Appendix 10

Biodiversity Development Assessment Report
prepared by
EcoLogical Australia Pty Ltd

(Total No. of pages including blank pages = 92)

This page has intentionally been left blank

Dowe's Quarry
Biodiversity Development Assessment Report

Prepared for R.W. Corkery & Co Pty Ltd on behalf of Darryl McCarthy Constructions Pty Ltd

ecological AUSTRALIA
A TETRA TECH COMPANY

1300 646 131
www.ecoaus.com.au

DOCUMENT TRACKING

Project Name	Dowe's Quarry Biodiversity Assessment
Project Number	19BRI12960
Project Manager	Steven Jarman
Prepared by	Kirsten Velthuis
Reviewed by	Steve Jarman, Robert Cawley
Approved by	Robert Cawley
Status	**Final**
Version Number	**V1**
Last saved on	**26 September 2019**

This report should be cited as 'Eco Logical Australia. 2019 Dowe's Quarry BDAR. Prepared for R.W. Corkery & Co Pty Ltd on behalf of Darryl McCarthy Constructions Pty Ltd.'

Template 2.8.1

Executive Summary

Eco Logical Australia (ELA) were engaged by R.W. Corkery & Co Pty Ltd on behalf of Darryl McCarthy Constructions Pty Ltd to prepare a Biodiversity Development Assessment Report (BDAR) for the proposed expansion of the existing Dowe's Quarry, located at 811 Mount Lindesay Highway, Tenterfield.

The proposal is designated local development under Part 4 of the *Environmental Planning and Assessment Act* 1979 (EP&A Act) and an Environmental Impact Statement (EIS) is required to be submitted as part of the Development Application to Tenterfield Shire Council. This BDAR addresses the Secretary's Environmental Assessment Requirements (SEARs) Application Number EAR 1341 issued for the development. As part of the SEARs, Tenterfield Shire Council identified that the proposed development triggers the Biodiversity Offset Scheme (BOS) under the *Biodiversity Conservation Act 2016* (BC Act) and that a BDAR is required. This report has been prepared to meet the requirements of the Biodiversity Assessment Method (BAM) established under Section 6.7 of the BC Act. This report has also been prepared to meet requirements for biodiversity and impact assessment pursuant to Sections 7.2 and 7.7 of the BC Act.

The development site was surveyed by accredited BAM assessors Steve Jarman and Liz Brown from 22 to 26 April 2019. The development site was found to contain one Plant Community Type (PCT), *Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion*. This consisted of 4.63 ha in good condition and 1.78 ha in poor condition as it consisted largely of grassland with a high percentage of non-native grasses.

No threatened ecological communities or threatened species were recorded within the development site. However, five species credit species were assumed to be present within the site, as the survey was undertaken outside the required survey period for these species, and as suitable habitat was identified within the site. This includes Barking Owl (*Ninox connivens*); Powerful Owl (*Ninox strenua*), Masked Owl (*Tyto noaehollandiae*); Eastern Pygmy-possum (*Cercatetus nanus*); and Eastern Cave-bat (*Vespadelus troughtoni*).

This BDAR outlines the measures taken to avoid, minimise and mitigate impacts on the vegetation and species habitat present within the development footprint and measures to minimise impacts during construction and operation of the development. The Biodiversity Assessment Method Credit Calculator (BAMC) was then used to calculate the credits required to offset all residual impacts of the development.

A total of 134 ecosystem credits and 747 species credits are required to offset the residual impacts of the proposed project.

The results of this BDAR are considered preliminary. For the purposes of this initial assessment, it has been assumed that five species credit species are present. However, this conclusion is pending additional targeted ecological survey that will occur in late 2019. The BDAR will be updated once the results of the survey are confirmed.

Table 1 Ecosystem credit requirement of the project

PCT ID	PCT Name	Condition	BC Act	EPBC Act	Vegetation Integrity Score	Direct impact (ha)	Credits required
568	*Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion*	Good	Not listed	Not listed	66.4	4.63	134
568	*Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion*	Poor	Not listed	Not listed	3 (below offset threshold)	1.78	0
Total ecosystem credits to be offset							**134**

Table 2 Species credit requirement of the project

Species	Common Name	Direct impact habitat (ha)	Relevant Veg Zone	Credits required
Cercatetus nanus	Eastern Pygmy Possum	4.63	Zone 2 (good)	154
Ninox connivens	Barking Owl (breeding)	1.09	Zone 1 (poor)	2
		3.60	Zone 2 (good)	119
Ninox strenua	Powerful Owl (breeding)	1.09	Zone 1 (poor)	2
		3.60	Zone 2 (good)	119
Tyto novaehollandiae	Masked Owl (breeding)	1.09	Zone 1 (poor)	2
		3.60	Zone 2 (good)	119
Vespadelus troughtoni	Eastern Cave Bat	4.63	Zone 2 (good)	230
Total species credits to be offset				**747**

Serious and Irreversible Impacts (SAII) values have been considered in this assessment. The Eastern Cave-bat is a candidate entity for SAII for impacts to breeding habitat, however no breeding habitat for this species was identified within the development site (potential breeding habitat includes PCTs associated with the species within 100m of rocky areas, caves, overhangs crevices, cliffs and escarpments, or old mines or tunnels, old buildings and sheds within the potential habitat).

A significance assessment under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) for Matters of National Environmental Significance (MNES) considered to have the potential to occur within the site, found that the proposal is unlikely to have a significant impact on EPBC Act listed threatened and migratory species.

Contents

List of Figures

List of Tables

Abbreviations

Abbreviation	Description
BAM	Biodiversity Assessment Method
BAMC	Biodiversity Assessment Method Credit Calculator
BC Act	NSW Biodiversity Conservation Act 2016
BDAR	Biodiversity Development Assessment Report
BSSAR	Biodiversity Stewardship Site Assessment Report
CEEC	Critically Endangered Ecological Community
DoEE	Commonwealth Department of Environment and Energy
DPE	NSW Department of Planning and Environment
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
ELA	Eco Logical Australia Pty Ltd
EP&A Act	NSW Environmental Planning and Assessment Act 1979
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
IBRA	Interim Biogeographic Regionalisation for Australia
LGA	Local Government Area
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
PCT	Plant Community Type
SAII	Serious and Irreversible Impacts
SEPP	State Environmental Planning Policy
SEARs	Secretary's Environmental Approval Requirements
TEC	Threatened Ecological Community

Definitions

Terminology	Definition
Biodiversity credit report	The report produced by the Credit Calculator that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site.
BioNet Atlas	The BioNet Atlas (formerly known as the NSW Wildlife Atlas) is the database of flora and fauna records. The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails) and some fish.
Broad condition state	Areas of the same PCT that are in relatively homogenous condition. Broad condition is used for stratifying areas of the same PCT into a vegetation zone for the purpose of determining the vegetation integrity score.
Connectivity	The measure of the degree to which an area(s) of native vegetation is linked with other areas of vegetation.
Credit Calculator	The computer program that provides decision support to assessors and proponents by applying the BAM, and which calculates the number and class of biodiversity credits required to offset the impacts of a development or created at a biodiversity stewardship site.
Development	Has the same meaning as development at section 4 of the EP&A Act, or an activity in Part 5 of the EP&A Act. It also includes development as defined in section 115T of the EP&A Act.
Development footprint	The area of land that is directly impacted on by a proposed development, including access roads, and areas used to store construction materials.
Development site	An area of land that is subject to a proposed development that is under the EP&A Act.
Ecosystem credits	A measurement of the value of EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur with a PCT. Ecosystem credits measure the loss in biodiversity values at a development site and the gain in biodiversity values at a biodiversity stewardship site.
High threat exotic plant cover	Plant cover composed of vascular plants not native to Australia that if not controlled will invade and outcompete native plant species.
Hollow bearing tree	A living or dead tree that has at least one hollow. A tree is considered to contain a hollow if: (a) the entrance can be seen; (b) the minimum entrance width is at least 5 cm; (c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance); (d) the hollow is at least 1 m above the ground. Trees must be examined from all angles.
Important wetland	A wetland that is listed in the Directory of Important Wetlands of Australia (DIWA) and SEPP 14 Coastal Wetlands.
Linear shaped development	Development that is generally narrow in width and extends across the landscape for a distance greater than 3.5 kilometres in length.
Local population	The population that occurs in the study area. In cases where multiple populations occur in the study area or a population occupies part of the study area, impacts on each subpopulation must be assessed separately.
Local wetland	Any wetland that is not identified as an important wetland (refer to definition of Important wetland).
Mitchell landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000.

Terminology	Definition
Multiple fragmentation impact development	Developments such as wind farms and coal seam gas extraction that require multiple extraction points (wells) or turbines and a network of associated development including roads, tracks, gathering systems/flow lines, transmission lines.
Operational Manual	The Operational Manual published from time to time by OEH, which is a guide to assist assessors when using the BAM
Patch size	An area of intact native vegetation that: a) occurs on the development site or biodiversity stewardship site, and b) includes native vegetation that has a gap of less than 100 m from the next area of native vegetation (or ≤30 m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the development site or stewardship site.
Proponent	A person who intends to apply for consent to carry out development or for approval for an activity.
Reference sites	The relatively unmodified sites that are assessed to obtain local benchmark information when benchmarks in the Vegetation Benchmarks Database are too broad or otherwise incorrect for the PCT and/or local situation. Benchmarks can also be obtained from published sources.
Regeneration	The proportion of over-storey species characteristic of the PCT that are naturally regenerating and have a diameter at breast height <5 cm within a vegetation zone.
Remaining impact	An impact on biodiversity values after all reasonable measures have been taken to avoid and minimise the impacts of development. Under the BAM, an offset requirement is calculated for the remaining impacts on biodiversity values.
Retirement of credits	The purchase and retirement of biodiversity credits from an already-established biobank site or a biodiversity stewardship site secured by a biodiversity stewardship agreement.
Riparian buffer	Riparian buffers applied to water bodies in accordance with the BAM.
Sensitive biodiversity values land map	Development within an area identified on the map requires assessment using the BAM.
Site attributes	The matters assessed to determine vegetation integrity. They include: native plant species richness, native over-storey cover, native mid-storey cover, native ground cover (grasses), native ground cover (shrubs), native ground cover (other), exotic plant cover (as a percentage of total ground and mid-storey cover), number of trees with hollows, proportion of over-storey species occurring as regeneration, and total length of fallen logs.
Site-based development	a development other than a linear shaped development, or a multiple fragmentation impact development
Species credits	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection.
Subject land	Is land to which the BAM is applied in Stage 1 to assess the biodiversity values of the land. It includes land that may be a development site, clearing site, proposed for biodiversity certification or land that is proposed for a biodiversity stewardship agreement.
Threatened Biodiversity Data Collection	Part of the BioNet database, published by OEH and accessible from the BioNet website.
Threatened species	Critically Endangered, Endangered or Vulnerable threatened species as defined by Schedule 1 of the BC Act, or any additional threatened species listed under Part 13 of the EPBC Act as Critically Endangered, Endangered or Vulnerable.

Terminology	Definition
Vegetation Benchmarks Database	A database of benchmarks for vegetation classes and some PCTs. The Vegetation Benchmarks Database is published by OEH and is part of the BioNet Vegetation Classification.
Vegetation zone	A relatively homogenous area of native vegetation on a development site, land to be biodiversity certified or a biodiversity stewardship site that is the same PCT and broad condition state.
Wetland	An area of land that is wet by surface water or ground water, or both, for long enough periods that the plants and animals in it are adapted to, and depend on, moist conditions for at least part of their life cycle. Wetlands may exhibit wet and dry phases and may be wet permanently, cyclically or intermittently with fresh, brackish or saline water.
Woody native vegetation	Native vegetation that contains an over-storey and/or mid-storey that predominantly consists of trees and/or shrubs.

1. Stage 1: Biodiversity assessment

1.1 Introduction

Darryl McCarthy Constructions Pty Ltd (DMC) is the manager and operator of Dowe's Quarry near Tenterfield, NSW. DMC is seeking approval under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) for the expansion of the existing Dowe's Quarry, to extract and process up to 230,000 tonnes of quartzose material per year, until 2045.

The proposal is designated local development under Part 4 of the EP&A Act and an EIS is required to be submitted as part of the Development Application to Tenterfield Shire Council. SEARs were issued for the project on 28 May 2019 by the Secretary of the NSW Department of Planning and Environment (DPE) for Application Number EAR 1341.

The SEARs require the following biodiversity items to be included in the EIS:

- *accurate predictions of any vegetation clearing on site, including the location and amount of clearing and types of communities and species affected.*
- *a detailed assessment of the potential biodiversity impacts of the development, paying particular attention to threatened species, populations and ecological communities and groundwater dependent ecosystems undertaken in accordance with Sections 7.2 and 7.7 of the BC Act, and having regard to advice from the Office of Environment and Heritage (OEH).*
- *a detailed description of the proposed measures to maintain or improve the biodiversity values of the site in the medium to long term, as relevant.*

As part of the SEARs, OEH advised that:

- *The EIS must assess the impacts of the proposed development on biodiversity values to determine if the proposed development is "likely to significantly affect threatened species" for the purposes of Section 7.2 of the BC Act.*
- *More specifically, as part of the SEARs, Tenterfield Shire Council identified that the proposed development triggers the BOS under the BC Act that a BDAR under the BC Act is required.*

This BDAR addresses the above requirements from OEH, Tenterfield Shire Council, and the SEARs. The BDAR structure follows the report sections and minimum information requirements for a BDAR provided in the BAM. The BDAR has been undertaken by Liz Brown, Steve Jarman and Kirsten Velthuis; who are all Accredited Persons under the BC Act.

1.1.1 General description of the development site

The proposed development is situated within the Tenterfield Shire Council area and is located 8 km north east of Tenterfield at 811 Mount Lindesay Highway, Tenterfield. The Quarry Site is located on rural land within:

- Lots 3 and 4 DP 42044;
- Lots 308 and 309 DP 751540; and
- Lots 239 and 260 DP 751540.

Under the Proposal the Quarry Site would extend into Lots 1, 2 and 3 DP1092215. The following lots will also be added to enable access to the site:

- 4 DP1092215
- 245 DP751540
- 246 DP751549

The boundary of the Quarry Site has been determined principally to define an area in which all activities are proposed, recognising that not all land within the Quarry Site would be disturbed. The Quarry Site would comprise approximately 26.8ha of land owned by Mr Rod Dowe and leased by the Applicant. The northern boundary of the Quarry Site coincides with a Crown Road that traverses Lot 308 DP 751540.

The site currently contains:

- An extraction area, including constructed dams and associated collection drains.
- An internal access and haulage road.

Due to the large area of land associated with the lots listed above, the development site relevant to this BDAR has been rationalised to include the overall potential area of direct disturbance by the project. This includes development areas that may be either temporary (for construction) or permanent (for operational infrastructure). The proposed development site assessed includes the location of operational infrastructure and construction work sites proposed for:

- Access and haulage routes.
- Construction laydown areas.

This report includes two base maps, the Site Map (Figure 1) and the Location Map (Figure 2). Each of these show the development site boundary relevant to this BDAR.

Figure 1 shows that some of the proposed development footprint includes “previously approved disturbance” areas. This includes areas proposed to be developed under Development Consent 2014.078 (DA 2014.078, granted in March 2015) as well as the modification to DA 2014.078, which was approved in January 2016. These areas have been excluded from assessment within this BDAR due to the existing approval.

The areas within the proposed development footprint that are “proposed disturbance” (see Figure 1) are the areas which are not part of the aforementioned approvals and therefore are assessed within this BDAR.

The development proposes the following elements:

- An area for overburden and fines emplacement
- A realigned access road
- An overburden and fines stockpile area
- A processing area
- A bund around the processing area.

Each of these project elements is shown within Chapter 2 (Figure 2.1) of the EIS.

1.1.2 Data Sources used

The following data sources were reviewed as part of this report:

- BioNet Vegetation Classification
- BioNet Atlas 5 km database search
- Threatened Biodiversity Data Collection
- Directory of Important Wetlands Australia
- EPBC Act Protected Matters Search Tool (5 km radius linear search)
- National Flying-fox Monitoring Viewer
- Dowe's Quarry Ecological Assessment (Eco Logical Australia, 2014)
- *Ecological Assessment Additional Information – Dowe's Quarry (DA2014/078)* (Eco Logical Australia 2014).

A full refence list is included in Section 3.

