



APPENDIX C
Biodiversity Assessment Report and
Biodiversity Offset Report

**COWAL GOLD OPERATIONS
PROCESSING RATE MODIFICATION**

Environmental Assessment
2018



COWAL GOLD OPERATIONS PROCESSING RATE MODIFICATION

BIODIVERSITY ASSESSMENT REPORT
AND BIODIVERSITY OFFSET STRATEGY



PREPARED BY
RESOURCE STRATEGIES

MARCH 2018
Project No. HAL-16-41
Document No. 00909723

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EXECUTIVE SUMMARY

This *Biodiversity Assessment Report and Biodiversity Offset Strategy* was prepared for a Modification to the Cowal Gold Operations (CGO) located approximately 38 kilometres (km) north-east of West Wyalong in New South Wales (NSW). Evolution Mining (Cowal) Pty Limited (Evolution) is proposing changes to the CGO to accommodate an increase to the CGO's approved ore processing rate (i.e. the Modification).

Approval is being sought for the Modification under Section 75W of the NSW *Environmental Planning and Assessment Act, 1979* and under the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act).

This *Biodiversity Assessment Report and Biodiversity Offset Strategy* 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). The FBA requires the use of an online program (the *OEH Biobanking Credit Calculator for Major Projects and BioBanking* [the OEH Biobanking Credit Calculator]) to assess biodiversity impacts and determine the biodiversity offset requirements for those impacts. There are three stages described in this document:

- Stage 1 involves summarising the biodiversity values of the disturbance area that are inputs into the OEH Biobanking Credit Calculator;
- Stage 2 involves assessing the potential impacts on biodiversity, describing impact avoidance and mitigation measures and determining the offset requirements; and
- Stage 3 involves describing how impacts on biodiversity would be offset (i.e. the Biodiversity Offset Strategy).

Stage 1 Biodiversity Assessment

This assessment uses the results of flora and fauna surveys undertaken by AMBS Ecology & Heritage (AMBS) during August, September and November 2017 and January 2018. The surveys were conducted in consideration of the relevant State and Commonwealth survey guidelines and included targeted searches for potentially occurring threatened species and communities listed under the NSW *Biodiversity Conservation Act, 2016* (BC Act), NSW *Fisheries Management Act, 1994* (FM Act) and EPBC Act.

In addition to the recent surveys, the assessment considers the results of many past flora and fauna surveys that have been undertaken in the locality, mainly associated with environmental assessments for various developmental stages of the CGO as well as for ongoing monitoring and management.

The modified approximate extent of surface development is represented by two Biodiversity Assessment Report Footprints (BAR Footprints), one covering modifications at the mine site and the other covering a duplication of the current pipeline which traverses Lake Cowal.

The BAR Footprints are predominantly located on land which has been historically cleared for cropping or grazing livestock and comprises native grassland. The Modification would result in the removal of approximately 286.7 hectares (ha) of native vegetation, of which most (approximately 91 percent [%] [260.8 ha]) is derived grassland in low/moderate condition.

No threatened flora species listed under the BC Act or EPBC Act have been recorded within the BAR Footprints.

Despite past disturbances to the native vegetation (historic clearance and livestock grazing), some semi-cleared woodland and derived native grassland in the BAR Footprints meets the criteria for endangered ecological communities (EECs) listed under the BC Act and EPBC Act. The Modification would clear:

- approximately 30 ha of *Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions* EEC listed under the BC Act;
- approximately 11.5 ha of *Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia* EEC listed under the EPBC Act;
- approximately 4.5 ha of *Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions* EEC listed under the BC Act; and
- approximately 1.5 ha of *Weeping Myall Woodlands* EEC listed under the EPBC Act.

The *Aquatic Ecological Community in the Natural Drainage System of the Lowland Catchment of the Lachlan River Endangered Ecological Community* listed under the FM Act includes Lake Cowal in the listing and is therefore present along part of the pipeline duplication.

One species credit species (as defined by the FBA) has been recorded inside the BAR Footprints during past or previous surveys (Superb Parrot [*Polytelis swainsonii*]). Potential breeding habitat for the Superb Parrot does occur in the River Red Gum Forest (Moderate Condition) (LA191) along the edge of Lake Cowal and approximately 0.4 ha occurs in the BAR Footprint associated with the pipeline duplication.

Stage 2 Impact Assessment

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. There are a number of existing measures which are implemented the CGO to minimise impacts on biodiversity that would be continued for the Modification.

The result of running the OEH Biobanking Credit Calculator is that the Modification requires a Biodiversity Offset Strategy which accounts for a total of 3,687 ecosystem credits and 7 species credits for the Superb Parrot as listed in Table ES-1.

**Table ES-1
Credit Requirements**

Credit Type	Clearance Area (ha)	Credit Requirement
Ecosystem Credits (including credits for EECs)	286.7	3,687
Superb Parrot Species Credits	0.4	7

Stage 3 Biodiversity Offset Strategy

The existing Biodiversity Offset Strategy for the CGO would be augmented with an additional Biodiversity Offset Strategy for the Modification. Evolution has elected to address the offset requirements by offsetting through four additional offset areas on land owned by Evolution.

The four proposed offset areas have a combined area of 486.5 ha and provide a like-for-like offset outcome. Ecosystem and species credits generated from the four proposed offset areas would meet (and exceed) the credit requirements of the Modification.

1 INTRODUCTION

1.1 PROJECT OVERVIEW

Evolution Mining (Cowal) Pty Limited (Evolution) is the owner and operator of the Cowal Gold Operations (CGO) located approximately 38 kilometres (km) north-east of West Wyalong in New South Wales (NSW) (Figures 1, 2a and 2b).

Recent feasibility studies have identified potential opportunities to maximise the ore processing capacity of the CGO's existing processing plant. On this basis, Evolution proposes to modify Development Consent (DA 14/98) under Section 75W of the NSW *Environmental Planning and Assessment Act, 1979* (EP&A Act) to increase the CGO's approved ore processing rate of 7.5 million tonnes per annum (Mtpa) to 9.8 Mtpa (herein referred to as the Modification).

The main activities associated with development of the Modification would include (Figures 2a and 2b):

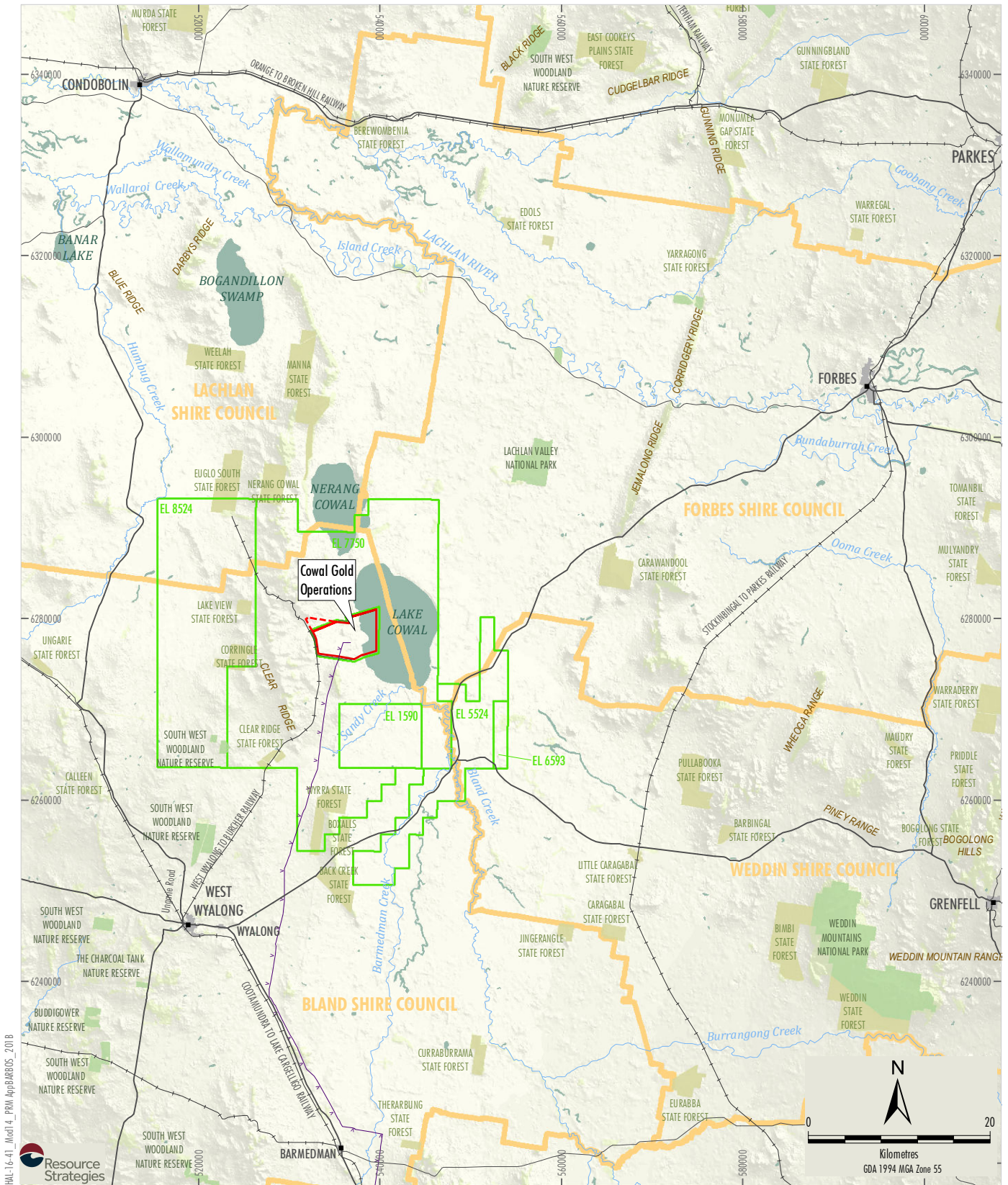
- increasing the ore processing rate from 7.5 Mtpa to 9.8 Mtpa;
- modification of the existing Tailings Storage Facilities (TSFs) to form one larger TSF, which would also accommodate mine waste rock (herein referred to as the Integrated Waste Landform [IWL]);
- relocation of water management infrastructure (i.e. the Up-Catchment Diversion System and approved location for contained water storage D10) and other ancillary infrastructure (e.g. internal roads and soil and ore stockpiles) elsewhere within Mining Lease (ML) 1535 and Mining Lease Application (MLA) 1;
- installation of a secondary crushing circuit within the existing process plant area;
- duplication of the existing water supply pipeline across Lake Cowal;
- increased annual extraction of water from the CGO's external water supply sources;
- increased consumption of process reagents (including cyanide) and other process consumables;
- an increase in the average and peak workforce employed at the CGO;
- relocation of a travelling stock reserve (TSR) and Lake Cowal Road; and
- provision of crushed rock material to local councils to assist with road base supplies.

1.2 GENERAL DESCRIPTION OF THE BIODIVERSITY ASSESSMENT REPORT FOOTPRINTS

The modified approximate extent of surface development is represented by two Biodiversity Assessment Report Footprints (BAR Footprints) shown on Figures 3a and 3b, namely:

1. BAR Footprint associated with the mine site; and
2. BAR Footprint associated with the pipeline duplication.

Two BAR Footprints are required as the assessment approach varies slightly for site-based developments (such as the modification at the mine site) and linear shaped developments (such as the pipeline duplication).



HAL-16-41_Mat14_PRM-AppBARRIOS_2018



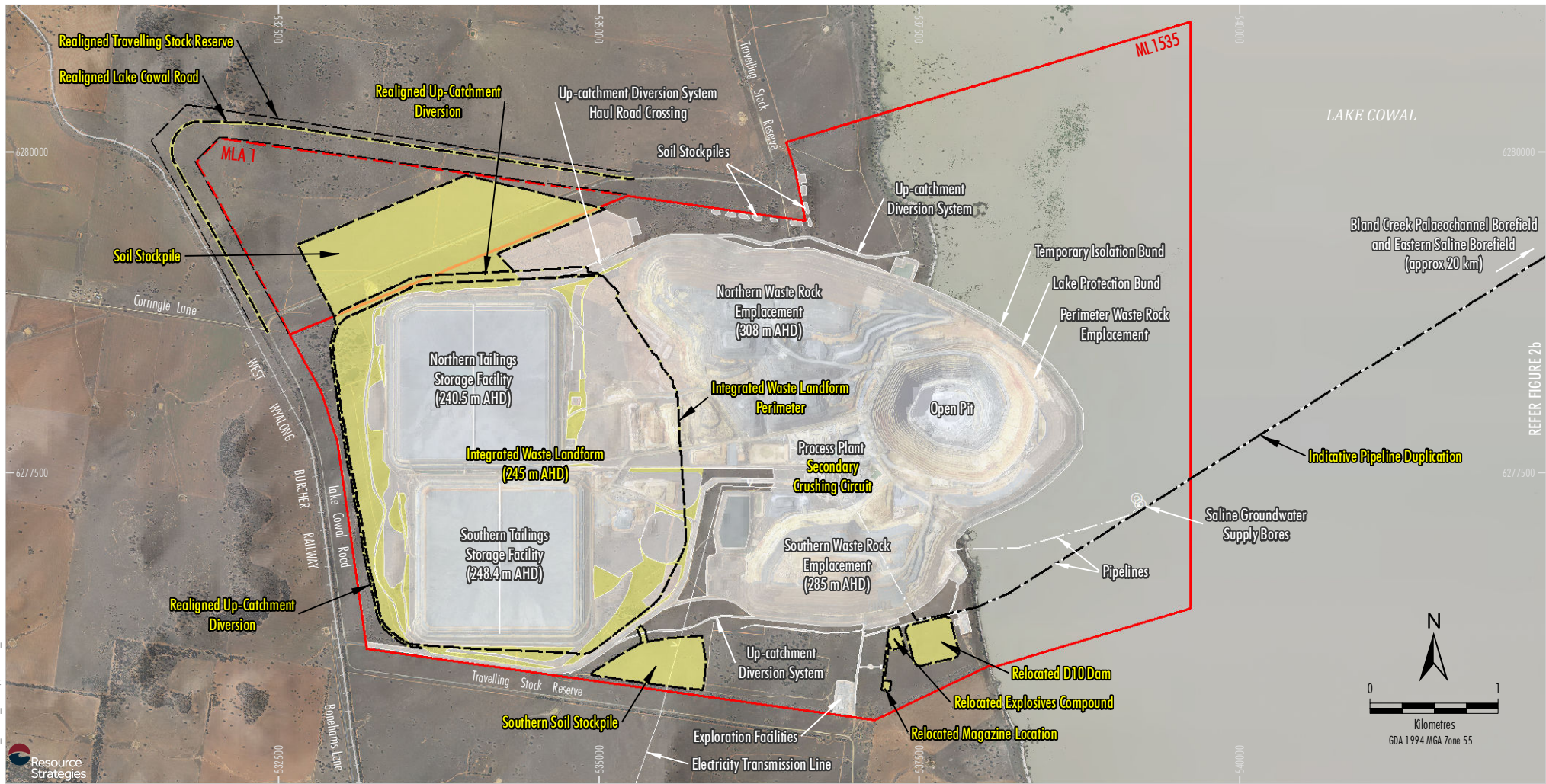
- LEGEND**
- Mining Lease Application (MLA 1)
 - Mining Lease Boundary (ML 1535)
 - Exploration Licence (EL)
 - National Park & Nature Reserve
 - State Forest
 - Local Government Area Boundary
 - Electricity Transmission Line
 - Railway

Source: © NSW Department of Finance, Services & Innovation (2017); Office of Environment & Heritage NSW (2017)



CGO PROCESSING RATE MODIFICATION
Regional Location

Figure 1



HAL-16-41_Mod14_PRM-AppBARRIOS_2020



LEGEND

- Mining Lease Boundary (ML 1535)
- Mining Lease Application Boundary (MLA 1)
- Approximate Extent of Approved Surface Development
- Approximate Extent of Additional Modification Surface Disturbance
- Modification Component

Source: Evolution (2018); © NSW Department of Finance, Services & Innovation (2017)
 Orthophoto: Evolution (Oct 2017)



CGO PROCESSING RATE MODIFICATION

Cowl Gold Operations
 General Arrangement
 - Mine Site

Figure 2a



HAL-16-41_Mod14_PRM App BARBOS_2019A



LEGEND

- Approximate Extent of Approved Surface Development
- Indicative Pipeline Duplication

Source: Evolution (2018); © NSW Department of Finance, Services & Innovation (2017)
 Orthophoto: Evolution (Oct 2017)



CGO PROCESSING RATE MODIFICATION
 Cowl Gold Operations
 General Arrangement
 - Pipeline







Figure 2b



HAL-16-41_Mod14_PRM-AppBARBOS_2018



LEGEND

-  Mining Lease Boundary (ML 1535)
-  Mining Lease Application Boundary (MLA 1)
-  Approximate Extent of Approved
-  Surface Development
-  BAR Footprint - Mine Site
-  BAR Footprint - Pipeline

Source: Evolution (2018); © NSW Department of Finance, Services & Innovation (2017)
 Orthophoto: Evolution (Oct 2017)

Blond Creek Palaeochannel Borefield and Eastern Saline Borefield (approx 20 km)

REFER FIGURE 3b



Evolution
MINING
Cowl

CGO PROCESSING RATE MODIFICATION
 Cowl Gold Operations
 Assessment Areas

Figure 3a



HAL-16-41_Mod14_PRM App BARBOS_2048



LEGEND

-  Approximate Extent of Approved Surface Development
-  BAR Footprint - Pipeline

Source: Evolution (2018); © NSW Department of Finance, Services & Innovation (2017)
 Orthophoto: Evolution (Oct 2017)



CGO PROCESSING RATE MODIFICATION
 Cowal Gold Operations
 Assessment Areas

Figure 3b

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

1.3 ASSESSMENT REQUIREMENTS/APPROACH

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

- provide an assessment of the likely adverse impacts of the Modification on terrestrial flora and fauna in accordance with the NSW *Framework for Biodiversity Assessment* (FBA) (NSW Office of Environment and Heritage [OEH], 2014a) as required by 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) as required by the SEARs.

The FBA (OEH, 2014a) outlines the methodology which underpins the NSW Offset Policy (OEH, 2014b). The NSW Offset Policy commenced on 1 October 2014 for a transitional period, after which it would be reviewed (OEH, 2014b). During the transitional period, there is some flexibility in the policy's application to address any technical or administrative issues (OEH, 2014b). This report was prepared during the transitional period.

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). This Biodiversity Assessment Report and Biodiversity Offset Strategy was peer reviewed by Dr Colin Driscoll (Hunter Eco) (Appendix G) who is also an accredited assessor (assessor accreditation number 0011).

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 Biobanking Credit Calculator *for Major Projects and BioBanking (Version 4.1)*¹ (the OEH Biobanking Credit Calculator) was used as part of this assessment.

The threatened species assessment has been undertaken in accordance with the FBA (OEH, 2014a) rather than the Draft Guidelines for *Threatened Species Assessment* (Department of Environment and Conservation [DEC], and Department of Primary Industries [DPI], 2005), which would otherwise apply to EP&A Act Part 3A Modifications. Assessments of Significance in accordance with section 5A of the EP&A Act are not required for EP&A Act Part 3A Modifications.

Environment Protection and Biodiversity Conservation Act, 1999

The Cowal Gold Project was referred under the *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) in August 2001 (EPBC 2001/421). On 29 September 2001, the Commonwealth Minister for the Environment and Heritage decided that the Cowal Gold Project was not a 'controlled action', with the consequence that no approval under the EPBC Act was required.

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

The Modification was referred under the EPBC Act on 1 August 2017 and was determined to be a 'controlled action' on the 6 November 2017 due to likely significant impacts on the *Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia* Endangered Ecological Community (EEC) listed under the EPBC Act (Grey Box EEC listed under the EPBC Act) (2017/7989) (controlling provision threatened species and communities). The Modification 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 impacts on the relevant threatened species and communities listed under the EPBC Act.

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 Footprints that are inputs into the OEH Biobanking Credit Calculator (e.g. landscape features, native vegetation and threatened species) (Stage 1 for the mine site is provided in Section 2 and Stage 1 for the pipeline duplication is provided in Section 3);
- Stage 2 involves assessing the potential impacts on biodiversity, describing impact avoidance and mitigation measures and determining the offset requirements (Section 4); and
- Stage 3 involves describing the Biodiversity Offset Strategy (Section 5).

1.5 INFORMATION SOURCES USED IN THIS ASSESSMENT

This assessment uses the results of detailed flora and fauna survey work undertaken by AMBS Ecology & Heritage (AMBS) (2018a) (Attachment A) and AMBS (2018b) (Attachment B). These and other information sources are referenced through-out this assessment. The *Archived Biometric and Threatened Species Profiles Datasets* (OEH, 2017a) were used as required by the FBA (OEH, 2014a).

2 STAGE 1 – BIODIVERSITY ASSESSMENT MINE SITE

Stage 1 of the biodiversity assessment involves summarising the biodiversity values of the BAR Footprints that are inputs into the OEH Biobanking Credit Calculator. This section provides information on the application of the site-based assessment on the mine site. Landscape features are described in Section 2.1, native vegetation is described in Section 2.2, and threatened species relevant to the BAR Footprint associated with the mine site are described in Section 2.3.

2.1 LANDSCAPE FEATURES

Landscape features relevant to the Modification (such as regional setting and biodiversity links) are described in this sub-section.

2.1.1 Regional Setting and Landscape

The BAR Footprint associated with the mine site is located within the regions listed in Table 1.

**Table 1
Regional Setting and Landscape Associated with the Mine Site**

Boundary	BAR Footprint Location
Interim Biogeographic Regionalisation for Australia (IBRA) Region	NSW South Western Slopes
IBRA Sub-region	Lower Slopes
Catchment Management Authority (CMA)*	Lachlan
CMA Sub-region	Lower Slopes - Lachlan
Local Government Area (LGA)	Bland
Mitchell Landscape	Ardlethan Hills (approximately 85%) and Bimbi Plains (approximately 15%)

* The OEH Biobanking Credit Calculator uses superseded CMA regions not up-to-date Local Land Service Regions.

2.1.2 Landscape Value Score

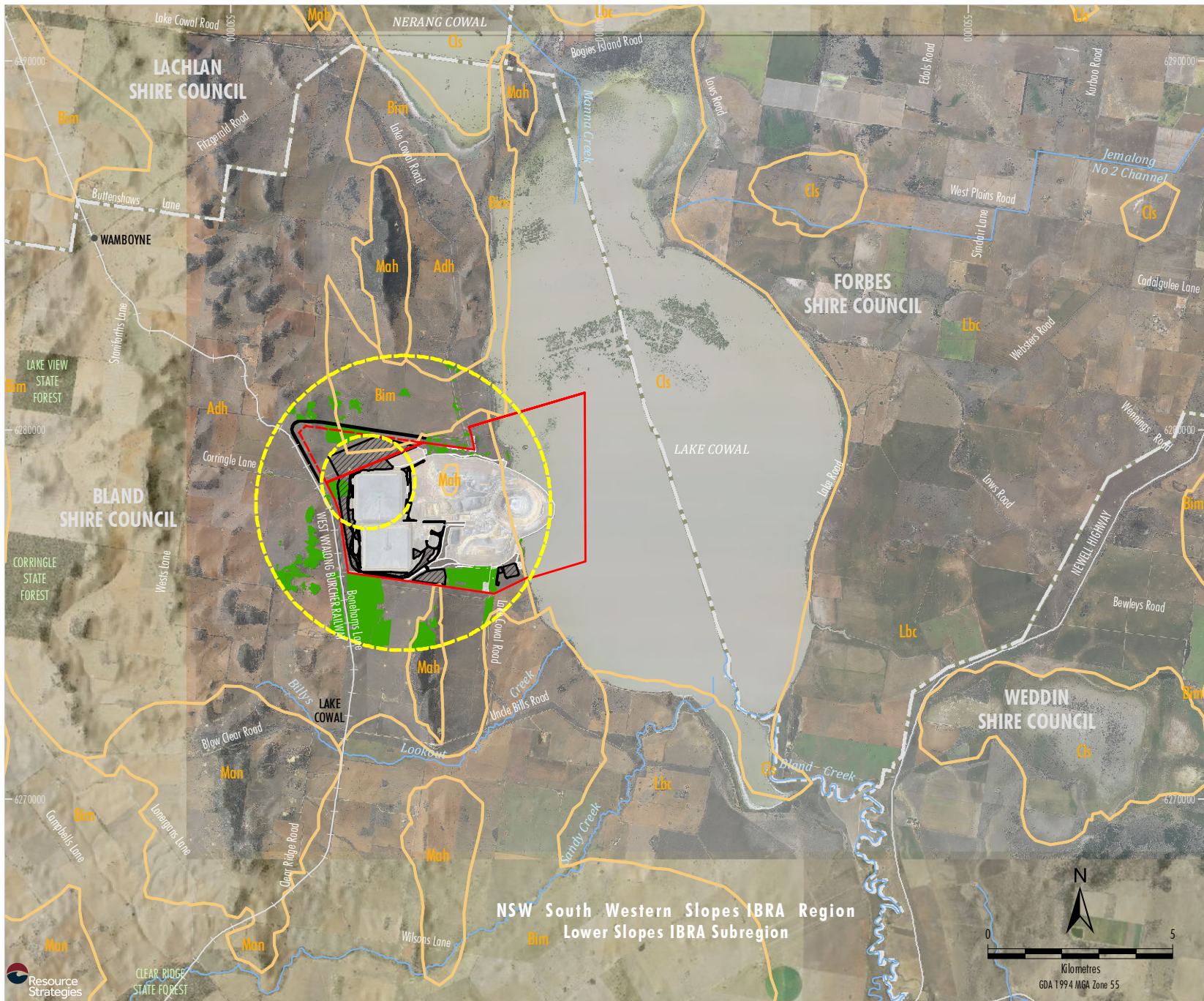
A site-based assessment was undertaken. Under the FBA (OEH, 2014a), two circles are used for the purpose of the site-based assessment (an outer circle and inner circle) (Figure 4). For the purpose of this assessment, a 5,000 hectare (ha) outer circle and a 500 ha inner circle was adopted (based on standard circle sizes in the FBA [OEH, 2014a]).

The extent of native vegetation in the outer circle was informed by AMBS (2018a) (Attachment A) and OEH (2015a) (Figure 4) and it was assumed that all native vegetation is in moderate to good condition (except that confirmed to be in low condition by AMBS) (Figure 4). The approved CGO footprint within the circles was assumed cleared for the purpose of the assessment.

In summary, the outer circle contains approximately 6-10 % of native vegetation cover before development and the same after development. The inner circle contains approximately 6-10 % of native vegetation cover before development and less than 5 % after development.

Regionally or State Significant Biodiversity Links

The Modification would not impact a state or regionally significant biodiversity link. Drainage lines (and riparian buffer distances based on Strahler stream ordering) are shown on Figure 5 from the DPI – Water (2017). None are relevant to the BAR Footprint associated with the mine site.



- LEGEND**
- Mining Lease Boundary (ML 1535)
 - Mining Lease Application Boundary (MLA 1)
 - Local Government Boundary
 - Approximate Extent of Approved Surface Development
 - BAR Footprint - Mine Site
 - BAR Assessment Area
 - Vegetation within Buffer Mitchell Landscape
- Mitchell Landscape**
- Adh Ardlethan Hills
 - Bim Bimbi Plains
 - Cls Cowl Lakes, Swamps and Lunettes
 - Lbc Lachlan - Bland Channels and Floodplains
 - Man Manitoba Hills and Footslopes
 - Mah Manna Hills and Footslopes

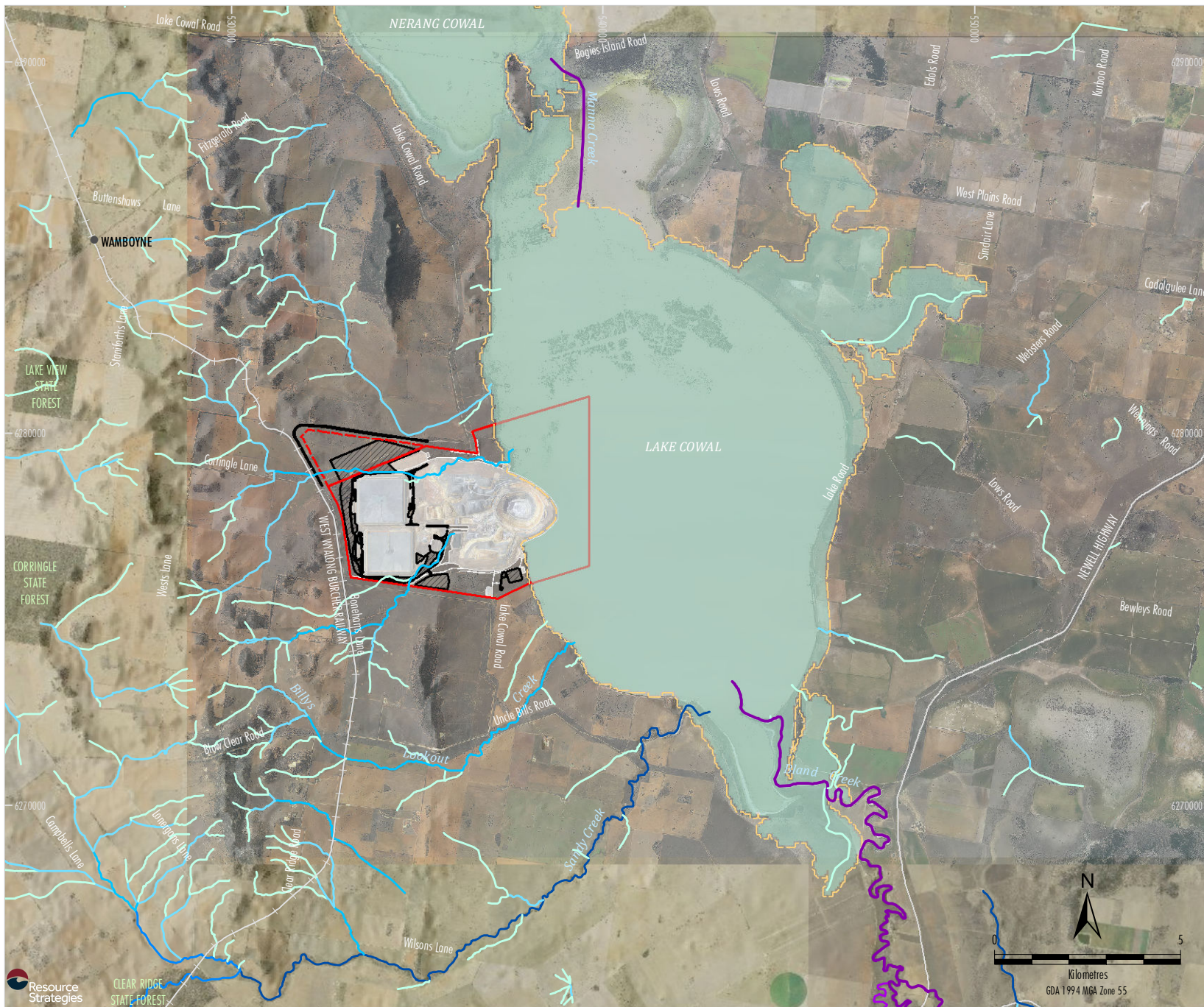
Source: Evolution (2018); © NSW Department of Planning and Environment (2017); Department of Finance, Services & Innovation (2017); Department of Environment and Heritage (2017) Orthophoto: Evolution (Oct 2017); Department Finance, Services & Innovation (2017)



CGO PROCESSING RATE MODIFICATION
Location Map
- Mine Site



Figure 4



- LEGEND**
- Mining Lease Boundary (ML 1535)
 - Mining Lease Application Boundary (MLA 1)
 - Approximate Extent of Approved Surface Development
 - BAR Footprint - Mine Site
 - Wetland in the Directory of Important Wetlands Australia
 - 50 m Buffer of a Wetland in the Directory of Important Wetlands Australia
 - Strahler Stream Order
 - 1st Order
 - 2nd Order
 - 3rd Order
 - 4th Order
 - 5th Order
 - 6th Order
 - 7th Order

Source: Evolution (2018); © NSW Department of Planning and Environment (2017); Department of Finance, Services & Innovation (2017); Crown Lands and Water - a Division of the NSW Department of Industry (2013); Office of Environment and Heritage NSW; Australian Government Department of the Environment (2017)
 Orthophoto: Evolution (Oct 2017); Department of Finance, Services & Innovation (2017)



CGO PROCESSING RATE MODIFICATION
 Site Map
 - Mine Site

Figure 5

2.2 NATIVE VEGETATION

Historically, the BAR Footprints comprise former cleared and semi-cleared farmland that was used for grazing of predominantly native pastures by livestock. Grazing and cropping is still undertaken in areas outside of ML 1535. The original native tree cover has largely been removed except for scattered individual trees and patches of remnant vegetation.

2.2.1 Plant Community Types/Biometric Vegetation Types

AMBS (2018a) (Attachment A) conducted flora surveys within the BAR Footprints (including surrounds) and developed vegetation community mapping. Sites sampled by AMBS (2018a) (Attachment A) are shown on Figures 6a and 6b. Vegetation communities were classified by AMBS (2018a) (Attachment A) according to the NSW Biometric Vegetation Types (BVTs) and are shown on Figures 7a and 7b.

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

The areas of each BVT in the BAR Footprint associated with the mine site are provided in Table 2.

Table 2
Vegetation Communities in the BAR Footprint Associated with the Mine Site

#	Vegetation Community	PCT	Area (ha)
Grassy Woodlands – Floodplain Transition Woodlands			
2a	Inland Grey Box - White Cypress Pine Woodland (Semi Cleared in Moderate Condition) (LA152)	82	6.5 ^A
2b	Inland Grey Box - White Cypress Pine Woodland (Derived Grassland in Low Condition) (LA152)		23.5 ^B
Semi-arid Woodland (Grassy sub-formation) – Northwest Floodplain Woodlands			
4	Belah Woodland (Low Condition) (LA105)	55	16.5
Semi-arid Woodland (Scrubby sub-formation) – Inland Rocky Hill Woodlands			
5	Dwyer's Red Gum - White Cypress Pine - Currawang Woodland (Moderate Condition) (LA144)	185	1
Grasslands – Western Slopes Grasslands			
6a	Highly Modified Derived Grasslands (Moderate Condition) (LA138)	250	63.5
6b	Highly Modified Derived Grasslands (Low Condition) (LA138)		170.5
Total Native Vegetation			281.5
Cleared Land (non-native)			10
Plantings			8.5
Total BAR Footprint Associated with the Mine Site			300

A 6.5 ha equivalent to the Grey Box EEC listed under the EPBC Act and the NSW *Biodiversity Conservation Act, 2016* (BC Act).

