Groundwork Plus Pty Ltd Resources Environment Planning Laboratories
Phone: 1800 GW PLUS (1800 497 587)
Email: info@groundwork.com.au
Website: groundwork.com.au
ABN 13 609 422 791

28 April 2022
BCS Ref: DOC21/880625
Council Ref: DA34/2021 and CNR-28134
GW+ Ref: 2542 DA1 015

Patsy Cox
Planning Officer
Gwydir Shire Council

Samantha Wynn
Senior Team Leader Planning North West
Biodiversity, Conservation and Science
Department of Planning, Industry and Environment

Dear Patsy and Samantha

RE: North Star Quarry, Response to request for additional information from BCS

Groundwork Plus Pty Ltd continue to act on behalf of Regional Quarries Australia Pty Ltd in relation to the proposed North Star Quarry (the proposal). On the 22 February 2022, Gwydir Shire Council (Council), provided us with a copy of the letter from Biodiversity, Conservation and Science (BCS) Directorate of Department of Planning, Industry and Environment (DPIE) dated 19 October 2021 in relation to the proposal.

Response to information request and revised BDAR

We have reviewed the points raised by BCS and liaised with OzArk to provide a response to the matters raised by BCS including revised Biodiversity Development Assessment Report (BDAR) (refer Attachment 1). As explained in the OzArk covering letter and revised BDAR, the proposal has been revised in line with the recommendations and comments from BCS including:

- All references to the PCT occurring on site now read "PCT 445 - Brigalow viney scrub open forest on loamy soils in low hill landscapes in the northern Brigalow Belt South Bioregion." This is the correct PCT and number.

- Targeted surveys in March 2022 for Ooline (*Cadellia pentastylis*) and Belson's Panic (*Homopholis belsonii*) have now been conducted, to reflect changes in the impact footprint and were not found to be present and thus excluded from the site.

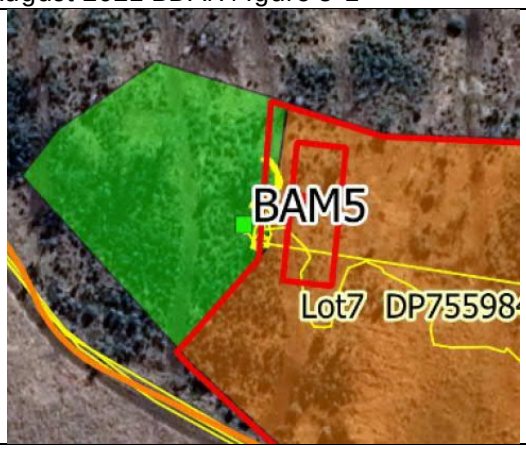
- Targeted surveys in March 2022 identified that resumption of quarrying in areas subject to an existing development approval had occurred which reduced the impact area for the assessment to approximately 2.03ha. We understand that the existing development approval is DA1527/2010, granted by Council on 2 July 2012.

The revised BDAR by OzArk advises that the following species credits are required to be offset:

Species	Vegetation zone	Species Credits
Chalinolobus dwyeri / Large-eared Pied Bat (Fauna)	445_Derived 445_Cropped	7 1
Miniopterus orianae oceanensis / Large Bent-winged Bat (Fauna)	445_Derived 445_Cropped	7 1
Ninox connivens / Barking Owl (Fauna)	445_Derived 445_Cropped	5 1
Tyto novaehollandiae / Masked Owl (Fauna)	445_Derived 445_Cropped	5 1
Vespadelus troughtoni / Eastern Cave Bat (Fauna)	445_Derived 445_Cropped	7 1

Subsequent minor revision to proposal plans

When OzArk were reviewing the previous BDAR dated August 2021 (submitted with the EIS for the proposal), OzArk identified as shown on the image below (from Figure 5-1 of the August 2021 BDAR) that the previous BDAR inadvertently included a quarry footprint (red line below) which impacted PCT 445 Woodland (green shading below). That was not the intention as the proposal had sought to avoid the PCT 445 Woodland (green shading below). The revised BDAR prepared for this response to the BCS information request has included a minor realignment of the quarry footprint to fully avoid the PCT 445 Woodland area (also as shown below and in Figure 5-1 of the revised BDAR attached to this response letter).

August 2021 BDAR Figure 5-1	April 2022 BDAR Figure 5-1
	

This requires a minor realignment of the quarry footprint of the proposal plans included within the EIS. The revised proposal plans are provided for Council reference (Attachment 2). As can be seen in the images above, the realignment of the quarry footprint is minor and is not substantially different.

Conclusion

It is our understanding that the matters raised by BCS have been addressed by the cover letter and revised BDAR by OzArk and the revised proposal plans. If you require any further information, please do not hesitate to contact me on 0406 680 969.

Yours faithfully
Groundwork Plus Pty Ltd

Jim Lawler
Associate

Samantha Wynn
Senior Team Leader Planning North West
Biodiversity, Conservation and Science Directorate

20 April 2022

Dear Samantha,

North Star Quarry, 5535 North Star Road, North Star

The Biodiversity Development Assessment Report (BDAR) for the proposed North Star Quarry has been revised in line with the recommendations and comments provided by the Biodiversity, Conservation and Science Directorate. The BDAR has also been revised to reflect the fact that targeted surveys for Ooline (*Cadellia pentastylis*) and Belson's Panic (*Homopholis belsonii*) have now been conducted, to reflect changes in the impact footprint.

The initial survey work and reporting were carried out by Dr Kate Hammill (BAAS18022). Subsequent revisions and additional survey work was undertaken by Dr David Orchard (BAAS21028).

In this letter, the original recommendations are given in **blue,** and the revisions made are discussed in black.

1. References to the PCT on site are not consistent

1.1 Update all PCT references throughout the BDAR with the correct PCT number and PCT name.

All references to the PCT occurring on site now read "PCT 445 - Brigalow viney scrub open forest on loamy soils in low hill landscapes in the northern Brigalow Belt South Bioregion." This is the correct PCT and number.

2. Vegetation zones not consistent between BDAR and BAM-C

2.1 Map all vegetation zones on site based on PCT and broad condition state.

This concerns the mapping of the existing quarry area to the same derived grassland vegetation zone as the unquarried area. This was originally done as the quarry was inactive and grasses had regrown across the quarry. On returning to the site to conduct targeted surveys, it was observed that quarrying has resumed, and that no native vegetation now persists within this quarried area. It is understood that the quarry site itself is subject to a prior development approval and is permitted to be cleared under the existing conditions of consent; consequently, this area has been removed from the impact calculations. It was not possible to determine whether the derived grassland in the unquarried area was the same as that which had previously dominated the quarried area. The initial mapping has been retained where it is necessary to discuss changes to the proposal footprint.

2.2 Vegetation zones not consistent between BDAR and BAM-C.

BAM-C data has been re-entered using two vegetation zones: 445_Derived and 445_Cropped. The BDAR has been revised to reflect this. An additional zone, 445_Woodland, is discussed in places to highlight the proponent's avoidance strategies but is not included in the impact footprint.

3. It is unclear whether BAM 2017 or BAM 2020 has been applied

3.1 Ensure that the BDAR conforms to BAM 2020.

The BDAR was completed according to BAM 2020 and conforms to BAM 2020 requirements.

3.2 It is unclear whether BAM 2017 or BAM 2020 has been applied.

The BDAR was completed according to BAM 2020. This is now reflected in the text. Incorrect references to BAM 2017 have been removed.

4. There are inconsistencies in the clearing amount

4.1 Ensure all figures relating the native vegetation clearing are correct and consistent.

Following modification of the proposal footprint, the total clearing area is 2.00 ha, comprising 1.76 ha of 445_Derived and 0.24 ha of 445_Cropped. The BDAR has been updated to reflect this change. The clearing area of 445_Derived has been given as 1.8 ha where that is the value given in the BAM-C outputs.

5. There are inconsistencies between the plot data presented in the BDAR and BAM-C

5.1 All data in the BDAR and the BAM-C must be correct and consistent.

The identified error has been corrected. The values in the BAM-C were correct while the values in the BDAR were in error. This has been corrected so that the BDAR reflects the BAM-C inputs.

The hollow-bearing tree recorded in Plot 6 was a stag, not a live tree. For this reason, the plot was recorded as containing a hollow-bearing tree but no tree species were reported.

6. Advice should be sought from DAWE regarding EPBC referral

6.1 Seek advice from DAWE on whether a referral should be made for Belson's Panic.

The initial report indicated that Belson's Panic (*Homopholis belsonii*) had been recorded in a BAM plot adjacent to the subject land. It has been possible to examine a preserved sample from this putative population and it was determined that the sample did not represent *H. belsonii*, lacking signature features of the species including the long (8-15 cm) racemes and comparatively long (4.8-8 mm), laterally compressed spikelets. The preserved sample possessed conspicuously shorter racemes (< 4 cm) and smaller, rounded spikelets. While the condition of the sample did not allow for a positive identification, the most likely candidate is a *Panicum* species. To confirm this, targeted surveys were conducted in March 2022 to determine whether any population of Belson's Panic occurs on the subject land. These surveys used parallel transects of 5-10 m width. While several broadly similar species were noted – including *Panicum coloratum*, *P. buncei*, and *P. decompositum* – no individuals of this species were observed. The BDAR has been updated to reflect the absence of Belson's Panic. Targeted survey details are now incorporated into the report.

Additional Changes and Comments

Owing to the exclusion of the active quarry from the subject land, the total impact area has changed. Consequently, mapping of PCTs and other site features has been revised. Likewise, the total credit obligation generated by this proposal is markedly different.

Targeted surveys for Belson's Panic and Ooline (*Cadellia pentastylis*) have been conducted and are described in the BDAR. The BDAR and BAM-C data have been revised to reflect the absence of these species from the site.

The Masked Owl (*Tyto novaehollandiae*) has been retained in the impact calculations, despite having previously been removed. It was felt that this removal could not be justified, as suitable habitat (one hollow-bearing tree) occurs within the site.

Yours sincerely,

David Orchard

Ecologist, OzArk Environment & Heritage

BAAS21028

Biodiversity Development Assessment Report

North Star Quarry

North Star, NSW

Gwydir Local Government Area

April 2021

Report prepared by

OzArk Environment & Heritage

for Groundwork Plus

on behalf of

Regional Quarries Pty Ltd

OzArk
Environment & Heritage

145 Wingewarra St
(PO Box 2069)
Dubbo NSW 2830

Phone: (02) 6882 0118
Fax: (02) 6882 0630
enquiry@ozarkehm.com.au
www.ozarkehm.com.au

OzArk and staff acknowledge Traditional Owners and Custodians of the country on which we work

DOCUMENT CONTROLS

Proponent	Regional Quarries Australia Pty Ltd		
Client	Groundwork Plus		
Document description	Biodiversity Development Assessment Report (BDAR)		
	Name	Signed	Date
Clients reviewing officer			
Clients representative managing this document		OzArk representative managing this document	
Jim Lawler		Dr Crystal Graham (CG)	
File Location		OzArk job number	
S:\OzArk EHM Data\Clients\Groundworks Plus\North Star Quarry_Nov 2020\Ecology		2900	
Document status: **V3.0 FINAL**		Version	Date	Action
Internal Draft series V1.X		V1.0 V1.1 V1.2 V1.3 V1.4	2/7/2021 2/7/2021 15/7/2021 16/7/2021 19/7/2021	KH to CG CG to KH KH to CG CG to KH KH to CG
First Draft for Client Review		V2.0	20/7/2021	CG to JL
Final		V3.0	11/8/2021	CG to JL
Prepared for		Prepared by		
Jim Lawler Associate / Project Director Groundwork Plus 6 Mayneview St, Milton, QLD 4064 T: 1800 497 587 E: jlawler@groundwork.com.au		Dr Kate Hammill BAM Accredited Ecologist (BAAS 18022) KHS Ecology & Bushfire T: 0407 021 472 E: KHSecologybushfire@bigpond.com Dr Crystal Graham Senior Ecologist OzArk Environment & Heritage Pty Ltd 145 Wingewarra Street (PO Box 2069) Dubbo NSW 2830 T: 02 6882 0118 E: crystal@ozarkehm.com.au		

CERTIFICATION

I certify that I have prepared the contents of this BDAR and, to the best of my knowledge, it is in accordance with the *NSW Biodiversity Conservation Act 2016* and the Biodiversity Assessment Method (BAM). The information it contains is neither false nor misleading. It addresses, to the fullest extent possible, all matters affecting or likely to affect biodiversity as a result of the proposed activity. This BDAR has been prepared by a BAM Accredited Assessor.

BDAR prepared by	**Dr Kate Hammill**
Signed	
Date	11/8/2021
Organisation	KHS Ecology & Bushfire with OzArk Environment and Heritage
Position	Senior Ecologist / Botanist
Qualification	Doctor of Philosophy (Ecology)
Accreditation number	BAAS18022

BDAR revised by	**Dr David Orchard**
Signed	
Date	20/04/2022
Organisation	OzArk Environment and Heritage
Position	Ecologist
Qualification	Doctor of Philosophy (Science)
Accreditation number	BAAS21028

EXECUTIVE SUMMARY

OzArk Environment & Heritage (OzArk) has been engaged by Groundworks Plus, on behalf of Regional Quarries Australia Pty Ltd (the proponent) to complete a Biodiversity Assessment Report (BDAR) for the proposed hard rock quarry at 5535 North Star Road, North Star (the proposal). The proposal is within the Gwydir Shire Council Local Government Area (LGA).

The assessment seeks to address the requirements of the *Biodiversity Conservation Act 2016* in relation to biodiversity assessment and the NSW Biodiversity Offset Scheme. This report applies the *Biodiversity Assessment Method* (BAM) (OEH 2020) to calculate the number of ecosystem and species credits generated by the proposal requiring offset.

The native vegetation to be cleared has been identified as 2.00 ha of one Plant Community Type (PCT):

- PCT 445 *Brigalow viney scrub open forest on loamy soils in low hill landscapes in the northern Brigalow Belt South Bioregion.*

The vegetation within the modified quarry footprint as of March 2022 includes partially cleared, degraded, and wholly cleared areas. The wholly cleared areas belong to the quarry, which is subject to an existing development approval. These areas were excluded from impact calculations. The vegetation on the site is not of sufficient condition to be part of any of the TECs associated with the Brigalow vegetation in the surrounding woodland areas.

In total 16 potential ecosystem credit species were predicted for the PCT and condition as a derived grassland. Woodland areas around the quarry site were excluded from the development footprint after the design was modified, as part of avoidance measures. Due to the low VI scores for each zone, no ecosystem credits either for the PCT or for the 16 predicted species are required to be offset.

Ten candidate species credit species were determined from the BAM calculations. The following species have been excluded and are considered not impacted due to habitat requirements not being present in the subject land (suitable habitat trees, flora species, and intact native vegetation not present) or due to targeted surveys having been conducted to determine presence or absence.

- Absent: Pale Imperial Hairstreak (*Jalmenus eubulus*), Grey-headed Flying-fox (*Pteropus poliocephalus*), Koala (*Phascolarctos cinereus*), Masked Owl (*Tyto novaehollandiae*), Ooline (*Cadellia pentastylis*), Belson's Panic (*Homopholis belsonii)*.

The following species have been assessed as ‘assumed present’, due to there being no justifiable reason for excluding them from the site. Targeted surveys were not conducted for these species.

- Present: Large-eared Pied Bat (*Chalinolobus dwyeri*), Large Bent-winged Bat (*Miniopterus orianae oceanensis*), Barking Owl (*Ninox connivens*), Eastern Cave Bat (*Vespadelus troughtoni*).

The proponent is obligated to offset the impacts of the development on potential threatened species (species credit species) by purchasing and retiring species credits on the open market or by making a payment to the Biodiversity Conservation Fund.

The following threatened species present or assumed present on the subject land have been assessed in relation to potential SAII on the species, as per section 9.1.2 of the BAM manual.

- Large-eared Pied Bat (*Chalinolobus dwyeri*), Large Bent-winged Bat (*Miniopterus orianae oceanensis*), Eastern Cave Bat (*Vespadelus troughtoni*).

The significance of the proposed impact to EPBC Listed threatened, migratory, wetland and marine species predicted to occur within a 10 km search area was assessed. No significant impact to a threatened, migratory, wetland or marine species likely to result in the extinction of a local population was identified. The residual ecological impacts of the project would be adequately mitigated using the management actions recommended. Therefore, a referral of the project to the Federal Department of Agriculture, Water and the Environment for these matters is not required.

This assessment covers the current form of the project as shown in **Figure 1-2** at the start of this report. Any change to the development layout or scope of work may require re-assessment.

Table of Contents

LIST OF TABLES

TABLE OF FIGURES

1 Introduction

1.1 Description of the proposal

OzArk Environment & Heritage (OzArk) has been engaged by Groundworks Plus, on behalf of Regional Quarries Australia Pty Ltd (the proponent) to complete a Biodiversity Assessment Report (BDAR) for the proposed hard rock quarry at 5535 North Star Road (the proposal), approximately 6 km southeast of North Star, NSW (**Figure 1-1**). This assessment assumes no native vegetation clearing will occur on the access track between the public road (Minilya Rd) north of the quarry, to the quarry site. The proposal is located on Lot 7 DP755984 and Lot 1 DP1227212 within the Gwydir Shire Council Local Government Area (LGA) and will be accessed via Minilya Rd.

The proposal is to establish a quarry producing a maximum of 490,000 tonnes per year (t/yr) for a period of five years to service the Inland Rail Project and associated road upgrade projects. The proposal is to produce a further 150,000 t/yr for a period of ten additional years to service the general market in the local area.

The plans used to determine the impact footprint for this assessment were provided by the proponent and dated 24 May 2021. These are the updated plans that consider avoidance and minimisation of impacts outlined in **Section 5.1** of this report. The impact area was further revised in April 2022 following the resumption of quarrying in areas subject to an existing development approval. These areas were excluded from the subject land. The final impact area (subject land) is approximately 2.03 ha in size and includes unquarried land north of the existing quarry, a processing and stockpile area, and a sediment basin and cleanwater dam, but excludes the existing quarry and the surrounding disturbance area. This disturbance area contains piled quarried materials and lacks native vegetation. The development will be accessed via a 1.3-kilometre (km) existing access road through the property (**Figure 1-2**), which connects to Minilya Rd. As the access road is already used by heavy vehicles, it is assumed that no further clearing will be required.

Figure 1-1. The location of the proposed quarry, south of North Star.

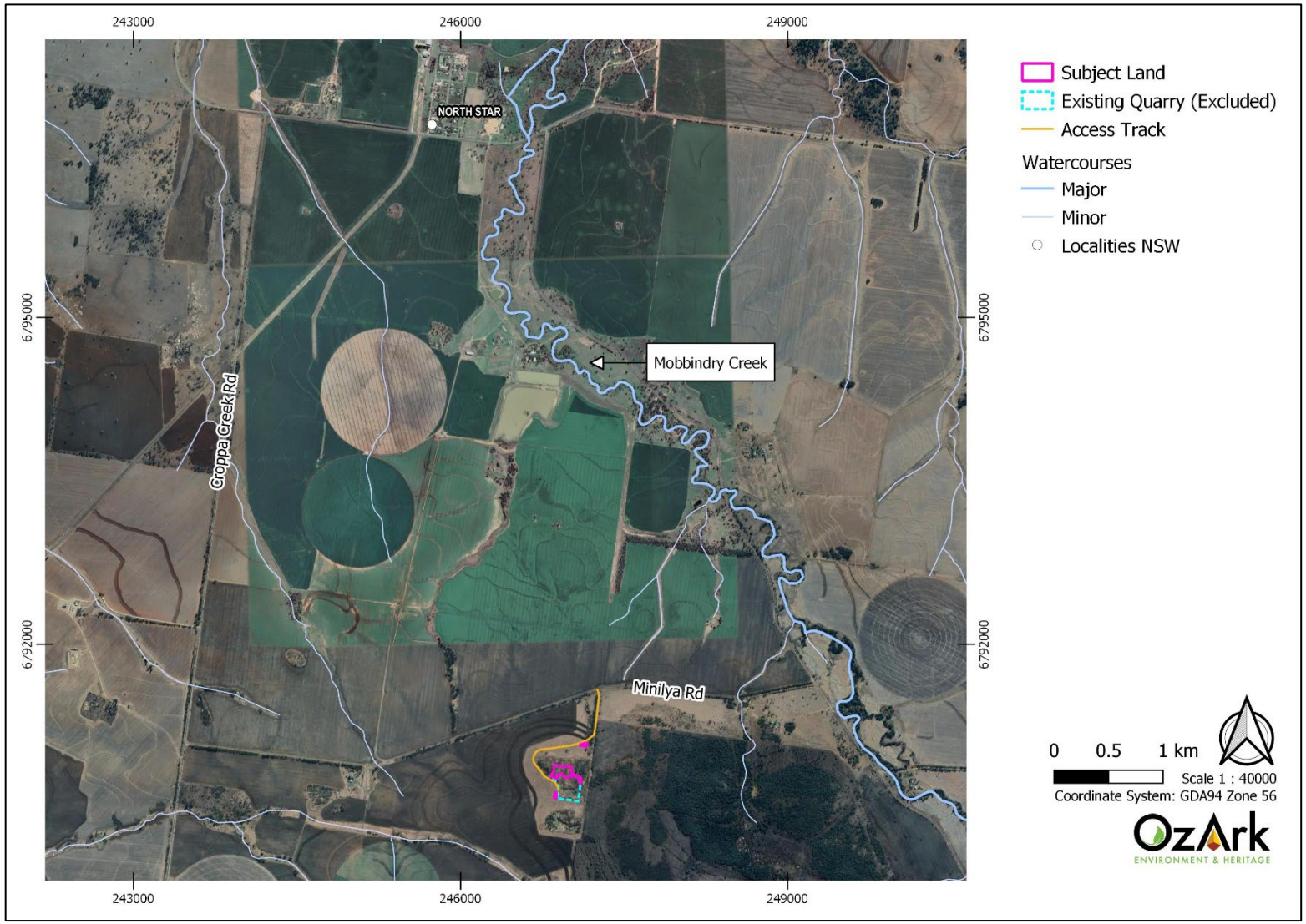
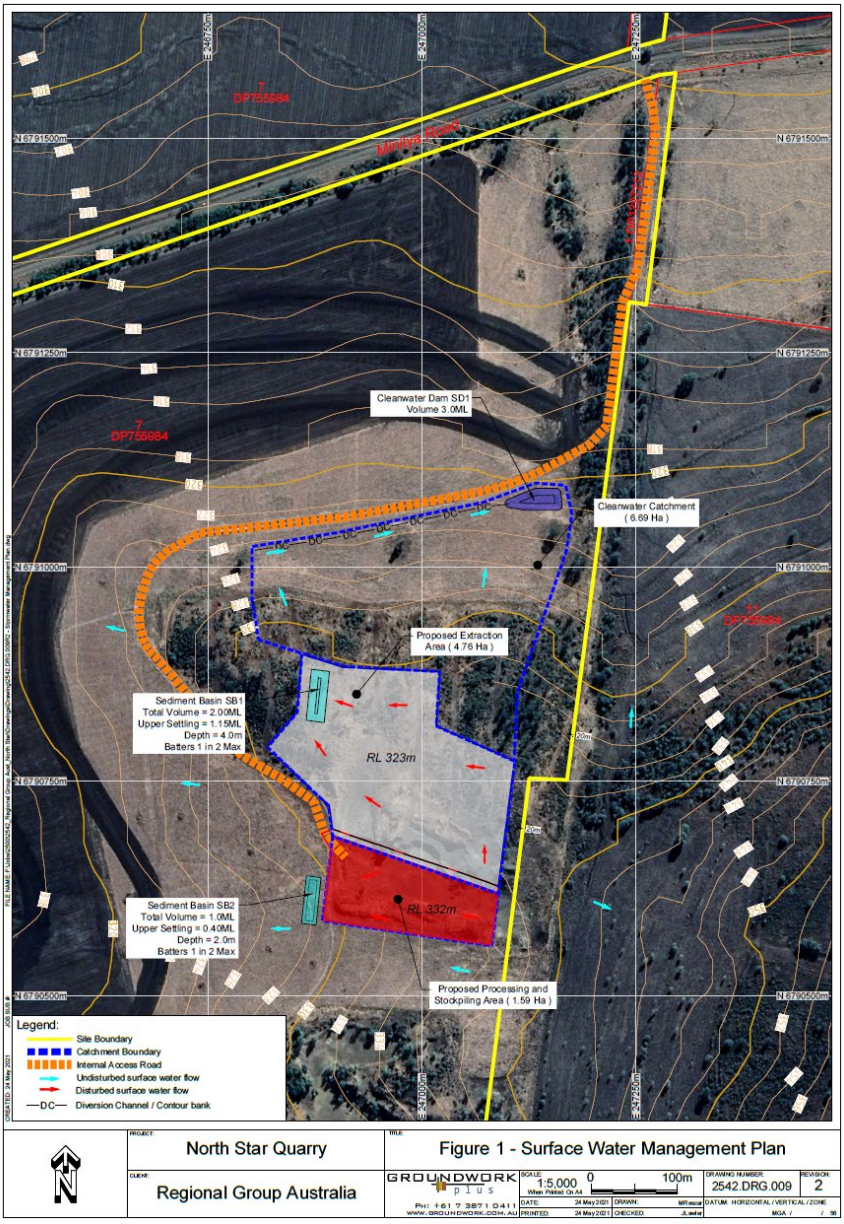


Figure 1-2. Proposed quarry layout (proponent's Surface Water Management Plan, 24 May 2021).