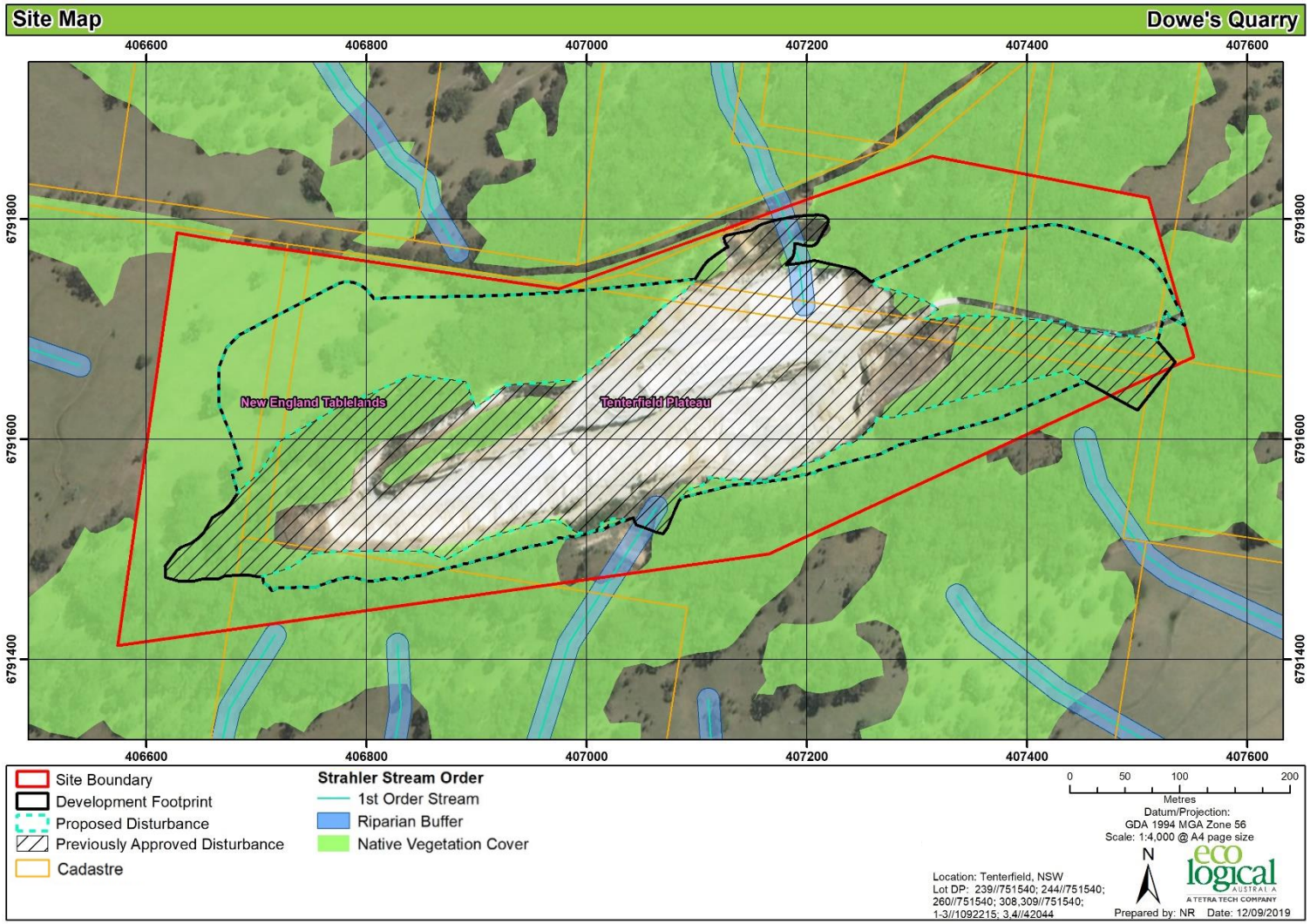

Figure 1: Site Map

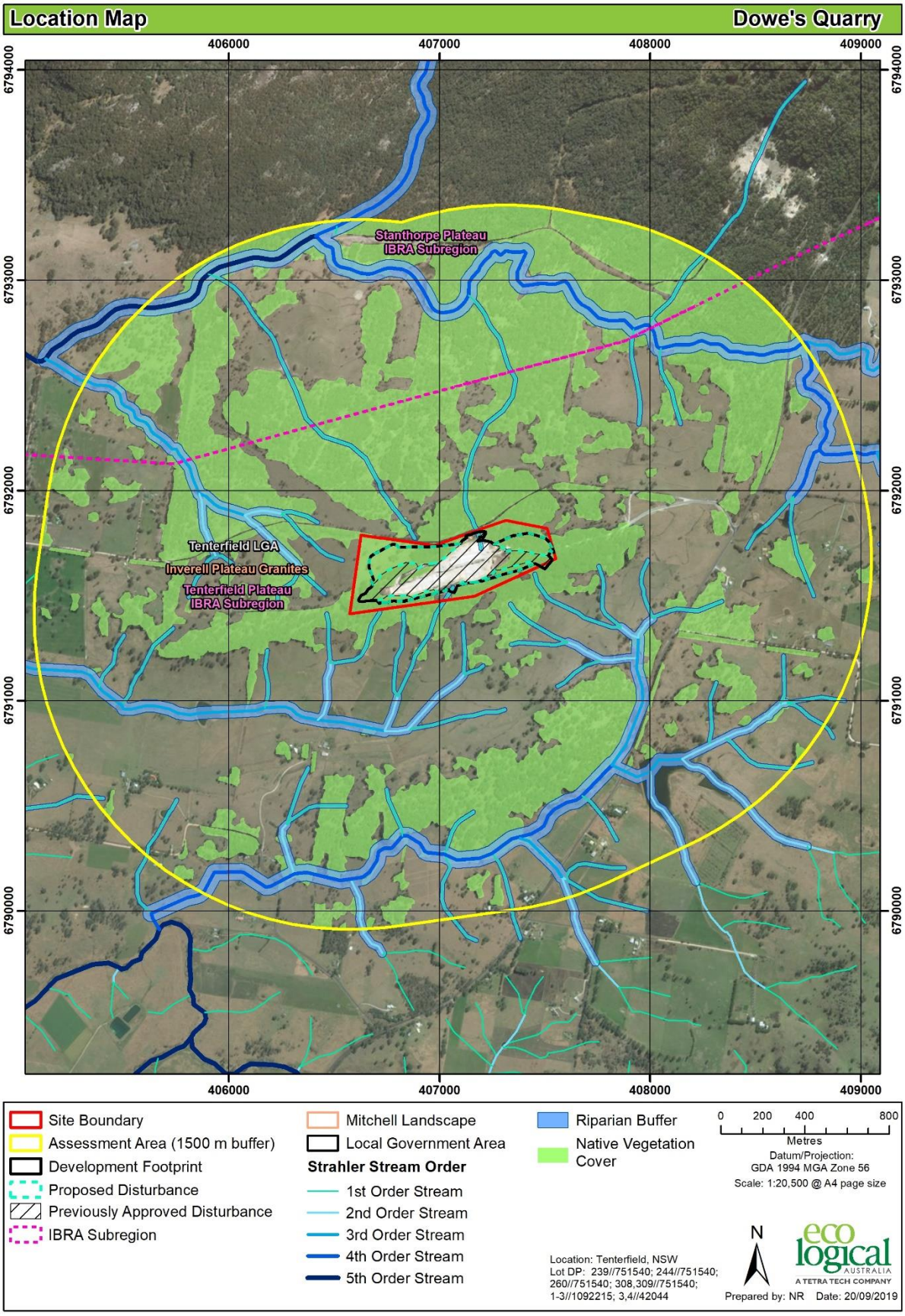

Figure 2: Location Map

1.2 Legislative context

Table 3: Legislative context

Name	Relevance to the project	Report Section
Commonwealth		
Environment Protection and Biodiversity Conservation Act 1999	This report assesses impacts to MNES and concludes that the development is unlikely to have significant impacts on threatened species.	2.5
NSW		
Environmental Planning and Assessment Act 1979	The proposed development requires consent under Part 4 of the EP&A Act.	N/A
Biodiversity Conservation Act 2016	The proposed development exceeds the BAM threshold and requires submission of a Biodiversity Development Assessment Report.	BDAR
Planning Instruments		
SEPP 44 – Koala Habitat Protection	SEPP 44 applies to the local government area in which the development is proposed. An assessment of Koala habitat has been made in accordance with the SEPP.	2.5
Tenterfield Shire Council Local Environment Plan	The subject site is zoned RU1 under the Tenterfield LEP and requires development consent.	N/A

1.3 Landscape features

1.3.1 IBRA regions and subregions

The development site falls within the IBRA region and subregions as outlined in Table 4 and Table 5. IBRA subregions are shown on Figure 2.

Table 4: IBRA regions

IBRA region	Area within development site (ha)
New England Tablelands	6.53

Table 5: IBRA subregions

IBRA subregion	Area within development site (ha)
Tenterfield Plateau	6.53

1.3.2 Native vegetation extent

The extent of native vegetation within the development site and buffer is outlined in Table 6.

Table 6: Native vegetation extent

Area within the development site (ha)	Area within the 1,500 m buffer area (ha)
6.41	473

There are differences between the mapped vegetation extent and the aerial imagery. As mentioned above, part of the site contains an area which has previously been approved for disturbance; and some of the vegetation shown in the aerial has since been cleared or disturbed, as part of the previous approval for disturbance.

1.3.3 Rivers and streams

There are two unnamed 1st order streams (with a 10m riparian buffer) within the development site boundary but there are no rivers or streams within the development footprint. The two unnamed streams are ephemeral drainage lines and are not well formed (barely visible).

1.3.4 Wetlands

There are no mapped important wetlands within the development site. There are two dams within the development site boundary, but none within the development footprint.

1.3.5 Connectivity features

Vegetation at and immediately adjacent to the development site is connected to a large area of contiguous vegetation to the north (approximately 1.5 km away) which includes Bald Rock National Park (approximately 3km to the north of the site), and further afield, Girraween, Boonoo and Basket Swamp National Parks. However, there is limited vegetation further southwards; eastwards and westward of the development site which limits ongoing connectivity.

1.3.6 Areas of geological significance and soil hazard features

The development site does not contain areas of geological significance and soil hazard features.

1.4 Native vegetation

1.4.1 Survey effort

Vegetation survey was undertaken within the development site by Liz Brown and Steve Jarman between 22 to 26 April 2019 to identify PCTs, collect vegetation integrity data and note potential threatened species habitat. A total of 4 vegetation integrity plots were undertaken on the in accordance with the BAM (Table 7) to assess the composition, condition and integrity of PCTs.

Note that one vegetation integrity plot was undertaken just outside the northern boundary of the site, however vegetation within the plot was considered to be representative of the nearest vegetation just inside the boundary of the site.

All field data collected at full-floristic and vegetation integrity plots is included in Appendix A.

1.4.2 Plant Community Types present

A total of one PCT was identified on the development site (Table 7, Figure 3). This was stratified into two vegetation zones as per Table 7 and Figure 4

Justification for the selection of this PCT occurring on the development site is based on a quantitative analysis of full-floristic plot data. Key reasons for selection of PCT 568 include the following:

- A significant area of PCT 524 is mapped as part of existing VIS mapping in the wider area and on the site. However, the plot data shows the vegetation is not 'shrubby', therefore PCT 568 is considered more suitable. PCT 568 is also mapped in the area.
- Onsite observations confirmed the vegetation class was New England Dry Sclerophyll Forests, and this aligned with Keith's vegetation class mapping downloaded from <<https://data.nsw.gov.au>>
- PCT 568 occurs on granitic slopes and ridges, consistent with site observations.
- *Eucalyptus caliginosa* was present in the upper stratum, forming approximately 15 to 25% cover within each plot.
- The following species within PCT 568's VIS scientific description were also observed within the plots: *Angophera subvelutina, Lissanthe strigosa, Oleara visidula, Lomandra longifolia, Dianell revoluta,* and *Microlaena stipoides*.

Table 7: Plant Community Types

PCT ID	PCT Name	Vegetation Class / Formation	Area	Vegetation Zone	Plots surveyed	Percent cleared
568	*Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion*	New England Dry Sclerophyll Forests / Dry Sclerophyll Forest (Shrub/grass sub-formation)	1.78	Poor	1	0.59
568	*Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion*	New England Dry Sclerophyll Forests / Dry Sclerophyll Forest (Shrub/grass sub-formation)	4.63	Good	3	0.59

1.4.3 Vegetation integrity assessment

A vegetation integrity assessment using the Credit Calculator (BAMC) was undertaken and the results are outlined in Table 8. The two vegetation zones are shown in Figure 4.

Vegetation Zone 1 was in a poor condition due to prior vegetation clearing. It was dominated by the exotic high threat weed *Eragrostis curvula* (African Love Grass).

Vegetation Zone 2 was open in forest in good condition. It generally consisted of a mature canopy of *Eucalyptus caliginosa*, *Eucalyptus biturbinata* and *Eucalyptus moluccana,* and had a grassy understory. The average canopy height was 25m.

Photos of both vegetation zones are provided in Appendix A.

Table 8: Vegetation integrity

Veg Zone	PCT ID	Condition	Area (ha)	Composition Condition Score	Structure Condition Score	Function Condition Score	Current vegetation integrity score
1	568	Poor	1.78	27.1	0	30.1	3
2	568	Good	4.63	60.5	49.6	97.3	66.4

1.4.4 Threatened Ecological Community

The development site does not contain any listed TECs under the BC Act and EPBC Act.

1.4.5 Groundwater Dependent Ecosystems

Site survey confirmed that the development site does not contain groundwater dependent ecosystems.

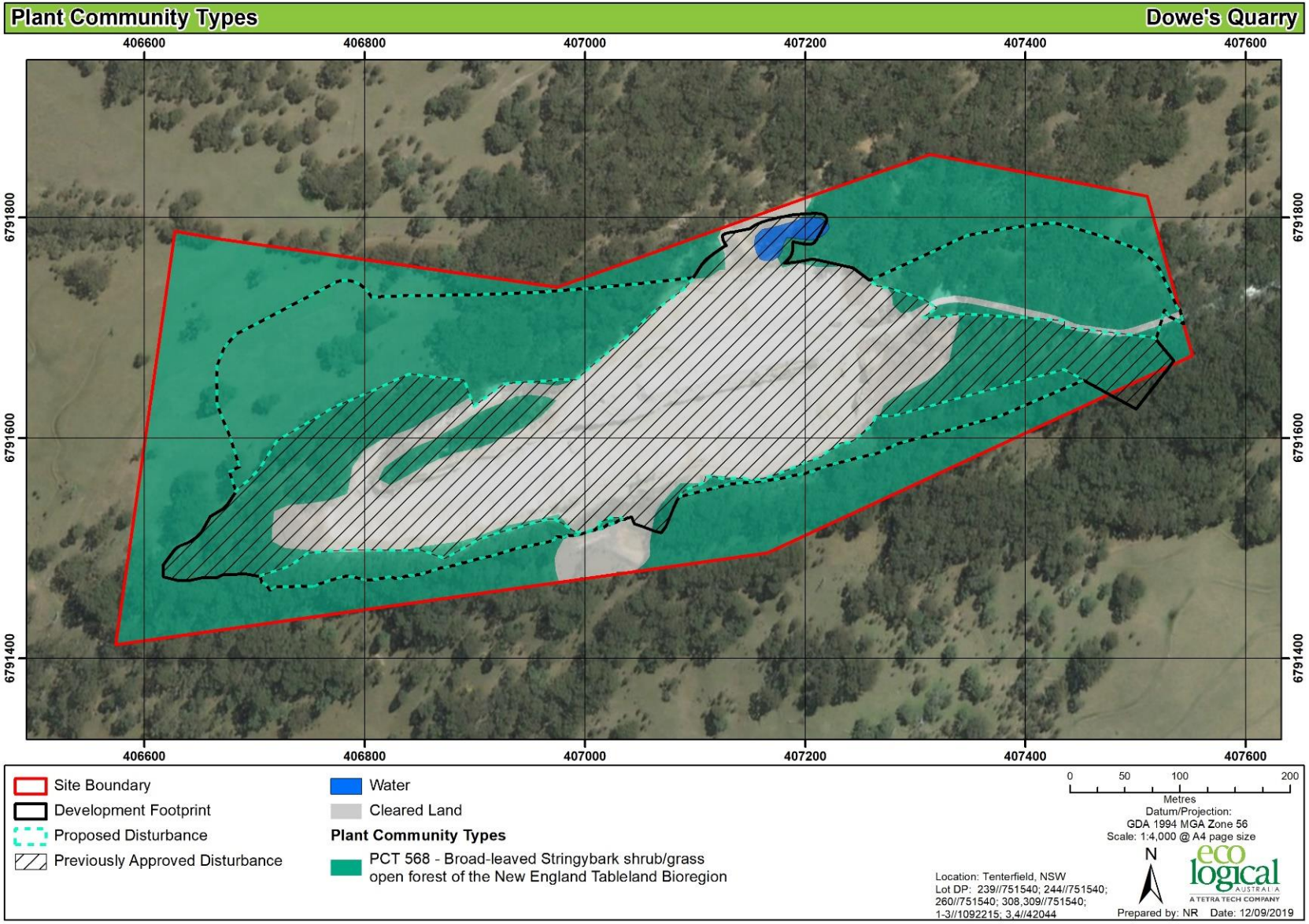

Figure 3: Plant Community Types

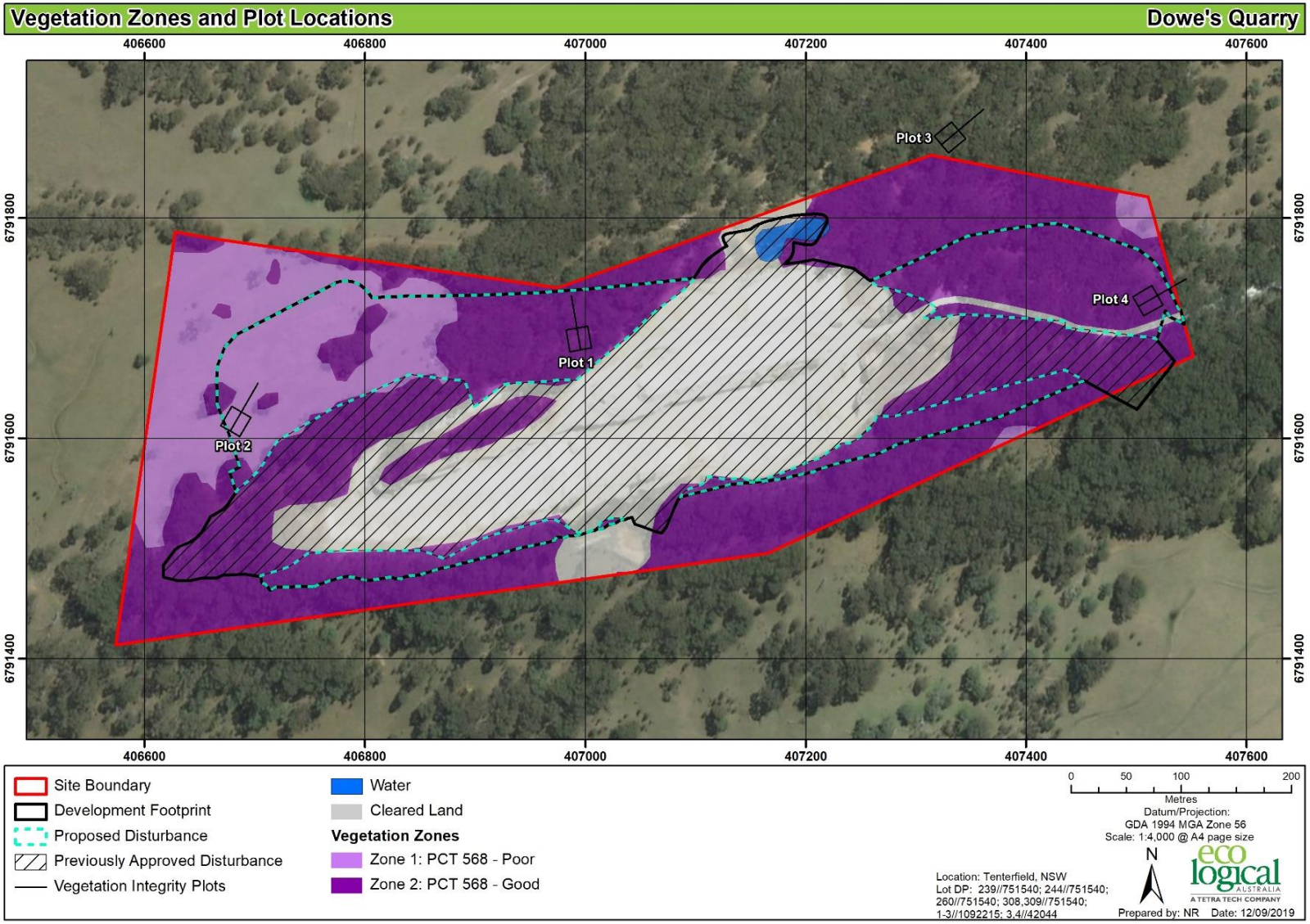

Figure 4: Vegetation zones and plot locations

1.5 Threatened species

1.5.1 Ecosystem credit species

Ecosystem credit species predicted to occur at the development site, their associated habitat constraints, geographic limitations and sensitivity to gain class is included in Table 9.