B 23.5 ha equivalent to the Grey Box EEC listed under the BC Act, including approximately 5 ha equivalent to the Grey Box EEC listed under the EPBC Act.

The BAR Footprint associated with the mine site is predominantly (approximately 78%) Highly Modified Derived Grasslands (LA138) (Plate 1). These derived grasslands are mostly native but are highly disturbed such that AMBS (2018a) (Attachment A) could not determine the original BVT which would have occurred prior to clearing. The Highly Modified Derived Grasslands were likely (prior to historic clearing) a variety of vegetation types that occur in the general locality.



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LEGEND

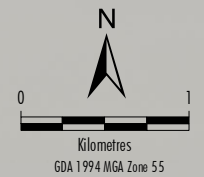
- Mining Lease Boundary (ML 1535)
- Mining Lease Application Boundary (MLA 1)
- Approximate Extent of Approved Surface Development
- FBA Plot
- Threatened Ecological Communities**
- Grey Box Woodland EEC (BC Act and EPBC Act)
- Grey Box Woodland EEC (BC Act)
- Weeping Myall Woodland EEC (BC Act and EPBC Act)
- Weeping Myall Woodland EEC (BC Act)

VEGETATION MAPPING

- 1a Weeping Myall Open Woodland (Semi Cleared in Moderate Condition) (LA212)
- 1b Weeping Myall Open Woodland (Semi Cleared in Low Condition) (LA212)
- 1c Weeping Myall Open Woodland (Derived Grassland in Low Condition) (LA212)
- Grassy Woodlands - Floodplain Transition Woodlands
- 2a Inland Grey Box - White Cypress Pine Woodland (Semi Cleared in Moderate Condition) (LA152)
- 2b Inland Grey Box - White Cypress Pine Woodland (Derived Grassland in Low Condition) (LA152)
- Forested Wetlands - Inland Riverine Forests
- 3 River Red Gum Forest (Moderate Condition) (LA191)
- Semi-arid Woodlands (Grassy sub-formation) - Northwest Floodplain Woodlands
- 4 Belah Woodland (Low Condition) (LA105)
- Semi Arid Woodland (Shubby sub-formation) - Inland Rocky Hill Woodlands
- 5 Dwyer's Red Gum - White Cypress Pine - Currawang Woodland (Moderate Condition) (LA144)

- Grasslands - Western Slopes Grasslands
- 6a Highly Modified Derived Grasslands (Moderate Condition) (LA138)
- 6b Highly Modified Derived Grasslands (Low Condition) (LA138)
- Other Map Units**
- A Plantings
- B Lake Bed
- D Cleared

Source: © NSW Department of Finance, Services & Innovation (2017)
 Orthophoto: Evolution (Oct 2017)



CGO PROCESSING RATE MODIFICATION
 Flora Survey Sites
 - Mine Site

Figure 6a



HAL-16-41_Merit 4_PRM-AppBARBOS_20BA



- LEGEND**
- Approximate Extent of Approved Surface Development
 - FBA Plot
 - Threatened Ecological Communities
 - Weeping Myall Woodland EEC (BC Act and EPBC Act)
 - Weeping Myall Woodland EEC (BC Act)

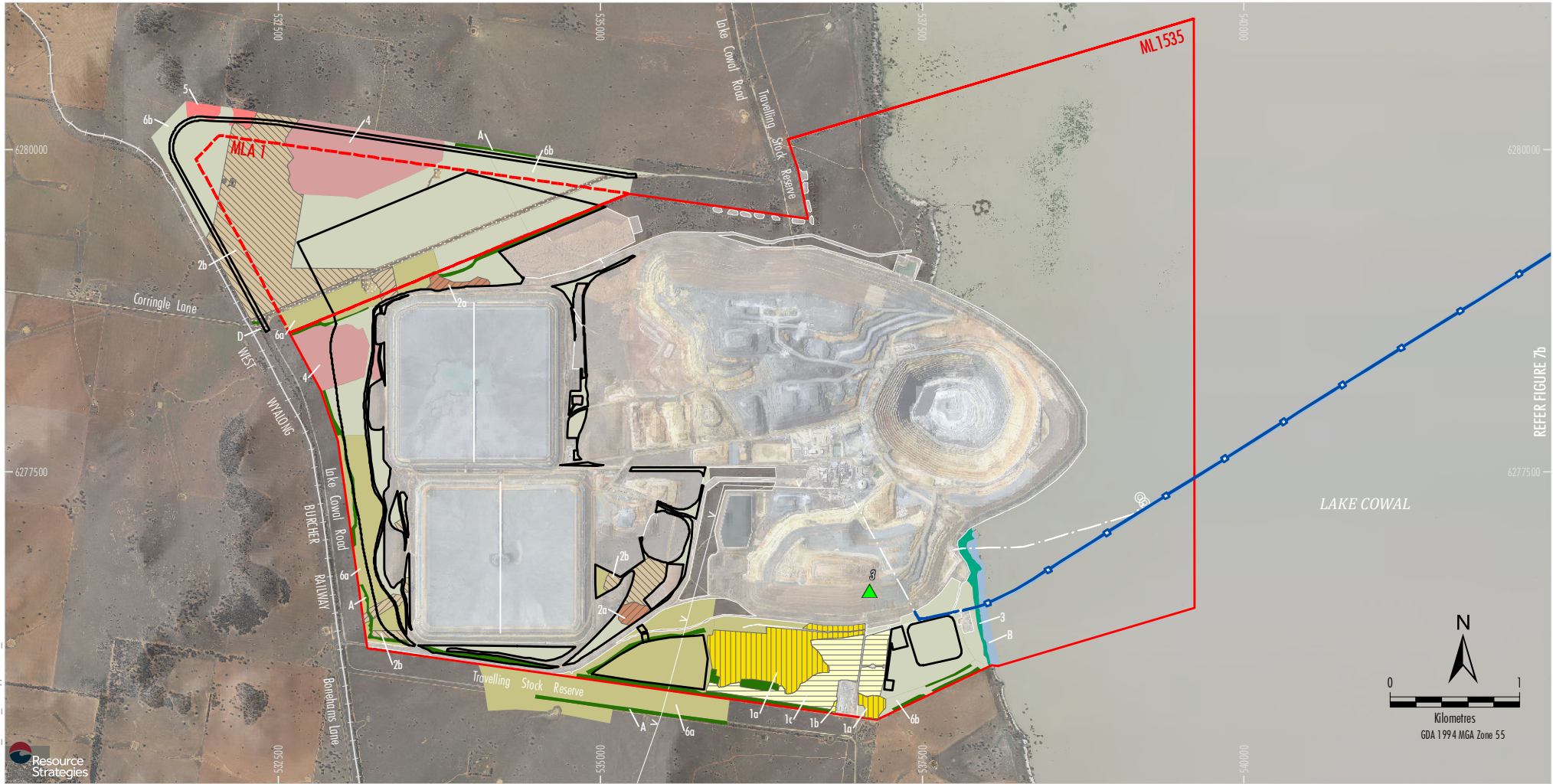
- VEGETATION MAPPING**
- Semi-arid Woodlands (Grassy sub-formation) - Riverine Plain Woodlands**
- 1a Weeping Myall Open Woodland (Semi Cleared in Moderate Condition) (LA212)
 - 1b Weeping Myall Open Woodland (Semi Cleared in Low Condition) (LA212)
 - 1c Weeping Myall Open Woodland (Derived Grassland in Low Condition) (LA212)
- Forested Wetlands - Inland Riverine Forests**
- 3 River Red Gum Forest (Moderate Condition) (LA191)
- Other Map Units**
- B Lake Bed
 - C Cropping

Source: © NSW Department of Finance, Services & Innovation (2017)
 Orthophoto: Evolution (Oct 2017)



CGO PROCESSING RATE MODIFICATION
 Flora Survey Sites
 - Pipeline

Figure 6b



HAL-16-41_Mod14_PRM_AppBARRIOS_221A



LEGEND

- Mining Lease Boundary (ML 1535)
- Mining Lease Application Boundary (MLA)
- Approximate Extent of Approved Surface Development
- BAR Footprint - Mine Site
- BAR Footprint - Pipeline
- Threatened Ecological Communities
- Grey Box Woodland EEC (BC Act and EPBC Act)
- Grey Box Woodland EEC (BC Act)
- Weeping Myall Woodland EEC (BC Act and EPBC Act)
- Weeping Myall Woodland EEC (BC Act)

VEGETATION MAPPING

- 1a Weeping Myall Open Woodland (Semi Cleared in Moderate Condition) (LA212)
- 1b Weeping Myall Open Woodland (Semi Cleared in Low Condition) (LA212)
- 1c Weeping Myall Open Woodland (Derived Grassland in Low Condition) (LA212)
- Grassy Woodlands - Floodplain Transition Woodlands
- 2a Inland Grey Box - White Cypress Pine Woodland (Semi Cleared in Moderate Condition) (LA152)
- 2b Inland Grey Box - White Cypress Pine Woodland (Derived Grassland in Low Condition) (LA152)
- 3 Forested Wetlands - Inland Riverine Forests
- 3 River Red Gum Forest (Moderate Condition) (LA191)
- Semi-arid Woodlands (Grassy sub-formation) - Northwest Floodplain Woodlands
- 4 Belah Woodland (Low Condition) (LA105)
- Semi Arid Woodland (Shrubby sub-formation) - Inland Rocky Hill Woodlands
- 5 Dwyer's Red Gum - White Cypress Pine - Currawang Woodland (Moderate Condition) (LA144)

- Grasslands - Western Slopes Grasslands
 - 6a Highly Modified Derived Grasslands (Moderate Condition) (LA138)
 - 6b Highly Modified Derived Grasslands (Low Condition) (LA138)
 - Other Map Units
 - A Plantings
 - B Lake Bed
 - D Cleared
 - Threatened Flora Species
 - ▲ Austral Pillwort
- Reference: 3. OEH (2017)
- Source: Evolution (2018); © NSW Department of Finance, Services & Innovation (2017)
- Orthophoto: Evolution (Oct 2017)

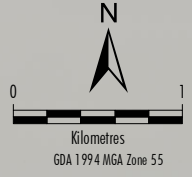


CGO PROCESSING RATE MODIFICATION

Vegetation Communities and Threatened Flora Species - Mine Site

Figure 7a

REFER FIGURE 7b





HAL-16-41_Mxd14_PrimAppBARBOS_222A



- LEGEND**
- Approximate Extent of Approved Surface Development
 - BAR Footprint - Pipeline
 - Threatened Ecological Communities
 - Weeping Myall Woodland EEC (BC Act and EPBC Act)
 - Weeping Myall Woodland EEC (BC Act)

- VEGETATION MAPPING**
- 1a Weeping Myall Open Woodland (Semi Cleared in Moderate Condition) (LA212)
 - 1b Weeping Myall Open Woodland (Semi Cleared in Low Condition) (LA212)
 - 1c Weeping Myall Open Woodland (Derived Grassland in Low Condition) (LA212)
 - 3 River Red Gum Forest (Moderate Condition) (LA191)
 - B Lake Bed
 - C Cropping
 - Threatened Flora Species
 - Austrostipa wakaolica*
- Other Map Units**
- B Lake Bed
 - C Cropping
- Threatened Flora Species**
- Austrostipa wakaolica*

Reference: 3. OEH (2017)
 Note: There are no references 1 and 2 on this figure.
 Source: © NSW Department of Finance, Services & Innovation (2017)
 Orthophoto: Evolution (Oct 2017)



CGO PROCESSING RATE MODIFICATION
 Vegetation Communities and
 Threatened Flora Species
 - Pipeline

Figure 7b



Source: AMBS (2018a) (Attachment A)

Plate 1 Example of LA138 a Derived Grassland Community Characterised by a Mixed Assemblage of Perennial Native Grasses and Annual Exotic Herbs and Grasses

2.2.2 Threatened Ecological Communities

AMBS (2018a) (Attachment A) undertook targeted surveys for potentially occurring threatened ecological communities listed under the BC Act or EPBC Act in accordance with relevant listing advice.

The Inland Grey Box woodland and derived grassland in the BAR Footprint associated with the mine site (Vegetation Community 2a and 2b – approximately 30 ha) represents the *Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penneplain, Nandewar and Brigalow Belt South Bioregions* listed under the BC Act (Grey Box EEC listed under the BC Act) (Table 3) (Plate 2). Approximately 11.5 ha of the Grey Box EEC listed under the BC Act also meets the criteria for the Grey Box EEC listed under the EPBC Act as described and mapped by AMBS (2018a) (Attachment A) (Table 3).

The site condition (from plot data) of Vegetation Community 2a (Inland Grey Box - White Cypress Pine Woodland [Semi Cleared in Moderate Condition] [LA152]) indicates the understorey comprises 2-4% cover of native grasses, 2-10% cover of other native plants (e.g. herbs) and 10-20% cover of weeds. The site condition (from plot data) of Vegetation Community 2b (Inland Grey Box - White Cypress Pine Woodland [Derived Grassland in Low Condition] [LA152]) indicates the understorey comprises a greater cover of weeds (15-35% cover).

**Table 3
Threatened Ecological Communities in the BAR Footprint Associated with the Mine Site**

Threatened Ecological Community	Conservation Status		2a Inland Grey Box - White Cypress Pine Woodland (Semi Cleared in Moderate Condition) (LA152)	2b Inland Grey Box - White Cypress Pine Woodland (Derived Grassland in Low Condition) (LA152)	Area (ha)
	EPBC Act	BC Act			
<i>Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penneplain, Nandewar and Brigalow Belt South Bioregions</i> (Grey Box EEC listed under the BC Act)	-	E	6.5	23.5	30
<i>Grey Box (<i>Eucalyptus microcarpa</i>) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia</i> (Grey Box EEC listed under the EPBC Act)	E	-	6.5	5	11.5

¹ Threatened status under the BC Act and/or EPBC Act (current as at March 2018).
E = Endangered



Source: AMBS (2018a) (Attachment A)

Plate 2 Example of Grey Box EEC listed under the BC Act and EPBC Act in the BAR Footprint

2.2.3 Vegetation Zones

The vegetation communities described in Section 2.2.1 were grouped into vegetation zones according to their condition. Table 4 outlines the vegetation zones present in the BAR Footprint associated with the mine site, 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 Biobanking Credit Calculator based on the floristic plot data collected by AMBS (2018a) (Attachment A).

The patch size for each vegetation zone (other than vegetation in low condition) was greater than 1,000 ha (i.e. connecting with vegetation outside of the BAR Footprint) (Table 4).

Table 4
Vegetation Zones in the BAR Footprint Associated with the Mine Site

Vegetation Zone	#	Vegetation Community	PCT	Area (ha)	Condition Class	Site Value Score	Patch Size
Grassy Woodlands – Floodplain Transition Woodlands							
3	2a	Inland Grey Box - White Cypress Pine Woodland (Semi Cleared in Moderate Condition) (LA152)	82	6.5	Moderate/Good	47.74	>1,001
4	2b	Inland Grey Box - White Cypress Pine Woodland (Derived Grassland in Low Condition) (LA152)		23.5	Low	27.60	N/A
Semi-arid Woodland (Grassy sub-formation) – Northwest Floodplain Woodlands							
5	4	Belah Woodland (Low Condition) (LA105)	55	16.5	Low	34.00	N/A
Semi-arid Woodland (Scrubby sub-formation) – Inland Rocky Hill Woodlands							
6	5	Dwyer's Red Gum - White Cypress Pine - Currawang Woodland (Moderate Condition) (LA144)	185	1	Moderate/Good	27.60	>1,001
Grasslands – Western Slopes Grasslands							
7	6a	Highly Modified Derived Grasslands (Moderate Condition) (LA138)	250	63.5	Moderate/Good	30.00*	>1,001
8	6b	Highly Modified Derived Grasslands (Low Condition) (LA138)		170.5	Low	30.67*	N/A
Total				281.5			

* The OEH Biobanking Credit Calculator does not contain benchmark data for LA138 and therefore the more conservative benchmarks for LA152 and LA105 were used. A consistent approach was applied to the offset area calculations.

2.2.4 Vegetation Condition

Site condition data was collected by AMBS (2018a) (Attachment A) at each FBA Plot location (Figures 6a and 6b).

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 Biobanking Credit Calculator. None of the vegetation communities present in the BAR Footprint associated with the mine site (Section 2.2.1) are communities that require further consideration.

2.3 THREATENED SPECIES

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

- ecosystem credit species (i.e. species that can be predicted to be present based on 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 predetermined by OEH in the OEH Biobanking Credit Calculator and *Archived Biometric and Threatened Species Profiles Datasets* (OEH, 2017a).

2.3.1 Habitat Features for Particular Species Credit Species

The OEH Biobanking 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 Biobanking Credit Calculator are listed in Table 5, along with the relevance of the habitat features to the BAR Footprint associated with the mine site.

Table 5
Threatened (Species Credit) Species Habitat Features - BAR Footprint Associated with the Mine Site

Common Name	Scientific Name	Conservation Status ¹		Habitat Feature (OEH Biobanking Credit Calculator)	Potentially Relevant
		BC Act	EPBC Act		
Flora					
Spiny Peppergrass	<i>Lepidium aschersonii</i>	V	V	On ridges of gilgai clays.	Yes
Winged Peppergrass	<i>Lepidium monoplacoides</i>	E	E	Land containing seasonally damp or waterlogged sites.	Yes
Amphibian					
Sloane's Froglet	<i>Crinia sloanei</i>	V	-	Land within 50 meters (m) of identified breeding habitat.	Yes
Birds					
Grey Falcon	<i>Falco hypoleucos</i>	E	-	Land within 100 m of riparian woodland on inland rivers containing mature living eucalypts or isolated paddock trees overhanging water or dry watercourses.	Yes
Black-breasted Buzzard	<i>Hamirostra melanosternon</i>	V	-	Land within 40 m of riparian woodland on inland watercourses/waterholes containing dead or dying eucalypts.	Yes


¹ Threatened fauna species status under the BC Act and/or EPBC Act (current as at March 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. A list of candidate species credit species requiring survey was produced by the OEH Biobanking Credit Calculator (Table 6).

**Table 6
Threatened (Species Credit) Species Survey Timing - BAR Footprint Associated with the Mine Site**

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															
A spear-grass	<i>Austrostipa metatoris</i>	V	V	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
A spear-grass	<i>Austrostipa wakoolica</i>	E	E									Yes	Yes	Yes	Yes
Narrow Goodenia	<i>Goodenia macbarronii*</i>	-	-	Yes	Yes							Yes	Yes	Yes	Yes
Pine Donkey Orchid	<i>Diuris tricolor</i>	V	-									Yes	Yes		
Silky Swainson-pea	<i>Swainsona sericea</i>	V	-									Yes	Yes	Yes	Yes
Slender Darling Pea	<i>Swainsona murrayana</i>	V	V	Yes	Yes							Yes	Yes	Yes	Yes
Spiny Peppercross	<i>Lepidium aschersonii</i>	V	V	Yes	Yes	Yes	Yes	Yes				Yes	Yes	Yes	Yes
Winged Peppercross	<i>Lepidium monoplacoides</i>	E	E	Yes	Yes									Yes	Yes
Woolly Ragwort	<i>Senecio garlandii</i>	V	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Amphibian															
Sloane's Froglet	<i>Crinia sloanei</i>	V	-						Yes	Yes	Yes				
Birds															
Black-breasted Buzzard	<i>Hamirostra melanosternon</i>	V	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Grey Falcon	<i>Falco hypoleucos</i>	E	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mammals															
Koala	<i>Phascolarctos cinereus</i>	V	V	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Brush-tailed Phascogale	<i>Phascogale tapoatafa</i> [^]	V	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

LEGEND  Highlighted month is the month in which targeted surveys were undertaken for the relevant species by AMBS (2018a) (Attachment A)

¹ Threatened fauna species status under the BC Act and/or EPBC Act (current as at March 2018). V = Vulnerable; E = Endangered

* *Goodenia macbarronii* is no longer listed as threatened in NSW.

[^] The Brush-tailed Phascogale is not known to occur in the region (Section 2.3.4.1).

2.3.3 Targeted Surveys for Threatened Flora Species

The potential presence of threatened flora species within the BAR Footprints was determined by recent surveys, a review of previous surveys and a review of database records.

2.3.3.1 Recent Flora Surveys

In 2017, AMBS (2018a) (Attachment A) undertook vegetation mapping in the BAR Footprints and surrounds, this also included targeted surveys for potentially detectable species such as *Austrostipa metatoris*.

Flora surveys were conducted in August, September and November 2017 by AMBS (2018a) (Attachment A). AMBS (2018a) (Attachment A) undertook targeted surveys for the flora species listed in Table 6 in accordance with the FBA (OEH, 2014a) and the following relevant survey guidelines:

- *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft)* (DEC, 2004); and
- *NSW Guide to Surveying Threatened Plants* (OEH, 2016).

All potentially occurring threatened flora species listed under the EPBC Act were also targeted during the surveys.

No threatened flora species were recorded during these surveys by AMBS (2018a) (Attachment A). It is noted that the OEH Biobanking Credit Calculator does not require targeted surveys for the Austral Pillwort (*Pilularia novae-hollandiae*) which is a threatened flora species listed as 'Endangered' under the BC Act and EPBC Act. This species has been previously recorded in ML1535, but not since 2003 (Figure 7a). Despite this, AMBS (2018a) (Attachment A) undertook targeted surveys for the Austral Pillwort though it was not found.

2.3.3.2 Previous Flora Surveys

Flora studies undertaken in the broader Lake Cowal catchment that are applicable to BAR Footprints and surrounds are outlined in Table 7.

Regional Studies (Between 1987 and 2008)

Broader vegetation studies in the wider locality surrounding ML 1535 area have been conducted by Sivertsen and Metcalfe (1995), Austin *et al.* (2000) and Benson (2008). Sivertsen and Metcalfe (1995) described the vegetation on the Forbes 1:250,000 map sheet and Austin *et al.* (2000) analysed the vegetation of the Central Lachlan Region. Benson (2008) reviewed previous published and unpublished work to compile a comprehensive list and descriptions of the plant communities of the NSW South-western Slopes IBRA Bioregion.

Table 7
Previous Flora Studies in Modification Area and Surrounds

Surveys	Timing	Reference
Regional studies	Between 1987 and 2008	Sivertsen and Metcalfe (1995); Austin <i>et al.</i> (2000); Benson (2008)
Flora species recorded within ML 1535 and surrounds before operations	Between 1969 and 2003	Vestjens (1977); Anne Clements and Associates (1995); Charles Sturt University (1997); Bower (1997; 1998a; 1998b; 2003a; 2003b; 2003c)
Flora surveys for the <i>Cowal Gold Mine E42 Modification Environmental Assessment</i> (Barrick, 2008a)	2008	FloraSearch (2008)
Flora species recorded during monitoring	2008 to present	DnA Environmental (2008, 2010, 2011a, 2011b, 2011c, 2012a, 2012b, 2012c, 2013a, 2013b, 2013c, 2014a, 2014b, 2014c, 2015a, 2015b, 2015c, 2016a, 2016b, 2016c, 2017a and b)
Austral Pillwort monitoring	2012-2017	DnA Environmental (2012d, 2013d, 2015d, 2016d and 2017c)
Targeted flora searches and vegetation mapping	2012 and 2013	Australian Museum Business Services (2012); FloraSearch (2013)

Flora Species Recorded within ML 1535 and Surrounds before Operations (Between 1969 and 2003)

Between 1974 and 1975, Vestjens (1977) opportunistically recorded flora species during fauna surveys in the north-eastern portion of Lake Cowal. A total of 162 flora species were recorded by Vestjens (1977). The first systematic flora surveys within ML 1535 and/or surrounds were conducted by Anne Clements and Associates (1995) and Charles Sturt University (1997). Anne Clements and Associates (1995) surveyed 115 transects and 126 spot locations in October and December 1993. In September and October 1997, Charles Sturt University (1997) surveyed 42 quadrats inside ML 1535.

Bower (Orchid Research and FloraSearch) has conducted a number of targeted threatened species searches within ML 1535 and surrounds. Further targeted threatened species searches were conducted at the approved CGO and pipeline (Bower, 1997, 1998a, 1998b, 2003a; Barrick, 2003a), along the Temora to Cowal electricity transmission line (ETL) (Bower, 2003b; Country Energy, 2004) and along the approved CGO access road upgrade (Bower, 2003b).

Flora Surveys for the CGO E42 Modification Environmental Assessment (2008)

FloraSearch (2008) undertook flora and vegetation surveys within ML 1535 for the CGO E42 Modification Environmental Assessment. The survey focused on mapping vegetation communities, assessing the condition of vegetation communities, recording flora species and targeted searches for threatened flora species within the proposed disturbance area for the CGO E42 Modification. Methods involved quadrat sampling and random meander searches.

Flora Species Recorded During Monitoring (2008 to present)

DnA Environmental has undertaken flora monitoring within and surrounding the CGO. Monitoring has been undertaken for the CGO Remnant Vegetation Enhancement Program (RVEP), within the CGO Compensatory Wetland and within rehabilitation areas. These are described in more detail below.

Remnant Vegetation Enhancement Program

DnA Environmental (2008, 2010, 2011a, 2012a, 2013a, 2014a, 2015a, 2016a, 2017a) has undertaken vegetation monitoring for the CGO RVEP, as required under the *Cowal Gold Project Land Management Plan* (Barrick, 2003a). A total of 11 sites adjacent to the approved CGO development areas are monitored as part of the CGO RVEP. Two RVEP monitoring sites are located within the existing Southern Offset Area. DnA Environmental (2008, 2010, 2011a, 2012a, 2013a, 2014a, 2015a, 2016a, 2017a) has monitored the condition of the vegetation within the 11 monitoring sites since 2008.

Compensatory Wetland

DnA Environmental (2011b, 2012b, 2013b, 2014b, 2015b, 2016b) has undertaken surveys within the compensatory wetland at Lake Cowal in accordance with the *Cowal Gold Project Compensatory Wetland Management Plan* (Barrick, 2003c). The monitoring has been undertaken at 12 monitoring sites on an annual basis during late spring (October/November) since 2005 to monitor changes in vegetation cover, species diversity and to determine the extent of regeneration, if any, occurring within monitoring sites.

Rehabilitation Areas

DnA Environmental (2011c, 2012c, 2013c, 2014c, 2015c, 2016c, 2017b) has undertaken monitoring of the revegetation on the post-mine landforms since 2010. The aim of the monitoring is to follow and analyse the progressive rehabilitation of mining disturbed areas to establish sustainable endemic vegetation communities which are appropriate for the topography and slope of the rehabilitated landforms. Rehabilitation trials have been conducted at: two sites along the Lake Foreshore and five on the outer walls of the southern and northern TSFs. Additionally, rehabilitation trials have been established on the southern waste rock emplacement; the northern waste rock emplacement and perimeter waste rock emplacement (DnA Environmental, 2011c, 2012c, 2013c and 2014c).

Flora Surveys in 2012

Flora surveys were undertaken by the Australian Museum Business Services (2012) within and surrounding ML 1535 within Evolution-owned lands between October 2011 and September 2012. Targeted searches for potential threatened flora species were undertaken at all full floristic survey sites (AMBS, 2012). Incidental searches were also undertaken at rapid data points and condition assessment sites.

Austral Pillwort Monitoring

DnA Environmental (2012d, 2013d, 2015d, 2016d and 2017c) undertook annual monitoring for the Austral Pillwort within ML 1535 and surrounds. No Austral Pillwort have been found.

2.3.3.3 *Flora Database Records*

The *BioNet Atlas of NSW Wildlife* (OEH, 2017b) and *Atlas of Living Australia Website* (Atlas of Living Australia, 2017) 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 (Department of the Environment and Energy [DEE], 2017).

2.3.3.4 Results - Threatened Flora Species Records

The threatened species database and literature search results are provided in Attachment C. No flora species threatened under the BC Act or EPBC Act have been recorded within the BAR Footprints (Figures 7a and 7b). A previous record of *Austrostipa wakoolica* was specifically avoided during the design of the pipeline duplication (Figure 7b).

2.3.4 Targeted Surveys for Threatened Fauna Species

2.3.4.1 Recent Fauna Surveys

AMBS (2018a) (Attachment A) undertook targeted surveys for threatened fauna species listed under the BC Act and/or EPBC Act, including the list of candidate species credit species requiring survey produced by the OEH Biobanking Credit Calculator (Table 6).

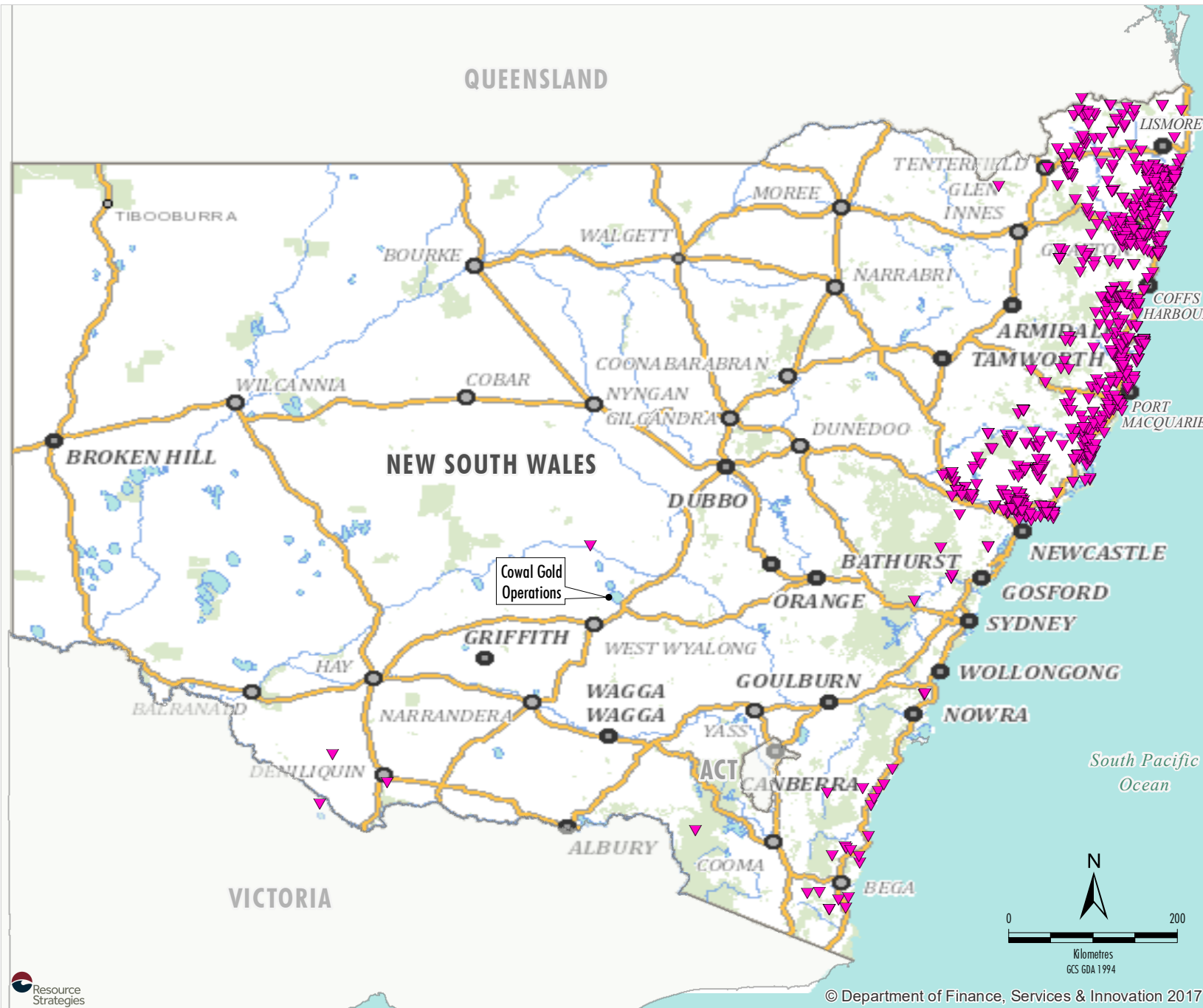
Threatened fauna species were targeted in accordance with the survey timing, techniques and effort described within the following survey guidelines:

- *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* (Department of Environment, Climate Change and Water [DECC], 2009).
- *Survey Guidelines for Australia's Threatened Bats* (Department of the Environment, Water, Heritage and the Arts [DEWHA], 2010a).
- *Survey Guidelines for Australia's Threatened Birds* (DEWHA, 2010b).
- *Survey Guidelines for Australia's Threatened Mammals* (Department of Sustainability, Environment, Water, Population and Communities [DSEWPaC], 2011a).
- *Survey Guidelines for Australia's Threatened Reptiles* (DSEWPaC, 2011b).
- *EPBC Act Referral Guidelines for the vulnerable koala (combined populations of Queensland, New South Wales and the Australian Capital Territory)* (Commonwealth of Australia, 2014).

Brush-tailed Phascogale

A habitat assessment for the Brush-tailed Phascogale was undertaken along with spotlighting. However, trapping for the Brush-tailed Phascogale was not undertaken as this species is highly unlikely to use the habitat in the BAR Footprints as:

- The Brush-tailed Phascogale is not known to occur in the region. In NSW, the Brush-tailed Phascogale is mainly found east of the Great Dividing Range although there are occasional records west of the Great Dividing Range (OEH, 2017c).
- It is likely that the OEH Biobanking Credit Calculator is predicting the species occurrence based on a single historic record of this species within 200 km of the CGO (Figure 8) (OEH, 2017b). However, the record is from 1919 made by the South Australian Museum from population that is no longer extant (OEH, 2017b).
- The many previous fauna surveys (Section 2.3.4) have not recorded any evidence of this species.



LEGEND
 ▼ Brush-tailed Phascogale

Source: © NSW Department of Finance, Services & Innovation (2017); Office of Environment & Heritage NSW (2017)

Figure 8

Superb Parrot

The OEH Biobanking Credit Calculator does not require targeted surveys for the Superb Parrot (*Polytelis swainsonii*) (a dual ecosystem/species credit species) which has been previously recorded at the CGO. Despite this, AMBS (2018a) (Attachment A) undertook targeted surveys for the Superb Parrot.

2.3.4.2 Previous Fauna Surveys

A large number of fauna surveys have been conducted in the broader Lake Cowal catchment and are applicable to BAR Footprints and surrounds (Table 8). The surveys listed in Table 8 are discussed below.