1.2 Subject Land and Study area

The following terms are used to define the subject land and study area for this assessment.

Subject land – The subject land includes the area directly affected by the project. The subject land has been amended from the land identified in the project plans from May 2021, which were themselves amended to exclude areas of remnant woodland and semi-cleared woodland from the development. The subject land now excludes existing quarried areas (see **Figure 1-2, Figure 1-3,** and **Figure 5-1**.)

1500 m buffer (Study area) – A 1500 m buffer has been applied to the subject land. The BAM defines this buffer for the landscape assessment and vegetation cover mapping used in the credit calculations. (Refer to **Figure 1-4**.)

10 km search area – The area within 10 km of the subject land. The 10 km search area has been used to search for known records of threatened species near the study area and to inform the threatened species review in this assessment.

1.3 Aims

The aim of the Biodiversity Development Assessment Report (BDAR) is to determine the biodiversity assets, of the subject land including flora, fauna, threatened species, threatened communities and habitat values.

The assessment seeks to address the requirements of the *Biodiversity Conservation Act 2016* in relation to biodiversity assessment and the NSW Biodiversity Offset Scheme. This report applies the *Biodiversity Assessment Method* (BAM) (OEH 2020) to calculate the number of ecosystem and species credits generated by the proposal requiring offset.

Figure 1-3. Site map showing the subject land and proposed disturbance footprint.

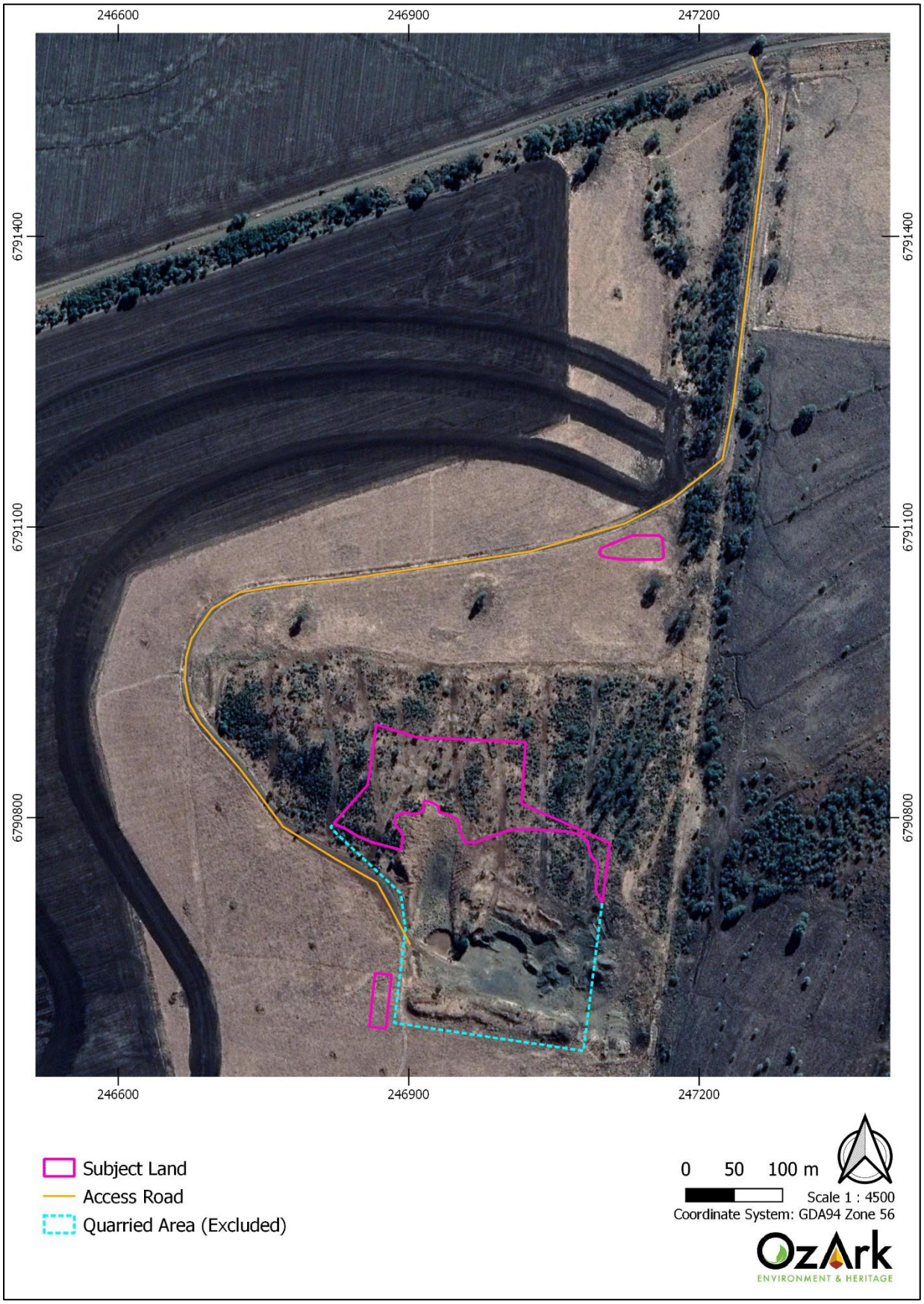


Figure 1-4. Location map, showing the study area (1500 m buffer) around the development.

Note that the above figure shows the entirety of the proposed quarry footprint, including areas already subject to clearing and quarrying.

1.4 Personnel

OzArk Environment & Heritage Pty Ltd (OzArk) operates under NSW Scientific Research License 101908, and NSW Department of Primary Industries (DPI) Accreditation of a corporation as an animal research establishment Ref No. AW2017/012. The role and details of personnel involved in the assessment are provided in **Table 1-1**.

Table 1-1. Summary of OzArk personnel qualifications.

Name	Position	Role	CV Details
Dr David Orchard	BAM Accredited Assessor BAAS21028	Targeted surveys, additional BAM calculations, revision of BDAR	Doctor of Philosophy – Charles Sturt University Graduate Diploma in Science (Botany) – University of New England Bachelor of Arts – Australian National University First aid training WH&S Induction Training for Construction Work
Dr Kate Hammill	BAM Accredited Assessor BAAS18022	Field survey of vegetation, GIS analysis, BAM calculations and preparation of the BDAR. KHS Ecology & Bushfire sub-contractor.	PhD land restoration and revegetation, Bachelor of Science, University of Sydney Ecological Consultants Association (ECA), Practicing Member 2021 4WD and First Aid training 20 years' experience in ecological research and consulting Scientific Licence # 102300
Dr Crystal Graham	Senior Ecologist	Project management, technical review of BDAR, client liaison	Postdoctoral Fellow – Smithsonian Tropical Research Institute Doctor of Philosophy (Biology) – University of Sydney Honours in Biology – University of Sydney Bachelor of Advanced Science – University of Sydney 4WD Training First Aid Training WH&S Induction Training for Construction Work Scientific License 101908

1.5 Information sources

Existing information sources were reviewed to contextualise the study area, identify entities for targeted surveys, predict possible constraints, refine field survey methodology and assist with assessing and minimising the impacts of the project.

- Aerial imagery interpretation of the landscape.
- Border Rivers Gwydir / Namoi Regional Native Vegetation Mapping SVT map, published by NSW Office of Environment & Heritage, 2015.
- NSW BioNet Wildlife Atlas Vegetation classification (https://www.environment.nsw.gov.au/research/Visclassification.htm)
- NSW BioNet Threatened Biodiversity Data Collection (www.bionet.nsw.gov.au/)
- NSW BioNet Atlas (www.bionet.nsw.gov.au/)

- Literature reviews to determine vegetation and species habitat(s) within the proposed study area
- EPBC Protected Matters Search Tool (https://www.environment.gov.au/epbc/protected-matters-search-tool)
- Register of Declared Areas of Outstanding Biodiversity Value (www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/about-threatened-species/critical-habitats)
- PlantNET, NSW Flora Online (https://plantnet.rbgsyd.nsw.gov.au)
- Department of Environment and Planning *Biodiversity Values Map* (https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BOSETMap)
- Mapping of vulnerable lands – steep and highly erodible (NSW Office of Environment and Heritage, 2011)
- Acid Sulphate Soils Risk mapping (NSW Office of Environment and Heritage, 1998)
- Directory of Important Wetlands of Australia (DIWA) (https://www.environment.gov.au/water/wetlands/australian-wetlands-database/directory-important-wetlands)
- NSW wetlands mapping (NSW Office of Environment and Heritage, 2011a)
- Important area mapping for Regent Honeyeater and draft important area mapping for Swift Parrot (available on request from NSW Office of Environment and Heritage).

All databases were searched in January to May 2021 and results of the database searches are provided in **Appendix A**.

1.6 Native vegetation regulatory assessment

In accordance with section 6.8 of the BC Act, The BAM is to exclude the assessment of impacts of any clearing of native vegetation and loss of habitat on Category 1-exempt land (within the meaning of Part 5A of the *Local Land Services Act 2013*), other than any impacts prescribed by the regulations under section 6.3.

The Native Vegetation Regulatory Assessment of Category 1 land has not been applied in this case, instead the credits have been assessed for the vegetation condition as surveyed in the field. No credits are incurred for land that has been farmed and cropped in the past due to the vegetation integrity being under the threshold that produces credits.

1.7 Methods overview

This BDAR has been prepared in accordance with the NSW Biodiversity Assessment Method (BAM) (NSW Government 2020). The assessment uses a site-based approach using a buffer of 1500 m around the development footprint to define the study area and landscape context.

The assessment was carried out in three stages:

1. Desktop searches and review of ecological databases and information to identify threatened species, populations or ecological communities listed in the BC Act or the

EPBC Act that have the potential to occur in the study area.

2. Field survey of the subject land to collate species lists for the purposes of identifying the vegetation communities present and habitat for predicted threatened species and ecological communities. Where a threatened species or community or habitat feature is identified, document the nature and extent of the protected matter and describe its 'viable local population' or occurrence.
3. Preparation of a BDAR that describes the impacts of the proposed activity on native vegetation and threatened species, populations and ecological communities, including measures to avoid and minimise impacts. Residual (unavoidable) impacts are mitigated by the ecosystem credits and species credits required to be offset by the development, which are detailed in this report.

1.8 Field survey effort

The initial field survey was carried out by one ecologist over two days on 18-19 March 2021, entailing a site assessment, recording f habitat observations and collection of Vegetation Integrity data. The location of the Vegetation Integrity plots and the ecologist's GPS survey tracks are mapped in **Figure 1-5**.

Vegetation Integrity surveyed was completed according to the BAM as follows:

- A total of seven (7) plots of size 20m x 50m were located randomly within vegetation zones across the subject land and replicated for the zone size. The details of the vegetation zones and plot locations are provided in **Section 3.2** of this report (refer also to **Figure 1-5** below).
- Species composition and structure was surveyed within each nested 20m x 20m plot, and Vegetation function (size and number of trees, presence of hollow-bearing trees and woody debris) was surveyed within each 20m x 50m plot.
- Percent litter cover was recorded within five 1m x 1m squares positioned at 5m, 15m, 25m, 35m and 45m along the 50m midline of the plot.
- The plots were positioned with random locations and orientation of the midline within the vegetation zones mapped for the subject land and their locations were recorded by handheld GPS (GDA 94 / MGA Zone 56). Data were collected on paper field sheets and entered into excel after the field survey was completed, for upload into the BAM calculator.

The plot locations were randomly selected within vegetation zones to provide the required number of plots for the zone area, as per the BAM, as shown in **Table 1-2**. The impact footprint of the subject land has been modified by the client to avoid areas of high-quality woodland, and the biodiversity credits have been calculated for the layout provided 9 May 2021. All vegetation plot data has been reported in this BDAR to provide site context and demonstrate the avoid and minimise approach.

Table 1-2. Minimum number of plots and transects required per zone area (OEH, 2020).

Vegetation zone area (ha)	Minimum number of plots/transects
<2	1 plot/transect

Vegetation zone area (ha)	Minimum number of plots/transects
>2 – 5	2 plots/transects
>5 – 20	3 plots/transects
>20 – 50	4 plots/transects
>50 – 100	5 plots/transects
>100 – 250	6 plots/transects
>250 – 1000	7 plots/transects; more plots may be needed if the condition of the vegetation is variable across the zone
>1000	8 plots/transects; more plots may be needed if the condition of the vegetation is variable across the zone

Targeted flora surveys were conducted for Ooline (*Cadellia pentastylis*) and Belson's Panic (*Homopholis belsonii*) during a second site visit on 29-30 March 2022. No targeted threatened fauna species surveys were carried out for this assessment. The assessment includes observations of the presence/absence of suitable habitat for threatened species on the subject land based on the observations and data collected during the traverses across the site by the ecologist. In the absence of targeted threatened species surveys, species that have no suitable habitat on the subject land have been excluded from the credit calculations; while species with potential suitable habitat have been retained in the calculations as 'Assumed present, not surveyed'.

1.9 Targeted surveys

Targeted surveys were carried out to confirm the presence/absence of two candidate species credit species identified by the BAM-C, namely Ooline (*Cadellia pentastylis*) and Belson's Panic (*Homopholis belsonii*). A summary of OzArk's field survey methods is provided in **Table 1-3** and described in further detail in **Section 4** of this report.

Table 1-3. Summary of targeted survey methods and effort undertaken.

Survey date	Method	Effort
29 March 2021 to 30 March 2021	• Transects (5 - 10 m separation) for Belson's Panic (*Homopholis belsonii*). • Transects (20 m separation) for Ooline (*Cadellia pentastylis*).	c. 6.67 km plant transects – 5 to 10 m spacing across all suitable habitat

Figure 1-5. Initial vegetation mapping, plot locations and ecologist's survey track.

1.10 Survey conditions

The survey was conducted in early Autumn (March) 2021, during mild to warm fine weather. The surveys followed a wetter than average period in 2020 and early 2021. The weather records for Tulloona weather station 28.7km from North Star (Bureau of Meteorology station 053041; (Bureau of Meteorology, 2021)) show there was above average rainfall in February, October and December 2020 (**Figure 1-6**), and also in January and March 2021 (**Figure 1-7**) leading into the survey period in March 2021.

Figure 1-6. Rainfall records at Tulloona (28.7km from North Star) for 2020.

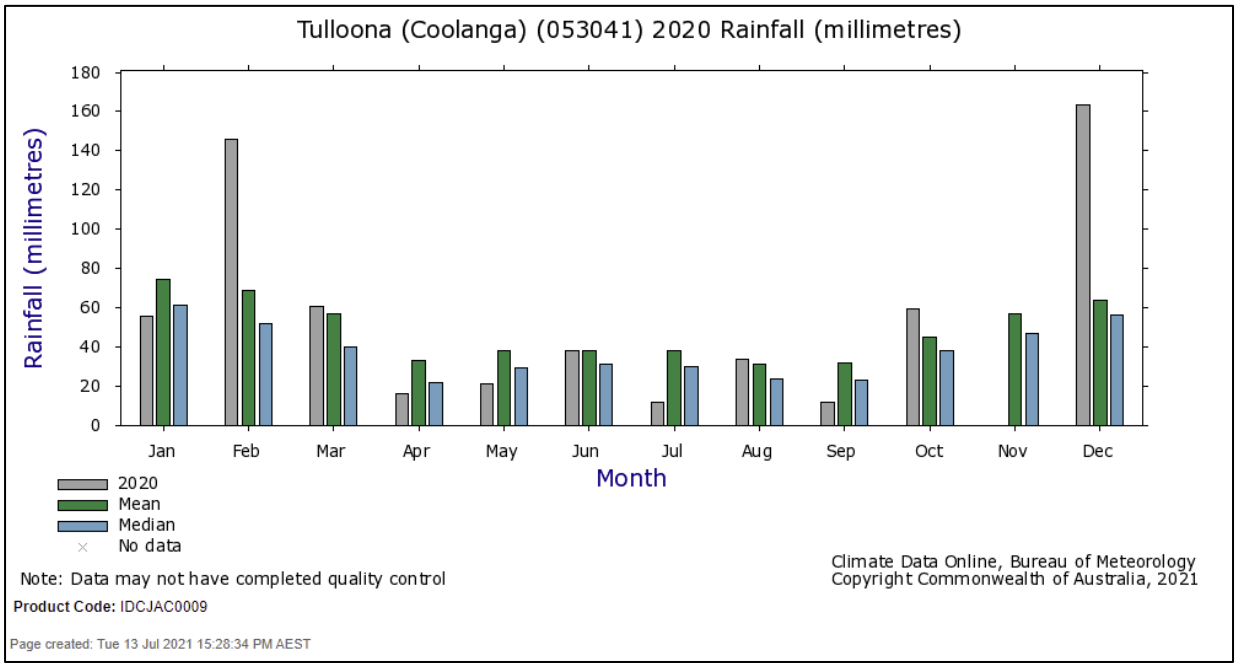
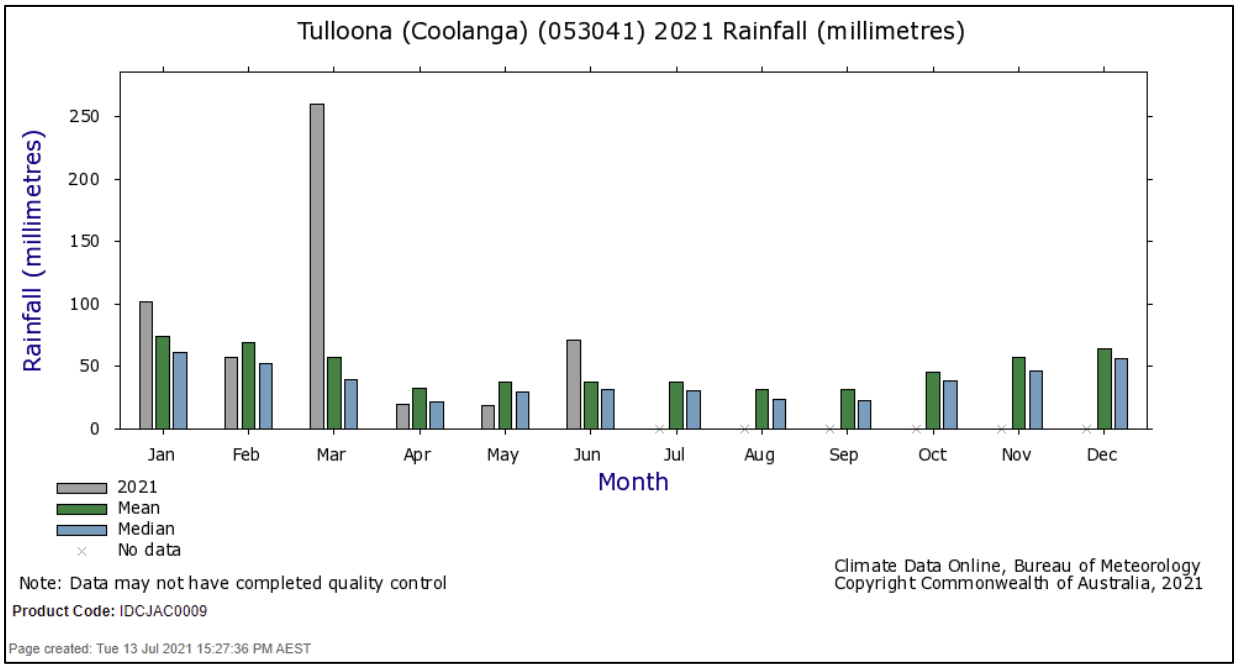


Figure 1-7. Rainfall records at Tulloona (28.7km from North Star) for early 2021.



1.11 Limitations and assumptions

This study is based upon the species data available at the time of the field investigation, and the environmental conditions, season, and time constraints imposed by the project for the field survey.

Specific limitations on this study include the following.

- The initial BAM vegetation field survey was completed over two days in March 2021. Certain flora species which are undetectable at the time due to not being in flower or fruit (which can be essential for identification of some species) may not have been observed during the field survey.
- A ‘precautionary approach’ for species presence has been adopted, whereby a species is assumed present if suitable habitat for the species is present on the site and the conditions for targeted survey were not suitable or able to be met (e.g. due to conditions or timing of targeted surveys).
- The above-mentioned constraints were also considered when preparing the recommendations of avoiding, minimising and mitigating potential impacts.

2 Landscape context

2.1 Bioregion and NSW (Mitchell) landscape

The study area is in the Northern Basalts subregion of the Brigalow Belt South bioregion, according to the Interim Biogeographic Regionalisation of Australia (IBRA) (Thackway & Cresswell, 1995). The Darling Depression sub-region is characterised by aspects of geology, landforms, soil types and vegetation, as described in **Table 2-1**.

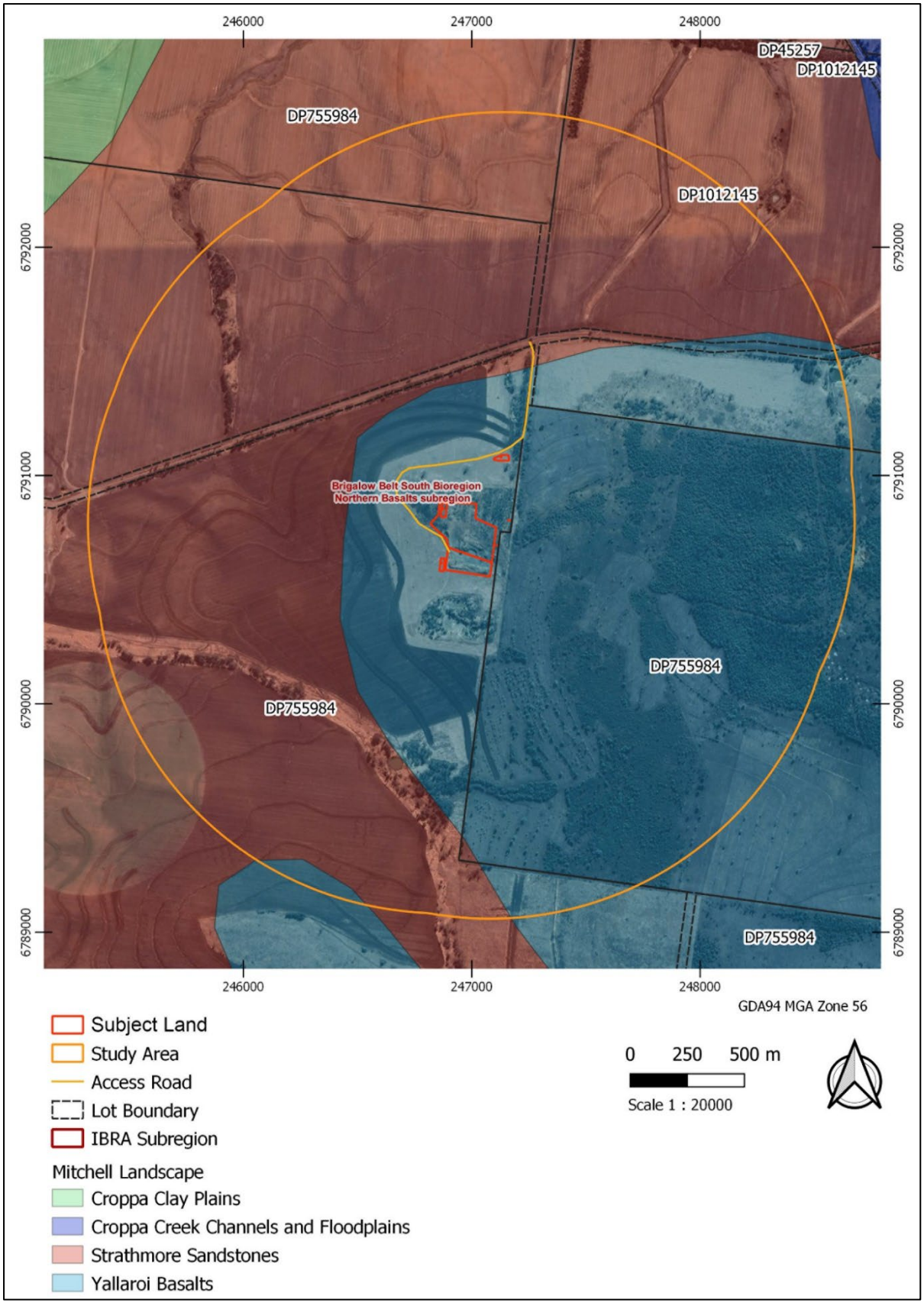
Table 2-1: Description of the subregion.

