Associated with the Rail Spur	**82.7**	

Note: Numbering of vegetation communities as per Attachment C, Table 4. Vegetation Communities 1, 4, 5, 6 and 7 do not occur in the BAR Footprint associated with the Project rail spur.

* OEH (2017a).

Secondary/derived native grasslands are grasslands that have developed after clearing of the original vegetation (Keith, 2004; Benson, 1996). FloraSearch (2018) (Attachment C) describes that the secondary/derived native grasslands occur as a result of native grassland species that have recolonised land that has been previously cultivated (e.g. via windblown or animal carried seed) or are native grasslands that remain after removal of the woody canopy vegetation (shrubs and trees).

Section 5.2.1.11 of the FBA (2014) requires 'derived or secondary vegetation communities' to be assigned to the original PCT (i.e. the original woodland/forest that would have likely occurred prior to clearing) as done by FloraSearch (2018) (Attachment C). FloraSearch (2018) (Attachment C) describes that the secondary/derived native grasslands of a particular PCT in the study area are all in a similar condition (i.e. it was not possible to separate the secondary/derived native grasslands into separate vegetation zones based on condition).

The Project rail spur would traverse the northern portion of the Offset Area 5 (Figure 19). It is proposed that the boundary of Offset Area 5 is revised to include further habitat to the south of the current Offset Area 5 boundary (Figure 20). The proposed change to Offset Area 5 is further described in Section 6.2.2.6.

3.2.2 Threatened Ecological Communities

No threatened ecological communities listed under the BC Act or EPBC Act occur in the BAR Footprint associated with the Project rail spur.

The OEH Credit Calculator recognised NA185 as potentially representing an occurrence of the Artesian Springs Ecological Community listed under the BC Act, however the occurrence of NA185 in the BAR Footprint does not equate to this community as the Approved Mine and the Project lie outside of the Great Artesian Basin.

3.2.3 Vegetation Zones

The vegetation communities described in Section 3.2.1 were grouped into vegetation zones according to their condition. Table 14 outlines the vegetation zones present in the BAR Footprint associated with the Project rail spur, the relevant BVT, condition, site value score (i.e. the quantitative measure of vegetation condition), area and patch size.

Table 14
Vegetation Zones Associated with the Project Rail Spur

Vegetation Zone Number*	Vegetation Community	BVT	Condition Class and Sub-category	Site Value Score	Area (ha)	Patch Size (ha)
Semi-arid Woodlands (Grassy Sub-formation)						
1	2 Poplar Box Woodland on Alluvial Clay Soils	NA185	Moderate/Good	67.76	3.5	>1,000
2	2a Poplar Box Woodland on Alluvial Clay Soils (secondary/derived grassland)		Moderate/Good_DNG	78.69	18.5	>1,000
Dry Sclerophyll Forests (Shrub/Grass Sub-formation)						
3	3 Pilliga Box – Poplar Box Shrubby Woodland	NA324	Moderate/Good	65.62	1.2	>1,000
4	3a Pilliga Box – Poplar Box Shrubby Woodland (secondary/derived grassland)		Moderate/Good_DNG	21.35	2.8	>1,000
Forested Wetlands						
5	8a River Red Gum Riparian Tall Woodland	NA193	Moderate/Good	46.65	1	>1,000
6	8a River Red Gum Riparian Tall Woodland (secondary/derived grassland)		Moderate/Good_DNG	12.02	1.7	>1,000
			Total		**28.7**	

Notes: Numbering of vegetation communities as per Attachment C. Vegetation Communities 1, 4, 5, 6 and 7 do not occur in the BAR Footprint associated with the Project rail spur.

* Vegetation zone numbers derived from the credit report (Attachment F).

The patch size for each vegetation zone was greater than 1,000 ha (i.e. connecting with vegetation outside of the BAR Footprint associated with the Project rail spur, mostly secondary/derived native grasslands in moderate to good condition) (Table 14). All vegetation zones are in moderate to good condition (according to the FBA definition) and there is one vegetation zone with a current site value score less than 17, namely Zone 6 (12.02) (Table 14).

3.2.4 Vegetation Condition

In addition to collecting floristic cover abundance data, biometric data were collected by FloraSearch (2018) (Attachment C) at each FBA quadrat location (Figure 19). The plot and transect data are provided in Attachment C.

3.2.5 Vegetation Impacts that Require Further Consideration

Each of the threatened ecological communities listed in Section 2.2.5 were targeted during surveys of the Project rail spur and none were recorded (Attachment C). Therefore there are no vegetation impacts requiring further consideration.

3.3 THREATENED SPECIES

Threatened species relevant to the Project rail spur are identified in this sub-section.

3.3.1 Habitat Features for Particular Species Credit Species

Habitat features from the OEH Credit Calculator are listed in Table 15, along with the relevance of the habitat features to the BAR Footprint associated with the Project rail spur.

Table 15
Threatened (Species Credit) Species Habitat Features Associated with the Project Rail Spur

Common Name	Scientific Name	Conservation Status[1]		Habitat Feature	Relevance
		BC Act	EPBC Act		
Flora					
-	*Cyperus conicus*	E	-	Wetlands and wet run on areas.	**Not relevant.** FloraSearch (2018) (Attachment C) states that *Cyperus conicus* grows in sandy soils which are not present.
Belson's Panic	*Homopholis belsonii*	E	V	Dry woodland on poor soils or areas of basalt capping over sandstone.	Potentially relevant.
Austral Toadflax	*Thesium australe*	V	V	Coastal headlands, grassland, grassy open forest or woodland on fertile or moderately fertile soils.	**Not relevant.** FloraSearch (2018) (Attachment C) states that the Austral Toad-flax is highly unlikely to occur on the study area as Kangaroo Grass is very uncommon.
Reptiles					
Pale-headed Snake	*Hoplocephalus bitorquatus*	V	-	Land within 40 m of watercourses, containing hollow-bearing trees, loose bark and/or fallen timber.	Potentially relevant.