Table 8
Previous Fauna Studies in Modification Area and Surrounds

Surveys	Timing	Reference
Regional studies	Between 1987 and 2008	Goldney and Bowie (1987); Goldney <i>et al.</i> (2008).
Fauna species recorded within ML 1535 and surrounds before operations	Between 1969 and 1997	Vestjens (1977); Gunninah Consultants (1995); Young (1979); Pease and Grinberg (1995); Scribner and Kathuria (1996); Mount King Ecological Surveys (1997); Greg Richards and Associates (1997a, 1997b).
Waterbird monitoring	1989 to present	Australian Museum Business Services (2013); Gell and Peake (2012, 2013, 2014, 2015, 2016).
Fauna surveys for the <i>Implementation of the Threatened Species Management Protocol</i> (TSMP) (Barrick, 2003b)	2003	Barrick (2003b, 2003d); Country Energy (2004).
Fauna surveys for the <i>CGO E42 Modification Environmental Assessment</i> (Barrick, 2008a)	2008	Western Research Institute (2008).
Fauna species recorded within ML 1535 during operations	2005 to present	Donato Environmental Services (2006, 2007, 2008a-c, 2009, 2010a-b, 2011a-b, 2012a-b, 2013) and Barrick (2005a-ziv, 2006a-d, 2007a-g, 2008a-c, 2009a-c, 2010a-b, 2011, 2012a-b, 2013; 2014, 2015, Evolution, 2016c and 2017d).
Amphibian survey	2011	Cenwest Environmental Services (2011).
Fish surveys	2011, 2012, 2016 and 2017	frc environmental (2011; 2012; 2016; 2017).
Targeted fauna surveys and habitat mapping	2012	Kerle (2013a); Kerle (2013b).

Regional Studies (Between 1987 and 2008)

In the late 1980s, Goldney and Bowie (1987) consolidated existing vertebrate species data in their report to the Commonwealth Government, providing a status assessment of all vertebrate fauna in the Central Western Region. More recently, Goldney *et al.* (2008) have mapped the distribution and assessed the status of nearly 600 vertebrate fauna species in the Lachlan Catchment.

Fauna Species Recorded within ML 1535 and Surrounds before Operations (between 1969 and 1997)

The first documented fauna surveys of Lake Cowal and surrounds (fish, amphibians, reptiles, birds and mammals) were carried out by the Commonwealth Scientific and Industrial Research Organisation Scientist Vestjens (1977) in the northern half of Lake Cowal from 1969 to 1976. Vestjens (1977) surveyed for a week every month (except in 1974 and 1975 when the area was visited three and five times, respectively). The methods included survey by canoe, vehicle and on foot. The surveys covered a filling and drying cycle of Lake Cowal.

Gunninah Consultants (1995) undertook extensive surveys in ML 1535 and surrounds for fish, amphibians, reptiles, birds and mammals. The surveys involved 515 trap nights with 103 'A size' Elliot traps, 85 trap nights with 17 pitfall traps, 22 person-hours spotlighting, Anabat™ detecting, amphibian call recording, habitat searches and waterbird counts.

Young (1979) conducted fish surveys of Lake Cowal across a range of habitats, and Pease and Grinberg (1995) and Scribner and Kathuria (1996) provided summaries of fish recorded at Lake Cowal during commercial fishing activities. Commercial fishing for native fin-fish ceased in NSW on 1 September 2010 but had not been carried out at Lake Cowal since the mid-1990s.

Mount King Ecological Surveys (1997) and Greg Richards and Associates (1997a, 1997b) conducted fauna and bat surveys and assessments of the proposed Temora to Cowal ETL. This ETL traverses ML 1535.

Waterbird Monitoring (1989 to present)

Monitoring of wetland bird species diversity and abundance and their breeding success has been conducted three times a year at Lake Cowal since 1989. Studies associated with the monitoring of waterbirds, including breeding events on Lake Cowal, were consolidated in the Australian Museum Business Services (2013) *Lake Cowal Waterbird Monitoring (1989 to 2012) Compilation Report*.

Gell and Peak (2013, 2014, 2015, 2016, 2017a and 2017b) has continued monitoring waterbird species along transects T1, T2, T7 and T8 at Lake Cowal.

Fauna Surveys for the Implementation of the Threatened Species Management Protocol (2003)

Targeted surveys for threatened fauna species (amphibians, reptiles, birds and mammals [including bats]) were conducted within ML 1535 in 2003 by Cenwest Environmental Services, Charles Sturt University and Greg Richards and Associates as part of the TSMP (Barrick, 2003a).

These surveys involved herpetological searches, bird census surveys, call broadcasting, spotlighting, targeted searches, Anabat™ detecting and harp trapping. Lake Cowal was dry during these surveys.

Additional targeted surveys for threatened species were also conducted for the approved CGO access road (Barrick, 2003d) and the Temora to Cowal ETL (Country Energy, 2004) by Cenwest Environmental Services, Charles Sturt University and Greg Richards and Associates, using similar methods.

Fauna Surveys for the CGO E42 Modification Environmental Assessment (2008)

In autumn 2008, Western Research Institute (2008) undertook fauna surveys within ML 1535. Western Research Institute also undertook targeted searches for threatened fauna species.

Methods used included spotlighting on foot, spotlighting by vehicle, herpetological searches, bird surveys, call playback, opportunistic observations and interpreting tracks and traces of fauna. A habitat assessment was also conducted. Lake Cowal was dry during these surveys.

Cenwest Environmental Services (2009) used these data in the *Cowal Gold Mine E42 Modification – Modified Request Fauna Assessment*.

Fauna Species Recorded within ML 1535 During Operations (2005 to present)

Fauna species were recorded during the following activities:

- monitoring of daily and seasonal fauna usage of the TSFs within ML 1535 (Donato Environmental Services, 2006, 2007, 2008a, 2008b, 2008c, 2009, 2010a, 2010b, 2011a, 2011b, 2012a, 2012b, 2013a, 2013b, 2014a, 2014b, 2015a, 2015b, 2016a, 2016b and 2017a);
- pre-clearance fauna surveys within ML 1535 (Barrick, 2005a-z and zi, 2006a-c, 2007a-f, 2008b, 2009a-b, 2010a, 2012a, 2013b and 2014); and
- observations of fauna within ML 1535 reported annually (Barrick, 2005ziii, 2006d, 2007g, 2008c, 2009c, 2010b, 2011, 2012b, 2013, 2014, 2015, Evolution, 2016c and 2017d).

These activities are described below.

Monitoring at the Tailings Storage Facilities

In accordance with the *Flora and Fauna Management Plan* (Evolution, 2016b), regular reporting has been undertaken by Donato Environmental Services on data collected at the tailings storage facilities with reference to the risk to fauna (Donato Environmental Services, 2006, 2007, 2008a, 2008b, 2008c, 2009, 2010a, 2010b, 2011a, 2011b, 2012a, 2012b, 2013a, 2013b, 2014a, 2014b, 2015a, 2015b, 2016a, 2016b and 2017a).

Pre-Clearance Fauna Surveys within ML 1535

Vegetation clearance for areas that are approved to be cleared within ML 1535 is undertaken in accordance with the Vegetation Clearance Protocol which requires Evolution to identify any habitat features present within approved clearance areas. If habitat features are present, a secondary habitat assessment is conducted, which involves further surveys of areas deemed as containing fauna habitat (i.e. trees with hollows, bat presence, etc.). The results of these surveys, including any sightings of threatened species) are recorded within a Vegetation Clearance Protocol report. To date, Evolution has compiled 41 Vegetation Clearance Protocol reports (Barrick, 2005a-z and zi, 2006a-c, 2007a-f, 2008b, 2009a-b, 2010a, 2012a, 2013b and 2014).

Observations of Fauna within ML 1535 Reported Annually

A requirement of the CGO annual review is to report on any fauna deaths within ML 1535 during the reporting period (Barrick, 2005ziii, 2006d, 2007g, 2008c, 2009c, 2010b, 2011, 2012b, 2013, 2014, 2015, Evolution, 2016c and 2017d). This includes reporting the deaths of any threatened fauna species recorded within ML 1535.

Amphibian Survey (2011)

In January 2011, Cenwest Environmental Services (2011) undertook an amphibian survey at 15 sites within ML 1535 and the immediate surrounds under conditions when Lake Cowal was nearly full. Sites were located within ML 1535 and immediately surrounding ML 1535, including: along the Temporary Isolation Bund and Lake Cowal interface and the area between the Temporary Isolation Bund and the Lake Protection Bund, lignum areas within Lake Cowal, farm dams, regrowth woodland, offset areas and creek lines. All native frogs, including threatened species were targeted.

Methods included the use of spotlighting on foot, spotlighting by vehicle, call playback, opportunistic observations, listening for and interpreting frog calls, searching for egg masses and dip netting for tadpoles. A habitat assessment of all survey sites was also conducted.

Fish Surveys (2011, 2012, 2016 and 2017)

Fish surveys in Lake Cowal were undertaken by frc Environmental (2011 and 2012) in February 2011 and July 2012. Surveys were conducted within six 200 square metre sites in 2011: two sites within the Compensatory Wetland, two sites within the outer areas of ML 1535 (Enhancement Wetland) and two comparative sites outside ML 1535. An additional two sites near the shoreline of Lake Cowal within ML 1535 (New Lake Foreshore) were also surveyed in 2012.

The sites surveyed allowed for a broad comparison of aquatic habitat and fish communities, including each of the habitat types present in the ephemeral lake (cane grass, lignum and bare substrate) and key habitats of targeted threatened species, where possible.

Fish communities were surveyed using a combination of electrofishing and baited traps. At each site, the species present, the abundance of each species in relation to its life history stage (juvenile, intermediate, or adult) and the apparent health of individuals were recorded. A habitat assessment of all survey sites was also conducted.

frc Environmental (2016 and 2017) undertook targeted fish surveys in December 2016 and August 2017. No threatened species of fish were recorded and diversity of fish species in Lake Cowal in the surveys was lower than that found by historical studies (frc Environmental, 2017).

Targeted Fauna Surveys and Habitat Mapping (2012)

Kerle (2013a) undertook targeted fauna surveys and habitat mapping within and surrounding ML 1535 from 28 to 31 August 2012. These fauna surveys specifically targeted the Superb Parrot since the species is known to occur in the locality.

2.3.4.3 Fauna Database Records

The *BioNet Atlas of NSW Wildlife* (OEH, 2017b), *Atlas of Living Australia Website* (Atlas of Living Australia, 2017) and *Birdlife Australia Atlas Database* (Birdlife Australia, 2017) was reviewed for nearby threatened fauna species records. In addition, a Protected Matters Search was undertaken for threatened fauna species listed under the EPBC Act that are predicted to occur (DEE, 2017).

An error was found in the *BioNet Atlas of NSW Wildlife* (OEH, 2017b). A total of 365 records at Location Key LEXK99072200 came from a 1997 list of species from CSIRO that was not a record list i.e. it included species that may occur. OEH (pers. comm. 2017) will remove the records from the *BioNet Atlas of NSW Wildlife*.

2.3.4.4 Results - Threatened Fauna Species Records

The threatened species database and literature search results are provided in Attachment C. Threatened fauna species records in the BAR Footprints and surrounds are shown on Figures 9a, 9b, 10a and 10b. Threatened fauna species recorded in the BAR Footprint associated with the mine site are (Figure 9a):

- Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis subsp. temporalis*) (an ecosystem credit species);
- Superb Parrot (a dual ecosystem/species credit species);
- Little Eagle (*Hieraaetus morphnoides*) (an ecosystem credit species); and
- Black Falcon (*Falco subniger*) (an ecosystem credit species).

2.3.5 Ecosystem Credit Species

A total of four ecosystem credit species are listed in Table 9 from the OEH Biobanking Credit Calculator. Table 9 shows that the Little Pied Bat is the predicted threatened species with lowest T_G (i.e. 0.475)². The Little Pied Bat has been recorded at Wamboyne Mountain (OEH, 2017b).

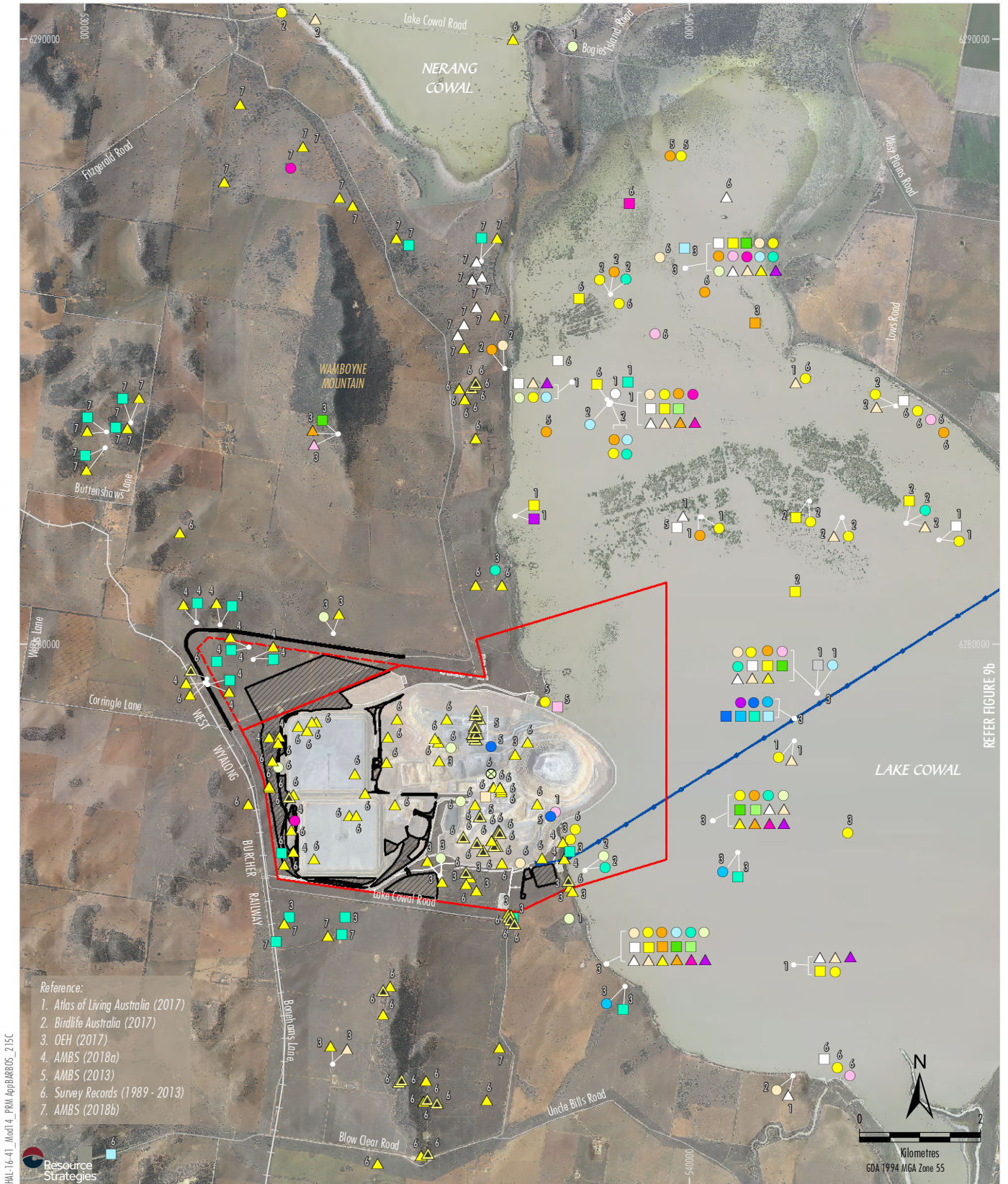
Table 9
Ecosystem Species from the OEH Biobanking Credit Calculator - BAR Footprint Associated with the Mine Site

Common Name	Scientific Name	Conservation Status ¹		TS Offset Multiplier	T_G Value	Presence in the BAR Footprint (Figure 9a)
		BC Act	EPBC Act			
Birds						
Major Mitchell's Cockatoo	<i>Lophochroa leadbeateri</i>	V	-	Yes	0.525	-
Swift Parrot	<i>Lathamus discolor</i>	E	CE	Yes	0.75	-
Grey-crowned Babbler (eastern subspecies)	<i>Pomatostomus temporalis subsp. temporalis</i>	V	-	Yes	0.75	Recorded in the BAR Footprint
Mammals						
Little Pied Bat	<i>Chalinolobus picatus</i>	V	-	Yes	0.475	-

¹ Threatened species status under the BC Act (current as at March 2018). V= Vulnerable, E = Endangered
Threatened species status under the EPBC Act (current as at March 2018). CE = Critically Endangered

The species with the lowest T_G value influences the offset multiplier designated to each vegetation zone. Table 10 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 0.475 – the Little Pied Bat).

² T_G value is defined by OEH (2014a) as the ability of a species to respond to improvement in site value or other habitat improvement at an offset site with management actions. T_G is based on an assessment of effectiveness of management actions, life history characteristics, naturally very rare species, and very poorly known species.



HAL-16-41_Mud4_PRM_AppBARBOS_215C

LEGEND	
	Mining Lease Boundary (ML 1535)
	Mining Lease Application Boundary (MLA 1)
	Approximate Extent of Approved Surface Development
	BAR Footprint - Mine Site
	BAR Footprint - Pipeline
	Threatened Bird Species
	Malleefowl
	Magpie Goose
	Freckled Duck
	Blue-billed Duck
	Australasian Bittern
	Black Falcon
	Eastern Osprey
	Square-tailed Kite
	Black-breasted Buzzard
	White-bellied Sea-Eagle
	Spotted Harrier
	Little Eagle
	Little Eagle Nest
	Australian Bustard
	Brolga
	Bush Stone-curlew
	Australian Painted Snipe
	Black-tailed Godwit
	Curlew Sandpiper
	Glossy Black-Cockatoo
	Major Mitchell's Cockatoo
	Turquoise Parrot
	Swift Parrot
	Superb Parrot
	Barking Owl
	Brown Treecreeper (eastern subspecies)
	Speckled Warbler
	Painted Honeyeater
	White-fronted Chat
	Grey-crowned Babbler (eastern subspecies)
	Grey-crowned Babbler (eastern subspecies) nest
	Varied Sittella
	Gilbert's Whistler
	Diamond Firetail
	Dusky Woodswallow

Source: Evolution (2018); © NSW Department of Planning and Environment (2017); Department of Finance, Services & Innovation (2017)
Orthophoto: Evolution (Oct 2017)



CGO PROCESSING RATE MODIFICATION
Threatened Bird Species
Recorded within the Wider Locality
- Mine Site
Figure 9a



HAL-16-41_Mwd14_PRM-AppBARRBOS_223A



- LEGEND**
- Approximate Extent of Approved Surface Development
 - BAR Footprint - Pipeline
 - Threatened Bird Species**
 - Grey Falcon
 - White-bellied Sea-Eagle
 - Australian Painted Snipe
 - Major Mitchell's Cockatoo
 - Grey-crowned Babbler (eastern subspecies)

- Reference:**
1. Atlas of Living Australia (2017)
 3. OEH (2017)
 5. AMBS (2013)

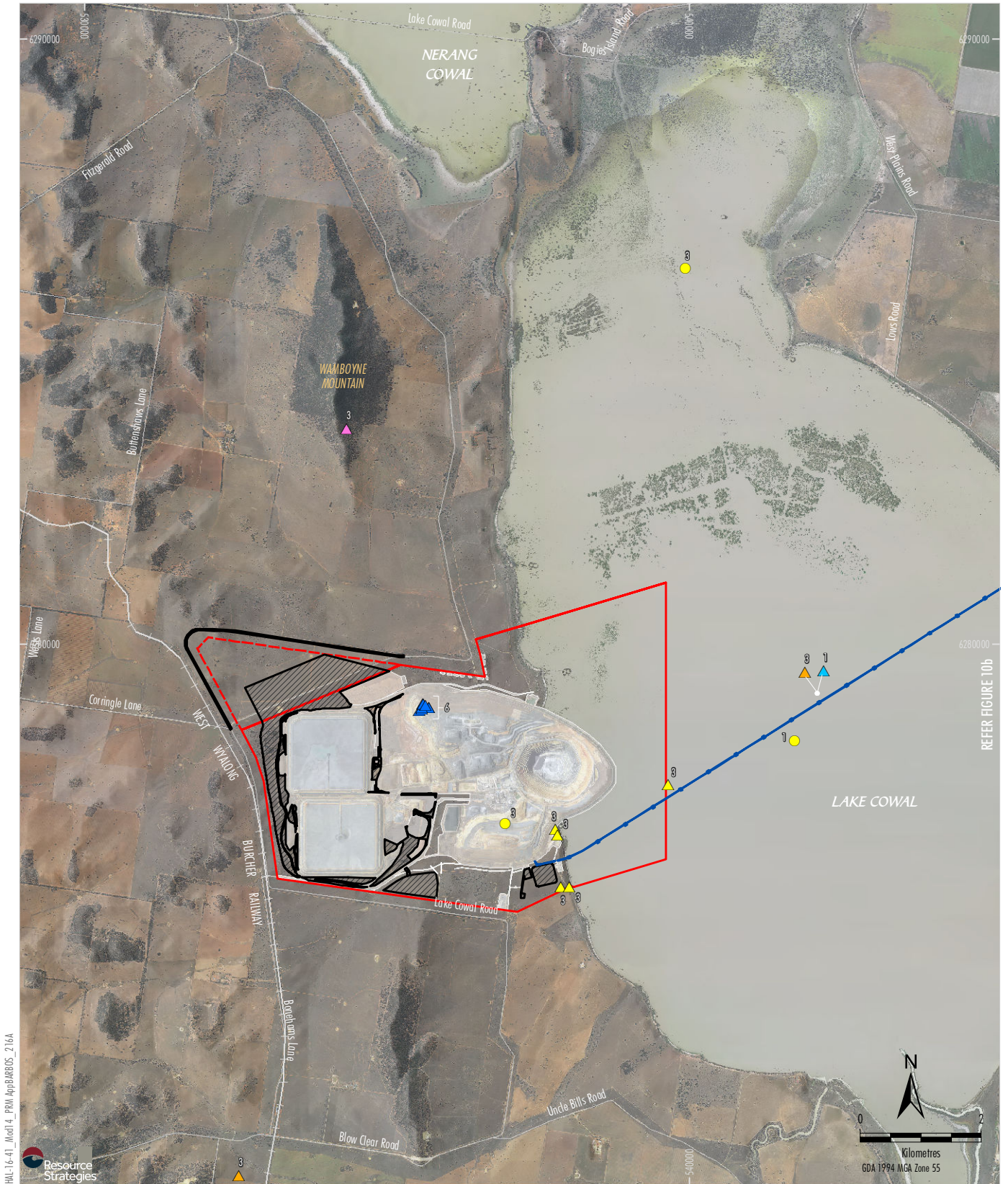
Note: There are no references 2 and 4 on this figure.

Source: © NSW Department of Finance, Services & Innovation (2017)
 Orthophoto: Evolution (Oct 2017)



CGO PROCESSING RATE MODIFICATION
 Threatened Bird Species
 - Pipeline

Figure 9b



HAL-16-41_Mod14_PRM_AppBARBOS_2164



LEGEND

- Mining Lease Boundary (ML 1535)
- Mining Lease Application Boundary (MLA 1)
- Approximate Extent of Approved Surface Development

- BAR Footprint - Mine Site
- BAR Footprint - Pipeline

THREATENED SPECIES

Amphibian

Sloane's Froglet

Bats

Yellow-bellied Sheath-trail-bat

Corben's Long-eared Bat

Little Pied Bat

- ▲ Inland Forest Bat
- ▲ Southern Myotis

Reference:

1. Atlas of Living Australia (2017)
3. OEH (2017)
6. Survey Records (1989 - 2013)

Note: There are no references 2, 4 and 5 on this figure.

Source: Evolution (2018); © NSW Department of Planning and Environment (2017); Department of Finance, Services & Innovation (2017) Orthophoto: Evolution (Oct 2017)



CGO PROCESSING RATE MODIFICATION

**Threatened Amphibian and Bat Species
Recorded within the Wider Locality
- Mine Site**

Figure 10a



- LEGEND**
- Approximate Extent of Approved Surface Development
 - BAR Footprint - Pipeline
 - Threatened Bat Species
 - Yellow-bellied Sheathtail-bat

Reference:
 3. OEH (2017)

Note: There are no references 1 and 2 on this figure.

Source: © NSW Department of Finance, Services & Innovation (2017)
Orthophoto: Evolution (Oct 2017)



CGO PROCESSING RATE MODIFICATION
 Threatened Bat Species
 - Pipeline

Figure 10b

Table 10
Vegetation Zones and Predicted Threatened Species - BAR Footprint Associated with the Mine Site

Vegetation Zone Number	Vegetation Community	Predicted Threatened Species with Lowest T _G Value	Species T _G Value
Grassy Woodlands – Floodplain Transition Woodlands			
2a	Inland Grey Box – White Cypress Pine Woodland (Semi Cleared in Moderate Condition) (LA152)	Little Pied Bat	0.475
2b	Inland Grey Box – White Cypress Pine Woodland (Semi Cleared in Low Condition) (LA152)	-	-
Forested Wetlands – Inland Riverine Forests			
3	River Red Gum Forest (Moderate Condition) (LA 189)	-	-
Semi-arid Woodlands (Grassy sub-formation) – Northwest Floodplain Woodlands			
4	Belah Woodland (Low Condition) (LA105)	-	-
Semi-arid Woodlands (Shrubby sub-formation) – Inland Rocky Hill Woodlands			
5	Dwyer’s Red Gum – White Cypress Pine – Currawang Woodland (Moderate Condition) (LA144)	Little Pied Bat	0.475
Grasslands – Western Slopes Grasslands			
6a	Highly Modified Derived Grasslands (Moderate Condition) (LA138)	-	-
6b	Highly Modified Derived Grasslands (Low Condition) (LA138)	-	-

Ecosystem species cannot be added to the OEH Biobanking Credit Calculator, however there are some species that have been recorded locally but are not predicted to occur within the OEH Biobanking Credit Calculator. These species are discussed below.

Little Eagle and Black Falcon

Two ecosystem species recorded in the BAR Footprint associated with the mine site (Little Eagle and Black Falcon, both ‘Vulnerable’ under the BC Act) (Figure 9a) were not predicted to occur within the OEH Biobanking Credit Calculator (i.e. the species are not listed in Table 9). The Little Eagle has a T_G value of 0.775 (OEH, 2017a) and therefore it would not increase the ecosystem credit requirement as the lowest T_G value is 0.475 (Table 9). The Black Falcon does not have a T_G value (OEH, 2017a).

Superb Parrot

One dual ecosystem/species credit species recorded in the BAR Footprint associated with the mine site (the Superb Parrot) (Figures 11a and 11b) was also not predicted to occur within the OEH Biobanking Credit Calculator (i.e. the species is not listed in Table 9). This species has a T_G value of 0.575 (OEH, 2017a) and therefore it would not increase the ecosystem credit requirement as the lowest T_G value is 0.475 (Table 9).

2.3.6 Species Credit Species

No species credit species have been recorded in the BAR Footprint associated with the mine site. As described in Section 2.3.2, while not predicted to occur in the locality by the OEH Biobanking Credit Calculator, the Superb Parrot (a dual ecosystem/species credit species) has been previously recorded at the CGO (Figure 9a). This species is a species credit species for breeding habitat (not foraging habitat).

Potential breeding habitat for the Superb Parrot does not occur in the BAR Footprint associated with the mine site, however the pipeline duplication does traverse potential foraging and breeding habitat for the Superb Parrot, along the foreshores of Lake Cowal (Figures 11a and 11b) (Section 3.3.4).

2.3.7 Species That Cannot Withstand Loss

No species credit species (those that cannot withstand loss) are relevant to the BAR Footprint associated with the mine site.

2.3.8 Impacts on Species That Require Further Consideration

The FBA (OEH, 2014a) describes that some threatened species require further consideration (by the NSW Government) in addition to the OEH Biobanking Credit Calculator. No species relevant to the BAR Footprint associated with the mine site require further consideration.

2.3.9 EPBC Act Threatened Species and Communities

Threatened Species

No flora species threatened under the EPBC Act have been recorded within the BAR Footprints (Figures 7a and 7b).

The FBA assessment of the BAR Footprint associated with the mine site included the following two threatened fauna species under the EPBC Act:

- Swift Parrot (*Lathamus discolor*) (ecosystem credit species) (Table 9); and
- Superb Parrot (dual ecosystem/species credit species).

These species are discussed below.

Swift Parrot

The Swift Parrot has not been recorded during extensive field surveys at the CGO (Section 2.3.4). This species is not likely to be adversely impacted by the Modification.

Superb Parrot

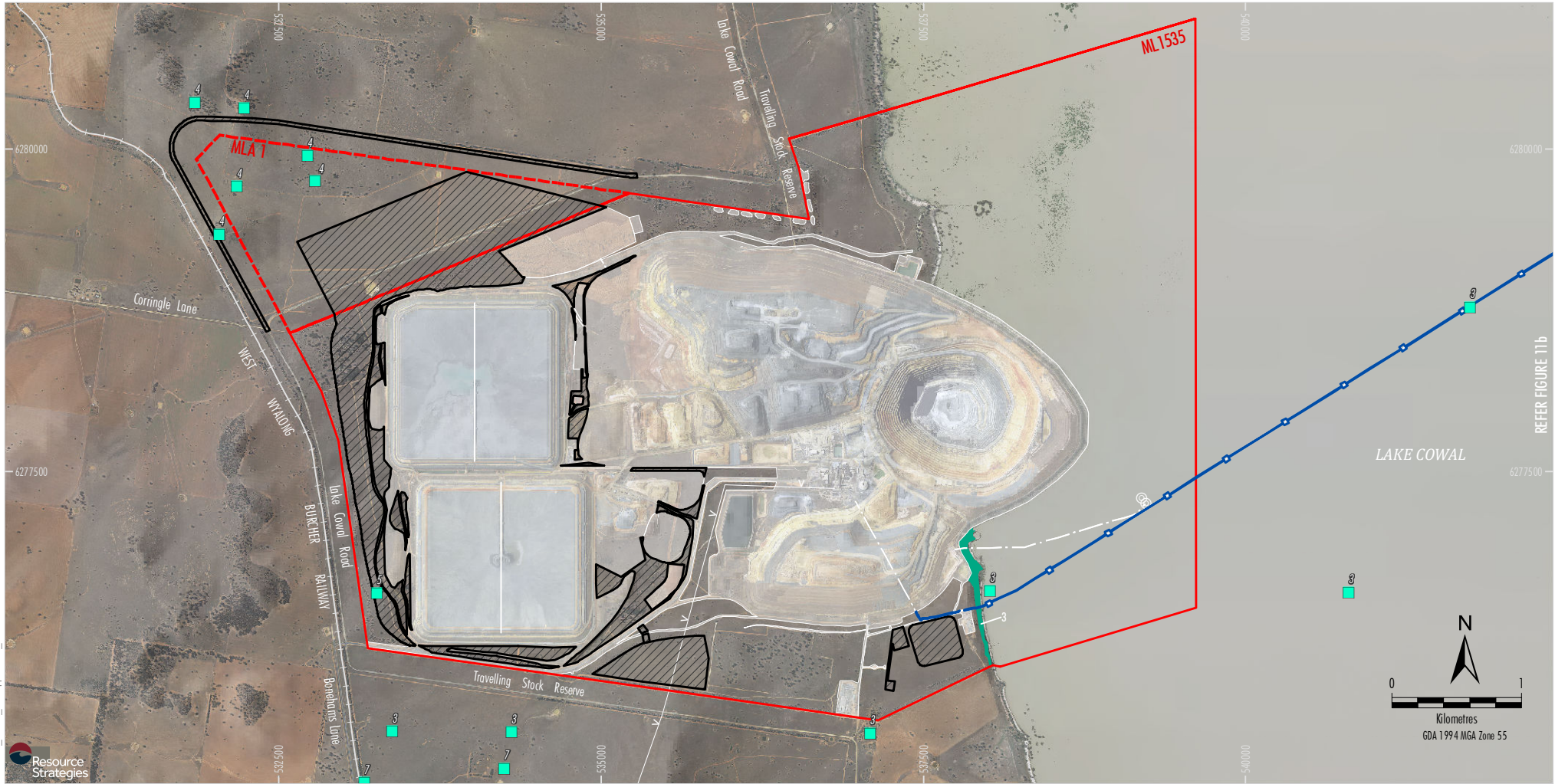
As detailed in Section 2.3.6, the Superb Parrot (Vulnerable under the EPBC Act) was recorded within the BAR Footprints (Figure 9a). Impacts on this species are further assessed in Section 4.2.

Other Threatened Species

The following EPBC Act listed threatened species have survey and/or database records in the wider locality of (but not within) the BAR Footprints (Figure 9a):

- Malleefowl;
- Australasian Bittern;
- Curlew Sandpiper; and
- Painted Honeyeater.

These species are discussed below.



HAL-16-41_Mod 4_PRM_AppBARBOS_211A



- LEGEND**
- Mining Lease Boundary (ML 1535)
 - Mining Lease Application Boundary (MLA 1)
 - Approximate Extent of Approved Surface Development
 - BAR Footprint - Mine Site
 - BAR Footprint - Pipeline
 - Superb Parrot Recorded Location
 - SUPERB PARROT POTENTIAL BREEDING HABITAT
 - Forested Wetlands - Inland Riverine Forests
 - River Red Gum Forest (Moderate Condition) (LA191)

Reference:
 3. OEH (2017)
 4. AMBS (2018a)
 5. AMBS (2013)
 7. AMBS (2018b)

Note: There are no references 1, 2 or 6 on this figure.

Source: Evolution (2018); © NSW Department of Finance, Services & Innovation (2017) Orthophoto: Evolution (Oct 2017)



CGO PROCESSING RATE MODIFICATION
 Superb Parrot Potential Breeding Habitat
 - Mine Site

Figure 11a

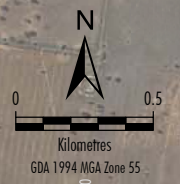


HAL-16-41_Merit 4_PRM-AppBARRBOS_212C
REFER FIGURE 11a



- LEGEND**
- Approximate Extent of Approved Surface Development
 - BAR Footprint - Pipeline
 - SUPERB PARROT POTENTIAL BREEDING HABITAT
 - Forested Wetlands - Inland Riverine Forests
 - River Red Gum Forest (Moderate Condition) (LA191)

Source: © NSW Department of Finance, Services & Innovation (2017)
Orthophoto: Evolution (Oct 2017)



CGO PROCESSING RATE MODIFICATION
Superb Parrot Potential Breeding Habitat
- Pipeline

Figure 11b

Malleefowl

The database record for the Malleefowl as shown on Figure 9a is from 1997 (Atlas of Living Australia, 2017). The validity of the record is doubtful given the absence of suitable habitat for this species. This ecosystem credit species is not likely to be adversely impacted by the Modification, and as stated in Section 2.3.5, ecosystem species cannot be added to the OEH Biobanking Credit Calculator.