Brigalow Belt South Bioregion				
Subregion	Geology	Landform	Soils	Vegetation
Northern Basalts	Tertiary basalts over Jurassic quartz sandstones and alluvial sediments derived from these.	Undulating low stony hills, long slopes with sandy wash and heavy clays in the valley floors.	Black loams on basalt ridges, deep sands on sandstones and texture sediments contrast soils on slopes. Heavy grey clay on alluvial flats.	Vegetation on the northern basalts includes brigalow, belah, whitewood, wilga, budda and poplar box on the hills, with river red gum, belah, myall (*Acacia pendula*) and poplar box on the flats. White box with silver-leaved ironbark, white wood, bull oak and brigalow are present on alluvial clays. River red gum occurs on all streams

The study area is located within the NSW (Mitchell) Landscape Yallaroi Basalts (Mitchell, 2002). The landscape is described as:

Rolling hills and flat top ridges on Tertiary basalt flows over Jurassic quartz and lithic sandstone. General elevation 300 to 530m, local relief 100m. Shallow stony, red or brown, well-structured clays with high nutrient values. Similar but thicker soils on the slopes and the valley floors. Woodland and open forest of; white box (*Eucalyptus albens*), with silver-leaved ironbark (*Eucalyptus melanophloia*), white wood (*Atalaya hemiglauca*), bull oak (*Allocasuarina luehmannii*), ironbarks (*Eucalyptus* sp.), brown bloodwood (*Corymbia trachyphloia*) and brigalow (*Acacia harpophylla*) on alluvial clays. River red gum (*Eucalyptus camaldulensis*) on all streams (Mitchell, 2002).

Figure 2-1. Site Map showing the Subject Land, Study Area, Lot Boundaries, IBRA Subregions and Mitchell (NSW) Landscapes.



2.2 Native vegetation cover and connectivity

The subject land is surrounded by highly disturbed landscape within a predominantly agricultural landscape. However native vegetation remains along roadsides and the nearby hill to the east of the subject site connecting the site to a larger area of remnant native vegetation. The extent of native vegetation within the study area (i.e. within the 1500m buffer) is mapped in **Figure 2-2**. Some of the subject land has been cleared in the past for agricultural and mining purposes. A summary of the vegetation cover assessment is provided below:

- Area of the 1500 m assessment circle: 979 ha
- Area of woodland/forest in assessment circle: 225 ha
- Percent vegetation cover: 22.98%

For the purposes of the BAM, the native vegetation cover class has been determined as >10-30% native vegetation cover.

Figure 2-2. Extent of native vegetation cover (green shading) in the 1500m buffer area.

2.3 Rivers, streams and wetlands

The Strahler stream order and associated riparian buffer distance of each watercourse that occurs within the study area was determined using Appendix 3 of the BAM Manual (OEH, 2020) (refer also to **Figure 2-2** above).

There are no major watercourses or wetlands within the subject land. A number of first order streams occur at the outer edges of the 1500m buffer area, and one second order stream traverses the southwestern part of the study area, approximately 800 m from the subject land.

2.4 Karst, caves, crevices, cliffs and areas of geological significance

There are no areas of geological significance in the study area or on the subject land. There are no cliffs or previously mapped karst or cave systems in the study area.

Due to past mining / quarrying activity on the site, there are some areas of rock cutting and outcropping with crevices that might represent potential habitat for threatened fauna. This has been considered in relation to the assumption of presence of threatened microbats in the credit calculations.

2.5 Areas of Outstanding Biodiversity Value (OBV)

There are no areas of outstanding biodiversity value listed under the BC Act in the subject land, or study area.

2.6 SEPP (Koala habitat protection) 2020 and 2021

The State Environmental Planning Policy (Biodiversity and Conservation) 2021 (Biodiversity and Conservation SEPP) consolidates, transfers and repeals provisions of 11 SEPPs, the following of which are relevant to the current assessment:

- *SEPP (Koala Habitat Protection) 2020*
- *SEPP (Koala Habitat Protection) 2021*

The *SEPP (Koala Habitat Protection)* aims to encourage the 'proper conservation and management of areas of natural vegetation that provide habitat for Koalas to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline'. Currently two versions of the Koala SEPP apply in NSW as follows:

- Koala SEPP 2021 applies to all zones in nine LGAs: Metropolitan Sydney (Blue Mountains, Campbelltown, Hawkesbury, Ku-Ring-Gai, Liverpool, Northern Beaches, Hornsby, Wollondilly) and the Central Coast LGA.
- Koala SEPP 2020 applies to all RU1, RU2 and RU3 zoned land outside of the Sydney Metropolitan Area and the Central Coast. This is an interim measure while new land management and private native forestry codes are developed in line with the NSW Government's announcement on 8 March 2021.

The subject land is on RU1 zoned land within Gwydir Shire LGA. The land is within the Northwest Slopes Koala Management area. Gwydir Shire LGA is included in the Schedule 1 of Koala SEPP 2020 and the land therefore is required to be assessed as to whether it is potential Koala habitat.

Under the Koala SEPP 2020, 'potential koala habitat' means areas of native vegetation where trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component.

'Core koala habitat', is defined under Koala SEPP 2020 as:

a) An area of land where Koalas are present, or
b) An area of land

i. Which has been assessed by a suitably qualified and experienced person in accordance with the guidelines as being highly suitable Koala habitat, and
ii. Where Koalas have been recorded as being present in the previous 18 years.

The preference of the Koala is to inhabit woodland and forest areas including riparian corridors with suitable feed trees. The subject land is not considered to be core koala habitat because it is largely cleared with few feed trees. None of the feed tree species listed in Schedule 2 of the Koala SEPP 2020 are present on site. Specifically, feed tree species listed in Schedule 2 of the Koala SEPP 2020 are: *Eucalyptus tereticornis, Eucalyptus microcorys, Eucalyptus punctata, Eucalyptus viminalis, Eucalyptus camaldulensis, Eucalyptus haemastoma, Eucalyptus signata, Eucalyptus albens, Eucalyptus populnea, Eucalyptus robusta*.

There are five records for Koala within 10 km of the subject land, from 2006 to 2019. All of the records have minimal location and sighting notes, so it is not possible to determine exactly where the records were made. The location descriptions for the records are provided as ‘Suburb only, North Star’.

3 Native vegetation

3.1 Plant species

The vegetation survey recorded a total of 74 plant species across all Vegetation Integrity plots, comprising 50 native species and 24 non-native species (**Appendix C**). Plant identification followed nomenclature in the Royal Botanic Gardens PlantNet online database (Royal Botanic Gardens and Domain Trust, 2021). Growth form types are defined in the accompanying data with the NSW Government's BAM resources.

Of the native species recorded per growth form type, there were 4 native tree species, 12 native shrub species, 18 native forbs species, 12 grass and grass-like species, no ferns and 4 other growth form species (**Appendix C**).

The trees comprised *Alstonia constricta* (Quinine Bush), *Casuarina cristata* (Belah), *Eucalyptus melanophloia* (Silver-leaved Ironbark), and *Notelaea microcarpa* (Native Olive). Other trees near the subject land (not within the subject land and therefore not within any plots) include *Acacia harpophylla* (Brigalow) and *Eucalyptus populnea* (Poplar Box).

In the understorey, common shrubs included *Abutilon oxycarpum* (Straggly Lantern-bush), *Beyeria viscosa* (Sticky Wallaby Bush), *Croton phebalioides*, *Geijera parviflora* (Wilga), *Rhagodia spinescens* (Thorny Saltbush), *Salsola australis*, *Sclerolaena muricata* (Black Rolypoly). Grasses and forbs included species such as: *Atriplex muelleri*, *Bergia trimera*, *Calotis lappulacea*, *Chloris divaricata*, *Dactyloctenium radulans*, *Dysphania pumilio*, *Einadia nutans*, *Enteropogon acicularis*, *Eriochloa pseudoacrotricha*, *Portulaca oleracea*, *Tetragonia tetragonioides*, *Tribulus micrococcus*, *Vittadinia cuneata*.

3.2 Fauna species

No fauna species were recorded during the field survey.

3.3 Vegetation communities

Vegetation communities have been identified in accordance with the current NSW vegetation classification system for Plant Community Types (PCTs) published on BioNet. This classification system is used for ecological and development assessments in NSW and describes over 1,500 PCTs across the state, also classified to vegetation Class and Formation as per Keith (2004).

The following inputs were used to identify PCTs on the subject land.

- Regional Scale State Vegetation Map*:* Border Rivers Gwydir / Namoi Regional Native Vegetation Mapping, which provides predictive mapping of PCTs in and around the subject land. This mapping is indicative (modelled / predicted) and not necessarily accurate at a fine scale for the purposes of the current study.

- Field survey results to confirm the flora species present, vegetation structure, landscape position and soil type at the subject site and the extent and condition of native vegetation.
- The BioNet Vegetation Classification database and PCT descriptions, which were used to identify a shortlist of candidate PCTs likely to be present based on the site conditions (flora species present, vegetation structure, bioregion, and landscape position and soil type).

One PCT (in four condition states) was identified within the subject land namely:

- PCT 445 *Brigalow viney scrub open forest on loamy soils in low hill landscapes in the northern Brigalow Belt South Bioregion*.

PCT 445 occurs on basalt on hills and low hills in the Moree Plains, Gwydir and Inverell LGAs, within the Northern Basalts; Northern Outwash; Kaputar; Peel IBRA subregions. The community is described as a very tall mid-dense to dense open forest or very tall shrubland dominated by Brigalow (*Acacia harpophylla*) with other trees including Belah (*Casuarina cristata*), *Eucalyptus melanophloia* or *Eucalyptus populnea* subsp. *bimbil* with a shrub layer of semi-evergreen vine thicket species such as *Notelaea microcarpa* var. *microcarpa*, *Carissa ovata*, *Spartothamnella juncea*, *Jasminum lineare*, *Breynia cernu*a, *Psydrax odorata*, *Santalum acuminatum* and *Croton phebalioides*.

A description of the identified PCT and justification for identifying the PCT on the subject land is provided in **Table 3-1**.

Existing vegetation mapping of the Border Rivers Gwydir / Namoi Regional Native Vegetation mapping of the study area is shown in **Appendix J**.

Table 3-1: Identification of PCTs on the subject land.

PCT ID and name	**445, Brigalow viney scrub open forest on loamy soils in low hill landscapes in the northern Brigalow Belt South Bioregion**
Formation / Class	Rainforests / Western Vine Thickets
Associated TEC	EPBC Act, Endangered: Brigalow-Gidgee woodland/shrubland in the Mulga Lands and Darling Riverine Plains Bioregions (Part); BC Act, Endangered: Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions (Part); EPBC Act, Endangered: Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions (Part).
Published description	Very tall mid-dense to dense open forest or very tall shrubland dominated by Brigalow (*Acacia harpophylla*) with other trees including Belah (*Casuarina cristata*), *Eucalyptus melanophloia* or *Eucalyptus populnea* subsp. *bimbil*. The shrub layer may be mid-dense to sparse and contains semi-evergreen vine thicket shrub species such as *Notelaea microcarpa* var. *microcarpa*, *Carissa ovata*, *Spartothamnella juncea*, *Jasminum lineare*, *Breynia cernu*a, *Psydrax odorata*, *Santalum acuminatum* and *Croton phebalioides*. Other common shrubs include *Pimelea neo-anglica, Myoporum montanum, Dodonaea sinuolata* subsp. *sinuolata, Rhagodia spinescens, Enchylaena tomentosa* and *Capparis mitchellii*. Vines include *Parsonsia eucalyptophylla*, *Clematis microphylla var. leptophylla* and *Marsdenia viridiflora*. The ground cover is usually sparse or very sparse with substantial areas of bare earth. Grass species include *Austrostipa scabra, Austrostipa verticillata, Austodanthonia bipartita* and *Aristida personata*. Forb species include *Einadia nutans subsp. linifolia, Eianada hastata, Brunoniella australis, Eremophila debilis, Chenopodium pumilio, Einadia polygonoides, Sida corrugata, Oxalis perennans* and *Goodenia hederacea*. Sedges include *Cyperus gracilis* and *Gahnia aspera*. Occurs on red to brown loam to light clay soils on plains or footslopes in low hills and hills landsform patterns in the Terry Hie Hie, Bingara and North Star regions of the Brigalow Belt South Bioregion. Grades into dry scrub or semi-evergreen vine thicket on hills. Grades into the more widespread ID35 Brigalow open forest on heavy clay soils on alluvial plains to the west. Mostly cleared and highly threatened. Part of the NSW TSC Act Brigalow EEC
Justification for identification on site	Location being with the Northern Basalts subregion and Gwydir LGA. The landform being low hills with red to black basalt. Tree species observed on the subject land being *Casuarina cristata* (Belah), *Eucalyptus melanophloia* (Silver-leaved Ironbark), and nearby trees being *Eucalyptus populnea* and *Acacia harpophylla*. Characteristic shrubs on and near the subject land include *Notelaea microcarpa* var. *microcarpa*, *Carissa ovata*, *Rhagodia spinescens, Enchylaena tomentosa* and *Capparis mitchellii,* with a grassy herbaceous groundcover where native species were present (amongst significant weed cover).
Current NSW Extent (ha)	200 hectares
% Cleared	90%

3.4 Vegetation zones and patch size

Native vegetation PCTs and broad condition states were mapped across the subject land and have been assigned to vegetation zones according to the BAM. This was done using a combination of review of the existing PCT mapping (Border Rivers Gwydir / Namoi Regional Native Vegetation Mapping SVT map), interpretation of aerial imagery over the study area and field observations during the site survey. Broad condition states were determined by the presence or absence of the key structural elements of the respective PCT and evidence of disturbance and weeds.

The patch size for each vegetation zone was identified as connected areas of native woody and non-woody vegetation extending beyond the subject land. Individual patches are defined under the BAM as areas of native vegetation separated by less than 100 m for woody vegetation or 30 m for non-woody vegetation.

The mapping analysis of vegetation zones and patch size was completed in GIS using QGIS software (https://www.qgis.org/en/site/).

A summary of the vegetation zones and plots surveyed in this assessment is provided in **Table 3-2**. The vegetation zones and location of Vegetation Integrity plots have been presented in **Figure 1-5.**

Table 3-2. Vegetation zones, patch size, area of impact and vegetation integrity score.

Vegetation zone	Description	Patch size	Area of impact	BAM plots	Minimum plots required
PCT 445 Cropped	Cropped areas near the base of the hill proposed for sediment basin and the clean water dam.	170 ha, connecting to surrounding cropped paddocks	0.24	BAM 2	1
PCT 445 Derived	Cleared areas with mixed native and exotic shrubby grassland, generally lacking trees	5 ha	1.76 ha	BAM 1, 4, 6, 7	1
PCT 445 Woodland	Areas of remnant viney open-woodland in the north-western corner of the subject land. Most of this zone has been removed from the footprint.	>100 ha connecting to the hilltop area to the east	0.03 ha	BAM 3, 5	1

3.5 Threatened ecological communities

TECs that are known to occur in the Northern Basalt subregion have been assessed for potential presence at the subject site. The presence of a TEC was assessed by referring to the relevant Scientific Committee listing criteria and identification guides in relation to the site observations and vegetation identified.

TECs associated with PCT 445 are:

- EPBC Act, Endangered: *Brigalow-Gidgee woodland/shrubland in the Mulga Lands and Darling Riverine Plains Bioregions*;
- BC Act, Endangered: *Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregion*s;
- EPBC Act, Endangered: *Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions*.

The assessment of whether the native vegetation on the subject land is part of a TEC is provided in **Table 3-3**. The assessment considers only the land that is proposed to be developed within the modified quarry plans of May 2021, as per **Figure 1-2**. It is assumed that there will be no vegetation clearing along the existing access track to the quarry site, as this area is likely to contain a remnant of TEC vegetation. Other areas of semi-cleared and remnant woodland nearby, not on the immediate subject land, are likely to be part of a TEC.

It is concluded that parts of the site have characteristics of the following two TECs:

- *Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions* – on the lower slopes of the hill including along the edges of the access track where *Acacia harpophylla* and *Casuarina cristata* are present.
- *Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions* – on the basalt rock hilltop where the quarry is proposed, with scattered trees of E*ucalyptus melanophloia* (Silver-leaved Ironbark) over a mesic tall shrub/small tree layer.

However, when the vegetation within the subject site is assessed against the identification criteria for each of these TECs, it is concluded that the vegetation on the immediate subject land is not consistent with either TEC due to the degraded nature of these sites. The proposed development has been reduced in area to avoid the remnant woodland and scrubby vegetation that is likely part of these TECs (refer to **Section 5.1** for an overview of the avoidances measures and adjustments made to the quarry footprint).

Table 3-3. Assessment of potential TECs on the subject land.

TEC	NSW Status	Comm. status	Site assessment
Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions	E	E	Trees surrounding the site include *Casuarina cristata* (Belah), *Eucalyptus melanophloia* (Silver-leaved Ironbark), *Notelaea microcarpa* (Native Olive), *Acacia harpophylla* (Brigalow) and *Eucalyptus populnea* (Poplar Box). These species and the heavy dark brown clay soils indicate this TEC is present near the site and may have been present on the subject land in the past before clearing of the land for agricultural and previous mining activity. The TEC is present along the access road where *Acacia harpophylla* and *Casuarina cristata* are present. However, the subject land is already cleared and does not have a tree stratum with Brigalow. Some native species of the TEC are still present, but the diagnostic Brigalow are not

TEC	NSW Status	Comm. status	Site assessment
			present. Due to the degraded nature of the site and the lack of Brigalow trees on the subject land (although they do occur downslope nearby) this community is deemed not to be present on the development site.
*Cadellia pentastylis (*Ooline*) community in the Nandewar and Brigalow Belt South Bioregions*	E		The diagnostic tree *Cadellia pentastylis* is not present. The community does not occur on the subject site.
Carbeen Open Forest Community in the Darling Riverine Plains and Brigalow Belt South Bioregions	E		The site is not on siliceous sands, earthy sands and clayey sands on the riverine plains of the Meehi, Gwydir, MacIntyre and Barwon Rivers. The distinctive plants such as *Corymbia tessellaris* (Carbeen) are not present. The community does not occur on the subject site.
Coolibah-Black Box Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain and Mulga Lands Bioregions	E	E	Diagnostic trees *Eucalyptus coolabah* and *Eucalyptus largiflorens* not present and the site is not on a floodplain. The community does not occur on the subject site.
Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and Brigalow Belt South Bioregions	E		*Eucalyptus conica* is not present and the site is not on alluvial plains. The community does not occur on the subject site.
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	E	E	*Eucalyptus microcarpa* is not present and the site is not on typical slopes and plains. The community does not occur on the subject site.
Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	E3	E	*Acacia pendula* is not present. The community does not occur on the subject site.
Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions	E3	E	This community often occurs on rocky hills, in deep, loamy, high- nutrient soils derived from basalt or other volcanic rocks, in areas which are sheltered from frequent fire. It is a low, dense form of dry rainforest generally less than 10 m high, made up of vines and rainforest trees as well as some shrubs. The basalt soil type and hilltop location are characteristic of this TEC. It is likely that this TEC previously occurred within the subject land, however, the vegetation is now highly degraded and no longer constitutes a dry rainforest or scrub. Instead it forms a sparse shrubland or weedy derived grassland, lacking signature elements of this TEC, including vine thickets. Areas likely to meet the criteria have been excluded.
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and	E4B	CE	No Yellow Box, White Box or Red Gum are present. The community does not occur on the subject site.

3.6 Weeds

Five BAM listed 'High Threat Exotics' (HTE) weeds were recorded on the subject land. Some of these weeds are also listed under the *NSW Biosecurity Act 2015* and have a biosecurity duty for control.

- *Alternanthera pungens* (Khaki Weed), a common environmental weed, that alters native vegetation by smothering groundcover. Carries a General Biosecurity Duty under the *NSW Biosecurity Act 2015* for all of NSW.
- *Cenchrus ciliaris* (Buffel Grass), likely introduced as pasture for grazing. An environmental weed but not listed under the *NSW Biosecurity Act 2015* due to its use as a pasture species.
- *Lycium ferocissimum* (African Boxthorn), present mainly under trees. The Biosecurity Duty under the NSW Biosecurity Act 2015 for this weed in Northwest NSW is 'Land managers should mitigate the risk of new weeds being introduced to their land. Land managers should mitigate spread from their land. Land managers reduce impacts from the plant on priority assets.'
- *Xanthium occidentale* (Noogoora Burr), competes with summer crops and pasture. Carries a General Biosecurity Duty under the *NSW Biosecurity Act 2015* for all of NSW.
- *Xanthium spinosum* (Bathurst Burr), one of the most common and economically serious weeds in Australian agriculture affecting livestock and crops. Carries a General Biosecurity Duty under the *NSW Biosecurity Act 2015* for all of NSW.

4 Threatened species

4.1 Wildlife Atlas records

A search of the BioNet Wildlife Atlas database on 14/07/2021 returned a total of 15 records of six threatened species within 10km of the subject land. These records are included in **Appendix A** and a summary is provided below.

- Speckled Warbler (*Chthonicola sagittata*). One record for this species in 1979, described as being from the Far North Western Slopes Remnant Veg and Bird Survey Site W3 Specified Map No: 8940.
- Varied Sittella (*Daphoenositta chrysoptera*). Two records for this species in 1979, described as being from the Far North Western Slopes Remnant Veg and Bird Survey Site W3 Specified Map No: 8940.
- Little Eagle (*Hieraaetus morphnoides*). Two records for this species in 1979, described as being from the Far North Western Slopes Remnant Veg and Bird Survey Site W3 Specified Map No: 8940.
- Belson's Panic (*Homopholis belsonii*). Two records for this species in 1988, described as 'Warivan', 7.4 km from North Star on Warialda Road. Sighting notes include: 'Basalt hills. *Acacia harpophylla - Allocasuarina cristata* closed forest. Very rocky red brown friable loam.' and 'Tall caespitose grass located on basalt hills with very rocky red brown friable loam in *Acacia harpophylla/Allocasuarina cristata* closed forest.'
- Koala (*Phascolarctos cinereus*). Five records for Koala from 2004 to 2019. Suburb only provided with the records as being North Star, NSW. No further location notes or sighting descriptions provided with the records.
- Grey-crowned Babbler (eastern subspecies; *Pomatostomus temporalis temporalis*). Three records for this species from 2019 and 2020. Described as being at Croppa Creek Rd, North Star and Wolonga Camp TSR North Star, recorded during the LLS NW Goondiwindi survey 2020.

4.2 Habitat Features Present

The subject land was assessed for its potential to provide habitat for threatened flora and fauna known or predicted to occur in the study area. Habitat features including but not limited to rock outcrops, caves and overhangs, hollow-bearing trees, wetlands (including dams), and watercourses were recorded, if present.

The subject land was found to contain piles of quarried material and loose rock, which may provide habitat for certain fauna species, as well as small numbers of larger embedded rocks (**Figure 5-2**). One hollow-bearing live tree and one hollow-bearing stag (Plot 6) were recorded within the derived grassland vegetation zone. Both large (>20cm diameter) and small (<20 cm diameter) hollows were recorded. Areas of fallen timber, including hollow logs, were also recorded. No waterways, natural water bodies, wetlands or dams were present within the subject land.

4.3 Habitat suitability assessment

The candidate ecosystem and species credit species generated by the BAM calculator were reviewed in the context of information collected by the assessor about the site context and presence / absence of habitat attributes (**Appendix E**).

The likelihood of occurrence of ecosystem and species credit species was categorised as follows:

- 'Present' – the species was observed or has been previously recorded on the subject land.
- 'Assumed present' – the species was predicted to occur by the BAM calculator and suitable habitat features occurred within the subject land for that species.
- 'Absent' – habitat on-site and in the vicinity is unsuitable for the species or targeted survey during the species required survey timeframe confirmed the species absence.
- EPBC listed fauna that were predicted to occur within 10 km of the subject land were also assessed for their presence or absence within the subject land (**Appendix F**). Those species that were assessed as having a Moderate potential to occur on site were assessed using the EPBC Test of Significance (**Appendix G**).