Table 15 (Continued)
Threatened (Species Credit) Species Habitat Features Associated with the Project Rail Spur

Common Name	Scientific Name	Conservation Status[1]		Habitat Feature	Relevance
		BC Act	EPBC Act		
Birds					
Black-breasted Buzzard	*Hamirostra melanosternon*	V	-	Land within 40 m of riparian woodland on inland watercourses/waterholes containing dead or dying eucalypts.	Potentially relevant.
Black-necked Stork	*Ephippiorhynchus asiaticus*	E	-	Land within 40 m of freshwater or saline wetlands (e.g. saltmarsh, mangroves, mudflats, swamps, billabongs, floodplains, watercourse pools, wet heathland and/or farm dams).	Potentially relevant.
Grey Falcon	*Falco hypoleucos*	E	-	Land within 100 m of riparian woodland on inland rivers containing mature living eucalypts or isolated paddock trees overhanging water or dry watercourses.	Potentially relevant.
Mammals					
Brush-tailed Rock-wallaby	*Petrogale penicillata*	E	V	Rocky outcrops/cliffs in Pilliga (Part A) CMA subregion.	**Not relevant.** No rocky outcrops/cliffs occur within the BAR Footprint associated with the Project rail spur. Future Ecology (2018) (Attachment D) did not record this species during the fauna surveys.
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	V	Land containing escarpments, cliffs, caves, deep crevices, old mine shafts or tunnels.	**Habitat feature not relevant.** There is no breeding habitat for the Large-eared Pied Bat within the BAR Footprint associated with the Project rail spur.

[1] Threatened fauna species status under the BC Act and/or EPBC Act (current as at July 2018).

V = Vulnerable; E = Endangered.

3.3.2 Targeted Surveys for Threatened Species

The FBA (OEH, 2014a) only requires targeted surveys for threatened fauna species which are species credit species because ecosystem credit species are predicted to occur solely based on habitat. All threatened flora species are species credit species; therefore, targeted surveys are required. A list of candidate species credit species requiring survey has been determined by the OEH Credit Calculator (Table 16).

All potentially occurring threatened species listed under the EPBC Act were also targeted during the surveys as described further below as well as in Attachments C and D.

Table 16
Threatened (Species Credit) Species Requiring Survey and Timing Associated with the Project Rail Spur

Common Name	Scientific Name	Conservation Status[1]		Survey Timing											
		BC Act	EPBC Act	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Flora															
Native Milkwort	*Polygala linariifolia*	E	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bluegrass	*Dichanthium setosum*	V	V	Yes	Yes	Yes	Yes	Yes							Yes
Scant Pomaderris	*Pomaderris queenslandica*	E	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Belson's Panic	*Homopholis belsonii*	E	V	Yes	Yes	Yes	Yes								Yes
Slender Darling Pea	*Swainsona murrayana*	V	V	Yes	Yes							Yes	Yes	Yes	Yes
-	*Tylophora linearis*	V	E	Yes	Yes	Yes	Yes	Yes				Yes	Yes	Yes	Yes
Finger Panic Grass	*Digitaria porrecta*	E	-	Yes	Yes	Yes	Yes	Yes							Yes
Austral Toadflax	*Thesium australe*	V	V	Yes	Yes							Yes	Yes	Yes	Yes
Cyperus conicus	*Cyperus conicus*	E	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Reptiles															
Pale-headed Snake	*Hoplocephalus bitorquatus*	V	-	Yes	Yes	Yes	Yes						Yes	Yes	Yes
Birds															
Black-necked Stork	*Ephippiorhynchus asiaticus*	E	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Black-breasted Buzzard	*Hamirostra melanosternon*	V	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Grey Falcon	*Falco hypoleucos*	E	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regent Honeyeater	*Anthochaera phrygia*	CE	CE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 16 (Continued)
Threatened (Species Credit) Species Requiring Survey and Timing Associated with the Project Rail Spur

Common Name	Scientific Name	Conservation Status[1]		Survey Timing											
		BC Act	EPBC Act	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mammals															
Koala	*Phascolarctos cinereus*	V	V	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Squirrel Glider	*Petaurus norfolcensis*	V	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Eastern Pygmy-possum	*Cercartetus nanus*	V	-	Yes	Yes	Yes	Yes					Yes	Yes	Yes	Yes
Brush-tailed Rock-wallaby	*Petrogale penicillata*	E	V	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	V	Yes	Yes	Yes	Yes					Yes	Yes	Yes	Yes

LEGEND | | Surveyed during the investigation in the vicinity of the Project rail spur by FloraSearch (2018) (Attachment C) and Future Ecology (2018) (Attachment D).

Note: the Highlighted month is the month in which targeted surveys were undertaken for the relevant species.

[1] Threatened fauna species status under the BC Act and/or EPBC Act (current as at July 2018).

V = Vulnerable; E = Endangered; CE = Critically Endangered.

3.3.2.1 *Targeted Surveys for Threatened Flora Species*

Random meanders were used to search for threatened flora species (FloraSearch, 2018). The random meanders conducted by FloraSearch (2018) were targeted to the known habitats of the relevant threatened species. A detailed description of the targeted searches for threatened flora species is provided in Attachment C.

3.3.2.2 *Targeted Surveys for Threatened Fauna Species*

Threatened fauna species listed under the BC Act and/or EPBC Act, which are known or likely to occur in the locality, were specifically targeted during the surveys by Future Ecology (2018). Threatened fauna species were targeted in accordance with the survey timing, techniques and effort described within the following survey guidelines:

- *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft)* (DEC, 2004).
- *Threatened Species Survey and Assessment Guidelines: Field Survey Methods For Fauna – Amphibians* (DECC, 2009).
- *Survey Guidelines for Australia's Threatened Frogs* (DEWHA, 2010c).
- *Survey Guidelines for Australia's Threatened Bats* (DEWHA, 2010a).
- *Survey Guidelines for Australia's Threatened Birds* (DEWHA, 2010b).
- *Survey Guidelines for Australia's Threatened Mammals* (SEWPaC, 2011b).
- *Survey Guidelines for Australia's Threatened Reptiles* (SEWPaC, 2011a).

A detailed description of the targeted searches for threatened fauna species is provided in Attachment D.