Australasian Bittern

The Australasian Bittern has not been recorded within the BAR Footprints or during extensive field surveys at the CGO (Section 2.3.4). This species was recorded within Lake Cowal during Lake Cowal bird monitoring in January 1994 (Australian Museum Business Services, 2013). This species credit species is not likely to be adversely impacted by the Modification.

Curlew Sandpiper

This species was recorded in the surrounds of the Modification area during Lake Cowal bird monitoring on a single occasion, with 12 individuals being recorded during October 2001 (Figure 9a) (Australian Museum Business Services, 2013). In addition, a database record from 1997 for this species exists within 100 m of the eastern part of the Modification area within Lake Cowal (Figure 9a) (OEH, 2017b). This ecosystem credit species is not likely to be adversely impacted by the Modification, and as stated in Section 2.3.5, ecosystem species cannot be added to the OEH Biobanking Credit Calculator.

Painted Honeyeater

The Painted Honeyeater has not been recorded within the BAR Footprints or during extensive field surveys at the CGO (Section 2.3.4). The Painted Honeyeater was recorded by Vestjens (1977) in the north-eastern portion of Lake Cowal (Figure 9a).

There are also database records within Lake Cowal (Atlas of Living Australia, 2017 and OEH, 2017b). This species credit species is not likely to be adversely impacted by the Modification.

Threatened Ecological Communities

AMBS (2018a) (Attachment A) undertook targeted surveys for potentially occurring threatened ecological communities listed under the BC Act or EPBC Act in accordance with relevant listing advice. Threatened ecological communities listed under the EPBC Act are shown on Figures 12a and 12b. Approximately 11.5 ha of Grey Box EEC listed under the EPBC Act would be cleared for the Modification in the BAR Footprint associated with the mine site (Figure 12a).

2.3.10 FM Act Threatened Species and Communities

Threatened species and communities listed under the NSW *Fisheries Management Act, 1994* (FM Act) are discussed in Section 3.3.8.

2.3.11 Credit Summary - BAR Footprint Associated with the Mine Site

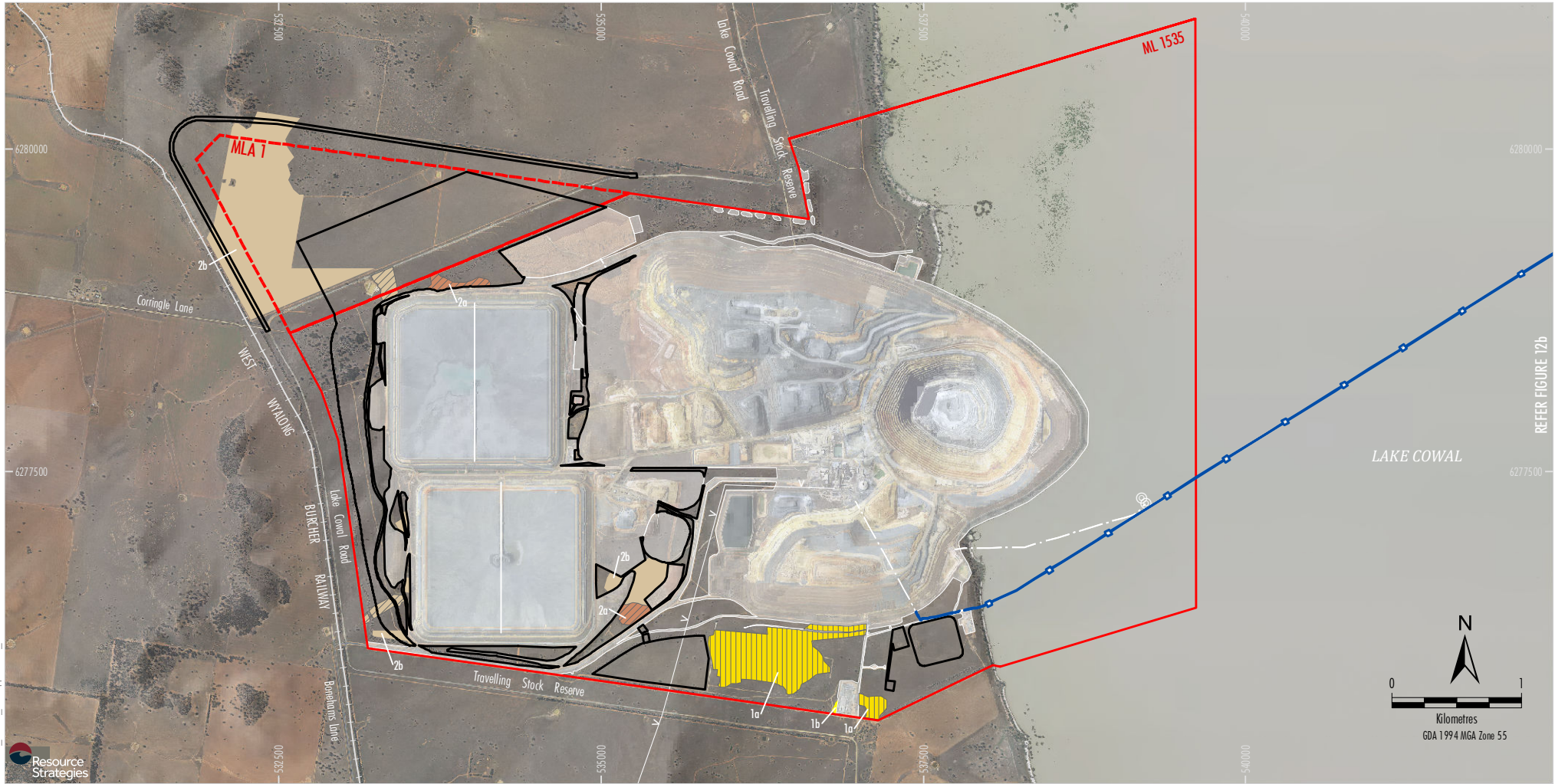
A summary of the credit requirements for the BAR Footprint associated with the mine site are provided in Table 11. The credit report is provided in Attachment D.

Table 11
Ecosystem Credit Requirements – BAR Footprint Associated with the Mine Site

#	Vegetation Community	PCT	Clearance Area (ha)	Credit Requirement (Attachment D)	Credits from BVTs able to be retired to address the Ecosystem Credit Requirement (Attachment D)	Offset Location
Grassy Woodlands – Floodplain Transition Woodlands						
2a	Inland Grey Box - White Cypress Pine Woodland (Semi Cleared in Moderate Condition) (LA152)	82	6.5 ^A	816	LA 152, LA 153, LA 154, LA162, LA 163, LA 175, LA 178, LA 194, LA 195	Lower Slopes - Lachlan
2b	Inland Grey Box - White Cypress Pine Woodland (Derived Grassland in Low Condition) (LA152)		23.5 ^B			
Semi-arid Woodland (Grassy sub-formation) – Northwest Floodplain Woodlands						
4	Belah Woodland (Low Condition) (LA105)	55	16.5	193	LA 105	Lower Slopes - Lachlan
Semi-arid Woodland (Scrubby sub-formation) – Inland Rocky Hill Woodlands						
5	Dwyer's Red Gum - White Cypress Pine - Currawang Woodland (Moderate Condition) (LA144)	185	1	18	LA 144, LA 204, LA 220, LA 122, LA 126, LA 141, LA 142, LA 143, LA 147, LA 148, LA 149, LA 181, LA 184, LA 200, LA237, LA 249, LA 270, LA 253, LA 254, LA 269, LA 267	Lower Slopes - Lachlan
Grasslands – Western Slopes Grasslands						
6a	Highly Modified Derived Grasslands (Moderate Condition) (LA138)	250	63.5	2,532	LA 138, LA 244, LA 238	Lower Slopes - Lachlan
6b	Highly Modified Derived Grasslands (Low Condition) (LA138)		170.5			
Total			281.5	3,559		

A 6.5 ha equivalent to the Grey Box EEC listed under the EPBC Act and BC Act.

B 23.5 ha equivalent to the Grey Box EEC listed under the BC Act, including approximately 5 ha equivalent to the Grey Box EEC listed under the EPBC Act.



HAL-16-41_Mod4_PRM_AppBARBOS_213A



LEGEND

- Mining Lease Boundary (ML 1535)
- Mining Lease Application Boundary (MLA 1)
- Approximate Extent of Approved Surface Development
- BAR Footprint - Mine Site
- BAR Footprint - Pipeline

VEGETATION MAPPING

- Semi-arid Woodlands (Grassy sub-formation) - Riverine Plain Woodlands**
- 1a Weeping Myall Open Woodland (Semi Cleared in Moderate Condition) (LA212)
- 1b Weeping Myall Open Woodland (Semi Cleared in Low Condition) (LA212)
- Grassy Woodlands - Floodplain Transition Woodlands**
- 2a Inland Grey Box - White Cypress Pine Woodland (Semi Cleared in Moderate Condition) (LA152)
- 2b Inland Grey Box - White Cypress Pine Woodland (Derived Grassland in Low Condition) (LA152)
- Threatened Ecological Communities**
- Grey Box Woodland EEC (EPBC Act)
- Weeping Myall Woodland EEC (EPBC Act)

Source: Evolution (2018); © NSW Department of Finance, Services & Innovation (2017)
 Orthophoto: Evolution (Oct 2017)



CGO PROCESSING RATE MODIFICATION

Threatened Ecological Communities
 EPBC Act
 - Mine Site

Figure 12a



HAL-16-41_Merit 4_PrimAppBARBOS_214A
REFER FIGURE 12a



- LEGEND**
- Approximate Extent of Approved Surface Development
 - BAR Footprint - Pipeline
 - VEGETATION MAPPING**
 - Semi-arid Woodlands (Grassy sub-formation) - Riverine Plain Woodlands**
 - 1a Weeping Myall Open Woodland (Semi Cleared in Moderate Condition) (LA212)
 - 1b Weeping Myall Open Woodland (Semi Cleared in Low Condition) (LA212)
 - Threatened Ecological Communities**
 - Weeping Myall Woodland EEC (EPBC Act)

Source: © NSW Department of Finance, Services & Innovation (2017)
Orthophoto: Evolution (Oct 2017)



CGO PROCESSING RATE MODIFICATION
Threatened Ecological Communities
EPBC Act
-Pipeline

Figure 12b

3 STAGE 1 – BIODIVERSITY ASSESSMENT – PIPELINE DUPLICATION

This section provides information on the application of the linear shaped development assessment for the pipeline duplication. The BAR Footprint associated with the pipeline duplication is approximately 6 m wide.

3.1 LANDSCAPE FEATURES

Landscape features relevant to the BAR Footprint associated with the pipeline duplication are described in this sub-section.

3.1.1 Regional Setting and Landscape

The BAR Footprint associated with the pipeline duplication is located within the regions listed in Table 12 and shown on Figure 13.

Table 12
Regional Setting and Landscape Associated with the Pipeline Duplication

Boundary	BAR Footprint Location
IBRA Region	NSW South Western Slopes
IBRA Sub-region	Lower Slopes
CMA	Lachlan
CMA Sub-region	Lower Slopes - Lachlan
LGA	Forbes Shire Council
Mitchell Landscape	Cowal Lakes, Swamps and Lunettes; Lachlan – Bland Channels and Floodplains; and Ardlethan Hills

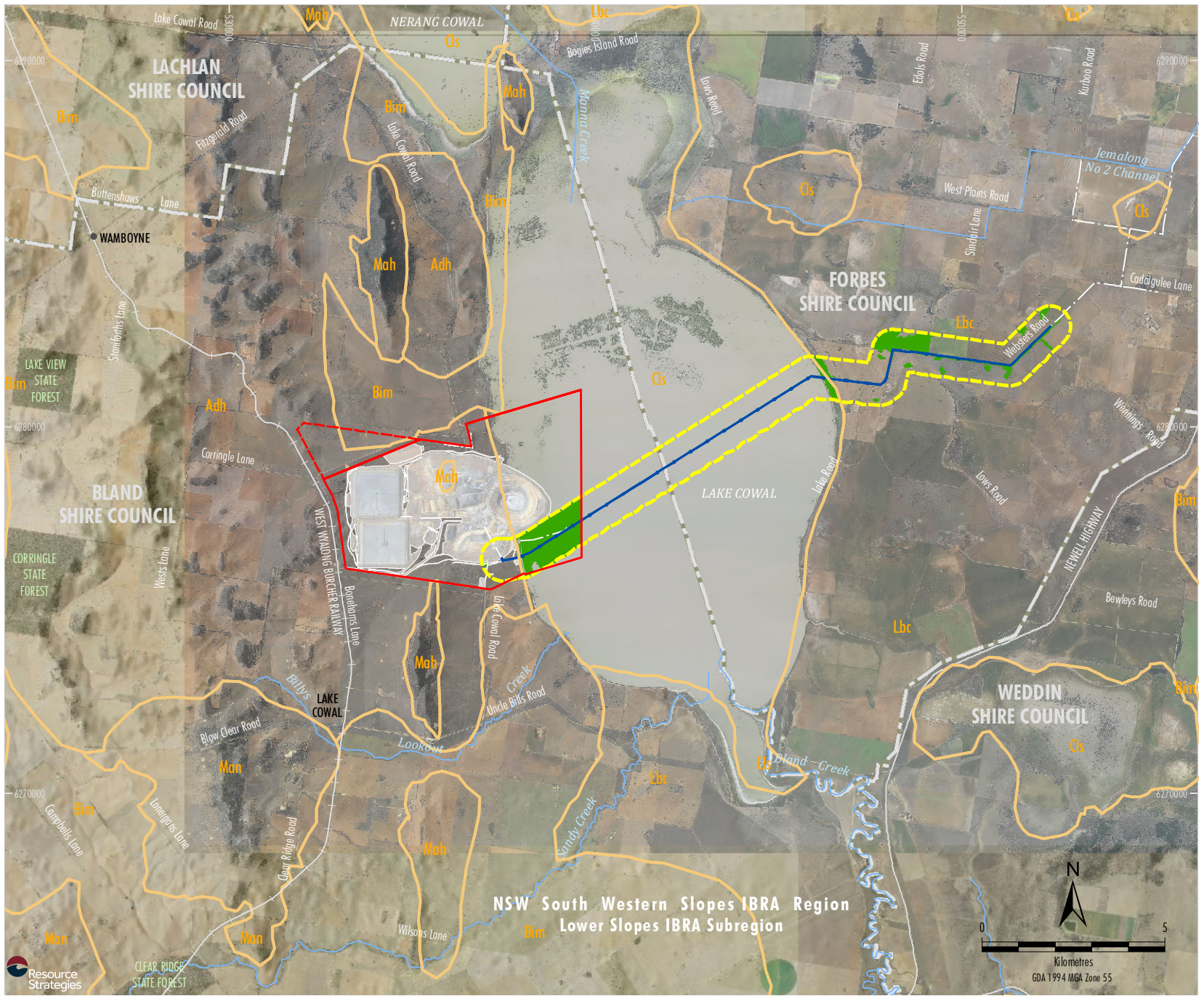
3.1.2 Landscape Value Score

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

In order to determine the landscape value score for the BAR Footprint associated with the pipeline duplication, the following landscape attributes were entered into the OEH Biobanking Credit Calculator:

- percent native vegetation cover (6-10% before and 6-10% after);
- connectivity value (the connectivity value score is 12.5); and
- area to perimeter ratio (74 before and 74 after).

The extent of native vegetation in the buffer area was informed by AMBS (2018a) (Attachment A) and OEH (2015a) (Figure 13) and it was assumed that all native vegetation is in moderate to good condition (except that confirmed to be in low condition by AMBS) (Figure 13). The approved CGO within the buffer area was assumed cleared for the purpose of the assessment.



- LEGEND**
- Mining Lease Boundary (ML 1535)
 - Mining Lease Application Boundary (MLA 1)
 - Local Government Boundary
 - Approximate Extent of Approved Surface Development
 - BAR Footprint - Pipeline
 - BAR Assessment Area
 - Vegetation within Buffer
- Mitchell Landscape**
- Adh Ardlethan Hills
 - Bim Bimbi Plains
 - Cls Cowl Lakes, Swamps and Lunettes
 - Lbc Lachlan - Bland Channels and Floodplains
 - Man Manitoba Hills and Footslopes
 - Mah Manna Hills and Footslopes

Source: Evolution (2018); © NSW Department of Planning and Environment (2017); Department of Finance, Services & Innovation (2017); Crown Lands and Water - a Division of the NSW Department of Industry (2013); Office of Environment and Heritage NSW; Australian Government Department of the Environment (2017)
 Orthophoto: Evolution (Oct 2017); Department of Finance, Services & Innovation (2017)



**CGO PROCESSING RATE MODIFICATION
 Location Map
 - Pipeline**

Figure 13

State and Regionally Significant Biodiversity Links

The BAR Footprint associated with the pipeline duplication traverses Lake Cowal (Figure 14). Lake Cowal/Wilbertroy Wetlands (NSW040) is a wetland on the Directory of Important Wetlands of Australia (DIWA) (DEE, 2018a) (Figure 14). According to the FBA (2014a), impacts on a wetland in the DIWA correspond to impacts on a state significant biodiversity link (with a maximum connectivity value score of 12.5 [FBA, 2014a]).

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.

3.1.3 Impacts on Landscape Features that Require Further Consideration

According to the FBA (2014a), impacts on state significant biodiversity links require further consideration. Further assessment is provided in Section 4.1.4.

3.2 NATIVE VEGETATION

Native vegetation relevant to the BAR Footprint associated with the pipeline duplication is described in this sub-section based on detailed flora survey work undertaken by AMBS (2018a) (Attachment A).

3.2.1 Plant Community Types/Biometric Vegetation Types

As described in Section 2.2.1, AMBS (2018a) (Attachment A) conducted flora surveys within the BAR Footprints and developed vegetation community mapping. Sites sampled by AMBS (2018a) (Attachment A) are shown on Figure 6a and 6b. Vegetation communities are shown on Figures 7a and 7b.

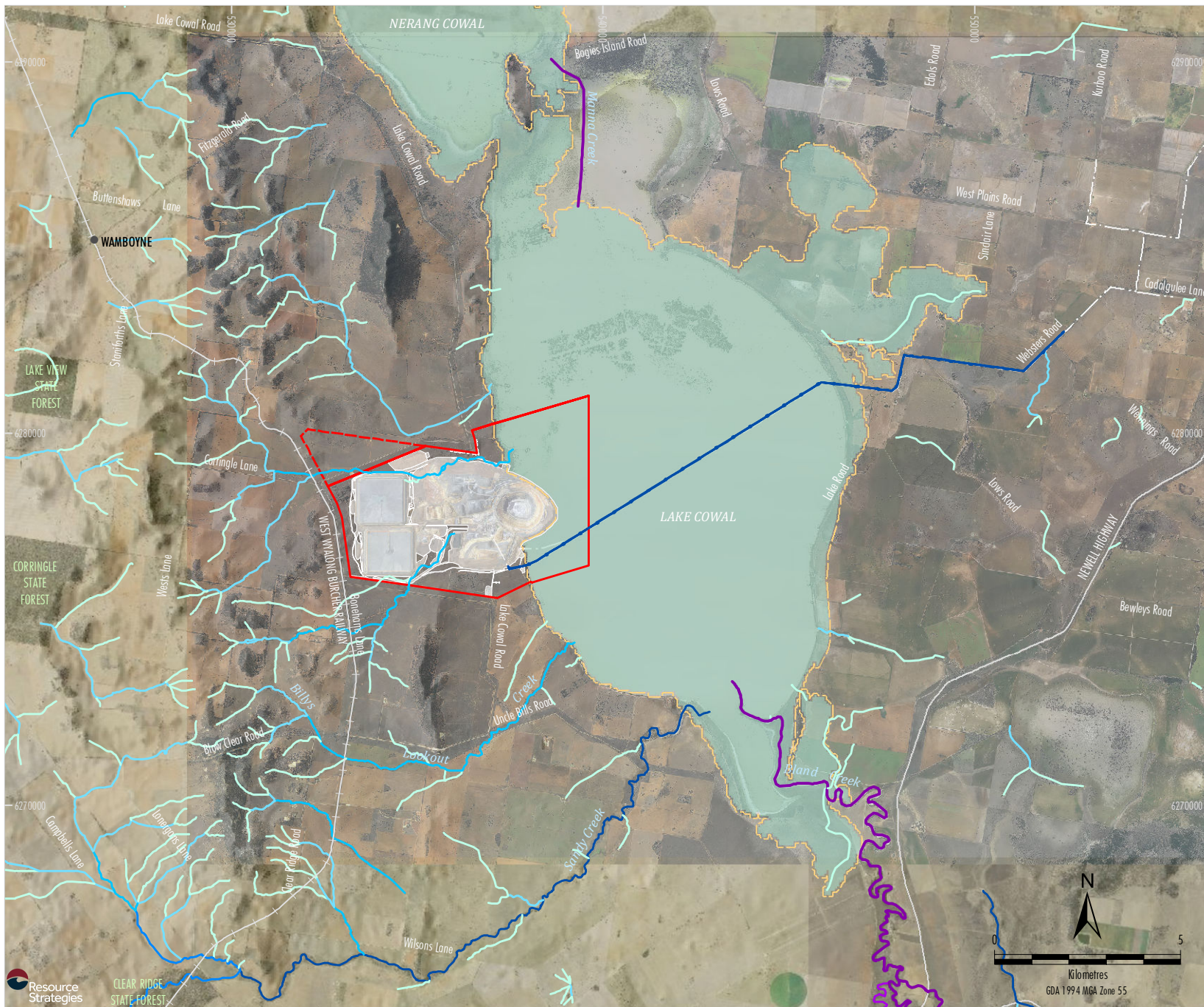
The area of each vegetation community in the BAR Footprint associated with the pipeline duplication is provided in Table 13. In summary, the BAR Footprint associated with the pipeline duplication is 15.2 ha in size, comprising 5.2 ha of native vegetation. The remaining 10 ha is composed of lake bed (8.5 ha) and land that has been cleared or is used for cropping (1.5 ha).

Table 13
Vegetation Communities in the BAR Footprint Associated with the Pipeline Duplication

#	Vegetation Community	PCT	Area (ha)
Semi-arid Woodlands Formation (Grassy Sub-formation) – Riverine Plain Woodlands			
1a	Weeping Myall Open Woodland (Semi Cleared in Moderate Condition) (LA212)	26	1.3 ^{A, B}
1b	Weeping Myall Open Woodland (Semi Cleared in Low Condition) (LA212)		0.2 ^{A, B}
1c	Weeping Myall Open Woodland (Derived Grassland in Low Condition) (LA212)		3 ^A
Forested Wetlands - Inland Riverine Forests			
3	River Red Gum Forest (Moderate Condition) (LA191)	249	0.4
Grasslands – Western Slopes Grasslands			
6b	Highly Modified Derived Grasslands (Low Condition) (LA138)	250	0.3
Total Native Vegetation			5.2
Cleared Land/Cropping			1.5
Lake Bed			8.5
Total BAR Footprint for the Pipeline Duplication			15.2

A Equivalent to the Myall Woodland EEC listed under the BC Act.

B Equivalent to the Myall Woodland EEC listed under the EPBC Act as it is part of a patch that is >0.5 ha in size.



- LEGEND**
- Mining Lease Boundary (ML 1535)
 - Mining Lease Application Boundary (MLA 1)
 - Approximate Extent of Approved Surface Development
 - BAR Footprint - Pipeline
 - Wetland in the Directory of Important Wetlands Australia
 - 50 m Buffer of a Wetland in the Directory of Important Wetlands Australia
 - Strahler Stream Order
 - 1st Order
 - 2nd Order
 - 3rd Order
 - 4th Order
 - 5th Order
 - 6th Order
 - 7th Order

Source: Evolution (2018); © NSW Department of Planning and Environment (2017); Department of Finance, Services & Innovation (2017); Crown Lands and Water - a Division of the NSW Department of Industry (2013); Office of Environment and Heritage NSW; Australian Government Department of the Environment (2017)
 Orthophoto: Evolution (Oct 2017); Department of Finance, Services & Innovation (2017)



CGO PROCESSING RATE MODIFICATION

Site Map
- Pipeline

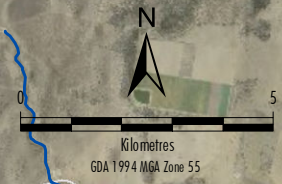


Figure 14

3.2.2 Threatened Ecological Communities

AMBS (2018a) (Attachment A) undertook targeted surveys for potentially occurring threatened ecological communities listed under the BC Act or EPBC Act in accordance with relevant listing advice.

The Weeping Myall (*Acacia pendula*) woodland and derived grassland in the BAR Footprint associated with the pipeline duplication (Vegetation Community 1a, 1b and 1c) represents the *Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Penneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions* listed under the BC Act (Myall Woodland EEC listed under the BC Act) (approximately 4.5 ha). Approximately 1.5 ha of the Myall Woodland EEC listed under the BC Act also meets the criteria for the Weeping Myall Woodlands listed under the EPBC Act (Myall Woodland EEC listed under the EPBC Act) (Table 14) (Plate 3).

Table 14
Threatened Ecological Communities in the BAR Footprint Associated with the Pipeline Duplication

Threatened Ecological Community	Conservation Status		1a Weeping Myall Open Woodland (Semi Cleared in Moderate Condition) (LA212)	1b Weeping Myall Open Woodland (Semi Cleared in Low Condition) (LA212)	1c Weeping Myall Open Woodland (Derived Grassland in Low Condition) (LA212)	Area (ha)
	EPBC Act	BC Act				
Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Penneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions (Myall Woodland EEC listed under the BC Act)	-	E	1.3	0.2	3	4.5
Weeping Myall Woodlands (Myall Woodland EEC listed under the EPBC Act)	E	-	1.3	0.2*	N/A	1.5

¹ Threatened status under the BC Act and/or EPBC Act (current as at March 2018).

E = Endangered

* Equivalent to the Myall Woodland EEC listed under the EPBC Act as it is part of a patch that is >0.5 ha in size.

The site condition (plot data) collected in Vegetation Community 1a (Weeping Myall Open Woodland [Semi Cleared in Moderate Condition] [LA212]) indicates the understorey comprises a nil-negligible cover of native grasses, 14-18% cover of other native plants (e.g. herbs) and 20-76% cover of weeds (mostly non-native grasses).

The site condition (plot data) collected in Vegetation Community 1b (Weeping Myall Open Woodland [Semi Cleared in Low Condition] [LA212]) indicates the understorey comprises a nil-negligible cover of native grasses, 42% cover of other native plants (e.g. herbs) and 6% cover of weeds.

The site condition (plot data) collected in Vegetation Community 1c (Weeping Myall Open Woodland [Derived Native Grassland in Low Condition] [LA212]) indicates the understorey comprises 14-62% cover of native grasses, 16-34% cover of other native plants (e.g. herbs) and 2-36% cover of weeds.



Source: AMBS (2018a) (Attachment A)

Plate 3 Example of Myall Woodland EEC listed under the BC Act and EPBC Act in the BAR Footprint (Community 1a)

3.2.3 Vegetation Zones

The vegetation communities described in Section 3.2.1 were grouped into vegetation zones according to their condition. Table 15 outlines the vegetation zones present in the BAR Footprint associated with the pipeline duplication, relevant PCT/BVT, condition, site value score (i.e. the quantitative measure of vegetation condition), area and patch size.

The patch size for two vegetation zones were greater than 1,000 ha (i.e. connecting with vegetation outside the BAR Footprint associated with the pipeline duplication, both were woodlands in moderate to good condition) (Table 15). One vegetation zone was derived native grassland in low condition with a current site value score of less than 17, namely the 0.3 ha of Highly Modified Derived Grasslands (Low Condition) (LA138) (Table 15). As such, this community does not require ecosystem credits.

3.2.4 Vegetation Condition

Site condition data was collected by AMBS (2018a) (Attachment A) at each FBA Plot location (Figures 6a and 6b)

3.2.5 Vegetation Impacts that Require Further Consideration

No threatened ecological communities described in the FBA (OEH, 2014a) and listed under the BC Act or EPBC Act were mapped by AMBS (2018a) (Attachment A) within the BAR Footprints.

Table 15
Vegetation Zones in the BAR Footprint Associated with the Pipeline Duplication

Vegetation Zone	#	Vegetation Community	PCT	Area (ha)	Condition Class	Site Value Score	Patch Size
Semi-arid Woodlands Formation (Grassy Sub-formation) – Riverine Plain Woodlands							
1	1a	Weeping Myall Open Woodland (Semi Cleared in Moderate Condition) (LA212)	26	1.3	Moderate/Good	51.33	>1001
2^	1b and 1c	Weeping Myall Open Woodland (Semi Cleared in Low Condition) (LA212) Weeping Myall Open Woodland (Derived Grassland in Low Condition) (LA212)		3.2	Low	48.89	0
Forested Wetlands – Inland Riverine Forests							
3	3	River Red Gum Forest (Moderate Condition) (LA191)	249	0.4	Moderate/Good	54.17	>1001
Grasslands – Western Slopes Grasslands							
4	6b	Highly Modified Derived Grasslands (Low Condition) (LA138)	250	0.3	Low	15.33*	0
Total				5.2			

* This vegetation zone has a current site value score of less than 17. As such, this community does not require ecosystem credits.

^ Zone 2 comprises Vegetation community 1b and 1c because both are in low condition and therefore must be grouped in the OEH Biobanking Credit Calculator.

3.3 THREATENED SPECIES

Threatened species relevant to the BAR Footprint associated with the pipeline duplication are identified in this sub-section.

3.3.1 Habitat Features for Particular Species Credit Species

Habitat features from the OEH Biobanking Credit Calculator are listed in Table 16, along with the relevance of the habitat features to the BAR Footprint associated with the pipeline duplication.

Table 16
Threatened (Species Credit) Species Habitat Features - BAR Footprint Associated with the Pipeline Duplication

Common Name	Scientific Name	Conservation Status ¹		Habitat Feature (OEH Biobanking Credit Calculator)	Potentially Relevant
		BC Act	EPBC Act		
Amphibian					
Sloane's Froglet	<i>Crinia sloanei</i>	V	-	Land within 50 m of identified breeding habitat.	Yes
Birds					
Grey Falcon	<i>Falco hypoleucos</i>	E	-	Land within 100 m of riparian woodland on inland rivers containing mature living eucalypts or isolated paddock trees overhanging water or dry watercourses.	Yes

¹ Threatened fauna species status under the BC Act and/or EPBC Act (current as at March 2018). V = Vulnerable; E = Endangered

3.3.2 Targeted Surveys for Threatened Species

A list of candidate species credit species requiring survey was produced by the OEH Biobanking Credit Calculator (Table 17). All species credit species requiring survey were surveyed by AMBS (2018a) (Attachment A).

The OEH Biobanking Credit Calculator does not require targeted surveys for the Superb Parrot (a dual ecosystem/species credit species) which has been previously recorded at the CGO (Figure 9a). Despite this, AMBS (2018a) (Attachment A) undertook targeted surveys for the Superb Parrot.

3.3.3 Ecosystem Credit Species

A total of 25 ecosystem credit species are listed in Table 18 from the OEH Biobanking Credit Calculator. Table 18 shows that the Barking Owl (*Ninox connivens*) is the predicted threatened species with lowest T_G (i.e. 0.325). There are database records of the Barking Owl in the wider locality (OEH, 2017b) (Figure 9a).

Table 17
Threatened (Species Credit) Species Survey Timing - BAR Footprint Associated with the Pipeline Duplication

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															
A spear-grass	<i>Austrostipa wakoolica</i>	E	E									Yes	Yes	Yes	Yes
Silky Swainson-pea	<i>Swainsona sericea</i>	V	-									Yes	Yes	Yes	Yes
Small Scurf-pea	<i>Cullen parvum</i>	E	-	Yes	Yes										Yes
Amphibian															
Sloane's Froglet	<i>Crinia sloanei</i>	V	-						Yes	Yes	Yes				
Birds															
Grey Falcon	<i>Falco hypoleucos</i>	E	-	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mammals															
Koala	<i>Phascolarctos cinereus</i>	V	V	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

LEGEND  Highlighted month is the month in which targeted surveys were undertaken for the relevant species by AMBS (2018a) (Attachment A)

¹ Threatened fauna species status under the BC Act and/or EPBC Act (current as at March 2018). V = Vulnerable; E = Endangered

Table 18
Ecosystem Species from the OEH Biobanking Credit Calculator – BAR Footprint Associated with the Pipeline Duplication

Common Name	Scientific Name	Conservation Status ¹		T _G Value	Presence in the BAR Footprint (Figures 9a, 9b, 10a and 10b)
		BC Act	EPBC Act		
Birds					
Freckled Duck	<i>Stictonetta naevosa</i>	V	-	0.75	-
Square-tailed Kite	<i>Lophoictinia isura</i>	V	-	0.725	-
Spotted Harrier	<i>Circus assimilis</i>	V	-	0.725	-
Little Eagle	<i>Hieraaetus morphnoides</i>	V	-	0.725	-
Brolga	<i>Grus rubicunda</i>	V	-	0.75	-
Bush Stone-curlew	<i>Burhinus grallarius</i>	E	-	0.375	-
Australian Painted Snipe	<i>Rostratula australis</i>	E	E	0.75	-
Major Mitchell's Cockatoo	<i>Lophochroa leadbeateri</i>	V	-	0.525	-
Turquoise Parrot	<i>Neophema pulchella</i>	V	-	0.55	Database record in Lake Cowal
Swift Parrot	<i>Lathamus discolor</i>	V	CE	0.75	Database record in Lake Cowal
Barking Owl	<i>Ninox connivens</i>	V	-	0.325	Database record in Lake Cowal
Brown Treecreeper (eastern subspecies)	<i>Climacteris picumnus victoriae</i>	V	-	0.5	-
Black-chinned Honeyeater (eastern subspecies)	<i>Melithreptus gularis</i>	V	-	0.75	-
Painted Honeyeater	<i>Grantiella picta</i>	V	-	0.75	-
Pied Honeyeater	<i>Certhionyx variegatus</i>	V	-	0.75	-
Hooded Robin (south-eastern form)	<i>Melanodryas cucullata</i>	V	-	0.6	-
Flame Robin	<i>Petroica phoenicea</i>	V	-	0.75	-
Scarlet Robin	<i>Petroica boodang</i>	V	-	0.75	-
Grey-crowned Babbler (eastern subspecies)	<i>Pomatostomus temporalis</i>	V	-	0.75	Recorded in the BAR Footprint
Varied Sittella	<i>Daphoenositta chrysoptera</i>	V	-	0.75	-
Diamond Firetail	<i>Stagonopleura guttata</i>	V	-	0.75	-
Mammals					
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	V	E	0.375	-
Corben's Long-eared Bat	<i>Nyctophilus corbeni</i>	V	V	0.475	-
Little Pied Bat	<i>Chalinolobus picatus</i>	V	-	0.475	-
Yellow-bellied Sheath-tail-bat	<i>Saccolaimus flaviventris</i>	V	-	0.45	Recorded in the BAR Footprint

¹ Threatened species status under the BC Act (current as at March 2018). V= Vulnerable, E = Endangered

Threatened species status under the EPBC Act (current as at March 2018). V= Vulnerable, E = Endangered, CE = Critically Endangered

Table 19 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). The species with the lowest T_G value influences the offset multiplier designated to each vegetation zone.