4.3.1 Ecosystem credit species

In total, 16 ecosystem credit species were predicted to occur on the subject land based on the PCT 445 *Brigalow viney scrub open forest on loamy soils in low hill landscapes in the northern Brigalow Belt South Bioregion* and other site features. These species are listed in **Table 4-1** and the habitat assessment is provided in **Appendix E.** Of these 16 species, 13 were assumed present and three were assumed absent based on habitat constraints (**Appendix E**).

Table 4-1. Ecosystem credit species predicted to occur on the subject land.

Scientific Name	Common Name	Species presence
Artamus cyanopterus cyanopterus	Dusky Woodswallow	Assumed present
Chalinolobus picatus	Little Pied Bat	Assumed present
Chthonicola sagittata	Speckled Warbler	Assumed present
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	Assumed present
Daphoenositta chrysoptera	Varied Sittella	Assumed present
Dasyurus maculatus	Spotted-tailed Quoll	Assumed present
Grantiella picta	Painted Honeyeater	Assumed absent – no mistletoe or habitat trees present
Hirundapus caudacutus	White-throated Needletail	Assumed present
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	Assumed present
Miniopterus orianae oceanensis	Large Bent-winged Bat	Assumed present
Ninox connivens	Barking Owl	Assumed present

Scientific Name	Common Name	Species presence
Phascolarctos cinereus	Koala	Assumed absent – no feed or shelter tree species present
Pteropus poliocephalus	Grey-headed Flying-fox	Assumed absent – no feed trees or camps present
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	Assumed present
Stagonopleura guttata	Diamond Firetail	Assumed present
Tyto novaehollandiae	Masked Owl	Assumed present

4.3.2 Species credit species

In total, 10 species credit species were generated by the BAM-C. Two species – Ooline (*Cadellia pentastylis*) and Belson's Panic (*Homopholis belsonii*) – were the subject of targeted surveys. Assessment for each of the remaining species is based on determining whether suitable habitat is present based on observations made during the field assessment, in relation to the habitat constraints and requirements for each the species. No targeted species searches were undertaken for the remaining species and hence these species are assumed present, where they cannot be reasonably excluded due to lack of habitat. The species credit species requiring assessment are listed in **Table 4-2** and the habitat assessment for each species is provided in **Appendix E**.

In summary, the following species have been assessed as 'present' and impacted, due to their being no justifiable reason for excluding them from occurring the site, i.e. potential habitat is present.

- Present: Large-eared Pied Bat (*Chalinolobus dwyeri*), Large Bent-winged Bat (*Miniopterus orianae oceanensis*), Barking Owl (*Ninox connivens*), Masked Owl (*Tyto novaehollandiae*), Eastern Cave Bat (*Vespadelus troughtoni*).

Species polygons for the species credit fauna assumed present are shown in **Figure 4-1**. In all cases, the species polygon includes a 100 m buffer around suitable habitat, thereby incorporating the entire impact footprint.

The following species have been excluded and are considered not impacted due to habitat requirements not being present in the subject land (suitable habitat trees and intact native vegetation not present) or due to the use of targeted surveys to rule the species out.

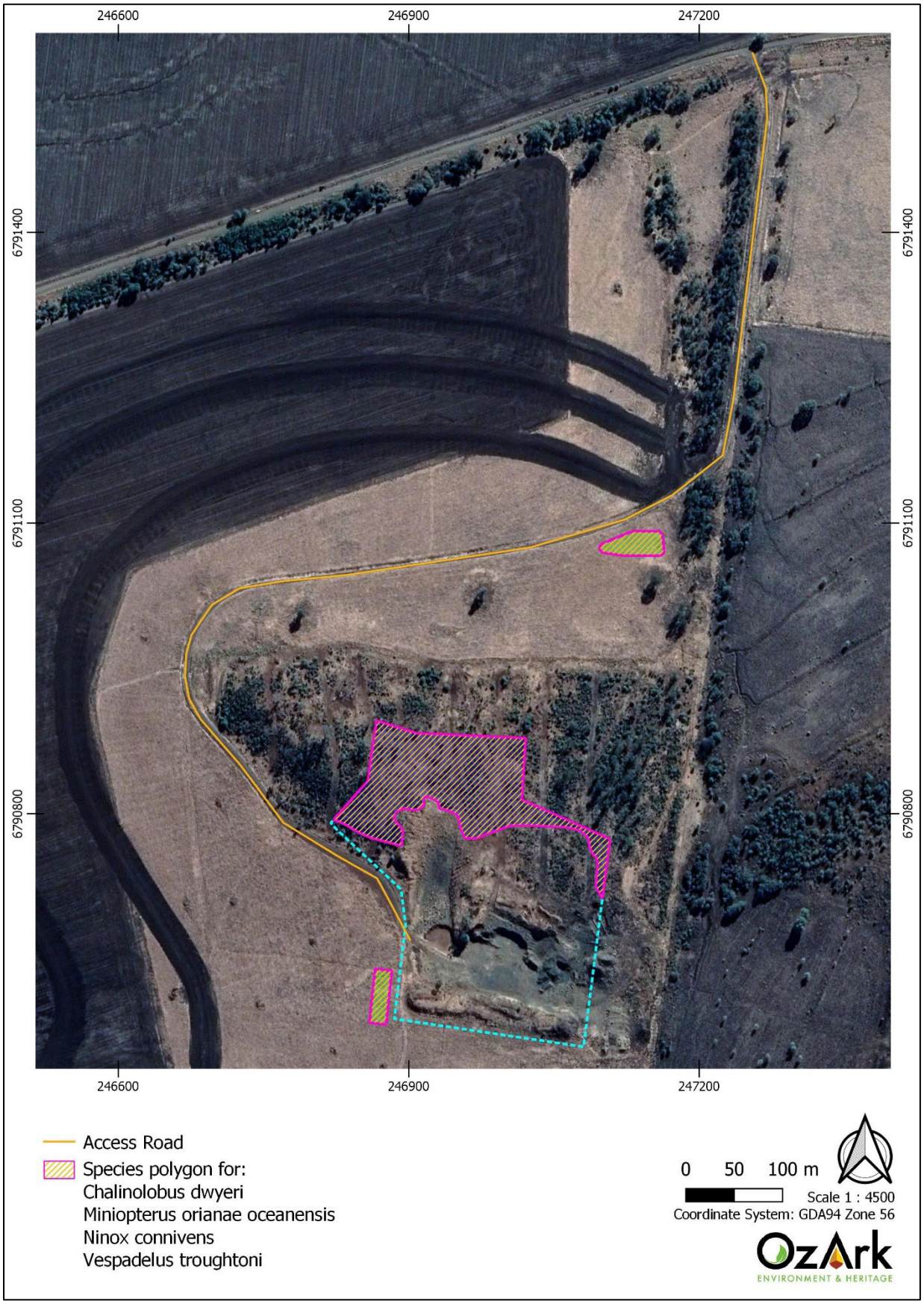
- Absent: Ooline (*Cadellia pentastylis*), Belson's Panic (*Homopholis belsonii*), Pale Imperial Hairstreak (*Jalmenus eubulus*), Grey-headed Flying-fox (*Pteropus poliocephalus*), Koala (*Phascolarctos cinereus*).

Table 4-2. Species credit species predicted to occur on the subject land.

Scientific Name	Common Name	Assumed present / or not present if suitable habitat is absent
Cadellia pentastylis	Ooline	Absent. Targeted survey undertaken in March 2022.
Chalinolobus dwyeri	Large-eared Pied Bat	Assumed present
Homopholis belsonii	Belson's Panic	Absent. Targeted survey undertaken in March 2022.

Scientific Name	Common Name	Assumed present / or not present if suitable habitat is absent
Jalmenus eubulus	Pale Imperial Hairstreak	Not present, habitat degraded, no suitable habitat trees present or impacted, no *Acacia harpophylla* within subject land
Miniopterus orianae oceanensis	Large Bent-winged Bat	Assumed present
Ninox connivens	Barking Owl	Assumed present
Vespadelus troughtoni	Eastern Cave Bat	Assumed present
Pteropus poliocephalus	Grey-headed Flying-fox	Not present, habitat degraded, no suitable habitat trees present or impacted
Phascolarctos cinereus	Koala	Not present, habitat degraded, no suitable habitat trees present or impacted
Tyto novaehollandiae	Masked Owl	Assumed present

Figure 4-1. Species credit species polygon for threatened fauna assumed present.



4.3.3 Species credit species targeted surveys

Targeted species surveys were conducted according to the methodologies outlined in **Table 4-3**, which were based on the BAM and its associated guidelines and documents. These surveys determined that the relevant threatened species do not occur on site.

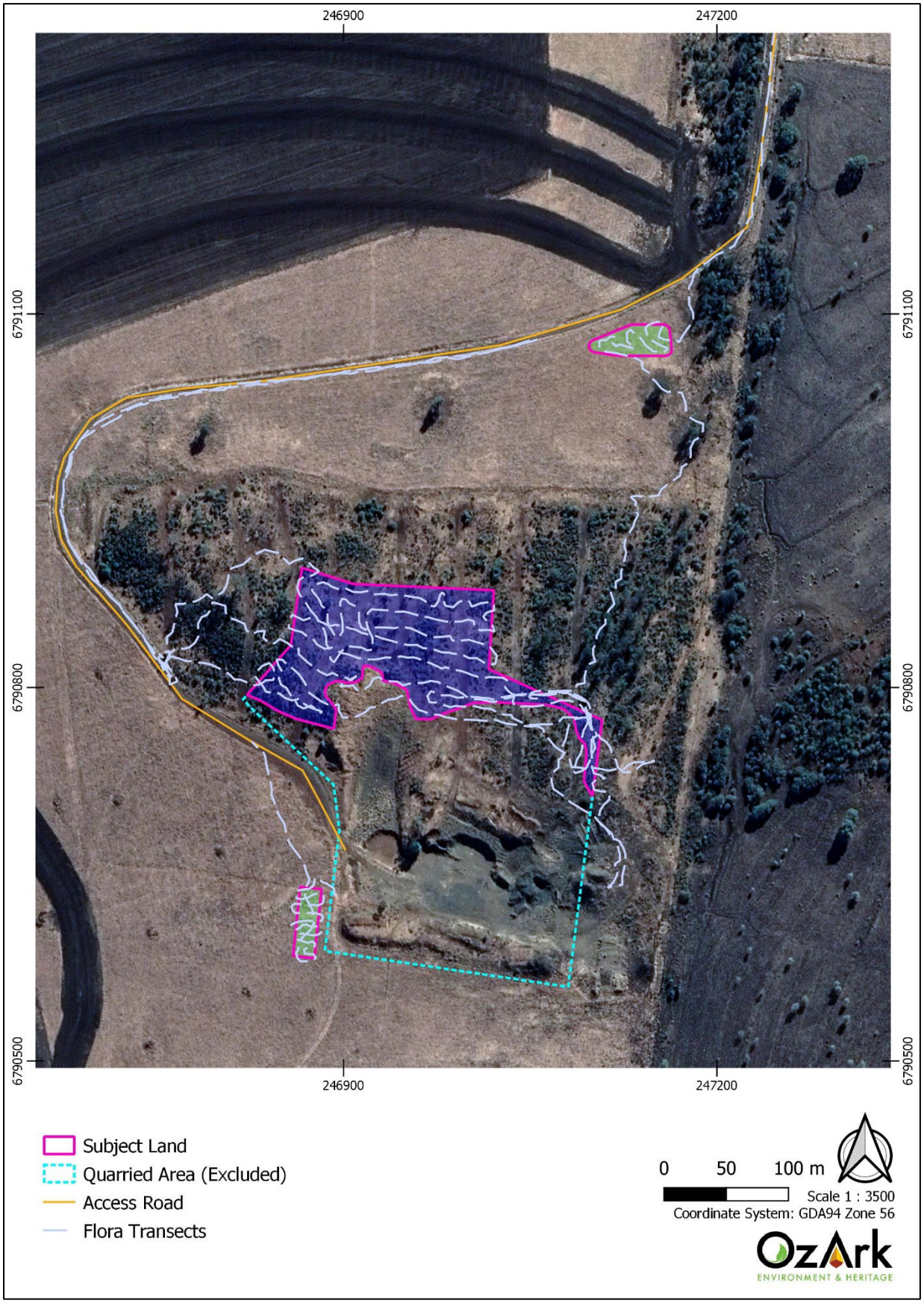
Table 4-3. Threatened Species Targeted Survey Methodology and Results.

Species	Survey requirements (TBDC)	Primary reference material	Survey timetable (BAM-C)	Survey Period (see also Table 2-3)	Results of survey
Ooline (*Cadellia pentastylis*)	1. Where a PCT associated with the target species is recorded **OR** the surveyor determines that habitat present on the subject land is likely to support the target species then a targeted survey must be conducted using the methodology detailed below such that the following conditions can be met. 2. (a) The survey must take place within the appropriate survey window and (b) within abiotic conditions under which the target species is likely to be detected if present. (c) Appropriate habitat must be identified on the subject land.	**OEH, 2016**	**All year**	Surveys were conducted on **29 to 30 March 2022.**	1. The target species is associated PCT 445. 2. (a) The targeted survey took place in March. The survey period allows for surveys to be conducted at any time of the year. (b) The survey followed three months of average to above average rainfall. (c) All vegetation zones in PCT 445 were searched. 3. (a) Targeted surveys were undertaken using 20 m transects, meeting the requirement for 20-40 m transects for tree species. (b) The vegetation was largely open throughout, with small areas of locally dense shrubland. (c) A suitable walking speed of 4 km/h was maintained. (d) All associated habitat was searched (e) Tracks were recorded using handheld GPS devices (**Figure 4-2**). This survey did not detect Ooline, nor any species

Species	Survey requirements (TBDC)	Primary reference material	Survey timetable (BAM-C)	Survey Period (see also Table 2-3)	Results of survey
	3. (a) Parallel transects must be conducted at a prescribed distance based on the growth form of the target species and (b) the density of the surrounding vegetation. (c) Transects must be walked at a reasonable speed based on the density of the surrounding vegetation to maximise the potential of detection by the surveyor. (d) All potential habitat on the subject land must be searched for the species and (e) tracks of the walked transects should be recorded using a suitable GPS device.				which may be mistaken for Ooline. **Result: Absent (Surveyed)**
Belson's Panic (*Homopholis belsonii*)	1. Where a PCT associated with the target species is recorded **OR** the surveyor determines that habitat present on the subject land is likely to support the target species then a targeted survey must be conducted using the methodology detailed below such that the following conditions can be met.	**OEH, 2016**	**Dec-Apr**	Surveys were conducted on **29 to 30 March 2022.**	1. The target species is associated PCT 445. 2. (a) The targeted survey took place in March, within the survey period for this species. (b) The survey followed three months of average to above average rainfall. (c) All vegetation zones in both PCT 267 and PCT 282 were searched. 3. (a) Targeted surveys were undertaken using 20 m transects, meeting the requirement for 20-40 m transects for tree species. (b) The vegetation was largely open throughout, with small areas of

Species	Survey requirements (TBDC)	Primary reference material	Survey timetable (BAM-C)	Survey Period (see also Table 2-3)	Results of survey
	2. (a) The survey must take place within the appropriate survey window and (b) within abiotic conditions under which the target species is likely to be detected if present. (c) Appropriate habitat must be identified on the subject land. 1. (a) Parallel transects must be conducted at a prescribed distance based on the growth form of the target species and (b) the density of the surrounding vegetation. (c) Transects must be walked at a reasonable speed based on the density of the surrounding vegetation to maximise the potential of detection by the surveyor. (d) All potential habitat on the subject land must be searched for the species and (e) tracks of the walked transects should be recorded using a suitable GPS device.				locally dense shrubland. (c) A suitable walking speed of 4 km/h was maintained. (d) All associated habitat was searched (e) Tracks were recorded using handheld GPS devices (**Figure 4-2**). This survey did not identify Belson's Panic. Several panicle-forming grasses were recorded from the site, including *Panicum decompositum*, *Panicum buncei*, and *Panicum coloratum*, but these could be clearly differentiated from the target species. **Result: Absent (Surveyed)**

Figure 4-2. Flora transects for Ooline (*Cadellia pentastylis*) and Belson's Panic (*Homopholis belsonii*).



5 Assessment of impacts

5.1 Avoid and minimise measures

The impact footprint of the subject land has been modified by the client to avoid areas of high-quality woodland. Biodiversity credits were initially calculated for the layout provided on 9 May 2021; however, following the resumption of quarrying in areas of the impact footprint subject to an existing development approval, the subject land was further reduced and credit calculations were performed on this smaller footprint. All vegetation plot data has been reported in this BDAR to provide site context and demonstrate the avoid and minimise approach.

The following avoidance measures have been integrated into the design of the project:

- The proposed impact footprint has been reduced in the planning phase to minimise impact on biodiversity. The original footprint, which has subsequently been revised, is shown in **Figure 5-1**. The amended plan has resulted in a reduction in clearing and associated habitat loss of approximately 0.84 ha on the western side and 1.03 ha on the northeastern side.
- Implementation of additional recommended environmental safeguards outlined in **Section 5.2** below.

5.2 Environmental safeguards

In addition to the avoidance measures implemented through the amended quarry layout, the following minimisation measures and environmental safeguards are recommended to be implemented.

- Before starting work, erect a physical vegetation clearing boundary with a suitable material such as temporary fencing, flagging tape, or similar.
- Vegetation will be removed in a manner that avoids damage to surrounding vegetation, ensuring disturbance to vegetation and soil is kept to a minimum.
- Implement the recommended environmental safeguards to reduce impacts on vegetation, soil and biodiversity outlined in **Table 5-1**.

Table 5-1. Recommended environmental safeguards.

Impact	Environmental Safeguard	Timing
Clearing and prevention of over-clearing	All personnel are to be inducted to be aware that disturbance of any stand of native vegetation outside the development footprint, or otherwise unauthorised disturbance, could have legislative consequences if done without approval. Evidence of all personnel receiving an induction would be kept on file (signed induction sheets). Before start of work, clearly identify the extent of permitted vegetation clearing and areas to be retained as native vegetation. A pre-clearing process and unexpected threatened species finds procedure is recommended. Any fauna found during the disturbance are to be allowed (or assisted) to relocate into adjoining habitat. Vegetation will be removed in such a way to avoid	Pre-construction

Impact	Environmental Safeguard	Timing
	unnecessary damage to surrounding vegetation. Where possible, vegetation to be removed will be mulched on-site and re-used to stabilise disturbed areas. Natural regeneration of any bare soil or cleared areas will be encouraged through retention of native vegetation material on site and brush-matting.	
Bushfire protection	Ensure vegetation management for bushfire protection is consistent, as far as practicable, with biodiversity protection and remove only the necessary vegetation to achieve fuel reduction.	
Soil management	An erosion and sediment control plan will be developed to comply with Council requirements and/or Landcom's Managing Urban Stormwater, Soils & Construction Guidelines 'The Blue Book' (Landcom 2004)	Pre-construction
Damage to native vegetation outside of impact zone	Stockpile and compound sites are to be located within the assessed subject site and preferentially according to the following criteria: At least 40 m away from the nearest waterway. In areas of low ecological conservation significance (i.e. previously disturbed land). On relatively level ground. Stockpiling of materials and equipment, and parking of vehicles, is to be avoided within the dripline (extent of foliage cover) of any tree.	Construction
Introduction and spread of significant weeds and pathogens	Inspection and control of environmental weeds in accordance with a site vegetation management plan and subject to requirements of Council. Construction machinery (bulldozers, excavators, trucks, loaders and graders) would be clean, and soil- and weed-free, before entry to the work site. Weed-free fill only to be used for on-site earthwork. Any herbicide use is to be in accordance with the requirements on the label. Any person carrying out herbicide application would be appropriately trained and competent in its use.	Construction
Disturbance to fallen timber, dead wood and bush rock	All bush rock encountered on site is to be relocated to the edge of the disturbance area to enhance habitat and regeneration. If threatened bats are detected, stop work immediately and either leave the area undisturbed until the individuals have dispersed or engage suitably qualified personnel to attempt their removal.	Pre-construction Construction
Threatened species	No new tracks to be cleared without further assessment, as threatened flora species may occur in any unassessed impact area. If the impact footprint changes from the current extent assessed in the study, re-assessment of the potential impact of the activity would be needed to ensure impacts to threatened species are not inadvertently caused, given that suitable habitat for threatened species occurs elsewhere on the property. Construction work to occur only during daylight hours to avoid indirect impacts on threatened fauna such as vehicle strikes. Enforce 40 km/h speed limits on access roads to reduce the risk of vehicle strikes.	Construction

Figure 5-1. Amended site layout to avoid impacts to remnant woodland.

5.3 Offset scheme thresholds

The project will not impact on land mapped on the Biodiversity Values Map (refer to **Appendix A**).

The project has been assessed against the relevant vegetation clearing thresholds under the BOS. The thresholds applicable to different lot size categories for the land zoning are provided in **Table 5-2** (NSW Office of Environment & Heritage, 2020).

The subject land is currently zoned RU1 (primary production), with a minimum lot size of 200 ha. Clearing of 1 ha or more of native vegetation will require entry into the BOS. The project will clear up to 2.00 ha of native vegetation; thus, entry into the BOS is required.

Due to the area of clearing being exceeded and triggering the BOS in this case, the Test of significance (5-part tests) for threatened species are not required.

Table 5-2. Area clearing thresholds for entry into the Biodiversity Offset Scheme.

LEP Minimum Lot Size	Threshold Area of Clearing
Less than 1 ha	0.25 ha or more
1 ha to less than 40 ha	0.5 ha or more
40 ha to less than 1000 ha	1 ha or more
1000 ha or more	2 ha or more

5.4 Impacts to wetlands, watercourses and aquatic habitat

There are no wetlands on the subject land or within the study area. Any potential for indirect impact to nearby watercourses from erosion and sedimentation related to construction activities will be avoided and minimised by developing and implementing an erosion and sediment control plan.

5.5 Impacts to native vegetation

This assessment has mapped one vegetation type, PCT 445 *Brigalow viney scrub open forest on loamy soils in low hill landscapes in the northern Brigalow Belt South Bioregion*, within the subject land occurring in three condition classes. The area of clearing is set out in **Table 5-3**.

Table 5-3. Vegetation zones, area of impact and VI score.

Vegetation zone	Description	Area of impact	VI Score
PCT 445 Cropped	Cropped areas near the base of the hill proposed for sediment basin and the clean water dam.	0.24 ha	0.8
PCT 445 Derived	Cleared areas with mixed native and exotic shrubby grassland, generally lacking trees	1.76 ha	5.5
PCT 445 Woodland	Areas of remnant viney open-woodland in the north-western corner of the subject land. This zone has been removed from the footprint.	N/A	30.8

5.6 Serious and Irreversible Impacts (SAII)

The *Guidance to assist a decision-maker to determine a serious and irreversible impact* (NSW Office of Environment and Heritage, 2017) and the NSW threatened species data collection has been used to inform the following further assessment for species at risk of Serious And Irreversible Impacts (SAII).

Based on the assessment described in this report, the following threatened species require assessment in relation to potential SAII, as per section 9.1.2 '*Additional impact assessment provisions for threatened species at risk of an SAII'* of the BAM 2020 manual: These are the species at risk of an SAII that are assumed present on the subject land.

- Large-eared Pied Bat (*Chalinolobus dwyeri*),
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*),
- Eastern Cave Bat (*Vespadelus troughtoni*).

Section 9.1.2 of the BAM 2020 manual is addressed below for these three bat species.

1. **In relation to actions and measures taken to avoid the direct and indirect impacts on the species at risk of SAII.**

The development layout has been significantly amended to avoid impacting and clearing the areas of remnant woodland on the western and northern edges of the proposed quarry site. The amended design of May 2021 will avoid clearing of vegetation and associated habitat loss of approximately 0.84 ha of woodland (western side) and 1.03 ha of semi-cleared woodland on the northeastern side (refer to **Figure 5-1**). These areas include remnant woodland of *Acacia harpophylla* (Brigalow), *Eucalyptus melanophloia* (Silver-leaved Ironbark) and *Casuarina cristata* (Belah) trees, with a native sub-tropical shrub and vine understorey and native groundcover. These trees and remnant vegetation represent potential habitat for a number of native species including the Large-eared Pied Bat, Large Bent-winged Bat and Eastern Cave Bat that may occur locally and forage in the woodland.