Table 9: Predicted ecosystem credit species

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Included or excluded in assessment
Calypthorychus lathami	Glossy Black Cockatoo (Foraging)	Presence of Allocasuarina and Casuarina species	Nil	High	Vulnerable	Not Listed	Included
Chalinolobus nigrogriseus	Hoary Wattled Bat	Nil	Nil	Moderate	Vulnerable	Not Listed	Included
Chthonicola sagittate	Speckled Warbler	Nil	Nil	High	Vulnerable	Not Listed	Included
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies	Nil	Nil	High	Vulnerable	Not Listed	Included
Daphoenositta chrysoptera	Varied Sitella	Nil	Nil	Moderate	Vulnerable	Not Listed	Included
Dasyurus maculatus	Spotted-tailed Quoll	Nil	Nil	High	Vulnerable	Endangered	Included
Falsistrellus tasmaniensis	Eastern False Pipistrelle	Nil	Nil	Moderate	Vulnerable	Not Listed	Included
Grantiella picta	Painted Honeyeater	Mistletoes present at >5/ha	Nil	Moderate	Vulnerable	Vulnerable	Included
Haliaeetus leucogaster	White-bellied Sea Eagle	Nil	Nil	High	Vulnerable	Not Listed	Included
Hieraaetus morphnoides	Little Eagle (Foraging)	Nil	Nil	Moderate	Vulnerable	Not Listed	Included
Lathamus discolour	Swift Parrot (Foraging)	Nil	Nil	Moderate	Endangered	Critically Endangered	Included
Lophoictinia isura	Square-tailed Kite (Foraging)	Nil	Nil	Moderate	Vulnerable	Not Listed	Included

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Included or excluded in assessment
Melanodryas cucullata cucullata	Hooded Robin (South-eastern form)	Nil	Nil	Moderate	Vulnerable	Not Listed	Included
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat (Foraging)	Nil	Nil	High	Vulnerable	Not Listed	Included
Ninox connivens	Barking Owl	Nil	Nil	Moderate	Vulnerable	Not Listed	Included
Ninox strenua	Powerful Owl	Nil	Nil	High	Vulnerable	Not Listed	Included
Petaurus australis	Yellow-bellied Glider	Hollow bearing trees with hollows >25m	Nil	Moderate	Vulnerable	Not Listed	Included
Petroica boodang	Scarlet Robin	Nil	Nil	Moderate	Vulnerable	Not Listed	Included
Petroica phoenicea	Flame Robin	Nil	Nil	Moderate	Vulnerable	Not Listed	Included
Phascolarctos cinereus	Koala (Foraging)	Nil	Nil	High	Vulnerable	Vulnerable	Included
Pteropus poliocephalus	Grey-headed Flying-fox (foraging)	Nil	Nil	High	Vulnerable	Vulnerable	Included
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	Nil	Nil	Moderate	Vulnerable	Not Listed	Included
Scoteanax reuppellii	Greater Broad-nosed Bat	Nil	Nil	Moderate	Vulnerable	Not Listed	Included
Stagonopleura guttata	Diamond Firetail	Nil	Nil	Moderate	Vulnerable	Not Listed	Included
Tyto novaehollandiae	Masked Owl (Foraging)	Nil	Nil	High	Vulnerable	Not Listed	Included

1.6 Species credit species

Species credit species predicted to occur at the development site (i.e. candidate species), their associated habitat constraints, geographic limitations and sensitivity to gain class is included in Table 10.

Table 10: Candidate species credit species

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Included or excluded
Acacia macnuttiana	MacNutt's Wattle	Nil	Nil	High	Vulnerable	Vulnerable	Included
Acacia pycnostachya	Bolivia Wattle	Rocky area, granite or acid volcanic outcrops	None	High	Vulnerable	Vulnerable	Included
Arthraxon hispidus	Hairy Jointgrass	Nil	None	High	Vulnerable	Vulnerable	Included
Calyptorhynchus lathami	Glossy Black-Cockatoo (Breeding)	Trees with hollows >15cm diameter and at >5m height above ground	Nil	High	Vulnerable	Not Listed	Included
Cercatetus nanus	Eastern Pygmy-possum	Nil	Nil	High	Endangered	Not Listed	Included
Eucalyptus nicholii	Narrow-leaved Black Peppermint	Nil	None	High	Vulnerable	Vulnerable	Included
Haliaeetus leucogaster	White-bellied Sea Eagle	Nil	None	High	Vulnerable	Not listed	Included
Hieraaetus morphnoides	Little Eagle (Breeding)	Nest trees - live (occasionally dead) large old trees within suitable vegetation and the presence of a male and female; or female with nesting material; or an individual on a large stick nest in the top half of the tree canopy.	Nil	Moderate	Vulnerable	Not Listed	Included

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Included or excluded
Lathamus discolour	Swift Parrot (Breeding)	As per Mapped Areas provided by DoPE	Nil	Moderate	Endangered	Critically Endangered	Excluded No mapped areas present
Litoria subglandulosa	Glandular Frog	Nil	East of New England Highway	Very High	Vulnerable	Not Listed	Included
Lophoictinia sura	Square-tailed Kite (Breeding)	Nil	Nil	Moderate	Vulnerable	Not Listed	Included
Miniopterus orianae oceanensis	Large Bentwing-bat (Breeding)	Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding	Nil	Very High	Vulnerable	Not Listed	Excluded No breeding habitat present
Ninox connivens	Barking Owl (Breeding)	Hollow bearing trees with hollows >20 cm diameter and > 4m above ground.	Nil	Moderate	Vulnerable	Not Listed	Include
Ninox strenua	Powerful Owl (Breeding)	Hollow bearing trees with hollows >20 cm diameter	Nil	High	Vulnerable	Not Listed	Included
Petaurus norfolcensis	Squirrel Glider	Nil	Nil	High	Vulnerable	Not Listed	Included
Petrogale penicillata	Brush-tailed Rock-wallaby	Land within 1 km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or clifflines	Nil	High	Endangered	Vulnerable	Excluded Not within 1km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or clifflines

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	NSW listing status	EPBC Listing status	Included or excluded
Phascogale tapoatafa	Brush-tailed Phascogale	Hollow Bearing Trees	Nil	High	Vulnerable	Not Listed	Included
Phascolarctos cinereus	Koala (Breeding)	Presence of 'Important' habitat. Note that this is not a mapped important habitat area but is defined by the density of koalas and quality of habitat determined by on-site survey.	Nil	High	Vulnerable	Vulnerable	Included
Pteropus poliocephalus	Grey-headed Flying-fox (Breeding)	Breeding camps	Nil	High	Vulnerable	Vulnerable	Included
Thesium australe	Austral Toadflax	Nil	None	Moderate	Vulnerable	Vulnerable	Included
Tyto novaehollandiae	Masked Owl (Breeding)	Hollow bearing trees with hollows >20cm diameter	Nil	High	Vulnerable	Not Listed	Included
Vespadelus troughtoni	Eastern Cave Bat	Caves. Within 2 km of rocky areas containing caves, overhangs, escarpments, outcrops, crevices, boulder piles, or old mines, tunnels, old buildings or sheds.	Nil	Moderate	Vulnerable	Not Listed	Included – however only Vegetation Zone 2 is presumed to be suitable habitat

1.6.1 Targeted surveys

Targeted surveys for species credit species were undertaken at the development site on the dates outlined in Table 11 by accredited BAM assessors Steve Jarman and Liz Brown.

Survey effort undertaken at the development is outlined in Table 12. Some of the cameras used for remote camera survey were located outside but near the project boundary and in similar habitat to habitat within the project boundary, such that the survey results would be considered representative for survey within project area.

The locations of targeted surveys are shown on Figure 5 with the results of the surveys shown as individual species polygons on Figure 6 to Figure 8.

Table 11: Targeted surveys and weather conditions

Date	Rainfall (mm)	Minimum temperature (degrees Celsius)	Maximum temperature (degrees Celsius)	Relative humidity (%)
22 April 2019	0.4	11.6	19.9	81
23 April 2019	0.4	11.8	21.5	77
24 April 2019	0.2	12.2	20.2	76
25 April 2019	0.2	10.9	22.8	90
26 April 2019	0	7.2	24.0	74

Table 12: Survey effort

Species	Common Name	Survey Method / Effort and Timing Required	Survey Method Undertaken	Survey effort	Survey Month Undertaken	Survey Effort method and timing met?	Species recorded?
Flora species							
Acacia macnuttiana	MacNutt's Wattle	Survey period is July to November. Survey via parallel transects.	Random Meander	2 ecologists/ 2 day	April	Yes*	No
Acacia pycnostachya	Bolivia Wattle	Survey period is July to November. Survey via parallel transects.	Random Meander	2 ecologists/ 2 days	April	Yes*	No
Arthraxon hispidus	Hairy Jointgrass	Survey period is November to May. Survey via parallel transects.	Random Meander	2 ecologists/ 2 days	April	Yes*	No
Eucalyptus nicholii	Narrow-leaved Black Peppermint	Survey via parallel transects at any time of year.	Random Meander	2 ecologists/ 2 days	April	Yes*	No
Thesium australe	Austral Toadflax	Survey via parallel transects at any time of year.	Random Meander	2 ecologists/ 2 days	April	Yes*	No
Birds							
Calyptorhynchus lathami	Glossy Black-Cockatoo (Breeding)	Survey period is March to August. Survey for suitable feed trees and then targeted survey for tell-tale signs of crushed fruits.	Habitat Search	2 ecologists/ 2 days	April	Yes	No

Species	Common Name	Survey Method / Effort and Timing Required	Survey Method Undertaken	Survey effort	Survey Month Undertaken	Survey Effort method and timing met?	Species recorded?
Haliaeetus leucogaster	White-bellied Sea Eagle	Survey period is July to December. Search for breeding habitat (e.g. stick nests)	Nest search	2 ecologists/ 2 days	April	Yes	No
Hieraaetus morphnoides	Little Eagle (Breeding)	Survey period is August to October. Search for breeding habitat (e.g. stick nests)	Nest search	2 ecologists/ 2 days	April	Yes	No
Lophoictinia isura	Square-tailed Kite (Breeding)	Survey period is September to January. Search for breeding habitat (e.g. stick nests)	Nest search	2 ecologists/ 2 days	April	**No – outside of survey period. See Table 14 however.**	No
Ninox connivens	Barking Owl (Breeding)	Survey period is May to December. Minimum five nights of call playback.	Call Playback Spotlighting	2 ecologists/ 3 nights 2 ecologists/ 3 nights	April	**No – outside of survey period**	No
Ninox Strenua	Powerful Owl (Breeding)	Survey period is May – August. Minimum eight nights of call playback.	Call Playback Spotlighting	2 ecologists/ 3 nights 2 ecologists/ 3 nights	April	**No – outside of survey period**	No
Tyto novaehollandiae	Masked Owl (Breeding)	Survey period is May – August. Minimum eight nights of call playback.	Call Playback Spotlighting	2 ecologists/ 3 nights 2 ecologists/ 3 nights	April	**No – outside of survey period**	No

Species	Common Name	Survey Method / Effort and Timing Required	Survey Method Undertaken	Survey effort	Survey Month Undertaken	Survey Effort method and timing met?	Species recorded?
Arboreal mammals							
Cercartetus nanus	Eastern Pygmy-possum	Survey period is October to March. Installation of nest boxes or 24 camera trap nights over three consecutive nights.	Remote camera traps Spotlighting	7 cameras/ 4 nights 2 ecologists/3 nights	April	**No – outside of survey period**	No
Petaurus norfolcensis	Squirrel Glider	All year. Camera traps set on rough-barked trees for a minimum of 24 camera trap nights over three consecutive nights. Surveys method also includes observation of marks on potential feed trees.	Remote camera traps Search for scats / signs Spotlighting	7 cameras/ 4 nights 2 ecologists/2 days 2 ecologists/3 nights	April	Yes	No
Phascogale tapoatafa	Brush-tailed Phascogale	All year. Minimum 24 camera trap nights over three consecutive nights.	Remote camera traps Spotlighting	7 cameras/ 4 nights 2 ecologists/ 3 nights	April	Yes	No
Phascolarctos cinereus	Koala (Breeding)	All year. Direct observation, scat and scratch searches in breeding habitat.	Search for scats/ signs Spotlighting	2 ecologists/ 1 day 2 ecologists/3 nights	April	Yes	No
Bats							
Pteropus poliocephalus	Grey-headed Flying-fox (Breeding)	All year. Daytime camp surveys.	Habitat Search (day)	2 ecologists/ 2 days	April	Yes	No

Species	Common Name	Survey Method / Effort and Timing Required	Survey Method Undertaken	Survey effort	Survey Month Undertaken	Survey Effort method and timing met?	Species recorded?
Vespadelus troughtoni	Eastern Cave Bat	Survey period November to January. No survey required if breeding habitat is within 2 km. Otherwise, harp trap (or mist net) placed in areas of potential breeding habitat.	Not surveyed	Not surveyed	April	**No – outside of survey period.**	N/A
Amphibians							
Litoria subglandulosa	Glandular Frog	Survey Period October to November. Systematic daytime searches for tadpoles and adult frogs in areas of suitable habitat. Nocturnal surveys - listening for frog calls, spotlighting, searching within habitat and call recording should be used.	Search for suitable habitat. Listening for call in the dams.	Meander of the development site	April	**No – outside of survey period. See Table 14 however.**	No (however no suitable habitat exists for this species)

* Due to the size of the site, flora survey via random meander was able to cover the entire site, covering the same area as the parallel transects

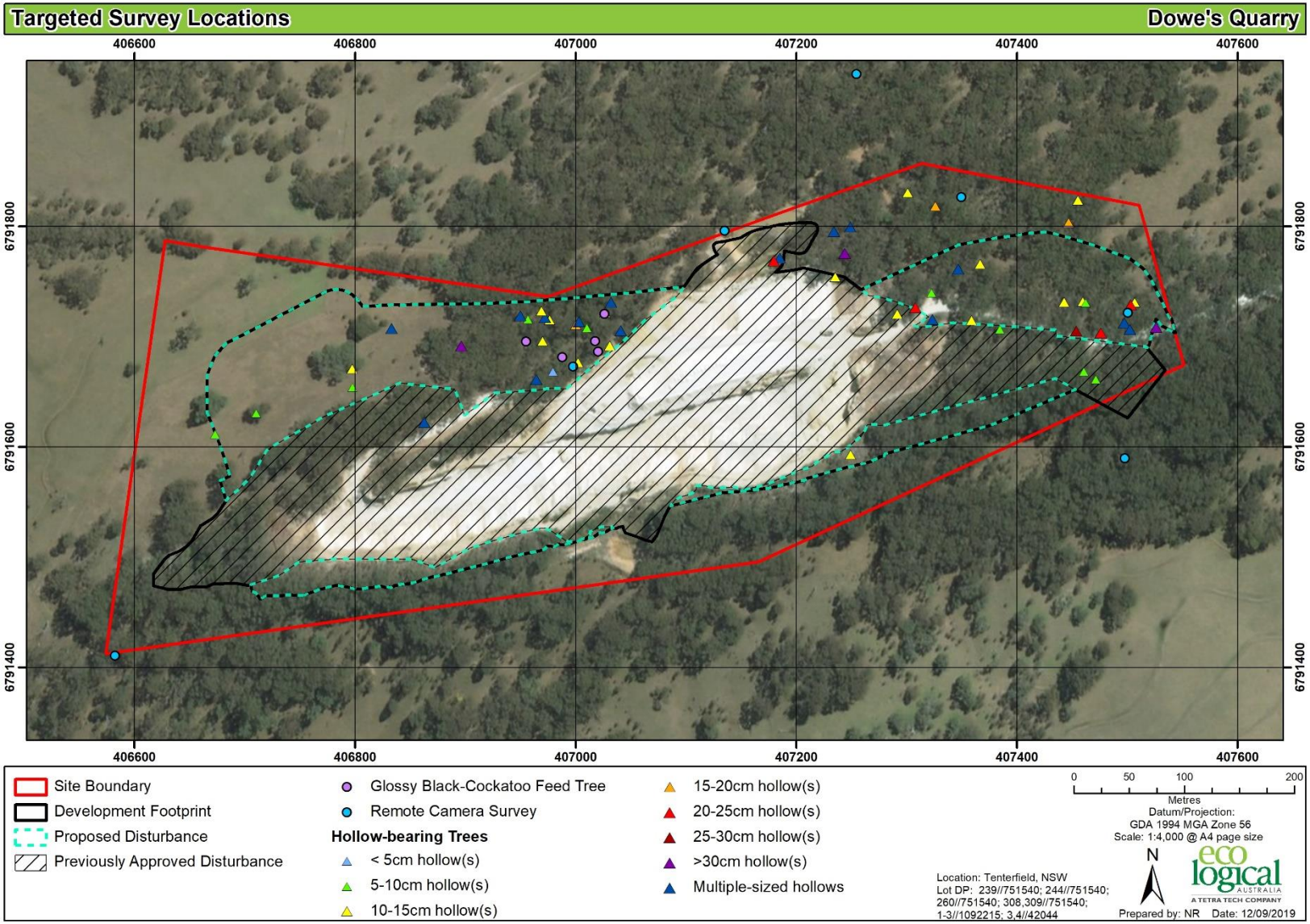

Figure 5: Targeted survey locations

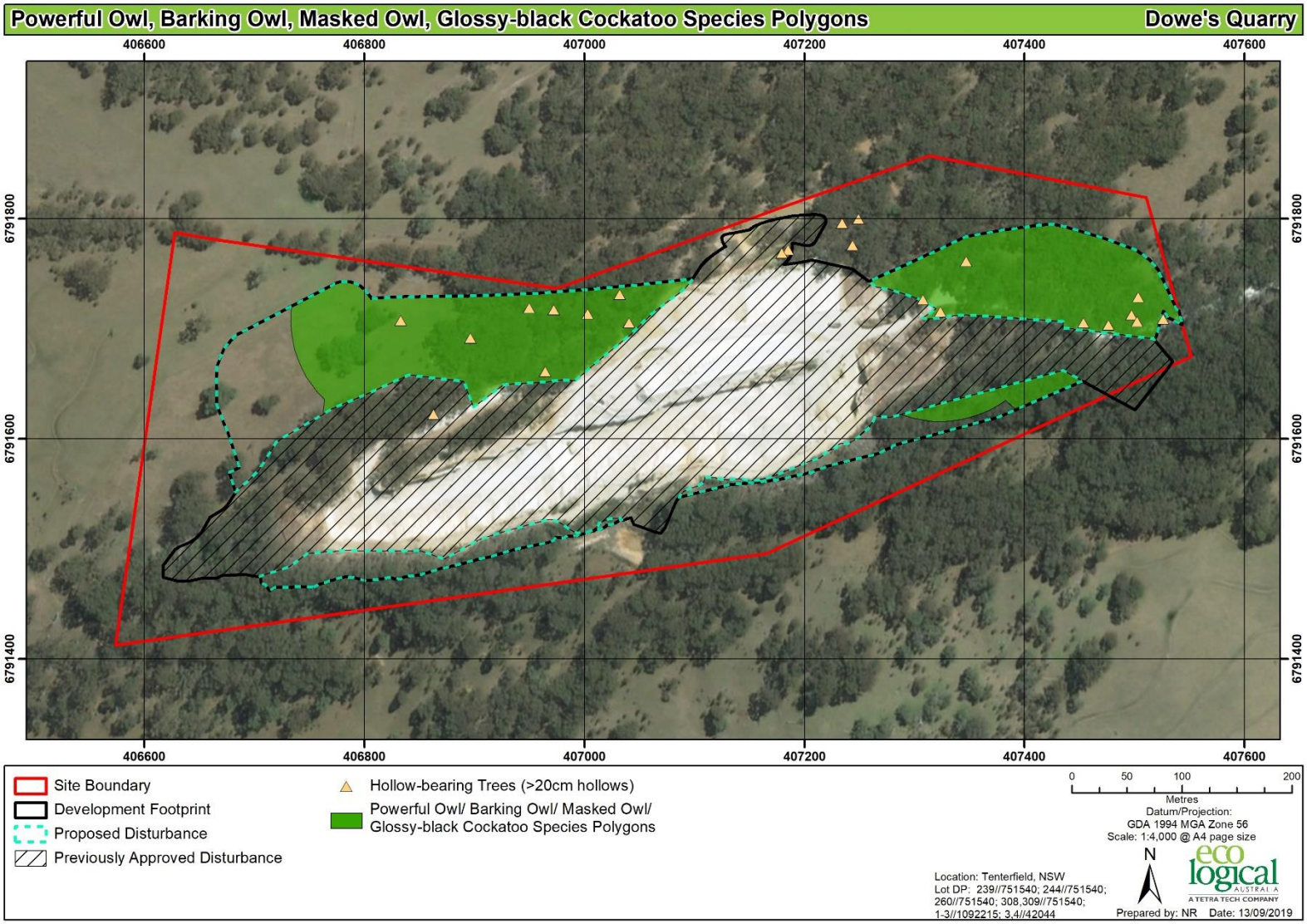

Figure 6: Species polygons – Powerful Owl, Barking Owl, Masked Owl and Glossy-black Cockatoo