3.3.3 Ecosystem Credit Species

A total of 29 ecosystem credit species are listed in Table 17 from the OEH Credit Calculator, three of which have been recorded within the BAR Footprint associated with the Project rail spur, namely the Painted Honeyeater, Grey-crowned Babbler and Yellow-bellied Sheathtail-bat (Figure 21). No ecosystem credit species were removed from (turned off in) the OEH Credit Calculator.

Table 18 identifies the vegetation zones along with the associated ecosystem credit species that have been identified as having the lowest T_G value for that zone (for all zones the lowest T_G is 0.325 for Masked Owl or Barking Owl). The species with the lowest T_G value influences the offset multiplier designated to each vegetation zone.

Table 17
Ecosystem Species from the OEH Credit Calculator Associated with the Project Rail Spur

Common Name	Scientific Name	Conservation Status[1]		TS Offset Multiplier	T_G Value*	Presence in the BAR Footprint associated with the Project Rail Spur
		BC Act	EPBC Act			
Birds						
Malleefowl	*Leipoa ocellata*	E	V	2.6	0.375	Recorded in the locality (Table 6)
Freckled Duck	*Stictonetta naevosa*	V	-	1.3	0.75	No records in the locality
Magpie Goose	*Anseranas semipalmata*	V	-	1.3	0.75	No records in the locality
Square-tailed Kite	*Lophoictinia isura*	V	-	1.4	0.725	Recorded in the locality (Table 6)
Spotted Harrier	*Circus assimilis*	V	-	1.4	0.725	Recorded in the locality (Table 6)
Little Eagle	*Hieraaetus morphnoides*	V	-	1.4	0.725	Recorded in the locality (Table 6)
Brolga	*Grus rubicunda*	V	-	1.3	0.75	Recorded in the locality (Table 6)
Australian Painted Snipe	*Rostratula australis*	E	E	1.3	0.75	Recorded in the locality (Table 6)
Bush Stone-curlew	*Burhinus grallarius*	E	-	2.6	0.375	No records in the locality
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	V	-	1.8	0.55	Recorded in the locality (Table 6)
Little Lorikeet	*Glossopsitta pusilla*	V	-	1.8	0.575	Recorded in the locality (Table 6)
Turquoise Parrot	*Neophema pulchella*	V	-	1.8	0.55	Recorded in the locality (Table 6)
Swift Parrot	*Lathamus discolor*	E	CE	1.3	0.75	Recorded in the locality (Table 6)
Masked Owl	*Tyto novaehollandiae*	V	-	3.0	0.325	Recorded in the locality (Table 6)
Barking Owl	*Ninox connivens*	V	-	3.0	0.325	Recorded in the locality (Table 6)
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	V	-	2.0	0.5	Recorded in the locality (Table 6)
Speckled Warbler	*Chthonicola sagittata*	V	-	2.6	0.375	Recorded in the locality (Table 6)
Black-chinned Honeyeater (eastern subspecies)	*Melithreptus gularis gularis*	V	-	1.3	0.75	Recorded in the locality (Table 6)
Painted Honeyeater	*Grantiella picta*	V	V	1.3	0.75	Recorded in the BAR footprint associated with the Project rail spur (Table 6)
Hooded Robin (south-eastern form)	*Melanodryas cucullata cucullata*	V	-	1.7	0.6	Recorded in the locality (Table 6)
Scarlet Robin	*Petroica boodang*	V	-	1.3	0.75	No records in the locality
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis temporalis*	V	-	1.3	0.75	Recorded in the BAR footprint associated with the Project rail spur (Table 6)

Table 17 (Continued)
Ecosystem Species from the OEH Credit Calculator Associated with the Project Rail Spur

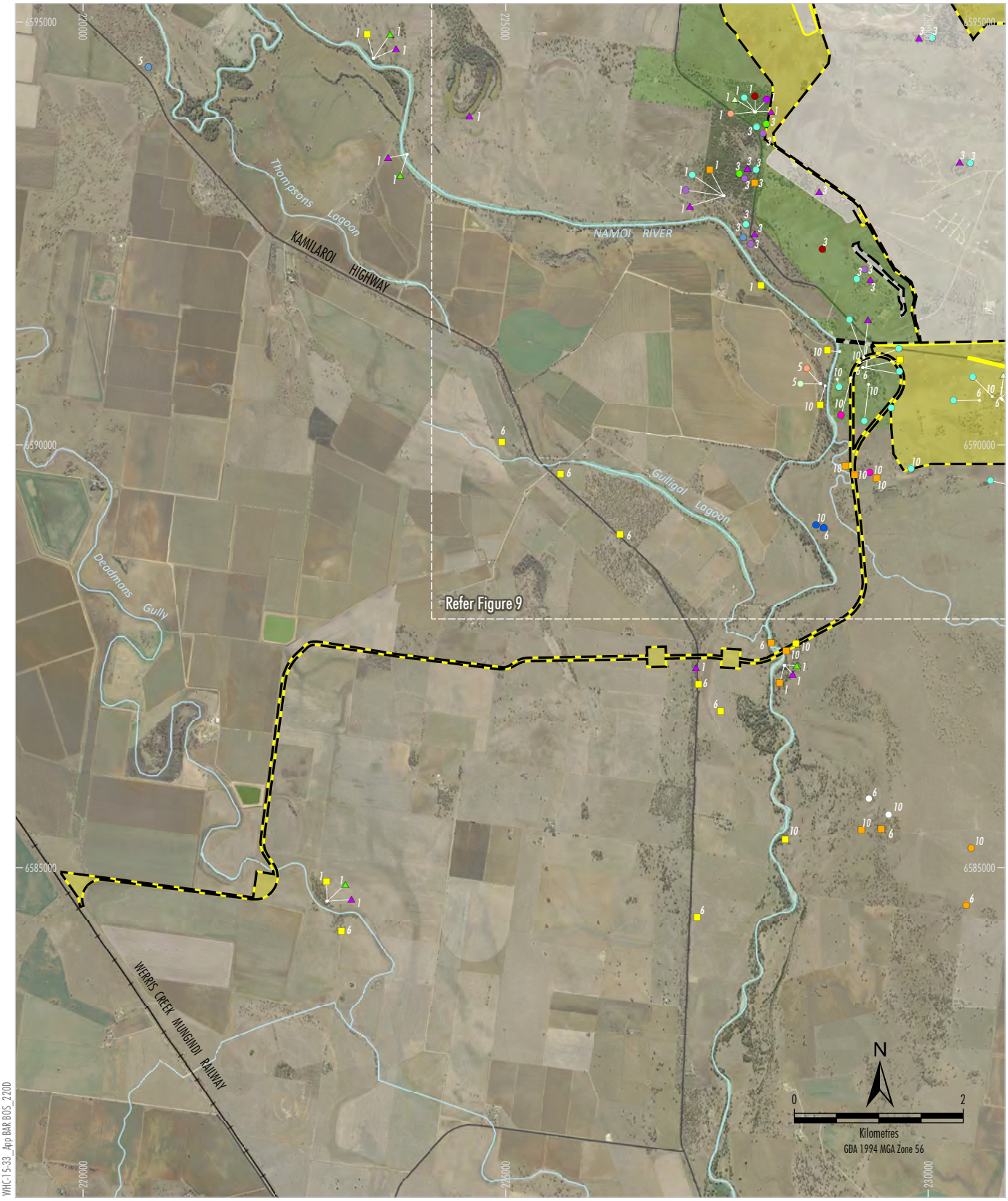
Common Name	Scientific Name	Conservation Status[1]		TS Offset Multiplier	T_G Value*	Presence in the BAR Footprint associated with the Project Rail Spur
		BC Act	EPBC Act			
Birds (Continued)						
Varied Sittella	*Daphoenositta chrysoptera*	V	-	1.3	0.75	Recorded in the locality (Table 6)
Diamond Firetail	*Stagonopleura guttata*	V	-	1.3	0.75	Recorded in the locality (Table 6)
Mammals						
Spotted -tail Quoll	*Dasyurus maculatus maculatus*	V	E	2.6	0.375	Recorded in the locality (Table 6)
Pilliga Mouse	*Pseudomys pilligaensis*	V	V	2.6	0.375	No records in the locality
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	V	-	2.2	0.45	Recorded in the BAR footprint associated with the Project rail spur (Table 6)
Corben's Long-eared Bat	*Nyctophilus corbeni*	V	V	2.1	0.475	Recorded in the locality (Table 6)
Little Pied Bat	*Chalinolobus picatus*	V	-	2.1	0.475	Recorded in the locality (Table 6)