The areas of woodland avoided have been partially cleared in the past but still contain a good diversity of native species and large trees amongst some non-native groundcover. These woodland areas have not been included in the credit calculations in this BDAR. There will need to be environmental protection measures in place to ensure those areas are retained and not impacted by the quarry works. Any change to the site layout or additional footprint would be subject to additional impact assessment, other than what is provided in this BDAR.

2. **In relation to the current population of the species across NSW, its decline, size, geographic range, and potential response to management.**

The Large-eared Pied Bat (*Chalinolobus dwyeri*) is 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. There are scattered records from the New England Tablelands and North West Slopes. This species roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-

shaped mud nests of the Fairy Martin (*Petrochelidon ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features.

The Large Bent-winged Bat (*Miniopterus orianae oceanensis*) occurs along the entire eastern coastline of Australia. Caves (limestone and sandstone) are the primary roosting habitat, but they also use derelict mines, concrete bunkers, storm-water tunnels, buildings and other man-made structures. They form discrete populations centred on maternity caves that are used annually in spring and summer for the birth and rearing of young. Maternity caves have very specific temperature and humidity regimes. At other times of the year, populations disperse within about 300 km of maternity caves. Cold caves are used for hibernation in southern Australia. Breeding or roosting colonies can number from 100 to 150,000 individuals. This species hunts in forested areas, catching moths and other flying insects above the tree tops.

The Eastern Cave Bat (*Vespadelus troughtoni*) is found in a broad band on both sides of the Great Dividing Range from Cape York to Kempsey, with records from the New England Tablelands and the upper north coast of NSW. The western limit appears to be the Warrumbungle Range, and there is a single record from southern NSW, east of the ACT. Very little is known about the biology of this uncommon species. It is a cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals. Occasionally found along cliff-lines in wet eucalypt forest and rainforest. Little is understood of its feeding or breeding requirements or behaviour.

Relevant to the subject land, for all three species there are records in Arakoola National Park to the east, Warialda to the south and Bullala National Park to the southwest. Maps of the records are shown below (**Figure 5-2** to **Figure 5-4**), for each species.

Figure 5-2. Large-eared Pied Bat (*Chalinolobus dwyeri*) records surrounding the subject land. Source: Saving our Species

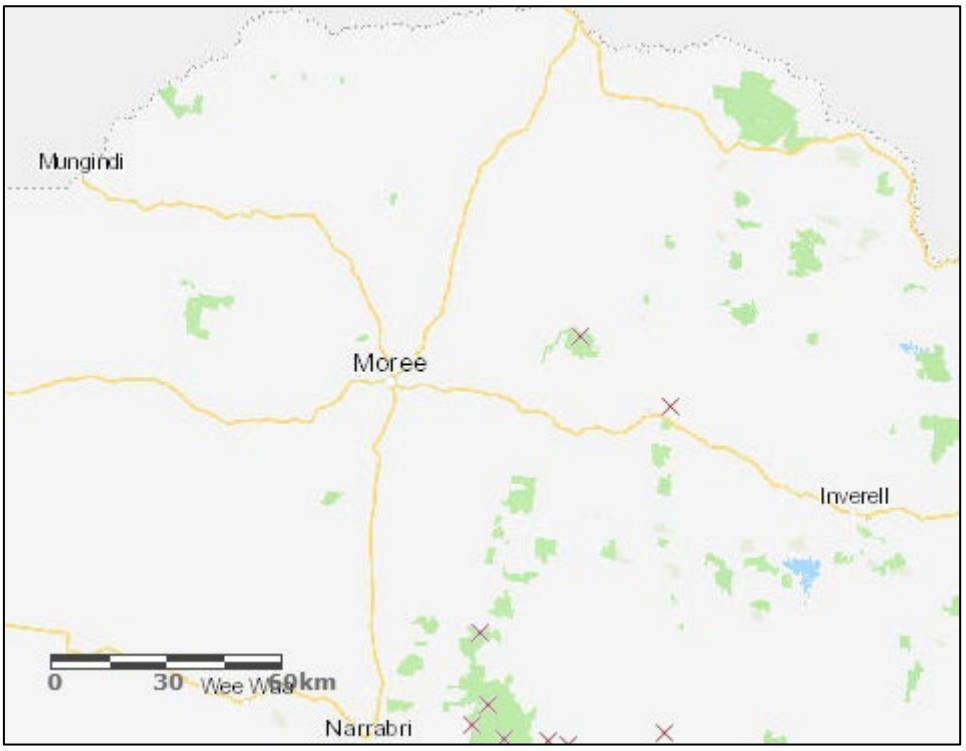


Figure 5-3. Large Bent-winged Bat (*Miniopterus orianae oceanensis*) records surrounding the subject land. Blue shaded areas show priority management sites. Source: Saving our Species

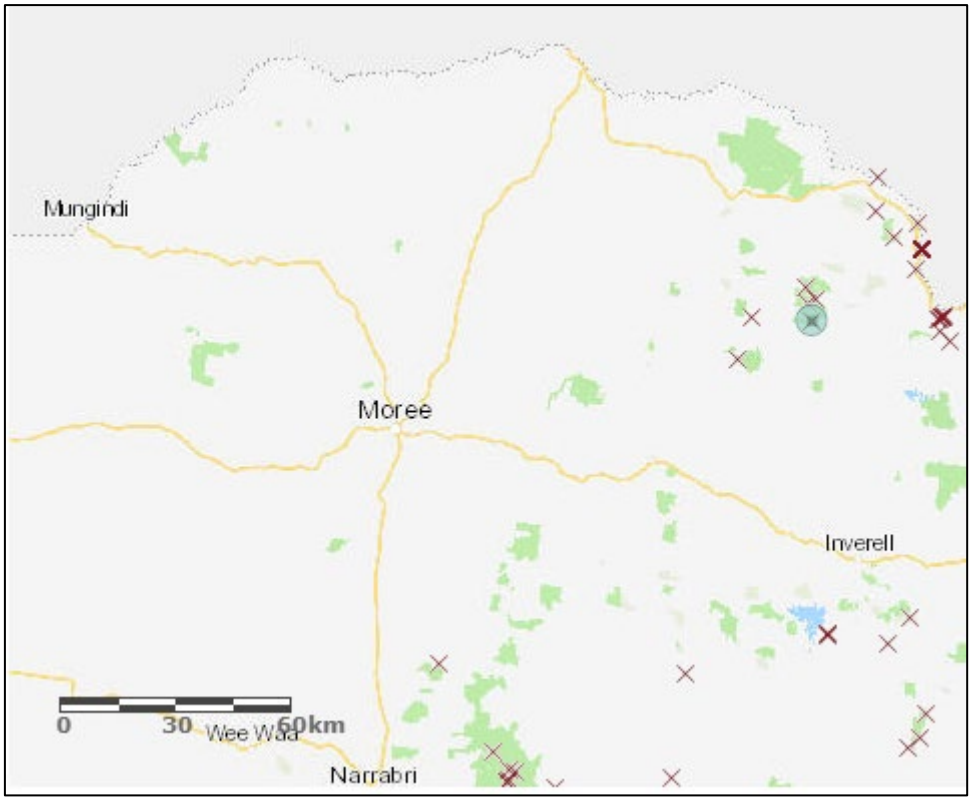
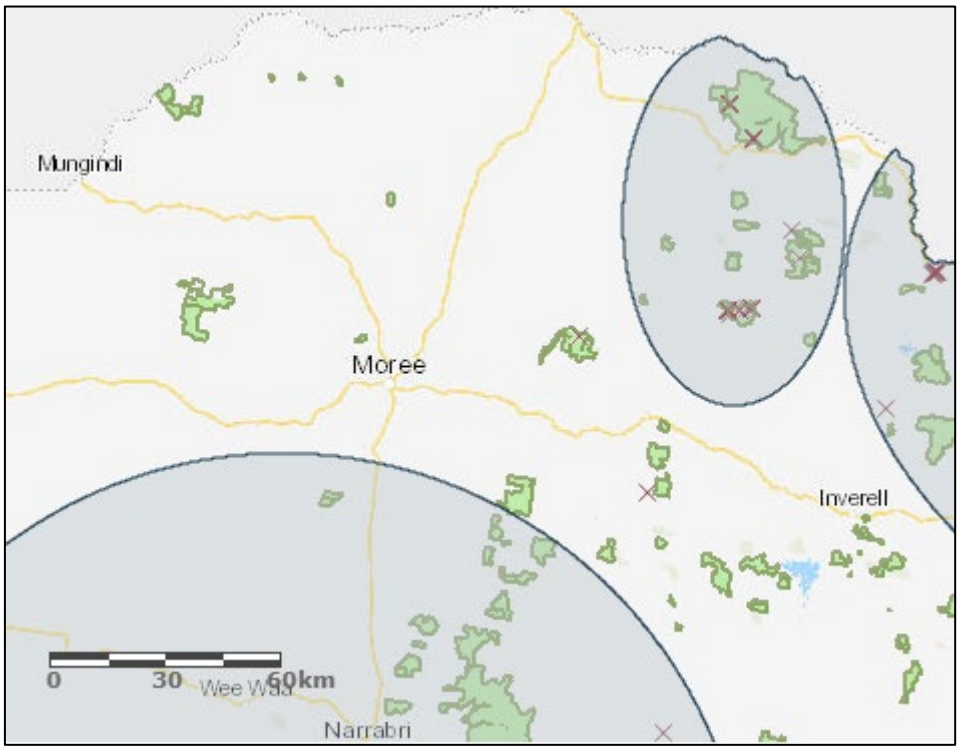


Figure 5-4. Eastern Cave Bat (*Vespadelus troughtoni*) records surrounding the subject land. Blue shaded areas show priority management sites. Source: Saving our Species



3. **In relation to whether the species is 'unknown' or a 'data deficient' species.**
    - **Large-eared Pied Bat (*Chalinolobus dwyeri*):** this species is assigned to the data-deficient management stream.
    - **Large Bent-winged Bat (*Miniopterus orianae oceanensis*):** this species has been assigned to the Site-managed species management stream.
    - **Eastern Cave Bat (*Vespadelus troughtoni*):** this species has been assigned to the Landscape species management stream.
4. **In relation to the impacts of the proposal of the species at risk of an SAII, on its population and geographic range.**

For all three species, the proposal will impact a small area of low-quality habitat that has been cleared and modified in the past, and that is also to the west of the main areas of known occurrence. The area of modified potential habitat that will be cleared for the proposed quarry is approximately 2.00 ha. The removal of this small extent of low-qualify habitat is not expected to threaten the survival of any local populations of any of these species. The project intends to retain the adjoining woodland areas, which were originally proposed to be part of the quarry and which have been excised from the development footprint to avoid impact to the woodland.

5. **Any new information that may be used to demonstrate that the principle identifying the species as at risk of an SAII is inaccurate.**

No new information has been generated by this project since there were no targeted surveys for any of these species. The proponent has elected to use the option to assume the species are present, and pay for the credits in this case.

For the SAII species, Principle 4, clause 6.7(2) (d) Biodiversity Conservation Regulation 2017, is required to be addressed. Specifically, in this instance, an impact is to be regarded as serious and irreversible if it is likely to contribute significantly to the risk of one or more of the above threatened species becoming extinct because the species "is unlikely to respond to measures to improve its habitat and vegetation integrity and therefore its members are not replaceable". The aforementioned Principle 4 is explored below for these three bat species.

i. known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site

    - **Large-eared Pied Bat (*Chalinolobus dwyeri*):** this species occurs in eastern Australia (Qld, NSW) and utilises dry sclerophyll forests and woodlands, cypress pine woodland, rainforest edges, tall open forest, subalpine woodland (Van Dyck et al. 2012). This species roosts in rock overhangs, caves, mines, and Fairy Martin nests (Van Dyck et al. 2012). This species has one to two young per year and nursery colonies have been reported in caves and mines (Dwyer 1966, Hoye and Dwyer 1995). Considering its generally broad habitat use, its ability to occupy new habitat (e.g., on a Biodiversity Stewardship site) is likely not a limiting factor.

- **Large Bent-winged Bat (*Miniopterus orianae oceanensis*):** this species occurs in eastern Australia (Qld, NSW, Vic) and utilises rainforest, sclerophyll forest, monsoon forest, open woodland and grassland, and *Melaleuca* forest (Van Dyck et al. 2012). Considering its fairly broad habitat use for foraging purposes, its ability to occupy new foraging habitat (e.g., on a Biodiversity Stewardship site) is likely not a limiting factor. This species roosts in caves, mines, concrete bunkers and lava tubes (Van Dyck et al. 2012). Reproduction for this species is centred on maternity caves that are used repeatedly (Mills 2021), therefore, this is a limiting abiotic factor. The subject land does not contain caves.
- **Eastern Cave Bat (*Vespadelus troughtoni*):** this species occurs in eastern Australia (Qld, NSW) and utilises rainforest edges, tropical and temperate forests, woodlands, and semiarid areas. This species roosts in rock overhangs, caves, mines, culverts, buildings, Fairy Martin nests, and lava tubes (Law et al. 2005, Law and Chidel 2007, Van Dyck et al. 2012). Considering its generally broad habitat use, its ability to occupy new habitat (e.g., on a Biodiversity Stewardship site) is likely not a limiting factor.

ii. the species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site

- **Large-eared Pied Bat (*Chalinolobus dwyeri*):** this species is associated with sandstone cliffs and caves (neither of which are present on the subject land), but also occurs in manmade abiotic habitats such as mine shafts and culverts (Dwyer 1966). Considering its opportunistic use of manmade abiotic habitat, it is not considered reliant on abiotic habitat which cannot be restored or replaced.
- **Large Bent-winged Bat (*Miniopterus orianae oceanensis*)**: this species is reliant on maternity caves for breeding (Mills 2021) and cold caves for hibernation. Suitable caves may not be able to be restored or replaced. No caves are present on the subject land, therefore no caves will be impacted by the development.
- **Eastern Cave Bat (*Vespadelus troughtoni*):** this species utilises both natural and manmade habitat for breeding, therefore it is not considered reliant on abiotic habitat which cannot be restored or replaced. No lava tubes or caves will be impacted by the development.

iii. life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus).

- **Large-eared Pied Bat (*Chalinolobus dwyeri*):** this species is not well studied and is considered “data-deficient”. However, life history trait data and basic ecological information is available (Dwyer 1966, Hoye and Dwyer 1995, Pennay 2008, Van Dyck et al. 2012). Key threatening processes specific to this species have not been elucidated.

- **Large Bent-winged Bat (*Miniopterus orianae oceanensis*):** this species is reasonably well studied (e.g., Gonsalves and Law 2017, Holz et al. 2020, Mills 2021) and life history trait data and ecological information is available (Mills 2021 Dwyer 1966, Hoye and Dwyer 1995, Van Dyck et al. 2012). Key threatening processes specific to this species have not been elucidated.
- **Eastern Cave Bat (*Vespadelus troughtoni*):** this species is relatively understudied but basic life history trait data and ecological information is available (e.g., Law and Chidel 2005, Law and Chidel 2007, Van Dyck et al. 2012). Key threatening processes specific to this species have not been elucidated.

In summary, based on the above summary and considering the small area of proposed impact in low-quality disturbed vegetation (that does not contain caves) and that the amended site layout avoids impacting the patches of woodland at the site, it is unlikely that the development will cause any substantial loss of habitat or lead to a SAII for any of these three species. The assessment of potential SAII is however subject to the consent authority and reviewing authority to make a decision in this case.

5.7 Prescribed impacts

The Biodiversity Regulation 2017 lists nine impacts as prescribed impacts that must be avoided, minimised and mitigated. These prescribed impacts and their relevance to the proposed development are described in **Table 5-4.**

Table 5-4. Prescribed impacts of the project.

Prescribed Impacts	Site Assessment	Mitigation Measure
Impacts on the habitat of threatened species or ecological communities associated with karst, caves, crevices, cliffs and other features of geological significance.	No karsts, caves, crevices, cliffs or other features of geological significance are present on the subject land or known within the study area.	None required.
Impacts of development on the habitat of threatened species or ecological communities associated with rocks.	Previous quarry/mine workings may provide rock crevices that could be inhabited by threatened bats. These are not considered features of geological significance, however. Species credits have been incurred for the predicted threatened bats which are assumed present in the absence of targeted survey.	Biodiversity credits incurred for potential presence of threatened bats in old mine workings.
Impacts of development on the habitat of threatened species or ecological communities associated with human made structures.	No human made structures occur within the subject land. Potential impacts of the proposal on the old mine workings have been address in the line above.	None required.

Prescribed Impacts	Site Assessment	Mitigation Measure
Impacts of development on the habitat of threatened species or ecological communities associated with non-native vegetation.	Areas of non-native dominated vegetation have been cropped and are highly degraded and contained no or very few native species. It is not likely that any species relies on the non-native areas of cropped land due to its lack of structure and habitat resources. The predicted species would, at best, fly over or pass through the areas of non-native vegetation, rather than inhabit or rely upon it for survive or breeding.	None required.
Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range.	The proposed quarry is at the western end of a short section of low hills in the landscape that is otherwise highly modified and cleared for agriculture. The proposed quarry site will impact an existing disturbed portion of these low hills, on the west end of the hills, at a site that has already been cleared and fragmented by past mining and agricultural activity. There is an adjoining larger area of native vegetation to the east on these hills. The proposed will reduce connectivity by a minimal amount, between a small fragment of native woodland on the western side of the proposed quarry site and the larger areas of native vegetation to the east. However, the subject land in its current state is already cleared and modified. Overall, there will be minimal new fragmentation caused with no new areas of fragmentation been created. The road vegetation corridor will still be a viable passage for fauna which may use it to access adjoining native vegetation. Wooded vegetation within the subject land is no less than 70 m from connecting wooded corridors, therefore contributing minimal value to connectivity.	Refer to environmental protection measures in **Table 5-1.**
Impacts of the development on movement of threatened species that maintains their life cycle.	The subject land potentially contains foraging habitat for a number of threatened bird species, and bats, however the project will not significantly alter connectivity of native woodland within the landscape due to the site being on an existing disturbed area that has been previously mined/quarried.	Refer to environmental protection measures in **Table 5-1.**
Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities.	The project will not impact any watercourses, there are no watercourses within the subject land A second order stream is situated 800 m to the southwest of the subject land, but will not be impacted by the proposal. The proposed includes a stormwater management plan for sediment retention and clear water dam, which should retain all surface flows from the site – refer to **Figure 1-2** . No wetlands occur within the subject site.	Refer to the project Stormwater plan shown in **Figure 1-2**.

Prescribed Impacts	Site Assessment	Mitigation Measure
Impacts of wind turbine strikes on protected animals.	None associated with the project.	None required.
Impact of vehicle strikes on threatened species of animals or on animals that are part of a TEC.	The risk of vehicle strikes on native animals is minimal, but is possible both during the construction and operational phases of the project. The main areas of operational risk would be along the access road to the quarry site which goes through a corridor of remnant native vegetation (refer to **Figure 1-3**)	Refer to **Table 5-1**. Enforce 40 km/h speed limits on access roads to reduce the risk of vehicle strikes.

5.8 Indirect impacts

The main impacts of the project are expected to be contained within the subject land, provided there is adequate demarcation between the construction and non-construction areas. Disturbance from machinery and construction activities will occur, such as noise and dust. However, these impacts will be minimised by following the environmental safeguards proposed in **Table 5-1**. Additionally, the continued operation of the quarry has and will produce noise and dust. There is also the risk of biosecurity associated with vehicle movements through farmland and waste management, however the operations should comply with the *Protection of the Environment Operations Act 1997, Environmental Planning & Assessment Act, Environmental Planning & Regulation 2000, Gwydir Local Environmental Plan 2013* and *Contaminated Land Management Act 1997* to ensure these impacts are controlled appropriately.

5.9 Matters of National Environmental Significance

Under the environmental assessment provisions of the EPBC Act, Matters of National Environmental Significance (MNES) and impacts on Commonwealth land are required to be considered to assist in determining whether the project should be referred to the Commonwealth Government Department of Agriculture, Water and the Environment.

The results of the EPBC Act protected matters search is provided in **Appendix A**. This search has identified, three Wetlands of International Importance, six TECs, 22 threatened species and 9 migratory relevant to the 10 km search area. Of the former items, one migratory and six threatened species were assessed as having a Moderate likelihood of occurrence on the subject land (**Appendix F**). Tests of significance in accordance with the EPBC Act have been carried out and are presented in **Appendix G**.

A summary of these matters and whether the project is likely to impact them is provided in **Table 5-5**. It is concluded that no MNES will be significantly impacted by the project.

Table 5-5. Impacts to matters of national environmental significance.

Factor	Potential impact
Any impact on a World Heritage property?	NIL
Any impact on a National Heritage place?	NIL
Any impact on a wetland of international importance?	NIL
Any impact on a listed threatened species or communities?	Unlikely, see **Appendix G**

Factor	Potential impact
Any impacts on listed migratory species?	Unlikely, see Appendix G
Any impact on a Commonwealth marine area?	NIL
Does the project involve a nuclear action (including uranium mining)?	NIL
Additionally, any impact (direct or indirect) on Commonwealth land?	NIL
Any impact on a water resource, in relation to coal seam gas development and large coal mining development?	NIL

6 Biodiversity Credit and Offset Report

6.1 Management zones

The BAM considers future vegetation condition of different areas of the development footprint when calculating biodiversity credits and offsets. It has been assumed that all vegetation within the development footprint will be cleared and, therefore, the offset calculations have assumed one future management zone, where there will be complete loss of native vegetation.

6.2 Vegetation Integrity assessment

Vegetation integrity (VI) scores have been calculated for each vegetation zone based on patch size, area to be impacted, vegetation composition, structure and function, as defined below.

Patch size – Area in hectares of total vegetation zone patch (i.e. the connected woody and non-woody vegetation).

Area – Area within the property that will be subject to clearing, modification or other treatment by the Project. There is only one management zone as described above.

Composition – Score calculated based on species richness, i.e. the number of native species present.

Structure – Score calculated based on the cover (%) of each native species growth form.

Function – Score calculated based on habitat features, i.e. presence of tree sizes, hollow trees, coarse woody debris, litter cover (%) and high threat weed cover (%).

Benchmark data for the PCTs is also used in this calculation.

Data required for the VI calculations were collected in the field using the BAM, as described above. The VI assessment for each vegetation zone including the loss of VI due to the development is shown in **Table 6-1**.

Table 6-1. Vegetation Integrity (VI) assessment.

Vegetation zone	Zone name	Area of impact (ha)	Assessed VI score	Future VI score	Change in VI score
1	445_cropped	0.24	0.8	0	0.8
2	445_cleared	1.76	5.5	0	5.5

6.3 Ecosystem Credit summary

Ecosystem credits requiring offset by the project have been calculated using field data entered into the BAM calculator. A summary of the ecosystem credits generated is provided in **Table 6-2**. Note that due to the low VI Score no ecosystem credits are generated for this site.

The Biodiversity Credit Report generated by the BAM calculator is included in **Appendix D**.

Table 6-2. Ecosystem credits produced for vegetation and threatened species habitat cleared.

Zone	Vegetation zone name	Vegetation integrity loss/gain	Area (ha)	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Ecosystem credits
1	445_cropped	0.8	0.24	Low sensitivity to potential gain	2.00	0
2	445_cleared	5.5	1.76	High sensitivity to potential gain	2.50	0
					Total	**0**

6.4 Species Credit summary

The species credit species output by the BAM calculator have been described in **Section 4.2** of this report. Some of the species credit species have been excluded from the calculations on the basis that no suitable habitat is present on the subject land. Others that were not able to be excluded on the basis of habitat and that were not assessed by targeted survey have been retained in the credit calculations as 'Assumed Present, not surveyed'.

The following species have been excluded and are considered not impacted due to habitat requirements not being present in the development footprint (suitable habitat trees and intact native vegetation not present) or due to targeted surveys determining that the species is not present.

- Absent: Pale Imperial Hairstreak (*Jalmenus eubulus*), Grey-headed Flying-fox (*Pteropus poliocephalus*), Koala (*Phascolarctos cinereus*), Ooline (*Cadellia pentastylis*), Belson's Panic (*Homopholis belsonii*).

The following species have been assessed as 'present', due to there being no justifiable reason for excluding them from the site, and also not being assessed by targeted survey.

- Present: Large-eared Pied Bat (*Chalinolobus dwyeri*), Large Bent-winged Bat (*Miniopterus orianae oceanensis*), Barking Owl (*Ninox connivens*), Masked Owl (*Tyto novaehollandiae*), Eastern Cave Bat (*Vespadelus troughtoni*)

The credits generated for the retained species credit species are summarised in **Table 6-3** below.