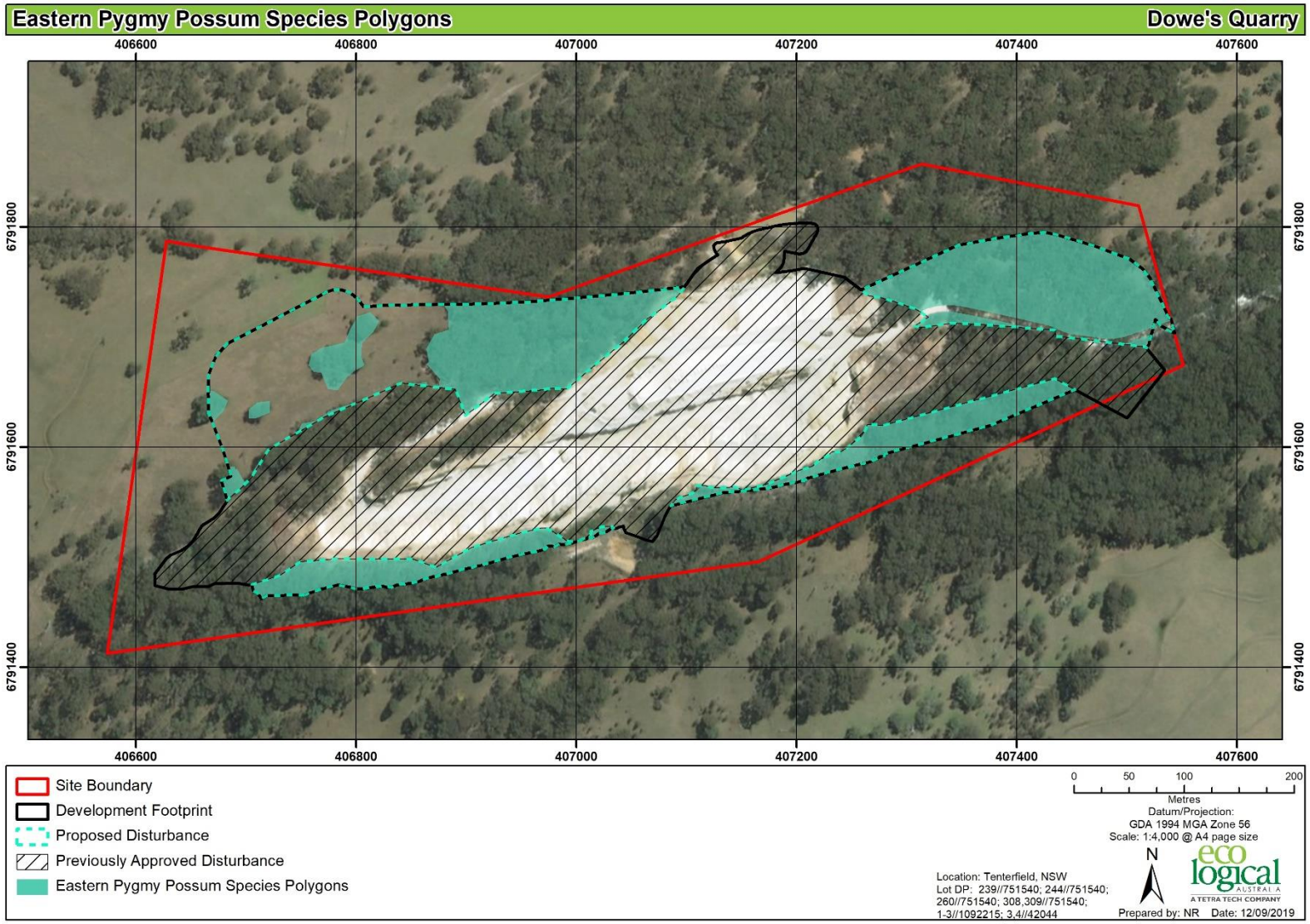

Figure 7: Species polygons – Eastern Pygmy Possum

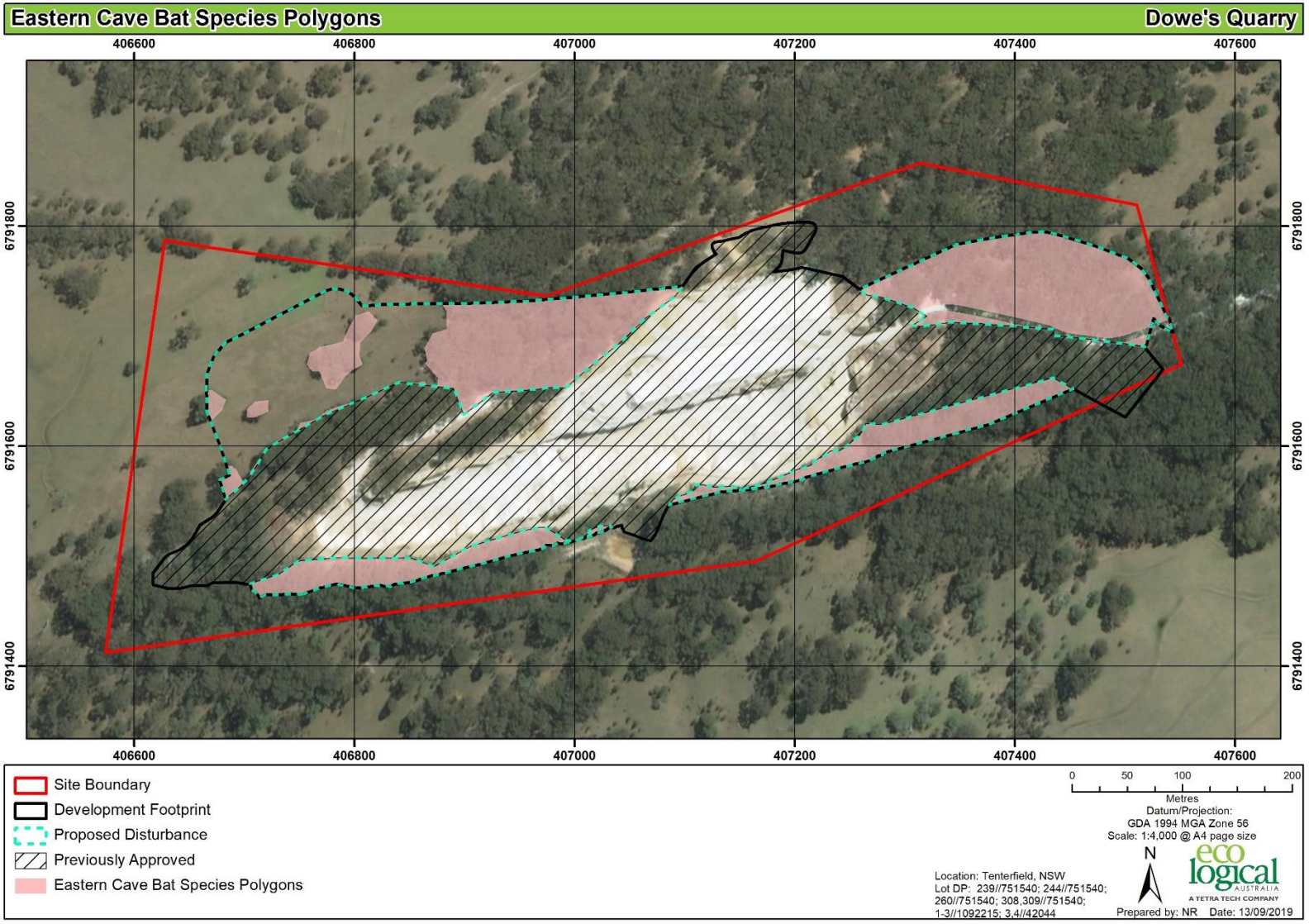

Figure 8: Species Polygon – Eastern Cave Bat

Following completion of targeted surveys, the species credit species included in the assessment are outlined in Table 13 and species credit species excluded are outlined in Table 14.

Table 13: Details of species credit species included in the assessment

Species	Common Name	Survey Method	Habitat Impact Area (ha)	Relevant Veg Zone	Biodiversity Risk Weighting
Cercartetus nanus	Eastern Pygmy Possum	While not recorded during the survey, the survey was outside required survey period. Assumed present.	4.63	Zone 2	2.00
Ninox connivens **(breeding)**	Barking Owl	While not recorded during the survey, the survey was outside required survey period, and breeding habitat (hollows >20cm diameter) is present. Assumed present.	1.09 3.60	Zone 1 Zone 2	2.00
Ninox strenua **(breeding)**	Powerful Owl	While not recorded during the survey, the survey was outside required survey period, and breeding habitat (hollows >20cm diameter) is present. Assumed present.	1.09 3.60	Zone 1 Zone 2	2.00
Tyto novaehollandiae **(breeding)**	Masked Owl	While not recorded during the survey, the survey was outside required survey period, and breeding habitat (hollows >20cm diameter) is present. Assumed present.	1.09 3.60	Zone 1 Zone 2	2.00
Vespadelus troughtoni	Eastern Cave Bat	Not surveyed. Assumed present due to assumption that breeding habitat exists within 2 km of the development site (see Figure 11).	4.63	Zone 2	3.00

Table 14: Justification for exclusion of candidate species credit species

Species	Common Name	Justification for exclusion of species
Acacia macnuttiana	MacNutts Wattle	Not recorded during survey. It is noted that *Acacia macnuttiana* was not surveyed within the required survey period during flowering, which aims to ensure the species is not confused with the similar *Acacia acrionastes.* However, as neither *Acacia acrionastes* nor *Acacia macnuttiana* were identified during the survey, no such potential confusion could have arisen. As such, *Acacia macnuttiana* is not considered present.
Acacia pycnostachya	*Bolivia Wattle*	*Not recorded during survey.*
Arthraxon hispidus	*Hairy Jointgrass*	*Not recorded during survey.*
Calyptorhynchus lathami	Glossy Black Cockatoo (breeding)	While breeding habitat (hollows >15cm diameter) has been identified to occur within the study area, no individuals were recorded during the survey.
Eucalyptus nicholii	Narrow-leaved Black Peppermint	Not recorded onsite during survey.
Haliaeetus leucogaster	White-bellied Sea-Eagle	No nests recorded during survey.

Species	Common Name	Justification for exclusion of species
Hieraaetus morphnoides	Little Eagle (Breeding)	No nests recorded during survey. While the survey was outside of required survey period, remains of these large nests would still have been evident at the time of the survey.
Litoria subglandulosa	Glandular frog	No suitable habitat exists within the development site. As per the *National Recovery Plan for Stream Frogs of South-east Queensland 2001-2005*, this species lives along streams in upland areas (altitude range of 500-1400m) in a range of habitats, usually associated with dense overhanging vegetation. Populations usually inhabit streams that are slow-flowing, with sections of permanent pools, and surrounded by dry and wet sclerophyll forest, rainforest, montane forest and heathland.
Lophoictinia isura	Square-tailed Kite (Breeding)	No nests recorded during survey. While the survey was outside of required survey period, remains of these large nests would still have been evident at the time of the survey.
Petaurus norfolcensis	Squirrel Glider	Not recorded during survey in accordance with BAM requirements.
Phascogale tapoatafe	Brush-tailed Phascogale	Not recorded during survey in accordance with BAM requirements.
Phascolarctos cinereus	Koala (Breeding)	Excluded as a species credit species for the following reasons. • The area was not considered to contain 'important habitat based on the density and quality of breeding habitat onsite'. • No individuals or signs/ records of the species were recorded during survey in line with BAM requirements. • No primary food tree species and only two species of secondary food tree species *(Eucalyptus moluccana and E. caliginosa)* of the Northern Tablelands (as detailed in Koala Recovery Plan [DECC 2008] and the Northern Tablelands Koala Recovery Strategy 2015-2025 [Northern Tablelands Local Land Services, 2016]) was identified within the site during the survey. • While it is noted that signs of this species were identified in 2014 within the site boundary (ELA, 2014), including in the area mapped as 'previously assessed clearing' in this report, this vegetation has since been largely cleared. Additionally, the 2014 survey identified that the signs (scratches in trees) were old and concluded that there was a low density of Koala activity across the site. Note that this species is still included as an ecosystem credit species in this report.
Pteropus poliocephalus	Grey-headed Flying-fox (Breeding)	No camps have been recorded within or in vicinity to the site on the National Flying-fox Monitoring Viewer (viewed 3 Sep 2019). No breeding habitat was recorded during the survey. Note that this species is still included as an ecosystem credit species in this report.
Thesium australe	Austral Toadflax	Not recorded during survey. While the survey was outside of required survey period, this species is considered unlikely to occur within the development site.

2. Stage 2: Impact assessment (biodiversity values)

2.1 Avoiding impacts

2.1.1 Locating a project to avoid and minimise impacts on vegetation and habitat

The development has been located in a way which avoids and minimises impacts as outlined in Table 15.

Table 15: Locating a project to avoid and minimise impacts on vegetation and habitat

Approach	How addressed	Justification
Locating the project in areas where there are no biodiversity values.	The project has been located predominantly in areas where there are no biodiversity values.	The project is centred around an existing quarry, and an area around this quarry which has previously been approved for disturbance and which has been cleared since approval. The project area also includes existing access roads. The location of the proposed quarry expansion is constrained due to the location of the existing quarry, and the location of the resource.
Locating the project in areas where the native vegetation or threatened species habitat is in the poorest condition.	Part of the project is located in areas where native vegetation is in poor condition.	The project includes an area of 1.78ha of PCT 568 which is of poor condition (vegetation integrity score 3) of as it has been largely cleared of native vegetation and consists largely of non-native grassland.
Locating the project in areas that avoid habitat for species and vegetation in high threat categories (e.g. an EEC or CEEC), indicated by the biodiversity risk weighting for a species.	The project is not located in an area where native vegetation is part of an EEC or CEEC. The project has impact on habitat of high threat category threatened species.	There is no EEC or CEEC within the project footprint. The project impacts on 4.63 ha of habitat of the Eastern Cave Bat which has a very high (3) biodiversity risk weighting. The project impacts on 4.68 ha of habitat for the Powerful Owl, Masked Owl and Barking Owl and on 4.63 ha of habitat for the Eastern Pygmy-possum, all of which have a high (2) biodiversity weighting.
Locating the project such that connectivity enabling movement of species and genetic material between areas of adjacent or nearby habitat is maintained.	Connectivity enabling movement of species and genetic material between areas of nearby habitat will be maintained.	The project is located such that connectivity to adjacent habitat is maintained by retaining a corridor of vegetation along the southern boundary of the site. This is connected to a large area of vegetation to the north.

2.1.2 Designing a project to avoid and minimise impacts on vegetation and habitat

The development has been designed in a way which avoids and minimises impacts as outlined in Table 16.

Table 16: Designing a project to avoid and minimise impacts on vegetation and habitat

Approach	How addressed	Justification
Reducing the clearing footprint of the project.	The clearing footprint is 6.41ha of native vegetation.	The clearing footprint is 6.41ha of native vegetation, of which 1.78 ha in poor condition. Through design, the proposed access road has been realigned to be coterminous with the northern boundary of the quarry expansion. This has significantly reduced the impact footprint of the original proposal. The original design planned for the road to sweep to the north (where the position of Plot 3 is – See Figure 4).
Locating ancillary facilities in areas where there are no biodiversity values.	Ancillary facilities will be located within the proposed operational footprint and not result in additional impact to biodiversity value areas.	Ancillary features will be located within the operational footprint, avoiding additional impacts to areas containing biodiversity values.
Locating ancillary facilities in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas that have a lower vegetation integrity score).	Ancillary facilities will be located within the proposed operational footprint and not result in additional impact to biodiversity value areas.	Ancillary features will be located within the operational footprint, avoiding additional impacts to areas containing biodiversity values.
Locating ancillary facilities in areas that avoid habitat for species and vegetation in high threat status categories (e.g. an EEC or CEEC).	Ancillary facilities will be located within the proposed operational footprint and not result in additional impact to biodiversity value areas.	Ancillary features will be located within the operational footprint, avoiding additional impacts to areas containing biodiversity values.
Providing structures to enable species and genetic material to move across barriers or hostile gaps.	The development will not include structures to enable species and genetic material to move across barriers or hostile gaps.	The project is located such that connectivity to adjacent habitat is maintained by retaining a corridor of vegetation along the southern boundary of the site. This is connected to a large area of vegetation to the north.
Making provision for the demarcation, ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on the development site.	Recommendations for the demarcation and maintenance of retained native vegetation have been include as mitigation measures in this report.	Recommendations for the demarcation and maintenance of retained native vegetation have been include as mitigation measures in this report.

2.1.3 Prescribed biodiversity impacts

The development site does not have any prescribed biodiversity impacts (Table 17).

Table 17: Prescribed biodiversity impacts

Prescribed biodiversity impact	Description in relation to the development site
Impacts of development on the habitat of threatened species or ecological communities associated with: • karst, caves, crevices, cliffs and other geological features of significance, or • rocks, or • human made structures, or • non-native vegetation	With regards to non-native vegetation: An area of 1.78ha of PCT568 in poor quality will be impacted by the development, which has been cleared of canopy and shrub layer and now largely consists of non-native grassland. It is unlikely that this would be habitat for threatened species given the proximity of better-quality native vegetation. The project will not result in impacts to: • karst, caves, crevices, cliffs and other geological features of significance, or • significant rocks, or • human made structures
Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range.	N/A. The project is located such that connectivity to adjacent habitat is maintained by retaining a corridor of vegetation along the southern boundary of the site, which retains the connection between habitat to the east and west of the project and the retention of a thin strip of vegetation to the east of the site, which retains connectivity to a large area of vegetation to the north. The vegetation is part of a contiguous vegetation patch of approximately 340ha.
Impacts of development on movement of threatened species that maintains their lifecycle.	N/A The project is located such that connectivity to adjacent habitat is maintained by retaining a corridor of vegetation along the southern boundary of the site, which retains the connection between habitat to the east and west of the project and the retention of a thin strip of vegetation to the east of the site, which retains connectivity to a large area of vegetation to the north. The vegetation is part of a contiguous vegetation patch of approximately 340ha.
Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining).	N/A. No water bodies are located within the project footprint. Two sediment dams, located outside the project footprint to the north and south of the project footprint, will contain all surface water runoff from the quarry overburden and fines stockpile and other disturbed areas around the extraction areas.
Impacts of vehicle strikes on threatened species or on animals that are part of a TEC.	N/A. The development aims to progressively increase the truck capacity, which would allow an increase in the material despatched from the Quarry without increasing traffic levels.