Highlighted species have been recorded in the BAR Footprint associated with the Project rail spur. Records shown on Figure 21.
TS Offset Multiplier = a species specific multiplier used to determine the extent of habitat required to be located within the offset area.
T_G Value = the ability of a species to respond to improvement in site value or other habitat improvement at an offset site with management actions (OEH, 2016a).
* *Archived BioMetric and Threatened Species Profiles Datasets* (OEH, 2017b).
[1] Threatened fauna species status under the BC Act and/or EPBC Act (current as at July 2018).
V = Vulnerable; E = Endangered, CE = Critically Endangered

Table 18
Vegetation Zones and Predicted Threatened Species which Influence the Offset Required for Each Vegetation Zone Associated with the Project Rail Spur

Vegetation Zone Number	Vegetation Community	BVT	Predicted Threatened Species with Lowest T_G Value	Species T_G Value
Semi-arid Woodlands (Grassy Sub-formation)				
1	2a Poplar Box Woodland on Alluvial Clay Soils	NA185	Masked Owl	0.325
2	2a Poplar Box Woodland on Alluvial Clay Soils (secondary/derived grassland)		Masked Owl	0.325
Dry Sclerophyll Forests (Shrub/Grass Sub-formation)				
3	3 Pilliga Box – Poplar Box Shrubby Woodland	NA324	Barking Owl	0.325
4	3a Pilliga Box – Poplar Box Shrubby Woodland (secondary/derived grassland)		Barking Owl	0.325
Forested Wetlands				
5	8 River Red Gum Riparian Tall Woodland	NA193	Masked Owl	0.325
6	8a River Red Gum Riparian Tall Woodland (secondary/derived grassland)		Masked Owl	0.325

Note: Numbering of vegetation communities as per Attachment C. Vegetation Communities 1, 4, 5, 6 and 7 do not occur in the BAR Footprint associated with the Project rail spur.



WHC-15-33_App BAR BOS_2200

LEGEND

- Approximate Extent of Approved Mine
- Biodiversity Assessment Report
- Development Site Footprint
- Approximate Extent of Vickery Extension Project (EPBC 2016/7649) Footprint
- Local Biodiversity Enhancement Measures

Threatened Fauna

- Black Falcon
- Square-tailed Kite
- Spotted Harrier
- Little Eagle
- Little Lorikeet
- Turquoise Parrot
- Barking Owl
- Brown Treecreeper (eastern subspecies)
- Speckled Warbler
- Painted Honeyeater
- Grey-crowned Babbler (eastern subspecies)
- Varied Sittella
- Dusky Woodswallow
- Diamond Firetail
- Koala
- Squirrel Glider
- Yellow-bellied Sheathtail-bat
- Eastern Bentwing-bat
- Corben's Long-eared Bat
- Large-eared Pied Bat
- Eastern Cave Bat

Source
(1) Future Ecology (2018)
(5) Birdlife (2016)
(6) OEH (2017)
(7) Parsons Brinckerhoff (2010)

Note: Sources 2 to 4 are not shown on this figure.

Note: The Masked Owl, Little Lorikeet, Brown Treecreeper, Diamond Firetail and Yellow-bellied Sheathtail-bat were also recorded within the locality however coordinates were not provided.

Source: Orthophoto - Department of Land and Property Information, Aerial Photography (July 2011)

WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Threatened Fauna Records - Project Rail Spur

Figure 21

3.3.4 Species Credit Species

Two species credit species (as defined by the FBA) have been recorded inside the BAR Footprint associated with the Project rail spur during past or previous surveys, namely the Koala and Squirrel Glider. A third species credit species is included in the species credit calculation for the BAR Footprint, namely, the Regent Honeyeater (*Anthochaera phrygia*) (Table 19).

