Report

Biodiversity Development Assessment Report

Redden's Quarry

Quarry Solutions

12 August, 2019

Rev 1 (Final)

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History

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Endorsements

Function	Signature	Name and Title	Date
Field Assistance and Preparation of Report		Jed Field Ecologist	12 August, 2019
Field Assistance and Document Review		Luke Pickett Senior Ecologist / Biodiversity Accredited Assessor BAAS17100	12 August, 2019
Preparation and Certification of the Assessment		Dr Rod Bennison Lead Environmental Scientist / Biodiversity Accredited Assessor BAAS19023	12 August, 2019

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GLOSSARY

Definitions

Cumulative impact	The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Refer to Clause 228(2) of the EP&A Regulation 2000 for cumulative impact assessment requirements.
Direct impact	Where an event or circumstance is a direct consequence of the action (ref http://www.environment.gov.au/system/files/resources/0b0cfb1e-6e28-4b23-9a97-fdadda0f111c/files/environment-assessment-manual.pdf).
Habitat	An area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community, including any biotic or abiotic component
Indirect impact	Where a primary action is a substantial cause of a secondary event or circumstance which has an impact on a protected matter (ref http://www.environment.gov.au/system/files/resources/0b0cfb1e-6e28-4b23-9a97-fdadda0f111c/files/environment-assessment-manual.pdf).
Matters of NES	A matter of national environmental significance (NES) protected by a provision of Part 3 of the EPBC Act
Mitchell landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000
Mitigation	Action to reduce the severity of an impact
Population	All the individuals that interbreed within a given area.
Proposal area/ Proposal site	The area of land that is directly impacted on by a proposed Major Proposal that is under the EP&A Act, including access roads, and areas used to store construction materials
Study area	The area directly affected by the development and any additional areas likely to be affected by the development, either directly or indirectly
Target species	A species that is the focus of a study or intended beneficiary of a conservation action or connectivity measure.

Abbreviations

BC Act	Biodiversity Conservation Act 2016
BVT	Biometric Vegetation Type
CEMP	Construction Environmental Management Plan
DP&E	Department of Planning and Environment
DPI	Department of Primary Industries
DPIE	Department of Planning, Industry and Environment
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999 (Federal)
FBA	Framework for Biodiversity Assessment
FM Act	Fisheries Management Act 1994 (NSW)
GDE	Groundwater Dependent Ecosystems
IBRA	Interim Biogeographically Regionalisation of Australia
MNES	Matters of National Environmental Significance
OEH	Office of Environment and Heritage
PCT	Plant Community Type
REF	Review of Environmental Factors
SEARS	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
TEC	Threatened Ecological Communities
TSPD	Threatened Species Profile Database
VIS	Vegetation information system

1. INTRODUCTION

Advitech Pty Limited (trading as Advitech Environmental) was engaged by Groundwork Plus Pty Ltd (Groundwork Plus) on behalf of Quarry Solution Pty Ltd. Groundwork Plus is compiling an Environmental Impact Statement for Redden's Quarry, with the intent to supply the Australian Rail Track Corporation with extractive materials for the construction of the Melbourne to Brisbane Inland Rail project. This Biodiversity Development Assessment Report (BDAR) has been completed in accordance to the Biodiversity Assessment Methodology (BAM). The Redden's Quarry proposal is considered Designated Development under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). As such, this BDAR supports the Environment Impact Statement (EIS) completed in accordance with the Planning Secretary's environmental assessment requirements (EAR 1250).

It should be noted that this report was prepared by Advitech Pty Limited for Quarry Solutions Pty Ltd ('the customer') in accordance with the scope of work and specific requirements agreed between Advitech and the customer. This report was prepared with background information, terms of reference and assumptions agreed with the customer. The report is not intended for use by any other individual or organisation and as such, Advitech will not accept liability for use of the information contained in this report, other than that which was intended at the time of writing.

1.1 Project Background

Groundwork Plus propose to develop and operate a hard rock quarry off Wallaby Road, south east of the township of Narromine (a site map is provided in **Figure 1.1**). The Redden's Quarry is one of several possible sources of ballast material for the Inland Rail project. The quarry proposes to extract up to 490,000 tonnes of material per annum over a four year period.

While the proposed area includes an area of 8.22 ha, a number of existing tracks are present through this area. Overall, the proposed clearing will only impact on 7.84 ha of existing native vegetation. The proposed project exceeds the threshold for clearing under the *Biodiversity Conservation Regulation 2017*, above which the BAM and NSW Biodiversity Offsets Scheme apply.

The proposed works would include:

- Construction and operation of a new hard rock quarry;
- Preparation of materials (crushing and stockpiling) in a manner required by the Inland Rail project;
- Transport of materials off the property to a rail loading point within the rail corridor; and
- Rehabilitation of the quarry to a suitable landform for continuing rural activities and plant community restoration.

1.2 Site Description

The proposed Redden's Quarry is located along Wallaby Road, approximately 7 kilometres south east of the township of Narromine on the New South Wales Central West slopes and plains. The proposed quarry lies on Lot 102 DP 792484 within the Narromine Local Government Area on land zoned RU1 Primary Production. The lot comprises of 560 hectares, although the footprint of the quarry would be 8.22 hectares. The haul road to the quarry area will follow an existing access track (see **Figure 1.1**).

A low hill (a knoll), located at the far south eastern end of the proposal site rises approximately 20 metres above the surrounding plains with a maximum elevation of 269 metres. The knoll consists of less fertile Red Earths (granites, metasediments and chernozems) while the surrounding plains consist of solodic soils. Land surrounding the knoll is tilled and supports cropping including wheat production.

Vegetation in the study area is generally sparse, often restricted to road corridors or drainage lines. At the proposal site, vegetation on the knoll is isolated and significantly disturbed with mature trees largely restricted to the crest of the hill. West of the knoll, adjoining the Wallaby Road corridor, the proposal site supports a 14 ha stand of Mixed Box Eucalypt woodland not subject to this BDAR assessment. A location map showing site features is provided in **Figure 1.2**.

The following definitions are used throughout this report to refer to locations in the project area:

- The 'proposal site/area' is the development footprint comprising all areas that would be directly impacted by the works. This includes all areas proposal to vegetation clearing and earthworks;
- The 'study area' includes the proposal site and the areas adjacent to the proposal site that may be indirectly impacted by the proposed works; and
- The 'search area' refers to a 20 km area surrounding the proposal site for the purpose of database searches.

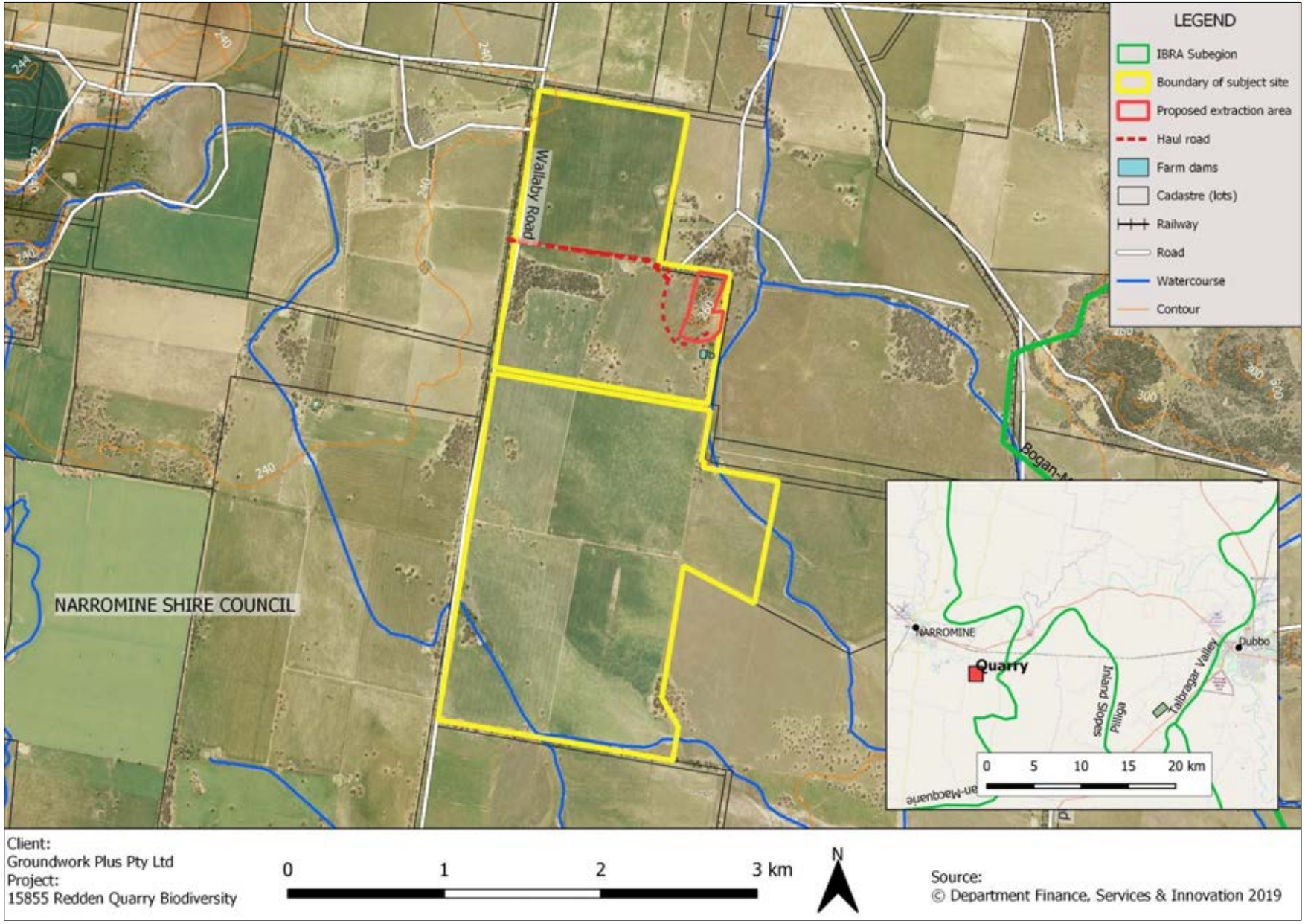

Figure 1.1: Site Map and insert, IBRA subregion boundaries.

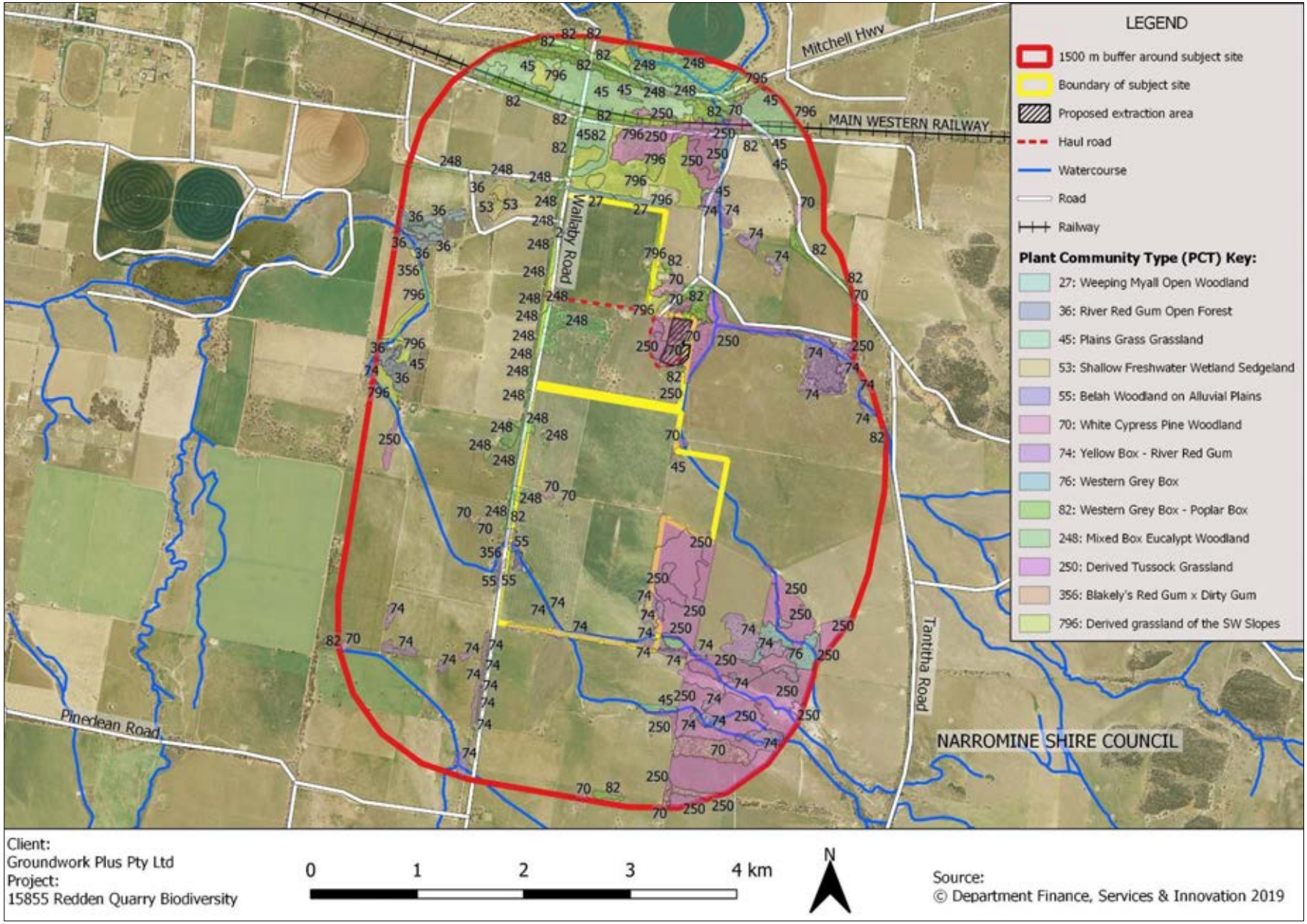

Figure 1.2: Location Map showing habitat connectivity and indicative PCT (according to the Central Tablelands VIS ID 4778).

1.3 Secretary's Environmental Assessment Requirements

This report will be appended to an Environmental Impact Statement (EIS) which must comply with the requirements of Clauses 6 and 7 of the Environmental Planning and Assessment Regulation 2000, and which addresses environmental considerations identified in the Planning Secretary's Environmental Assessment Requirements (SEARs) (EAR 1250) relevant to biodiversity.

The SEARs notes the following requirements for biodiversity assessment including:

- Accurate predictions of any vegetation clearing on site;
- 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 *Biodiversity Conservation Act 2016*; and
- 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.

1.4 Study Aims

This study aims to assess the potential impacts of the proposed works on the biodiversity values of the local area. Specifically, it aims to:

- Address relevant biodiversity requirements as set out in the SEARs;
- Describe the existing environment and assess site biodiversity values;
- Determine whether the proposed development is likely to significant affect threatened species or ecological communities protected under Federal and State legislation;
- Assess all direct and indirect potential impacts and, recommend measures to avoid and minimise any potential impacts on biodiversity values; and
- Determine offset requirements using the BAM calculator.

1.5 Legislative Context

1.5.1 New South Wales Legislation

1.5.1.1 Biodiversity Conservation Act 2016

The proposed project exceeds the threshold for clearing listed under Clause 7.23 of the Biodiversity Conservation Regulation 2017 (BC Regulation) (**Table 1.1**). Subsequently, biodiversity impacts related to the proposal are to be assessed in accordance with the Biodiversity Assessment Method (BAM) (OEH, 2017) and documented in a Biodiversity Development Assessment Report (BDAR). The BDAR must be prepared by an accredited assessor (BC Act, S.6.10) and include information in the form detailed in the BC Act (S.6.12), BC Regulation (S.6.8) and the BAM.

The BAM sets out the requirements for a repeatable and transparent assessment of terrestrial biodiversity values on land in order to:

- identify the biodiversity values on land subject to proposed development;
- determine the impacts of proposed development on biodiversity values; and
- quantify and describe the biodiversity credits required to offset the residual impacts of proposed development on biodiversity values.

Table 1.1: Offset Scheme Thresholds – Vegetation Clearing Area Criteria

Minimum lot size associated with the property	Threshold for clearing, above which the BAM and offsets scheme apply
Less than 1 ha	0.25 ha or more
1 ha, and less than 40 ha	0.5 ha or more
40 ha, and less than 1000 ha	1 ha or more
1000 ha or greater	2 ha or more

1.5.1.2 Environmental Planning and Assessment Act 1979

Development in NSW is subject to the requirements of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and its associated regulations and planning instruments. Developments requiring consent, such as the Redden's Quarry proposal, are assessed under Part 4 of the EP&A Act. As the proposed quarry is designated development, the application for development must be accompanied by an environmental impact assessment in the form prescribed by the accompanying regulations, and as stipulated in the SEARs detailed above. Where extractive industries, including quarries, generate more than 30,000 cubic metres per year and or disturb greater than 2.0 ha of land, consent under Schedule 3 (Part 19) of the Environmental Planning and Assessment Regulation 2000 (EP&A Regulation) is also required.

1.5.1.3 Local Planning Instruments

Development at the site is regulated under the Narromine Local Environmental Plan 2011. These policies determine which development is permissible, prohibited, exempt or complying. As the proposed quarry is on land zoned RU1 Primary Production, an extractive industry located at the proposal site would be permissible with development consent.

1.5.1.4 Commonwealth legislation

Under the Federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), referral is required to the Australian Government for proposed actions that have the potential to significantly impact on Matters of National Environmental Significance (MNES) or the environment of Commonwealth land. The assessment of the impact of the proposal on MNES and the environment of Commonwealth land found that there is unlikely to be a significant impact on relevant MNES or on Commonwealth land. Accordingly, the proposal has not been referred to the Australian Government Department of the Environment and Energy (DoEE) under the EPBC Act.

2. METHODOLOGY

This chapter outlines the methods (desktop and field survey investigations) used to determine the biodiversity values of the proposal site.