Table 19
Vegetation Zones and Predicted Threatened Species - BAR Footprint Associated with the Pipeline Duplication

Vegetation Zone Number	Vegetation Community	Predicted Threatened Species with Lowest T _G Value	Species T _G Value
Grassy Woodlands – Floodplain Transition Woodlands			
1	1a Weeping Myall Open Woodland (Semi Cleared in Moderate Condition) (LA212)	Bush Stone-curlew	0.375
2	1b Weeping Myall Open Woodland (Semi Cleared in Low Condition) (LA212) 1c Weeping Myall Open Woodland (Derived Grassland in Low Condition) (LA212)	-	-
Forested Wetlands – Inland Riverine Forests			
3	3 River Red Gum Forest (Moderate Condition) (LA 189)	Barking Owl	0.325
Grasslands – Western Slopes Grasslands			
4	6b Highly Modified Derived Grasslands (Low Condition) (LA138)	N/A	N/A

Superb Parrot

One dual ecosystem/species credit species recorded in the BAR Footprint associated with the pipeline duplication (the Superb Parrot) (Figure 9a) was also not predicted to occur within the OEH Biobanking Credit Calculator (i.e. the species is not listed in Table 18). This species has a T_G value of 0.575 (OEH, 2017a) and therefore it would not increase the ecosystem credit requirement as the lowest T_G value is 0.325 (Table 18).

3.3.4 Species Credit Species

As described in Section 2.3.2, while not predicted to occur in the locality by the OEH Biobanking Credit Calculator, the Superb Parrot (a dual ecosystem/ species credit species) has been previously recorded at the CGO (Figure 9a).

There is no evidence of Superb Parrot nesting in the BAR Footprints or in the surrounds from the extensive monitoring and field surveys which have been undertaken at the CGO (Section 2.3.4). However, potential breeding habitat for the Superb Parrot does occur in the BAR Footprint associated with the pipeline duplication. The River Red Gum Forest (Moderate Condition) (LA 189) contains River Red Gum (*Eucalyptus camaldulensis*) with numerous hollows over 5 centimetres (cm) wide, as such this vegetation community is considered potential foraging and breeding habitat for the Superb Parrot (Table 20) (Figures 11a and 11b).

Table 20
Relevant Species Credit Species

Species	Presence	Conservation Status ¹		Potential Habitat	Clearance Area (ha) *	T _G Score	Credit Requirement
		BC Act	EPBC Act				
Superb Parrot	Yes	E	CE	River Red Gum Forest (Moderate Condition) (LA191)	0.4	1.8	7
Total					0.4	1.8	7

¹ Threatened species status under the BC Act (current as at March 2018). E = Endangered
Threatened species status under the EPBC Act (current as at March 2018). CE = Critically Endangered

No other species credit species are relevant to the BAR Footprint associated with the pipeline duplication.

It is recognised that Lake Cowal provides habitat for waterbirds when the lake is inundated. Species credit species previously recorded at Lake Cowal are: the Australasian Bittern (*Botaurus poiciloptilus*), Australian Painted Snipe (*Rostratula australis*), and White-bellied Sea-Eagle (*Haliaeetus leucogaster*) (Attachment C).

None of these species credit species are likely to be adversely impacted by the pipeline duplication. Similar to the existing pipeline, the duplicated pipeline would be buried. Should Lake Cowal contain water at the time of construction, the pipeline would be placed on the lake bed before being buried once lake levels subside and ground conditions allow burial of the pipeline.

Grazing and opportunistic cropping within the full storage water line of Lake Cowal (outside of ML 1535) occur when the lake has receded, and moisture and market conditions are suitable.

3.3.5 Species That Cannot Withstand Loss

The Superb Parrot (the only relevant species credit species) is not a species that cannot withstand loss as classified by OEH (2017a).

3.3.6 Impacts on Species That Require Further Consideration

No species relevant to the BAR Footprint associated with the pipeline duplication require further consideration.

3.3.7 EPBC Act Threatened Species and Communities

Threatened Species

No flora species threatened under the EPBC Act have been recorded within the BAR Footprints (Figures 7a and 7b).

The FBA assessment of the BAR Footprint associated with the pipeline duplication included the following five threatened fauna species under the EPBC Act:

- Australian Painted Snipe (*Rostratula australis*) (ecosystem credit species) (Table 18);
- Swift Parrot (*Lathamus discolor*) (ecosystem credit species) (Table 18);
- Superb Parrot (dual ecosystem/species credit species);
- Spotted-tailed Quoll (*Dasyurus maculatus*) (ecosystem credit species) (Table 18); and
- Corben's Long-eared Bat (*Nyctophilus corbeni*) (ecosystem credit species) (Table 18).

These species are discussed below.

Australian Painted Snipe

The Australian Painted Snipe has several records from the Lake Cowal area, however it has not been recorded during extensive field surveys at the CGO. Therefore, this species is not likely to be adversely impacted by the Modification. Despite this, potential impacts on this species habitat are accounted for in the credit calculation because the species is included in Table 18.

Swift Parrot

The Swift Parrot has not been recorded during extensive field surveys at the CGO (Section 2.3.4). This species is not likely to be adversely impacted by the Modification. Despite this, potential impacts on this species habitat are accounted for in the credit calculation because the species is included in Table 18.

Superb Parrot

As detailed in Section 2.3.6, the Superb Parrot (Vulnerable under the EPBC Act) was recorded within the BAR Footprints (Figure 9a). Impacts on this species are further assessed in Section 4.2.

Spotted-tailed Quoll

A single record of the Spotted-tailed Quoll exists within the wider CGO surrounds from 1997 (Atlas of Living Australia, 2017). Validity of this record is questionable as it is not recognised habitat for the species. Extensive surveys have not recorded the species within the Modification Area. This species is not likely to be adversely impacted by the Modification. Despite this, potential impacts on this species habitat are accounted for in the credit calculation because the species is included in Table 18.

Corben's Long-eared Bat

Nyctophilus sp./spp. have been recorded within the CGO at the tailing storage facilities (Donato Environmental Services, 2006, 2007, 2008b, 2008c, 2009, 2010a, 2010b, 2011a, 2012a, 2012b, 2013a and b). However, it is uncertain whether or not this species occurs in the surrounds since *Nyctophilus* spp. calls are unable to be identified at the species level using current Anabat™ technology. The records are indeterminate as to what species may or may not be present. Hence a conservative position has been adopted and the Corben's Long-eared Bat is assessed as being present, even though this may not be the case. Potential impacts on this species habitat are accounted for in the credit calculation because the species is included in Table 18.

Threatened Ecological Communities

AMBS (2018a) (Attachment A) undertook targeted surveys for potentially occurring threatened ecological communities listed under the BC Act or EPBC Act in accordance with relevant listing advice. Approximately 1.5 ha of Myall Woodland EEC listed under the EPBC Act would be cleared for the Modification in the BAR Footprint associated with the pipeline duplication (Figures 12a and 12b).

3.3.8 FM Act Threatened Species and Communities

Threatened Species

The Macquarie Perch (*Macquaria australasica*) and Silver Perch (*Bidyanus bidyanus*) were recorded within the Lachlan River Catchment area between 1947 and 1992 (Pease and Grinberg, 1995). No threatened fish species were recorded within Lake Cowal during targeted surveys in February 2011 or July 2012 surveys (undertaken in conditions when Lake Cowal was nearly full) by frc Environmental (2011, 2012).

Recent surveys of fish communities in Lake Cowal undertaken by frc Environmental in December 2016 and August 2017 recorded no threatened species (frc Environmental, 2016 and 2017).

The *Freshwater Threatened Species Distribution Maps* (Department of Primary Industries Fishing, 2018) indicate that one other species listed under the FM Act has a distribution that includes the locality, i.e. the Western Olive Perchlet (*Ambassis agassizii*) population. However, the Western Olive Perchlet population is now found only at a few sites in the Darling River drainage.

Threatened Ecological Communities

The *Aquatic Ecological Community in the Natural Drainage System of the Lowland Catchment of the Lachlan River Endangered Ecological Community* (Lachlan River Catchment EEC) is listed under the FM Act and includes Lake Cowal in the listing (DPI Threatened Species Unit, 2006).

The dynamics of the Lake Cowal system have been modified significantly by a number of factors including agricultural land use within the catchment, clearing, levee construction and modifications to flood entry and exit points and the construction of the Jemalong-Wyldes Plains irrigation system, including the Jemalong Weir (Resource Strategies *et al.*, 1997 in North Limited, 1998). European Carp (*Cyprinus carpio*), a recognised threat to the Lachlan River Catchment EEC have, at times, also been recorded in plague proportions in Lake Cowal.

Grazing and opportunistic cropping within the full storage water line of Lake Cowal (outside of ML 1535) occur when the lake has receded, and moisture and market conditions are suitable.

3.3.9 Credit Summary

A summary of the ecosystem credit requirements for the BAR Footprint associated with the pipeline duplication are provided in Table 21. The credit report is provided in Attachment E.

**Table 21
Ecosystem Credit Requirements - BAR Footprint Associated with the Pipeline Duplication**

#	Vegetation Community	PCT	Clearance Area (ha)	Credit Requirement (Attachment E)	Credits from BVTs able to be retired to address the Ecosystem Credit Requirement (Attachment E)	Offset Location
<i>Semi-arid Woodlands (Grassy sub-formation) – Riverine Plain Woodlands</i>						
1a	Weeping Myall Open Woodland (Semi Cleared in Moderate Condition) (LA212)	26	1.3 ^A	51	LA 212	Lower Slopes - Lachlan
1b and 1c	Weeping Myall Open Woodland (Semi Cleared in Low Condition) (LA212) Weeping Myall Open Woodland (Derived Grassland in Low Condition) (LA212)		3.2 ^B	58		
<i>Forested Wetlands – Inland Riverine Forests</i>						
3	River Red Gum Forest (Moderate Condition) (LA191)	249	0.4	19	LA 191, LA 263	Lower Slopes - Lachlan
<i>Grasslands – Western Slopes Grasslands</i>						
6b	Highly Modified Derived Grasslands (Low Condition) (LA138)	250	0.3	0*	LA 138, LA 244, LA 238	Lower Slopes - Lachlan
Total			5.2	128		

* This vegetation zone has a current site value score of less than 17. As such, this community does not require ecosystem credits.

A Equivalent to the Myall Woodland EEC listed under the BC Act and EPBC Act

B Equivalent to the Myall Woodland EEC listed under the BC Act and 0.2 ha equivalent to the Myall Woodland EEC listed under the EPBC Act

In addition to the ecosystem credits in Table 21, the BAR Footprint associated with the pipeline duplication also requires 7 species credits for the Superb Parrot (Attachment E).

4 STAGE 2 – IMPACT ASSESSMENT

The potential impacts from the CGO on flora and fauna have been identified in various environmental impact assessments prepared over the past 20 years. An Environmental Impact Statement (EIS) (North Limited, 1998) was prepared for the CGO which includes a Species Impact Statement; a document that specifically identifies the potential and likely impacts from the CGO on threatened species and their habitat (Resource Strategies *et al.*, 1997). In recognition of the potential impacts to Lake Cowal, the EIS also includes a document titled *Ecological Study - An Ecosystem Perspective on Post-Mining Conservation Values Associated with Cowal Gold Project* (Goldney *et al.*, 1997) which provides an analysis of the long-term compatibility of the rehabilitated Project with the ephemeral lake system. More recent environmental impact assessments have been prepared for modifications to the CGO (Cenwest Environmental Services, 2011; FloraSearch, 2011; Western Research Institute, 2008; FloraSearch, 2008; Resource Strategies, 2013).

The CGO operates under various conditions (i.e. Consent Conditions) applied by the NSW Government. A number of management actions, protocols and monitoring programmes are being undertaken in accordance with the Consent Conditions and the environmental performance of the CGO is reported annually to the NSW Government.

4.1 IMPACT ASSESSMENT AND MEASURES TO AVOID AND MINIMISE IMPACTS

4.1.1 Measures to Avoid and Minimise Impacts

A number of mitigation measures applicable to flora and fauna have been developed for the approved CGO (that are also relevant to the Modification) as described in Table 22. Many of these measures are described in the *Cowan Gold Operations Rehabilitation Management Plan* (RMP) (Evolution, 2017b), *Cowan Gold Operations Flora and Fauna Management Plan* (Evolution, 2016b) and *Cowan Gold Project Implementation of the Threatened Species Management Protocol* (Barrick, 2003b). The measures described below would apply as appropriate to the Modification.

Table 22
Existing Impact Avoidance and Mitigation Measures at the CGO

Measure	Description
Rehabilitation	
Revegetation of the post-mine landforms (including waste rock emplacements)	<p>The RMP (Evolution, 2017b) describes the rehabilitation objectives and strategies for the CGO. The CGO rehabilitation philosophy is to operate as a non-intrusive land user and to create stable rehabilitated landforms that increase the areas of endemic vegetation in the mine area and the status of land-lake habitats.</p> <p>Surface development areas associated with the CGO are progressively rehabilitated and revegetated with species characteristic of native species endemic to the local area. Landforms are revegetated with selected species of native and/or endemic vegetation that are both suitable to the physiographic and hydrological features of each landform, and which expand the areas of remnant endemic vegetation that currently exist in the immediate region (Evolution, 2017b).</p> <p>Permanent monitoring plots within remnant and rehabilitation areas have been established throughout the CGO and are monitored annually.</p>
Rehabilitation of the final void	Rehabilitation objectives for the final void are to leave the void surrounds safe (for humans and stray stock) and create habitat opportunities for waterbirds at the approximate level at which void water will reach equilibrium, where feasible (Evolution, 2017b).

Table 22 (Continued)
Existing Impact Avoidance and Mitigation Measures at the CGO

Measure	Description
Rehabilitation of the approved TSFs	<p>The rehabilitation objectives for the tailings storage facilities are to:</p> <ul style="list-style-type: none"> • establish permanently stable landforms; • during operations, stabilise batters so they provide minimal habitat value for bird life (i.e. rock mulch or pasture cover); • post-operations, to establish vegetative communities (including Eucalypt and Riverine Woodland species and understorey species such as Rush and pasture species) which are suited to the hydrological features and substrate materials of the landform; and • exclude grazing and agricultural production.
Vegetation Clearance	
Delineation of disturbance area	Clearance activities are restricted to areas occupied by the mine activities, buildings and paved surface, and those necessary for fire control (Evolution, 2016b).
Pre-clearance surveys	Pre-clearance surveys are undertaken in areas that are approved to be cleared and consist of preliminary habitat assessment to identify any habitat features present and secondary habitat assessment which involves further surveys of areas deemed as potentially containing fauna habitat (i.e. trees with hollows, bat presence, etc.) (Evolution, 2016b).
Fauna management strategies	Involves management strategies to minimise the impact of clearing activities on resident fauna in the short-term (including capture and removal of animal[s] found during pre-clearance surveys to alternative suitable habitat) and minimise the loss of habitat in the long-term (including the placement of nesting boxes in suitable habitat for birds and arboreal mammals) (Evolution, 2016b).
Vegetation clearance procedure	Procedures to be employed upon tree felling include the salvage of habitat features (such as hollow branches) as well as the collection of seed where available (Evolution, 2016b).
Specific Management Measures Applicable to Flora and Fauna	
Vehicle speed limits and road signage	Speed limits are imposed on vehicles using roads and tracks within ML 1535 (Evolution, 2016b). Signposting has been installed to remind personnel of the danger of vehicles to wildlife (Evolution, 2016b).
Threatened Species Management Protocol	The TSMP was developed to minimise potential impacts of the approved CGO on threatened flora and fauna species known and/or considered possible to occur in the disturbance area and/or immediate surrounds (Barrick, 2003b). The TSMP includes provisions for targeted searches prior to construction and proposed mitigation measures where threatened flora or fauna species are found (Barrick, 2003b). The TSMP also includes management strategies prepared for threatened species which have been recorded in the course of targeted surveys or for which habitat resources typically associated with the lifecycle components of a threatened species have been identified (Barrick, 2003b).
Mechanisms to keep fauna away from the tailings storage facilities	<p>Mechanisms have been developed to keep fauna away from the approved CGO tailings storage facilities and include (Evolution, 2016b):</p> <ul style="list-style-type: none"> • minimising the area of open water in the tailings dams; • fencing to prevent both medium and large terrestrial fauna and amphibians, from entering the area; • making the area non-conductive to the establishment of wildlife habitats, as far as possible; and • use of current best practice methods for avifauna deterrence.
Cyanide destruction process	Cyanide levels in the aqueous component of the tailings slurry do not exceed: 20 mg CN _{WAD} /L (90 percentile over six months) and 30 mg CN _{WAD} /L (maximum permissible limit at any time), at the process plant. This level is in accordance with industry experience that indicates bird mortalities approach zero at levels of cyanide exposure below 50 mg/L CN _{WAD} (Evolution, 2016b).
Monitoring of fauna usage of the final void	A post, a closure monitoring programme to monitor fauna usage of the final void at the approved CGO would be developed (Evolution, 2016b). The monitoring programme would be developed as a component of the long-term land use strategy (Evolution, 2016b).

Table 22 (Continued)
Existing Impact Avoidance and Mitigation Measures at the CGO

Measure	Description
Monitoring of fauna usage of the tailings storage facilities	The perimeter of the TSFs are patrolled twice a day to observe and record fauna usage of the storages and whether deaths or other effects or incidents are occurring. Usage of the TSFs by bat fauna is also monitored.
Remnant Vegetation Enhancement	Four Remnant Vegetation Enhancement Areas have been established in accordance with the RVEP (Figure 15) to improve the quality of habitat available to flora and fauna, expand the extent of remnant vegetation, increase the diversity and/or abundance of native flora and fauna within the enhancement areas and significantly contribute to the conservation of regional biodiversity (Evolution, 2016b).
Protection of Remnant Vegetation within ML 1535	Areas of woodland (Myall Woodland EEC) located near the southern boundary of ML 1535 was fenced and sign posted in 2005 and protected from disturbance (Evolution, 2016b).
CGO Compensatory Wetland	Management of an area of existing wetland within ML1535 during operation and following closure of the mine (Barrick, 2003c) (Figure 15).
General Management	
Dust control	The mitigation and management measures for windblown and mine generated dust at the approved CGO are presented in the <i>Cowel Gold Operations Air Quality Management Plan</i> . Control measures to suppress dust include watering disturbed surfaces.
Noise management	A range of noise control measures are implemented at the CGO to minimise noise emissions. Examples include the restriction of truck movements, adjustment of reversing alarms, scheduling the use of noisy equipment, directing noise emissions away from any sensitive areas and keeping equipment well maintained (Evolution, 2016b).
Blasting management	A number of measures to minimise the impact of blasting activities are implemented at the approved CGO. These include eliminating secondary blasting, varying the direction of initiation, keeping face heights to a practical minimum, and exercising strict control over the burden, spacing and orientation of all blast drill holes (Evolution, 2016b).
Pest (animal and vermin) control	Pest control activities are implemented at the CGO and include (Evolution, 2016b): regular inspections to assess the status of pest populations within ML1535 and Evolution-owned land; mandatory pest control for declared pests; and inspections to assess the effectiveness of control measures implemented and a review of these measures if necessary.
Weed management	Evolution currently manage weeds at the CGO to minimise the possibility of new weed incursion and controlling the spread of any existing noxious weeds within ML1535 and Evolution-owned land (Evolution, 2016b).
Site water management	Measures have been developed for the CGO for the management and monitoring of surface water and groundwater quality and quantity within and around the mine site (Evolution, 2017c). Management strategies to prevent the degradation of the quality of water in Lake Cowal during the mine operation phase include a variety of erosion, sediment and salinity control measures.

4.1.2 Direct Impacts and Measures to Avoid and Minimise Impacts

4.1.2.1 Land Clearance

The additional surface disturbance associated with the Modification is predominantly located on land which has been historically cleared for cropping or grazing livestock and comprises native grassland. The Modification would result in the removal of 286.7 ha of native vegetation, of which most (91%) is derived grassland in low/moderate condition (260.8 ha).

The modified Project components have been proposed to avoid clearance of remnant woodland where there was opportunity, namely:

- the relocated magazine and relocated explosives compound (Figure 2a) were positioned to avoid the need to clear extant woodland vegetation within ML 1535 (Figure 7a); and
- the pipeline duplication was positioned to avoid the need to clear extant woodland vegetation within road easements (Figure 7b).

The largest additional surface disturbance associated with the Modification is for a proposed soil stockpile, which again is mostly Highly Modified Derived Grasslands (Low Condition) (LA138) (Figures 2a and 7a). This soil stockpile would be used temporarily during operations to assist with management of soil for rehabilitation purposes. After rehabilitation is complete the soil stockpile would be removed.

The other main additional surface disturbance associated with the Modification is associated with the IWL and would result in clearance of small already fragmented areas of woodland and grassland around the approved disturbance areas (Table 23). The IWL, however, cannot be designed to avoid clearance of the already highly fragmented woodland areas (Figure 7a).

Belah Woodland

Condition 3.2 (a) (ii)³ requires no topsoil stockpiles to be located in the area of Belah Woodland (Low Condition) (LA105) mapped by AMBS (2018a) (Attachment A). It is recognised that a portion of this Belah Woodland (Low Condition) (LA105) would be cleared for the Modification (approximately 16.5 ha) (Figure 7a).

CGO Compensatory Wetland

The proposed pipeline duplication will traverse the CGO Compensatory Wetland described within the *Cowal Gold Project Compensatory Wetland Management Plan* (Barrick, 2003c) (Figure 15). Disturbance to the CGO Compensatory Wetland would be managed in accordance with the approved *Cowal Gold Project Compensatory Wetland Management Plan* (Evolution, 2003c). These management measures may include:

- limiting vehicular access during construction to reduce the degree of disturbance;
- planting of native species to enhance the regeneration of native species; and
- implementing pest and weed control.

4.1.2.1 State Environmental Planning Policy (SEPP) 44 - Koala Habitat

The CGO on the western side of Lake Cowal is located within the Local Government Area of Bland, which is not listed in Schedule 1 of State Environmental Planning Policy (SEPP) 44 - Koala Habitat. Therefore SEPP 44 does not apply to the clearance at the mine site.

The pipeline duplication on the eastern side of Lake Cowal is located within the Local Government Area of Forbes which is listed in SEPP 44. Of the SEPP 44 preferred feed trees, only River Red Gum (*E. camaldulensis*) is present along the pipeline duplication within River Red Gum Forest (Moderate Condition) (LA191).

³ Condition 3.2 (a) (ii) states: 'The Applicant shall not locate topsoil stockpiles within any area of Wilga Woodland (now mapped as Belah Woodland (Low Condition) (LA105) by AMBS [2018a]) in the DA area as identified in Figure 3-13 in the 1998 EIS (Appendix 3)

Less than 0.4 ha of River Red Gum Forest (Moderate Condition) (LA191) which meets the definition of potential koala habitat would be cleared for the pipeline duplication within the Local Government Area of Forbes.

No Koalas have been recorded in the River Red Gum Forest associated with the pipeline duplication (Figures 10a and 10b), therefore no core koala habitat would be cleared.

4.1.2.2 *Groundwater Drawdown*

Future water demand would be met (in part) by sourcing water from Lachlan River regulated flows (licensed extraction purchased on the open market). Given the provisions inherent in the *Water Management Act, 2000* regarding environmental flows, the impact of sourcing additional regulated flow from the Lachlan River would be neutral because if not extracted by Evolution for use at CGO the licenses could be either purchased and the same water extracted by others or the water could be used by the existing licence holders if they were unable to sell the water on the open market.

No groundwater-dependent ecosystems have been previously recorded at the CGO or surrounds. BoM GDE Atlas has mapped aquatic GDEs in Lake Cowal and Terrestrial GDEs in vicinity of the CGO. Coffey (2018) has reviewed these and concluded that these ecosystems are unlikely to be groundwater dependent.

**Table 23
Vegetation Clearance Summary**

#	Vegetation Community	PCT	Area (ha)
Semi-arid Woodlands Formation (Grassy Sub-formation) – Riverine Plain Woodlands			
1a	Weeping Myall Open Woodland (Semi Cleared in Moderate Condition) (LA212)	26	1.3 ^{A, B}
1b	Weeping Myall Open Woodland (Semi Cleared in Low Condition) (LA212)		0.2 ^{A, B}
1c	Weeping Myall Open Woodland (Derived Grassland in Low Condition) (LA212)		3 ^A
Grassy Woodlands – Floodplain Transition Woodlands			
2a	Inland Grey Box - White Cypress Pine Woodland (Semi Cleared in Moderate Condition) (LA152)	82	6.5 ^C
2b	Inland Grey Box - White Cypress Pine Woodland (Derived Grassland in Low Condition) (LA152)		23.5 ^D
Forested Wetlands - Inland Riverine Forests			
3	River Red Gum Forest (Moderate Condition) (LA191)	249	0.4
Semi-arid Woodland (Grassy sub-formation) – Northwest Floodplain Woodlands			
4	Belah Woodland (Low Condition) (LA105)	55	16.5
5	Dwyer's Red Gum - White Cypress Pine - Currawang Woodland (Moderate Condition) (LA144)	185	1
6a	Highly Modified Derived Grasslands (Moderate Condition) (LA138)	250	63.5
6b	Highly Modified Derived Grasslands (Low Condition) (LA138)		170.8
Total Native			286.7
<i>Native Vegetation in Moderate Condition</i>			<i>1.4 (0.5%)</i>
<i>Semi Cleared Native Vegetation in Moderate Condition</i>			<i>7.8 (2.7%)</i>
<i>Native Vegetation in Low Condition</i>			<i>16.5 (5.7%)</i>
<i>Semi Cleared Native Vegetation in Low Condition</i>			<i>0.2 (0.1%)</i>
<i>Derived Grassland in Moderate Condition</i>			<i>63.5 (22%)</i>
<i>Derived Grassland in Low Condition</i>			<i>197.3 (69%)</i>
Cleared Land (non-native)			11.5
Plantings			8.5
Lake Bed			8.5
Total BAR Footprints			315.2

A Equivalent to the Myall Woodland EEC listed under the BC Act.

B Equivalent to the Myall Woodland EEC listed under the EPBC Act.

C 6.5 ha equivalent to the Grey Box EEC listed under the EPBC Act and BC Act.

D 23.5 ha equivalent to the Grey Box EEC listed under the BC Act, including approximately 5 ha equivalent to the Grey Box EEC listed under the EPBC Act.

4.1.3 Indirect Impacts and Measures to Avoid and Minimise Impacts

The following potential indirect impacts are assessed below:

- fauna interaction with the tailing storage facilities/IWL;
- hydrology, sedimentation and runoff;
- introduced flora and fauna;
- noise and dust;
- artificial lighting;
- bushfire risk; and
- fauna interaction with the final void.

4.1.3.1 *Fauna Interaction with the Integrated Waste Landform*

As part of the approved CGO, the tailings (finely ground rock residue left after the flotation and leaching processes), is treated to destroy cyanide to prescribed limits (less than 20 mg/L for 90% of the time and no greater than 30 mg/L) and pumped to one of two TSFs (Figure 2a).

Between 2006 and 2018 interaction of fauna with tailings storage surfaces at the CGO have been monitored and reported biennially (Donato Environmental Services, 2006 to 2017a). During this period no fauna deaths have been attributed to cyanide toxicity associated with the TSFs (Donato Environmental Services, 2006 to 2017a).

To accommodate the increased annual volume of tailings resulting from the increased ore processing rate, Evolution proposes to modify/expand the size of the existing TSFs to form one tailings storage facility. The landform would also integrate with the existing mine waste rock emplacement and would be known as an IWL (Figure 2a).

It is possible that more birds and bats will interact with the IWL compared to the existing TSFs due to the overall greater size of the IWL. During construction of the IWL (before it is covered with tailings), there are aspects which may attract birds such as shallow rainfall ponds on uneven ground, regrowth vegetation (such as herbs and grass) and platforms created by the existing TSF walls.

Despite the potential for increased visitation to the IWL, no birds and bats are expected to be affected by cyanide in the IWL. The Modification would involve no change to the cyanide leaching circuit or cyanide destruction method. WAD cyanide concentrations within the proposed IWL will be destroyed to within existing prescribed limits.

As described in Table 22, the *Flora and Fauna Management Plan* (Evolution, 2016b) provides mechanisms to keep fauna away from the TSFs, including minimising the area of open water in the tailings dams, fencing and ensuring the area is non-conducive to the establishment of wildlife habitats. These mechanisms would also be applied to the IWL.

In addition to the above, the following measures would be adopted relevant to ensuring the IWL is less conducive to the establishment of wildlife habitats:

- vegetation would be removed and topsoil stripped within the IWL footprint during its construction;
- the IWL floor would be contoured during its construction to reduce island formation and number of rainfall-derived ponds;
- vegetation regrowth within the IWL prior to commencement and during tailings discharge would be managed by herbicide use;
- following construction of the IWL, bare ground within the IWL active cell would be covered with tailings as soon as practical using a low throughput tailings pipeline with moveable spigots to enable flexibility in direction and location of spigot discharge; and
- if aquatic algae, vegetation or macroinvertebrate species are present in rainfall-derived ponds within the IWL, tailings discharge into rainfall-derived ponds would suppress the unwanted habitat resources.

The *Flora and Fauna Management Plan* (Evolution, 2016b) provides methods for monitoring the daily and seasonal fauna usage of the existing TSFs. These methods would be revised to provide a monitoring programme which enables fauna usage (e.g. species, number, location, habits) to be documented during construction and operation of the IWL.

4.1.3.2 Hydrology, Sedimentation and Runoff

The Modification would involve the relocation of water management infrastructure (i.e. the Up-Catchment Diversion System and approved location for contained water storage D10) and other ancillary infrastructure (e.g. access roads and soil stockpiles). This infrastructure is proposed to be located elsewhere within ML 1535 and in a new mining lease to the north-west (Figure 2a).

Runoff from the additional proposed soil stockpiles would be directed to a sediment dam constructed at the eastern boundary. No indirect adverse impacts on surrounding vegetation are likely to occur.

4.1.3.3 Introduced Flora and Fauna

AMBS (2018a) (Attachment A) recorded seven introduced fauna species, including:

- Red Fox (*Vulpes vulpes*);
- Feral Cat (*Felis catus*);
- Dog (*Canis lupus familiaris*);
- European Hare (*Lepus europaeus*);
- Cattle (*Bos taurus*);
- House Mouse (*Mus musculus*); and
- Common Starling (*Sturnus vulgaris*).

With the existing measures to prevent and control introduced flora and fauna species at the CGO (Evolution, 2016b), it is unlikely that the potential for introduced flora and fauna species would increase as a result of the Modification.

The *Threat Abatement Plan for Predation by the European Red Fox* (DEWHA, 2008a) and *Threat Abatement Plan for Predation by Feral Cats* (DEWHA, 2008b) are considered as part of the pest control programmes.

4.1.3.4 Noise and Dust

The Modification is not likely to materially change the noise or dust emissions from the CGO. Development of the IWL would involve waste rock being transported and emplaced as part of embankment construction. Additional dust emissions associated with this activity would be controlled via additional watering of work areas. Potential noise and dust impacts on flora and fauna as a result of the Modification would be substantially the same as the CGO and would be managed in accordance with the air and noise management plans (Evolution, 2015; Evolution, 2016b).

4.1.3.5 Artificial Lighting

There would be no change to the use of fixed artificial lighting at the CGO as a result of the Modification, however there would be additional mobile fleet lighting (e.g. haul trucks) on the western portion of ML1535 whilst construction of the IWL embankments is ongoing. Potential artificial lighting impacts on fauna as a result of the Modification would be substantially the same as the CGO.

4.1.3.6 *Bushfire Risk*

Bushfire risk as a result of the Modification would be substantially the same at the CGO. Existing bushfire management measures would continue to be implemented.

4.1.3.7 *Fauna Interaction with the Final Void*

The Modification would involve no change to the extent and depth of the open pit. The Modification does not involve a change to the CGO final void, and therefore there is no change to fauna interaction with the final void.

4.1.4 Impacts on Landscape Features that Require Further Consideration

According to the FBA (2014a), impacts on state significant biodiversity links require further consideration. Additional information required for impacts on important wetlands:

- (a) *the category of wetland that is being impacted by the Major Project*
- (b) *whether the wetland itself, and/or its buffer area, is being impacted*
- (c) *the extent of impact to the wetland or buffer area*
- (d) *the condition of the area of the wetland or buffer area subject to the impact*
- (e) *any indirect impacts on wetlands, or on wetlands or watercourses downstream of the proposed development*
- (f) *the measures proposed to minimise the impact on the biodiversity values of the wetland area*

(a) *the category of wetland that is being impacted by the Major Project*

Lake Cowal/Wilbertroy Wetlands (NSW040) is listed on the DIWA (DEE, 2018a). Wetland types associated with Lake Cowal/Wilbertroy Wetlands (NSW040) are (DEE, 2018a):

- B3 Inland deltas (permanent).*
- B6 Seasonal/intermittent freshwater lakes (>8 ha), floodplain lakes.*
- B13 Shrub swamps; shrub-dominated freshwater marsh, shrub carr, alder thicket on inorganic soils.*
- B14 Freshwater swamp forest; seasonally flooded forest, wooded swamps; on inorganic soils.*

(b) *whether the wetland itself, and/or its buffer area, is being impacted*

As part of the Modification, the water supply pipeline which already exists across Lake Cowal would be duplicated along its length, up to Bore 4 of the Bland Creek Palaeochannel Borefield (Figure 2b).

Disturbance within the pipeline corridor would be up to approximately 6 m wide, and approximately 1 m deep. Soil would then be backfilled to ground level, and any excess soil would be spread over the pipeline disturbance area.

Should Lake Cowal contain water at the time of construction, the pipeline would be laid onto the lake bed via boat. Once Lake Cowal has sufficiently dried to allow construction activities, excavation would be conducted within the pipeline disturbance corridor and the pipeline placed within the excavated channel.

The vegetation in the pipeline disturbance area would be left to naturally regenerate. Visual inspections for weeds and weed control would occur monthly until native vegetation cover is similar to adjacent vegetation.