Table 19
Species Credit Species in the Credit Calculation for the BAR Footprint Associated with the Project Rail Spur

Species	Conservation Status[1]		Loss of Potential Habitat (ha) (Table 20)
	BC Act	EPBC Act	
Regent Honeyeater	CE	CE	4.5
Squirrel Glider	V	-	2.2
Koala	V	V	5.7

[1] Threatened fauna species status under the BC Act and/or EPBC Act (current as at July 2018).

V = Vulnerable; CE = Critically Endangered

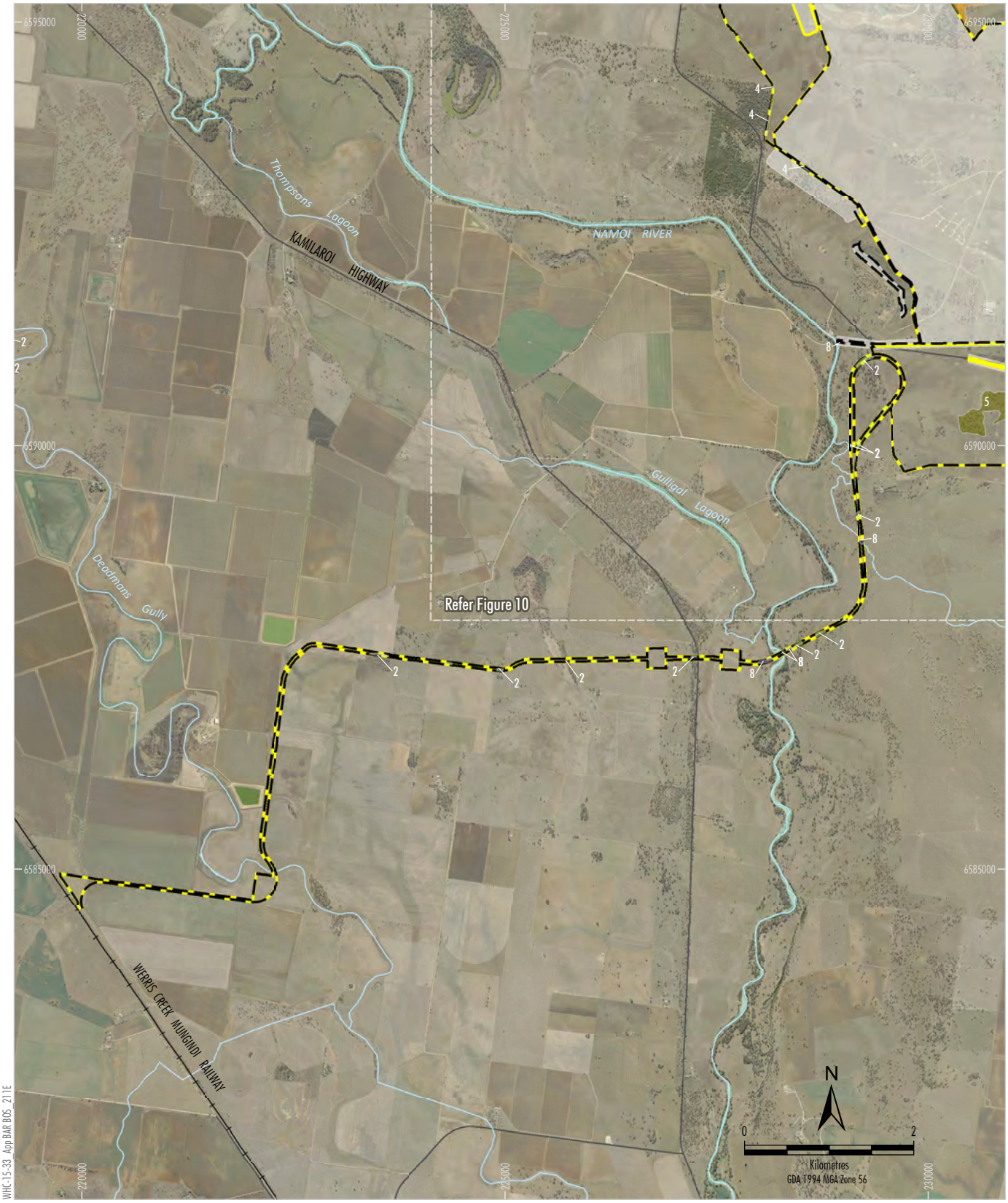
Species polygons (i.e. potential habitat extent) for the species credit species listed in Table 19 have been prepared in accordance with the FBA (OEH, 2014a). Table 20 details the area of habitat for the fauna species in the BAR Footprint associated with the Project rail spur based on vegetation communities.

Table 20
Vegetation Types Representing Potential Habitat for Species Credit Species in the BAR Footprint Associated with the Project Rail Spur

#	Community	BVT	Regent Honeyeater Potential Habitat (ha)	Squirrel Glider Potential Habitat (ha)	Koala Potential Habitat (ha)
2	Poplar Box Woodland on Alluvial Clay Soils	NA185	3.5	N/A	3.5
3	Pilliga Box – Poplar Box Shrubby Woodland	NA324	N/A	1.2	1.2
8	River Red Gum Riparian Tall Woodland	NA193	1	1	1
		Total	**4.5**	**2.2**	**5.7**
		Credit Requirement	**346**	**48**	**148**

Regent Honeyeater (Anthochaera phrygia)

The Regent Honeyeater has not been recorded in the BAR Footprint associated with the Project rail spur. The extent of potential habitat (species polygons) for the Regent Honeyeater in the BAR Footprint associated with the Project rail spur (and Vickery Extension Project [EPBC 2016/7649] Footprint) is shown on Figure 22. There are no records of the Regent Honeyeater in the BAR Footprint associated with the Project rail spur or immediate surrounds (Figure 11).