2.1 Key Personnel

Key personnel responsible for the assessment are detailed in **Table 2.1**

Table 2.1.: Key Personnel

Name	Role	Experience
Jed Field *BEnvSc&Mgt (Hons.I)*	Field work and author	Graduate ecologist with 5 years experience in ecological restoration and assisting in vegetation surveys. Associate member of the Ecological Consultants Association of NSW.
Luke Pickett *BEnvSci* *MWldMgt (Habitat)*	Field work and document review	Over 14 years of experience in the environmental and ecological consulting industry. Practicing member of the Ecological Consultants Association of NSW and accredited assessor (BAAS 17100).
Dr Rod Bennison *JP BSc MEnvStudies* *GCPTT PhD FLS*	Certification of the assessment	Over 15 years of experience in a consulting environment, with particular expertise in construction management. Practicing member of the Ecological Consultants Association of NSW and accredited assessor (BAAS19023).

2.2 Database Searches and Literature Reviews

A desktop assessment was undertaken that included searches of databases and a review of literature relevant to the site and local area, particularly:

- NSW Department of Planning, Industry and Environment (DPIE) (formerly Office of Environment and Heritage (OEH):
  - Atlas of NSW Wildlife database (licensed) for records of threatened species and endangered ecological communities which have been recorded within a 20 km radius (locality) of the subject site (February, 2019);
  - Vegetation information system (VIS) database: http://www.environment.nsw.gov.au/NSWVCA20PRapp/LoginPR.aspx;
  - NSW Vegetation Types Database: http://www.environment.nsw.gov.au/projects/BiometricTool.html;
  - State Vegetation Type Map: Central Tablelands Region Version 0.1. VIS ID 4778; and
  - NSW (Mitchell) Landscapes - version 3.1.
- Australian Government Department of the Environment and Energy (DoEE):
  - Protected Matters Search Tool for Matters of National Environmental Significance (MNES) listed under the EPBC Act within a 20 km radius from the site (December, 2018);
  - Interim Biogeographic Regionalisation for Australia (IBRA) version 7.0;
  - Significant Impact Guidelines 1.1 - Matters of National Environmental Significance (Department of the Environment, Water, Heritage and the Arts, 2013 EPBC Act Policy);

- Species Profiles and Threats Database (SPRAT) http://www.environment.gov.au/cgibin/sprat/public/sprat.pl;

- Australian Bureau of Meteorology (BOM):
  - National Atlas of Groundwater Dependent Ecosystems: http://www.bom.gov.au/water/groundwater/gde/index.shtml; and

- Spatial Information Exchange (SIX) Aerial Imagery for Map production.

2.3 Site Assessment

A site assessment was undertaken from 19 February to 21 February, 2019, by accreditor assessor (BAAS17100), Luke Pickett; and the Advitech Environmental ecologist, Jed Field.

2.3.1 Flora

A number of sampling techniques were used to ensure the site was adequately sampled. The site was scoped using the Random Meander Technique described by Cropper (1993). This involved walking in a random meander throughout the proposal site, visiting the full range of habitats and recording every plant species observed. Vegetation quadrat and transects were established according to **Section 2.2.1.1** and consistent with the *Biodiversity Assessment Method Operational Manual - Stage 1.* Plant community types (PCTs) were determined by comparing the floristic structure and composition of the vegetation on site with vegetation profiles described within the VIS database and community descriptions of endangered ecological communities known to occur in the local area. A list of all plant species recorded during fieldwork is listed in **Appendix I** and BAM site field survey forms in **Appendix II**. The location of the vegetation surveys is shown in **Figure 2.1**.

2.3.1.1 *Vegetation Plots*

Nine plots were used to assess the composition, structure and function components of vegetation integrity. **Table 2.2** shows that one PCT was identified on site. Around a central 50 m transect, a 20 x 20 metre quadrat was established to record floristic diversity and combined with a 20 x 50 metre quadrat for recording fauna habitat and forest regeneration. Within the 20 x 50 m plot area, five 1 m^2 plots were also established to assess groundcover composition.

Data collected within each plot/transect includes:

- Flora diversity and composition;
- Vegetation structure (including canopy, sub-canopy, shrub and groundcovers);
- Fauna habitats (including hollow trees, fallen timber);
- Regeneration of canopy species;
- Landscape features (including. slope, gully, and aspect);
- Soil features (including soil type, rocks, organic matter); and
- Geographical coordinates and a photographic record.

Table 2.2: Vegetation plots undertaken

PCT/ Zone	Patch size (ha)	Area(ha) of impact	Minimum plots required	Quadrats completed
70: White Cypress Pine woodland on sandy loams in central NSW wheatbelt				
Zone 1 (good condition)		3.25	2	2 (Q2,7)
Zone 2 (moderate condition)		0.45	1	1 (Q4)
Zone 3 (moderate condition)		1.62	1	2 (Q1,3)
Zone 4 (grassland in good condition)		1.31	1	3 (Q6,8,9)
Zone 5 (grassland in good condition)		1.21	1	1 (Q5)
TOTAL	> 100	7.84[1]	6	9

[1] Note, while the proposal area is 8.22 ha, only 7.84 ha of native vegetation would be impacted. This is attributed to cleared agriculture tracks in the proposal area.

2.3.2 Fauna

Fauna surveys targeted species that may occur within the habitat available within the proposal area. The sampling methods used to survey fauna habitat within the survey area are detailed below in **Table 2.3.** A list of all fauna species observed during fieldwork is provided in **Appendix I**. The location of targeted fauna surveys is shown in **Figure 2.1.**

Table 2.3: Fauna surveys conducted

Fauna Group	Surveys	Methods
Diurnal Birds	Area search	A search was undertaken to identify any birds present. Birds were identified from observations or call identification. A search for nests was also undertaken during the survey.

Fauna Group	Surveys	Methods
Herpetofauna	Habitat search	Opportunistic active searches reptiles were undertaken during the survey within suitable habitat (i.e. leaf litter, under rocks).
Microchiropteran Bats	Song Meter recording	Echo-location recording (conducted over two separate nights) targeting microchiropteran bats over the nearest waterbody to the proposal area (a farm dam; (see **Figure 2.1**).
All	Opportunistic sightings	Any opportunistic sightings and indications of fauna on site were recorded.

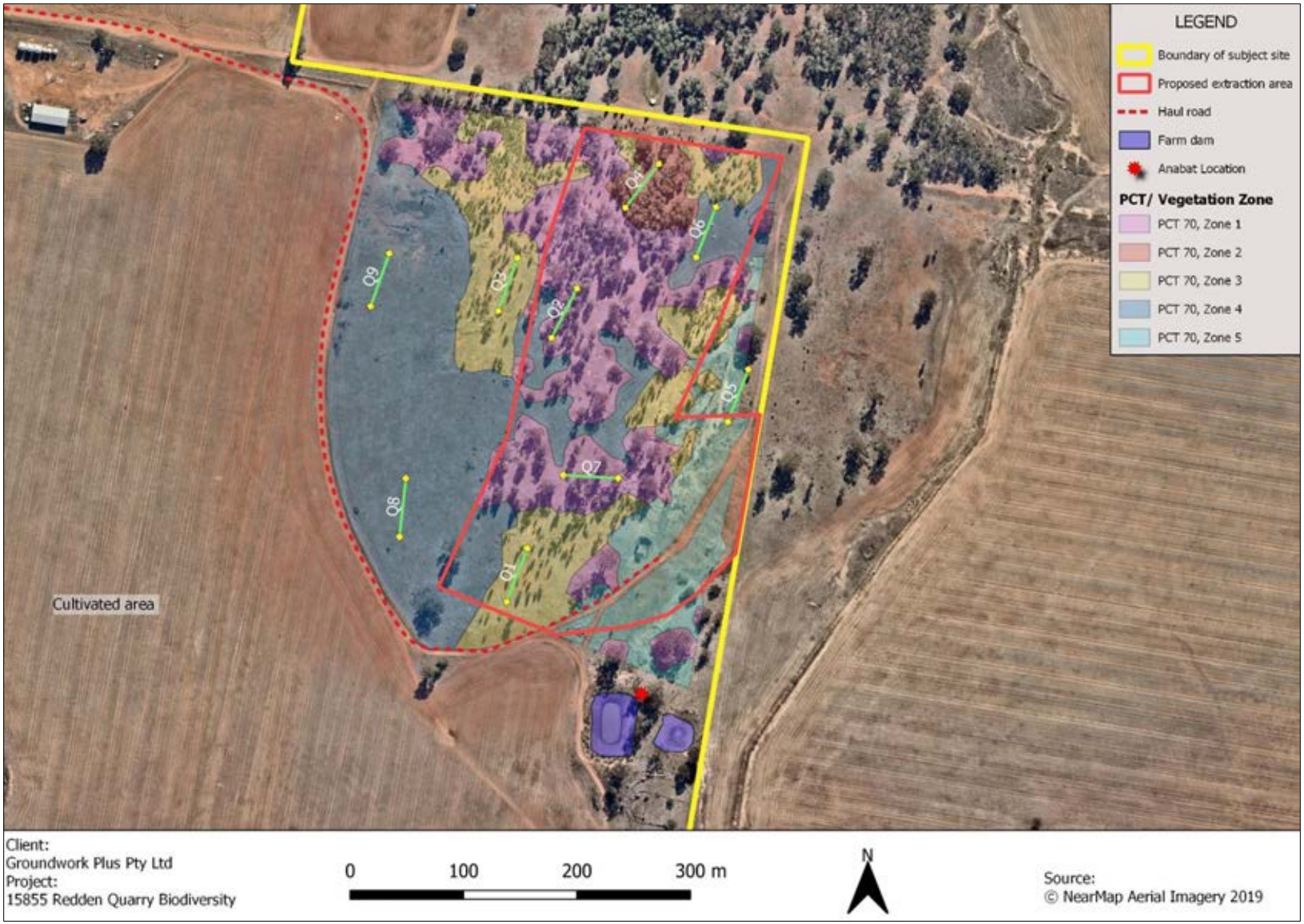

Figure 2.1: Location of quadrats and targeted fauna surveys.

2.4 Threatened species data searches

Three data sources were used to compile a list of threatened species that may potentially occur at the proposal site. They include:

1. BAM calculator list of predicted and candidate species;
2. Atlas of NSW Wildlife database (BioNet) records of threatened species within a 20km radius (locality) of the subject site; and
3. Commonwealth Department of the Environment and Energy (DoEE) website – Protected Matters Search Tool (PMST).

The BAM calculator may not import all potential threatened species that may occur at the proposal site. BioNet and PMST sources were used to provide a complete list of potential threatened species recorded in the search area of the proposal site. For each threatened species recorded from Bionet and PMST searches, the habitat suitability of the proposal site was assessed taking into account a number of factors including:

- Structural and floral diversity;
- Occurrence and extent of habitat types in the general vicinity;
- Continuity with similar habitat adjacent to the site, or connection with similar habitat off site by way of corridors;
- Key habitat features such as tree hollows, water bodies, caves and crevices, rocky areas;
- Degree of disturbance and degradation; and
- Topographic features such as aspect and slope.

Each species was assigned with a rating (**Table 2.4**) based on their likelihood to occur within the proposal site. The habitat assessment is provided in **Appendix III.**

Table 2.4: Likelihood of occurrence criteria

Likelihood Rating	Criteria
Known	The species was recorded within the study area during site surveys.
High	It is likely that a species would inhabit or utilise habitat within the proposal site. Criteria for this category may include: ▪ Species recently and/or regularly recorded in contiguous or nearby habitat. ▪ High quality habitat types or resources present within study area. ▪ Species is known or likely to maintain a resident population surrounding the study area. ▪ Species is known or likely to visit during migration or seasonal availability of resources.
Moderate	Potential habitat for a species occurs within the proposal site. Criteria for this category may include: ▪ Species previously recorded in contiguous habitat albeit not recently (>10 years). ▪ Poor quality, depauperate or modified habitat types and/or resources present within study area. ▪ Species has potential to utilise habitat during migration or seasonal availability of resources.

	▪ Cryptic flora species with potential habitat available within the proposal site that have not been seasonally targeted by surveys.
Low	It is unlikely that the species inhabits the area and would likely be considered a transient visitor if ever encountered. Criteria for this category may include: ▪ The proposal site or study area lacks specific habitat types or resources required by the species. ▪ The proposal site is beyond the current distribution of the species or is isolated from known populations. ▪ Non cryptic flora species that were found to be absent during targeted surveys. ▪ The proposal site only contains common habitat which would not be considered important for the local survival of a threatened species.
Unlikely	The habitat within proposal site and study area is unsuitable for the species.

2.5 Limitations

The effectiveness of a survey detecting a given species will be influenced by a range of factors. For this type of survey, such limitations are generally related to the short period of time in which the fieldwork was carried out during a single season. Given the small period of time spent within the study area, the detection of certain species may be limited by:

- Seasonal migration (particularly migratory birds);
- Seasonal flowering periods (some species are cryptic and are unlikely to be detected outside of the known flowering period);
- Seasonal availability of food such as blossoms;
- Weather conditions during the survey period (some species may go through cycles of activity related to specific weather conditions, for example some microchiropteran bats, reptiles and frogs can be inactive during cold weather); and
- Species lifecycle (cycles of activity related to breeding).

These limitations have been overcome by applying the precautionary principle in all cases where the survey methodology or impeded access to the impact area may have given a false negative result. All species have been assessed on the basis of the presence of their habitat and the likely significance of that habitat to a viable local population.

3. LANDSCAPE CONTEXT

In accordance with Section 4.2 of the BAM, this chapter identifies the landscape features within the proposal site and the assessment area surrounding the proposal site. **Table 3.1** provides an overview of the landscape context of the study area.

Table 3.1: Environmental context summary

Attribute	Description
LGA	Narromine Shire Council
Local Land Service Division	Central West
Zoning	RU1 (Primary Production)
Catchment	Macquarie-Bogan catchment
IBRA Bioregion	Darling Riverine Plains
IBRA Subregion	Bogan Macquarie
Characteristic landforms[1]	Channels, floodplains, and through flow swamps of past and present river systems.
Typical Soils[2]	Wyanga: This hydrogeological landscape covers areas of ridges to low hills and rolling rises, colluvial slopes and depositional areas. The soil landscapes in the Wyanga include portions of Goonumbla Soil Landscape (Red Chromosols - Sodic subsoils are widespread) and Habberworth Soil Landscape (Red Chromosols). Sappa Bulga: This hydrogeological landscape covers extends west from the Newell Highway to the Yellow Tank area, and north to almost Webbs Siding. The landscape is granitic with many landforms from steep, rugged tors to flat colluvial slopes, on the western slopes. The dominant soils are found within a number of soil landscapes. Glennie Ridge, Gullengambal and Oxley soil landscapes have surface soils of coarse loamy sands. Yellow Tank soil landscape surface soils which are silty clay loams and fine sandy clay loams. Wallaby Creek soil landscape surface soils are fine sandy clay loams and silty clay loams, but some fine sandy loam surface soils also occur.
Mitchell Landscape	Boggy Cowal Alluvial Plains (Bcp)
Groundwater Dependent Ecosystems (GDE)	No Aquatic or Terrestrial GDEs are known to occur in the proposal area.
Rivers and streams	No rivers or streams cross the subject site.
Wetlands	Not applicable
Areas of Geological Significance and Soil Hazards	Not applicable
Areas of Outstanding Biodiversity Value	Not applicable
Nearest NPWS park	Sappa Bulga (Community Conservation Area, Zone 1) National Park, located 19 km east.

[1] Description from Darling Riverine Plains Bioregion- Bogan-Macquarie subregion (OEH, 2019).

[2] Description from Hydrogeological Landscapes for the Western Central West Catchment (OEH, 2013)

3.1. Connectivity

Vegetation is isolated to the knoll of the hill and does not connect to large areas of continuous vegetation in the local landscape. Paddock trees provide 'stepping stones' which help support highly mobile species such as birds move across the landscape, to and from the proposal area. This proposal is unlikely to result in any impacts on wildlife movement in the local landscape but will impact movement of wildlife on the knoll at the proposal site.

3.2. Assessing native vegetation cover

Using the Central Tablelands Region State Vegetation Type Map (Version 0.1, VIS ID 4778), native vegetation cover on the proposal site and within 1500 m of the outside boundary was considered as per the BAM. The total assessment area is 2963 ha, **Table 3.2** shows that 13 PCTs were recorded which cover a total area of 727 ha. Native vegetation cover was assigned as 24.5% in the BAM calculator.

Vegetation cover in the assessment area is based on satellite imagery up to the year 2005. Review of new aerial imagery in the assessment area (May, 2019) determined that many mapped areas of PCTs are now cleared of native vegetation. These areas were not included as native vegetation for this assessment. Within the assessment area we estimate that native vegetation cover has decreased substantially (by 456 ha or 38.6%) between the year 2005 and 2019.

Table 3.2: Vegetation in the 1500 m assessment area

PCTs in the assessment area	Sum of area (ha)	% of cover
Native Vegetation		
27	4.44	0.15
36	21.61	0.73
45	89.44	3.02
53	5.45	0.18
55	5.00	0.17
70	38.11	1.29
74	88.81	3.00
76	11.44	0.39
82	58.80	1.98
248	73.46	2.48
250	250.42	8.45
356	0.47	0.02
796	79.56	2.69
TOTAL	727.02	24.54
Non PCTs		
Not Native	2236.00	75.46
GRAND TOTAL	**2963**	**100**

3.3. Assessing patch size

The area of intact native vegetation that occurs on the development site and adjoining land that is not part of the development site was calculated. In assessing patch size, as per the BAM, patches of woody vegetation were assessed as separate patches when > 100 m from the next area of moderate to good condition native vegetation. One isolated patch of vegetation was identified on the knoll with a patch size of 35 ha (see **Figure 2.1**).