2.2 Assessment of Impacts

2.2.1 Direct impacts

The direct impacts of the development on:

- native vegetation are outlined in Table 18
- threatened species and threatened species habitat is outlined in Table 19
- prescribed biodiversity impacts are outlined in Section 2.1.3.

Direct impacts including the final project footprint (construction and operation) are shown on Figure 9. All construction and operational works will be constrained to the development footprint.

'Construction' includes vegetation clearing activities, cut and fill for a work pad and works associated with the road realignment. 'Operations' includes excavation, processing and haulage of quarry materials. More detail is provided in Chapter 2 of the EIS for the proposed development.

Within Table 19, the differences between the direct impact area (ha) is due to the method used to calculate impact areas. That is:

- for Eastern Pygmy Possum and Eastern Cave Bat, the entire area of PCT 568 (good condition) is included as an impact area (4.63 ha);
- for the two owl species, surveyed tree hollows (>20cm in width) have been buffered by 100m. This has resulted in an area within Vegetation Zone 1 and 2 of 1.09 ha and 3.60 ha respectively.

Table 18: Direct impacts to native vegetation

PCT ID	PCT Name	Condition	Vegetation Class	Vegetation Formation	Direct impact (ha)
568	Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion	Poor	New England Dry Sclerophyll Forest	Dry Sclerophyll Forest (Shrub/grass sub-formation)	1.78
568	Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion	Good	New England Dry Sclerophyll Forest	Dry Sclerophyll Forest (Shrub/grass sub-formation)	4.63

Table 19: Direct impacts on threatened species and threatened species habitat

Species	Common Name	Direct impact number of individuals / habitat (ha)	Relevant Veg Zone	NSW listing status	EPBC Listing status
Cercatetus nanus	Eastern Pygmy Possum	4.63	Zone 2 (good)	Endangered	Not Listed
Ninox connivens	Barking Owl	1.09 3.60	Zone 1 (poor) Zone 2 (good)	Vulnerable	Not Listed
Ninox strenua	Powerful Owl	1.09 3.60	Zone 1 (poor) Zone 2 (good)	Vulnerable	Not Listed
Tyto novaehollandiae	Masked Owl (breeding)	1.09 3.60	Zone 1 (poor) Zone 2 (good)	Vulnerable	Not Listed
Vespadelus troughtoni	Eastern Cave Bat	4.63	Zone 2 (good)	Vulnerable	Not Listed
PCT 568	Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion	6.41	Both	N/A	N/A

2.2.2 Change in vegetation integrity

The change in vegetation integrity as a result of the development is outlined in Table 20.

Table 20: Change in vegetation integrity

Veg Zone	PCT ID	Condition	Area (ha)	Current vegetation integrity score	Future vegetation integrity score	Change in vegetation integrity
1	568	Poor	1.78	3	0	-3
2	568	Good	4.63	64.5	0	-64.5

Figure 9: Final project footprint including construction and operation

2.2.3 Potential indirect impacts

Potential indirect impacts are considered pursuant to Section 9.1.4 of the BAM. The potential indirect impacts of the development are outlined in Table 21. For assessment purposes, indirect impacts identified in a context where no management occurs. In reality however, mitigation and management of these impacts will occur, as outlined in Section 2.2.4.

Table 21: Indirect impacts

Indirect impact	Project phase	Nature	Extent	Frequency	Duration	Timing
Sedimentation and contaminated and/or nutrient rich run-off	Construction	Runoff during construction and operation	Potential sedimentation and contaminated runoff into adjacent creek and dams	During heavy rainfall or storm events	Throughout construction and operation period	Potentially long-term impacts
Noise, dust or light spill	Construction	Noise and dust from machinery. Light spill during operational phase	Adjacent vegetation	Daily, during construction works and operational phases	Throughout construction and operation period	Potentially long-term impacts
Inadvertent impacts on adjacent habitat or vegetation	Construction	Potential damage to adjacent habitat or vegetation	Adjacent vegetation	Daily, during construction works and operational phases	Throughout construction and operation period	Potentially long-term impacts
Transport of weeds and pathogens from the site to adjacent vegetation	Construction	Spread of weed seed and pathogens from incoming machinery and equipment	Potential spread into nearby habitat	Daily, during construction and operational phases	Throughout construction and operation period	Potentially long-term impacts
Vehicle strike	Construction / operation	Potential for native fauna to be struck by working machinery and moving vehicles	Within development site and adjacent	Daily, during construction and operational phases	Throughout construction and operation period	Potentially long-term impacts
Rubbish dumping	Construction / operation	Illegal dumping by workers	Potential for rubbish to spread into adjacent vegetation and outside development site	Daily, during construction and operational phases	Throughout life of project	Potentially long-term impacts

Indirect impact	Project phase	Nature	Extent	Frequency	Duration	Timing
Wood collection	Construction / operation	Unregulated removal of wood in vegetation adjacent to development site	Throughout adjacent vegetation	Potential to occur at any time during construction or operational phases	Throughout life of project	Short-term impacts
Bush rock removal and disturbance	Construction / operation	Unregulated removal of rocks in vegetation adjacent to development site	Potential for disturbance in adjacent vegetation and area surrounding the development site	Potential to occur at any time during construction or operational phases	Throughout life of project	Short-term impacts
Increase in predatory species populations	Construction / operation	Negligible potential for an increase in predatory species in the locality through disturbance to vegetation	Throughout adjacent vegetation	Potential to occur gradually after disturbance to habitat and vegetation takes place	During construction phase of project	Potentially negligible long-term impacts
Increase in pest animal populations	Construction / operation	Potential to increase if food scraps/rubbish is left on site. Potential to increase -/+ decrease due to disturbance to existing vegetation.	Throughout adjacent vegetation	Potential to occur gradually after disturbance to habitat and vegetation takes place	During construction phase of project	Potentially long-term impacts
Increased risk of fire	Construction / operation	Potential for fire to spark during construction and operation from any machinery or electrical works	Throughout adjacent vegetation	Potential to occur at any time throughout the operational or construction phases	During operating/ construction hours	During operational /construction hours
Disturbance to specialist breeding and foraging habitat, e.g. beach nesting for shorebirds.	Construction / operation	Potential to impact potential breeding habitat of species relying in tree hollows for breeding	Hollow-bearing trees within and adjacent the site	Potential to occur at any time throughout the operational or construction phases	Throughout life of project	Potentially long-term impacts

2.2.4 Mitigating and managing impacts

Measures proposed to mitigate and manage impacts at the development site before, during and after construction are outlined in Table 22. A vegetation clearing protocol that will be implemented during works is also provided in Appendix C.

As mentioned in Section 2.2, 'construction' includes vegetation clearing activities, cut and fill for a work pad and works associated with the road realignment. 'Operations' includes excavation, processing and haulage of quarry materials. More detail is provided in Chapter 2 of the EIS for the proposed development.

Table 22: Measures proposed to mitigate and manage impacts

Measure	Action	Outcome	Timing	Responsibility
Timing works to avoid critical life cycle events such as breeding or nursing	Where possible avoid impact on trees that have hollows: • >20cm (potential breeding habitat for Masked, Barking and Powerful Owl) between May-Dec; • up to 10cm (potential breeding habitat for Eastern Pygmy Possum) between Sep-March.	Prevent injury and disturbance of breeding wildlife	during construction	Project manager Clearing contractor
Implement clearing protocols for fauna	Protocol to include pre-clearing surveys for active breeding places (nests, burrows, hollows etc), daily surveys and staged clearing, the presence of a trained ecological or licensed wildlife handler during clearing events, fauna handling protocol, and identification of fauna release areas. Where breeding threatened species are identified, works shall cease until the species is confirmed and necessary approvals are obtained. The breeding place will be fenced off and excluded from works. Works shall not continue until the breeding place is no longer active.	Prevent injury and disturbance of wildlife	Before and during construction	Project manager project ecologist/wildlife handler Clearing contractor
Replace habitat resources lost onsite in retained vegetation	Place any habitat features removed from the development site, including logs, rocks and hollows (where saved) in retained and adjacent vegetation, particularly along the eastern boundary and riparian buffer zones.	Habitat features retained offsite	Before and during construction	Project manager Clearing contractor
Implement clearing protocols for flora	Include clear delineation of vegetation to be retained, including around riparian zones in proximity to the works. Removal of native vegetation by chain-saw, rather than heavy machinery where possible.		Before and during construction	Project manager project ecologist Clearing contractor
Implement sediment and erosion controls to control the quality of	Install sediment barriers and erosion controls during and post construction to prevent runoff into adjacent streams.	No sediment impacting on	For the life of the project	Project manager

Measure	Action	Outcome	Timing	Responsibility
water released from the site into the receiving environment	Maintain controls throughout construction and undertake weekly inspections.	the receiving environment		Clearing contractor
Implement a waste control plan to reduce risk of pest species onsite	Waste control plan to include covered waste receptacles for food wastes, regime for disposal offsite and staff awareness.	Minimise attracting pest species onsite	For the life of the project	Project manager Clearing contractor Quarry operator
Staff training and site briefing to communicate environmental features to be protected and measures to be implemented	All staff to receive environmental induction. This induction will include items such as: • Site environmental procedures (vegetation management, sediment and erosion control, exclusion fencing and noxious weeds) • What to do in case of environmental emergency (chemical spills, fire, injured fauna) • Key contacts in case of environmental emergency Site briefings should be updated based on phase of the work and associated risks.	All staff entering the site are fully aware of all environmental aspects relating to the development and know what to do in case of any environmental emergencies	To occur for all staff entering / working at the site and when environmental issues become apparent	Project manager Clearing contractor Quarry operator (all staff)
Risk of fire	Site Emergency Plan and bushfire management to be implemented.	Reduced fire risk	For the life of the project	Quarry operator
Weed washdown	All new machinery to arrive on site free of caked mud and dirt (which can potentially carry weed seed).	Reduced risk of weed spread	For the life of the project	Clearing contractor Quarry operator

2.2.5 Serious and Irreversible Impacts (SAII)

The Eastern Cave Bat is a potential candidate Serious and Irreversible Impact species. The threshold for the SAII for this species is:

- Potential breeding habitat and presence of breeding individuals. Potential breeding habitat is PCTs associated with the species within 100m of rocky areas, caves, overhangs crevices, cliffs and escarpments; or old mines, tunnels, old buildings and sheds within the potential habitat.

A map showing topography within 100m of the site is shown in Figure 10. This provides an indication that no breeding habitat for the Eastern Cave Bat exists within 100m. Site observations also confirmed this. It is also assumed that the quarry pit itself (cliffs and cervices) does not provide breeding habitat due to the ongoing operational disturbances. Nonetheless, it is conservatively assumed that breeding habitat exists within 2km of the development site due to topography (mountainous areas to the north – see Figure 11), and also because survey of all potential breeding habitat (e.g. old buildings and sheds) within a 2km radius is not practical.

As the potential breeding habitat as described above is not present within the development site or within 100m of the development site, the SAII threshold is not met and the species not further assessed for SAII.

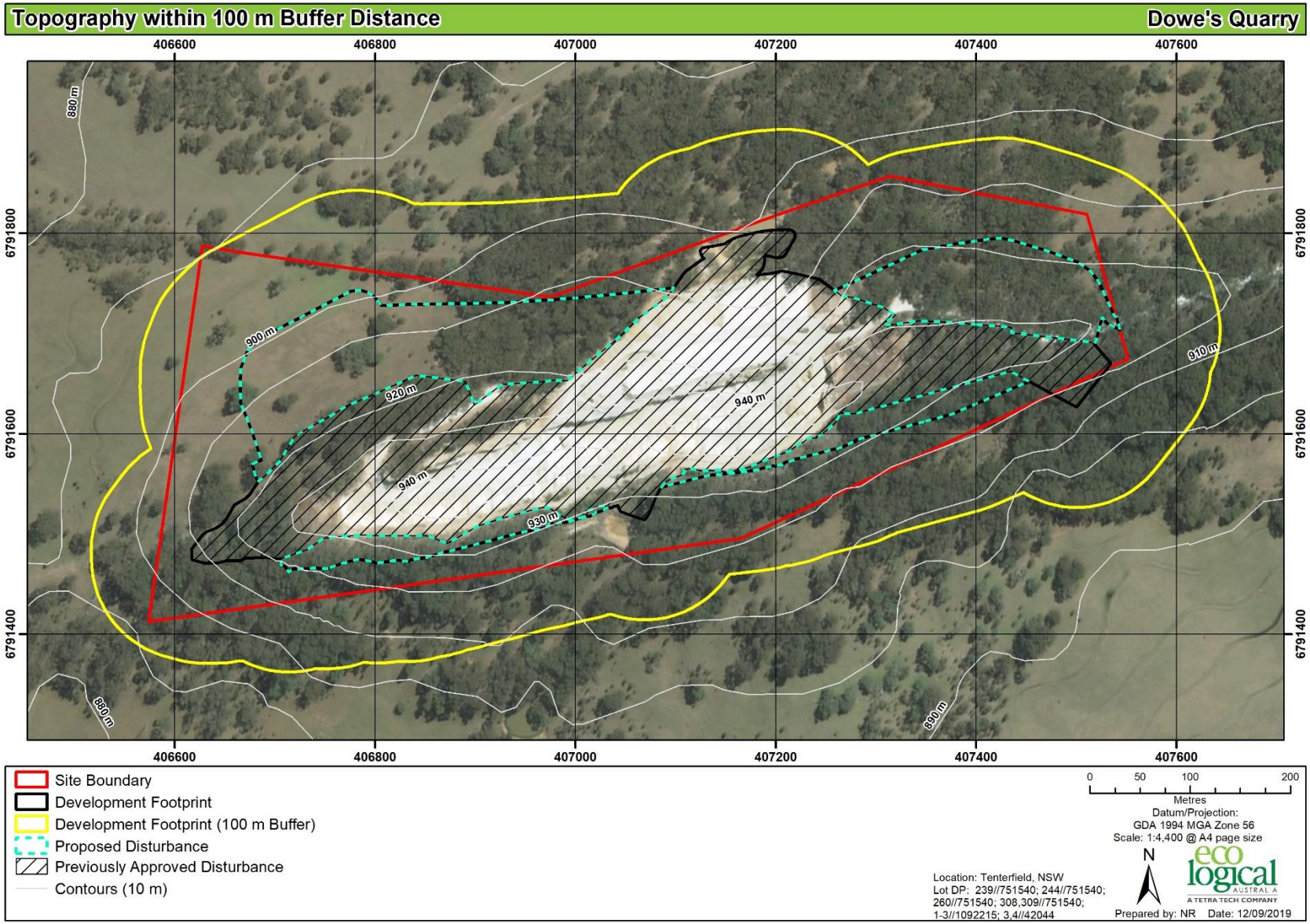

Figure 10: Topography within 100m of the development site

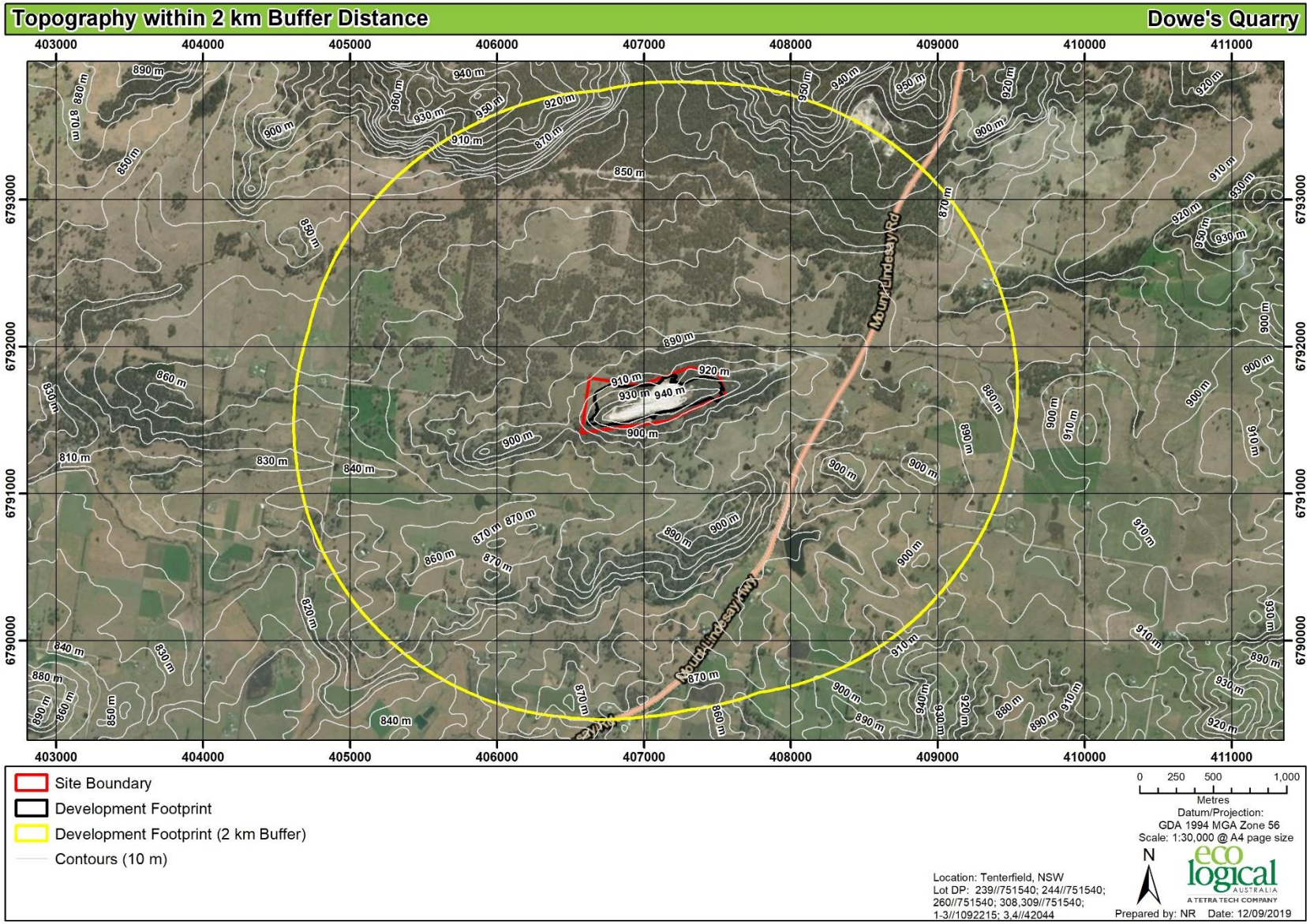

Figure 11: Topography within 2km of the development site

2.3 Risk assessment

A risk assessment for project ecological impact has been undertaken. Likelihood criteria, consequence criteria and the risk matrix are provided in Table 23, Table 24 and Table 25 respectively. The risk assessment for the project is provided in Table 26.