Potential adverse impacts from erosion on adjacent vegetation would be minimised by back filling the excavated channel as soon as practicable. If monthly visual inspections identify a risk to adjacent vegetation from erosion, corrective measures would be implemented (active revegetation or use of temporary sediment control structures).

(c) the extent of impact to the wetland or buffer area

As stated above, the duplicated pipeline would be buried similar to the existing pipeline. Should Lake Cowal contain water at the time of construction, the pipeline would be placed on the lake bed before being buried once lake levels subside and ground conditions allow burial of the pipeline.

(d) the condition of the area of the wetland or buffer area subject to the impact

Grazing and opportunistic cropping within the full storage water line of Lake Cowal (outside of ML 1535) occurs when the lake has receded, and moisture and market conditions are suitable.

(e) any indirect impacts on wetlands, or on wetlands or watercourses downstream of the proposed development

Due to the minor nature of the works involved in duplicating the pipeline, its construction is unlikely to have any indirect impacts on Lake Cowal or its ecology. A potential minor risk of indirect impacts in the short-term (following burial of the pipeline) from incursion by weeds and erosion would be managed.

(f) the measures proposed to minimise the impact on the biodiversity values of the wetland area

As described above, should Lake Cowal contain water at the time of construction, the pipeline (600 mm diameter) would be laid onto the lake bed via boat. Once Lake Cowal has sufficiently dried to allow construction activities, excavation would be conducted within the pipeline disturbance corridor and the pipeline placed within the excavated channel.

The vegetation in the pipeline disturbance area would be left to naturally regenerate. Visual inspections for weeds and weed control would occur monthly until native vegetation cover is similar to adjacent vegetation.

Potential adverse impacts from erosion on adjacent vegetation would be minimised by filling the excavated channel. If the monthly visual inspections identify a risk to adjacent vegetation from erosion, corrective measures would be implemented (active revegetation or use of temporary sediment control structures).

4.1.5 Cumulative Impacts

Cumulative impacts are considered to be the total impact on the environment that would result from the incremental impacts of the Modification added to other existing impacts. They include direct and indirect impacts. In this assessment cumulative impacts from proposed (but not yet existing) developments in the local area are also considered.

Prior to the CGO, the surrounding locality comprised former cleared and semi-cleared farmland that was used for grazing of native and introduced pastures by livestock. Grazing and cropping remains the predominant land use in areas outside of ML 1535. The original native tree cover had largely been removed except for scattered individual trees and patches of remnant vegetation.

Since commencing operations, the CGO has resulted in the clearance of native vegetation and fauna habitat mostly within ML1535. In addition to this vegetation clearing, the CGO has resulted in approximately 440 ha of biodiversity offsets which have already been established. The existing biodiversity offsets are comprised of two areas, both located less than 5 km from the CGO (i.e. Offset Area 1 and Offset Area 2) (Section 5.1).

The potential cumulative impact on threatened species and communities has been considered and it has been concluded that the change in potential cumulative impacts on threatened species and communities arising from the Modification is considered to be minimal due to the localised nature of the works compared to the wider distribution of the species, their habitats and communities.

The Modification would result in the removal of 286.7 ha of native vegetation, of which most (91%) is derived grassland in low/moderate condition (260.8 ha). The existing Biodiversity Offset Strategy for the CGO would be augmented with an additional Biodiversity Offset Strategy for the Modification. Evolution has elected to address the offset requirements through offsetting four additional land based offset areas. The four proposed offset areas have a combined area of 486.5 ha.

4.2 EPBC ACT THREATENED SPECIES AND COMMUNITIES

Application of the FBA (2014a) and OEH Biobanking Credit Calculator identifies all relevant threatened species and communities that may be impacted by a development. The Modification was determined to be ‘controlled action’ due to likely significant impacts on the Grey Box EEC listed under the EPBC Act). Based on the extensive surveys described in Section 2.3, relevant EPBC Act listed threatened species and communities likely to be adversely impacted by the Modification are:

- Grey Box EEC;
- Weeping Myall Woodlands EEC; and
- Superb Parrot.

These EPBC Act listed threatened species and communities are further discussed below.

The significance of residual impacts on MNES has been assessed in accordance with the *Matters of National Environmental Significance Significant Impact Guidelines 1.1* (DEE, 2013). This assessment has been prepared in consideration of relevant Commonwealth guidelines and policy statements including listing advice, conservation advice recovery plans and threat abatement plans. The *Species Profiles and Threats Database* (DEE, 2018b) was reviewed and considered.

Grey Box EEC

This assessment has been prepared in consideration of the guide to the identification, assessment and management of the Grey Box EEC listed under the EPBC Act (DSEWPaC, 2012a), Commonwealth listing advice (Threatened Species Scientific Committee [TSSC], 2010), and approved conservation advice (DEWHA, 2010c).

Targeted Surveys

The EPBC Act referral (Evolution, 2017) stated that the previous vegetation mapping prepared by Australian Museum Business Services (2012), and preliminary results from AMBS (pers. comm.) indicate that approximately 14.5 ha of the Grey Box EEC listed under the EPBC Act⁴ may occur within the BAR Footprints.

⁴ Note that this area was refined by more recent contemporary mapping by AMBS (2018a) (Attachment A).

AMBS (2018a) (Attachment A) undertook contemporary targeted surveys for the Grey Box EEC to update the mapping from 2012. Details of the scope, timing and methodology for the surveys, and how they are consistent with published Australian Government guidelines and policy statements, are provided in Attachment A.

Occurrence

Grey Box EEC listed under the EPBC Act occurs as semi cleared woodland and derived grassland within the BAR Footprint associated with the mine site (AMBS, 2018a) (Attachment A) (Figure 12a).

Impact Alternatives, Avoidance and Mitigation Measures

There are no alternatives or impact avoidance measures relevant to the Grey Box EEC listed under the EPBC Act that would be impacted by the Modification. However, impacts on Grey Box EEC would be mitigated by:

- excluding livestock from the land between the re-aligned TSR and the proposed stockpile (comprising approximately 55 ha of the Grey Box EEC) (Table 24) which is predicted to be effective because grazing is a recognised threat to the Grey Box EEC (DEWHA, 2010c);
- implementing weed control measures at the mine site (and within the land between the re-aligned TSR and the proposed stockpile) (Section 4.1.3.3) which is predicted to be effective because invasion by weeds is a recognised threat to the Grey Box EEC (DEWHA, 2010c);
- collecting seed stock from species characteristic of the Grey Box EEC from areas to be cleared (where available) for use in the mine rehabilitation programme (Section 4.4);
- delineation of disturbance areas (Table 22) and showing the area of Grey Box EEC within the mining lease area on future mine plans to reduce the risk of accidental clearance (Section 4.4); and
- the mine rehabilitation programme would aim to re-establish vegetation including the use of species characteristic of the Grey Box EEC (Section 4.4).

The measures above are consistent with relevant conservation advice for the Grey Box EEC listed under the EPBC Act (DSEWPaC, 2012a; DEWHA, 2010c), as the measures aim to minimise impacts on adjacent occurrences of the community, including the management of potential adverse impacts from weeds, runoff and livestock. The *Species Profiles and Threats Database* (DEE, 2018b) states that no *Threat Abatement Plans* are relevant to the Grey Box EEC.

Nature and Extent of the Likely Direct, Indirect and Consequential Impacts, including Short-term and Long-term Impacts

The outcome of the mitigation measures (above) is that the Modification would clear approximately 11.5 ha of Grey Box EEC listed under the EPBC Act, comprising semi cleared woodland (approximately 6.5 ha) (Plate 2) and derived grassland (approximately 5 ha) (Figure 12a) (AMBS, 2018a) (Attachment A)⁵.

Approximately 2.2 ha of Grey Box EEC would be lost to the soil stockpile, approximately 7.5 ha would be lost from clearing for the re-aligned road and approximately 1.8 for the IWL. The proposed stockpile would be temporary as soil from the stockpile would be used for mine rehabilitation works (i.e. the stockpile would eventually be removed and the stockpile area rehabilitated and revegetated).

⁵ The EPBC Act referral stated a higher quantity of Grey Box EEC (14.5 ha) based on previous vegetation mapping prepared by Australian Museum Business Services (2012), and preliminary results from AMBS (pers. comm.).

Grey Box EEC adjacent to the areas to be disturbed is in derived native grassland form. No indirect adverse impacts on this occurrence are likely to occur given weeds would be controlled and runoff from the additional proposed soil stockpiles would be directed to a sediment dam constructed at the eastern boundary. Further, livestock would be excluded from the land between the re-aligned TSR and the proposed stockpile (comprising approximately 55 ha of the Grey Box EEC) thus promoting a positive benefit to the occurrence of the Grey Box EEC (Table 22).

The consequence of the Modification is a 11.5 ha short and long-term reduction in a poor example of the Grey Box EEC mostly adjacent to the operating CGO, with the original tree and shrub layer largely removed and a long history of grazing.

Unpredictable or Irreversible Impacts

No potential impacts on the Grey Box EEC from the Modification are likely to be unpredictable. Clearance of an EEC is assumed to be irreversible for the purpose of the assessment (despite mine rehabilitation), hence an offset is provided (Section 5.2).

Significant Residual Adverse Impacts

The reduction of these patches of Grey Box EEC listed under the EPBC Act would not significantly adversely impact the overall occurrence of the Grey Box EEC in the local area, and a significant impact on the Grey Box EEC is unlikely, given:

- The occurrences of Grey Box EEC within the BAR Footprint associated with the mine site are degraded, and relatively small (approximately 11.5 ha) (Plate 2), adjacent to the approved mining area and isolated from other occurrences of the EEC.
- Much larger areas of Grey Box EEC occur to the south of ML 1535 (including within the proposed offset areas [Section 5.2]).

The impacts on the Grey Box EEC would be localised and negligible on a regional, state and national scale. The change in potential cumulative impacts on the Grey Box EEC arising from the Modification is considered to be minimal because of the localised nature of the works compared to the wider distribution of the community.

Despite this, an offset would be provided for impacts on the Grey Box EEC (Section 5.2).

Application of the FBA and Offset Details

Ecosystem credits have been calculated for impacts on Grey Box EEC listed under the EPBC Act (Section 4.5). A Biodiversity Offset Strategy for the Modification is described in Section 5.2. Proposed Offset Area 6 contains approximately 165.5 ha of Grey Box EEC represented by Inland Grey Box - White Cypress Pine Woodland (LA152) (the same BVT that would be cleared for the Modification).

Weeping Myall Woodlands EEC

This assessment has been prepared with consideration of Policy Statement 3.17 for the Weeping Myall Woodlands EEC listed under the EPBC Act (DEWHA, 2009), Commonwealth listing advice (TSSC, 2009), and approved conservation advice (DEWHA, 2008c).

Targeted Surveys

The EPBC Act referral (Evolution, 2017) stated that the Weeping Myall Woodlands EEC listed under the EPBC Act had not been mapped within the BAR Footprints, however, previous vegetation mapping prepared by Australian Museum Business Services (2012), and preliminary results from AMBS (pers. comm.) indicate that patches of Weeping Myall Woodland EEC may occur within the immediate surrounds.

AMBS (2018a) (Attachment A) undertook targeted surveys for the Weeping Myall Woodlands EEC. Details of the scope, timing and methodology for the surveys, and how they are consistent with published Australian Government guidelines and policy statements, are provided in Attachment A.

Occurrence

Weeping Myall Woodlands EEC listed under the EPBC Act occur as semi cleared woodland and derived grassland (Figures 12a and 12b) (Plate 3).

Impact Alternatives, Avoidance and Mitigation Measures

The relocated magazine and relocated explosives compound (Figure 2a) were positioned to avoid the need to clear Weeping Myall Woodlands EEC within ML 1535 (Figure 12a). The area of Weeping Myall Woodlands EEC within the mining lease area would be shown on future mine plans to reduce the risk of accidental clearance (Section 4.4).

Weeping Myall Woodlands EEC occur within the BAR Footprint for the pipeline duplication. The pipeline duplication was positioned to minimise the need to clear Weeping Myall Woodlands EEC within road easements (Figure 12b). Where clearance is required, those areas would be delineated to reduce the risk of accidental clearance (Table 22).

Similar to the existing pipeline, the duplicated pipeline would be buried. The vegetation in the pipeline disturbance area would be left to naturally regenerate. Visual inspections for weeds and weed control (control methods consistent with an approved management plan [Evolution, 2016b]) would occur monthly until native vegetation cover is similar to adjacent vegetation.

If monthly visual inspections identify a risk on adjacent vegetation from erosion, corrective measures would be implemented (active revegetation or use of temporary sediment control structures).

Weed management is predicted to be effective in reducing risks to the Weeping Myall Woodlands EEC as invasion by weeds is a recognised threat to the Weeping Myall Woodlands EEC (DEWHA, 2008c). The above measures are consistent with the approved conservation advice (DEWHA, 2008c) as protecting remnants from weeds including the speedy eradication of any new invasions is a priority recovery and threat abatement action relevant to the Weeping Myall Woodlands EEC listed under the EPBC Act.

The Species Profiles and Threats Database (DEE, 2018b) states that no Threat Abatement Plans are relevant to the Weeping Myall Woodlands EEC, other than the Cane Toad which is not relevant to the location of the CGO.

Nature and Extent of the Likely Direct, Indirect and Consequential Impacts, including Short-term and Long-term Impacts

The outcome of the avoidance and mitigation measures (above) is that the Modification would involve the clearance of approximately 1.5 ha of Weeping Myall Woodlands EEC (AMBS, 2018a) (Attachment A) (Plate 3). The BAR Footprint associated with the pipeline duplication is approximately 6 m wide.

A may be a potential indirect impact to the Weeping Myall Woodlands EEC in the short-term (following burial of the pipeline) from incursion by weeds and erosion. However, these potential indirect impacts would be managed.

The consequence of the Modification is a 1.5 ha reduction in a poor example of the Weeping Myall Woodlands EEC on the side of an existing road with the original tree and shrub layer largely removed. The vegetation in the pipeline disturbance area would be left to naturally regenerate in the long-term.

Significant Residual Adverse Impacts

The reduction of Weeping Myall Woodlands EEC listed under the EPBC Act would not significantly adversely impact the overall occurrence of the Weeping Myall Woodlands EEC in the local area (after DEE, 2013). A significant impact on the Weeping Myall Woodlands EEC is unlikely, given the occurrences of Weeping Myall Woodlands EEC within the BAR Footprint associated with the pipeline duplication are degraded, relatively small (multiple patches totalling approximately 1.5 ha) and narrow, and at the side of an existing road (Figure 12b) (after DEE, 2013).

The impacts on the Weeping Myall Woodlands EEC would be localised and negligible on a regional, state and national scale. Despite this, an offset would be provided for impacts on the Weeping Myall Woodlands EEC listed under the EPBC Act (Section 5.2.4).

The change in potential cumulative impacts on the Weeping Myall Woodlands EEC arising from the Modification is considered to be minimal because of the localised nature of the works compared to the wider distribution of the community.

Unpredictable or Irreversible Impacts

No potential impacts on the Weeping Myall Woodlands EEC from the Modification are likely to be unpredictable. Clearance of an EEC is assumed to be irreversible for the purpose of the assessment (though vegetation in the pipeline disturbance area would be left to naturally regenerate), hence an offset is provided (Section 5.2).

Application of the FBA and Offset Details

Credits have been calculated for impacts on Weeping Myall Woodlands EEC listed under the EPBC Act (Section 4.5). A Biodiversity Offset Strategy for the Modification is described in Section 5.2. Proposed Offset Area 6 contains approximately 1.5 ha of Weeping Myall Woodlands EEC listed under the EPBC Act represented by Weeping Myall Open Woodland (Derived Grassland in Moderate Condition) (LA212) (the same BVT that would be cleared for the Modification).

Superb Parrot

This assessment has been prepared with consideration of the conservation advice for the Superb Parrot (TSSC, 2016) and the national recovery plan (Baker-Gabb, 2011).

In NSW, the Superb Parrot is widespread west of the Great Dividing Range, mostly in the Darling Riverina Plains, Brigalow Belt South, Cobar Penneplain, Riverina and NSW South Western Slopes bioregions (Baker-Gabb, 2011).

Lake Cowal is not within a known breeding area for the Superb Parrot (after Baker-Gabb, 2011), however, in the Riverina the birds nest in the hollows of large trees (dead or alive) mainly in tall riparian River Red Gum Forest or Woodland (Baker-Gabb, 2011). Therefore, it is conservatively assumed that the River Red Gum along Lake Cowal could provide potential breeding habitat (in addition to foraging habitat).

The Superb Parrot feeds in trees and understorey shrubs and on the ground and their diet consists mainly of grass seeds and herbaceous plants (DEE, 2018b). Most Superb Parrots undertake regular seasonal movements between breeding and non-breeding areas, which could be associated with food supply (TSSC, 2016; Baker-Gabb, 2011).

Targeted Surveys

AMBS (2018a) (Attachment A) undertook targeted surveys for the Superb Parrot listed under the EPBC Act. Details of the scope, timing and methodology for the surveys, and how they are consistent with published Australian Government guidelines and policy statements, are provided in Attachment A.

Occurrence

AMBS (2018a) (Attachment A) recorded the Superb Parrot on 17 occasions during the surveys. Past surveys have also recorded the species. A group of Superb Parrots were observed flying over-head during the pre-clearance surveys in 2005 (Barrick, 2005a) and again in 2008 foraging on mistletoe within ML 1535 (Barrick, 2008b). A flock of 12 to 15 birds was sighted in 2012 from the trees that have been planted around ML 1535 (Kerle, 2013a). There are also OEH (2017) database records from 1995 which are sourced from the NSW Bird Atlasers and Illawarra Bird Observers Club as reported in Gunninah Consultants (1995).

AMBS (2018a) (Attachment A) recognise all of the native vegetation communities in the BAR Footprints as potential foraging habitat for the Superb Parrot (approximately 25.9 ha of woodland and 260.8 ha of derived grassland). Potential breeding habitat for the Superb Parrot is assumed to occur in the River Red Gum Forest (LA191) along the edge of Lake Cowal, noting however, there is no evidence of Superb Parrot nesting in the BAR Footprints or surrounds from the extensive monitoring and field surveys which have been undertaken at the CGO (Section 2.3.4). No habitat in the BAR Footprints is likely to be critical to the survival of the species.

Impact Alternatives, Avoidance and Mitigation Measures

The CGO Vegetation Clearance Protocol would continue to be implemented for the Modification and therefore the potential for land clearing activities to adversely impact Superb Parrot would likely be minimal.

The measures above are consistent with relevant conservation advice for the Superb Parrot (TSSC, 2016; Baker-Gabb, 2011), as the measures aim to minimise impacts on adjacent occurrences of habitat for the Superb Parrot. The *Species Profiles and Threats Database* (DEE, 2018b) states that no *Threat Abatement Plans* are relevant to the Superb Parrot.

Nature and Extent of the Likely Direct, Indirect and Consequential Impacts, including Short-term and Long-term Impacts

The outcome of the mitigation measures (above) is that the approximately 0.4 ha of potential breeding habitat for the Superb Parrot in the River Red Gum Forest (Moderate Condition) (LA191) along the edge of Lake Cowal would be cleared for the pipeline duplication.

A potential minor risk of indirect impacts on the River Red Gum Forest in the short-term (following burial of the pipeline) from incursion by weeds and erosion would be managed (see above description for Weeping Myall Woodlands EEC). However, AMBS (2018a) (Attachment A) describe that where the community has been recently actively grazed on the eastern side of Lake Cowal, the midstorey and understorey have been largely replaced by annual and perennial exotics.

The consequence of Modification is a 0.4 ha reduction in potential breeding habitat for the Superb Parrot, which may or may not be used by the species as breeding habitat. The vegetation in the pipeline disturbance area would be left to naturally regenerate in the long-term.

Potential direct and indirect impacts from the Modification are further described in Sections 4.1.2 and 4.1.3.

Significant Residual Adverse Impacts

Although some foraging and potential breeding habitat for the Superb Parrot may be disturbed by the Modification, the area to be disturbed is not considered material or crucial to the viability of the local populations of these species. The Modification is unlikely to significantly adversely impact the lifecycle of the Superb Parrot (after DEE, 2013) given the similar more extensive habitat resources occur in the wider surrounds. The impacts on the Superb Parrot would be localised and negligible on a regional, state and national scale.

Unpredictable or Irreversible Impacts

No potential impacts on the Superb Parrot from the Modification are likely to be unpredictable. Clearance of habitat for the Superb Parrot is assumed to be irreversible for the purpose of the assessment (though vegetation in the pipeline disturbance area would be left to naturally regenerate), hence an offset is provided (Section 5.2).

Application of the FBA and Offset Details

Ecosystem and species credits have been calculated for impacts on the Superb Parrot. Ecosystem credits would be retired to account for impacts on Superb Parrot foraging habitat (all the native vegetation communities in the BAR Footprints) and species credits would also be retired to account for impacts on Superb Parrot breeding habitat.

A Biodiversity Offset Strategy for the Modification is described in Section 5.2. Proposed Offset Area 3 contains potential breeding habitat equivalent to that which would be cleared (i.e. River Red Gum Forest [Moderate Condition] [LA191] along the edge of Lake Cowal). There is 13.5 ha of River Red Gum Forest [Moderate Condition] [LA191] within Proposed Offset Area 3.

Other Species

Austrostipa wakoolica

Austrostipa wakoolica was recorded on the opposite side of the road to the proposed pipeline duplication (Figure 7b). No disturbance would be required on the southern side of Websters Road for the pipeline duplication associated with the Modification, and the known record of *Austrostipa wakoolica* in this location (Figure 7b) would be avoided.

As previously described, visual inspections for weeds and weed control would occur monthly until native vegetation cover is similar to adjacent vegetation. If the monthly visual inspections identify a risk on adjacent vegetation from erosion, corrective measures would be implemented (active revegetation or use of temporary sediment control structures).

Migratory Species

The EPBC Act controlling provision for the Modification is ‘threatened species and communities’. Migratory species listed under the EPBC Act are not a relevant controlling provision. The EPBC Act referral (Evolution, 2017) provided an assessment of the impacts on migratory species and concluded that the Modification is not likely to significantly impact any migratory species.

4.3 FM ACT THREATENED SPECIES AND COMMUNITIES

An assessment is provided below in consideration of the Department of Primary Industries Fisheries (2013) *DPI Fisheries Policy and Guidelines for Fish Habitat Conservation and Management (Update 2013)*. As described in Section 4.1.4, the pipeline across Lake Cowal would be duplicated. No significant impacts on any threatened species or ecological communities (the Lachlan River Catchment EEC, or potentially occurring threatened fish [Section 3.3.8]) are likely to occur due to the minor nature of the works involved in duplicating the pipeline. A potential minor risk of indirect impacts in the short-term (following burial of the pipeline) from incursion by weeds and erosion would be managed. No offset under Department of Primary Industries Fisheries (2013) is considered necessary as potential impacts on Lake Coal from the duplicated pipeline can be mitigated as per the existing pipeline.

4.4 SUMMARY OF THE IMPACT AVOIDANCE AND MITIGATION MEASURES

Table 24 provides a summary of additional impact avoidance and mitigation measures for the Modification.

Table 24
Additional Impact Avoidance and Mitigation Measures for the Modification

Measure	Description
Design – Impact Avoidance	The relocated magazine and relocated explosives compound (Figure 2a) are positioned to avoid the need to clear extant woodland vegetation (Weeping Myall Woodlands EEC) within ML 1535 (Figure 7a). The pipeline duplication is positioned to avoid the need to clear extant woodland vegetation (Weeping Myall Woodlands EEC) within road easements (Figure 7b).
Revegetation of the post-mine landforms	The mine rehabilitation programme would aim to re-establish vegetation including the use of species characteristic of the Grey Box EEC and Weeping Myall Woodlands EEC listed under the EPBC Act.
Vegetation Clearance Protocol - Delineation of disturbance area	The area of Grey Box EEC and Weeping Myall Woodlands EEC listed under the EPBC Act within the mining lease areas would be shown on future mine plans to reduce the risk of accidental clearance.
Fencing	Fencing would be installed either side of the re-aligned Travelling Stock Reserve (TSR) consistent with the existing TSR. The purpose of the fencing is primarily to contain livestock which are periodically moved along the TSR. The fencing along the TSR would also exclude livestock from the land between the re-aligned TSR and the proposed stockpile. There is approximately 55 ha of Grey Box EEC listed under the EPBC Act in this location mapped by AMBS (2018a) (Attachment A).
Seed Collection	Evolution has an existing seed collection programme that would be used to mitigate the loss of the Grey Box EEC listed under the EPBC Act. This would extend to collecting seed stock from species characteristic of the Grey Box EEC and Weeping Myall Woodlands EEC listed under the EPBC Act from areas to be cleared (where available).
Mechanisms to keep fauna away from the tailings storage facilities	The following measures would be adopted relevant to making the IWL less conducive to the establishment of wildlife habitats: <ul style="list-style-type: none"> • vegetation would be removed and topsoil stripped within the IWL during its construction; • the IWL floor would be contoured during its construction to reduce island formation and number of rainfall-derived ponds (where possible); • vegetation regrowth within the IWL prior to commencement and during tailings discharge would be managed by herbicide use; • following construction of the IWL, bare ground within the IWL would be covered with tailings as soon as practical using a low throughput tailings pipeline with moveable spigots to enable flexibility in direction and location of spigot discharge; and • if aquatic algae, vegetation or macroinvertebrate species are present in rainfall-derived ponds within the IWL, tailings discharge into rainfall-derived ponds would suppress unwanted habitat resources.

The existing *Cowl Gold Operations Flora and Fauna Management Plan* (Evolution, 2016b) and *Cowl Gold Project Implementation of the Threatened Species Management Protocol* (Barrick, 2003b) would be updated to incorporate the Modification and the additional impact avoidance and mitigation measures (where appropriate to each document). The *Cowl Gold Operations Flora and Fauna Management Plan* is approved by DP&E and prepared in consultation with DPI (Fisheries) and OEH.

Annual monitoring for the Austral Pillwort as outlined in the existing *Cowl Gold Mine Flora and Fauna Management Plan* (Evolution, 2016b) would be discontinued on the basis that the monitoring since 2012 (DnA Environmental, 2012d, 2013d, 2015d, 2016d and 2017c) and surveys by AMBS (2018a) (Attachment A) have not detected the presence of the species.

4.5 BIODIVERSITY CREDIT REPORT – SUMMARY OF CREDIT REQUIREMENTS

Table 25 provides a summary of the ecosystem credit requirements for the Modification (i.e. the sum of the ecosystem credit requirements for the mine site [Table 11] and pipeline duplication [Table 21]).

Table 25
Ecosystem Credit Requirements

#	Vegetation Community	PCT	Clearance Area (ha)	Credit Requirement (Attachments D and E)	Credits from BVTs able to be retired to address the Ecosystem Credit Requirement (Attachments D and E)	Offset Location (Attachments D and E)
Semi-arid Woodlands (Grassy sub-formation) – Riverine Plain Woodlands						
1a	Weeping Myall Open Woodland (Semi Cleared in Moderate Condition) (LA212)	26	1.3 ^{A, B}	51	LA 212	Lower Slopes - Lachlan
1b	Weeping Myall Open Woodland (Semi Cleared in Low Condition) (LA212)		0.2 ^{A, B}	58		
1c	Weeping Myall Open Woodland (Derived Native Grassland in Low Condition) (LA212)		3 ^A			
Grassy Woodlands – Floodplain Transition Woodlands						
2a	Inland Grey Box - White Cypress Pine Woodland (Semi Cleared in Moderate Condition) (LA152)	82	6.5 ^C	816	LA 152, LA 153, LA 154, LA162, LA 163, LA175, LA 178, LA 194, LA 195	Lower Slopes - Lachlan
2b	Inland Grey Box - White Cypress Pine Woodland (Derived Grassland in Low Condition) (LA152)		23.5 ^D			
Forested Wetlands - Inland Riverine Forests						
3	River Red Gum Forest (Moderate Condition) (LA191)	249	0.4	19	LA 191, LA 263	Lower Slopes - Lachlan
Semi-arid Woodland (Grassy sub-formation) – Northwest Floodplain Woodlands						
4	Belah Woodland (Low Condition) (LA105)	55	16.5	193	LA 105	Lower Slopes - Lachlan

Table 25 (Continued)
Ecosystem Credit Requirements

#	Vegetation Community	PCT	Clearance Area (ha)	Credit Requirement (Attachments D and E)	Credits from BVTs able to be retired to address the Ecosystem Credit Requirement (Attachments D and E)	Offset Location (Attachments D and E)
Semi-arid Woodland (Scrubby sub-formation) – Inland Rocky Hill Woodlands						
5	Dwyer's Red Gum - White Cypress Pine - Currawang Woodland (Moderate Condition) (LA144)	185	1	18	LA 144, LA 204, LA 220, LA 122, LA 126, LA 141, LA 142, LA 143, LA 147, LA 148, LA 149, LA 181, LA 184, LA 200, LA237, LA 249, LA 270, LA 253, LA 254, LA 269, LA 267	Lower Slopes - Lachlan
6a	Highly Modified Derived Grasslands (Moderate Condition) (LA138)	250	63.5	679	LA 138, LA 244, LA 238	Lower Slopes - Lachlan
6b	Highly Modified Derived Grasslands (Low Condition) (LA138)		170.8	1,853		
		Total	286.7	3687	-	-

A Equivalent to the Myall Woodland EEC listed under the BC Act.

B Equivalent to the Myall Woodland EEC listed under the EPBC Act.

C 6.5 ha equivalent to the Grey Box EEC listed under the EPBC Act and BC Act.

D 23.5 ha equivalent to the Grey Box EEC listed under the BC Act, including approximately 5 ha equivalent to the Grey Box EEC listed under the EPBC Act.

Table 26 provides a summary of the Modification species credit requirements.

Table 26
Species Credit Requirements

Species	Clearance Area (ha)	Credit Requirement (Attachment E)	Offset Location (OEH, 2014a)	Offset Size (ha) ^{1,2}	Offset Ratio
Superb Parrot	0.4	7	Anywhere in NSW	1	1:2.5

¹ Calculated in accordance with the *BioBanking Assessment Methodology 2014*, or its revision (OEH, 2014c) where: size of the offset area = species credits required divided by 7.1.

² The species credit requirements can overlap with other species credit requirements and the ecosystem credit requirements (i.e. the requirements are not mutually exclusive).

5 STAGE 3 – BIODIVERSITY OFFSET STRATEGY

The existing Biodiversity Offset Strategy for the CGO is described in Section 5.1 and the additional Biodiversity Offset Strategy for the Modification is described in Section 5.2. Measures that are proposed to avoid and mitigate impacts from the Modification on terrestrial flora and fauna are described in Sections 4.1.1 and 4.5.

5.1 EXISTING BIODIVERSITY OFFSET REQUIREMENTS

Evolution has two existing offset areas for the CGO. One offset area is located approximately 1 km north of ML 1535 (the Northern Offset Area) (Offset Area 2) and the other is located approximately 3 km south of ML 1535 (the Southern Offset Area) (Offset Area 1) (Figure 15). The CGO existing offset areas total approximately 440 ha (Table 27).

Table 27
Summary of Existing Biodiversity Offset Areas

	Area	Minimum Size
Offset Area 1	Southern Offset Area (Enhancement Area) (including 230 ha CGO Mod 11 Extension)	260 ha
	Southern Offset Area (Revegetation Area)	100 ha
Offset Area 2	Northern Offset Area (Enhancement Area)	80 ha
	Total	440 ha

Source: CGO DA 14/98 Consent Condition 3.4.

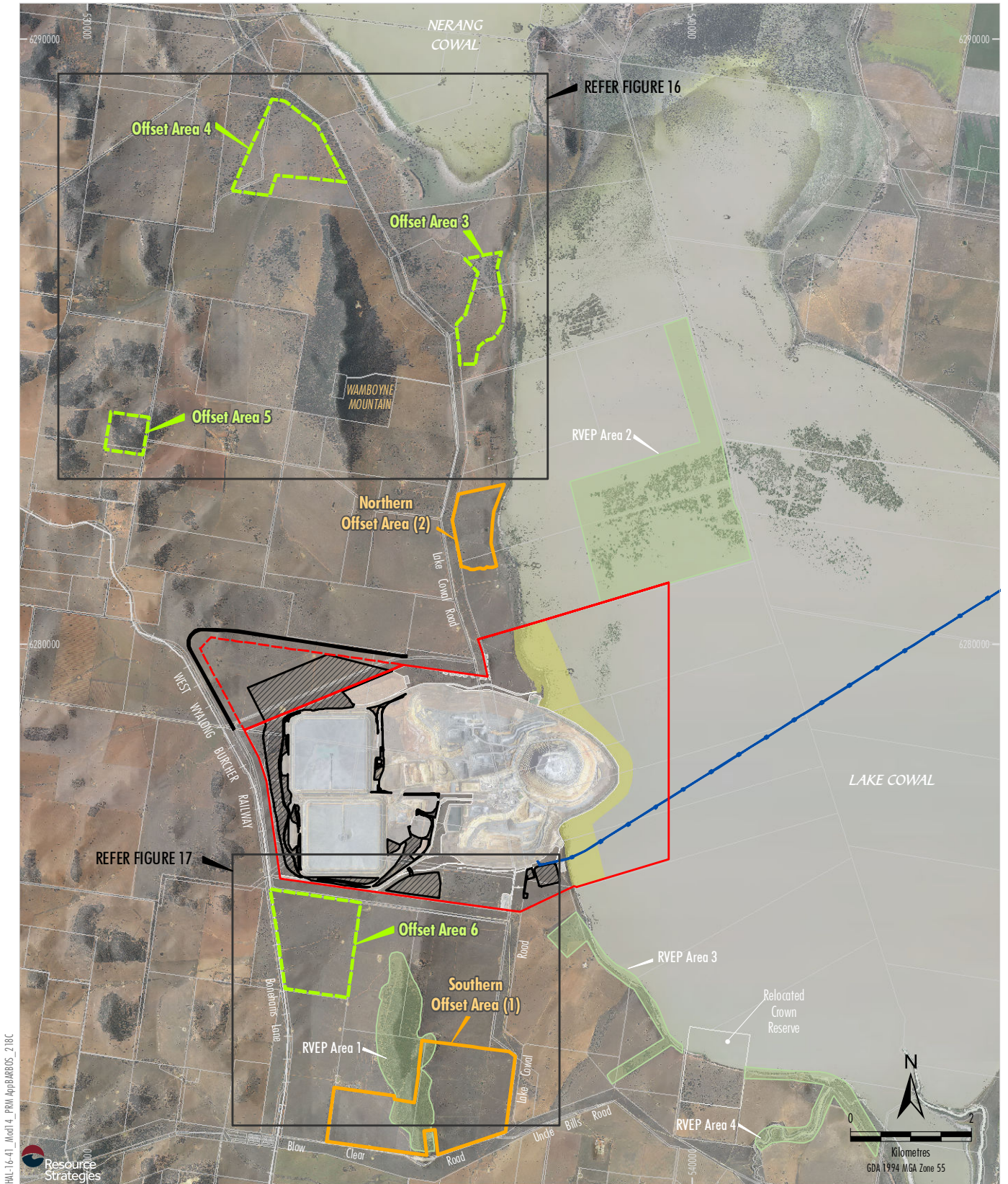
The objectives for the existing CGO offset areas are to:

- secure the tenure of the offset areas for long-term conservation purposes (excluding the land within the ETL and gas pipeline easements);
- enhance flora and fauna habitats within the offset areas, including increasing the area of Myall Woodland through regeneration and revegetation;
- establish native vegetation characteristic of a Eucalypt woodland in the previously cleared agricultural land within the Revegetation Area of the Southern Offset Area; and
- improve the flora value of the land in the CGO existing offset areas in the medium to long-term.