4. NATIVE VEGETATION

This chapter identifies and describes the most likely PCTs within the proposal site and assesses vegetation integrity based on methods detailed in **Section 2.3.1.**

4.1 Plant community types

One PCT was identified within the proposal area, a description is provided in **Table 4.1** and **4.2.** A full list of species recorded during the field survey is provided in **Appendix I**.

Table 4.1.: Description of PCT 70

PCTID	70: White Cypress Pine woodland on sandy loams in central NSW wheatbelt
Estimate of % cleared	65% (based on the VIS classification database)
Area (ha)	7.84
BC Act Status	N/A
EPBC Act Status	N/A
Vegetation Formation	Grassy Woodlands
Vegetation Class	Floodplain Transition Woodlands
Identifying features and occurrence on site	This PCT resembles a disturbed woodland/ grassland and occurs in various condition classes (including a derived grassland area) along the knoll. Remnant trees are scattered in the proposal area and include *Callitris glaucophylla* (White Cypress Pine), *Eucalyptus microcarpa* (Western Grey Box) and *Eucalyptus dwyeri* (Dwyer's Red Gum). Shrubs, including *Maireana microphylla* (Small-leaf Bluebush) and *Geijera parviflora* (Wilga) are sparse. The ground layer is dominated by a high diversity of grasses and forbs such as *Boerhavia dominii* (Tarvine), *Einadia nutans* (Climbing Saltbush), *Austrostipa scabra* and *Enneapogon gracilis* (Slender Nineawn). *Lycium ferocissimum* (African Boxthorn) often occurs in dense patches within the understorey of areas with mature trees. Large areas of bare soil also occur, attributed to previous earthworks in the proposal area. However, the site does hold regeneration potential. Stands of *C. glaucophylla* fringe areas with mature trees. Two vegetation zones of derived vegetation were also identified, these primarily occur on the lower slopes of the knoll. These vegetation zones resemble a grassland derived from clearing of woodland vegetation. Trees and shrubs are sparse, however, *Eucalyptus microcarpa* (Grey Box) occurs as an occasional paddock tee. Groundcover consists of various grasses and chenopods.
Canopy (to 20m)	*Callitris glaucophylla* (White Cypress Pine), *Eucalyptus microcarpa* (Western Grey Box) and *E. dwyeri* (Dwyer's Red Gum).
Shrubs (0.5 0-2m)	*Maireana microphylla* (Small-leaf Bluebush), *Geijera parviflora* (Wilga), *Sclerolaena muricata var. semiglabra, Eremophila debilis* (Winter Apple), *Dodonaea viscosa* and *Cassinia laevis*.
Goundcover (0-0.5m)	*Boerhavia dominii* (Tarvine), *Einadia nutans* (Climbing Saltbush), *Austrostipa scabra, Enneapogon gracilis* (Slender Nineawn), *Aristida vagans* (Threeawn

	Speargrass), *Austrostipa verticillata* (Slender Bamboo Grass), *Chloris ventricosa* (Tall Chloris) and *Paspalidium constrictum* (Tussock Grass).
Weeds	*Lycium ferocissimum* (African Boxthorn) occurs in all condition classes of the PCT, however, occurs in greater density under mature canopy trees. Groundcover weeds include *Tribulus terrestris* (Cat-ear), *Marrubium vulgare* (White Horehound), *Salvia sp.* (Mintweed) and *Centaurea solstitialis* (Yellow Star-thistle).
Condition	This community is a disturbed isolated remnant that has been subject to previous clearing and ongoing grazing disturbance. Despite these pressures, the site does hold regeneration potential. Five condition classes of vegetation were described (see **Photos 1-5**) including: ▪ Zone 1 - moderate condition vegetation occurs along the top of the knoll. These areas consist of a layer of mature *Callitris glaucophylla*, interspersed by Eucalyptus, many of which are hollow bearing. ▪ Zone 2 - encompasses a small mature monotypic mature stand of *C. glaucophylla*. Native shrubs and groundcover occur in low density. The understorey is dominated by thickets of *Lycium ferocissimum.* ▪ Zone 3 - regrowth stands of *C. glaucophylla* occur around the fringes of areas with large, mature trees. Vegetation is in moderate condition, with poor function, but contains high groundcover species diversity of forbs and grasses. ▪ Zone 4 - very good condition grassland occurs on the western slope of the knoll. This area is characterised by high species diversity and cover of native grasses and forbs. There is limited ground disturbance (in terms of patches of bare soil). ▪ Zone 5 - occurs on the eastern side of the knoll. This area is heavily disturbed (subject to previous earthworks) and includes areas with low groundcover and bare soil. Thickets of *Lycium ferocissimum* also occur.

Photo 1: PCT 70, Zone 1 showing a stand of mature *Callitris glaucophylla* (White Cypress Pine) and *Eucalyptus microcarpa* (Western Grey Box) surrounded by native grassland.

Photo 2: PCT 70, Zone 2, showing a relative mature, monotypic stand of *Callitris glaucophylla.*

Photo 3: PCT 70, Zone 3 showing regenerating *Callitris glaucophylla.*

Photo 4: PCT 70, Zone 4, showing the ground layer dominated by native grasses.

Photo 5: PCT 70, Zone 5 showing areas of soil disturbance and *Lycium ferocissimum* thickets.

4.2 PCT Selection

The State Type Vegetation Map (Central Tablelands Region. VIS ID 4778) indicated that PCT 250 (*Derived tussock grassland of the central western plains and lower slopes of NSW)* may occur on the lower slopes of the proposal area. This PCT can form part of the TEC: *White Box Yellow Box Blakely's Red Gum Woodland* (listed in NSW as Endangered under the BC Act and Critically Endangered Federally under the EPBC Act) when it is derived from vegetation associated with this TEC.

All woody vegetation in the proposal area was found to correspond to PCT 70 (*White Cypress Pine woodland on sandy loams in central NSW wheatbelt*). PCT 70 can occur as a derived community (OEH, 2019) and it is likely the native grassland recorded on site is derived from this PCT given the composition of ground cover is similar to groundcover recorded in woody areas of this PCT. Furthermore, areas of woody vegetation and grassland patches in the proposal area occur on similar soils and position in the landscape (a low rise).

PCT 70 is not associated with any TEC, and the community lacks key diagnostic canopy species associated with the aforementioned *White Box Yellow Box Blakely's Red Gum Woodland.* Therefore, it is considered that the native grassland recorded on site (PCT 250) is not likely to be associated with any TEC.

4.3 Vegetation Integrity

Nine vegetation condition plots were undertaken within the proposal site and the summary of plot data is provided in **Table 4.5**. Plots were randomly positioned within the proposal area using random coordinates generated using geographical information system (GIS) software. Plots were randomly selected in each vegetation zone. The default bearing of each plot was north, this was modified if vehicle trails/ other recent anthropogenic disturbance to vegetation occurred inside plot boundaries or the bearing would result in the plot extending outside the vegetation zone.

Table 4.5: Vegetation integrity scores

	Composition						Structure						Function				
Plot ID	Tree	Shrub	Grass and grass like	Forb	Fern	Other	Tree	Shrub	Grass and grass like	Forb	Fern	Other	Number of large trees	Litter cover	Total length of fallen logs	Stems <5 cm DBH?	Vegetation integrity score and assigned class
Benchmark: PCT 70	3	6	4	7	0	1	22	6	12	4	0	0	3	36	55	Yes	**100**
Plot 2	2	4	9	7	0	1	29	1	37.3	1.1	0	1.5	4	57.8	40	Y	87.7 - Zone 1
Plot 7	2	2	5	10	0	3	38	0.2	21.9	1.3	0	0.9	3	86.2	49	Y	
Plot 4	1	2	9	4	0	0	44	0.2	25.5	0.4	0	0	0	72	44	Y	64.7 - Zone 2
Plot 1	2	4	4	8	0	2	7.1	0.8	40.3	33.9	0	3.1	0	13.6	0	Y	53.9 - Zone 3
Plot 3	1	2	7	7	0	1	4	10.1	45.6	1.1	0	3	0	11	0	Y	
Plot 6	0	2	9	9	1	1	0	0.6	32.7	1.3	0.1	0.1	0	28	0	N	31.4- Zone 4
Plot 8	0	3	6	8	1	0	0	1	26.4	1.2	0.2	0	0	41	0	N	
Plot 9	0	3	7	6	1	1	0	0.8	26.7	0.8	0.2	0.1	0	41.8	0	N	
Plot 5	0	3	6	7	0	1	0	0.4	7.9	0.6	0	0.1	0	16.6	0	Y	34.8- Zone 5

4.4 Fauna habitat

Fauna habitat resources are present throughout the proposal area, including within the construction footprint. Key habitat features recorded within the proposal site include:

- Trees and shrubs may provide foraging and nesting habitat for a range of birds and reptiles, for example, a *Falco cenchroides* (Nankeen Kestrel) was observed sitting on a stick nest just outside the proposal area in the crown of a mature *Eucalyptus microcarpa* tree (see **Figure 4.1**);
- Hollow bearing trees provide nesting and shelter habitat for birds, owls, possums and microchiropteran bats;
- Fallen timber including hollow logs provide habitat for fauna including invertebrate species dependent on decaying wood;
- Ground cover including leaf litter, grassy tufts, and dead wood may provide habitat and cover for a range of small terrestrial species; and
- Rocks including loose boulders provide shelter for shelter for small terrestrial species.

Observations of fauna species recorded during the field survey are contained in **Appendix I.**

4.4.1 Habitat Trees

Figure 4.1 shows that a total of 24 hollow bearing trees with 58 hollows were recorded on the knoll at the proposal site. Seventeen hollow bearing trees with 43 hollows were recorded within the proposal area. This figure does not include all potential habitat trees in the proposal area or at the proposal site, as some trees might have been missed. **Table 4.6** shows that out of the 43 hollows recorded in the proposal area, 22 had a small entrance diameter (2.0-5.0 cm), 14 had medium entrances (5.0-10.0 cm) and seven had large entrances (>10cm).

Table 4.6: Hollow-bearing trees recorded at the proposal site

Tree No. (Figure 4.1.)	Inside proposal area?	Easting	Northing	Veg zone (in proposal area)	Species	DBH	S[1]	M[2]	L[3]
1	Y	623541	6428657	70_Z1	*Eucalyptus microcarpa*	71	1	1	
2	N	623539	6428676	-	*E. microcarpa*	66	2		
3	N	623510	6428668	-	*E. microcarpa*	137	1	1	1
4	N	623382	6428698	-	*E. microcarpa*	169		1	
5	N	623380	6428713	-	*E. microcarpa*	-	1		
6	N	623362	6428655	-	*E. microcarpa*	92	2	2	2
7	Y	623597	6428486	70_Z1	*Eucalyptus dwyeri*	89	2	2	
8	Y	623588	6428487	70_Z1	*E. microcarpa*	83	1		
9	Y	623605	6428473	70_Z1	*E. microcarpa*	92	2	1	1
10	Y	623597	6428480	70_Z1	Stag	42			1
11	Y	623537	6428566	70_Z1	*E. dwyeri*	51		1	
12	Y	623544	6428599	70_Z1	*E. microcarpa*	84	2		
[13]	Y	623560	6428356	70_Z1	*E. microcarpa*	60		1	
14	Y	623530	6428367	70_Z1	*E. microcarpa*	92	1	1	

15	Y	623542	6428372	70_Z1	*E. microcarpa*	124	3	2	
16	Y	623558	6428365	70_Z1	*E. microcarpa*	90	2		
17	Y	623560	6428359	70_Z1	*E. microcarpa*	53	4	1	1
18	Y	623582	6428399	70_Z1	*E. microcarpa*	112	1	1	2
19	Y	623591	6428385	70_Z1	*E. microcarpa*	92	2	2	1
20	Y	623588	6428357	70_Z1	*E. microcarpa*	152	1		
21	Y	623551	6428289	70_Z1	*E. microcarpa*	108		1	1
22	Y	623529	6428272	70_Z1	*E. microcarpa*	63			
23[4]	N	623413	6428302	70_Z3	*E. microcarpa*	124	1		
24[4]	N	623396	6428252	-	*E. microcarpa*	114	1		
Number of hollows recorded inside the proposal area							**22**	**14**	**7**
Total number of hollows recorded at the proposal site (on the knoll)							**30**	**18**	**10**

[1] Small sized hollow openings (i.e. 2-5cm) suitable for species such as microchiropteran bats

[2] Medium sized hollow openings (i.e. 5-15cm) suitable for species such as gliders and possums

[3] Large sized hollow openings (i.e. >15cm) suitable for large birds and owls

[4] Paddock tree (not in the proposal area)

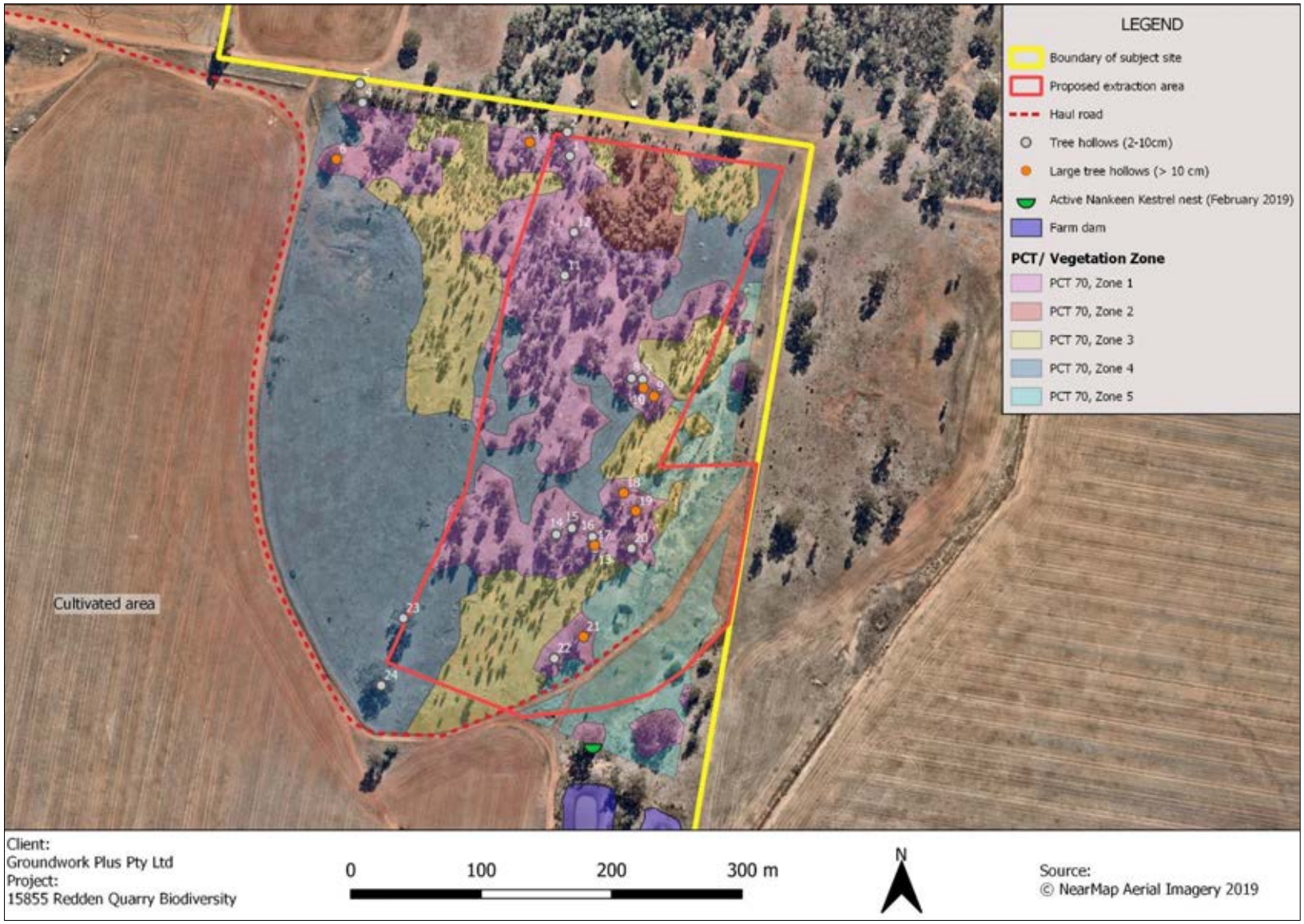

Figure 4.1: Location of hollow bearing trees and active stick nests recorded within the proposal site.

4.5 Weeds

Two State priority weed species were recorded within the proposal site. The control categories for each of these species are detailed below in **Table 4.7**. Priority weeds should be managed in accordance with the *Central West Regional Strategic Weed Management Plan 2017-2022* (Local Land Services, 2017) and safeguards detailed in **Section 6** to minimise their impact and ensure compliance with the *Biosecurity Act 2015.*

Table 4.7: Priority weeds recorded in proposal area for the Central West LLS region.

Species	State priority	Mandatory Measure[1]	WoNS?[2]	HTE?[3]	Occurrence
Centaurea solstitialis (Yellow star-thistle)	-	-	N	Y	Recorded in low density in quadrat 2 and 3 of PCT 70.
Lycium ferocissimum (African boxthorn)	Asset Protection	A person must not, import into the State or sell.	Y	Y	Common, dense under mature trees and present in areas of soil disturbance.

[1] Mandatory Measure (Division 8, Clause 33, *Biosecurity Regulation 2017*)
[2] Weed of National Significance
[3] High Threat Exotic (HTE) cover is assigned in the function attribute of the BAM calculator. A list of HTE is available from: https://www.lmbc.nsw.gov.au/bamcalc

Weeds on site require appropriate controls in order to comply with the *Biosecurity Act 2015*. The contractor must ensure that all plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

5. THREATENED SPECIES

This chapter assesses habitat suitability for threatened species including ecosystem credit species (predicted species) associated with habitat and species credit species (candidate species) associated with the site context. The results of targeted surveys for threatened species are also provided.