Table 23: Likelihood criteria

Likelihood criteria	Description
Almost certain (Common)	Will occur, or is of a continuous nature, or the likelihood is unknown. There is likely to be an event at least once a year or greater (up to ten times per year). It often occurs in similar environments. The event is expected to occur in most circumstances.
Likely (Has occurred in recent history)	There is likely to be an event on average every one to five years. Likely to have been a similar incident occurring in similar environments. The event will probably occur in most circumstances.
Possible (Could happen, has occurred in the past, but not common)	The event could occur. There is likely to be an event on average every five to twenty years.
Unlikely (Not likely or uncommon)	The event could occur but is not expected. A rare occurrence (once per one hundred years).
Remote (Rare or practically impossible)	The event may occur only in exceptional circumstances. Very rare occurrence (once per one thousand years). Unlikely that it has occurred elsewhere; and, if it has occurred, it is regarded as unique.

Table 24: Consequence criteria

Consequence category	Description
Critical (Severe, widespread long-term effect)	Destruction of sensitive environmental features. Severe impact on ecosystem. Impacts are irreversible and/or widespread. Regulatory and high-level government intervention/action. Community outrage expected. Prosecution likely.
Major (Wider spread, moderate to long term effect)	Long-term impact of regional significance on sensitive environmental features (e.g. wetlands). Likely to result in regulatory intervention/action. Environmental harm either temporary or permanent, requiring immediate attention. Community outrage possible. Prosecution possible.
Moderate (Localised, short-term to moderate effect)	Short term impact on sensitive environmental features. Triggers regulatory investigation. Significant changes that may be rehabilitated with difficulty. Repeated public concern.
Minor (Localised short-term effect)	Impact on fauna, flora and/or habitat but no negative effects on ecosystem. Easily rehabilitated. Requires immediate regulator notification.
Negligible (Minimal impact or no lasting effect)	Negligible impact on fauna/flora, habitat, aquatic ecosystem or water resources. Impacts are local, temporary and reversible. Incident reporting according to routine protocols.

Table 25: Risk matrix

Consequence	Likelihood				
	Almost certain	Likely	Possible	Unlikely	Remote
Critical	Very High	Very High	High	High	Medium
Major	Very High	High	High	Medium	Medium
Moderate	High	Medium	Medium	Medium	Low
Minor	Medium	Medium	Low	Low	Very Low
Negligible	Medium	Low	Low	Very Low	Very Low

Table 26: Risk assessment

Potential impact	Project phase	Risk (pre-mitigation)	Risk (post mitigation)
Vegetation clearing outside clearing footprint	Construction / operation	Medium	Low
Sedimentation and contaminated and/or nutrient rich run-off offsite	Construction	Medium	Low
Noise, dust or light spill	Construction	Low	Low
Rubbish dumping	Construction / operation	Low	Very low
Wood collection	Construction / operation	Low	Very low
Bush rock removal and disturbance	Construction / operation	Low	Very low
Increase in predatory species populations	Construction / operation	Low	Very low
Increase in pest animal populations	Construction / operation	Low	Very low

Potential impact	Project phase	Risk (pre-mitigation)	Risk (post mitigation)
Disturbance to specialist breeding and foraging habitat, e.g. hollow-bearing trees impacting on fauna	Construction	Medium	Low
Risk of anthropogenic fire (and associate impact on adjacent vegetation)	Construction / operation	Low	Low

2.4 Impact summary

Following implementation of the BAM and the BAMC, the following impacts have been determined.

2.4.1 Serious and Irreversible Impacts

The development does not have any SAII.

2.4.2 Impacts requiring offsets

The impacts of the development requiring offset for native vegetation are outlined in Table 27 and shown on Figure 12. The impacts of the development requiring offset for threatened species and threatened species habitat are outlined in Table 28 and on Figure 12.

Table 27: Impacts to native vegetation that require offsets

PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Direct impact (ha)
568	Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion	New England Dry Sclerophyll Forest	Dry Sclerophyll Forest (Shrub/grass sub-formation)	4.63

Table 28: Impacts on threatened species and threatened species habitat that require offsets

Species	Common Name	Direct impact habitat (ha)	Relevant Veg Zone	NSW listing status	EPBC Listing status
Cercatetus nanus	Eastern Pygmy Possum	4.63	Zone 2 (good)	Endangered	Not Listed
Ninox connivens	Barking Owl	1.09 3.60	Zone 1 (poor) Zone 2 (good)	Vulnerable	Not Listed
Ninox strenua	Powerful Owl	1.09 3.60	Zone 1 (poor) Zone 2 (good)	Vulnerable	Not Listed
Tyto novaehollandiae	Masked Owl (breeding)	1.09 3.60	Zone 1 (poor) Zone 2 (good)	Vulnerable	Not Listed
Vespadelus troughtoni	Eastern Cave Bat	4.63	Zone 2 (good)	Vulnerable	Not Listed

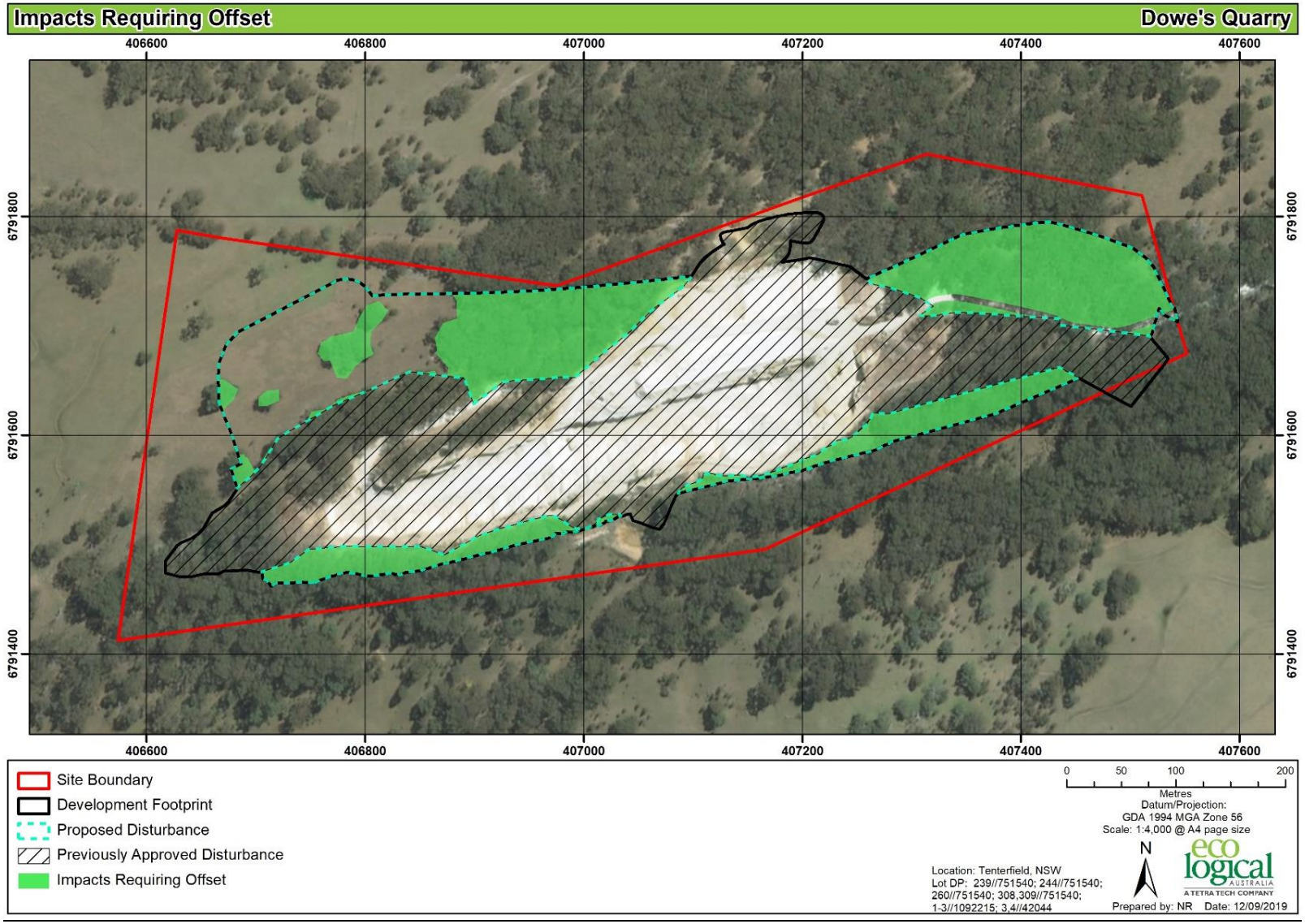

Figure 12: Impacts Requiring Offset

2.4.3 Impacts not requiring offsets

The impacts of the development not requiring offset for native vegetation are outlined in Table 29 and shown on Figure 13.

Table 29: Impacts to native vegetation that do not require offsets

PCT ID	PCT Name	Vegetation Class	Direct impact (ha)	Rationale
568	Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion	Poor	1.78	Vegetation integrity score of 3. This is below the offset threshold.

2.4.4 Areas not requiring assessment

Areas not requiring assessment are shown on Figure 14. These are cleared areas which are part of the existing quarry and areas of previously approved disturbance associated with a previously approved extension of the quarry.

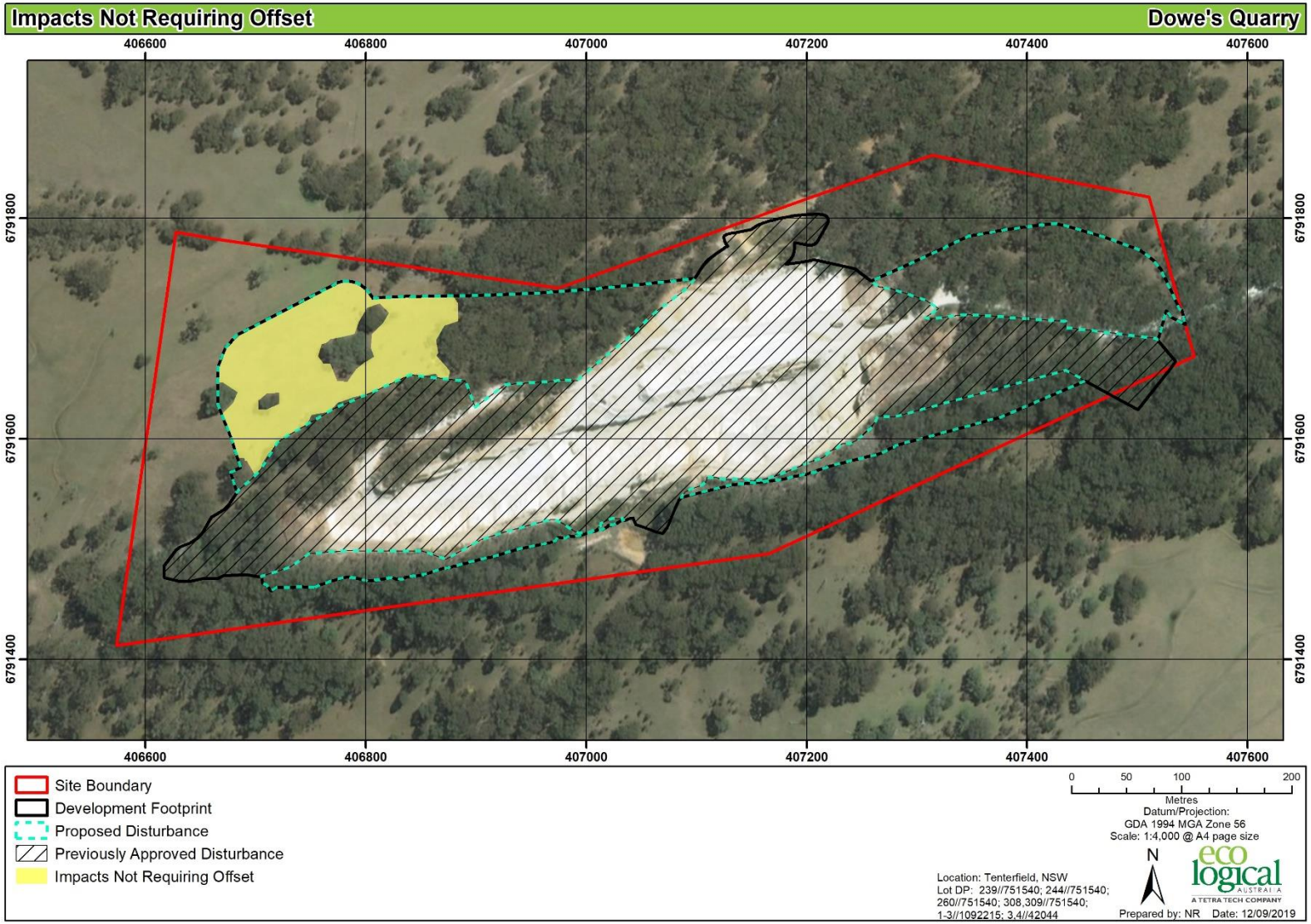

Figure 13: Impacts not requiring offset

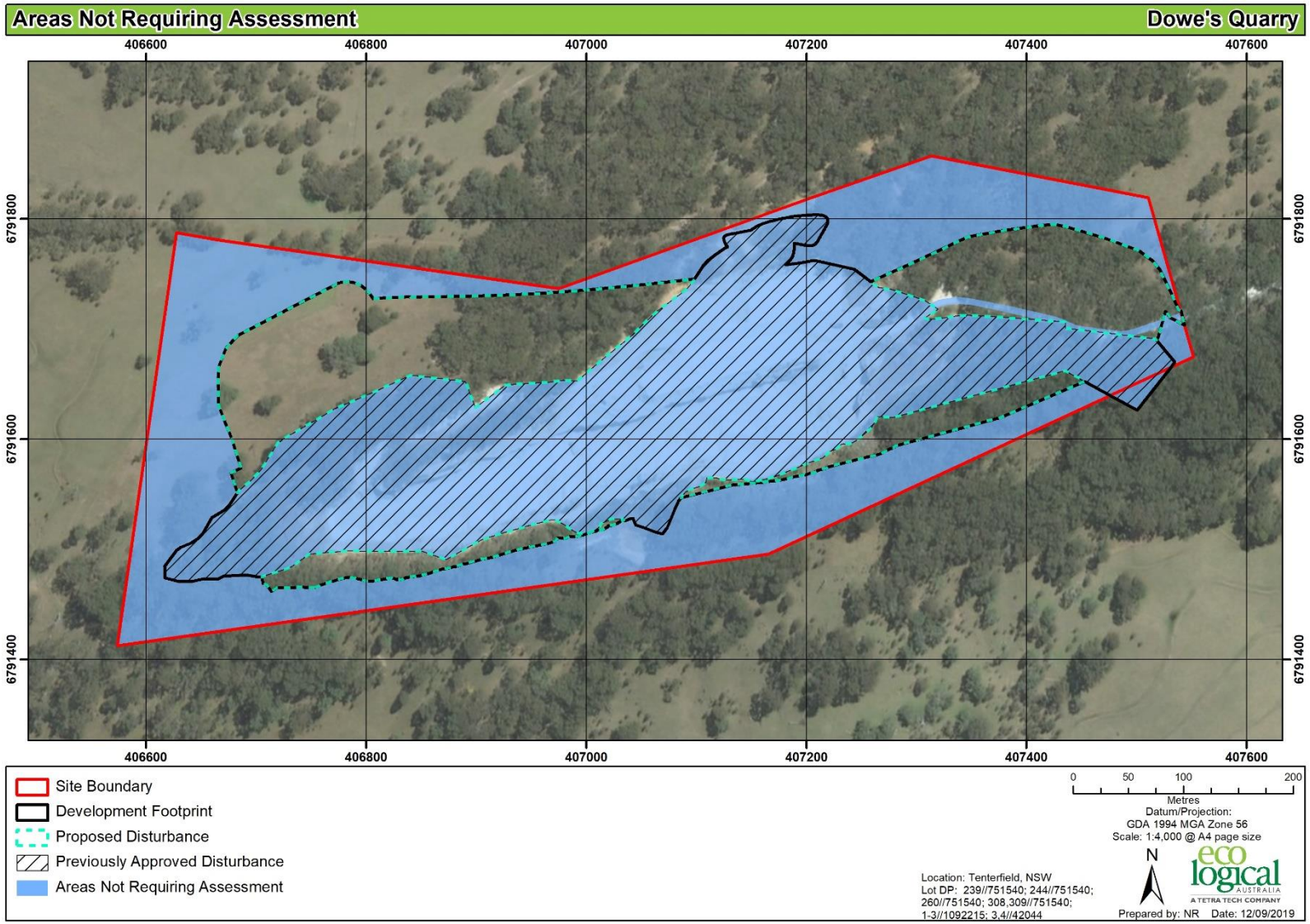

Figure 14: Areas not requiring assessment

2.4.5 Credit summary

The number of ecosystem credits required for the development are outlined in Table 30. The number of species credits required for the development are outlined in Table 31. A biodiversity credit report is included in Appendix B.

The results of this BDAR are considered preliminary. Prior to determination of the application, further survey will occur to further confirm the presence of the five species above and an updated BDAR will be provided. Due to this, credit requirements may change.

As the species credit species are assumed to occur, their presence in the proposed area of disturbance is not confirmed. Further survey will have two possible outcomes:

- Species credit species are confirmed to be present and further assessed (as per the avoid, mitigate, offset hierarchy). This is also likely to result in the requirement for a threatened species management plan, to be integrated into the Site Environmental Management Plan.
- Species credit species are assumed not to occur (due to habitat assessment and survey results) and species credit requirements will be removed.

Table 30: Ecosystem credits required

PCT ID	PCT Name	Vegetation Formation	Direct impact (ha)	Credits required
568	Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion	New England Dry Sclerophyll Forest	4.63	134

Table 31: Species credit summary

Species	Common Name	Direct impact habitat (ha)	Relevant Veg Zone	Credits required
Cercatetus nanus	Eastern Pygmy Possum	4.63	Zone 2 (good)	154
Ninox connivens	Barking Owl (breeding)	1.09	Zone 1 (poor)	2
		3.60	Zone 2 (good)	119
Ninox strenua	Powerful Owl (breeding)	1.09	Zone 1 (poor)	2
		3.60	Zone 2 (good)	119
Tyto novaehollandiae	Masked Owl (breeding)	1.09	Zone 1 (poor)	2
		3.60	Zone 2 (good)	119
Vespadelus troughtoni	Eastern Cave Bat	4.63	Zone 2 (good)	230
Total species credits to be offset				**747**

2.5 Consistency with legislation and policy

Additional matters relating to impacts on flora and fauna which are not covered by the BC Act must also be addressed for the proposed development. Potential impacts on MNES in accordance with the EPBC Act have been addressed below, along with SEPP 44 requirements.

2.5.1 Environment Protection and Biodiversity Conservation Act (EPBC Act) 1999.

The EPBC Act is the Australian Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places, which are known under the Act as MNES. The Act requires that if an action has, will have, or is likely to have a significant impact on MNES, it must be referred to the Australian Government Minister for the Environment for consideration. The Minister may require further assessment and approval of an action, which in this instance is deemed a 'controlled action'.

Eleven MNES threatened species and fifteen migratory species are considered as having a likelihood of occuring onsite based on desktop review, including PMST search, NSW BioNet Records, Atlas of Living Australia records, aerial imagery and the BAMC.