LEGEND

Approximate Extent of Approved Mine

Approximate Extent of Vickery Extension Project (EPBC 2016/7649) Footprint

Potential Habitat

- 2 Poplar Box Woodland on Alluvial Clay Soils (NA185)
- 4 White Box – Silver-leaved Ironbark Shrubby Open Forest (NA349)
- 5 Narrow-leaved Ironbark – White Box Shrubby Forest (NA311)
- 8 River Red Gum Riparian Tall Woodland (NA193)
- Scattered Trees

Source: Orthophoto - Department of Land and Property Information, Aerial Photography (July 2011); FloraSearch (2018)

WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Regent Honeyeater Potential Habitat - Project Rail Spur

Figure 22

Consistent with the *Archived BioMetric and Threatened Species Profiles Datasets* (OEH, 2017b), the following vegetation communities which have been recorded in the BAR Footprint associated with the Project rail spur are potential habitat for the Regent Honeyeater (Figure 22):

- Poplar Box Woodland on Alluvial Clay Soils (NA185); and
- River Red Gum Riparian Tall Woodland (NA193).

None of the cleared land in the BAR Footprint associated with the Project rail spur provides potential habitat for the Regent Honeyeater. Based on the above, there are approximately 4.5 ha of potential habitat for the Regent Honeyeater in the BAR Footprint associated with the Project rail spur (Table 20; Figure 22).

Koala (Phascolarctos cinereus)

The Koala was recorded in the BAR Footprint associated with the Project rail spur. The extent of potential habitat (species polygons) for the Koala in the BAR Footprint associated with the Project rail spur (and Vickery Extension Project [EPBC 2016/7649] Footprint) is shown on Figure 23, along with records of the species. Koala records in the vicinity of the Project rail spur are shown on Figure 23. The landscape distribution of Koala records in the *BioNet Atlas of NSW Wildlife* (OEH, 2017c) is shown on Figure 14.

The following vegetation communities provide potential habitat for the Koala in the BAR Footprint associated with the Project rail spur (Figure 23):

- Pilliga Box – Poplar Box Shrubby Woodland (NA324);
- River Red Gum Riparian Tall Woodland (NA193); and
- Poplar Box Woodland on Alluvial Clay Soils (NA185).

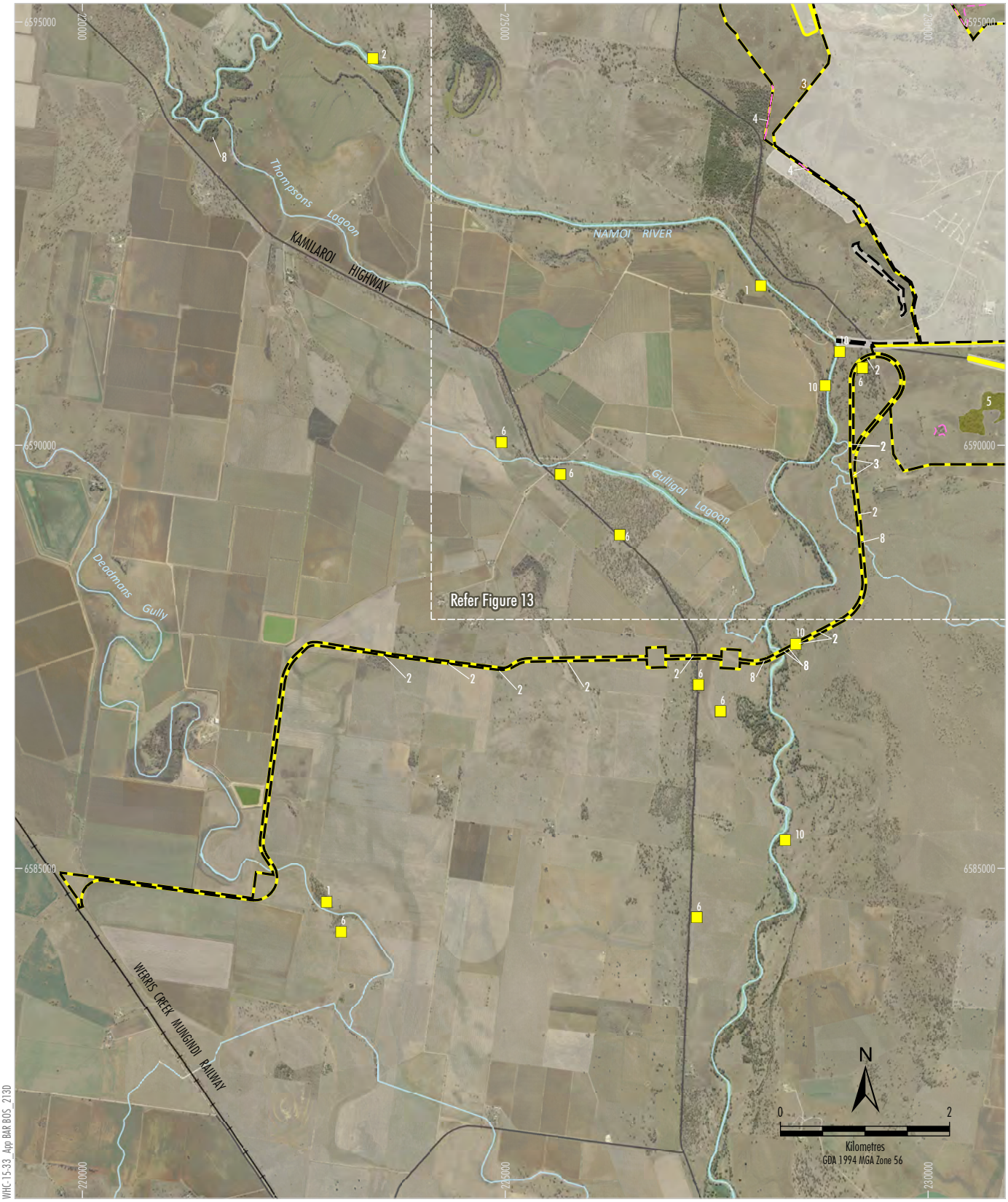
Based on the above, there are approximately 5.7 ha of potential habitat for the Koala in the BAR Footprint associated with the Project rail spur (Table 20; Figure 23). None of the cleared land in the BAR Footprint associated with the Project rail spur provides potential habitat for the Koala.