5.1 Threatened Species for Assessment

Using six criteria (listed below), the BAM Credit Calculator identified that 14 candidate species (species credit species) and 28 predicted species (ecosystem credit species) that required consideration for assessment. This preliminary list is generated where all six criterions were met. The calculator maintains assessment species where information for a species was not available for a certain criterion.

The BAM Credit Calculator determined candidate species for assessment based on the following six criteria:

1. The distribution of the species includes the IBRA subregion in which the subject land (Bogan-Macquarie IBRA subregion);
2. The study area is within any geographic constraints of the distribution of the species within the IBRA subregion;
3. The species is associated with any of the PCTs identified within the study area;
4. The native vegetation cover within an assessment area including a 1500m buffer around the study area is equal to or greater than the minimum required for the species;
5. The patch size that each vegetation zone is part of is equal to or greater than the minimum required for that species; and
6. The species is identified as an ecosystem or species credit species in the Threatened Biodiversity Data Collection.

5.1.1 Species Credit Species

Species credit species cannot be confidently predicted by vegetation surrogates and landscape features; however, can be reliably detected by survey (BAM, 2017). These species are assessed according to habitat suitability and are recorded as either present or absent. Species may be recorded as present if detected during field assessment or assumed as present (including by expert report). Where a species is assumed present during a BDAR (not by expert report), the species polygon must encompass the entire vegetation zone/s within which the candidate species is predicted to use/occur.

Species credit species were assessed as absent from the proposal site if:

- There were habitat/geographical constraints (including those generated from the BAM calculator);
- The species was not recorded during site assessment visits (during the specified survey period); or
- If according to BAM Section 6.4.1.17, habitat was assessed as substantially degraded, such that the species is unlikely to utilise the proposal site (or specific vegetation zones).

Table 5.1 outlines the assessment of limitations to determine whether or not species were maintained as candidate species. Due to seasonal constraints, only three out of 14 candidate species could be surveyed during February (subject to this current assessment). None of these species were identified in the proposal area. Nine out of the eleven remaining species were assumed present and two were assessed as absent due to a lack of suitable habitat. Further survey work is intended to be undertaken while the EIS subject of this current assessment is reviewed.

Table 5.1: Validation of species credit (candidate) species

Scientific name/ Common name	BAM Habitat constraints/ Geographic limitations	Confirmed candidate species?	Species habitat, ecology and justification of candidate species status
FAUNA			
Burhinus grallarius Bush Stone-curlew	None	No	Not recorded (surveyed in February) The Bush Stone-curlew inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber. The bird is largely nocturnal and known to be active on moonlit nights. An individual was last recorded in the assessment in area in 1991, 10km north east of the proposal area at Minore. This species was not recorded during field assessments.
Calyptorhynchus lathami Glossy Black-Cockatoo	Living or dead tree with hollows greater than 15cm diameter and greater than 5m above ground.	Yes (assumed presence)	Survey required March-August The Glossy Black-Cockatoo inhabits open forest and woodlands and feeds on the seeds of *Casuarina* and *Allocasuarina* species. A small number of *Allocasuarina luehmannii* trees and at least 10 large hollows > 5 m above the ground were identified at the proposal site. This species has been recorded in the assessment area 17 times, between Narromine and Dubbo with the most recent record from the year 2006. Despite the presence of suitable foraging (limited amount) and breeding habitat, this species was not recorded during February.
Geophaps scripta scripta Squatter Pigeon (southern)	None	No	Not recorded (surveyed in February) The Squatter Pigeon is a medium-sized ground-dwelling pigeon that inhabits grassy woodlands and plains, preferring sandy areas and usually close to water. This species has not been recorded in the assessment area and was not recorded during field assessments.
Haliaeetus leucogaster White-bellied Sea-Eagle	Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines	No	Habitat constraints The White-bellied Sea-Eagle is highly selective in nesting locations. Breeding habitat is live large old trees within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines and the presence of a large stick nest within tree canopy; or an adult with nest material; or adults observed duetting within breeding period. This species has not been recorded in the assessment area. No large stick nests indicative of historical breeding was recorded within the proposal area. There is a lack of suitable feeding habitat for this species within 1 km of the proposal site. Potential habitat for this species is available along the Macquarie River, 3 km north of the proposal area.

Scientific name Common name	BAM Habitat constraints/ Geographic limitations	Confirmed candidate species?	Species habitat, ecology and justification of candidate species status
Hieraaetus morphnoides Little Eagle	Nest trees - live (occasionally dead) large old trees within vegetation.	Yes (assumed presence)	Survey required August-October The Little Eagle requires nest trees - live (occasionally dead) large old trees within vegetation. Paddock trees are known to provide important breeding habitat. Breeding habitat includes 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. This species has been recorded on the outskirts of Dubbo in the assessment area as recently as 2016. No large stick nests indicative of historical breeding was recorded within the proposal area.
Lophochroa leadbeateri Major Mitchell's Cockatoo	Hollow bearing trees	Yes (assumed presence)	Survey required September-December The Major Mitchell's Cockatoo inhabits a range of treed and treeless inland habitats, within reach of water. This species nests in living or dead trees with large hollows (> 10 cm DBH). Nests are at least 1 km apart, with no more than one pair every 30km^2. This species has not been recorded in the assessment area.
Lophoictinia isura Square-tailed Kite	Nest trees	Yes (assumed presence)	Survey required September-January The species is allocated to dual credit because they tend to be sensitive to disturbance around nests. No large stick nests indicative of historical breeding was recorded within the proposal area. This species has not been recorded in the assessment area. Kites need to be present to determine breeding.
Ninox connivens Barking Owl	Living or dead trees with hollows greater than 20cm diameter.	Yes (assumed presence)	Survey required May-December Seven large tree hollows, which may support the Barking Owl were recorded in the proposal area. In addition, tree hollows (including hollows with large entrances) were recorded in vegetation surrounding the proposal area. Within the assessment area, the Barking Owl has been recorded in Dubbo. The proposal area contains suitable habitat in which the Barking Owl is predicted to use for breeding, shelter or foraging.
Phascolarctos cinereus Koala	None	No	Not recorded (surveyed in February) Vegetation in the proposal area is isolated from large habitat patches with known Koala populations. Woody native vegetation cover in the assessment area is low (16.09%) which may limit movement of individuals to the proposal site. There are two isolated recordings of Koalas < 20 km of the proposal site. A Koala was recorded 5 km north of the proposal area along the Macquarie River in 1986 and there is also another record 6.7 km east of the proposal area along Tomingley Road. No evidence of Koala occupation was observed at the proposal site.

Scientific name Common name	BAM Habitat constraints/ Geographic limitations	Confirmed candidate species?	Species habitat, ecology and justification of candidate species status
Polytelis swainsonii Superb Parrot	Hollow bearing trees	Yes (assumed presence)	Survey required September – November The Superb Parrot inhabits Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. They nest in small colonies, often with more than one nest in a single tree. Nesting has been recorded in a range of living or dead Eucalyptus with hollows > 5cm and 4m above the ground, including in *Eucalyptus microcarpa,* recorded at the proposal site. This species has been recorded in a range of habitats throughout the proposal area, including as recently as 2016.
Pteropus poliocephalus Grey-headed Flying-fox	Breeding camps	No	Habitat constraints: No known local breeding camps The Grey-headed Flying-fox is a dual credit because foraging habitat is broad ranging but breeding camps are localised. No breeding camps were recorded within the subject site or are known from the local area.
Tyto novaehollandiae Masked Owl	Living or dead trees with hollows greater than 20cm diameter.	Yes (assumed presence)	Survey required May-August Seven large tree hollows, which may support the Masked Owl were recorded in the proposal area. In addition, tree hollows (including hollows with large entrances) were recorded in vegetation surrounding the proposal area. This species has not been recorded in the assessment area. The proposal area contains suitable habitat in which the Masked Owl is predicted to use for breeding, shelter or foraging.
FLORA			
Diuris tricolor Pine Donkey Orchid		Yes (assumed presence)	Survey required September - October The Pine Donkey Orchid grows in sclerophyll forest among grass, often with Cypress Pine. It is found in sandy soils, either on flats or small rises. The species has been noted as growing in large colonies. This species has not been recorded in the assessment area, the nearest records of this species are from the outskirts of Dubbo.
Pterostylis cobarensis Greenhood Orchid		Yes (assumed presence)	Survey required September- November The Greenhood Orchid is found in eucalypt woodlands, open mallee or *Callitris* shrublands on low stony ridges and slopes in skeletal sandy-loam soils. The orchid occurs as frequent to abundant plants (sometimes occasional) in usually very localised populations. There are no known populations in the assessment area.

5.1.2 Ecosystem Credit Species

Targeted surveys are not required for ecosystem credit species because the likelihood of occurrence of a species or elements of the species' habitat can be predicted by vegetation surrogates and landscape features (BAM, 2017). The BAM calculator determines biodiversity credits for these species using the vegetation integrity score for each vegetation zone. **Table 5.2** lists ecosystem credit species predicted to occur on site. Potential habitat is available for all predicted species; hence, they were maintained as ecosystem credits in the calculator.

Table 5.2: Ecosystem species

Scientific name	Common name
FAUNA	
Antechinomys laniger	Kultarr
Artamus cyanopterus cyanopterus	Dusky Woodswallow
Calyptorhynchus lathami	Glossy Black-Cockatoo
Certhionyx variegatus	Pied Honeyeater
Chalinolobus picatus	Little Pied Bat
Chthonicola sagittata	Speckled Warbler
Circus assimilis	Spotted Harrier
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)
Daphoenositta chrysoptera	Varied Sittella
Falco hypoleucos	Grey Falcon
Grantiella picta	Painted Honeyeater
Haliaeetus leucogaster	White-bellied Sea-Eagle
Hieraaetus morphnoides	Little Eagle
Lophochroa leadbeateri	Major Mitchell's Cockatoo
Lophoictinia isura	Square-tailed Kite
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)
Neophema pulchella	Turquoise Parrot
Ninox connivens	Barking Owl
Nyctophilus corbeni	Corben's Long-eared Bat
Petroica boodang	Scarlet Robin
Phascolarctos cinereus	Koala
Polytelis swainsonii	Superb Parrot
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)
Pteropus poliocephalus	Grey-headed Flying-fox
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat
Stagonopleura guttata	Diamond Firetail
Tyto novaehollandiae	Masked Owl

5.2 Threatened Species Search Area Results

Table 5.3 shows that database searches for the proposal site identified 31 threatened species with the potential to occur within the search area (20 km radius around the proposal site). Seven out of the 14 candidate species were recorded in the search area, including:

- *Burhinus grallarius* (Bush Stone-curlew);
- *Calyptorhynchus lathami* (Glossy Black-Cockatoo);
- *Hieraaetus morphnoides* (Little Eagle);
- *Ninox connivens* (Barking Owl);
- *Phascolarctos cinereus* (Koala);
- *Polytelis swainsonii* (Superb Parrot; and
- *Pteropus poliocephalus* (Grey-headed Flying-fox).

An additional 46 threatened species were identified in the search area results but not on the BAM candidate species list. A habitat assessment determining the likelihood of these species to be impacted by the proposed works is provided in **Appendix III.** Given habitat and geographic constraints, none of these threatened species were considered likely to occur at the proposal site. Species identified with a moderate or high potential at occurring in the proposal area were either candidate species already considered in this assessment or classified as ecosystem species.

Table 5.3: Threatened species that may occur in the local area

Scientific name	Common name	BC ACT[1]	EPBC Act[1]	Records [2]	Potential occurrence
Flora					
Androcalva procumbens		V	V	0	Low
Austrostipa wakoolica		V	E	0	Low
Caladenia tessellata	Thick Lip Spider Orchid	E	V	1	Low
Commersonia procumbens		V	V	1	Low
Dichanthium setosum	Bluegrass	V	V	2	Low
Homoranthus darwinioides		V	V	0	Low
Indigofera efoliata	Leafless Indigo	E	E	1	Low
Leucochrysum albicans var. tricolor	Hoary Sunray		E	0	Low
Prasophyllum petilum	Tarengo Leek Orchid	E	E	0	Low
Prasophyllum sp. Wybong	A leek-orchid		CE	0	Low
Swainsona murrayana	Slender Darling-pea	V	V	0	Low
Swainsona recta	Small Purple-pea	E	E	0	Low
Swainsona sericea	Silky Swainson-pea	V		1	Low
Tylophora linearis		V	E	0	Low
Aves					
Anseranas semipalmata	Magpie Goose	V		6	Low
Anthochaera phrygia	Regent Honeyeater	E	CE	7	Low

Ardeotis australis	Australian Bustard	E		2	Low
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V		2	Low
Botaurus poiciloptilus	Australasian Bittern	E	E	0	Low
Burhinus grallarius	Bush Stone-curlew	E		1	Low
Calidris ferruginea	Curlew Sandpiper	E	CE	0	Low
Calyptorhynchus lathami	Glossy Black-Cockatoo	V		17	Moderate
Chthonicola sagittata	Speckled Warbler	V		8	Moderate
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V		26	Moderate
Daphoenositta chrysoptera	Varied Sittella	V		2	Low
Falco subniger	Black Falcon	V		2	Low
Glossopsitta pusilla	Little Lorikeet	V		1	Low
Grantiella picta	Painted Honeyeater	V	V	0	Low
Hieraaetus morphnoides	Little Eagle	V		6	Moderate
Hirundapus caudacutus	White-throated Needletail		C,J	0	Low
Lathamus discolor	Swift Parrot	E	CE	1	Low
Leipoa ocellata	Malleefowl	E	V	0	Low
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	V		1	Low
Neophema pulchella	Turquoise Parrot	V		6	Moderate
Ninox connivens	Barking Owl	V		1	Low
Numenius madagascariensis	Eastern Curlew		CE	0	Low
Polytelis swainsonii	Superb Parrot	V	V	14	Moderate
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V		112	Moderate
Rostratula australis	Australian Painted-snipe	E	E	0	Low
Stagonopleura guttata	Diamond Firetail	V		8	Moderate
Fish					
Maccullochella macquariensis	Trout Cod	E	E	0	Low
Maccullochella peelii	Murray Cod		V	0	Low
Macquaria australasica	Macquarie Perch	E	E	0	Low
Mammalia					
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	0	Low
Chalinolobus picatus	Little Pied Bat	V		7	Moderate
Dasyurus maculatus	Spot-tailed Quoll	V	E	0	Low
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V		1	Low
Nyctophilus corbeni	Corben's Long-eared Bat	V	V	0	Low
Phascolarctos cinereus	Koala	V	V	2	Low
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	1	Low

Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V		3	Low
Reptilia					
Aprasia parapulchella	Pink-tailed Worm-lizard	V	V	0	Low
Delma impar	Striped Legless Lizard	V	V	0	Low

[1] Status Abbreviations: V – Vulnerable, E – Endangered, CE – Critically Endangered, C (CAMBA migratory protected bird) and J (JAMBA migratory protected bird).

[2] Number of OEH wildlife atlas records in selected area Approx. 20km radius [North: -31.97 West: 148.01 East: 148.61 South: -32.57]

5.3 Results of Targeted Field surveys for Threatened / Candidate Species

To determine the impacts of development on candidate species identified at the proposal site, the BAM Calculator assesses the habitat condition within mapped species polygons and biodiversity risk weighing for species contained in the Threatened Biodiversity Collection. Based on the species sensitivity to loss, the BAM Credit Calculator generates credit calculations.

5.3.1 Survey Effort

A summary of the time spent during fieldwork and the prevailing weather conditions is summarised below in **Table 5.4**. Weather data is recorded from Dubbo Airport AWS (station 065070), located 25 km north east of the proposal site.

Table 5.4: Survey dates, times, activities and weather conditions

Date	Time	Activity	Weather (Temp/ relative humidity)		
			9am	3pm	Rain mm
19.02.19	07.30-16.30	General site inspection Vegetation survey Overnight echo-location recording Opportunistic searches and sightings	Mostly clear 26.4 53%	Mostly clear 35.0 20%	0.2
20.02.19	07.30-16.30	Vegetation survey Diurnal bird search Overnight echo-location recording Opportunistic searches and sightings	Mostly clear 24.6 53%	Mostly clear 33.0 21%	0
21.02.19	07.30-8.30	Opportunistic searches and sightings	Mostly clear 25.0 52%	Mostly clear 32.7 29%	0

5.3.2 Flora

No threatened / candidate flora species were recorded at the proposal site during seasonal surveys undertaken in February, 2019. Two candidate species (*Diuris tricolor* and *Pterostylis cobarensis*) were assumed present because of seasonal constraints at the time of survey (February, 2019). These deciduous orchids die back to underground tubers after seed release and are not detectable on the surface until September. The species polygon (area of suitable habitat for these species) was determined to be across all vegetation zones (PCT 70) in the proposal area (7.84 ha). A list of all plant species recorded during fieldwork is listed in **Appendix I**.

5.3.3 Fauna

No candidate fauna species were recorded at the proposal site during surveys undertaken in February, 2019. Due to survey period constraints, six candidate species (**Table 5.1**) were assumed present across vegetation zones with overstorey vegetation (zones 1-3) in the proposal area (5.32 ha) (**Figure 5.1**). A list of all fauna species recorded during fieldwork is listed in **Appendix I**.