Table 6-3. Species credits produced for the habitat cleared.

Species	Vegetation zone	Vegetation integrity (Habitat condition)	Area (ha)	Biodiversity risk weighting	Potential SAII	Species credits
Chalinolobus dwyeri / Large-eared Pied Bat (Fauna)	445_Derived 445_Cropped	5.5 0.8	1.8 0.24	3	Yes	7 1
Miniopterus orianae oceanensis / Large Bent-winged Bat (Fauna)	445_Derived 445_Cropped	5.5 0.8	1.8 0.24	3	Yes	7 1
Ninox connivens / Barking Owl (Fauna)	445_Derived 445_Cropped	5.5 0.8	1.8 0.24	2	No	5 1

Species	Vegetation zone	Vegetation integrity (Habitat condition)	Area (ha)	Biodiversity risk weighting	Potential SAII	Species credits
Tyto novaehollandiae / Masked Owl	445_Derived 445_Cropped	5.5 0.8	1.8 0.24	2	No	5 1
Vespadelus troughtoni / Eastern Cave Bat (Fauna)	445_Derived 445_Cropped	5.5 0.8	1.8 0.24	3	Yes	7 1

6.5 Offset requirement

Like for like credit retirement options and the variation rules according to the Biodiversity Conservation Regulation 2017 are summarised in **Table 6-4** (for only the species credits produced, in this case).

Table 6-4. Retirement options for credits, including like-for-like and IBRA region options.

Species	Like-for-like credit retirement options	IBRA Subregion
Chalinolobus dwyeri Large-eared Pied Bat	Spp *Chalinolobus dwyeri* Large-eared Pied Bat	Any in NSW
Miniopterus orianae oceanensis Large Bent-winged Bat	Spp *Miniopterus orianae oceanensis* Large Bent-winged Ba	Any in NSW
Ninox connivens Barking Owl	Spp *Ninox connivens* Barking Owl	Any in NSW
Tyto novaehollandiae Masked Owl	Spp *Tyto novaehollandiae* Masked Owl	Any in NSW
Vespadelus troughtoni Eastern Cave Bat	Spp *Vespadelus troughtoni* Eastern Cave Bat	Any in NSW

7 Summary and conclusions

The native vegetation consists of one Plant Community Type:

- PCT 445 *Brigalow viney scrub open forest on loamy soils in low hill landscapes in the northern Brigalow Belt South Bioregion.*

PCT 445 is associated with the following threatened ecological communities (TECs):

- EPBC Act, Endangered: *Brigalow-Gidgee woodland/shrubland in the Mulga Lands and Darling Riverine Plains Bioregions*;
- BC Act, Endangered: *Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregion*s;
- EPBC Act, Endangered: *Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions*.

However, based on the cleared and degraded nature of the subject land, this assessment finds that the vegetation on the site is not of sufficient condition to be part of any of the above TECs.

In total 16 potential ecosystem credit species were predicted for the PCT and condition as a derived grassland. Woodland areas around the quarry site were excluded from the development footprint after the design was modified, as part of avoidance measures. Due to the low VI scores for each zone, no ecosystem credits either for the PCT or for the 16 predicted species are required to be offset.

Ten candidate species credit species were determined from the BAM calculations. The following species have been excluded and are considered not impacted due to habitat requirements not being present in the development footprint (suitable habitat trees and intact native vegetation not present) or due to targeted surveys failing to locate the species within the subject land.

- Absent: Pale Imperial Hairstreak (*Jalmenus eubulus*), Grey-headed Flying-fox (*Pteropus poliocephalus*), Koala (*Phascolarctos cinereus*), Ooline (*Cadellia pentastylis*), Belson's Panic (*Homopholis belsonii*).

The following species have been assessed as ‘assumed present’, due to there being no justifiable reason for excluding them from the site. The species credits have been calculated for these species and summarised in **Table 6-3** above.

- Present: Large-eared Pied Bat (*Chalinolobus dwyeri*), Large Bent-winged Bat (*Miniopterus orianae oceanensis*), Barking Owl (*Ninox connivens*), Masked Owl (*Tyto novaehollandiae*), Eastern Cave Bat (*Vespadelus troughtoni*).

The proponent is obligated to offset the impacts of the development on potential threatened species (species credit species) by purchasing or retiring species credits on the open market or by making a payment to BCT.

The following threatened species assumed present on the subject land have been assessed in relation to potential SAII on the species, as per section 9.1.2 of the BAM (2020).

- Large-eared Pied Bat (*Chalinolobus dwyeri*)
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*),
- Eastern Cave Bat (*Vespadelus troughtoni*).

The likelihood of a SAII occurring for any of these bat species will be determined by the consent authority.

The significance of the proposed impact to EPBC Listed threatened, migratory, wetland and marine species predicted to occur within a 10 km search area was assessed. No significant impact to a threatened, migratory, wetland or marine species likely to result in the extinction of a local population was identified. The residual ecological impacts of the project would be adequately mitigated using the management actions recommended. Therefore, a referral of the project to the Federal Department of Agriculture, Water and the Environment for these matters is not required.

This assessment covers the current form of the project as shown in **Figure 1-2** at the start of this report. Any change to the development layout or scope of work will require re-assessment.

8 References

Australian Department of the Environment and Energy. (2008). Directory of Important Wetlands in Australia (DIWA) Spatial Database. Canberra.

Australian Government Department of environment and Energy. (2021). *Species Profile and Threats Database: Grantiella picta - Painted Honeyeater*. Retrieved from Australian Governement Department of environment and Energy: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=470

Australian Government Department of Environment and Energy. (2021). *Species Profile and Threats Database: Hirundapus caudacutus - White-throated Needletail*. Retrieved from Australian Government Department of Environment and Energy : http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=682

Australian Government Department of Environment and Energy. (2021). *Species Profile and Threats Database - Rostratula australis - Australian Painted Snipe*. Retrieved from Australian Government Department of Environment and Energy: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=77037

Australian Government Department of Environment and Energy. (2021). *Species Profile and Threats Database Calidris ferruginea - Curlew Sandpiper*. Retrieved from Australian Government Department of Environment and Energy: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=856

Australian Government Department of Environment and Energy. (2021). *Species Profile and Threats Database: Apus pacificus - Fork-tailed Swift*. Retrieved from Australian Government Department of Environment and Energy: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=678

Australian Government Department of Environment and Energy. (2021). *Species Profile and Threats Database: Cadelia pentastylis - Ooline*. Retrieved from Australian Government Department of Environment and Energy: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=9828

Australian Government Department of Environment and Energy. (2021). *Species Profile and Threats Database: Myiagra cyanoleuca - Satin Flycatcher*. Retrieved from Australian Government Department of Environment and Energy: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=612

Australian Government Department of Environment and Energy. (2021). *Species Profile and Threats Database: Nyctophilus corbeni - Corben's Long-eared Bat*. Retrieved from Australian Government Department of Environment and Energy: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=83395

Australian Government Department of Environnent and Energy. (2021). *Species Profile and Threats Database: Pteropus poliocephalus - Grey-headed Flying-fox*. Retrieved from Australian Government Department of Environment and Energy: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=186

Australian Government Department of the Environment. (2013). *Matters of National Environmental Significance: Significant impact guidlines 1.1.* Canberra: Commonwealth of Australia.

Bureau of Meteorology. (2021). *Groundwater Dependant Ecosystem Atlas*. Retrieved from Bureau of Meteorology: http://www.bom.gov.au/water/groundwater/gde/

Bureau of Meteorology. (2021). *Climate Data Online*. Retrieved from Australian Government Bureau of Meteorology: http://www.bom.gov.au/jsp/ncc/cdio/cvg/av

Commonwealth of Australia. (2014). *EPBC Act Referral Guidelines for the Vulnerable Koala.* Canberra: Commonwealth of Australia.

Commonwealth of Australia. (2016). *National Recovery Plan for the Regent Honeyeater.* Canberra: Commonwealth of Australia.

DoE. (2013). *Matters of National Environmental Significance - Significant impact guidelines 1.1 - Environment Protection and Biodiversity Conservation Act 1999.* Department of the Environment. Canberra, ACT: Commonwealth of Australia . http://www.environment.gov.au/system/files/resources/42f84df4-720b-4dcf-b262-48679a3aba58/files/nes-guidelines_1.pdf

Dwyer (1966). *Observations on Chalinolobus dwyeri (Chiroptera: Vespertilionidae) Australia.* Journal of Mammalogy 47: 716-718.

Gonsalves and Law (2017). *Seasonal activity patterns of bats in North Sydney, New South Wales: implications for urban bat monitoring programs.* Australian Mammalogy 40(2): 220-229.

Holtz et al. (2020). *Does size matter? Morphometrics of southern bent-winged bats (Miniopterus orianae bassanii) and eastern bent-winged bats (Miniopterus orianae oceanensis).* Australian Zoologist 41(1): 42-53.

Hoye and Dwyer (1995). *Large-eared pied bat Chalinolobus dwyeri.* In: The Mammals of Australia. Page 510-511. Chatswood, NSW: Reed Books.

Keith. (2004). *Ocean Shores to Desert Dunes: the native vegetation of New South Wales and the ACT*, NSW National Parks and Wildlife Service, Sydney.

Law and Chidel (2007). *Bats under a hot tin roof: comparing the microclimate of eastern cave bat (Vespadelus troughtoni) roosts in a shed and cave overhands.* Australian Journal of Zoology 55(1): 49-55.

Law et al. (2005). *Life under a sandstone overhang: the ecology of the eastern cave bat Vespadelus troughtoni in northern New South Wales.* Australian Mammalogy 27(2): 137-145.

Mills. (2021). *Summer and autumn activity patterns of the eastern bent-wing bat (Miniopterus orianae oceanensis) at a large maternity site in southern New South Wales.* Australian Journal of Zoology: online first.

Mitchell. (2002). *Descriptions for NSW (Mitchell) Landscapes.* NSW: Department of Envrionment and Climate Change.

Morgan, G. (1992). *Nature conservation in western New South.* Hurstville: NPWS. Retrieved from NSW Office of Environment and Heritage: https://www.environment.nsw.gov.au/bioregions/BrigalowBeltSouth-Subregions.htm

NSW Department of Environment and Planning. (2021). *Biodiversity Value Map*. Retrieved from NSW Department of Environment and Planning: https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BVMap

NSW Office of Environment and Heritage. (1998). Acid Sulfate Soils Risk. Sydney.

NSW Office of Environment and Heritage. (2011). NSW Wetlands. Sydney, NSW, Australia.

NSW Office of Environment and Heritage. (2011). Vulnerable Land - Steep or Highly Erodible. Sydney.

NSW Office of Environment and Heritage. (2011a). NSW Wetlands. Sydney.

NSW Office of Environment and Heritage. (2021). *NSW Vegetation Information System: Classification*. Retrieved from NSW Office of Environment & Heritage: http://www.environment.nsw.gov.au/NSWVCA20PRapp/default.aspx

NSW Office of Environment and Heritage. (2021). *BioNet Vegetation Classification*. Retrieved from NSW Office of Environment and Heritage: https://www.environment.nsw.gov.au/NSWVCA20PRapp/default.aspx

NSW Office of Environment and Heritage. (2021). *NSW BioNet Atlas*. Retrieved from BioNet - the website for the Atlas of NSW Wildlife: http://www.bionet.nsw.gov.au/

OEH. (2020). *Biodiversity Assessment Method.* Sydney: Office of Environment and Heritage for the NSW Government.

Pennay (2008). *A maternity roost of the Large-eared Pied Bat Chalinolobus dwyeri (Ryan) (Microchiroptera: Vespertilionidae) in central New South Wales Australia.* Australian Zoologist 34(4): 564-569.

Royal Botanic Gardens and Domain Trust, Sydney. (2021). Retrieved from PlantNET (The NSW Plant Information Network System): http://plantnet.rbgsyd.nsw.gov.au

Thackway, R., & Cresswell, I. (1995). *An interim biogeographic regionalisation for Australia: a framework for setting priorities in the National Reserves System Cooperative Program.* Canberra: Australian Nature Conservancy.

Van Dyck et al. (2012). *Field Companion to The Mammals of Australia.* New Holland Books.

Appendix A: Database search results

BioNET Atlas search of records with 10km of the development site.

Data from the BioNet Atlas website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°C; ^^ rounded to 0.01°C. Copyright the State of NSW through the Department of Planning, Industry and Environment. Search criteria: Public Report of all Valid Records of Threatened (listed on BC Act 2016), Commonwealth listed, CAMBA listed, JAMBA listed or ROKAMBA listed Entities in selected area [North: -28.93 West: 150.36 East: 150.46 South: -29.03] returned a total of 15 records of 6 species. Database search on 14/07/2021.

Class	Scientific Name	Common Name	NSW Status	Comm Status	Date	No. Individs.	Description	Latitude GDA94	Longitude GDA94	Accuracy	Sighting Notes
Aves	*Chthonicola sagittata*	Speckled Warbler	V,P		1/03/1979	0	Far North Western Slopes Remnant Veg and Bird Survey Site W3 Specified Map No: 8940	-28.9917	150.4196	1000	
Aves	*Daphoenositta chrysoptera*	Varied Sittella	V,P		1/03/1979	0	Far North Western Slopes Remnant Veg and Bird Survey Site W3 Specified Map No: 8940	-28.9917	150.4196	1000	
Aves	*Daphoenositta chrysoptera*	Varied Sittella	V,P		1/03/1979	0	NW Slopes - W3	-28.9984	150.4178	100	
Aves	*Hieraaetus morphnoides*	Little Eagle	V,P		1/03/1979	0	Far North Western Slopes Remnant Veg and Bird Survey Site W3 Specified Map No: 8940	-28.9917	150.4196	1000	
Aves	*Hieraaetus morphnoides*	Little Eagle	V,P		1/03/1979	0	NW Slopes - W3	-28.9984	150.4178	100	
Aves	*Pomatostomus temporalis temporalis*	Grey-crowned Babbler (eastern subspecies)	V,P		17/01/2020	5	Wolonga Camp TSR North Star	-29.0089	150.4432	500	LLS NW Goondiwindi survey 2020
Aves	*Pomatostomus temporalis*	Grey-crowned	V,P		31/03/2020	8	Wolonga Camp TSR North Star	-29.0089	150.4432	500	LLS NW Goondiwindi survey 2020

Class	Scientific Name	Common Name	NSW Status	Comm Status	Date	No. Individs.	Description	Latitude GDA94	Longitude GDA94	Accuracy	Sighting Notes
	temporalis	Babbler (eastern subspecies)									
Aves	*Pomatostomus temporalis temporalis*	Grey-crowned Babbler (eastern subspecies)	V,P		28/03/2019	0	Croppa Creek Rd, North Star, NSW	-28.9851	150.4034	20	
Mammalia	*Phascolarctos cinereus*	Koala	V,P	V	13/03/2019	0	Suburb only provided: North Star, 2408	-28.942	150.4173	16970	Encounter broad: Unknown; Encounter narrow: Unknown
Mammalia	*Phascolarctos cinereus*	Koala	V,P	V	1/07/2004	1		-28.9595	150.3919	10000	Data Entry: Aimery Thomas.
Mammalia	*Phascolarctos cinereus*	Koala	V,P	V	11/10/2015	0	Suburb only provided: North Star, NSW, 2408	-28.942	150.4173	16970	Encounter broad: Unknown; Encounter narrow: Unknown
Mammalia	*Phascolarctos cinereus*	Koala	V,P	V	13/03/2019	0	Suburb only provided: North Star, 2408	-28.942	150.4173	16970	Encounter broad: Unknown; Encounter narrow: Unknown
Mammalia	*Phascolarctos cinereus*	Koala	V,P	V	13/03/2019	0	Suburb only provided: North Star, 2408	-28.942	150.4173	16970	Encounter broad: Unknown; Encounter narrow: Unknown
Flora	*Homopholis belsonii*	Belson's Panic	E1	V	22/09/1988	0	`Warivan', 7.4 km from North Star on Warialda road.	-28.9818	150.4178	1000	Determination status: conf. Determiner: K.E. Wills Date Determined: 1 Jul 2001 Habit / Notes: Rare. Tall caespitose grass. Noted NPWS Rare Plant Data Base 1991.
Flora	*Homopholis belsonii*	Belson's Panic	E1	V	22/09/1988	0	Warivan 7.4km from Nth Star on Warialda Rd	-29.0204	150.4145	1000	Tall caespitose grass located on basalt hills

Class	Scientific Name	Common Name	NSW Status	Comm Status	Date	No. Individs.	Description	Latitude GDA94	Longitude GDA94	Accuracy	Sighting Notes
							Specified Map No: 8939				with very rocky red brown friable loam in *Acacia harpophylla/Allocasuraina cristata* closed forest. Collected in flower.

Biodiversity Values Map

NSW Government's BV map online layer accessed 17/03/2021. Areas marked as purple are areas mapped on the BV map biodiversity value. The red outline indicates the subject land.

Appendix B: Vegetation plot locations and photographs

Plot	Plot photographs (from 0m, along centreline)
BAM 1 Bearing: 270° 247065E, 6790591N (zone 56) PCT 445 Derived grassland zone	

Plot	Plot photographs (from 0m, along centreline)
	

Plot	Plot photographs (from 0m, along centreline)
BAM 2 Bearing: 80° 247111E, 6791082N (zone 56) PCT 445 Cropped zone	

Plot	Plot photographs (from 0m, along centreline)
	

Plot	Plot photographs (from 0m, along centreline)
BAM 3 Bearing: 20° 247133E, 6790825N (zone 56) PCT 445 Woodland zone – not in proposed impact footprint	

Plot	Plot photographs (from 0m, along centreline)
	

Plot	Plot photographs (from 0m, along centreline)
BAM 4 Bearing: 250° 247009E, 6790812N (zone 56) PCT 445 Derived grassland zone	

Plot	Plot photographs (from 0m, along centreline)
	

Plot	Plot photographs (from 0m, along centreline)
BAM 5 Bearing: 20° 246865E, 6790837N (zone 56) PCT 445 Woodland zone – not in proposed impact footprint	

Plot	Plot photographs (from 0m, along centreline)
	

Plot	Plot photographs (from 0m, along centreline)
BAM 6 Bearing: 200° 246993E, 6790769N (zone 56) PCT 445 Derived grassland zone	

Plot	Plot photographs (from 0m, along centreline)
	

Plot	Plot photographs (from 0m, along centreline)
BAM 7 Bearing: 250° 247090E, 6790699N (zone 56) PCT 445 Derived grassland zone	

Plot	Plot photographs (from 0m, along centreline)
	

Appendix C: Flora species list and plot data summary

List of species recorded in each BAM Vegetation Integrity plot, with cover scores.

Family	Scientific Name	Common Name	HTE	Growth form	BAM Plot # (% cover)						
					1	2	3	4	5	6	7
Malvaceae	*Abutilon oxycarpum*	Straggly Lantern-bush		Shrub (SG)	0.1		0.2		2		
Apocynaceae	*Alstonia constricta*	Quinine Bush		Tree (TG)					0.5		
Amaranthaceae	*Alternanthera pungens*	Khaki Weed	HTE	Non-Native						0.2	
Amaranthaceae	*Amaranthus deflexus*	Spreading Amaranth		Non-Native			0.1	0.1	0.1	0.1	0.1
Chenopodiaceae	*Atriplex muelleri*	Mueller's Saltbush		Forb (FG)	0.2		0.1			0.2	
Poaceae	*Austrostipa scabra*	Speargrass		Grass & grasslike (GG)					0.2		
Elatinaceae	*Bergia trimera*	Small Water-fire		Forb (FG)	0.1						
Euphorbiaceae	*Bertya* spp.			Shrub (SG)					10		
Euphorbiaceae	*Beyeria viscosa*	Sticky Wallaby Bush		Shrub (SG)		0.1	0.1	5	30	2	1
Asteraceae	*Bidens pilosa*	Cobbler's Pegs		Non-Native			0.5				0.1
Nyctaginaceae	*Boerhavia dominii*	Tarvine		Forb (FG)	0.1		2	2			
Asteraceae	*Calotis lappulacea*	Yellow Burr-daisy		Forb (FG)				0.1			
Capparaceae	*Capparis lasiantha*	Nepine		Other (OG)	0.2	0.1	0.1		0.5		
Casuarinaceae	*Casuarina cristata*	Belah		Tree (TG)			3				
Poaceae	*Cenchrus ciliaris*	Buffel Grass	HTE	Non-Native	0.5		0.1	10	20	20	
Poaceae	*Chloris*			Grass & grasslike (GG)	0.1				0.2		

Family	Scientific Name	Common Name	HTE	Growth form	BAM Plot # (% cover)						
					1	2	3	4	5	6	7
	divaricata										
Asteraceae	*Conyza bonariensis*	Flaxleaf Fleabane		Non-Native	0.1	0.1					
Poaceae	*Sorghum* sp. (CROP)	Sorghum		Non-Native		70					
Euphorbiaceae	*Croton phebalioides*			Shrub (SG)			5		2		
Cucurbitaceae	*Cucumis myriocarpus*	Paddy Melon		Non-Native		0.2	0.1	0.2		0.5	
Poaceae	*Cynodon dactylon*	Common Couch		Grass & grasslike (GG)				5	5	10	
Poaceae	*Dactyloctenium radulans*	Button Grass		Grass & grasslike (GG)	0.1				0.1		
Fabaceae	*Desmodium brachypodum*	Large Tick-trefoil		Forb (FG)							0.1
Poaceae	*Digitaria eriantha*	Finger Panic Grass		Non-Native				1			
Chenopodiaceae	*Dysphania pumilio*	Small Crumbweed		Forb (FG)				0.1	0.1	0.2	0.1
Chenopodiaceae	*Einadia nutans*	Climbing Saltbush		Forb (FG)			0.1	0.1	0.1		
Chenopodiaceae	*Enchylaena tomentosa*	Ruby Saltbush		Shrub (SG)			0.1		0.2		
Poaceae	*Enneapogon* sp.	Nineawn Grass, Bottlewashers		Grass & grasslike (GG)				0.1			
Poaceae	*Enteropogon acicularis*	Curly Windmill Grass		Grass & grasslike (GG)					0.1		
Poaceae	Poaceae sp.	Unknown Native Grass		Grass & grasslike (GG)					0.5		
Poaceae	*Eragrostis cilianensis*	Stinkgrass		Non-Native				5	0.5		
Poaceae	*Eragrostis* sp.	Lovegrass		Grass & grasslike (GG)	20					0.2	
Myoporaceae	*Eremophila mitchellii*	Budda		Shrub (SG)			0.1		2		

Family	Scientific Name	Common Name	HTE	Growth form	BAM Plot # (% cover)						
					1	2	3	4	5	6	7
Poaceae	*Eriochloa pseudoacrotricha*	Early Spring Grass		Grass & grasslike (GG)	0.1		5	5	2	2	1
Myrtaceae	*Eucalyptus melanophloia*	Silver-leaved Ironbark		Tree (TG)					5		
Euphorbiaceae	*Euphorbia dallachyana*			Forb (FG)		0.1					
Rutaceae	*Geijera parviflora*	Wilga		Shrub (SG)					0.5		
Fabaceae	*Glycine tabacina*	Variable Glycine		Other (OG)	0.1						
Solanaceae	*Lycium ferocissimum*	African Boxthorn	HTE	Non-Native	0.2		0.1		1		
Malvaceae	*Malvastrum americanum*	Spiked Malvastrum		Non-Native	20		0.2	5	0.5	5	
Malvaceae	*Malvastrum coromandelianum*	Prickly Malvastrum		Forb (FG)		0.1	0.1				
Fabaceae	*Medicago polymorpha*	Burr Medic		Non-Native	0.1						
Oleaceae	*Notelaea microcarpa*	Native Olive		Tree (TG)			0.1		0.1		
Oxalidaceae	*Oxalis perennans*			Forb (FG)	0.1						
Bignoniaceae	*Pandorea pandorana*	Wonga Wonga Vine		Other (OG)			0.1				
Poaceae	*Panicum coloratum*	Coolah Grass		Non-Native			0.1	1	2		
Poaceae	*Panicum decompositum*	Native Millet		Grass & grasslike (GG)		0.2	0.2				
Apocynaceae	*Parsonsia lanceolata*	Rough Silkpod		Other (OG)	0.1			0.1			
Poaceae	*Paspalidium gracile*	Slender Panic		Grass & grasslike (GG)			0.1				