Two types of management areas have been defined in order to facilitate the management of native vegetation and habitat in the CGO existing offset areas, namely, Enhancement Areas and a Revegetation Area (Table 27).

The management of the existing CGO offset areas is described in the *Cowal Gold Operations Biodiversity Offset Management Plan* (Evolution, 2016a). Management measures include:

- fencing to exclude grazing;
- provision of signage to restrict access;
- soil erosion management;
- control of animal pests and weeds;
- vehicle access management; and
- habitat enhancement (e.g. nest boxes).



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LEGEND

- Mining Lease Boundary (ML 1535)
- Mining Lease Application Boundary (MLA 1)
- Approximate Extent of Approved Surface Development
- Existing Offset Area
- Proposed Offset Area
- BAR Footprint - Mine Site
- BAR Footprint - Pipeline
- Local Management Initiatives
- Remnant Vegetation Enhancement Program Areas
- Compensatory Wetland

Source: Evolution (2018); © NSW Department of Planning and Environment (2017); Department of Finance, Services & Innovation (2017) Orthophoto: Evolution (Oct 2017)



CGO PROCESSING RATE MODIFICATION
Existing Approved and Proposed Biodiversity Offset Areas

Figure 15

5.2 PROPOSED BIODIVERSITY OFFSET STRATEGY

This section describes the proposed biodiversity offset strategy, which aims to address residual impacts from the Modification that cannot be avoided or mitigated.

5.2.1 Offset Approach

A biodiversity offset strategy has been prepared in accordance with the NSW Offset Policy (OEH, 2014b) and FBA (OEH, 2014a). The NSW Offset Policy (OEH, 2014b) requires like-for-like offset outcomes which mean:

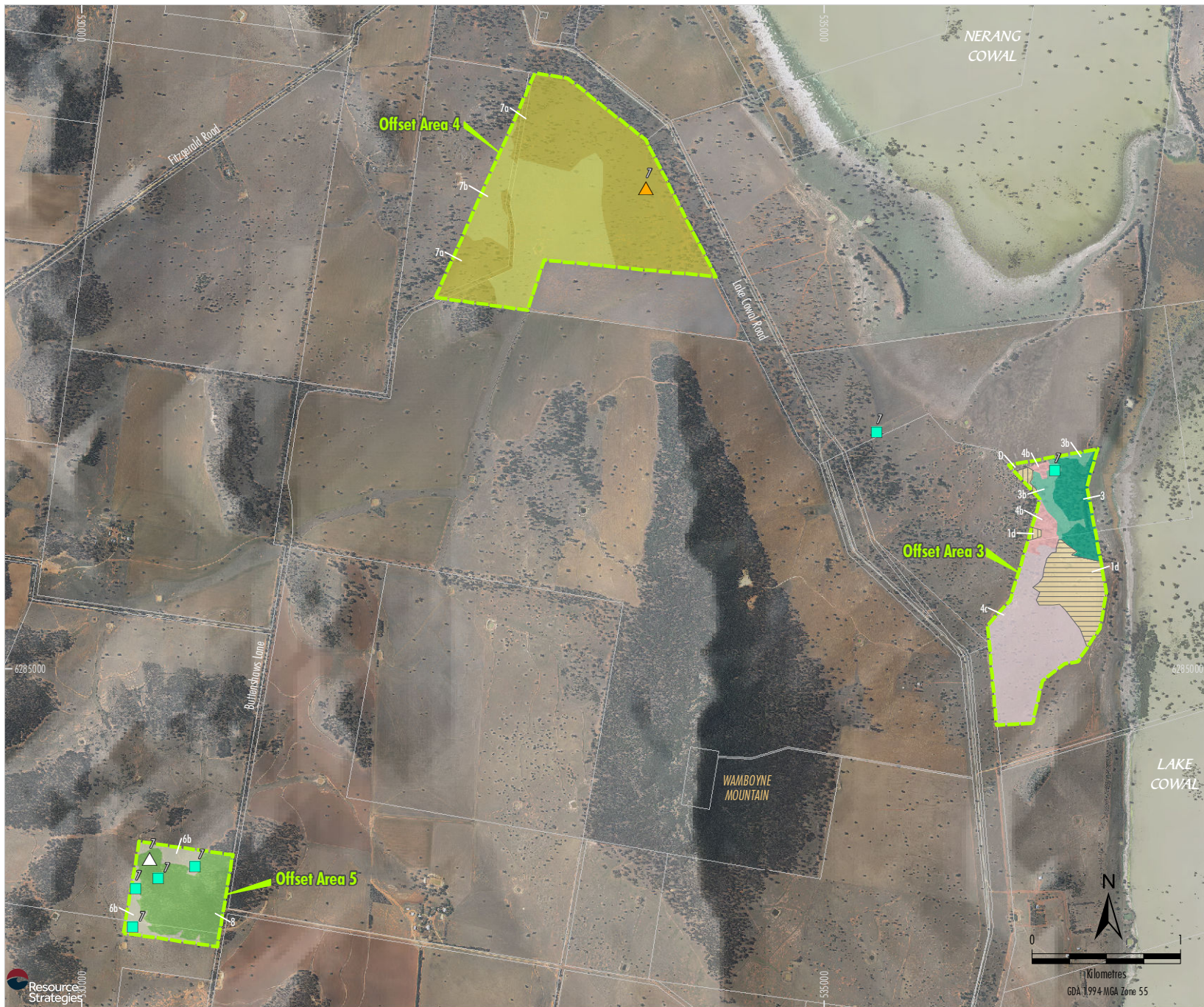
- species credit species must be offset with the same species credit species;
- BVTs must be offset with closely related BVTs (Credits from BVTs able to be retired to address the Ecosystem Credit Requirements are listed in the credit report [Attachments D and E] and re-stated in Table 25).

Evolution has elected to address the offset requirements by offsetting through land based offset areas. Evolution proposes creating four new spatially separated offset areas (Figures 15 to 17). The additional offset areas were created to meet the like-for-like offset requirement of the NSW Offset Policy (OEH, 2014b), rather than expanding the existing Offset Areas. As required by the FBA (OEH, 2014a), the *Biobanking Assessment Methodology 2014* (OEH, 2014c) and Credit Calculator were used to assess the biodiversity values of the land-based offset areas.

5.2.2 Offset Identification

AMBS (2018b) (Attachment B) undertook surveys in the proposed offset areas in September 2016, November and December 2017 and January 2018. The surveys included identification of vegetation communities and collection of condition data. Fauna surveys were undertaken concurrently with the flora surveys, and involved searching and listening for the Superb Parrot.

The proposed offset areas (including a general description of the vegetation communities present) are described in Table 28. Proposed offset areas 3 to 6 have a combined area of approximately 486.5 ha.



- LEGEND**
- Proposed Offset Area
 - Threatened Species Records
 - ▲ Superb Parrot Recorded Location
 - ▲ *Austrostepta wakoalica*
 - △ *Tylophora linearis*
 - Threatened Ecological Communities
 - Weeping Myall Woodland EEC (BC Act and EPBC Act)
 - Weeping Myall Woodland EEC (BC Act)
 - VEGETATION MAPPING**
 - Semi-arid Woodlands (Grassy sub-formation) - Riverine Plain Woodlands
 - 1d Weeping Myall Open Woodland (Derived Grassland in Moderate Condition) (LA212)
 - 3 Forested Wetlands - Inland Riverine Forests
 - 3b River Red Gum Forest (Moderate Condition) (LA191)
 - 3b River Red Gum Forest (Derived Grassland in Moderate Condition) (LA191)
 - Semi-arid Woodlands (Grassy sub-formation) - Northwest Floodplain Woodlands
 - 4b Belah Woodland (Semi Cleared in Moderate Condition) (LA105)
 - 4c Belah Woodland (Derived Grassland in Moderate Condition) (LA105)
 - Grasslands - Western Slopes Grasslands
 - 6b Highly Modified Derived Grasslands (Low Condition) (LA138)
 - Grassy Woodlands - Floodplain Transition Woodlands
 - 7a Poplar Box - Belah Woodland (Semi Cleared in Moderate Condition) (LA175)
 - 7b Poplar Box - Belah Woodland (Derived Grassland in Moderate Condition) (LA175)
 - Semi-arid Woodland (Scrubby sub-formation) - Inland Rocky Hill Woodlands
 - 8 Green Mallee - White Cypress Pine Woodland (Moderate Condition) (LA148)
 - Other Map Units**
 - D Cleared

Reference: 7. AMBS (2018b)
 Note: There are no references 1 - 6 on this figure.
 Source: © NSW Department of Finance, Services & Innovation (2017)
 Orthophoto: Evolution (Oct 2017)



CGO PROCESSING RATE MODIFICATION
Vegetation Communities
- Proposed Biodiversity Offset Areas 3, 4, 5

Figure 16



- LEGEND**
- Mining Lease Boundary (ML 1535)
 - Approximate Extent of Approved Surface Development
 - Remnant Vegetation Enhancement Program Area
 - Existing Offset Area
 - Proposed Offset Area
 - Threatened Species Records**
 - Superb Parrot Recorded Location
 - Threatened Ecological Communities**
 - Grey Box Woodland EEC (BC Act and EPBC Act)
 - VEGETATION MAPPING**
 - Grassy Woodlands - Floodplain Transition Woodlands
 - 2b Inland Grey Box - Poplar Box - White Cypress Pine (Derived Grassland in Low Condition) (LA152)
 - Grasslands - Western Slopes Grasslands
 - 6b Highly Modified Derived Grasslands (Low Condition) (LA138)
 - Freshwater Wetlands - Inland Floodplain Swamps
 - 9 Shallow freshwater mixed marsh sedgeland (Moderate Condition) (LA198)
 - Other Map**
 - D Cleared

Reference: 3. OEH (2017)
7. AMBS (2018b)

Note: There are no references 1 - 2 and 4 - 6 on this figure.

Source: Evolution (2018); © NSW Department of Planning and Environment (2017); Department of Finance, Services & Innovation (2017)
Orthophoto: Evolution (Oct 2017)



CGO PROCESSING RATE MODIFICATION
Vegetation Communities
- Proposed Biodiversity Offset Area 6

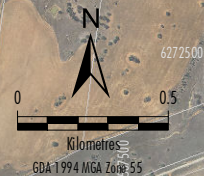


Figure 17

Table 28
Offset Identification

Aspect	Proposed Offset Area 3	Proposed Offset Area 4	Proposed Offset Area 5	Proposed Offset Area 6
Lot and DP	Lot 7 DP753097 Lot 29 DP753097	Lot 58 DP753124	Lot 30 DP753124 Lot 31 DP753124	Lot 22 DP753083
Major Catchment Area	Lachlan	Lachlan	Lachlan	Lachlan
LGA	Bland	Bland	Bland	Bland
IBRA Subregion	Lower Slopes	Lower Slopes	Lower Slopes	Lower Slopes
Mitchell Landscape	Ardlethan Hills and Bimbi Plains	Ardlethan Hills and Bimbi Plains	Ardlethan Hills	Ardlethan Hills
Land type	Freehold	Freehold	Freehold	Freehold
Owner	Evolution	Evolution	Evolution	Barrick (Cowan)/Barrick Austral
Location	North of ML1535	North of ML1535	North-west of ML1535	South of ML1535
Total Area (ha)	88	157	39.5	202
Area Native Vegetation (ha)	86.8*	157	39.5	201.3*
General Description	Offset Area 3 is composed primarily of Belah Woodland and Derived Grassland. Offset Area 3 also contains Weeping Myall Derived Grassland and both River Red Gum Woodland and Derived Grassland	Offset Area 4 is composed entirely of Moderate Condition Poplar Box Communities of Woodland and Derived Grassland structures.	Green Mallee – White Cypress Pine Woodland composes the largest extent of vegetation in Offset Area 5, with the remaining being Highly Modified Derived Grassland	Large portion of Inland Grey Box - White Cypress Pine Woodland Derived Grassland with small areas of shallow freshwater mixed marsh sedgeland and Highly Modified Derived Grasslands
Land Use History	Grazing livestock	Grazing livestock	Grazing livestock	Grazing livestock
Proposed Security Mechanism (Section 5.2.6)	Biobanking Agreement	Biobanking Agreement	Biobanking Agreement	Biobanking Agreement

* the remainder is cleared land.

5.2.3 Site Values

Table 29 identifies the change in site value score of each vegetation zone located in the proposed offset areas based on data collected by AMBS (2018b) (Attachment B) and calculated by the OEH Biobanking Credit Calculator.

Table 29
Change in Site Value Scores Relevant to the Offset Areas

Vegetation Zone Number	Vegetation Community	BVT	Area (ha)	Condition	Current Site Value	Future Site Value	Gain In Site Value
Proposed Offset Area 3							
1	1d Weeping Myall Open Woodland (Derived Grassland in Moderate Condition)	LA212	20 ^A	Moderate	44.67	68.22	23.55
2	3 River Red Gum Forest (Moderate Condition)	LA191	13.5	Moderate	70.83	87.85	17.02

Table 29 (Continued)
Change in Site Value Scores Relevant to the Offset Areas

Vegetation Zone Number	Vegetation Community	BVT	Area (ha)	Condition	Current Site Value	Future Site Value	Gain In Site Value
3	3b River Red Gum Forest (Derived Grassland in Moderate Condition)	LA191	6	Moderate	28.12	55.64	27.52
4	4b Belah Woodland (Semi Cleared in Moderate Condition)	LA105	4.8	Moderate	68.67	82.67	14.00
5	4c Belah Woodland (Derived Grassland in Moderate Condition)	LA105	42.5	Moderate	58.00	81.33	23.33
Proposed Offset Area 4							
1	7a Poplar Box - Belah Woodland (Semi Cleared in Moderate Condition)	LA175	62	Moderate	58.85	80.90	22.05
2	7b Poplar Box - Belah Woodland (Derived Grassland in Moderate Condition)	LA175	95	Moderate	32.81	61.37	28.56
Proposed Offset Area 5							
1	6b Highly Modified Derived Grasslands (Low Condition)	LA138	9	Low	35.33	42.33	7.00
2	8 Green Mallee - White Cypress Pine Woodland (Moderate Condition)	LA148	30.5	Moderate	73.44	92.36	18.92
Proposed Offset Area 6							
1	6b Highly Modified Derived Grasslands (Low Condition)	LA138	29	Low	37.33	40.00	2.67
2	2b Inland Grey Box - White Cypress Pine Woodland (Derived Grassland in Low Condition)	LA152	165.5 ^B	Low	25.52	46.01	20.49
3	9 Shallow freshwater mixed marsh sedgeland (Moderate Condition)	LA198	6.8	Moderate	54.35	66.67	12.32
Total			484.6				

A Equivalent to the Myall Woodland EEC listed under the EPBC Act and BC Act.

B Equivalent to the Grey Box EEC listed under the EPBC Act and BC Act.

5.2.4 Ecosystem Credits

Ecosystem credits generated from proposed offset areas 3, 4, 5 and 6 are summarised in Table 30.

Ecosystem credits generated from the proposed offset areas would meet (and exceed) the credit requirements of the Modification. Table 31 provides a reconciliation of the ecosystem credits required, available and additional to that required for the Modification. Under the NSW Biobanking Offset Scheme, the additional credits (2,069 ecosystem credits) could be sold and/or used to offset a future development.

As described in Section 2.2.1, the Highly Modified Derived Grasslands (LA138) were likely (prior to historic clearing) a variety of vegetation types that occur in the general locality. Given this, ecosystem credits from a variety of vegetation types (in better condition) would be used to offset impacts on the more highly modified derived grasslands. This would provide a better conservation outcome than including greater areas of Highly Modified Derived Grasslands (LA138) within the offset areas.

Threatened Ecological Communities

Ecosystem credits have been calculated for threatened ecological communities in the proposed offset areas. Threatened ecological communities in the proposed offset areas are summarised in Table 32. Plate 4 shows an example of Myall Woodland EEC listed under the BC Act and EPBC Act in Offset Area 3 and Plate 5 shows an example of Grey Box EEC listed under the BC Act and EPBC Act in Offset Area 6.

The site condition (plot data) collected by AMBS (2018b) (Attachment B) in the Grey Box EEC indicates the understorey comprises 2-32% cover of native grasses, 0-12% cover of other native plants (e.g. herbs) and greater than 75% cover of weeds. The site condition (plot data) collected in the Myall Woodland EEC indicates the understorey comprises a 30-40% cover of native grasses, 4-22% cover of other native plants (e.g. herbs) and 0-46% cover of weeds.

Superb Parrot Foraging Habitat

Approximately 106 ha of woodland and 324.5 ha of derived grassland in the offset areas provide potential foraging habitat for the Superb Parrot as mapped by AMBS (2018b) (Attachment B). Ecosystem credits have been calculated for these areas of potential foraging habitat for the Superb Parrot.

Table 30
Ecosystem Credits Generated from Proposed Offset Areas

Vegetation Zone Number	Vegetation Community	BVT	Proposed Offset Areas 3		Proposed Offset Area 4		Proposed Offset Area 5		Proposed Offset Area 6		Total	
			Area (ha)	Credits (Attachment F1)	Area (ha)	Credits (Attachment F2)	Area (ha)	Credits (Attachment F3)	Area (ha)	Credits (Attachment F4)	Area (ha)	Credits
<i>Semi-arid Woodlands Formation (Grassy sub-formation) – Riverine Plain Woodlands</i>												
1	Weeping Myall Open Woodland	LA212	20	305	0	0	0	0	0	0	20	305
<i>Forested Wetlands - Inland Riverine Forests</i>												
3	River Red Gum Forest	LA191	19.5	292	0	0	0	0	0	0	19.5	292
<i>Semi-arid Woodland (Grassy sub-formation) – Northwest Floodplain Woodlands</i>												
4	Belah Woodland	LA105	47.3	714	0	0	0	0	0	0	47.3	714
<i>Grasslands – Western Slopes Grasslands</i>												
6	Highly Modified Derived Grasslands	LA138	0	0	0	0	9	50	29	241	38	291
<i>Grassy Woodlands – Floodplain Transition Woodlands</i>												
7	Poplar Box - Belah Woodland	LA175	0	0	157	1,694	0	0	0	0	157	1,694
2	Inland Grey Box - White Cypress Pine Woodland	LA152	0	0	0	0	0	0	165.5	2,084	165.5	2,084
<i>Semi-arid Woodland (Scrubby sub-formation) – Inland Rocky Hill Woodlands</i>												
8	Green Mallee - White Cypress Pine Woodland	LA148	0	0	0	0	30.5	300	0	0	30.5	300
<i>Freshwater Wetlands - Inland Floodplain Swamps</i>												
9	Shallow freshwater mixed marsh sedgeland	LA198	0	0	0	0	0	0	6.8	76	6.8	76
Total			86.8	1,311	157	1,694	39.5	350	201.3	2,401	484.6	5,756

A Equivalent to the Myall Woodland EEC listed under the EPBC Act and BC Act.

B Equivalent to the Grey Box EEC listed under the EPBC Act and BC Act.

Table 31
Reconciliation of the Ecosystem Credits Required, Available and Additional

Vegetation Zone Number	Vegetation Community	BVT	Ecosystem Credits Required (Table 25)	Ecosystem Credits to be Retired (Table 30)	Additional Credits Not Required*
Semi-arid Woodlands Formation (Grassy Sub-formation) – Riverine Plain Woodlands					
1	Weeping Myall Open Woodland	LA212	109	109 (LA212 in Offset Area 3) ^A	196 (LA212 in Offset Area 3) ^A
Grassy Woodlands – Floodplain Transition Woodlands					
2	Inland Grey Box - White Cypress Pine Woodland	LA152	816	816 (LA152 in Offset Area 6) ^B	1,079 (LA152) ^B
Forested Wetlands - Inland Riverine Forests					
3	River Red Gum Forest	LA191	19	19 (LA191 in Offset Area 3)	273 (LA191 in Offset Area 3)
Semi-arid Woodland (Grassy sub-formation) – Northwest Floodplain Woodlands					
4	Belah Woodland	LA105	193	193 (LA105 in Offset Area 3)	521 (LA105)
Semi-arid Woodland (Scrubby sub-formation) – Inland Rocky Hill Woodlands					
5	Dwyer's Red Gum - White Cypress Pine - Currawang Woodland	LA144	18	18 (LA148 in Offset Area 5)	-
Grasslands – Western Slopes Grasslands					
6	Highly Modified Derived Grasslands	LA138	2,532	50 (LA138 in Offset Area 5) 241 (LA138 in Offset Area 6) 1,694 (LA175 in Offset Area 4) 282 (LA148 in Offset Area 5) 76 (LA198 in Offset Area 6) 189 (LA152 in Offset Area 6) ^B	-
Total			3,687	3,687	2,069

* Under the NSW Biobanking Offset Scheme, these additional credits could be sold and/or used to offset a future development.

A Equivalent to the Myall Woodland EEC listed under the EPBC Act and BC Act.

B Equivalent to the Grey Box EEC listed under the EPBC Act and BC Act.

Table 32
Threatened Ecological Communities in the Proposed Offset Areas

Threatened Ecological Communities	Offset Area	Area (ha)	Ecosystem Credits (Attachments F1 and F4)
THREATENED COMMUNITIES UNDER THE BC ACT			
<i>Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penneplain, Nandewar and Brigalow Belt South Bioregions</i>			
2b Inland Grey Box - White Cypress Pine Woodland (LA152)	Offset Area 6	165.5	2,084
<i>Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Penneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions</i>			
1d Weeping Myall Open Woodland (Derived Grassland in Moderate Condition) (LA212)	Offset Area 3	20	305
THREATENED COMMUNITIES UNDER THE EPBC ACT			
<i>Grey Box (<u>Eucalyptus microcarpa</u>) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia</i>			
2b Inland Grey Box - White Cypress Pine Woodland (LA152)	Offset Area 6	165.5	2,084
<i>Weeping Myall Woodlands</i>			
1d Weeping Myall Open Woodland (Derived Grassland in Moderate Condition) (LA212)	Offset Area 3	1.5 [^]	~23 [*]

* Calculated by dividing 305 credits by 20 ha (which equals 15.25 credits per ha) multiplied by 1.5 ha.

[^] There is also 18.5 ha of Weeping Myall Open Woodland (Derived Grassland in Moderate Condition) (LA212) that currently does not meet the criteria for the Myall Woodland EEC listed under the EPBC Act but is likely to in the future.



Plate 4 Example of Myall Woodland EEC listed under the BC Act and EPBC Act in Offset Area 3

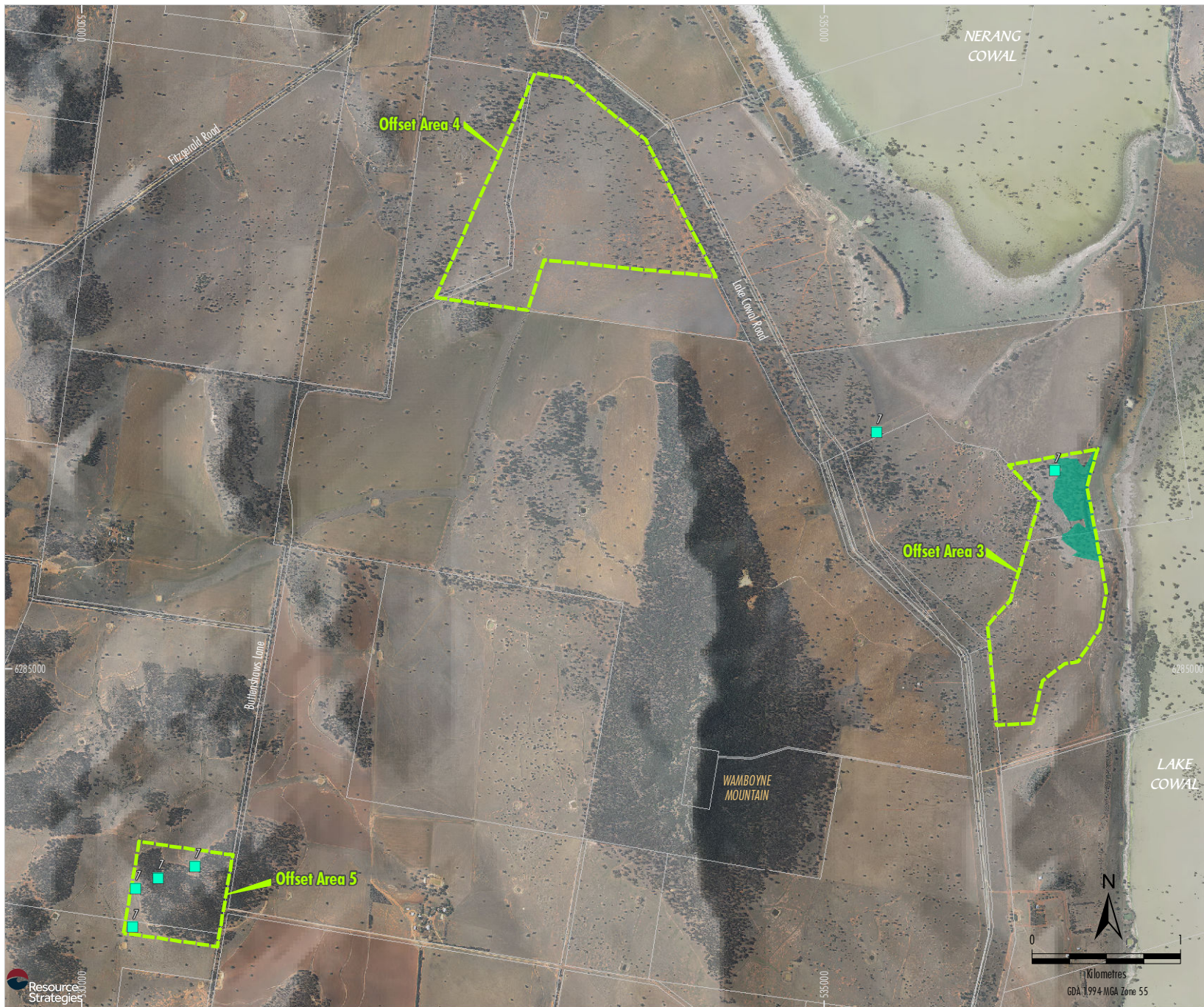


Plate 5 Example of Grey Box EEC listed under the BC Act and EPBC Act in Offset Area 6

5.2.5 Species Credits

In February 2018, AMBS (2018b) (Attachment B) undertook targeted threatened fauna surveys in the proposed offset areas. Threatened flora and fauna recorded in the offset areas are shown on Figures 16 and Figure 17.

The Superb Parrot was recorded relatively frequently during surveys by AMBS (2018b) (Attachment B) (Figures 16 and Figure 17). Proposed Offset Area 3 contains potential breeding habitat for the Superb Parrot equivalent to that which would be cleared (i.e. River Red Gum Forest [Moderate Condition] [LA191] along the edge of Lake Cowal) (Figure 18; Plate 6). There are 13.5 ha of River Red Gum Forest (Moderate Condition) (LA191) within Proposed Offset Area 3 which would produce 96 Superb Parrot species credits.



- LEGEND**
- Proposed Offset Area
 - Threatened Species Records
 - Superb Parrot Recorded Location
 - SUPERB PARROT POTENTIAL BREEDING HABITAT**
 - Forested Wetlands - Inland Riverine Forests
 - 3 River Red Gum Forest (Moderate Condition) (LA191)

Reference: 7. AMBS (2018b)
 Note: There are no references 1 - 6 on this figure.

Source: © NSW Department of Finance, Services & Innovation (2017)
 Orthophoto: Evolution (Oct 2017)



CGO PROCESSING RATE MODIFICATION
Superb Parrot Potential Breeding Habitat
- Offset Areas 3, 4, 5

Figure 18



Plate 6 Superb Parrot Potential Habitat – River Red Gum Woodland

A total of 7 Superb Parrot species credits would be required for the Modification. Under the NSW Biobanking Offset Scheme, the remaining 89 Superb Parrot species credits could be sold and/or used to offset a future development. The conservation benefit would be conservation and ongoing management of River Red Gum Forest which provides potential foraging and breeding habitat for the Superb Parrot.

AMBS (2018b) (Attachment B) also recorded *Tylophora linearis* and *Austrostipa wakoolica* in the proposed offset areas (Figure 16). Species credits could be generated for these species and sold and/or used to offset a future development.

5.2.6 Long-term Security of the Proposed Offset Areas

As required by the FBA (OEH, 2014a), the *Biobanking Assessment Methodology 2014* (OEH, 2014c) and Credit Calculator were used to assess the biodiversity values of the land-based offset areas. The *Biobanking Assessment Methodology 2014* (OEH, 2014c) is used to assess the biodiversity values of a biobank site for the purpose of entering into a Biobanking Agreement - an agreement between the Minister for the Environment and the landowner to establish a BioBank site. The Biobanking Agreement is registered on the title of the property so is transferred to new owners if the property is sold.

5.2.7 Management of the Proposed Offset Areas

Consistent with the existing CGO offset areas (Section 5.2.2), management measures for the proposed offset areas would include:

- fencing to exclude grazing;
- provision of signage to restrict access; and
- control of animal pests and weeds.

The proposed offset areas would be managed according to the requirements in the agreement for long-term security. The biodiversity credit report for the proposed offset areas (Attachments F1, F2, F3 and F4) lists the following required management measures:

- excluding commercial apiaries;
- control of feral and/or over-abundant native herbivores; and
- maintenance of natural flow regimes.

The improvement in condition of the vegetation in the proposed offset areas would be monitored according to the requirements in the agreement for long-term security.

5.3 NSW OFFSET POLICY PRINCIPLES

Table 33 provides a reconciliation of the Biodiversity Offset Strategy against the offset principles from the NSW Offset Policy (OEH, 2014b).

Table 33
Reconciliation of the Offset Areas against the NSW Offset Policy Principles

NSW Offset Policy Principles	Elements of the Modification Offset that address these Requirements
<i>Principle 1: Before offsets are considered, impacts must first be avoided and unavoidable impacts minimised through mitigation measures. Only then should offsets be considered for the remaining impacts.</i>	Impact avoidance and mitigation measures are described in Sections 4.1.1 and 4.5.
<i>Principle 2: Offset requirements should be based on a reliable and transparent assessment of losses and gains.</i>	The offset requirements have been calculated using the OEH Biobanking Credit Calculator and the FBA (OEH, 2014a).
<i>Principle 3: Offsets must be targeted to the biodiversity values being lost or to higher conservation priorities.</i>	The offset strategy described for the Modification has been developed in accordance with the requirements of the FBA to target biodiversity values that would be lost as a result of the Modification.
<i>Principle 4: Offsets must be additional to other legal requirements.</i>	The implementation of the offset strategy is beyond existing requirements.
<i>Principle 5: Offsets must be enduring, enforceable and auditable.</i>	The implementation of the offset strategy is likely to be a condition of Development Consent. Any offset areas would be secured as required.
<i>Principle 6: Supplementary measures can be used in lieu of offsets.</i>	Supplementary measures are not proposed.

5.4 COMMONWEALTH OFFSET REQUIREMENTS

A reconciliation of the Biodiversity Offset Strategy against the Commonwealth offset principles (DSEWPaC, 2012b) is presented in Table 34.

Table 34
Reconciliation of the Biodiversity Offset Strategy against the Commonwealth Offset Principles

Offset Principles¹	Elements of the Modification Offset that Address these Requirements
<i>Deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is protected by national environmental law and affected by the action.</i>	<p>The offsets directly contribute to the ongoing viability of the specific protected matter impacted i.e. 'like for like' outcome.</p> <p>The residual impacts on Grey Box EEC and Weeping Myall EEC are offset with the same BVT (LA152 and LA212, respectively) which has been confirmed to meet the criteria for the EPBC Act listed threatened ecological communities.</p> <p>Impacts on potential breeding habitat for the Superb Parrot would be offset with conservation and management of similar potential breeding habitat for the Superb Parrot (same BVT [LA191]).</p> <p>The conservation benefit from the offset areas would be the long-term security and management of larger areas of Grey Box EEC, Weeping Myall EEC and potential foraging and breeding habitat for the Superb Parrot, than would be disturbed by the Modification.</p>
<i>Be built around direct offsets but may include other compensatory measures.</i>	Evolution has elected to address the offset requirements by offsetting through four additional land based offset areas (Section 5.2).
<i>Be in proportion to the level of statutory protection that applies to protected matters.</i>	<p>The NSW Offset Policy (OEH, 2014b), which was applied to the Modification, accounts for the level of statutory protection (vulnerable to critically endangered) of the relevant protected matters in calculating the offset requirement.</p> <p>The land-based offset areas would satisfy 100% of the offset requirements for each threatened species and community potentially impacted by the Modification.</p>
<i>Be of a size and scale proportionate to the impacts on the protected matter.</i>	The size and scale of the offset was determined using the NSW Offset Policy (OEH, 2014b). This takes into consideration specific attributes of the relevant protected matters and its habitat and the quality and importance of the habitat.
<i>Effectively account for and manage the risks of the offset not succeeding.</i>	The implementation of the offset strategy is likely to be a condition of Development Consent (DA 14/98).
<i>Be additional to what is already required, determined by law or planning regulations or agreed to under other schemes or programs.</i>	The implementation of the offset strategy is beyond existing requirements, in that it is not part of any private conservation reserve system. The enduring protection that would be applied to the biodiversity offset areas is new and additional under duty of care or any environmental planning laws.
<i>Be efficient, effective, transparent, proportionate, scientifically robust and reasonable.</i>	The size and scale of the offset was determined using the NSW Offset Policy (OEH, 2014b).
<i>Have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced.</i>	The proposed offset areas would be secured using an agreement between the Minister for the Environment and a landholder to permanently protect and manage an area of land.

¹ DSEWPaC, 2012b.