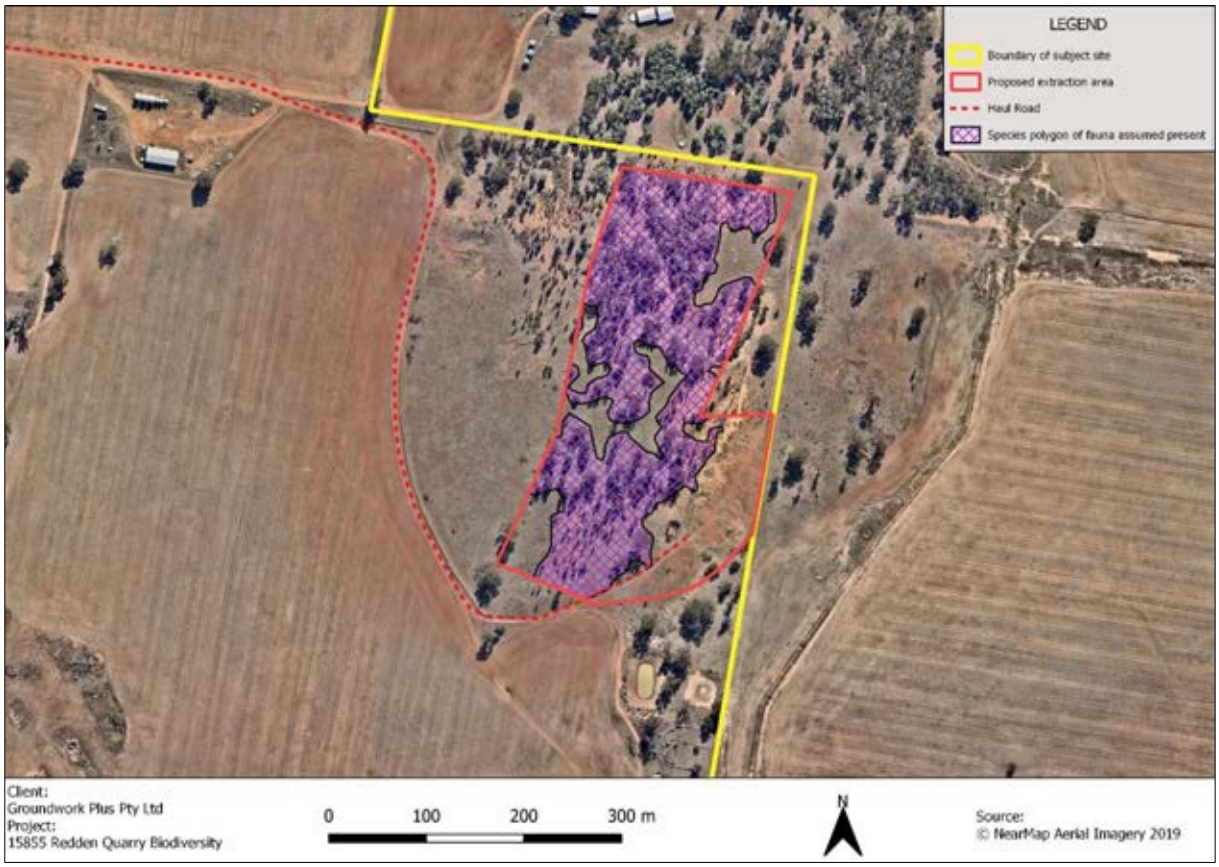

Figure 5.1: Species polygon area of candidate fauna species assumed present (in woodland areas)

5.3.3.1 Microchiropteran Bats

Using echo-location over two separate nights, at least five species of microchiropteran bats, including one threatened (ecosystem credit) species was recorded in the proposal area (using the Song Meter SM4). **Table 5.5** shows that two species with similar call frequencies could not be confidently separated.

Table 5.5: Microchiropteran Bats recorded at the proposal site using echo-location

Scientific name	Common Name	Roosting habitat[1]	Ecosystem credit species?	Comments
Mormopterus planiceps	South-Eastern Freetail Bat	Tree hollows		
Nyctophilus sp.		Tree hollows	Yes (possible)	Possibly *Nyctophilus corbeni*, an ecosystem credit species listed in NSW and Federally as Vulnerable. *Nyctophilus sp.* cannot be separated to species level by call (Pennay *et al.,* 2004).

Scientific name	Common Name	Roosting habitat[1]	Ecosystem credit species?	Comments
Scotorepens balstoni	Inland Broad-nosed Bat	Tree hollows		
Miniopterus schreibersii oceanensis	Eastern Bent-Wing Bat	Caves	Yes (possible)	Calls of these two species are similar and can't be confidently separated. *Miniopterus schreibersii oceanensis* is an ecosystem credit species listed in NSW as Vulnerable.
Vespadelus vulturnus	Little Forest Bat	Tree hollows		

[1] From Churchill (2008).

6. IMPACT ASSESTMENT

Using information collected during desktop investigations and site assessments, this chapter assesses potential impacts to ecological values as a result of the proposed works.

6.1 Avoid and Minimise Potential Impacts

This proposal requires access to hard rock resources to provide ballast and other materials for the Inland Rail project. The extraction footprint of the quarry (8.22 ha) would impact PCT 70, which is not consistent with any TECs.

Using information collected during desktop investigations and field assessments, the proposal has been modified to avoid and minimise impacts on native vegetation and habitat. The client originally provided an extraction footprint of 14.73 ha compared to the current 8.22 ha subject to this current assessment. **Table 6.1** shows the difference of the area of vegetation zones that would have been impacted if the original proposal footprint was retained.

The impact footprint of vegetation zone 4 (an area of native grassland) is reduced by 72%. Although this vegetation zone obtained a relative low VIS score of 31.4, it contained high species diversity with a total of 29 native understorey species recorded. **Figure 6.1** shows that in total, the extraction footprint has been reduced by 44.63% to minimise potential impacts on site biodiversity values.

Table 6.1: Comparison of impact to vegetation zones considering the original impact footprint and current impact footprint

PCT 70 Vegetation Zone	VIS	Footprint area		Change in area (%)
		Original	Current	
Zone 1 (very good condition)	87.7	4.30	3.25	- 24.33
Zone 2 (good condition)	64.7	0.45	0.45	0
Zone 3 (regrowth vegetation in good condition)	53.9	3.04	1.62	- 46.61
Zone 4 (grassland in good condition)	31.4	4.67	1.31	- 72.02
Zone 5 (grassland in good condition)	34.8	1.71	1.21	- 29.23
GRAND TOTAL		**14.17**	**7.84**	**- 44.63**

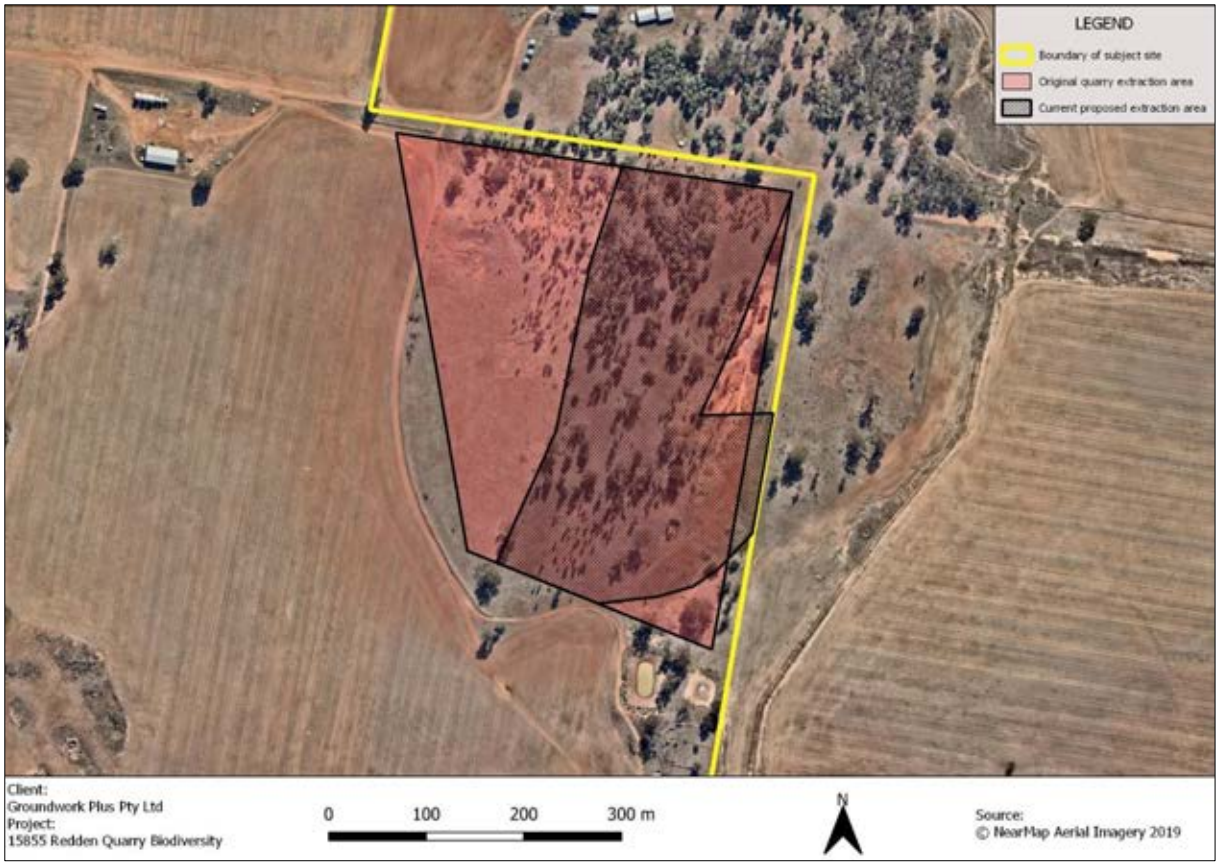

Figure 6.1: Original proposed extraction footprint overlayed with current extraction footprint.

6.2 Avoiding and minimising prescribed biodiversity impacts

The BC Regulation (Division 6.1) identifies actions that are prescribed as impacts to be assessed under the biodiversity offsets scheme, they include:

- *Impacts of development on the following habitat of threatened species or ecological communities:*
  - *Karst, caves, crevices, cliffs and other geological features of significance; or*
  - *Rocks; or*
  - *Human made structures; or*
  - *Non-native vegetation.*
- *Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range;*
- *Impacts of development on movement of threatened species that maintains their lifecycle,*
- *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 or other development);*
- *Impacts of wind turbine strikes on protected animals; and*
- *Impacts of vehicle strikes on threatened species of animals or on animals that are part of a threatened ecological community.*

There are no occurrences of karst, caves, crevices, cliffs or other geological features of significance at the proposal site. No threatened species or ecological communities that are dependent on these habitat features will be impacted by the proposed works. In addition, there are no known impacts to water quality, water bodies and hydrological processes that sustain threatened species or threatened ecological communities. Wind farm development is not applicable to the proposal. Prescribed impacts that are relevant to the proposal (including; rock removal, habitat connectivity and movement of animals and vehicle strikes) are assessed below.

6.3 Assessment of Direct Impacts

6.3.1 Loss of Vegetation and Habitat

The potential loss of vegetation and habitat associated with the proposal is summarised in **Table 6.2**. The proposed extraction area would impact five vegetation zones of PCT 70. The haul road follows an existing agriculture track and will not result on impacts to native vegetation.

Table 6.2: Vegetation to be impacted by the proposed works

Plant Community Type and Vegetation Zone	Listing		Potential Direct Impact (ha)
	BC Act	EPBC Act	
70: White Cypress Pine woodland on sandy loams in central NSW wheatbelt	**N/A**	**N/A**	
Zone 1 (very good condition)			3.25
Zone 2 (good condition)			0.45
Zone 3 (regrowth vegetation in good condition)			1.62
Zone 4 (grassland in good condition)			0.45
Zone 5 (grassland in good condition)			1.62
GRAND TOTAL			**7.84**[1]

[1] Note, while the proposal area is 8.22 ha, only 7.84 ha of native vegetation would be impacted. This is attributed to cleared agriculture tracks in the proposal area.

6.3.2 Habitat Removal

6.3.2.1 Habitat trees

A total of 17 hollow bearing trees containing 43 hollows were recorded within the proposal area (note, not all potential hollow bearing trees were detected during site surveys). A range of hollows with different entrance diameters were recorded, including 22 with a small entrance diameter (2.0 - 5.0 cm), 14 with a medium entrance diameter (5.0 – 10.0 cm) and seven with a large entrance diameter (> 10.0 cm). The original extraction area considered (**Figure 6.1**) would have impacted an additional eight hollow bearing trees.

6.3.2.2 Bush rocks

The proposal will result in the removal of natural surface deposit of rock from areas of native vegetation. Bushrock removal is a prescribed impact requiring consideration and is listed as a key threatening process (KTP) under the BC Act 2016. Bushrock removal may remove or disturb habitat of native species which may find shelter under rocks or use rocks for basking. The PMST for the proposal site identified two threatened reptiles with the potential to occur within the search area that require surface

rock including, *Aprasia parapulchella* (Pink-tailed Worm-lizard) and *Delma impar* (Striped Legless Lizard). There are no existing records of these cryptic species within 20 km of the proposal site. Given the isolation of the proposal area from large habitat patches, these species are unlikely to be adversely impacted by the proposed removal of bushrock from the proposal site.

6.4 Indirect Impacts

Indirect impacts occur when the proposal or activities relating to the construction or operation of the proposal affect native vegetation, threatened ecological communities and threatened species habitat beyond the subject land. Impacts may also result from changes to landuse patterns, such as an increase in vehicular access and human activity on native vegetation, threatened ecological communities and threatened species habitat. **Table 6.3** describes and assesses the impacts of the proposal on native vegetation and habitat beyond the subject site as detailed in Section 9.1.4.2 of the BAM.

Table 6.3: Assessment of indirect impacts on adjacent habitat

Indirect Impact	Extent and Duration	Threatened species, TECs and their habitats likely to be affected.	Consequences of the impacts for the bioregional persistence of the threatened species, TECs and their habitats.
(a) inadvertent impacts on adjacent habitat or vegetation	Edge effects including weed growth and disturbance by vehicles (quarry trucks) may impact retained vegetation around the extraction area (see **Section 6.4.1)**	N/A (no threatened species were recorded during an assessment in February 2019).	These impacts may degrade areas of retained EEC. Mitigation measures (**Table 6.6**) including weed management and fencing off retained areas of vegetation (where practicable) will help manage these impacts.
(b) reduced viability of adjacent habitat due to edge effects	As above.	N/A (no threatened species were recorded during an assessment in February 2019).	As above
(c) reduced viability of adjacent habitat due to noise, dust or light spill	The quarry activities, including truck movements at the proposal site may exacerbate noise and dust impacts.	N/A (no threatened species were recorded during an assessment in February 2019).	Dust deposition on vegetation may affect plant health through reduced ability to photosynthesis. Noise may also impact fauna that shelter in habitat adjacent to the extraction area.
(d) transport of weeds and pathogens from the site to adjacent vegetation	The proposal has the potential to introduce or increase weeds occurrence in adjacent habitat.	N/A (no threatened species were recorded during an assessment in February	This site is already subject to moderate weed infestation. Implementation of weed and pathogen control measures (**Table 6.6**) will help manage these impacts.

Indirect Impact	Extent and Duration	Threatened species, TECs and their habitats likely to be affected.	Consequences of the impacts for the bioregional persistence of the threatened species, TECs and their habitats.
		2019).	
(e) increased risk of starvation, exposure and loss of shade or shelter	The proposal has the potential to impact threatened fauna dependent on habitat within and adjacent to the proposal area.		Native fauna including birds, reptiles and mammals will lose shade and shelter resources.
(f) loss of breeding habitats	The proposal has the potential to impact breeding habitat important to threatened species in the local area.		Native fauna will lose breeding habitat, including tree hollows. (see **Section 6.3.2.1**)
(g) trampling of threatened flora species	No threatened flora species were identified within the proposal area	N/A	Implementation of management measures (**Table 6.6**) should help prevent trampling in areas where vegetation is retained.
(h) inhibition of nitrogen fixation and increased soil salinity	The site is already substantially disturbed, and it is unlikely the proposal would further exacerbate these issues.	N/A	N/A
(i) fertiliser drift	It is unlikely the proposal would further exacerbate these issues.	N/A	N/A
(j) rubbish dumping	This issue is not likely to affect the subject land.	N/A	N/A
(k) wood collection	This issue is not likely to affect the subject land.	N/A	N/A
(l) bush rock removal and disturbance	Assessed as a direct impact in **Section 6.3.2.2**		
(m) increase in predatory species populations	It is unlikely that the proposal works will influence or alter predatory populations.	N/A	N/A

Indirect Impact	Extent and Duration	Threatened species, TECs and their habitats likely to be affected.	Consequences of the impacts for the bioregional persistence of the threatened species, TECs and their habitats.
(n) increase in pest animal populations	It is unlikely that the proposal will influence or alter pest species populations. Pest animals are likely present within the subject land and adjacent habitats	N/A	N/A
(o) increased risk of fire	The proposal is unlikely to increase the risk of fire in the local area.	N/A	N/A
(p) disturbance to specialist breeding and foraging habitat, e.g. beach nesting for shorebirds.	No specialist breeding or foraging habitat is present in or adjacent to the site.	N/A	N/A

6.4.1 Wildlife Connectivity and Habitat Fragmentation

The removal of vegetation for the proposed works will add to the incremental fragmentation of vegetation within the local area. The vegetation on site is isolated from other habitat areas by rural farmland; the proposed removal of vegetation from the site is unlikely to significantly impact any local habitat links.

6.4.2 Weeds

The proposal would involve clearing and earthworks in areas subject to minor weed infestation. During construction there is potential to disperse weed seeds and plant material into adjoining remnant vegetation. Increased weed growth has the potential to result in decreased native species diversity and can further degrade local native flora and fauna habitats.

6.4.3 Injury and Mortality of Fauna

Injury and mortality of fauna could occur during vegetation clearing and vehicle movements across the proposal site. Fauna potentially impacted by vegetation clearing include birds and reptiles that may shelter in vegetation, tree hollows and woody debris. Macropods and birds are susceptible to vehicle strikes. Given limited vegetation cover along the haul road, impacts to fauna crossing the haul road are likely to be avoided through application of and strict adherence to site speed limits (40 km/h) and responsible driver behaviour.

6.5 Offset

It is proposed to acquit the liability of ecosystem credits (**Section 7)** by making a lump sum payment of equivalent value to the Biodiversity Conservation Trust Fund. The proponent is also investigating the possibility of establishing a stewardship site at the proposal site to retire the liability of credits.