Following habitat assessments and survey onsite as part of this report, the list of MNES that are known or have the potential to occur on site has been reduced to three threatened species and two migratory species. An assessment of impacts for these species is presented below and has been undertaken in accordance with *EPBC Act Significant impact guidelines 1.1* and other relevant policy advice.

The results of the detailed assessments for species known or with the potential to occur on site are presented in the tables below. The overall conclusion is that the project is unlikely to have a significant impact on MNES.

The full suite of EPBC Act listed threatened species considered include:

- Spotted-tailed Quoll – potential foraging habitat occurs on site, further assessment provided
- Koala – potential foraging habitat occurs on site, further assessment provided
- Grey-headed Flying-fox – potential foraging habitat occurs on site, further assessment provided
- Swift Parrot – no habitat identified on site, no further assessment
- Brush-tailed Rock-wallaby – no habitat identified on site, no further assessment
- Mac Nutt's Wattle – not recorded on site during surveys, no further assessment
- Beadle's Grevillea – site is outside this species' geographic range, no further assessment
- Narrow-leaved Black Peppermint – not recorded on site during surveys, no further assessment
- Bolivia Wattle – not recorded on site during surveys, no further assessment
- Hairy Jointgrass – not recorded on site during surveys, no further assessment
- Austral Toadflax – not recorded on site during surveys, no further assessment

The full suite of EPBC Act listed migratory species considered include:

- Fork-tailed Swift - potential foraging habitat occurs on site, further assessment provided
- Satin Flycatcher - potential foraging habitat occurs on site, further assessment provided
- Black-faced Monarch - unlikely to occur on site based on available habitat, no further assessment
- Rufous Fantail - unlikely to occur on site based on available habitat and previous records, no further assessment
- Oriental Cuckoo/Horsfield's Cuckoo – unlikely to occur on site based on available habitat and previous records, no further assessment

- White-throated Needletail – unlikely to occur on site based on available habitat and previous records, no further assessment
- Spectacled Monarch – unlikely to occur on site based on available habitat and previous records, no further assessment
- Yellow Wagtail – unlikely to occur on site based on available habitat and previous records, no further assessment
- Common Sandpiper – unlikely to occur on site based on available habitat and previous records, no further assessment
- Sharp-tailed Sandpiper – unlikely to occur on site based on available habitat and previous records, no further assessment
- Curlew Sandpiper – unlikely to occur on site based on available habitat and previous records, no further assessment
- Pectoral Sandpiper – unlikely to occur on site based on available habitat and previous records, no further assessment, no further assessment
- Latham's Snipe/Japanese Snipe – unlikely to occur on site based on available habitat and previous records, no further assessment
- Osprey – unlikely to occur on site based on available habitat and previous records, no further assessment

Table 32: Assessment of Significance: Spotted-tailed Quoll (endangered)

Criterion	Question	Response
An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility of the following:		
1)	will the action lead to a long-term decrease in the size of a population	No. This species was not identified on site during surveys. The project area provides potential foraging habitat for the species and a limited number of fallen logs and hollow-bearing trees that may be used as dens. The habitat within the project area is fragmented due to the location of the existing quarry, however is connected to a large area of contiguous vegetation of ~340 ha. This connectivity is important, as the species is known to require suitable denning sites, an abundance of small prey items and large areas of relatively intact vegetation through which to forage (DoELWP 2016). The Tenterfield population of this species is listed as an important stronghold population, i.e. an area of high abundance in the region (DoELWP 2016). In the context of the local population size and the availability of a large area of contiguous vegetation, the removal of 4.63 ha of potential foraging habitat is unlikely to lead to a long-term decrease in the size of a population of this species. This is especially so, given there is no evidence of current site use by the species.
2)	will the action reduce the area of occupancy of the species	No. There is currently no evidence that the species is occupying the project area. The proposal will result in the removal of 4.63 hectares of native vegetation which is considered potential foraging habitat. Given the position of this vegetation in the landscape i.e surrounding an existing quarry and on the edge of a large contiguous patch of vegetation, it is not considered that its removal will reduce the overall area of occupancy of this species.

Criterion	Question	Response
3)	will the action fragment an existing population into two or more populations	No. The project is located such that connectivity to adjacent habitat is maintained by: • retaining a corridor of vegetation along the southern boundary of the site, which retains the connection between habitat to the east and west of the project, and • retaining a strip of vegetation along the eastern boundary which connects it to a large area of vegetation to the north. The vegetation remaining in the project area is part of a contiguous vegetation patch of approximately 340ha.
4)	will the action adversely affect habitat critical to the survival of a species	No. Habitat critical to the survival of the species is defined for the Spotted-tailed Quoll as large patches of forest with adequate denning resources and relatively high densities of medium-sized mammalian prey (DoELWP 2016). Given there is no evidence to suggest potential habitat within the project is currently utilised by quolls, and that the denning resources are few, it is concluded that the project area does not support habitat critical to the survival of this species.
5)	will the action disrupt the breeding cycle of a population	No. The project areas contains limited denning resources such as hollow bearing trees and fallen logs, but it does not contain significant rock outcrops, rock shelters or caves which are denning sites known to be important for supporting breeding. Further, only a small area (4.63 ha) of vegetation will be removed, relative to that available in directly connected landscapes (i.e. ~340 ha of contiguous vegetation).
6) i	will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	No. The proposal will result in the removal of 4.63 ha of native vegetation which is considered potential foraging habitat, as well as some limited denning resources. The species is known to require suitable denning sites, an abundance of small prey items and large areas of relatively intact vegetation through which to forage (DoELWP 2016). The removal of a small area of habitat is unlikely to alter the key habitat resources for the species in the wider landscape and therefore results in a population decline.
6) ii	will the action result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	No. This species is known to have competition from and predation by dogs, cats and foxes. However, the project area is situated in a mix of rural/ cleared and vegetated areas, and within the project area is an existing quarry. The expansion of the existing quarry footprint is not likely to exacerbate any existing threats from invasive species, which already exist within the wider area.
7)	will the action introduce disease that may cause the species to decline	No. There are no diseases that are known to threaten this species.

Criterion	Question	Response
8)	will the action interfere with the recovery of the species	No. The overall recovery objective for this species is to reduce the rate of decline of the Spotted-tailed Quoll, and ensure that viable populations remain throughout its current range in eastern Australia (DoELWP 2016). There are 11 specific recovery objectives also identified. The proposal will result in a small reduction in potential foraging habitat in an area that is not currently known to be occupied by the species. It is therefore considered that this will not affect the rate of decline (or increase) of the species and nor will the local population's viability be affected. The proposal is not inconsistent with the 11 specific recovery objectives.

Table 33: Assessment of Significance: Grey-headed Flying-fox (vulnerable)

Criterion	Question	Response
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:		
1)	lead to a long-term decrease in the size of an important population of a species	No. There are not distinct populations of the Grey-headed Flying-fox (GHFF) across the species' geographic range. However, the national population is spatially structured into colonies. Known roosting sites are regularly monitoring on the National Flying-fox monitoring viewer (DotEE 2016) and criteria established for determining nationally important roosts. The closest known GHFF camp as identified on the National Flying-fox monitoring viewer (DotEE 2016) is approximately 98 km east of the development site at Casino (Figure 15). The largest estimated size of this camp is in November 2012 with 10,000-16,000 individuals. It was last estimated at 500-2,500 individuals in November 2018. Given the proximity of this camp is approximately double the known foraging radius for this species and that no individuals were identified during survey, it is considered that the project area does not support an important population of GHFF.
2)	reduce the area of occupancy of an important population	No. The project area is not considered to support an important population of GHFF – see criterion 1 above.
3)	fragment an existing important population into two or more populations	No. The project area is not considered to support an important population of GHFF – see criterion 1 above.
4)	adversely affect habitat critical to the survival of a species	No. The draft recovery plan for GHFF (DECCW 2009) defines habitat critical to the survival of the species, both for foraging and breeding habitats. Habitat within the project area does not meet these definitions, primarily due to the lack of known large camps (i.e. >2,500 individuals) within 50 km of the project area and/or evidence of breeding individuals.
5)	disrupt the breeding cycle of an important population	No. The project area is not considered to support an important population of GHFF – see criterion 1 above. There is no breeding habitat within the project area.

Criterion	Question	Response
6)	modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	No. Habitat within the project area provides foraging resources and there are no known camps in the vicinity. The proposal will result in the removal of 4.63 ha of foraging resources. Given these resources are connected to a large area of continuous vegetation and that the nearest known camp is approximately twice the nightly foraging distance from the project area, it is considered unlikely that the removal of a small area of foraging habitat will result in the decline of the species.
7)	result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	No. The most relevant invasive species in the context are weeds, that may degrade the quality of foraging resources. The project area is situated in a mix of rural/ cleared and vegetated areas, and within the project area is an existing quarry. The expansion of the existing quarry footprint is not likely to exacerbate any existing threats from weeds, which already exist within the wider landscape.
8)	introduce disease that may cause the species to decline, or	No. GHFFs are reservoirs for the Australian bat lyssavirus (ABL) and can cause clinical disease and mortality in GHFF (DECCW 2009). The proposed action is unlikely to present a significant ecological stress on any camps or on individuals that may utilise the subject site and therefore the works are unlikely to introduce or exacerbate this virus or any other disease that may cause this species to decline.
9)	interfere substantially with the recovery of the species.	No. A Draft National Recovery Plan for the Grey-headed Flying-fox was developed in 2009 (DECCW 2009) and lists three overall recovery objectives including: • to reduce the impact of threatening processes on Grey-headed Flying-foxes and arrest decline throughout the species' range • to conserve the functional roles of Grey-headed Flying-foxes in seed dispersal and pollination • to improve the standard of information available to guide recovery of the Grey-headed Flying-fox, in order to increase community knowledge of the species and reduce the impact of negative public attitudes on the species. There are 13 associated specific objectives. The removal of 4.63 ha of foraging habitat far from the nearest known camp is not likely to interfere with the recovery of the species and does not contradict the desired specific outcomes listed in the recovery plan.

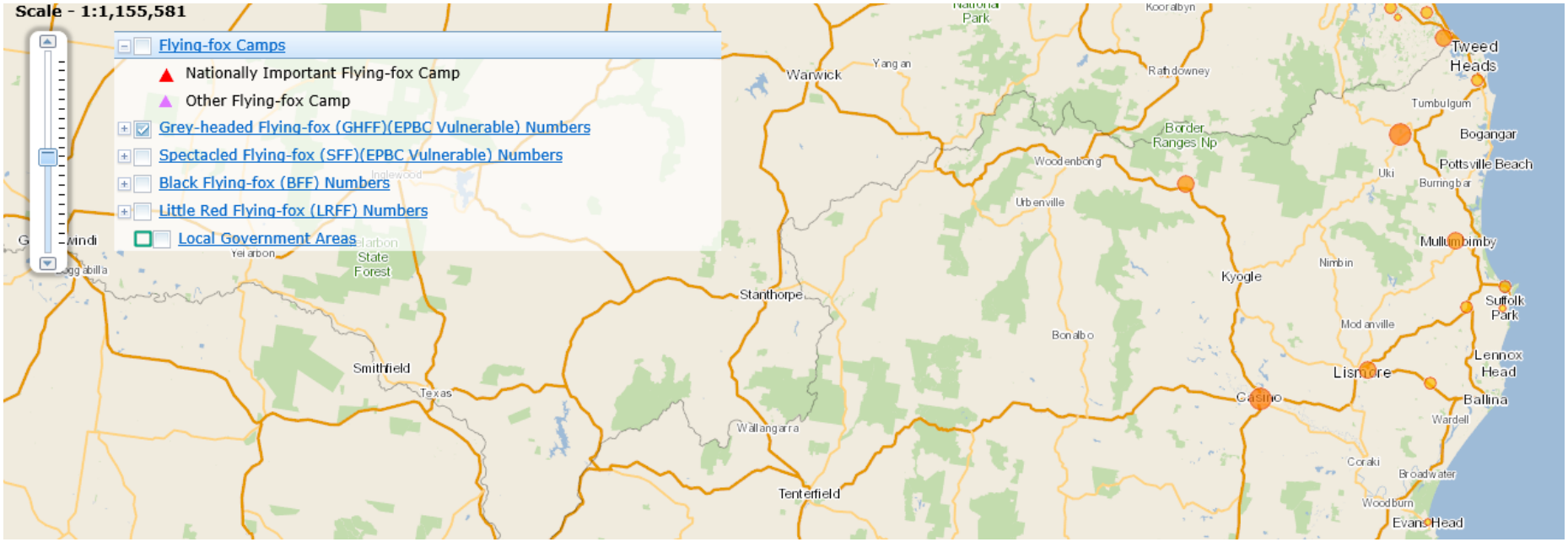

Figure 15: National Flying-fox monitoring viewer map

The EPBC Act Referral Guidelines for the vulnerable Koala (DoE, 2014) provides assessment criteria and a scoring system to assist in determining the presence of 'habitat critical to the survival of the Koala'. Under the Guidelines, impact areas that score 5 or higher are considered to contain 'habitat critical to the survival of the Koala'. These criteria have been applied to the project area, with a resulting score of 6 (see Table 35). Therefore, the following assessment has been undertaken on the basis that the project area provides habitat critical to the survival of the species.

Table 34: Assessment of Significance: Koala (vulnerable)

Criterion	Question	Response
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:		
1)	lead to a long-term decrease in the size of an important population of a species	No. There is evidence of historical use of the project area by Koala (ELA 2014), however the conclusion of this report was that there was a low density of Koala activity across the site. This is supported by the lack of recent evidence of Koala presence or site usage. Furthermore, the project area does not contain any primary food trees and only two species of secondary food tress, thereby limiting the likely value of the site to the species. It is therefore considered that there is not an important population of Koala in the project area.
2)	reduce the area of occupancy of an important population	No. The project area is not considered to support an important population of Koala – see criterion 1 above.
3)	fragment an existing important population into two or more populations	No. The project area is not considered to support an important population of Koala – see criterion 1 above.
4)	adversely affect habitat critical to the survival of a species	Unlikely. When considered against the criteria in the EPBC Act Referral Guidelines for the vulnerable Koala (DoE, 2014), the features of the project area should be considered habitat critical to the survival of the species. The proposal will result in clearing of 4.63 ha of such habitat. The Koala referral guidelines provide advice about the thresholds beyond which the clearing of habitat critical to the survival of the Koala would be considered significant, these include: • For habitat scoring 5 – 100 ha • For habitat scoring 6 or 7 – 25 ha • For habitat scoring 7 or 8 – 10 ha • For habitat scoring 9 or 10 – 5 ha The clearing for the project is under these thresholds and is therefore not considered to be a significant impact on habitat critical to the survival of the species.
5)	disrupt the breeding cycle of an important population	No. The project area is not considered to support an important population of Koala – see criterion 1 above.
6)	modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that	No. There is evidence of historical use of the project area by Koala (ELA 2014), however the conclusion of this report was that there was a low density of Koala activity across the site. This is supported by the lack of recent evidence of Koala

Criterion	Question	Response
	the species is likely to decline	presence or site usage. Furthermore, the project area does not contain any primary food trees and only two species of secondary food tress, thereby limiting the likely value of the site to the species. It is therefore considered unlikely that the removal of 4.63 ha of foraging habitat (secondary food trees) would result in the decline of this species.
7)	result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	No. Dog attack is listed as a key threat to this species. However, the project area is situated in a mix of rural/ cleared and vegetated areas, and within the project area is an existing quarry. The expansion of the existing quarry footprint is not likely to exacerbate the presence of dogs, which already exist within the wider area.
8)	introduce disease that may cause the species to decline, or	No. Chlamydia is a known threat to Koala and there is increasing evidence that other diseases may be impacting the population. However, the project is unlikely to present a significant ecological stress on any individuals that may utilise the subject site and therefore the works are unlikely to introduce or exacerbate Chlamydia or any other disease that may cause this species to decline.
9)	interfere substantially with the recovery of the species.	No. The Koala recovery plan (DECC 2008) provides a framework for localised recovery efforts throughout NSW through a number of recovery actions. The actions include: • Conserving Koalas in their existing habitat, rehabilitate and restore Koala habitat and populations • Develop a better understanding of the conservation biology of Koalas • Ensure that the community has access to factual information about the distribution, conservation and management of koalas at a national, state and local level • Manage captive, sick or injured Koalas and orphaned wild Koalas to ensure consistent and high standards of care • Manage overbrowsing to prevent both koala starvation and ecosystem damage in discrete patches of habitat • Coordinate, promote the implementation, and monitor the effectiveness of the NSW Koala Recovery Plan across New South Wales The project is not inconsistent with the above listed objectives, as there is no recent evidence of site usage and only a small area of habitat comprised of secondary food trees would be removed.

Table 35: Assessment of Koala habitat within the subject site^

Attribute	Score	Coastal context	Score	Justification
Koala occurrence	+2 (high)	Evidence of one or more Koalas within the last 2 years.	1	Scats of koala were identified during a targeted survey within the project area in 2014 (ELA, 2014)
	+1 (medium)	Evidence of one or more koalas within 2 km of the edge of the impact area within the last 5 years.		
	0 (low)	None of the above.		
Vegetation composition	+2 (high)	Has forest or woodland with 2 or more known Koala food tree species, OR 1 food tree species that alone accounts for >50% of the vegetation in the relevant strata.	2	*Eucalyptus moluccana* and *Eucalyptus caliginosa* are known secondary food tree species and occur within the site. As per the Koala referral guidelines (pp. 5), 'primary' and 'secondary' food trees are all considered to be 'food trees' for the purposes of assessment using these guidelines.
	+1 (medium)	Has forest or woodland with only 1 species of known Koala food tree present.		
	0 (low)	None of the above.		
Habitat connectivity	+2 (high)	Area is part of a contiguous landscape ≥ 500 ha.	1	Native vegetation within the site is part of contiguous vegetation patch of 380ha
	+1 (medium)	Area is part of a contiguous landscape < 500 ha, but ≥ 300 ha.		
	0 (low)	None of the above.		
Key existing threats	+2 (high)	Little or no evidence of Koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for Koala occurrence. Areas which score 0 for Koala occurrence and have no dog or vehicle threat present	2	No records of deceased koalas within or adjacent to the area were found within the Wildlife Atlas or included the Northern Tablelands Koala Recovery Strategy 2015-2025 (Northern Tablelands Local Land Services, 2016).
	+1 (medium)	Evidence of infrequent or irregular Koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for Koala occurrence, OR Areas which score 0 for koala occurrence and are likely to have some degree dog or vehicle threat present.		
	0 (low)	Evidence of frequent or regular Koala mortality from vehicle strike or dog attack in the study area at present, OR		

		Areas which score 0 for Koala occurrence and have a significant dog or vehicle threat present.		
Recovery value	+2 (high)	Habitat is likely to be important for achieving the interim recovery objectives for the relevant context.	0	The study area is located in between two populations which are not connected due to an existing barrier. However, a record of koala within the site was found in 2014, and the site is connected to a large area of vegetation to the north which contains the northern population. A relevant recovery objective is: conserving Koalas in their existing habitat, rehabilitate and restore Koala habitat and populations. It is unlikely that this will be an important habitat to achieve this.
	+1 (medium)	Uncertain whether the habitat is important for achieving the interim recovery objectives for the relevant context.		
	0 (low)	Habitat is unlikely to be important for achieving the interim recovery objectives for the relevant context.		
Habitat score:			6	

Conclusion:

- As per the Guidelines (DoE, 2014), Impact areas that score five or more using the habitat assessment tool for the koala contain habitat critical to the survival of the koala.
- Due to the score of six, the impact area is assessed as containing habitat critical to the survival of the Koala.