Family	Scientific Name	Common Name	HTE	Growth form	BAM Plot # (% cover)						
					1	2	3	4	5	6	7
Solanaceae	*Physalis angulata*			Non-Native		0.2					1
Portulacaceae	*Portulaca oleracea*	Pigweed		Forb (FG)	0.1			0.2	0.3		1
Chenopodiaceae	*Rhagodia spinescens*	Thorny Saltbush		Shrub (SG)	0.2				1		
Chenopodiaceae	*Salsola australis*			Shrub (SG)	0.5		0.1	0.2		2	2
Lamiaceae	*Salvia reflexa*	Mintweed		Non-Native	5	0.1	60	30		10	30
Chenopodiaceae	*Sclerolaena muricata*	Black Rolypoly		Shrub (SG)	5		0.1	0.1			5
Fabaceae	*Senna artemisioides*			Shrub (SG)				0.1			0.1
Fabaceae	*Senna coronilloides*			Shrub (SG)				1			0.1
Poaceae	*Setaria incrassata*	Purple Pigeon Grass		Non-Native							1
Malvaceae	*Sida cunninghamii*	Ridge Sida		Forb (FG)					0.1		
Malvaceae	*Sida spinosa*			Non-Native							0.1
Solanaceae	*Solanum esuriale*	Quena		Forb (FG)						0.1	
Solanaceae	*Solanum nigrum*	Black-berry Nightshade		Non-Native							0.1
Aizoaceae	*Tetragonia tetragonioides*	New Zealand Spinach		Forb (FG)			0.1	0.1	0.2		
Poaceae	*Tragus australianus*	Small Burrgrass		Grass & grasslike (GG)	1			0.1	0.1	0.1	
Aizoaceae	*Trianthema triquetra*	Small Hogweed		Forb (FG)	0.1			0.1	0.2	0.1	
Zygophyllaceae	*Tribulus micrococcus*	Spineless Caltrop		Forb (FG)	0.2	0.2	2	1	0.1		1
Poaceae	*Urochloa*	Urochloa Grass		Non-Native	10		10	5		40	30

Family	Scientific Name	Common Name	HTE	Growth form	BAM Plot # (% cover)						
					1	2	3	4	5	6	7
	panicoides										
Verbenaceae	*Verbena officinalis*	Common Verbena		Non-Native	0.1						
Verbenaceae	*Verbena tenuisecta*			Non-Native	2			0.1			
Asteraceae	*Verbesina encelioides*			Non-Native	5			3		2	1
Asteraceae	*Vittadinia cuneata*	A Fuzzweed		Forb (FG)	0.1						
Asteraceae	*Xanthium occidentale*	Noogoora Burr	HTE	Non-Native		1					
Asteraceae	*Xanthium spinosum*	Bathurst Burr	HTE	Non-Native		0.2		0.1		0.1	0.5
Zygophyllaceae	*Zygophyllum apiculatum*			Forb (FG)			0.2		0.5		

BAM Plot Summary Data

Plot summary - COUNTS of SPECIES per growth form							
	Plot 1	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**	**Plot 6**	**Plot 7**
Tree (TG)	0	0	2	0	3	0	0
Shrub (SG)	4	1	7	5	8	2	5
Forb (FG)	8	3	7	8	8	4	3
Grass & grasslike (GG)	5	1	3	4	8	4	1
Fern (EG)	0	0	0	0	0	0	0
Other (OG)	3	1	2	1	1	0	0
Native	20	6	21	18	28	10	9
Non-native	10	7	9	12	6	9	10
Total spp count	**30**	**13**	**30**	**30**	**34**	**19**	**20**

Plot summary - Sum of COVER per native growth form group and HTE							
	Plot 1	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**	**Plot 6**	**Plot 7**
Tree (TG)	0	0	3.1	0	5.6	0	0
Shrub (SG)	5.8	0.1	5.7	6.4	47.7	4	8.2
Forb (FG)	1	0.4	4.6	3.7	1.6	0.6	1.2
Grass & grasslike (GG)	21.3	0.2	5.3	10.2	8.2	12.3	1
Fern (EG)	0	0	0	0	0	0	0
Other (OG)	0.4	0.1	0.2	0.1	0.5	0	0
Non-native	43	71.8	71.2	60.5	24.1	77.9	63.9
High Threat Weed	0.7	1.2	0.2	10.1	21	20.3	0.5

Appendix D: BAM calculator reports

NSW GOVERNMENT

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00024870/BAAS21028/22/00032467	North Star Quarry - Reduced Footprint	24/11/2021
Assessor Name	Report Created	BAM Data version *
David Orchard	20/04/2022	50
Assessor Number	BAM Case Status	Date Finalised
BAAS21028	Finalised	20/04/2022
Assessment Revision	Assessment Type	BOS entry trigger
0	Part 4 Developments (General)	BOS Threshold: Area clearing threshold

* 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	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Brigalow viney scrub open forest on loamy soils in low hill landscapes in the northern Brigalow Belt South Bioregion												
1	445_Derived	Not a TEC	5.5	5.5	1.8	PCT Cleared - 90%	High Sensitivity to Potential Gain			2.50		0

BAM Credit Summary Report

2	445_Cropped	Not a TEC	0.8	0.8	0.24	PCT Cleared - 90%	High Sensitivity to Potential Gain			2.50		0
											Subtotal	**0**
											Total	**0**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits
Chalinolobus dwyeri / Large-eared Pied Bat (Fauna)									
445_Derived	5.5	5.5	1.8			Vulnerable	Vulnerable	True	7
445_Cropped	0.8	0.8	0.24			Vulnerable	Vulnerable	True	1
								Subtotal	**8**
Miniopterus orianae oceanensis / Large Bent-winged Bat (Fauna)									
445_Derived	5.5	5.5	1.8			Vulnerable	Not Listed	True	7
445_Cropped	0.8	0.8	0.24			Vulnerable	Not Listed	True	1
								Subtotal	**8**
Ninox connivens / Barking Owl (Fauna)									
445_Derived	5.5	5.5	1.8			Vulnerable	Not Listed	False	5
445_Cropped	0.8	0.8	0.24			Vulnerable	Not Listed	False	1
								Subtotal	**6**

NSW GOVERNMENT

BAM Credit Summary Report

Tyto novaehollandiae / Masked Owl (Fauna)									
445_Derived	5.5	5.5	1.8			Vulnerable	Not Listed	False	5
445_Cropped	0.8	0.8	0.24			Vulnerable	Not Listed	False	1
								Subtotal	**6**
Vespadelus troughtoni / Eastern Cave Bat (Fauna)									
445_Derived	5.5	5.5	1.8			Vulnerable	Not Listed	True	7
445_Cropped	0.8	0.8	0.24			Vulnerable	Not Listed	True	1
								Subtotal	**8**

Appendix E: Threatened species assessment

Ecosystem credit species – habitat assessment

Species	NSW status	Comm status	Records within 10km	Description	Site assessment	Presence/ Absence
Artamus cyanopterus cyanopterus Dusky Woodswallow	V		No	The Dusky Woodswallow occurs throughout most of NSW however is sparsely scattered in, or largely absent from, much of the upper western region. The majority of breeding occurs on the western slopes of the Great Dividing Range. Primarily inhabits dry, open eucalypt forests and woodlands, including mallee associations, with an open - sparse understory of eucalypt saplings and acacias, and understory of grasses, sedges and fallen woody debris. This species is sometimes found in farmland usually at the edges or forests or woodlands. The species migrates after breeding, to the north of NSW and south-eastern QLD, generally between March and May and do not return until breeding the following spring. Nesting occurs in trees or shrubs and is generally associated within an abundance of invertebrate food near watercourses.	The subject land is within the species known distribution. The species is known to occur within the vegetation PCT 445.	Assumed present
Chalinolobus picatus Little Pied Bat	V		No	The Little-Pied Bat is found in inland Queensland and NSW (including Western Plains and slopes) extending slightly into South Australia and Victoria. Occurs in dry open forest, open woodland, mulga woodlands, chenopod shrublands, cypress pine forest and mallee and Bimbil box woodlands. Roosts in caves, rock outcrops, mine shafts, tunnels, tree hollows and buildings. Can tolerate high temperatures and dryness but need access to nearby open water.	The species is associated with PCT 445 and there are rock cuttings associated with the old quarry. The species could be present and utilise the site.	Assumed present
Chthonicola sagittata Speckled Warbler	V		Yes	The Speckled Warbler has a patchy distribution throughout south-eastern Queensland, the eastern half of NSW and into Victoria, as far west as the Grampians. The species is most frequently reported from the hills and tablelands of the Great Dividing Range, and rarely from the coast. There has been a decline in population density throughout its range, with the decline exceeding 40% where no vegetation remnants larger than 100ha survive. The Speckled Warbler lives in a wide range of Eucalyptus dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy.	The species is associated with PCT 445 and has been recorded locally. The species could be present and utilise the site.	Assumed present

Species	NSW status	Comm status	Records within 10km	Description	Site assessment	Presence/ Absence
Climacteris picumnus victoriae Brown Treecreeper (eastern subspecies)	V		No	The Brown Treecreeper is endemic to eastern Australia and occurs in eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range. It is less commonly found on coastal plains and ranges. The western boundary of the range of *Climacteris picumnus victoriae* runs approximately through Corowa, Wagga Wagga, Temora, Forbes, Dubbo and Inverell and along this line the subspecies intergrades with the arid zone subspecies of Brown Treecreeper *Climacteris picumnus picumnus* which then occupies the remaining parts of the state. 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 with one or more shrub species; also found in mallee and River Red Gum (*Eucalyptus camaldulensis*) Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains.	The subject land is within the species known distribution. The species is known to occur within the vegetation PCT 445.	Assumed Present
Daphoenositta chrysoptera Varied Sittella	V		Yes	The Varied Sittella is sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands. Distribution in NSW is nearly continuous from the coast to the far west. The Varied Sittella's population size in NSW is uncertain but is believed to have undergone a moderate reduction over the past several decades. Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland.	The species is associated with PCT 445 and has been recorded locally. The species could be present and utilise the site.	Assumed Present
Dasyurus maculatus Spotted-tailed Quoll	V	E	No	The range of the Spotted-tailed Quoll has contracted considerably since European settlement. It is now found in eastern NSW, eastern Victoria, south-east and north-eastern Queensland, and Tasmania. Only in Tasmania is it still considered relatively common. 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. Females occupy home ranges of 200-500 hectares, while males occupy very large home ranges from 500 to over 4000 hectares. Are known to traverse their home ranges along densely vegetated creek lines.	The subject land is within the species known distribution and the species could be present.	Assumed present

Species	NSW status	Comm status	Records within 10km	Description	Site assessment	Presence/ Absence
Grantiella picta Painted Honeyeater	V	V	No	The Painted Honeyeater is endemic to mainland Australia, being found in Queensland and New South Wales west of the Great Dividing Range, through to northern Victoria. It is also found occasionally in the Northern Territory and may be a vagrant to South Australia. It is rare throughout its range. The Painted Honeyeater is found in dry open forests and woodlands and is strongly associated with mistletoe. It may also be found along rivers, on plains with scattered trees and on farmland with remnant vegetation. It has been seen in urban parks and gardens where large eucalypts are available.	The species is considered unlikely to be present due to habitat constraints: mistletoe is not present within the subject land.	Absent (habitat constraints not present)
Hirundapus caudacutus White-throated Needletail			No	The White-throated Needletail is widespread in across the coast of eastern and south-eastern Australia, and Tasmania and vagrant in the Northern Territory and in Western Australia. Almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland.	The species is aerial and would not be present or inhabit or rely upon the terrestrial habitat at the site.	Absent
Melanodryas cucullate cucullata Hooded robin	V		Yes	The Hooded Robin is widespread, found across Australia, except for the driest deserts and the wetter coastal areas - northern and eastern coastal Queensland and Tasmania. However, it is common in few places, and rarely found on the coast. It is considered a sedentary species, but local seasonal movements are possible. The south-eastern form (subspecies *cucullata*) is found from Brisbane to Adelaide and throughout much of inland NSW, with the exception of the extreme north-west, where it is replaced by subspecies *picata*. Two other subspecies occur outside NSW. Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas.	The subject land is within the species known distribution and the species could be present.	Assumed Present
Miniopterus orianae oceanensis Large Bent-winged Bat	V		No	Eastern Bentwing-bat occurs along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but they also use derelict mines, storm-water tunnels, buildings and other man-made structures. Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. This species has recently been renamed to *Miniopterus orianae oceanensis* or the large bent-winged bat, from *Miniopterus schreibersii subsp. oceanensis* or the eastern bent-wing bat.	The species is associated with PCT 445 and there are rock cuttings associated with the old quarry. The species could be present and utilise the site.	Assumed present

Species	NSW status	Comm status	Records within 10km	Description	Site assessment	Presence/ Absence
Ninox connivens Barking owl (Foraging)	V		Yes	The Barking Owl is found throughout continental Australia except for the central arid regions. Although still common in parts of northern Australia, the species has declined greatly in southern Australia and now occurs in a wide but sparse distribution in NSW. Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the higher density of prey found on these fertile riparian soils. Roost in shaded portions of tree canopies, including tall midstorey trees with dense foliage such as *Acacia* and *Casuarina* species. During nesting season, the male perches in a nearby tree overlooking the hollow entrance.	The subject land is within the species known distribution and the species could be present.	Assumed Present (foraging)
Phascolarctos cinereus Koala (foraging)	V	V	Yes	The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In New South Wales, koala populations are found on the central and north coasts, southern highlands, southern and northern tablelands, Blue Mountains, southern coastal forests, with some smaller populations on the plains west of the Great Dividing Range. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size.	The subject land is within the species known distribution and the species could be present. Five records exist locally at North Star between 2004 and 2019. The proposal has been modified to not affect woodland habitat.	Absent - Not within the vegetation zones for the PCT (habitat degraded)
Pteropus poliocephalus Grey-headed Flying-fox	V	V		Grey-headed Flying-fox are generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. In times of natural resource shortages, they may be found in unusual locations. Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	The proposal has been modified to not affect woodland habitat.	Absent. The proposal has been modified to not affect woodland habitat.

Species	NSW status	Comm status	Records within 10km	Description	Site assessment	Presence/ Absence
Saccolaimus flaviventris Yellow-bellied Sheathtail-bat	V		Yes	The Yellow-bellied Sheathtail-bat is a wide-ranging species found across northern and eastern Australia. In the most southerly part of its range - most of Victoria, south-western NSW and adjacent South Australia - it is a rare visitor in late summer and autumn. 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. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country.	The subject land is within the species known distribution and the species could be present.	Assumed Present
Stagonopleura guttata Diamond Firetail	V		Yes	The Diamond Firetail is endemic to south-eastern Australia, extending from central Queensland to the Eyre Peninsula in South Australia. It is widely distributed in NSW, with a concentration of records from the Northern, Central and Southern Tablelands, the Northern, Central and South Western Slopes and the North West Plains and Riverina. Not commonly found in coastal districts, though there are records from near Sydney, the Hunter Valley and the Bega Valley. This species has a scattered distribution over the rest of NSW, though is very rare west of the Darling River. This species is found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum *Eucalyptus pauciflora* Woodlands. It also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland. Foraging Feeds exclusively on the ground, on ripe and partly-ripe grass and herb seeds and green leaves, and on insects (especially in the breeding season). Breeding Nests built either in the shrubby understorey, or higher up, especially under hawk's or raven's nests. Birds roost in dense shrubs or in smaller nests built especially for roosting.	The subject land is within the species known distribution and the species could be present.	Assumed Present
Tyto novaehollandiae Masked owl (foraging)	V		No	Extends from the coast where it is most abundant to the western plains. Overall records for this species fall within approximately 90% of NSW, excluding the most arid north-western corner. There is no seasonal variation in its distribution. Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.	The subject land is within the species known distribution and the species could be present.	Assumed Present (foraging)

Species credit species – description and site assessment

Species	NSW status	Comm status	Records within 10km	Description	Site assessment	Presence/ Absence
Cadellia pentastylis Ooline	V	V	No	A medium-sized spreading tree usually about 10 m tall, and rarely to 25 m. Has glossy green leaves and single white flowers that produce a cluster of brown berries in clusters Occurs along the western edge of the North West Slopes from north of Gunnedah to west of Tenterfield. Also occurs in Queensland. General flowering period is October to January. Forms a closed or open canopy mixing with eucalypt and cypress pine species. Typically occurs on low- to medium-nutrient soils of sandy clay or clayey consistencies, with a typical soil profile having a sandy loam surface layer, grading from a light clay to a medium clay with depth.	All suitable habitat within the impact footprint was subjected to a targeted survey. The species was not detected on or near the subject land.	Absent (surveyed)
Chalinolobus dwyeri Large-eared Pied Bat	V	V	No	A small to medium-sized bat with long, prominent ears and glossy black fur. Found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland to the NSW Southern Highlands. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin. They remain loyal to the same cave over many years. Found in well-timbered areas containing gullies. The relatively short, broad wing combined with the low weight per unit area of wing indicates manoeuvrable flight. This species probably forages for small, flying insects below the forest canopy. Likely to hibernate through the coolest months. It is uncertain whether mating occurs early in winter or in spring.	The species is associated with PCT 445 and there are rock cuttings associated with the old quarry. The species could be present and utilise the site.	Assumed present
Homopholis belsonii Belson's Panic	V		Yes	Perennial tufted grass to 0.5 m high, with stems sparsely branched and an open panicle with solitary spikelets. Occurs on the northwest slopes and plains of NSW, mostly between Wee Waa, Goondiwindi and Glen Innes. It also occurs in Brigalow forests and temperate sub-humid woodlands in QLD, mainly in the Brigalow Belt South bioregion. Grows in dry woodland (e.g. *Belah* woodland) often on poor soils, although sometimes found in basalt-enriched sites north of Warialda and in alluvial clay soils. Habitat and ecology appear to be poorly known.	All suitable habitat within the impact footprint was subjected to a targeted survey. The species was not detected on or near the subject land.	Absent (surveyed)

Species	NSW status	Comm status	Records within 10km	Description	Site assessment	Presence/ Absence
Jalmenus eubulus Pale Imperial Hairstreak	CE		No	A striking medium-sized butterfly, pale brown to white with black and iridescent markings. Occurs in central QLD and north NSW. In NSW it is found only in brigalow-dominated open forests and woodlands in northern areas of the state. Only known to breed in old-growth forest or woodland and does not appear to colonise regowth habitats following clearing or other major disturbance. Suitable habitat is dominated by brigalow (*Acacia harpophylla*) and Buloke (*Casuarina cristata*) on clay soils on flat to gently undulating plains, usually with scattered emergent eucalypts such as Poplar Box (*Eucalyptus populnea*) and low trees of Wilga (*Geijera parviflora*).	The site contains vegetation that is consistent with the required habitat for this species. The proposal has been modified to not affect woodland habitat. Areas proposed for the quarry are highly disturbed and degraded and lack trees of *Acacia harpophylla.*	Absent. The proposal has been modified to not affect woodland habitat.
Miniopterus orianae oceanensis Large Bent-winged Bat	V		No	Eastern Bentwing-bat occurs along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but they also use derelict mines, storm-water tunnels, buildings and other man-made structures. Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. This species has recently been renamed to *Miniopterus orianae oceanensis* or the large bent-winged bat, from *Miniopterus schreibersii subsp. oceanensis* or the eastern bent-wing bat.	The species is associated with PCT 445 and there are rock cuttings associated with the old quarry. The species could be present and utilise the site.	Assumed present
Ninox connivens Barking Owl	V		No	The Barking Owl is found throughout continental Australia except for the central arid regions. Although still common in parts of northern Australia, the species has declined greatly in southern Australia and now occurs in a wide but sparse distribution in NSW. Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the higher density of prey found on these fertile riparian soils. Roost in shaded portions of tree canopies, including tall midstorey trees with dense foliage such as *Acacia* and *Casuarina* species. During nesting season, the male perches in a nearby tree overlooking the hollow entrance.	The subject land is within the species known distribution and the species could be present from time to time.	Assumed present

Species	NSW status	Comm status	Records within 10km	Description	Site assessment	Presence/ Absence
Vespadelus troughtoni Eastern Cave Bat	V		No	A small chestnut-brown bat found both sides of the Great Dividing Range from Cape York to Kempsey, with records from the New England Tablelands and the upper north coast of NSW. The western limit appears to be the Warrumbungle Range. A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals. Occasionally found along cliff-lines in wet eucalypt forest and rainforest. Little is understood of its feeding or breeding requirements or behaviour.	The species is associated with PCT 445 and there are rock cuttings associated with the old quarry. The species could be present and utilise the site.	Assumed present
Pteropus poliocephalus Grey-headed Flying-fox	V	V	No	Grey-headed Flying-fox are generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. In times of natural resource shortages, they may be found in unusual locations. Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	The proposal has been modified to not affect woodland habitat. There will be no suitable habitat or feed trees impacted.	Absent (habitat degraded/ absent)
Phascolarctos cinereus Koala	V	V	Yes	The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In New South Wales, koala populations are found on the central and north coasts, southern highlands, southern and northern tablelands, Blue Mountains, southern coastal forests, with some smaller populations on the plains west of the Great Dividing Range. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size.	The subject land is within the species known. Five records exist locally at North Star between 2004 and 2019. However, the proposal has been modified to not affect woodland habitat.	Absent (habitat degraded/ absent)
Tyto novaehollandiae Masked Owl	V		No	Extends from the coast where it is most abundant to the western plains. Overall records for this species fall within approximately 90% of NSW, excluding the most arid north-western corner. There is no seasonal variation in its distribution. Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.	The proposal has been modified to not affect woodland habitat. There will be no suitable habitat or hollow bearing trees impacted.	Assumed present

Additional threatened species previously recorded within 10km of the subject land (Bionet Wildlife Atlas records)

Species	NSW status	Comm status	Records within 10km	Description	Site assessment	Presence/ Absence
Hieraaetus morphnoides Little Eagle (foraging)	V		Yes	The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing range escarpment. It occurs as a single population throughout NSW. The species occupies eucalyptus forest, woodland or open woodland. Sheoak or *Acacia* woodlands and riparian woodlands of interior NSW are also used. Breeding The species nests in tall living trees within a remnant patch. The species preys on birds, reptiles and mammals, occasionally large insects and carrion.	Not predicted for PCT 445 but has been recorded within 10km of the site. The proposal has been modified to not affect woodland habitat.	Potentially present
Pomatostomus temporalis temporalis Grey-crowned Babbler (eastern subspecies)	V		Yes	The Grey-crowned Babbler has two distinctive subspecies that intergrade to the south of the Gulf of Carpentaria. The eastern subspecies (temporalis occurs from Cape York south through Queensland, NSW and Victoria and formerly to the south east of South Australia. This subspecies also occurs in the Trans-Fly Region in southern New Guinea. In NSW, the eastern sub-species occurs on the western slopes of the Great Dividing Range, and on the western plains reaching as far as Louth and Balranald. It also occurs in woodlands in the Hunter Valley and in several locations on the north coast of NSW. It may be extinct in the southern, central and New England tablelands. The species inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. The species feeds on invertebrates by foraging at the trunks of eucalyptus and other woodland trees or on the ground amongst litter and tussock grasses. Breeding Nests are built within the branches of shrubs or sapling eucalypts or in the outermost branches of large eucalypts.	Not predicted for PCT 445 but has been recorded within 10km of the site. The proposal has been modified to not affect woodland habitat.	Potentially present

Appendix F: MNES assessment

The EPBC Act protects nationally and internationally important flora, fauna, ecological communities and heritage places, which are defined in the EPBC Act as matters of national environmental significance. The EPBC Act policy *Matters of National Environmental Significance: Significant Impact Guidelines 1.1* (DoE, 2013) forms the basis of determining if impact to protected matters is significant.

A Protected Matters Search identified three Wetlands, five Endangered Ecological Communities, 22 threatened species and 15 migratory species as potentially occurring within 10 km of the subject site.

The following tables give an overview of the assessments of these threatened entities and shows that the Proposed activity:

1. Is not likely to have a significant impact on a matter of national environmental significance. The matters of national environmental significance are:
    i. World heritage properties.
    ii. National heritage places.
    iii. Wetlands of international importance.
    iv. Threatened species and ecological communities.
    v. Migratory species.
    vi. Commonwealth marine areas.
    vii. The Great Barrier Reef Marine Park. And;
    viii. Nuclear actions (including uranium mines).
    ix. A water resource, in relation to coal seam gas development and large coal mining development.
2. Is not likely to have a significant impact on the environment in general (for actions by Commonwealth agencies or actions on Commonwealth land) or the environment on Commonwealth land (for actions outside Commonwealth land).

Notes:

Important Population as determined by the *Environment Protection and Biodiversity Conservation Act 1999*, is one that for a vulnerable species:

a) is likely to be key source populations either for breeding or dispersal
b) is likely to be necessary for maintaining genetic diversity
c) is at or near the limit of the species range.