6.6 Other Relevant Legislation or Planning Policies

6.6.1 SEPP 44 – Koala Habitat

An assessment of koala habitat under SEPP 44 is provided below. In addressing SEPP 44, there are two questions that need to be considered:

a) *Is the land "Potential Koala Habitat"?*

'Potential Koala Habitat' is defined in SEPP 44 as, "...an area of native vegetation where trees of the type listed in Schedule 2 (Koala feed tree species) constitute at least 15% of the total number of trees in the upper or lower strata of the tree component"; and

b) *Is the land "Core Koala Habitat"?*

"Core Koala habitat" is defined as an area of land with a resident population of koalas, evidenced by attributes such as breeding females (females with young), recent sightings and historical records of a Koala population.

One primary Koala food tree, *Eucalyptus populnea* (Bimble Box), was identified in the proposal area. This food tree was uncommon at the proposal site and does not form more than 15% of the upper and lower stratum.

Vegetation in the proposal area is isolated from large habitat patches with known Koala populations. Woody native vegetation cover in the assessment area is low (16.09%) which may limit movement of individuals to the proposal site. No evidence of Koala usage was recorded in the proposal area, despite targeted scat searches undertaken during the vegetation survey. Additionally, no scratches indicative of Koalas was observed on any of the trees in the proposal area. The proposal site does not support potential or core Koala habitat under the definitions of SEPP 44.

6.6.2 Matters of National Environmental Significance

The EPBC Act requires approval of the Commonwealth Minister representing the Department of the Environment and Energy (DoEE), for actions that may have a significant impact on Matters of National Environmental Significance (MNES).

6.6.2.1 Listed threatened species and ecological communities

No listed threatened species and ecological communities will be impacted by the proposal.

6.6.2.2 Migratory Species Protected Under International Agreements

Ten nationally listed migratory terrestrial or wetland bird species were recorded on the DoEE protected matters database (see **Appendix IV**) or are considered to have potential habitat available within 20 km of the project site, as listed in **Table 6.4.**

None of the migratory species were recorded on site during the field survey. The proposed works are unlikely to impact on any area considered to be 'important habitat' for the above migratory species, or likely to impact a significant proportion of a migratory population.

Table 6.4: Listed migratory species with the potential to occur in the local area

Species name	Common name
Actitis hypoleucos	Common Sandpiper
Apus pacificus	Fork-tailed Swift
Calidris acuminata	Sharp-tailed Sandpiper
Calidris ferruginea	Curlew Sandpiper
Calidris melanotos	Pectoral Sandpiper
Gallinago hardwickii	Latham's Snipe
Hirundapus caudacutus	White-throated Needletail
Motacilla flava	Yellow Wagtail
Myiagra cyanoleuca	Satin Flycatcher
Numenius madagascariensis	Eastern Curlew

6.7 Mitigation and Management Measures

The proposal would follow a number of mitigation measures listed in **Table 6.6**. The proposed measures will assist with minimising the impacts of the project on biodiversity during construction and operation of the quarry.

Table 6.6: Mitigation and management measures

Impact	Measure	Responsibility
Pre-Construction		
General	A Flora and Fauna Management Plan will be prepared in and implemented as part of the CEMP. It will include, but not be limited to: • Plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and weed management areas; • Pre-clearing survey requirements; • Procedures for unexpected threatened species finds and fauna handling; and • Protocols to manage weeds and pathogens.	Contractor
Fauna handling	Before on ground works commence, contact an animal rescue agency/wildlife care group or vet before works start to ensure they are willing and available to be involved in fauna rescue and assist with injured animals. If any fauna handling is required, it must be undertaken by a licenced wildlife carer or ecologist.	Contractor
Vegetation clearing	The limits of clearing including where isolated trees are to be retained within areas of existing native vegetation will be delineated using appropriate signage and barriers, identified on site construction drawings and during construction staff induction.	Contractor
Vegetation protection	Where feasible, areas of vegetation to be retained surrounding the extraction area or along haul roads are to be fenced off to help prevent unintentional damage to these areas.	Contractor

Impact	Measure	Responsibility
Disturbance to fallen timber and dead wood	All woody debris are not to be mulched or chipped but will be re-used on site for habitat improvement. Woody debris will not be dragged but lifted and placed appropriately outside the construction footprint in an adjacent area of project sites to enhance habitat. If long logs are required to be cut to assist relocation, logs must be cut away from hollow ends.	Contractor
Invasion and spread of pathogens and disease	Pathogen control protocols shall be developed and implemented in accordance with the requirements of the *Biosecurity Act 2015*.	Contractor
Invasion and spread of weeds	Weed control protocols shall be developed and implemented as part of the CEMP quarry operation plan. For example, any regeneration of African Boxthorn (e.g. along disturbed edges of the quarry/ in the corridor area to be retained) should be controlled before plants reach maturity and set seed	Contractor
Management of *Lycium ferocissimum* (African Boxthorn)	African Boxthorn is an aggressive invader of pastures and remnant bushland. The weed may spread vegetatively (including broken root fragments) and through fruit (unripened fruit on cut branches can still ripen and produce seed). Care is to be taken to ensure fragments of the weed are not transferred into any remnant vegetation to prevent the weeds spread. NSW DPI recommend removing or destroying (i.e. burning) all plant material. Use of fire is not recommended to burn plant material without stringent controls to reduce risk of any potential break in fire containment areas.	Contractor
During operation		
Water quality	Potential water quality impacts to farm dams arising from run off are to be managed through appropriate sediment control measures specified in the CEMP quarry operation plan.	Contractor
Threatened species protection	If unexpected threatened fauna or flora species are discovered, works must stop immediately until threatened flora or fauna species are reviewed and assessed by ecologists.	Contractor
Fauna protection	Due care should be made by all vehicle operators to take care and avoid any potential collision with fauna, such as macropods (Kangaroos) that may transverse the project site. A site speed limit of 40 km/h should be observed.	Contractor
Pest Animal monitoring/ control	Pest animals such as rodents, foxes, rabbits, wild dogs, feral cats and pigs are controlled on a needs basis.	Contractor
Post operation		
Preparation of a site rehabilitation plan	A rehabilitation plan in accordance with the land manager needs to be prepared prior to quarry shut down.	Contractor

7. IMPACT SUMMARY

This chapter summarises the impact to PCTs and the number of credit classes required for ecosystem and species credits. The BAM Calculator report is provided in **Appendix V**.

7.1 Impact to Vegetation Integrity

Table 7.1 summarises the impact of the proposal to the vegetation integrity score of each PCT on site. The TEC identified on site is not subject to a Potential Serious and Irreversible Impact (SAII).

Table 7.1: Impact to the vegetation integrity score of each PCT

PCT/ Vegetation Zone	Listing		Current score	Future score	Change in score	BRW[1]
	BC	EPBC				
70: White Cypress Pine woodland on sandy loams in central NSW wheatbelt						**1.5 high sensitivity**
Zone 1 (very good condition)			87.7	0	-87.7	
Zone 2 (good condition)			64.7	0	-64.7	
Zone 3 (regrowth vegetation in good condition)			53.9	0	-53.9	
Zone 4 (grassland in good condition)			31.4	0	-31.4	
Zone 5 (grassland in good condition)			34.8	0	-34.8	

[1] Biodiversity Risk Weighing (for ecosystem credits). The biodiversity risk weighting for a TEC or a PCT containing threatened species habitat is based on the sensitivity to loss class of the TEC/PCT and the highest sensitivity to gain class of the predicted threatened species. For further explanation, see Appendix 7 of the BAM (2017).

7.2 Ecosystem Credits

The ecosystem credits required to offset the proposal are provided in **Table 7.2**. A total of 212 credits are required to offset the development.

Table 7.2: Ecosystem credits summary

PCT	Vegetation Zone	Area Impacted (ha)	Credits required
70: White Cypress Pine woodland on sandy loams in central NSW wheatbelt	1	3.25	125
	2	0.45	13
	3	1.62	38
	4	1.31	18
	5	1.21	18
TOTAL CREDITS REQUIRED			**212**

The following like-for-like offset rules apply for PCT 70:

1. Any PCT associated with Floodplain Transition Woodlands (≥ 50% - < 70% cleared group), this includes PCT's: 56, 70, 74, 76, 80, 81, 82, 237, 244, 248, 251 and 628;
2. In the IBRA subregions: Bogan-Macquarie, Boorindal Plains, Canbelego Downs, Castlereagh-Barwon, Inland Slopes, Lower Slopes, Nymagee and Pilliga, or
3. Any IBRA subregion that is within 100 kms of the outer edge of the impacted site; and
4. Contains hollow bearing trees.

7.3 Species Credits

The species credits required to offset the proposal are provided in **Table 7.3.** A total of 768 credits are required to offset the development for nine candidate species. The species polygon (area impacted) for fauna included all vegetation zones that included woody vegetation in PCT 70 (zones 1-3) and for flora (orchids) all vegetation zones (including grassland areas of PCT 70, zones 1-5). None of the candidate species are subject to a serious and irreversible impact (SAII).

Table 7.3: Species credits summary

PCT	NSW listing (BC Act)	Species presence type	PCT/ Vegetation Zones	Potential SAII	Area Impacted (ha)	Credits required
Lophochroa leadbeateri (Major Mitchell's Cockatoo)	V	Assumed present	PCT 70 (l zones 1-3)	N/A	5.33	202
Calyptorhynchus lathami (Glossy Black-Cockatoo)	V	Assumed present	PCT 70 (all zones 1-3)	N/A	5.33	202
Diuris tricolor (Pine Donkey Orchid)	V	Assumed present	PCT 70(all zones)	N/A	7.84	182
Lophoictinia isura (Square-tailed Kite)	V	Assumed present	PCT 70 (all zones 1-3)	N/A	5.33	151
Ninox connivens (Barking Owl)	V	Assumed present	PCT 70 (all zones 1-3)	N/A	5.33	202
Polytelis swainsonii (Superb Parrot)	V	Assumed present	PCT 70 (all zones 1-3)	N/A	5.33	202
Pterostylis cobarensis (Greenhood Orchid)	V	Assumed present	PCT 70 (all zones)	N/A	7.84	182
Tyto novaehollandiae (Masked Owl)	V	Assumed present	PCT 70 (all zones 1-3)	N/A	5.33	202
Hieraaetus morphnoides (Little Eagle)	V	Assumed present	PCT 70 (all zones 1-3)	N/A	5.33	151
TOTAL SPECIES CREDITS REQUIRED						**768**

7.4 Credit Costs

The total cost of credits, should the Biodiversity Conservation Trust (BCT) be used to offset the impacts, are currently (as at 12 August, 2019) estimated to be $2,359,020.27 (incl. GST). Details are provided in **Table 7.3** and **Appendix V**.

Table 7.3: Estimated credit costs

PCT or Species	Baseline price per credit	Price per credit	No. of credits	Final credits price (ex GST)	Final credits price (in GST)
Ecosystem Credits					
70: White Cypress Pine woodland on sandy loams in central NSW wheatbelt	$4,248.35	$6,009.29	212	1,273,969.88	
TOTAL			212	1,273,969.88	$1,401,366.87
Species Credits					
Lophochroa leadbeateri (Major Mitchell's Cockatoo)	N/A	$506.66	202	$126,844.15	
Calyptorhynchus lathami (Glossy Black-Cockatoo)	N/A	$506.66	202	$126,844.15	
Diuris tricolor (Pine Donkey Orchid)	N/A	$158.64	182	$38,284.09	
Lophoictinia isura (Square-tailed Kite)	N/A	$506.66	151	$94,819.14	
Ninox connivens (Barking Owl)	N/A	$173.02	202	$45,976.55	
Polytelis swainsonii (Superb Parrot)	N/A	$725.00	202	$179,765.36	
Pterostylis cobarensis (Greenhood Orchid)	N/A	$150.00	182	$36,397.27	
Tyto novaehollandiae (Masked Owl)	N/A	$506.66	202	$126,844.15	
Hieraaetus morphnoides (Little Eagle)	N/A	$506.66	151	$94,819.14	
TOTAL			768	$870,594.00	$957,653.40
GRAND TOTAL					**$2,359,020.27**

8. CONCLUSION

Through application of the BAM, this BDAR has assessed impacts on biodiversity values including threatened species and threatened ecological communities. The proposed Redden's Quarry; located seven kilometres south east of the township of Narromine proposes to extract up to 490,000 tonnes of ballast material per annum over four years for the Inland Rail project. The extraction area, restricted to a low rising hill on the north eastern corner at the proposal site, has a footprint of approximately 8.22 ha and may result in clearing up to 7.84 ha of existing vegetation.

Field assessments have identified that one PCT would be impacted by the proposal. The proposed construction footprint would impact five condition classes of PCT 70 (*White Cypress Pine woodland on sandy loams in central NSW wheatbelt*) with a combined impact area of 7.84 ha. This PCT includes patches that occur as a derived grassland, regrowth monotypic stands of *Callitris glaucophylla* (White Cypress Pine) and mature stands, recorded with high structural complexity including hollow bearing *Eucalyptus microcarpa* (Western Grey Box) and *E. dwyeri* (Dwyer's Red Gum) trees. All vegetation zones contained a relatively high diversity of groundcover grasses and forbs. PCT 70 was not consistent with the description of any TECs that are known to occur in the Darling Riverine Plains Bioregion.

This project has minimised impacts to biodiversity values at the proposal site by reducing the footprint of the extraction area by 55% (from 14.73 ha to 8.22 ha). The proposal avoids impact to areas of native grassland located on the western slope of the hill with high native understorey richness. No threatened species were identified at the proposal site.

The BAM calculator identified a total of 14 candidate species (species credit species) and 28 predicted species (ecosystem credit species) required consideration for assessment. Due to seasonal constraints, only three out of 14 candidate species could be surveyed during February, 2019 (subject to this current assessment). None of these species were identified in the proposal area. Out of the remaining eleven species, nine were assumed as present and two were assessed as absent due to habitat constraints. Further survey work is intended to be undertaken while the EIS subject to this current assessment is reviewed. This BDAR can then be updated including the results of any additional surveys undertaken.

Key safeguard and management measures identified to minimise and avoid biodiversity impacts include but are not limited to; detail delineation of vegetation clearing limits, relocation of woody debris into remnant habitat and development of protocols/ management plans to control invasion and spread of pathogens and weeds.

A total of 212 ecosystem credits and 768 species credits are required to offset the clearing of 7.84 ha of PCT 70. The proponent intends to acquit the liability of credits by making a lump sum payment of equivalent value to the Biodiversity Conservation Trust Fund. Alternatively, the proponent is investigating a stewardship site at the proposal site to retire the liability of credits.

The assessments identified that the proposed development is unlikely to significantly impact on any Matters of National Environment Significance.

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APPENDIX I: FLORA AND FAUNA SPECIES LIST

FLORA SPECIES LIST

The following is a list of all flora species recorded within the site. It should be noted that such a list cannot be considered comprehensive, but rather indicative of the flora. A period of some years is often required to identify all species present in an area, particularly for cryptic or seasonally detectable species (such as orchids, some grasses and grass-like herbs).

Note, weeds are marked under the column 'Exotic'

Family	*Scientific Name*	BAM Growth Form Group	Exotic	Common Name	P1	P2	P 3	P 4	P 5	P 6	P7	P 8	P9
ACANTHACEAE	*Brunoniella australis*	Forb (FG)		Blue Trumpet				1			1		
ADIANTACEAE	*Cheilanthes sp.*	Fern (EG)								1		1	1
AMARANTHACEAE	*Alternanthera nana*	Forb (FG)		Hairy Joyweed						1			
ASTERACEAE	*Brachyscome sp.*	Forb (FG)			1				1			1	
	Calotis cuneifolia	Forb (FG)		Purple Burr-daisy	1					1	1		
	Cassinia laevis	Shrub (SG)			1								
	Centaurea solstitialis		1	Yellow Star-thistle		1	1		1	1		1	1
	Chondrilla juncea		1	Skelton Weed			1		1			1	1
	Lactuca serriola		1	Prickly Lettuce								1	
	Vittadinia sp.	Forb (FG)		Fuzzweed			1						
BORAGINACEAE	*Heliotropium amplexicaule*		1	Blue Heliotrope									1
BRASSICACEAE	*Brassicaceae sp.*		1		1	1							
CAMPANULACEAE	*Wahlenbergia gracilis*	Forb (FG)					1						
	Wahlenbergia sp.	Forb (FG)				1				1	1	1	1

CASUARINACEAE	*Allocasuarina luehmannii*	Tree (TG)		Bulloak	1								
CELASTRACEAE	*Denhamia cunninghamii*	Shrub (SG)				1							
CHENOPODIACEAE	*Chenopodiaceae sp.*	Forb (FG)					1						
	Dysphania multifida	Forb (FG)	1	Scented Goosefoot		1			1			1	
	Einadia hastata	Forb (FG)				1					1	1	
	Einadia nutans	Forb (FG)		Climbing Saltbush	1	1		1	1	1	1	1	1
	Enchylaena tomentosa	Shrub (SG)	1	White Horehound	1	1					1	1	1
	Maireana microphylla	Shrub (SG)		Small-leaf Bluebush	1			1	1			1	1
	Salsola spp.	Shrub (SG)							1				
	Salsola australis	Forb (FG)			1	1	1						
	Sclerolaena muricata var. semiglabra	Shrub (SG)			1	1	1	1	1	1		1	1
CONVOLVULACEAE	*Convolvulus angustissimus*	Other (OG)			1				1				
	Dichondra repens	Forb (FG)		Kidney Weed							1		
CUPRESSACEAE	*Callitris glaucophylla*	Tree (TG)		White Cypress Pine	1	1	1	1			1		
CYPERACEAE	*Cyperus gracilis*	Grass and grasslike (GG)				1							
EUPHORBIACEAE	*Euphorbia sp.*	Forb (FG)			1								
	Euphorbia drummondii	Forb (FG)		Caustic Weed					1				
FABACEAE	*Glycine canescens*	Other (OG)		Silky Glycine	1	1	1			1	1		1