Squirrel Glider (Petaurus norfolcensis)

The Squirrel Glider was recorded in the BAR Footprint associated with the Project rail spur. The extent of potential habitat (species polygons) for the Squirrel Glider in the BAR Footprint associated with the Project rail spur is shown on Figure 24, along with records of the species. Consistent with the *Archived BioMetric and Threatened Species Profiles Datasets* (OEH, 2017b), the following vegetation communities would provide habitat for the Squirrel Glider:

- Pilliga Box – Poplar Box Shrubby Woodland (NA324); and
- River Red Gum Riparian Tall Woodland (NA193).

Based on the above, there are approximately 2.2 ha of potential habitat for the Squirrel Glider in the BAR Footprint associated with the Project rail spur (Table 20; Figure 24). None of the cleared land in the BAR Footprint associated with the Project rail spur provides potential habitat for the Squirrel Glider.



WHC-15-33_App BAR BOS_2130

LEGEND

- Approximate Extent of Approved Mine
- Approximate Extent of Vickery Extension Project (EPBC 2016/7649) Footprint
- Biodiversity Assessment Report Development Site Footprint
- Koala

Potential Habitat

- 2 Poplar Box Woodland on Alluvial Clay Soils (NA185)
- 3 Pilliga Box – Poplar Box Shrubby Woodland (NA324)
- 4 White Box – Silver-leaved Ironbark Shrubby Open Forest (NA349)
- 5 Narrow-leaved Ironbark – White Box Shrubby Forest (NA311)
- 8 River Red Gum Riparian Tall Woodland (NA193)
- NA349 that does not Provide Habitat for Koala

* Provisional vegetation mapping west of the Kamilaroi Highway based on airphoto interpretation

Source
(1) Future Ecology (2018)
(6) OEH (2017)
(10) Kendall&Kendall Ecological Services (2011)

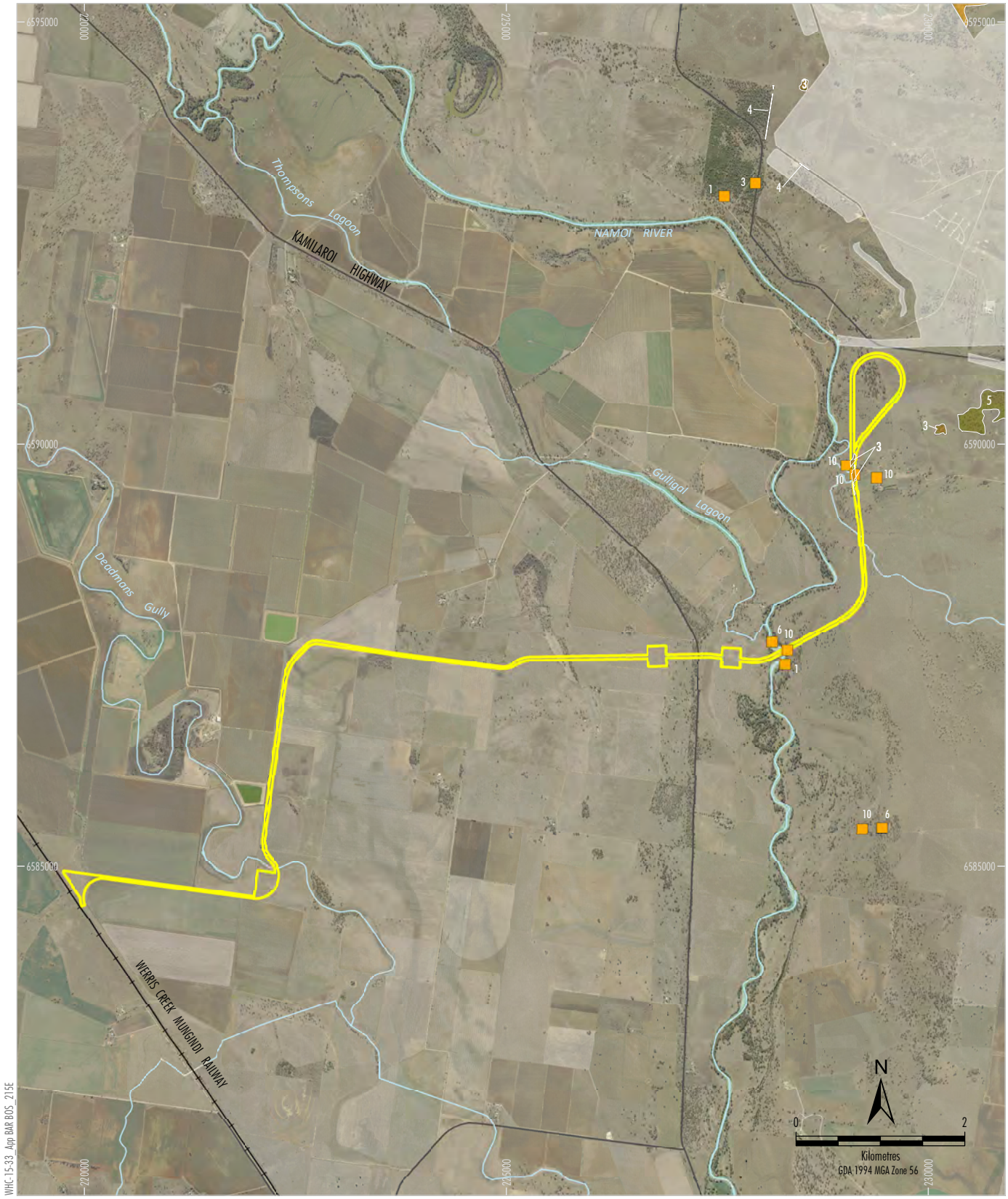
Source: Orthophoto - Department of Land and Property Information, Aerial Photography (July 2011); FloraSearch (2018)

WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Koala Potential Habitat - Project Rail Spur

Figure 23



LEGEND

- Approximate Extent of Approved Mine
- Biodiversity Assessment Report Development Site Footprint
- Squirrel Glider

Potential Habitat

- 3 Pilliga Box – Poplar Box Shrubby Woodland (NA324)
- 4 White Box – Silver-leaved Ironbark Shrubby Open Forest (NA349)
- 5 Narrow-leaved Ironbark – White Box Shrubby Forest (NA311)
- 8 River Red Gum Riparian Tall Woodland (NA193)