^ The subject site is categorised as a 'coastal' area as it experiences more than 800 millimetres of rainfall per annum, and as defined in Map 2 of the Guidelines (DoE, 2014).

Table 36: Assessment of Significance: Listed Migratory Species

Criterion	Question	Response
1)	Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of **important habitat** for a migratory species	The area impacted contains potential important habitat for the two identified migratory species. Important habitat is defined in the guidelines (DoE, 2015) as follows: Fork-tailed Swift – Found across a range of habitats, from inland open plains to wooded areas, where it is exclusively aerial. Satin Flycatcher – Eucalypt forest and woodlands, at high elevations when breeding. They are particularly common in tall wet sclerophyll forest, often in gullies or along water courses. In woodlands they prefer open, grassy woodland types. During migration, habitat preferences expand, with the species recorded in most wooded habitats except rainforests. The area thresholds of important habitat for each species likely to result in a significant impact if affected is given bellow (DoE, 2015). Fork-tailed Swift – Not determined Satin Flycatcher – 4,400 ha[2] The area impacted does not meet the area thresholds for the Satin Flycatcher and only represents a minute proportion of the available potential habitat within the locality for the Fork-tailed Swift. Given the extensive areas of suitable habitat available nearby for the species, it is

Criterion	Question	Response
		unlikely that the proposal will result in a significant impact to these species.
2)	Result in an invasive species that is harmful to the migratory species becoming established in an area of **important habitat** for the migratory species	Although the area impacted does contain important habitat for the four species, the proposal is unlikely to introduce any new invasive species to the locality.
3)	Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an **ecologically significant proportion of the population** of a migratory species	This question does not apply as the proposal will affect substantially less than the ecologically significant proportion of the population given in the guidelines (DoE, 2015): Fork-tailed Swift – 1,000 individuals Satin Flycatcher – 17,000 individuals

2.5.2 SEPP 44

The proposed development is located within a Local Government Area to which SEPP 44 applies. The identification of an area of land as Potential Koala Habitat is determined by the presence of primary koala-food tree species. These species are listed under Schedule 2 of SEPP 44: Koala Habitat Protection.

Potential Koala Habitat is defined as areas where the tree species listed under Schedule 2 constitute at least 15% of the total number of trees in the upper and lower strata of the tree component.

The Schedule 2 Primary Preferred food species occurring in the Tenterfield LGA are: *Eucalyptus punctata* (Grey Gum), *E. microcorys* (Tallowwood), *E. robusta* (Swamp Mahogany), *E. tereticornis* (Forest Red Gum) and *E. viminalis* (Manna Gum).

The subject land does not contain any koala feed trees listed on Schedule 2 of SEPP No. 44, hence is not Potential Koala Habitat. Therefore, assessment for Core Koala Habitat is not required.

No further provisions of SEPP 44 are relevant to the proposal.

3. References

Catling, P. C. and Burt, R. J. (1995) Why are red foxes absent from some eucalypt forests in eastern New South Wales? *Wildlife Research* **22**, 535-546.

Department of the Environment, 2013. Matters of National Environmental Significance. Significance Impact Guidelines 1.1. Environmental Protection and Biodiversity Conservation Act 1999. Commonwealth of Australia

Department of the Environment, 2014. EPBC Act Referral Guidelines for the vulnerable koala (combined populations of Queensland, New South Wales and the Australian Capital Territory. Commonwealth of Australia

Department of the Environment, 2015. Referral guideline for 14 birds listed as migratory species under the EPBC Act. Commonwealth of Australia

Department of Environment and Climate Change, 2008. Recovery Recovery Plan for the koala (Phascolarctos cinereus). Department of Environment and Climate Change NSW

Department of Environment, Climate Change and Water NSW [DECCW], 2009. Draft National Recovery Plan for the Grey-headed Flying-fox Pteropus poliocephalus. Prepared by Dr Peggy Eby. Department of Environment, Climate Change and Water NSW, Sydney.

Department of Environment, Land, Water and Planning. [DoELWP] 2016. National Recovery Plan for the Spotted-tailed Quoll Dasyurus maculatus. Australian Government, Canberra.

Eco Logical Australia 2014. Ecological Assessment for Dowe's Quarry, Tenterfield NSW. Prepared for R.W. Corkery & Co Pty Ltd on behalf of Darryl McCarthy Constructions Pty Ltd.

Northern Tablelands Local Land Services, 2016. Northern Tablelands Koala Recovery Strategy 2015-2025. Prepared by The Envirofactor on behalf of Northern Tablelands Local Land Services

Saunders, D.L. and Tzaros, C.L. 2011. *National Recovery Plan for the Swift Parrot Lathamus discolor*, Birds Australia, Melbourne.

Appendix A Vegetation plot data

Plot Location Data							
Plot no	PCT	Vegetation zone	Condition	Zone	Easting	Northing	Bearing
Plot 1	568	2	good	56	406995	6791680	350
Plot 2	568	1	poor	56	406677	6791606	30
Plot 3	568	2	good	56	407323	6791866	50
Plot 4	568	2	good	56	407501	6791720	60

Composition (number of species)						
Plot no.	Tree	Shrub	Grass	Forb	Fern	Other
1	3	2	7	7	1	3
2	1	0	4	6	1	1
3	3	2	7	5	0	3
4	4	1	10	13	0	2

Structure (Total cover)						
Plot no	Tree	Shrub	Grass	Forb	Fern	Other
1	25	8	21.5	1.1	0.3	0.3
2	0.1	0	0.4	0.7	0.1	0.1
3	45.2	1.1	4.2	0.7	0	0.5
4	62.2	0.3	67.7	1.6	0	0.5

Function											
Plot no.	Large Trees	Hollow trees	Litter Cover	Length Fallen Logs	Tree Stem 5- 9 cm	Tree Stem 10-19 cm	Tree Stem 20-29 cm	Tree Stem 30-49 cm	Tree Stem 50-79 cm	Tree Regen	High Threat Weed Cover
1	2	5	58	76	present	present	present	present	present	present	0.1
2	0	0	64	5	present	absent	absent	absent	absent	present	90.2
3	2	1	36	72	present	absent	present	present	present	present	1
4	3	1	80	55	present	absent	present	present	present	present	0.2

Plot no	Photo
Plot 1	
Plot 2	

Plot no	Photo
Plot 3	
Plot 4	

Plot Flora list

Species	Common Name	Exotic	High Threat Weed	Growth Form Group	plot 1		Plot 2		Plot 3		Plot 4	
					Cover	Abundance	Cover	Abundance	Cover	Abundance	Cover	Abundance
Acacia brownii	Heath Wattle			Shrub (SG)	0	0	0	0	0.1	1	0	0
Acacia irrorata	Green Wattle			Shrub (SG)	5	1	0	0	0	0	0	0
Acacia melanoxylon	Blackwood			Tree (TG)	0	0	0	0	0.2	1	0	0
Acetosella vulgaris	Sheep Sorrel	yes	Yes		0	0	0.1	10	0	0	0	0
Allocasuarina torulosa	Forest Oak			Tree (TG)	5	2	0	0	0	0	0	0
Angophora subvelutina	Broad-leaved Apple			Tree (TG)	0	0	0.1	1	0	0	0	0
Aristida vagans	Three-awn Speargrass			Grass & grasslike (GG)	2	10	0	0	0	0	0	0
Brachychiton populneus	Kurrajong			Tree (TG)	0	0	0	0	0	0	0.2	2
Calotis cuneifolia	Purple Burr-Daisy			Forb (FG)	0.3	20	0.2	5	0	0	0.1	5
Cheilanthes sieberi	Rock Fern			Fern (EG)	0.3	20	0.1	20	0	0	0	0
Commelina cyanea	Native Wandering Jew			Forb (FG)	0.1	5	0.1	5	0.2	5	0.1	5
Crassula sieberiana	Australian Stonecrop			Forb (FG)	0	0	0	0	0	0	0.1	1
Cymbopogon refractus	Barbed Wire Grass			Grass & grasslike (GG)	2	10	0	0	0.3	8	1	10
Cyperus aggregatus		yes			0	0	0.1	3	0	0	0	0
Cyperus gracilis	Slender Flat-sedge			Grass & grasslike (GG)	0.2	10	0.1	10	0	0	1	100
Desmodium gunnii	Slender Tick-trefoil			Forb (FG)	0	0	0	0	0	0	0.1	3
Desmodium varians	Slender Tick-trefoil			Other (OG)	0.1	5	0	0	0	0	0	0

Plot Flora list												
Desmodium varians	Slender Tick-trefoil			Other (OG)	0	0	0.1	3	0	0	0	0
Dianella revoluta	Blueberry Lily			Forb (FG)	0	0	0	0	0.1	1	0	0
Dichondra repens	Kidney Weed			Forb (FG)	0.3	15	0.1	20	0.2	10	0.2	10
Echinopogon ovatus	Forest Hedgehog Grass			Grass & grasslike (GG)	15	100	0	0	0.2	5	2	6
Einadia trigonos	Fishweed			Forb (FG)	0.1	5	0.1	5	0	0	0.2	10
Epilobium spp.				Forb (FG)	0	0	0	0	0	0	0.1	5
Eragrostis brownii	Brown's Lovegrass			Grass & grasslike (GG)	0	0	0	0	0	0	0.5	15
Eragrostis curvula	African Lovegrass	yes	Yes		0	0	90	1000	0.2	8	0.1	0.2
Eragrostis leptostachya	Paddock Lovegrass			Grass & grasslike (GG)	2	50	0	0	2	20	60	500
Eragrostis leptostachya	Paddock Lovegrass			Grass & grasslike (GG)	0	0	0	0	0.2	3	0	0
Eucalyptus biturbinata	Grey Gum			Tree (TG)	5	2	0	0	0	0	20	2
Eucalyptus caliginosa	Broad-leaved Stringybark			Tree (TG)	15	20	0	0	20	9	2	1
Eucalyptus moluccana	Grey Box			Tree (TG)	0	0	0	0	25	3	40	2
Gahnia aspera	Rough Saw-sedge			Grass & grasslike (GG)	0.1	1	0	0	0	0	0.3	2
Geitonoplesium cymosum	Scrambling Lily			Other (OG)	0.1	1	0	0	0.03	3	0	0
Glycine spp.				Other (OG)	0.1	5	0	0	0	0	0	0
Glycine tabacina	Variable Glycine			Other (OG)	0	0	0	0	0.1	5	0.3	8
Goodenia spp.				Forb (FG)	0	0	0	0	0.1	5	0.2	10
Hardenbergia violacea	False Sarsaparilla			Other (OG)	0	0	0	0	0.1	1	0.2	2
Hypochaeris radicata	Catsear	yes			0	0	0.1	10	0	0	0	0

Plot Flora list												
Juncus spp.	A Rush			Grass & grasslike (GG)	0	0	0.1	2	0	0	0	0
Lagenophora stipitata	Common Lagenophora			Forb (FG)	0	0	0	0	0	0	0.1	3
Ligustrum lucidum	Large-leaved Privet	yes	yes		0	0	0	0	0.5	1	0	0
Ligustrum sinense	Small-leaved Privet	yes	yes		0	0	0	0	0.3	2	0	0
Lobelia spp.				Forb (FG)	0.1	5	0	0	0	0	0.1	6
Lomandra filiformis	Wattle Matt-rush			Grass & grasslike (GG)	0	0	0	0	0.2	5	0	0
Lomandra glauca	Pale Mat-rush			Grass & grasslike (GG)	0	0	0	0	0	0	0.2	3
Lomandra longifolia	Spiny-headed Mat-rush			Grass & grasslike (GG)	0	0	0.1	2	0.2	5	0.2	6
Lomandra multiflora subsp. multiflora	Many-flowered Mat-rush			Grass & grasslike (GG)	0.2	2	0	0	0	0	0	0
Mentha spp.				Forb (FG)	0	0	0	0	0	0	0.1	3
Microlaena stipoides	Weeping Grass			Grass & grasslike (GG)	0	0	0.1	5	0	0	0.5	25
Olearia viscidula	Wallaby Weed			Shrub (SG)	0	0	0	0	1	1	0	0
Opercularia hispida	Hairy Stinkweed			Forb (FG)	0	0	0	0	0	0	0.1	1
Oxalis spp.				Forb (FG)	0.1	5	0.1	1	0.1	5	0	0
Ozothamnus spp.				Shrub (SG)	3	2	0	0	0	0	0.3	2
Paronychia brasiliana	Chilean Whitlow Wort, Brazilian Whitlow	yes			0	0	0.1	3	0	0	0	0
Plantago debilis	Shade Plantain			Forb (FG)	0	0	0	0	0	0	0.1	3
Rumex spp.	Dock			Forb (FG)	0	0	0.1	2	0	0	0	0

Plot Flora list												
Rytidosperma spp.				Grass & grasslike (GG)	0	0	0	0	0.1	3	2	10
Senecio madagascariensis	Fireweed	yes	yes		0.1	1	0.1	1	0	0	0.1	2
Solanum spp.				Forb (FG)	0.1	3	0	0	0	0	0	0

Appendix B Biodiversity credit report

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00017495/BAAS19048/19/00017496

Proposal Name
Dowes Quarry updated 9 Sept 2019

BAM data last updated *
30/08/2019

Assessor Name

Assessor Number

BAM Data version *
13

Proponent Names

Report Created
13/09/2019

BAM Case Status
Open

Assessment Revision
1

Assessment Type
Part 4 Developments (General)

Date Finalised
To be finalised

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Nil

Species
Vespadelus troughtoni / Eastern Cave Bat

Additional Information for Approval

PCTs With Customized Benchmarks

No Changes

BAM Biodiversity Credit Report (Like for like)

Predicted Threatened Species Not On Site

No Changes

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	Number of credits to be retired
568-Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion	Not a TEC	6.4	134.00

568-Broad-leaved Stringybark shrub/grass open forest of the New England Tableland Bioregion

Like-for-like credit retirement options

Class	Trading group	HBT	IBRA region
New England Dry Sclerophyll Forests This includes PCT's: 524, 526, 540, 541, 542, 559, 568, 608, 632, 738, 740, 949, 965, 970, 996, 997, 1164, 1394, 1396	New England Dry Sclerophyll Forests - ≥ 50% - < 70% cleared group (including Tier 6 or higher).	Yes	Tenterfield Plateau, Binghi Plateau, Deepwater Downs, Nandewar Northern Complex, Northeast Forest Lands, Rocky River Gorge and Stanthorpe Plateau. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

Species Credit Summary

Species	Area	Credits
Cercartetus nanus / Eastern Pygmy-possum	4.6	154.00
Ninox connivens / Barking Owl	4.7	121.00
Ninox strenua / Powerful Owl	4.7	121.00
Tyto novaehollandiae / Masked Owl	4.7	121.00
Vespadelus troughtoni / Eastern Cave Bat	4.6	230.00

Cercartetus nanus/ Eastern Pygmy-possum	568_Good	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Cercartetus nanus/Eastern Pygmy-possum	Any in NSW
Ninox connivens/ Barking Owl	568_Good	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Ninox connivens/Barking Owl	Any in NSW
	568_Low_cleared	**Like-for-like credit retirement options**	

		Spp	IBRA region
		Ninox connivens/Barking Owl	Any in NSW
Ninox strenua/ Powerful Owl	568_Good	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Ninox strenua/Powerful Owl	Any in NSW
	568_Low_cleared	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Ninox strenua/Powerful Owl	Any in NSW
Tyto novaehollandiae/ Masked Owl	568_Good	**Like-for-like credit retirement options**	
		Spp	IBRA region
		Tyto novaehollandiae/Masked Owl	Any in NSW

Tyto novaehollandiae/ Masked Owl	568_Good	
	568_Low_cleared	**Like-for-like credit retirement options**
		Spp / IBRA region
		Tyto novaehollandiae/Masked Owl / Any in NSW
Vespadelus troughtoni/ Eastern Cave Bat	568_Good	**Like-for-like credit retirement options**
		Spp / IBRA region
		Vespadelus troughtoni/Eastern Cave Bat / Any in NSW

Appendix C Vegetation Clearing Protocol

Darryl McCarthy Constructions Pty Ltd

Vegetation Clearing Protocol for Operations at the Dowe's Quarry, Tenterfield

This protocol has been compiled in recognition of the need to avoid, wherever possible, any direct impacts on fauna species inhabiting the hollow-bearing trees within the approved extraction area or Koalas present in any trees to be cleared.

Aspect and Associated Management	Action Taken/Comments
Weed Management	
• All new machinery to arrive on site free of caked mud and dirt (which can potentially carry weed seed).	
• Weed controls, such as inspection of the undercarriage of any equipment brought onto the quarry site prior to each campaign of vegetation clearing.	
• Management and removal of weed species should occur immediately prior to clearing of mature trees.	
Clearing Mature Trees (including hollow-bearing trees)	
• Ensure that all areas of proposed disturbance are clearly marked prior to the commencement of clearing campaigns.	
• Engage a qualified or suitably experienced spotter-catcher to undertake an initial assessment of the mature trees to be cleared for threatened species and to guide and inspect the felling of hollow-bearing trees.	
• Check all trees for the presence of nesting or roosting fauna before felling or pushing, then start tree removal immediately after the visual inspection.	
• When a tree with hollows requires removal, the tree is to be gradually nudged at intermittent intervals so that any fauna has the chance of vacating the area after the initial disturbance. There should be a pause of at least one minute between intervals and at the end of the process.	
• If no fauna appears, the tree is to be pushed over as slowly or gently as possible (known as 'soft felled').	
• After the felled tree has settled, the spotter-catcher is to inspect the hollows and any other part of the tree for the presence of fauna.	
• Where breeding threatened species are identified, works shall cease until the species is confirmed and necessary approvals are obtained. The breeding place will be fenced	

Aspect and Associated Management	Action Taken/Comments
off and excluded from works. Works shall not continue until the breeding place is no longer active.	
• Where possible avoid impact on trees that have hollows: o >20cm (potential breeding habitat for Masked, Barking and Powerful Owl) between May-Dec; o up to 10cm (potential breeding habitat for Eastern Pygmy Possum) between Sep-March.	
• Avoid leaving trees on ground unmanaged for more than two weeks as these would quickly become habitat for hollow-dependent species.	
• Salvage tree trunks, major limbs and, if practicable, minor branches for use in rehabilitation of disturbed areas within the Quarry.	
Observations for Koalas	
For each clearing campaign, the following should occur. • An initial site assessment is undertaken by a spotter-catcher to identify if any Koalas are present in the trees to be removed.	
• If Koalas are observed within the area to be cleared, only the surrounding vegetation should be cleared (this must not include any tree with a crown overlapping a tree where a Koala is present).	
• Clearing of the remaining area where Koalas are present will not recommence until the Koala has moved without human intervention.	
Other	
• Allow any other fauna that has become displaced from vegetation clearing to find its way to remnant vegetation and give suitable assistance to any injured fauna including capture and transfer to a local veterinarian or WIRES representative where necessary.	

This page has intentionally been left blank

ecological AUSTRALIA
A TETRA TECH COMPANY

1300 646 131
www.ecoaus.com.au