FABACEAE (CAESALPINIOIDEAE)	*Senna barclayana*	Forb (FG)					1		1		1			1
FABACEAE (FABOIDEAE)	*Desmodium varians*	Other (OG)									1			
GOODENIACEAE	*Goodenia glabra*	Forb (FG)			1									
LAMIACEAE	*Marrubium vulgare*		1	White Horehound	1	1								1
	Mentha satureioides	Forb (FG)		Creeping Mint						1				
	Salvia sp.	Forb (FG)	1					1		1		1	1	
	Salvia verbenaca		1	Wild Clary	1									
LORANTHACEAE	*Dendrophthoe spp.*	Other (OG)									1			
MALVACEAE	*Sida corrugata*	Forb (FG)		Corrugated Sida	1	1	1	1	1	1	1	1		1
MURICIDAE	*Tribulus terrestris*		1	Caltrop		1								
MYOPORACEAE	*Eremophila debilis*	Shrub (SG)		Winter Apple							1			
MYRTACEAE	*Eucalyptus dwyeri*	Tree (TG)				1								
	Eucalyptus microcarpa	Tree (TG)		Grey Box							1			
	Eucalyptus populnea	Tree (TG)		Bimble Box										
NYCTAGINACEAE	*Boerhavia dominii*	Forb (FG)		Tarvine	1	1				1	1	1		
OXALIDACEAE	*Oxalis chnoodes*	Forb (FG)									1			
	Oxalis sp.	Forb (FG)						1						
POACEAE	*Aristida ramosa*	Grass and grasslike (GG)		Purple Wiregrass	1			1		1		1	1	
	Aristida sp.		1									1		

	Aristida vagans	Grass and grasslike (GG)					1								
	Austrostipa scabra	Grass and grasslike (GG)				1	1	1		1	1	1		
	Austrostipa verticillata	Grass and grasslike (GG)		Slender Bamboo Grass		1		1			1			
	Bothriochloa macra	Grass and grasslike (GG)		Red Grass	1	1	1		1	1	1	1		1
	Cenchrus ciliaris		1	Buffel Grass		1	1							
	Chloris truncata	Grass and grasslike (GG)					1							
	Chloris ventricosa	Grass and grasslike (GG)		Tall Chloris	1									
	Digitaria brownii	Grass and grasslike (GG)				1				1	1	1		1
	Digitaria divaricatissima	Grass and grasslike (GG)		Umbrella Grass						1				
	Elymus scaber	Grass and grasslike (GG)				1		1				1		
	Enneapogon gracilis	Grass and grasslike (GG)		Slender Nineawn	1	1	1	1	1	1				1
	Enteropogon acicularis	Grass and grasslike (GG)				1	1		1	1				1
	Eragrostis leptostachya	Grass and grasslike (GG)		Paddock Lovegrass				1		1				
	Eragrostis sp.		1									1		1

	Pannicum sp.	Grass and grasslike (GG)						1	1				
	Paspalidium constrictum	Grass and grasslike (GG)				1		1			1		1
	Poaceae sp.	Grass and grasslike (GG)					1						
	Sporobolus caroli	Grass and grasslike (GG)							1				
	Tragus australianus	Grass and grasslike (GG)		Small Burrgrass				1	1	1		1	1
PORTULACACEAE	*Portulaca oleracea*	Forb (FG)		Purslane		1	1		1	1		1	1
RUTACEAE	*Geijera parviflora*	Shrub (SG)		Wilga		1							
SAPINDACEAE	*Dodonaea viscosa*	Shrub (SG)					1						
SOLANACEAE	*Lycium ferocissimum*		1	African boxthorn		1		1	1	1	1		
	Solanum esuriale	Forb (FG)								1		1	1
	Solanum ferocissimum	Shrub (SG)		Spiny Potato Bush						1			
VERBENACEAE	*Verbena rigida*		1	Veined Verbena			1						
TOTALS			**16**		**23**	**30**	**22**	**18**	**20**	**25**	**23**	**25**	**24**

FAUNA SPECIES LIST

The following is a list of all fauna species recorded within the site during the survey period.

Observation Type:

O – Observed	**B** - Burnt	**F** - Tracks/scratchings
T - Trapped or netted	**H** - Hair, feathers, or skin	**Y** - Bone or teeth
R - Road kill	**P** - Scat	**D** - Dog kill
W - Heard call	**C** - Cat kill	**Z** - In raptor/owl pellet
V - Fox kill	**E** - Nest/roost	**K** - Dead
M - Miscellaneous	**X** - In scat	**U** – Bat Recording

Notes
** – Indicates an introduced species.

Family	Scientific Name	Common Name	BC Act	EPBC Act	Observation Type
AVES					
ACANTHIZIDAE	*Acanthiza nana*	Yellow Thornbill			O
ACCIPITRIDAE	*Aquila audax*	Wedge-tailed Eagle			O
ARTAMIDAE	*Cracticus nigrogularis*	Pied Butcherbird			O
	Gymnorhina tibicen	Australian Magpie			O
CACATUIDAE	*Cacatua sanguinea*	Little Corella			O
	Eolophus roseicapilla	Gallah			O
CAMPEPHAGIDAE	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike			O
CORCORACIDAE	*Corcorax melanorhamphos*	White-winged Chough			O
	Struthidea cinerea	Apostlebird			O
CORVIDAE	*Corvus coronoides*	Australian Raven			O
FALCONIDAE	*Falco cenchroides*	Nankeen Kestrel			O
MELIPHAGIDAE	*Acanthagenys rufogularis*	Spiny-cheeked Honeyeater			O
	Manorina melanocephala	Noisy Miner			O
MONARCHIDAE	*Grallina cyanoleuca*	Magpie-lark			O
RHIPIDURIDAE	*Rhipidura leucophrys*	Willie Wagtail			O
MAMMALS					
LEPORIDAE	***Lepus capensis*	Brown Hare			O
MACROPODIDAE	*Macropus giganteus*	Eastern Grey Kangaroo			O
MINIOPTERIDAE	*Miniopterus schreibersii oceanensis*	Eastern Bent-Wing Bat			U
MOLOSSIDAE	*Mormopterus planiceps*	South-Eastern Freetail Bat			U
VESPERTILIONIDAE	*Nyctophilus sp.*				U
	Vespadelus vulturnus	Little Forest Bat			U

	Scotorepens balstoni	Inland Broad-nosed Bat	U
REPTILES			
SCINCIDAE	*Ctenotus sp.*		O

APPENDIX II: BAM SITE SURVEY FORMS

APPENDIX III: HABITAT ASSESSMENT FOR THREATENED SPECIES

Likelihood of occurrence criteria

Likelihood	Criteria
Recorded	The species was observed in the study area during the current survey.
High	It is highly likely that a species inhabits the study area and is dependent on identified suitable habitat (ie. for breeding or important life cycle periods such as winter flowering resources), has been recorded recently in the locality (20km) and is known or likely to maintain resident populations in the study area. Also includes species known or likely to visit the study area during regular seasonal movements or migration.
Moderate	Potential habitat is present in the study area. Species unlikely to maintain sedentary populations, however may seasonally use resources within the study area opportunistically or during migration. The species is unlikely to be dependent (ie. for breeding or important life cycle periods such as winter flowering resources) on habitat within the study area, or habitat is in a modified or degraded state. Includes cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded.
Low	It is unlikely that the species inhabits the study area and has not been recorded recently in the locality (10km). It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area, meaning that the species is not dependent (ie. for breeding or important life cycle periods such as winter flowering resources) on available habitat. Specific habitat is not present in the study area or the species are a non-cryptic perennial flora species that were specifically targeted by surveys and not recorded.
None	Suitable habitat is absent from the study area.

Scientific name	Common name	BC ACT[1]	EPBC Act[1]	Habitat requirements	Records[2]	Potential occurrence
Flora						
Androcalva procumbens		V	V	Prostrate shrub with slender trailing stems to 30 cm. In sandy sites mainly confined to the Dubbo;-Mendooran;-and Gilgandra region, also in Pilliga and Nymagee areas.	0	Low
Austrostipa wakoolica		V	E	Perennial spear grass that grows on floodplains of the Murray River tributaries, in open woodland on grey, silty clay or sandy loam soils; habitats include the edges of a lignum swamp with box and mallee; creek banks in grey, silty clay; mallee and lignum sandy-loam flat; open Cypress Pine forest on low sandy range; and low, rocky rise.	0	Low
Caladenia tessellata	Thick Lip Spider Orchid	E	V	The Thick-lipped Spider-orchid is a perennial orchid that sprouts annually from an underground tuber. It is distributed from the central coast of NSW to the Westernport region of southern Victoria. It grows on clay loam or sandy soils.	1	Low
Commersonia procumbens		V	V	This prostrate shrub is endemic to NSW, mainly confined to the Dubbo-Mendooran-Gilgandra region, but also in the Pilliga and Nymagee areas. Recent collections made from the Upper Hunter region, and additional populations found in Goonoo SCA in response to the 2007 fires. It grows in sandy sites, often along	1	Low

				roadsides. And recorded in *Eucalyptus dealbata, E. sideroxylon Melaleuca uncinata* scrub, under mallee eucalypts with a *Calytrix tetragona* understorey, and in a recently burnt Ironbark and Callitris area.		
Dichanthium setosum	Bluegrass	V	V	Bluegrass is an upright grass less than 1 m tall. The grass is often found in moderately disturbed areas and is associated with heavy basaltic black soils and red-brown loams with clay subsoil. Flowering occurs 3 - 4 weeks after rainfall, and a seed head is required for ID. Bluegrass was last recorded in the study area from two sites on the outskirts of the township of Narromine in 1892..	2	Low This species was not recorded during field assessments inside the survey period
Homoranthus darwinioides		V	V	This slender hairless shrub, is rare in the central tablelands and western slopes of NSW, occurring from Putty to the Dubbo district. It is found west of Muswellbrook between Merriwa and Bylong, and north of Muswellbrook to Goonoo SCA. Grows in in various woodland habitats with shrubby understoreys, usually in gravely sandy soils. Landforms the species has been recorded growing on include flat sunny ridge tops with scrubby woodland, sloping ridges, gentle south-facing slopes, and a slight depression on a roadside with loamy sand.	0	Low
Indigofera efoliata	Leafless Indigo	E	E	The Leafless Indigo is a broom-like subshrub to 40 cm high.The plant is possibly extinct, known only from a few collections in the Dubbo area. Mr E.F. Biddiscombe is the only person alive to have seen *Indigofera efoliata* in the wild, in August 1955. Sites were located along the Dubbo to Minore railway line and road, on Wallaringa and Geurie properties and in Goonoo State Forest.	1	Low
Leucochrysum albicans var. tricolor	Hoary Sunray		E	The Hoary Sunray is a perennial everlasting daisy. In NSW it currently occurs on the Southern Tablelands adjacent areas in an area roughly bounded by Albury, Bega and Goulburn, with a few scattered locatlities know from beyond this region. Can occur in modified habitats such as semi-urban areas and roadsides.	0	Low
Prasophyllum petilum	Tarengo Leek Orchid	E	E	This orchid is known from seven populations in open eucalypt woodland and grassland in New South Wales. The species' area of occupancy is estimated to be 1.5 km2 with an estimated population size based on surveys in 2006 of 460 mature individuals. Occurs in a wide variety of grassland, woodland and forest habitats, generally on relatively heavy soils.	0	Low
Prasophyllum sp. Wybong	a leek-orchid		CE	Prasophyllum sp. Wybong (C. Phelps ORG 5269) is a terrestrial orchid that grows to approximately 30 cm high. The orchid is endemic to NSW, it is known from near Ilford, Premer, Muswellbrook, Wybong, Yeoval, Inverell, Tenterfield, Currabubula	0	Low

				and the Pilliga area. Known to occur in open eucalypt woodland and grassland.		
Swainsona murrayana	Slender Darling-pea	V	V	The species has been collected from clay-based soils, ranging from grey, red and brown cracking clays to red-brown earths and loams. Grows in a variety of vegetation types including bladder saltbush, black box and grassland communities on level plains, floodplains and depressions and is often found with Maireana species. Plants have been found in remnant native grasslands or grassy woodlands that have been intermittently grazed or cultivated.	0	Low
Swainsona recta	Small Purple-pea	E	E	In grassland and open woodland, often on stony hillsides. NSW subdivisions: CT, ST, CWS, SWS, ?NWP. The species grows in association with understorey dominants that include *Themeda triandra* and Poa sp. tussocks.	0	Low
Swainsona sericea	Silky Swainson-pea	V		Found in Box-Gum Woodland in the Southern Tablelands and South West Slopes, including in association with Callitris sp.	1	Low
Tylophora linearis		V	E	Grows in dry scrubland that may have a eucalypt, *Callitris glaucophylla* and/or *Allocasuarina luehmannii* overtopping the scrub, in the Barraba, Mendooran, Temora and West Wyalong districts. NSW subdivisions: NWS, CWS, NWP, Other Australian states: Qld.	0	Low
Aves						
Anseranas semipalmata	Magpie Goose	V		The Magpie Goose is found in central and northern NSW in shallow wetlands (less than 1 m deep) with dense growth of rushes or sedges. The bird feeds on grasses, bulbs and rhizomes centred on wetlands, mainly those on floodplains of rivers and large shallow wetlands formed by run-off.	6	Low Habitat not present
Anthochaera phrygia	Regent Honeyeater	E	CE	Inhabits eucalypt open forests and woodlands, predominantly box-ironbark types, but also Spotted Gum and Swamp Mahogany on the coast. The species also inhabits River She-oak gallery forest with *Amyema cambagei* (Needle-leaf Mistletoe). It is estimated that the NSW population of Regent Honeyeaters may now be fewer than 250 mature individuals.	7	Low Important habitat for this species is not known to occur in the local area.
Ardeotis australis	Australian Bustard	E		The Australian Bustard is a large ground-dwelling bird that inhabits grasslands, low shrublands, low grassy woodlands and occasionally seen in pastoral and cropping country.	2	Low The bird was last recorded in the search area (< 20 km of the proposal site) on the

						outskirts of township of Narromine in 1985.
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V		In NSW, this species is widespread from coast to inland, including the western slopes of the Great Dividing Range and farther west. It is sparsely scattered in, or largely absent from, much of the Upper Western region. Despite records showing a wide distribution and occurrence in a variety of habitats, the Dusky Woodswallow is considered to be a woodland dependent bird with the majority of breeding records, as well as presence records within the breeding period, occurring on the western slopes of the Great Dividing Range, a region dominated by woodland and open dry forest.	2	Low
Botaurus poiciloptilus	Australasian Bittern	E	E	Widespread but uncommon over south-eastern Australia. Lives alone or in loose groups and favours permanent fresh-waters dominated by sedges, rushes, reeds or cutting grasses (eg. Phragmites, Scirpus, Eleocharis, Juncus, Typha, Baumea and Gahnia).	0	Low Habitat not present
Burhinus grallarius	Bush Stone-curlew	E		Assessed as a candidate species in **Section 5** - Table 5.1	1	Low
Calidris ferruginea	Curlew Sandpiper	E	CE	Occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater wetlands in the Murray-Darling Basin. Inland records are probably mainly of birds pausing for a few days during migration.	0	Low Habitat not present
Calyptorhynchus lathami	Glossy Black-Cockatoo	V		Assessed as a candidate species in **Section 5** - Table 5.1	17	Moderate
Chthonicola sagittata	Speckled Warbler	V		Lives in a wide range of eucalypt-dominated vegetation that typically includes scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. Large, relatively undisturbed remnants are required for the species to persist in an area. This species is most frequently reported from the hills and tablelands of the Great Dividing Range, and rarely from the coast.	8	Moderate May forage or rest within proposal site but not considered important habitat for this species
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V		Brown Treecreeper is endemic to eastern Australia and occurs in eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range. Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes	26	Moderate May forage or rest within proposal site but not considered important habitat for this species

				with one or more shrub species. Usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging.		
Daphoenositta chrysoptera	Varied Sittella	V		A sedentary bird, in NSW distribution is nearly continuous from the coast to the far west. Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	2	Low
Falco subniger	Black Falcon	V		In NSW the Black Falcon occurs in inland regions. There is assumed to be a single population that is continuous with a broader continental population, given that falcons are highly mobile, commonly travelling hundreds of kms.	2	Low
Glossopsitta pusilla	Little Lorikeet	V		Forages primarily in the canopy of open Eucalypt forest and woodland, yet also forages on Angophoras, Melaleucas and other tree species. Riparian habitats are often utilised. Isolated flowering trees in open country, eg paddocks, roadside remnants and urban trees also help sustain viable populations of the species.	1	Low
Grantiella picta	Painted Honeyeater	V	V	Nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird are from the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. Inhabits Boree/ Weeping Myall (Acacia pendula), Brigalow (*A. harpophylla*) and Box-Gum Woodlands and Box-Ironbark Forests.	0	Low
Hieraaetus morphnoides	Little Eagle	V		Assessed as a candidate species in **Section 5** - Table 5.1	6	Moderate
Hirundapus caudacutus	White-throated Needletail		C,J	In eastern Australia, the bird is recorded in all coastal regions of Queensland and NSW, extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. In Australia, the White-throated Needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground	0	Low
Lathamus discolor	Swift Parrot	E	CE	Migrates to the Australian south-east mainland between March and October. The bird generally occurs in areas where eucalypts are flowering profusely or where there are abundant lerp infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany, Spotted Gum, Red Bloodwood, Mugga Ironbark and White Box.	1	Low
Leipoa ocellata	Malleefowl	E	V	The stronghold for this species in NSW is the mallee in the south west centred on Mallee Cliffs NP and extending east to near Balranald and scattered records as far north as Mungo NP. West of	0	Low

				the Darling River a population also occurs in the Scotia mallee including Tarawi NR and Scotia Sanctuary, and is part of a larger population north of the Murray River in South Australia.		
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	V		Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses.	1	Low
Neophema pulchella	Turquoise Parrot	V		The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland.	6	Moderate Common habitat present. May forage or rest within proposal site but not considered important habitat for this species.
Ninox connivens	Barking Owl	V		Assessed as a candidate species in **Section 5** - Table 5.1.	1	Low
Numenius madagascariensis	Eastern Curlew		CE	Primarily coastal distribution. Found in all states, particularly the north, east, and south-east regions. Eastern Curlews are rarely recorded inland. In NSW is mainly found in estuaries such as the Hunter River, Port Stephens, Clarence River, Richmond River and ICOLLs of the south coast.	0	Low Habitat not present
Polytelis swainsonii	Superb Parrot	V	V	Assessed as a candidate species in **Section 5** - Table 5.1.	14	Moderate
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V		In NSW, eastern sub-species of the Grey-crowned Babbler occurs on the western slopes of the Great Dividing Range. Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. It builds and maintains several conspicuous, dome-shaped stick nests about the size of a football.	112	Moderate Common habitat present. May forage or rest within proposal site but not considered important habitat for this species.
Rostratula australis	Australian Painted-snipe	E	E	Most records are from the south east, particularly the Murray Darling Basin. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds.	0	Low Habitat not present
Stagonopleura guttata	Diamond Firetail	V		The bird is widely distributed in NSW including concentration of records from the Northern, Central and Southern Tablelands, the	8	Moderate