Source
(1) Future Ecology (2018)
(4) Niche (2013)
(6) OEH (2017)
(10) Kendall&Kendall Ecological Services (2011)

Source: Orthophoto - Department of Land and Property Information, Aerial Photography (July 2011); FloraSearch (2018)

WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Squirrel Glider Potential Habitat - Project Rail Spur

Figure 24

3.3.5 Species That Cannot Withstand Loss

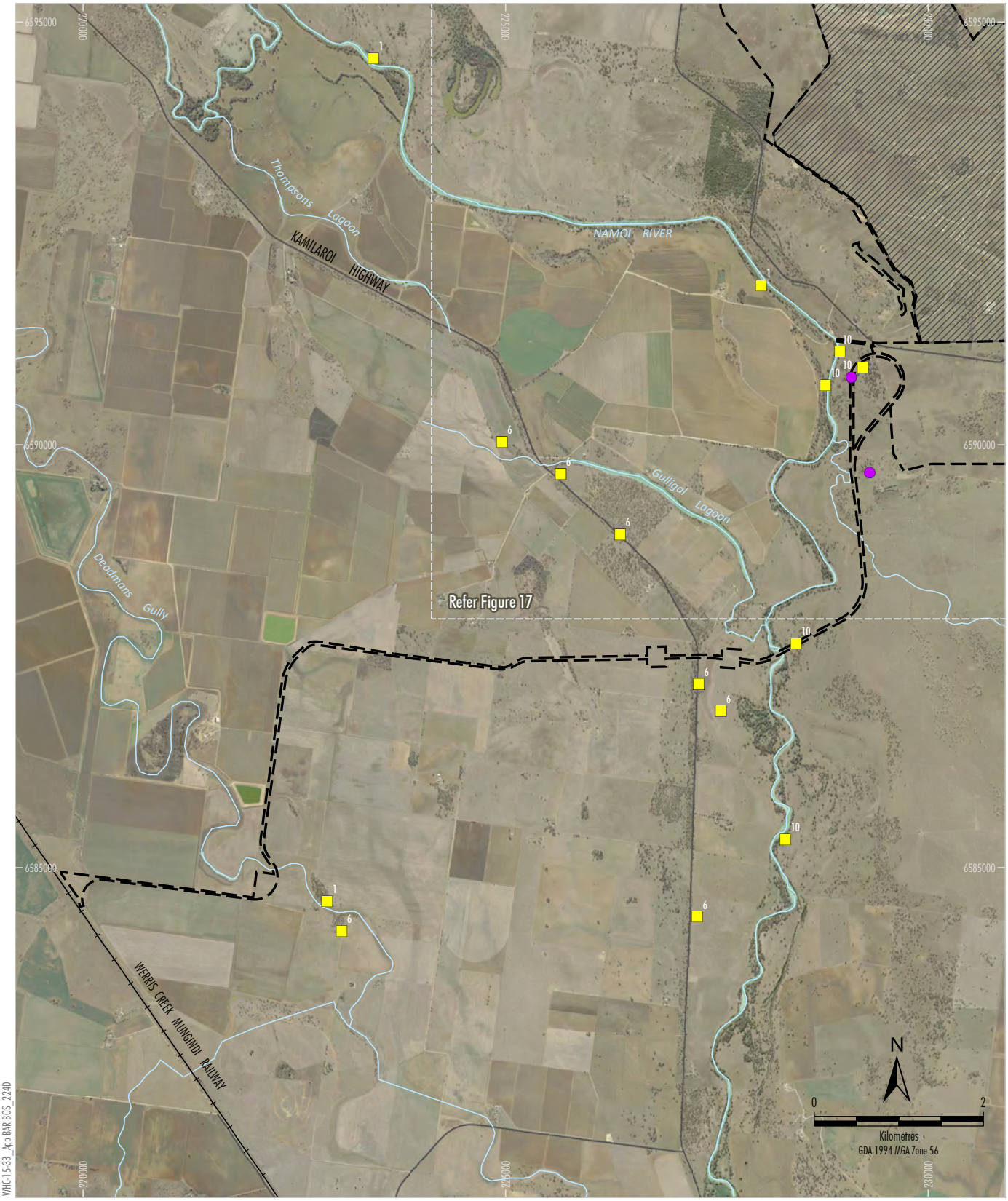
None of the species credit species in Section 3.3.4 are species that cannot withstand loss as classified by OEH (2016a). It is noted that species that cannot withstand further loss are not used in the decision making threshold for Major Projects being assessed in accordance with the FBA (OEH, 2014a), including this Project.

3.3.6 Impacts on Species That Require Further Consideration

The OEH's comments in the SEARs for the EIS requested further consideration of the impacts on threatened species listed in Table 11. None of the species listed in the table have been confirmed within the BAR Footprint associated with the Project rail spur and none of the species listed in Table 11 are species credit species (Section 3.3.4).

3.3.7 Threatened Species Listed under the EPBC Act

Targeted surveys for threatened flora or fauna species listed under the EPBC Act were undertaken within the Commonwealth Assessment Footprint associated with the Project rail spur (Attachments C and D). The Koala and Painted Honeyeater were recorded in the Commonwealth Assessment Footprint associated with the Project rail spur (Figure 25). The Commonwealth Assessment Footprint is further discussed in Section 4.4.



WHC-15-33_App BAR BOS_224D

LEGEND

Vickery Coal Project (EPBC 2012/6263)
Approximate Extent of Vickery Extension Project (EPBC 2016/7649) Footprint

Fauna

Koala
Painted Honeyeater

Source
(1) Future Ecology (2018)
(4) Niche (2013)
(6) OEH (2017)
(10) Kendall&Kendall Ecological Services (2011)

Note: Sources 1, 3, 5 and 7 to 9 are not shown on this figure.

Source: Orthophoto - Department of Land and Property Information, Aerial Photography (July 2011); Department of Industry (2015); FloraSearch, (2018)

WHITEHAVEN COAL

VICKERY EXTENSION PROJECT

Threatened Species and Communities under the EPBC Act - Project Rail Spur

Figure 25