6 CONCLUSION

The Modification would result in the removal of 286.7 ha of native vegetation, of which most (91%) is derived grassland in low/moderate condition (260.8 ha). The result of running the OEH Biobanking Credit Calculator is that the Modification requires a Biodiversity Offset Strategy which accounts for a total of 3,687 ecosystem credits and 7 species credits for the Superb Parrot.

The existing Biodiversity Offset Strategy for the CGO would be augmented with an additional Biodiversity Offset Strategy for the Modification. Evolution has elected to address the offset requirements by offsetting through four additional offset areas on land owned by Evolution.

The four proposed offset areas have a combined area of 486.5 ha and provide a like-for-like offset outcome. Ecosystem and species credits generated from the four proposed offset areas would meet (and exceed) the credit requirements of the Modification.

7 REFERENCES

- AMBS Ecology & Heritage (2018a) *Cowal Gold Operations Processing Rate Modification - Flora and Fauna Survey Report*. Prepared for Evolution Mining (Cowal) Pty Limited.
- AMBS Ecology & Heritage (2018b) *Cowal Gold Operations Processing Rate Modification – Biodiversity Offset Investigation*. Prepared for Evolution Mining (Cowal) Pty Limited.
- Anne Clements and Associates (1995) *Terrestrial Flora Report: Lake Cowal District*. Appendix F of NSR Environmental Consultants (1995) *Lake Cowal Gold Project Environmental Impact Statement*.
- Atlas of Living Australia (2017) *Atlas of Living Australia Website*. Database search within the following area: -33.4584 147.1777,-33.4584 147.6107,-33.8206 147.6107, -33.8206 147.1777. Website Accessed: September 2017.
- Austin, M.P., Cawsey, E.M., Baker, B.L., Yialeloglou, M.M., Grice, D.J. and Briggs, S.V. (2000) *Predicted Vegetation Cover in the Central Lachlan Region*. Final Report of Project AA1368.97, Natural Heritage Trust. 162 pp. + appendices.
- Australian Museum Business Services (2012) *Cowal Gold Mine and Surrounds Flora Survey*. Report prepared for Barrick (Australia Pacific) Limited.
- Australian Museum Business Services (2013) *Lake Cowal Waterbird Monitoring (1989 to 2012) Compilation Report*. Report prepared for Barrick (Australia Pacific) Limited.
- Baker-Gabb, D (2011) *National Recovery Plan for the Superb Parrot* *Polytelis swainsonii*. Available from: <http://www.environment.gov.au/biodiversity/threatened/recovery-plans/national-recovery-plan-superb-parrot-polytelis-swainsonii>.
- Barrick (Cowal) Limited (2003a) *Cowal Gold Project Land Management Plan*.
- Barrick (Cowal) Limited (2003b) *Cowal Gold Project Implementation of the Threatened Species Management Protocol*.
- Barrick (Cowal) Limited (2003c) *Cowal Gold Project Compensatory Wetland Management Plan*.
- Barrick (Cowal) Limited (2003d) *Cowal Gold Project Access Road Implementation of the Threatened Species Management Protocol*.
- Barrick (Cowal) Limited (2005a) *Cowal Gold Project – Vegetation Clearance Protocol Reports*. September 2005. VCP-Intro-B.
- Barrick (Cowal) Limited (2005b) *Cowal Gold Project – Vegetation Clearance Protocol Report – Public Road within the Travelling Stock Reserve*. September 2005. VCP-R025-A.
- Barrick Australia Limited (2005c) *Cowal Gold Project – Vegetation Clearance Protocol Report – Access Road (Blow Clear Road)*. September 2005. VCP-AR-Blow-A Clear Road.
- Barrick Australia Limited (2005d) *Cowal Gold Project – Vegetation Clearance Protocol Report – Access Road (Wamboyne Road)*. September 2005. VCP-AR-Wamboyne Road-A.
- Barrick Australia Limited (2005e) *Cowal Gold Project – Vegetation Clearance Protocol Report – Cowal West Borrow Pit (Extension)*. September 2005. VCP-CWBP-F.

- Barrick Australia Limited (2005f) *Cowal Gold Project – Vegetation Clearance Protocol Reports – Low Grade Ore Stockpile*. September 2005. VCP-LGOS-A.
- Barrick Australia Limited (2005g) *Cowal Gold Project – Vegetation Clearance Protocol Report – Borefield Pipeline*. September 2005. VCP-R001-D.
- Barrick Australia Limited (2005h) *Cowal Gold Project – Vegetation Clearance Protocol Report – Temporary Isolation Bund and Lake Protection Bund*. September 2005. VCP-R002-B.
- Barrick Australia Limited (2005i) *Cowal Gold Project – Vegetation Clearance Protocol Report – Northern tailings storage facility*. September 2005. VCP-R003-C.
- Barrick Australia Limited (2005j) *Cowal Gold Project – Vegetation Clearance Protocol Report – Up-Catchment Diversion System*. September 2005. VCP-R004-B.
- Barrick Australia Limited (2005k) *Cowal Gold Project – Vegetation Clearance Protocol Report – Permanent Catchment Divide*. September 2005. VCP-R005-C.
- Barrick Australia Limited (2005l) *Cowal Gold Project – Vegetation Clearance Protocol Report – Soil Stockpile 1*. September 2005. VCP-R006-C.
- Barrick Australia Limited (2005m) *Cowal Gold Project – Vegetation Clearance Protocol Report – Soil Stockpile 2*. September 2005. VCP-R007-B.
- Barrick Australia Limited (2005n) *Cowal Gold Project – Vegetation Clearance Protocol Report – Soil Stockpile 3*. September 2005. VCP-R008-B.
- Barrick Australia Limited (2005o) *Cowal Gold Project – Vegetation Clearance Protocol Report – Soil Stockpile 4*. September 2005. VCP-R009-B.
- Barrick Australia Limited (2005p) *Cowal Gold Project – Vegetation Clearance Protocol Report – Soil Stockpile 5*. September 2005. VCP-R010-B.
- Barrick Australia Limited (2005q) *Cowal Gold Project – Vegetation Clearance Protocol Report – Tailings Service Corridor*. September 2005. VCP-R011-B.
- Barrick Australia Limited (2005r) *Cowal Gold Project – Vegetation Clearance Protocol Report – Internal Mine Access Road*. September 2005. VCP-R012-B.
- Barrick Australia Limited (2005s) *Cowal Gold Project – Vegetation Clearance Protocol Report – Processing Plant*. September 2005. VCP-R013-C.
- Barrick Australia Limited (2005t) *Cowal Gold Project – Vegetation Clearance Protocol Report – Hardy Brothers Laydown Area (Southern Waste Emplacement)*. September 2005. VCP-R015-D.
- Barrick Australia Limited (2005u) *Cowal Gold Project – Vegetation Clearance Protocol Report – Open Pit*. September 2005. VCP-R017-B.
- Barrick Australia Limited (2005v) *Cowal Gold Project – Vegetation Clearance Protocol Report – Perimeter Waste Emplacement*. September 2005. VCP-R018-B.
- Barrick Australia Limited (2005w) *Cowal Gold Project – Vegetation Clearance Protocol Report – Cowal West Borrow Pit (Northern Waste Emplacement)*. September 2005. VCP-R020-B.

- Barrick Australia Limited (2005x) *Cowal Gold Project – Vegetation Clearance Protocol Report – Haul Road (Processing Plant to Tailings Storage Facilities)*. September 2005. VCP-R021-B.
- Barrick Australia Limited (2005y) *Cowal Gold Project – Vegetation Clearance Protocol Report – Contained Water Storage D2*. September 2005. VCP-R022-B.
- Barrick Australia Limited (2005z) *Cowal Gold Project – Vegetation Clearance Protocol Report – Contained Water Storage D8B*. September 2005. VCP-R023-B.
- Barrick Australia Limited (2005zi) *Cowal Gold Project – Vegetation Clearance Protocol Report – Southern tailings storage facility*. September 2005. VCP-R024-B.
- Barrick Australia Limited (2005zii) *Cowal Gold Mine Implementation Plan to Protect Fauna from Interactions with the Tailings Storage Facilities*.
- Barrick Australia Limited (2005ziii) *Cowal Gold Project 2003-2004 Annual Environmental Management Report*.
- Barrick Australia Limited (2005ziv) *Vegetation Clearing Protocol: Summary of Species Located on the MLA and Access Road, V Jan 10th – 14th 2005*.
- Barrick Australia Limited (2006a) *Cowal Gold Project – Vegetation Clearance Protocol Report – Northern Waste Emplacement*. September 2006. VCP-NWE-C.
- Barrick Australia Limited (2006b) *Cowal Gold Project – Vegetation Clearance Protocol Report – Magazine Laydown Area, Low Grade Ore Stockpile and Northern and Southern Tailings Storage Facilities Perimeter Fence Easement*. September 2006. VCP-R028-C.
- Barrick Australia Limited (2006c) *Cowal Gold Project – Vegetation Clearance Protocol Report – Contained Water Storage D9*. December 2006. VCP-R028-A.
- Barrick Australia Limited (2006d) *Cowal Gold Project 2004-2005 Annual Environmental Management Report*.
- Barrick Australia Limited (2007a) *Cowal Gold Project – Vegetation Clearance Protocol Report – Southern Waste Emplacement*. March 2007. VCP-SWE-B.
- Barrick Australia Limited (2007b) *Cowal Gold Project – Vegetation Clearance Protocol Report – Northern Waste Emplacement – Southern Section*. August 2007. VCP-NWE-SS-C.
- Barrick Australia Limited (2007c) *Cowal Gold Project – Vegetation Clearance Protocol Report – Soil Stockpile 6*. August 2007. VCP-SS6-C.
- Barrick Australia Limited (2007d) *Cowal Gold Project – Vegetation Clearance Protocol Report – Southern tailings storage facility – First Lift*. August 2007. VCP-southern tailings storage facility FL-C.
- Barrick Australia Limited (2007e) *Cowal Gold Project – Vegetation Clearance Protocol Report – Ammonium Nitrate Facility*. August 2007. VCP-ANF-C.
- Barrick Australia Limited (2007f) *Cowal Gold Project – Vegetation Clearance Protocol Report – Magazine Area*. September 2007. VCP_MA_A.
- Barrick Australia Limited (2007g) *Cowal Gold Project 2005-2006 Annual Environmental Management Report*.

- Barrick Australia Limited (2008a) *Cowal Gold Mine E42 Modification Environmental Assessment*.
- Barrick Australia Limited (2008b) *Cowal Gold Project – Vegetation Clearance Protocol Report – Southern Waste Emplacement (Campaign 2)*. August 2008. VCP-SWE(C2)-B.
- Barrick Australia Limited (2008c) *Cowal Gold Project 2006-2007 Annual Environmental Management Report*.
- Barrick (Cowal) Limited (2009a) *Cowal Gold Project – Vegetation Clearance Protocol Report – Northern Waste Emplacement Area (August 2009)*. November 2009. VCP-NWE-A.
- Barrick (Cowal) Limited (2009b) *Cowal Gold Project – Vegetation Clearance Protocol Report – Soil Stockpile Areas (November 2009)*. November 2009. VCP-SS-B.
- Barrick (Cowal) Limited (2009c) *Cowal Gold Project 2007-2008 Annual Environmental Management Report*.
- Barrick (Cowal) Limited (2010a) *Cowal Gold Project Vegetation Clearance Protocol Report Northern and Southern Waste Emplacement Areas and Soil Stockpile (March 2010)*. VCP-MARCH10-A.
- Barrick (Cowal) Limited (2010b) *Cowal Gold Project 2008-2009 Annual Environmental Management Report*.
- Barrick (Cowal) Limited (2011) *Cowal Gold Project 2009-2010 Annual Environmental Management Report*.
- Barrick (Cowal) Limited (2012a) *Cowal Gold Project Vegetation Clearance Protocol Report Southern Waste Rock Emplacement (Cowal West Shearing Shed) and Topsoil and Subsoil Stockpile Areas East of the Southern Tailings Storage Facility (May 2012)*. VCP-MAY12-A.
- Barrick (Cowal) Limited (2012b) *Cowal Gold Project 2010-2011 Annual Environmental Management Report*.
- Barrick (Cowal) Limited (2013) *Cowal Gold Mine – 2012 Annual Review Report. Prepared for Barrick Gold Australia, Cowal Gold Project*.
- Barrick (Cowal) Limited (2014) *Cowal Gold Mine – 2013 Annual Review Report. Prepared for Barrick Gold Australia, Cowal Gold Project*.
- Barrick (Cowal) Limited (2015) *Cowal Gold Mine – 2014 Annual Review Report. Prepared for Barrick Gold Australia, Cowal Gold Project*.
- Benson, J.S. (2008) New South Wales Vegetation Classification and Assessment: Part 2 Plant communities of the NSW South-western Slopes Bioregion and update of NSW Western Plains plant communities, Version 2 of the NSWVCA database. *Cunninghamia* 10: 599-673.
- Birdlife Australia (2017) *Birdlife Australia database search within the following area: -33.4584 147.1777,-33.4584 147.6107,-33.8206 147.6107, -33.8206 147.1777*.
Data received September 2017.
- Bower, C.C. (1997) *Cowal Gold Project: Flora – Threatened Species Assessment*. Report prepared for North Limited.
- Bower, C.C. (1998a) *Survey of the Cowal Project Area and surrounds for the Austral Pillwort (Pilularia novae-hollandiae)*. Unpublished report by Orchid Research to North Limited. 14 pp.

- Bower, C.C. (1998b) *Survey for the Endangered Peppercress, Lepidium hyssopifolium Desv. (Brassicaceae), on the Proposed Cowal Gold Project Site and the Route of the Borefield Pipeline*. Orchid Research.
- Bower, C.C. (2003a) *Vegetation Community Mapping along the Pipeline/Borefield Route*.
- Bower, C.C. (2003b) *Vegetation Community Mapping along the Access Road*.
- Bower, C.C. (2003c) *Survey of the Cowal Gold Project Area and Surrounds for the Austral Pillwort (Pilularia novae-hollandiae)*.
- Cenwest Environmental Services (2009) *Cowal Gold Mine E42 Modification – Modified Request Fauna Assessment*. Report prepared for Barrick.
- Cenwest Environmental Services (2011) *Cowal Augmentation Project Amphibian Survey*.
- Charles Sturt University (1997) *Cowal Gold Project Area Botanical Survey*. Report prepared for North Limited.
- Coffey Geotechnics Pty Ltd (2018) *Hydrogeological Assessment – Cowal Gold Operation Processing Rate Modification*.
- Commonwealth of Australia (2014). *EPBC Act Referral Guidelines for the Vulnerable Koala (Combined Populations of Queensland, New South Wales and the Australian Capital Territory)*. Commonwealth of Australia.
- Country Energy (2004) *Temora to Cowal Electricity Transmission Line – Implementation of the Threatened Species Management Protocol*.
- Department of Environment and Conservation (2004) *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (Working Draft)*.
- Department of Environment and Conservation and Department of Primary Industries (2005) *Draft Guidelines for Threatened Species Assessment*.
- Department of Environment, Climate Change and Water (2009) *Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna – Amphibians*.
- Department of the Environment and Energy (2017) *Protected Matters search for the following area: -33.4584 147.1777,-33.4584 147.6107,-33.8206 147.6107, -33.8206 147.1777*.
Data received September 2017.
- Department of the Environment (2013) *Matters of National Environmental Significance Significant Impact Guidelines 1.1*.
Website: https://www.environment.gov.au/system/files/resources/42f84df4-720b-4dcf-b262-48679a3aba58/files/nes-guidelines_1.pdf
- Department of the Environment and Energy (2018a) *Directory of Important Wetlands of Australia (DIWA)*.
- Department of the Environment and Energy (2018b) *Species Profile and Threats Database*.
<http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>
- Department of Primary Industries Threatened Species Unit (2006) *Final Recommendation – Aquatic Ecological Community in the Natural Drainage System of the Lowland Catchment of the Lachlan River*.

Department of Primary Industries Fisheries (2013) *DPI Fisheries Policy and Guidelines for Fish Habitat Conservation and Management (Update 2013)*.

Department of Primary Industries Fisheries (2018) *Freshwater Threatened Species Distribution Maps*. New South Wales.

Website:<https://www.dpi.nsw.gov.au/fishing/species-protection/threatened-species-distributions-in-nsw/freshwater-threatened-species-distribution-maps>

Accessed: February 2018.

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

Department of Sustainability, Environment, Water, Population and Communities (2011a). *Survey Guidelines for Australia's Threatened Mammals*.

Department of Sustainability, Environment, Water, Population and Communities (2011b). *Survey Guidelines for Australia's Threatened Reptiles*.

Department of Sustainability, Environment, Water, Population and Communities (2012a) *Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia- A guide to the identification, assessment and management of a nationally threatened ecological community - EPBC Act Policy Statement*.

Department of Sustainability, Environment, Water, Population and Communities (2012b) *Environment Protection and Biodiversity Conservation Act, 1999 Environmental Offsets Policy*.

Department of the Environment, Water, Heritage and the Arts (2008a) *Threat Abatement Plan for Predation by the European Red Fox*. Canberra.

Department of the Environment, Water, Heritage and the Arts (2008b) *Threat Abatement Plan for Predation by Feral Cats*. Canberra.

Department of the Environment, Water, Heritage and the Arts (2008c) *Approved Conservation Advice for Weeping Myall Woodlands Ecological Community*. Available from: <http://www.environment.gov.au/biodiversity/threatened/communities/pubs/98-conservation-advice.pdf>.

Department of the Environment, Water, Heritage and the Arts (2009) *Weeping Myall Woodlands. EPBC Act Policy Statement 3.17*. Nationally Threatened Species and Ecological Communities Guidelines.

Department of Environment, Water, Heritage and the Arts (2010a) *Survey Guidelines for Australia's Threatened Bats*.

Department of Environment, Water, Heritage and the Arts (2010b) *Survey Guidelines for Australia's Threatened Birds*.

Department of the Environment, Water, Heritage and the Arts (2010c) *Approved Conservation Advice for the Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-east Australia*. Available from: <http://www.environment.gov.au/biodiversity/threatened/communities/pubs/86-conservation-advice.pdf>.

DnA Environmental (2008) *Remnant Vegetation Enhancement Program: 2008 Monitoring Results*. Report to Barrick (Australia Pacific) Limited.

- DnA Environmental (2010) *Remnant Vegetation Enhancement Program: 2009 Monitoring Results*. Report to Barrick (Australia Pacific) Limited.
- DnA Environmental (2011a) *Remnant Vegetation Enhancement Program: 2010 Monitoring Results*. Report to Barrick (Australia Pacific) Limited.
- DnA Environmental (2011b) *2010 Compensatory Wetland Regeneration Monitoring Results for Cowal Gold Mine*.
- DnA Environmental (2011c) *2010 Rehabilitation Monitoring Report for Cowal Gold Mine*.
- DnA Environmental (2012a) *Remnant Vegetation Enhancement Program: 2011 Monitoring Results*. Report to Barrick (Australia Pacific) Limited.
- DnA Environmental (2012b) *2011 Compensatory Wetland Regeneration Monitoring Results for Cowal Gold Mine*.
- DnA Environmental (2012c) *2011 Rehabilitation Monitoring Report for Cowal Gold Mine*.
- DnA Environmental (2012d) *2011 Austral Pillwort Survey for Cowal Gold Mine*.
- DnA Environmental (2013a) *Remnant Vegetation Enhancement Program: 2012 Monitoring Results*. Report to Barrick (Australia Pacific) Limited.
- DnA Environmental (2013b) *2012 Compensatory Wetland Regeneration Monitoring Results for Cowal Gold Mine*.
- DnA Environmental (2013c) *2012 Rehabilitation Monitoring Report for Cowal Gold Mine*.
- DnA Environmental (2013d) *2012 Austral Pillwort Survey for Cowal Gold Mine*.
- DnA Environmental (2014a) *Remnant Vegetation Enhancement Program: 2010 Monitoring Results*. Report to Barrick (Australia Pacific) Limited.
- DnA Environmental (2014b) *2010 Compensatory Wetland Regeneration Monitoring Results for Cowal Gold Mine*.
- DnA Environmental (2014c) *2010 Rehabilitation Monitoring Report for Cowal Gold Mine*.
- DnA Environmental (2015a) *Remnant Vegetation Enhancement Program: 2010 Monitoring Results*. Report to Barrick (Australia Pacific) Limited.
- DnA Environmental (2015b) *2010 Compensatory Wetland Regeneration Monitoring Results for Cowal Gold Mine*.
- DnA Environmental (2015c) *2010 Rehabilitation Monitoring Report for Cowal Gold Mine*.
- DnA Environmental (2015d) *2015: Austral Pillwort Survey, Cowal Gold Operations, West Wyalong, NSW*.
- DnA Environmental (2016a) *Remnant Vegetation Enhancement Program: 2010 Monitoring Results*. Report to Barrick (Australia Pacific) Limited.
- DnA Environmental (2016b) *2010 Compensatory Wetland Regeneration Monitoring Results for Cowal Gold Mine*.

- DnA Environmental (2016c) *2010 Rehabilitation Monitoring Report for Cowal Gold Mine.*
- DnA Environmental (2016d) *2016: Austral Pilwort Survey, Cowal Gold Operations, West Wyalong, NSW.*
- DnA Environmental (2017a) *Remnant Vegetation Enhancement Program: 2010 Monitoring Results. Report to Barrick (Australia Pacific) Limited.*
- DnA Environmental (2017b) *2010 Rehabilitation Monitoring Report for Cowal Gold Mine.*
- DnA Environmental (2017c) *Draft 2017: Austral Pilwort Survey, Cowal Gold Operations, West Wyalong, NSW.*
- Donato Environmental Services (2006) *Seasonal Wildlife Use Patterns of the Cowal Gold Mine Tailings Facility.*
- Donato Environmental Services (2007) *Seasonal Wildlife Use Patterns of the Cowal Gold Mine Tailings Facility: October 2006 to March 2007.*
- Donato Environmental Services (2008a) *Seasonal Wildlife Use Patterns of the Cowal Gold Mine Tailings Facility: April 2007 to September 2008.*
- Donato Environmental Services (2008b) *Seasonal Wildlife Use Patterns of the Cowal Gold Mine Tailings Facility: October 2007 to March 2008.*
- Donato Environmental Services (2008c) *Seasonal Wildlife Use Patterns of the Cowal Gold Mine Tailings Facility: April to September 2007.*
- Donato Environmental Services (2009) *Seasonal Wildlife Use Patterns of the Cowal Gold Project tailings storage facility: 1 October 2008 to 30 March 2009.*
- Donato Environmental Services (2010a) *Seasonal Wildlife Use Patterns of the Cowal Gold Mine tailings storage facility: 1 April 2009 to 30 September 2009.*
- Donato Environmental Services (2010b) *Seasonal Wildlife Use Patterns of the Cowal Gold Mine tailings storage facility: 1 October 2009 to 31 March 2010.*
- Donato Environmental Services (2011a) *Seasonal Wildlife Use Patterns of the Cowal Gold Mine tailings storage facility: 1 April to 30 September 2010.*
- Donato Environmental Services (2011b) *Seasonal Wildlife Use Patterns of the Cowal Gold Mine tailings storage facility: 1 October 2010 to 31 March 2011.*
- Donato Environmental Services (2012a) *Seasonal Wildlife Use Patterns of the Cowal Gold Mine tailings storage facility: 1 April 2011 to 30 September 2011.*
- Donato Environmental Services (2012b) *Seasonal Wildlife Use Patterns of the Cowal Gold Mine tailings storage facility: 1 October 2011 to 31 March 2012.*
- Donato Environmental Services (2013a) *Seasonal Wildlife Use Patterns of the Cowal Gold Mine tailings storage facility: 1 April to 30 September 2012.*
- Donato Environmental Services (2013b) *Seasonal Wildlife Use Patterns of the Cowal Gold Operations Tailings Storage Facility: 1 July 2013 to 31 December 2013. Prepared for Barrick Gold Australia, Cowal Gold Project.*

- Donato Environmental Services (2014a) *Seasonal Wildlife Use Patterns of the Cowal Gold Operations Tailings Storage Facility: 1 January 2014 to 30 June 2014. Prepared for Barrick Gold Australia, Cowal Gold Project.*
- Donato Environmental Services (2014b) *Seasonal Wildlife Use Patterns of the Cowal Gold Operations Tailings Storage Facility: 1 July 2014 to 31 December 2014. Prepared for Barrick Gold Australia, Cowal Gold Project.*
- Donato Environmental Services (2015a) *Seasonal Wildlife Use Patterns of the Cowal Gold Operations Tailings Storage Facility: 1 January 2015 to 30 June 2015. Prepared for Evolution Mining, Cowal Gold Operations.*
- Donato Environmental Services (2015b) *Seasonal Wildlife Use Patterns of the Cowal Gold Operations Tailings Storage Facility: 1 July 2015 to 31 December 2015. Prepared for Evolution Mining, Cowal Gold Project.*
- Donato Environmental Services (2016a) *Seasonal Wildlife Use Patterns of the Cowal Gold Operations Tailings Storage Facility: 1 January 2016 to 30 June 2016. Prepared for Evolution Mining, Cowal Gold Project.*
- Donato Environmental Services (2016b) *Seasonal Wildlife Use Patterns of the Cowal Gold Operations Tailings Storage Facility: 1 July 2016 to 31 December 2016. Prepared for Evolution Mining, Cowal Gold Project.*
- Donato Environmental Services (2017a) *Seasonal Wildlife Use Patterns of the Cowal Gold Operations Tailings Storage Facility: 1 January 2016 to 30 June 2016. Prepared for Evolution Mining, Cowal Gold Project.*
- Evolution (2013b) *Cowal Gold Mine Vegetation Clearance Protocol Report - Processing Plant Expansion (June - August 2013).*
- Evolution (2014b) *Cowal Gold Mine Vegetation Clearance Protocol Report - Processing Plant Expansion (May 2014).*
- Evolution (2015) *Cowal Gold Project Air Quality Management Plan.*
- Evolution (2016a) *Cowal Gold Operations Biodiversity Offset Management Plan.*
- Evolution (2016b) *Cowal Gold Operations Flora and Fauna Management Plan.*
- Evolution (2016c) *Cowal Gold Operations – 2015 Annual Review. Prepared for Evolution Mining, Cowal Gold Project.*
- Evolution (2017a) *EPBC Act Referral Submission – Cowal Gold Operations Processing Rate Modification.*
- Evolution (2017b) *Cowal Gold Operations Rehabilitation Management Plan.*
- Evolution (2017c) *Cowal Gold Operations Water Management Plan.*
- Evolution (2017d) *Cowal Gold Operations – 2016 Annual Review. Prepared for Evolution Mining, Cowal Gold Project.*
- FloraSearch (2008) *Cowal Gold Mine E42 Modification Flora Assessment. Report to Barrick Australia Ltd.*

- FloraSearch (2011) *Cowal Gold Mine Modified Request Flora Assessment*. Report to Barrick Australia Ltd.
- FloraSearch (2013) *Cowal Gold Mine Modification - Proposed Pump Station: Impact on Flora*. Report to Barrick Australia Ltd.
- frc Environmental (2011) *Cowal Gold Mine Compensatory Wetland Habitat and Fish Investigation*.
- frc Environmental (2012) *Cowal Gold Mine Compensatory Wetland Habitat and Fish Investigation 2012*.
- frc Environmental (2016) *Cowal Gold Operations Compensatory Wetland Habitat and Fish Investigation*.
- frc Environmental (2017) *Cowal Gold Operations Compensatory Wetland Habitat and Fish Investigation*
- Gell, P.A. and Peake, P. (2012) *Lake Cowal Waterbird Monitoring Survey Progress Report October 2012*.
- Gell, P.A. and Peake, P. (2013) *Lake Cowal Waterbird Monitoring Survey Progress Report January 2013*.
- Gell, P.A. and Peake, P. (2014) *Lake Cowal Waterbird Monitoring Survey Progress Report August 2014*.
- Gell, P.A. and Peake, P. (2015) *Lake Cowal Waterbird Monitoring Survey Progress Report October 2015*.
- Gell, P.A. and Peake, P. (2016) *Lake Cowal Waterbird Monitoring Survey Progress Report November 2016*.
- Gell, P.A. and Peake, P. (2017a) *Lake Cowal Waterbird Monitoring Survey Progress Report January 2017*.
- Gell, P.A. and Peake, P. (2017b) *Lake Cowal Waterbird Monitoring Survey Progress Report August 2017*.
- Goldney, D.C. and Bowie, I.J.S. (1987) *National Trust scenic and scientific survey of the Central Western Region of NSW: Volumes 1 and 2*. A report to the Heritage Commission for the Commonwealth Government, Mitchell College of Advanced Education, Bathurst.
- Goldney, D.C., Kearns, A., Cowling, S. and Bower, C. (1997) *An Ecosystem Perspective on Post-Mining Conservation Values Associated with the Lake Cowal Gold Project*.
- Goldney, D.C., Kerle, A. and Fleming, M. (2008) *Status of Vertebrate Fauna and their Habitats in the Lachlan Catchments*. Western Research Institute, Bathurst.
- Greg Richards and Associates Pty Ltd (1997a) *Results of a Bat Fauna Survey to Target Threatened Species*. Attachment A7 of Resource Strategies Pty Ltd, Commonwealth Scientific and Industrial Research Organisation Wildlife and Ecology, Goldney, D. and Greg Richards and Associates Pty Ltd (1997) *Cowal Gold Project Species Impact Statement*. Appendix A of North Limited (1998) *Cowal Gold Project Environmental Impact Statement*.

- Greg Richards and Associates Pty Ltd (1997b) *Cowal Gold Project Significance of Operations on Threatened Bat Species*. In Appendix A of North Limited (1998) *Cowal Gold Project Electricity Transmission Line Environmental Impact Statement*. Report prepared by Resource Strategies Pty Ltd.
- Gunninah Consultants Pty Ltd (1995) *Fauna Impact Statement*. In Appendix A of North Limited (1995) *CGO Environmental Impact Statement*. Report prepared by NSR Environmental Consultants Pty Ltd.
- Kerle, A. (2013a) *Cowal Gold Mine and Surrounds Fauna Report*.
- Kerle, A. (2013b) *Proposed Pump Station – Cowal Gold Mine Extension Modification Potential Fauna Habitat*.
- Mount King Ecological Surveys (1997) *Fauna Report - Temora to Cowal Gold Project Electricity Transmission Line Fauna Assessment*. In Appendix D of North Limited (1998) *Cowal Gold Project Environmental Impact Statement*. Report prepared by Resource Strategies Pty Ltd.
- North Limited (1998) *Cowal Gold Project Environmental Impact Statement*.
- Office of Environment and Heritage (2014a) *Framework for Biodiversity Assessment*. NSW *Biodiversity Offsets Policy for Major Projects*.
- Office of Environment and Heritage (2014b) *NSW Biodiversity Offsets Policy for Major Projects*. Website: <http://www.environment.nsw.gov.au/biodivoffsets/biooffsetspol.htm>
- Office of Environment and Heritage (2014c) *BioBanking Assessment Methodology 2014*. September 2014.
- Office of the Environment and Heritage (2015a) *Central West and Lachlan Regional Native Vegetation Mapping*. NSW Office of Environment and Heritage, Sydney, Australia
- Office of Environment and Heritage (2015b) *Framework for Biodiversity Assessment – Linear Module*. Website: <http://www.environment.nsw.gov.au/resources/biobanking/150460-FBA-linear-instructions.pdf>
- Office of Environment and Heritage (2016a) *Credit Calculator for Major Projects and BioBanking Operational Manual*. Website: <http://www.environment.nsw.gov.au/resources/biobanking/09181bioopsman.pdf>
- Office of Environment and Heritage (2016b) *NSW Guide to Surveying Threatened Plants*. State of NSW, Sydney.
- Office of Environment and Heritage (2017a) *Archived BioMetric and Threatened Species Profiles Datasets*. Website: <http://www.environment.nsw.gov.au/projects/biometric-dataset.htm>
Accessed: March 2018.
- Office of the Environment and Heritage (2017b) *Atlas of New South Wales Atlas Wildlife database search for the following area: -33.4584 147.1777,-33.4584 147.6107,-33.8206 147.6107, -33.8206 147.1777*. Website Accessed: September 2017.

- Office of Environment and Heritage (2017c) *BioNet Threatened Species Profile Database*. Website: http://www.environment.nsw.gov.au/AtlasApp/UI_Modules/TSM_/Default.aspx Accessed: January 2017.
- Pease, B.C. and Ginberg, A. (1995) *New South Wales Commercial Fisheries Statistics 1940 to 1992*. New South Wales Fisheries Research Institute.
- Resource Strategies Pty Ltd, Commonwealth Scientific and Industrial Research Organisation Wildlife and Ecology, Goldney, D and Greg Richards and Associates Pty Ltd (1997) *Cowal Gold Project Species Impact Statement*. Appendix A of North Limited (1998) *Cowal Gold Project Environmental Impact Statement*.
- Resource Strategies (2013) *Cowal Gold Mine Extension Modification – Threatened Species Assessment*. Report prepared for Barrick Australia Limited.
- Scribner, E.A. and Kathuria, A. (1996) *New South Wales Commercial Fisheries Statistics 1992/93*. New South Wales Fisheries Research Institute.
- Sivertsen, D. and Metcalf, L. (1995) Natural vegetation of the southern wheat-belt (Forbes and Cargelligo 1: 250 000 map sheets). *Cunninghamia* 4(1): 103-128.
- Threatened Species Scientific Committee (2009) *Commonwealth Listing Advice on Weeping Myall Woodlands*. Department of the Environment, Water, Heritage and the Arts. Available from: <http://www.environment.gov.au/biodiversity/threatened/communities/pubs/98-listing-advice.pdf>.
- Threatened Species Scientific Committee (2010) *Commonwealth Listing Advice on Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia*. Department of the Environment, Water, Heritage and the Arts. Available from: <http://www.environment.gov.au/biodiversity/threatened/communities/pubs/86-listing-advice.pdf>.
- Threatened Species Scientific Committee (2016) *Conservation Advice Polytelis swainsonii superb parrot*. Available from: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/738-conservation-advice-05052016.pdf>.
- Vestjens, W.J.M. (1977) *Status, habitats and food of vertebrates at Lake Cowal, NSW*. Division of Wildlife Research Technical Memorandum No. 12 Commonwealth Scientific and Industrial Research Organisation, Canberra.
- Western Research Institute (2008) *Appendix E Cowal Gold Mine E42 Modification Fauna Assessment*. Appendix E in Barrick Australia Limited (2008a) *Cowal Gold Mine E42 Modification Environmental Assessment*.
- Young, C.J. (1979) *Examination of the Aquatic Fauna of Lake Cowal, NSW*. Unpublished Report. Inland Fisheries Research Station, Narrandera, New South Wales.