				Northern, Central and South Western Slopes and the North West Plains and Riverina. The bird is found in grassy eucalypt woodlands, including Box-Gum Woodlands.		Common habitat present. May forage or rest within proposal site but not considered important habitat for this species.
Fish						
Maccullochella macquariensis	Trout Cod	E	E	The Trout Cod is known from a single natural population, two stable translocated populations and many stocked populations. The single naturally occurring population is restricted to a small (approximately 120 km) stretch of the Murray River from below Yarrawonga Weir to Strathmerton.	0	Low Habitat not present
Maccullochella peelii	Murray Cod		V	The Murray Cod occurs naturally in the waterways of the Murray-Darling Basin and is known to live in a wide range of warm water habitats that range from clear, rocky streams to slow flowing turbid rivers and billabongs.	0	Low Habitat not present
Macquaria australasica	Macquarie Perch	E	E	Extant populations of the Macquarie Perch are known to occur in the upper reaches of the Lachlan, Murrumbidgee and Murray catchments in the Murray-Darling Basin, and in the Hawkesbury/Nepean catchment on the east coast.	0	Low Habitat not present
Mammalia						
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW.	0	Low Habitat in the form of cliffs or caves not found in the subject area.
Chalinolobus picatus	Little Pied Bat	V		The Little Pied Bat is found in inland Queensland and NSW (including Western Plains and slopes). Occurs in dry open forest, open woodland, mulga woodlands, chenopod shrublands, cypress pine forest and mallee and Bimbil box woodlands.	7	Moderate Habitat suitable for this species is available in the proposal area.
Dasyurus maculatus	Spot-tailed Quoll	V	E	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites with basking and latrine sites often nearby.	0	Low

Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V		The Eastern Bentwing-bat occurs along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. The bat hunts in forested areas, catching moths and other flying insects above the tree tops.	1	Low Habitat in the form of caves is not found in the subject area.
Nyctophilus corbeni	Corben's Long-eared Bat	V	V	Inhabits a variety of vegetation types, including mallee, bulloke *Allocasuarina leuhmanni* and box eucalypt dominated communities, but distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Roosts in tree hollows, crevices, and under loose bark.	0	Low
Phascolarctos cinereus	Koala	V	V	Assessed as a candidate species in **Section 5** - Table 5.1.	2	Low
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Assessed as a candidate species in **Section 5** - Table 5.1.	1	Low
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V		The Yellow-bellied Sheathtail-bat is a wide-ranging species found across northern and eastern Australia. In NSW, there are scattered records of this species across the New England Tablelands and North West Slopes. Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows	3	Low
Reptilia						
Aprasia parapulchella	Pink-tailed Worm-lizard	V	V	In NSW this Legless Lizard is known from the Central and Southern Tablelands, and the South Western Slopes. Inhabits sloping, open woodland areas with predominantly native grassy ground layers, particularly those dominated by Kangaroo Grass. Sites are typically well-drained, with rocky outcrops or scattered, partially-buried rocks.	0	Low
Delma impar	Striped Legless Lizard	V	V	Found mainly in Natural Temperate and occasionally in open Box-Gum Woodland. Habitat is where grassland is dominated by perennial, tussock-forming grasses such as *Themeda australis, Austrostipa spp. and Poa spp.*, and occasionally *Austrodanthonia spp.* Sometimes present in modified grasslands with a significant content of exotic grasses or surface rocks (used for shelter).	0	Low

[1] Status Abbreviations: V – Vulnerable, E – Endangered, CE – Critically Endangered, C (CAMBA migratory protected bird) and J (JAMBA migratory protected bird).

[2] Number of OEH wildlife atlas records in selected area Approx. 20km radius [North: -31.97 West: 148.01 East: 148.61 South: -32.57]

APPENDIX IV: MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE SEARCH

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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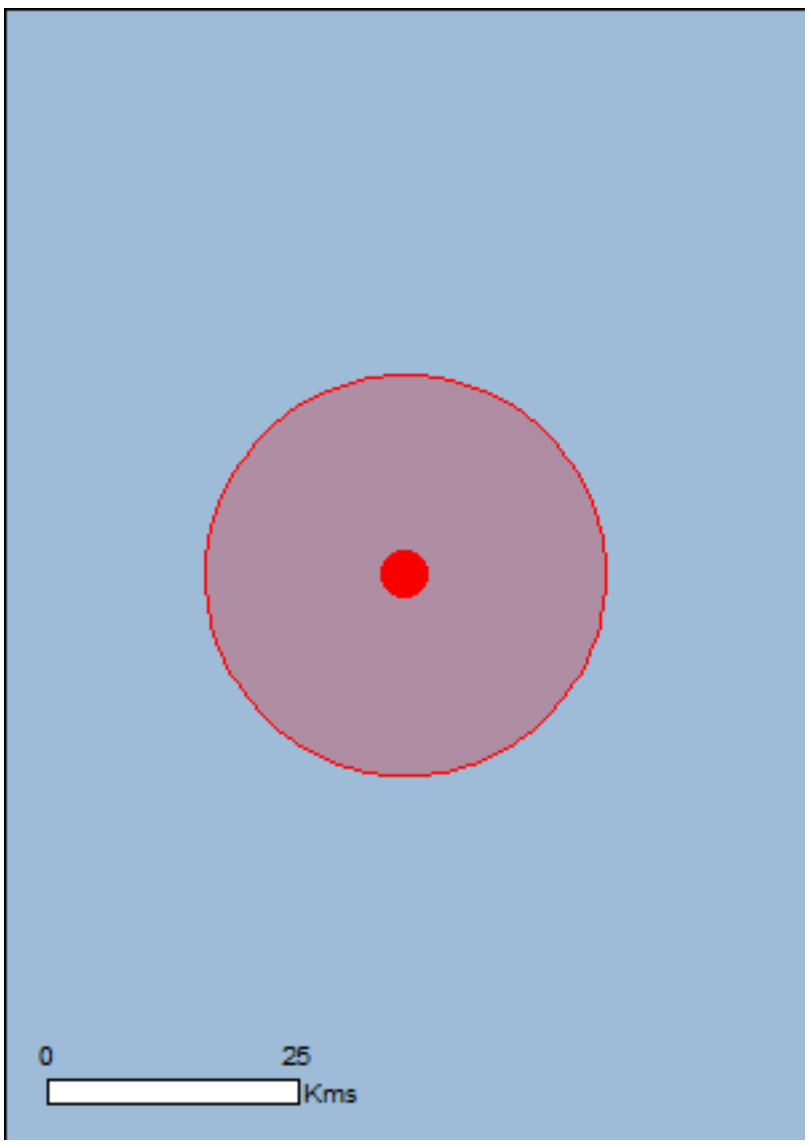

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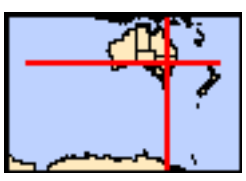

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	6
Listed Threatened Species:	29
Listed Migratory Species:	10

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	4
Commonwealth Heritage Places:	None
Listed Marine Species:	17
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	18
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar) [Resource Information]

Name	Proximity
Banrock station wetland complex	700 - 800km upstream
Riverland	600 - 700km upstream
The coorong, and lakes alexandrina and albert wetland	800 - 900km upstream
The macquarie marshes	100 - 150km upstream

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	Endangered	Community may occur within area
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community likely to occur within area
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	Critically Endangered	Community may occur within area
Poplar Box Grassy Woodland on Alluvial Plains	Endangered	Community may occur within area
Weeping Myall Woodlands	Endangered	Community likely to occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Species or species habitat known to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area

Name	Status	Type of Presence
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Species or species habitat known to occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Fish		
Maccullochella macquariensis Trout Cod [26171]	Endangered	Species or species habitat may occur within area
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat known to occur within area
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat may occur within area
Nyctophilus corbeni Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat likely to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Plants		
Androcalva procumbens [87153]	Vulnerable	Species or species habitat likely to occur within area
Austrostipa wakoolica [66623]	Endangered	Species or species habitat may occur within area
Homoranthus darwinioides [12974]	Vulnerable	Species or species habitat may occur within area
Leucochrysum albicans var. tricolor Hoary Sunray, Grassland Paper-daisy [56204]	Endangered	Species or species habitat may occur within area
Prasophyllum petilum Tarengo Leek Orchid [55144]	Endangered	Species or species habitat may occur within area
Prasophyllum sp. Wybong (C.Phelps ORG 5269) a leek-orchid [81964]	Critically Endangered	Species or species

Name	Status	Type of Presence
		habitat may occur within area
Swainsona murrayana Slender Darling-pea, Slender Swainson, Murray Swainson-pea [6765]	Vulnerable	Species or species habitat likely to occur within area
Swainsona recta Small Purple-pea, Mountain Swainson-pea, Small Purple Pea [7580]	Endangered	Species or species habitat may occur within area
Tylophora linearis [55231]	Endangered	Species or species habitat may occur within area
Reptiles		
Aprasia parapulchella Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat likely to occur within area
Delma impar Striped Legless Lizard [1649]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -
Commonwealth Land - Australian Postal Commission
Commonwealth Land - Australian Telecommunications Commission
Commonwealth Land - Commonwealth Trading Bank of Australia

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area

Extra Information

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-32.27362 148.31128

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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APPENDIX V: BAM CREDIT SUMMARY AND PAYMENT REPORT

BAM Credit Summary Report

Proposal Details

Assessment Id
00013863/BAAS19023/19/00013864

Proposal Name
Redden Quarry

BAM data last updated *
04/07/2019

Assessor Name
Luke Pickett

Report Created
12/08/2019

BAM Data version *
12

Assessor Number
BAAS17100

BAM Case Status
Open

Date Finalised
To be finalised

Assessment Revision
0

Assessment Type
Part 4 Developments (General)

* 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.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	Vegetation integrity loss / gain	Area (ha)	Constant	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAII	Ecosystem credits
White Cypress Pine woodland on sandy loams in central NSW wheatbelt								
1	70_2	64.7	0.5	0.25	High Sensitivity to Potential Gain	1.75		13
2	70_4	31.4	1.3	0.25	High Sensitivity to Potential Gain	1.75		18
3	70_5	34.8	1.2	0.25	High Sensitivity to Potential Gain	1.75		18

4	70_1	87.7	3.3	0.25	High Sensitivity to Potential Gain	1.75		125
5	70_3	53.9	1.6	0.25	High Sensitivity to Potential Gain	1.75		38
							Subtotal	**212**
							Total	**212**

Species credits for threatened species

Vegetation zone name	Habitat condition (HC)	Area (ha) / individual (HL)	Constant	Biodiversity risk weighting	Potential SAII	Species credits
Calyptorhynchus lathami / Glossy Black-Cockatoo (Fauna)						
70_2	64.7	0.45	0.25	2	N/A	15
70_1	87.7	3.25	0.25	2	N/A	143
70_3	53.9	1.62	0.25	2	N/A	44
					Subtotal	**202**
Diuris tricolor / Pine Donkey Orchid (Flora)						
70_2	64.7	0.45	0.25	1.5	False	11
70_1	87.7	3.25	0.25	1.5	False	107
70_3	53.9	1.62	0.25	1.5	False	33
70_4	31.4	1.31	0.25	1.5	False	15
70_5	34.8	1.21	0.25	1.5	False	16
					Subtotal	**182**
Hieraaetus morphnoides / Little Eagle (Fauna)						
70_1	87.7	3.25	0.25	1.5	N/A	107

70_2	64.7	0.45	0.25	1.5	N/A	11
70_3	53.9	1.62	0.25	1.5	N/A	33
					Subtotal	**151**
Lophochroa leadbeateri / Major Mitchell's Cockatoo (Fauna)						
70_2	64.7	0.45	0.25	2	N/A	15
70_1	87.7	3.25	0.25	2	N/A	143
70_3	53.9	1.62	0.25	2	N/A	44
					Subtotal	**202**
Lophoictinia isura / Square-tailed Kite (Fauna)						
70_2	64.7	0.45	0.25	1.5	N/A	11
70_1	87.7	3.25	0.25	1.5	N/A	107
70_3	53.9	1.62	0.25	1.5	N/A	33
					Subtotal	**151**
Ninox connivens / Barking Owl (Fauna)						
70_1	87.7	3.25	0.25	2	N/A	143
70_3	53.9	1.62	0.25	2	N/A	44
70_2	64.7	0.45	0.25	2	N/A	15
					Subtotal	**202**
Polytelis swainsonii / Superb Parrot (Fauna)						
70_2	64.7	0.45	0.25	2	N/A	15
70_1	87.7	3.25	0.25	2	N/A	143

70_3	53.9	1.62	0.25	2	N/A	44
					Subtotal	**202**
Pterostylis cobarensis / Greenhood Orchid (Flora)						
70_2	64.7	0.45	0.25	1.5	False	11
70_1	87.7	3.25	0.25	1.5	False	107
70_3	53.9	1.62	0.25	1.5	False	33
70_4	31.4	1.31	0.25	1.5	False	15
70_5	34.8	1.21	0.25	1.5	False	16
					Subtotal	**182**
Tyto novaehollandiae / Masked Owl (Fauna)						
70_2	64.7	0.45	0.25	2	N/A	15
70_1	87.7	3.25	0.25	2	N/A	143
70_3	53.9	1.62	0.25	2	N/A	44
					Subtotal	**202**

Biodiversity payment summary report

Assessment Id	Payment data version	Assessment Revision	Report created
00013863/BAAS19023/19/00013864	61	0	12/08/2019

Assessor Name	Assessor Number	Proposal Name	BAM Case Status
Luke Pickett	BAAS17100	Redden Quarry	Open

Assessment Type	Date Finalised
Part 4 Developments (General)	To be finalised

PCT list

Include	PCT common name	Credits
Yes	**70 -** White Cypress Pine woodland on sandy loams in central NSW wheatbelt	212

Species list

Include	Species	Credits
Yes	***Lophochroa leadbeateri*** (Major Mitchell's Cockatoo)	202
Yes	***Calyptorhynchus lathami*** (Glossy Black-Cockatoo)	202
Yes	***Diuris tricolor*** (Pine Donkey Orchid)	182
Yes	***Lophoictinia isura*** (Square-tailed Kite)	151
Yes	***Ninox connivens*** (Barking Owl)	202
Yes	***Polytelis swainsonii*** (Superb Parrot)	202
Yes	***Pterostylis cobarensis*** (Greenhood Orchid)	182
Yes	***Tyto novaehollandiae*** (Masked Owl)	202

Yes	***Hieraaetus morphnoides*** (Little Eagle)	151

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

IBRA sub region	PCT common name	Baseline price	Dynamic coefficient	Market coefficient	Risk premium	Administrative cost	Methodology adjustment factor	Price per credit	No. of ecosystem credits	Final credits price
Bogan-Macquarie	**70 -** White Cypress Pine woodland on sandy loams in central NSW wheatbelt **Warning: This PCT has NO trades recorded**	$4,248.35	0.71782200	2.51860000	19.99%	$20.00	1.0000	$6,009.29	212	$ 1,273,969.88

Subtotal (excl. GST)	**$1,273,969.88**
GST	**$127,396.99**
Total ecosystem credits (incl. GST)	**$1,401,366.87**

Species credits for threatened species

Species profile ID	Species	Threat status	Price per credit	Risk premium	Administrative cost	No. of species credits	Final credits price
10116	***Lophochroa leadbeateri*** (Major Mitchell's Cockatoo)	Vulnerable	$506.66	19.9900%	$20.00	202	$126,844.15

10140	***Calyptorhynchus lathami*** (Glossy Black-Cockatoo)	Vulnerable	$506.66	19.9900%	$20.00	202	$126,844.15
10243	***Diuris tricolor*** (Pine Donkey Orchid)	Vulnerable	$158.64	19.9900%	$20.00	182	$38,284.09
10495	***Lophoictinia isura*** (Square-tailed Kite)	Vulnerable	$506.66	19.9900%	$20.00	151	$94,819.14
10561	***Ninox connivens*** (Barking Owl)	Vulnerable	$173.02	19.9900%	$20.00	202	$45,976.55
10645	***Polytelis swainsonii*** (Superb Parrot)	Vulnerable	$725.00	19.9900%	$20.00	202	$179,765.36
10698	***Pterostylis cobarensis*** (Greenhood Orchid)	Vulnerable	$150.00	19.9900%	$20.00	182	$36,397.27
10820	***Tyto novaehollandiae*** (Masked Owl)	Vulnerable	$506.66	19.9900%	$20.00	202	$126,844.15
20131	***Hieraaetus morphnoides*** (Little Eagle)	Vulnerable	$506.66	19.9900%	$20.00	151	$94,819.14

Subtotal (excl. GST)	**$870,594.00**
GST	**$87,059.40**
Total species credits (incl. GST)	**$957,653.40**

Grand total	**$2,359,020.27**