A ‘significant impact’ is an impact which is important, notable, or of consequence, having regard to its context or intensity (DoE, 2013).

Wetlands of International Importance	Proximity	Site assessment	Significance of Impact
Banrock Station Wetland complex	400 – 500 km	The subject land is not within close proximity of Banrock Station Wetland complex.	No impact
Riverland	400 – 500 km	The subject land is not within close proximity of Riverland.	No impact
The Coorong, and Lakes Alexandrina and Albert Wetland	500 – 600 km	The subject land is not within close proximity of The Coorong, and Lakes Alexandrina and Albert Wetland.	No impact

Threatened Ecological Community	Status	Assessment	Potential Impact
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	Critically Endangered	The community does not occur on the subject land. Diagnostic trees *Eucalyptus coolabah* and *Eucalyptus largiflorens* are not present.	No impact
Poplar Box Grassy Woodland on Alluvial Plains	Endangered	The community does not occur on the subject land. The site is not on alluvial plains.	No impact
Weeping Myall Woodlands	Endangered	The community does not occur on the subject land. *Acacia pendula* is not present.	No impact
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	The community does not occur on the subject land. No Yellow Box or Red Gum present.	No impact
Brigalow (*Acacia harpophylla* dominant and codominant)	Endangered	The listed ecological community is characterised by the presence of Brigalow (*Acacia harpophylla*) as one of the three most abundant tree species (Butler 2007), and either dominant or co-dominant with *Casuarina cristata* (Belah), other *Acacia*, or *Eucalyptus* species. Occasionally Belah, or species or *Acacia* or *Eucalyptus* may be more common than Brigalow within the broad matrix of Brigalow vegetation. The structure of the vegetation ranges from open forest to open woodland. The height of the tree layer varies from about 9 m in low rainfall areas (~ 500 mm per annum) to 25 m in higher rainfall areas (~ 750 mm per annum). A prominent shrub layer is usually present. Due to the absence of *Acacia harpophylla* on the subject site and the presence of >50% cover of non-native species, it is concluded that the vegetation on the subject site does not meet the	No areas of woodland that comprise a viable example of this TEC will be impacted. The proposal has been modified so as to not affect woodland areas. The area of the proposed quarry is highly disturbed and degraded and

		identification criteria for the TEC. Refer to comments against the diagnostic characteristics from the Conservation Advice for the TEC below.	lacks trees of *Acacia harpophylla*.

This Conservation Advice was approved by the Delegate of the Minister on 17 December 2013

1.7. Key diagnostic characteristics and condition thresholds

The national ecological community is limited to patches that meet the following key diagnostic characteristics and condition thresholds:

1.7.1. Step 1 Key diagnostic characteristics

A patch must include the following key diagnostic characteristics to be considered the Brigalow ecological community:

1) The presence of *Acacia harpophylla* as one of the most abundant tree species in the patch. *A. harpophylla* is either dominant in the tree layer, or co-dominant with other species (notably *Casuarina cristata*, other species of *Acacia*, or species of *Eucalyptus*).

Acacia harpohylla is present nearby but absent from the quarry site

AND

2a) In Queensland - the patch is in one of the following Qld bioregions (including outliers) **and** it meets the description of one of 16 Qld REs[2] determined at the time of the national listing of the Brigalow ecological community under the EPBC Act. The 16 REs are, as described by the Queensland Herbarium (2013):

In the **Qld Brigalow Belt Bioregion –** REs 11.3.1, 11.4.3, 11.4.7, 11.4.8, 11.4.9, 11.4.10, 11.5.16, 11.9.1, 11.9.5, 11.9.6, 11.11.14 and 11.12.21;

In the **Qld Southeast Queensland Bioregion –** REs 12.8.23, 12.9-10.6 and 12.12.26; or,

In the **Qld Mulga Lands Bioregion –** RE 6.4.2.

OR

2b) In New South Wales - the patch meets one of the following NSW Vegetation Classification and Assessment (VCA) community descriptions. The NSW VCA communities are: VCA IDs 29, 31 and 35; as described in Benson et al. (2006)[3].

AND/OR

2c) The vegetation in the patch is brigalow regrowth with species composition and structural elements broadly typical of one of the identified Qld REs or NSW vegetation communities (although species density may be reduced). This can be assumed to be the case where it has been at least 15 years since it was last comprehensively cleared (not just thinned); unless direct evidence proves otherwise.

1.7.2. Step 2 Condition thresholds

A patch must meet the following condition thresholds to be considered the Brigalow ecological community:

3) The patch is 0.5 ha or more in size;

AND

4) Exotic perennial plants comprise less than 50% of the total vegetation cover of the patch, as assessed over a minimum sample area of 0.5 ha (100 m by 50 m), that is representative of the patch.

The vegetation on the proposed quarry site has some characteristic native species of the TEC, but is dominated by non-native species with cover >50%, including Salvia reflexa, Cenchrus ciliaris, Eragrostis cilianensis, Malvastrum americanum

[2] For complete descriptions of each RE refer to the Regional Ecosystem Description Database: http://www.ehp.qld.gov.au/ecosystems/biodiversity/regional-ecosystems/index.php

[3] At the time of listing, the Brigalow ecological community in NSW was described as including two NSW vegetation communities, the: Brigalow community of the northern floodplain; and, Brigalow outlier of the Mulga Lands bioregion. The NSW vegetation community classifications have since been updated.

Note: Species descriptions are sourced from DAWE (https://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl)

Threatened species	Common Name	Commonwealth Status	Description and habitat suitability at the site	Potential Impact
Anthochaera phrygia	Regent Honeyeater	CE	A striking black and yellow bird that has a patchy distribution between south-east Queensland and central Victoria. It primarily occurs in box-ironbark woodland, but also occurs in other forest types. The species primarily feeds on nectar and, to a lesser extent, insects and their exudates (lerps and honeydew). It mainly feeds on nectar from eucalypts and mistletoes and it prefers taller and larger diameter trees for foraging. **Low - Suitable habitat is not present on the subject land. Unlikely to occur.**	Unlikely, Negligible
Botaurus poiciloptilus	Australasian Bittern	E	Australasian Bitterns are widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha* spp.) and spikerushes (*Eleocharis* spp.). Hides during the day amongst dense reeds or rushes and feed mainly at night on frogs, fish, yabbies, spiders, insects and snails. Feeding platforms may be constructed over deeper water from reeds trampled by the bird; platforms are often littered with prey remains. Breeding occurs in summer from October to January; nests are built in secluded places in densely vegetated wetlands on a platform of reeds; there are usually six olive-brown eggs to a clutch. **Low - Associated with waterbodies and highly disturbed areas. No watercourses are within the subject land. Suitable habitat is not present on the subject land. Unlikely to occur.**	Unlikely, Negligible

Threatened species	Common Name	Commonwealth Status	Description and habitat suitability at the site	Potential Impact
Calidris ferruginea	Curlew Sandpiper	CE	In Australia, Curlew Sandpipers occur around the coasts and are also quite widespread inland, though in smaller numbers. Records occur in all states during the non-breeding period, and also during the breeding season when many non-breeding one year old birds remain in Australia rather than migrating north. In NSW, they are widespread east of the Great Divide, especially in coastal regions. They are occasionally recorded in the Tablelands and are widespread in the Riverina and south-west NSW, with scattered records elsewhere. Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters. **Low - No watercourses are within the subject land. Suitable habitat is not present on the subject land. Unlikely to occur.**	Unlikely, Negligible
Erythrotriorchis radiatus	Red Goshawk	V	Occurs in coastal and sub-coastal areas in wooded and forested lands of tropical and warm-temperate Australia. Riverine forests are also used frequently. The Red Goshawk nests in large trees, frequently the tallest and most massive in a tall stand, and nest trees are invariably within one km of permanent water. **Low - The inland location and absence of any nearby substantial waterbodies to encourage nesting means the subject land is not suitable habitat. Unlikely to occur.**	Unlikely, Negligible

Threatened species	Common Name	Commonwealth Status	Description and habitat suitability at the site	Potential Impact
Falco hypoleucos	Grey Falcon	V	The Grey Falcon is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. The breeding range has contracted since the 1950s with most breeding now confined to arid parts of the range. There are possibly less than 5000 individuals left. Population trends are unclear, though it is believed to be extinct in areas with more than 500mm rainfall in NSW. Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast. Also occurs near wetlands where surface water attracts prey. Preys primarily on birds, especially parrots and pigeons, using high-speed chases and stoops; reptiles and mammals are also taken. Like other falcons it utilises old nests of other birds of prey and ravens, usually high in a living eucalypt near water or a watercourse; peak laying season is in late winter and early spring; two or three eggs are laid. **Low – absence of trees on the subject land reduce the suitability of this habitat for this species. Unlikely to occur**.	Unlikely, Negligible
Geophaps scripta scripta	Squatter Pidgeon (Southern)	V	Squatter Pigeon (southern) habitat is generally defined as open-forests to sparse, open-woodlands and scrub that are (Baldwin 1975; Beruldsen 1972; Cooper et al. 2014; EPA 2006; Frith 1982b; Leach 1988; North 1913-14; Squatter Pigeon Workshop 2011): - mostly dominated in the overstorey by *Eucalyptus, Corymbia, Acacia* or *Callitris* species - remnant, regrowth or partly modified vegetation communities, and - within 3 km of water bodies or courses. **Low – absence of trees on the subject land reduce the suitability of this habitat for this species. Unlikely to occur.**	Unlikely, Negligible

Threatened species	Common Name	Commonwealth Status	Description and habitat suitability at the site	Potential Impact
Grantiella picta	Painted Honeyeater	V	The Painted Honeyeater is nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to be found in the north of its distribution. Inhabits Boree/ Weeping Myall (*Acacia pendula*), Brigalow (*A. harpophylla*) and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus *Amyema*. Insects and nectar from mistletoe or eucalypts are occasionally eaten. Nest from spring to autumn in a small, delicate nest hanging within the outer canopy of drooping eucalypts, she-oak, paperbark or mistletoe branches. **Low – absence of trees and mistletoe on the subject land reduce the suitability of this habitat for this species. Unlikely to occur.**	Unlikely, Negligible
Polytelis swainsonii	Superb Parrot	V	The Superb Parrot is found throughout eastern inland NSW. On the South-western Slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Birds breeding in this region are mainly absent during winter, when they migrate north to the region of the upper Namoi and Gwydir Rivers. The other main breeding sites are in the Riverina along the corridors of the Murray, Edward and Murrumbidgee Rivers where birds are present all year round. It is estimated that there are less than 5000 breeding pairs left in the wild. Inhabit Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. In the Riverina the birds nest in the hollows of large trees (dead or alive) mainly in tall riparian River Red Gum Forest or Woodland. On the South West Slopes nest trees can be in open Box-Gum Woodland or isolated paddock trees. Species known to be used are Blakely's Red Gum, Yellow Box, Apple Box and Red Box. Nest in small colonies, often with more than one nest in a single tree. Breed between September and January. May forage up to 10 km from nesting sites, primarily in grassy box woodland. Feed in trees and understorey shrubs and on the ground and their diet consists mainly of grass seeds and herbaceous plants. Also eaten are fruits, berries, nectar, buds, flowers, insects and grain. **Low – absence of trees on the subject land reduce the suitability of this habitat for this species. Unlikely to occur.**	Unlikely, Negligible

Threatened species	Common Name	Commonwealth Status	Description and habitat suitability at the site	Potential Impact
Rostratula australis	Australian Painted Snipe	E	The Australian Painted Snipe is restricted to Australia. In NSW many records are from the Murray-Darling Basin including the Paroo wetlands, Lake Cowal, Macquarie Marshes, Fivebough Swamp and more recently, swamps near Balldale and Wanganella. Other important locations with recent records include wetlands on the Hawkesbury River and the Clarence and lower Hunter Valleys. 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. The nest consists of a scrape in the ground, lined with grasses and leaves. Breeding is often in response to local conditions; generally, occurs from September to December. Incubation and care of young is all undertaken by the male only. Forages nocturnally on mud-flats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter. **Low - The inland location and absence of any nearby substantial waterbodies means the subject land is not suitable habitat. Unlikely to occur.**	Unlikely, Negligible
Chalinolobus dwyeri	Large-eared Pied Bat	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. There are scattered records from the New England Tablelands and North West Slopes. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Petrochelidon ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features. Found in well-timbered areas containing gullies. **Moderate - The inland location and absence of any natural cliffs/rocky areas and forest means the subject site is low suitability habitat. The presence of the old mine excavations could be habitat. Low likelihood of occurrence.**	Potential. See EPBC Act test of significance (**Appendix G**)

Threatened species	Common Name	Commonwealth Status	Description and habitat suitability at the site	Potential Impact
Dasyurus maculatus	Spot-tailed Quoll, (south-eastern mainland population)	E	The range of the Spotted-tailed Quoll has contracted considerably since European settlement. It is now found in eastern NSW, eastern Victoria, south-east and north-eastern Queensland, and Tasmania. Only in Tasmania is it still considered relatively common. 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. Females occupy home ranges of 200-500 hectares, while males occupy very large home ranges from 500 to over 4000 hectares. Are known to traverse their home ranges along densely vegetated creek lines. **Low - The subject land is within the species known distribution however, the absence of trees and watercourses on the subject land reduce the suitability of this habitat for this species. Unlikely to occur.**	Unlikely, Negligible
Nyctophilus corbeni	Corben's Long-eared Bat, South-eastern Long-eared Bat	V	Overall, the distribution of the south eastern form coincides approximately with the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for this species. Inhabits a variety of vegetation types, including mallee, Bulloke *Allocasuarina leuhmanni* and box eucalypt dominated communities, but it is 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. **Moderate –There is potential marginal foraging habitat for the species, which can utilize pastures and open woodlands. No records within 10km.**	Potential. See EPBC Act test of significance (**Appendix G**)

Threatened species	Common Name	Commonwealth Status	Description and habitat suitability at the site	Potential Impact
Phascolarctos cinereus	Koala	V	The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. Inhabit eucalypt woodlands and forests. Koalas naturally inhabit a range of temperate, sub-tropical and tropical forest, woodland and semi-arid communities dominated by Eucalyptus species (Martin & Handasyde 1999). Koala habitat can be broadly defined as any forest or woodland containing species that are known koala food trees, or shrubland with emergent food trees. The distribution of this habitat is largely influenced by land elevation, annual temperature and rainfall patterns, soil types and the resultant soil moisture availability and fertility. Preferred food and shelter trees are naturally abundant on fertile clay soils. Along the Great Dividing Range and the coastal belt throughout the species' range, Koalas inhabit moist forests and woodlands mostly dominated by Eucalyptus species. In coastal lowlands in Queensland and NSW, Koalas are also found in vegetation communities dominated by Melaleuca or Casuarina species (TSSC 2012p). On the western slopes, tablelands and plains in Queensland and NSW Koalas are found in sub-humid Eucalyptus-dominated forests and woodlands in riparian and non-riparian environments, and some Acacia-dominated forests and woodlands in non-riparian environments (Melzer et al. 2000). In the dry, subtropical to semi-arid environments in the western parts of the species' range, Koalas inhabit Eucalyptus-dominated forests and woodlands, particularly in the vicinity of riparian environments, and Acacia-dominated forests, woodlands and shrublands (Melzer et al. 2000; NSW DECC 2008; Sullivan et al. 2003a). Koalas are also known to occur in modified or regenerating native vegetation communities, as well as urban and rural landscapes where food trees or shelter trees may be highly scattered. There is a growing body of evidence that identifies the importance of shelter (non-food) trees to koalas. Crowther and colleagues (2013) expand on this and suggest that shelter trees are equally important as food trees and should be weighted as such when assessing habitat suitability. Shelter trees play an essential role in thermoregulation and are likely to be selected based on height, canopy cover and elevation (i.e. trees occurring in gullies are preferable) (Crowther et al. 2013). The difficulty in regards to shelter trees is that, unlike food trees, there is no identified sub-set of forest and woodland trees known to be shelter trees. The use of a particular tree species, or individual trees within a species is highly contextual and variable (Crowther et al. 2013). **Low – absence of trees on the subject land highly limits /negates the suitability of this habitat for this species. Unlikely to occur.**	Unlikely, Negligible

Threatened species	Common Name	Commonwealth Status	Description and habitat suitability at the site	Potential Impact
Cadellia pentastylis	Ooline	V	A medium-sized spreading tree usually about 10 m tall, and rarely to 25 m. Has glossy green leaves and single white flowers that produce a cluster of brown berries in clusters Occurs along the western edge of the North West Slopes from north of Gunnedah to west of Tenterfield. Also occurs in Queensland. General flowering period is October to January. Forms a closed or open canopy mixing with eucalypt and cypress pine species. Typically occurs on low- to medium-nutrient soils of sandy clay or clayey consistencies, with a typical soil profile having a sandy loam surface layer, grading from a light clay to a medium clay with depth. **Absent – Targeted surveys were conducted to determine whether this species occurs within or near the subject land. These surveys did not detect this species.**	No impact.
Dichanthium setosum	Bluegrass	V	Bluegrass occurs on the New England Tablelands, North West Slopes and Plains and the Central Western Slopes of NSW, extending to northern Queensland. It occurs widely on private property, including in the Inverell, Guyra, Armidale and Glen Innes areas. Associated with heavy basaltic black soils and red-brown loams with clay subsoil. Often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture. Often collected from disturbed open grassy woodlands on the northern tablelands, where the habitat has been variously grazed, nutrient-enriched and water-enriched. **Moderate – the subject land is on a basalt hill, with dark brown to red basalt soil. The species was not observed on the site, however the site was not traversed by targeted flora searches. No records of the species exist in the local area, the nearest being south at Warialda. The site is highly degraded and the species occurrence is possible but unlikely.**	Potential. See EPBC Act test of significance (**Appendix G**)
Homopholis belsonii	Belson's Panic	V	Perennial tufted grass to 0.5 m high, with stems sparsely branched and an open panicle with solitary spikelets. Occurs on the northwest slopes and plains of NSW, mostly between Wee Waa, Goondiwindi and Glen Innes. It also occurs in Brigalow forests and temperate sub-humid woodlands in QLD, mainly in the Brigalow Belt South bioregion. Grows in dry woodland (e.g. *Belah* woodland) often on poor soils, although sometimes found in basalt-enriched sites north of Warialda and in alluvial clay soils. Habitat and ecology appear to be poorly known. **Absent – A targeted survey determined that this species does not occur within the impact footprint.**	No impact.

Threatened species	Common Name	Commonwealth Status	Description and habitat suitability at the site	Potential Impact
Lepidium monoplocoides	Winged Pepper-cress	E	Widespread in the semi-arid western plains regions of NSW. Collected from widely scattered localities, with large numbers of historical records but few recent collections. There is a single collection from Broken Hill and only two collections since 1915, the most recent being 1950. Also previously recorded from Bourke, Cobar, Urana, Lake Cargelligo, Balranald, Wanganella and Deniliquin. Recorded more recently from the Hay Plain, south-eastern Riverina, and from near Pooncarie. Occurs on seasonally moist to waterlogged sites, on heavy fertile soils, with a mean annual rainfall of around 300-500 mm. Predominant vegetation is usually an open woodland dominated by *Allocasuarina luehmannii* (Bulloak) and/or eucalypts, particularly *Eucalyptus largiflorens* (Black Box) or *Eucalyptus populnea* (Poplar Box). The field layer of the surrounding woodland is dominated by tussock grasses. Recorded in a wetland-grassland community comprising *Eragrostis australasicus, Agrostis avenacea, Austrodanthonia duttoniana, Homopholis proluta, Myriophyllum crispatum, Utricularia dichotoma* and *Pycnosorus globosus*, on waterlogged grey-brown clay. Also recorded from a Maireana pyramidata shrubland. **Low – The species is not associated with any PCT recorded at the site. The subject land is not within the known range of the species nor associated with habitat at the site.**	Unlikely, Negligible
Tylophora linearis		E	Majority of linearis records occur in the central western region. Records from Goonoo, Pillaga West, Pillaga East, Bibblewindi, Cumbil and Eura State Forests, Coolbaggie NR, Goobang NP and Beni SCA. Also has been recorded Hiawatha State Forest near West Wyalong in the south and there are old records as far north as Crow Mountain near Barraba and near Glenmorgan in the western Darling Downs. Grows in dry scrub and open forest. Recorded from low-altitude sedimentary flats in dry woodlands of Eucalyptus fibrosa, Eucalyptus sideroxylon, Eucalyptus albens, Callitris endlicheri, Callitris glaucophylla and Allocasuarina luehmannii. Also grows in association with Acacia hakeoides, Acacia lineata, Melaleuca uncinata, Myoporum species and Casuarina species. **Low – The subject land is not associated with any PCT recorded at the site. The site is not within the known range of the species nor associated with habitat at the site.**	Unlikely, Negligible

Threatened species	Common Name	Commonwealth Status	Description and habitat suitability at the site	Potential Impact
Anomalopus mackayi	Five-clawed Worm-skink	V	The Five-clawed Worm-skink is found in the North West Slopes and Plains of north-east NSW and south-east Queensland, from the Ashford area west to Mungindi and Walgett in NSW and north to Dalby in Queensland. Occurs close to or on the lower slopes of slight rises in grassy White Box woodland on moist black soils, and River Red Gum-Coolibah-Bimble Box woodland on deep cracking loose clay soils. May also occur in grassland areas and open paddocks with scattered trees. **Moderate – the subject land is on a basalt hill, with dark brown to red basalt soil. The subject land is within the known distribution for the species. No records of the species exist within 10 km.**	Potential. See EPBC Act test of significance (**Appendix G**).
Apus pacificus	Fork-tailed Swift	Migratory	The Fork-tailed Swift is a non-breeding visitor to all states and territories of Australia. In NSW, the Fork-tailed Swift is recorded in all regions. Many records occur east of the Great Divide, however, a few populations have been found west of the Great Divide. These are widespread but scattered further west of the line joining Bourke and Dareton. Sightings have been recorded at Milparinka, the Bulloo River and Thurloo Downs. The Fork-tailed Swift is almost exclusively aerial, flying from less then 1 m to at least 300 m above ground and probably much higher. **Low – the species is almost exclusively aerial and does not breed in Australia.**	Unlikely, Negligible

Threatened species	Common Name	Commonwealth Status	Description and habitat suitability at the site	Potential Impact
Arenaria interpres	Ruddy Turnstone	Migratory	The Ruddy Turnstone is widespread within Australia during its non-breeding period of the year (Bamford et al. 2008), including from Tasmania in the south to Darwin in the north and many coastal areas in between. It is found in most coastal regions, with occasional records of inland populations (Higgins & Davies 1996). It strongly prefers rocky shores or beaches where there are large deposits of rotting seaweed (C.D.T. Minton 2002, pers. comm.). In Australasia, the Ruddy Turnstone is mainly found on coastal regions with exposed rock coast lines or coral reefs. It also lives near platforms and shelves, often with shallow tidal pools and rocky, shingle or gravel beaches. It can, however, be found on sand, coral or shell beaches, shoals, cays and dry ridges of sand or coral. It has occasionally been sighted in estuaries, harbours, bays and coastal lagoons, among low saltmarsh or on exposed beds of seagrass, around sewage ponds and on mudflats. Surveys demonstrate that the Ruddy Turnstone can live away from coastal areas in habitats such river beds, and on inland lakes and adjacent farmland (Higgins & Davies 1996). **Low – the species is associated with coastal habitat, however is occasionally found occupying inland wetlands. No such wetlands exist within the subject land.**	Unlikely, Negligible
Myiagra cyanoleuca	Satin Flycatcher	Migratory	The Satin Flycatcher is widespread in eastern Australia and vagrant to New Zealand (Blakers et al. 1984; Coates 1990a). In Queensland, it is widespread but scattered in the east, being recorded on passage on a few islands in the western Torres Strait. It is patchily recorded on Cape York Peninsula, from the Cape south to a line between Aurukun and Coen. The species is more widespread farther south, though still scattered, from Musgrave Station south to c. 24° S, mostly in coastal areas, but also on the Great Divide, and occasionally further west (Blakers et al. 1984). Satin Flycatchers are widespread in south-eastern Queensland, in the area from Fraser Island, west to Goombi and south to the NSW border. Satin Flycatchers inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests. **Moderate – The species is not associated with any PCT recorded at the site, records of this species exist within 10km of the subject site. The species is associated with habitat at the site.**	Potential. See EPBC Act test of significance (**Appendix G**).

Threatened species	Common Name	Commonwealth Status	Description and habitat suitability at the site	Potential Impact
Actitis hypoleucos	Common Sandpiper	Migratory	The Common Sandpiper mainly breeds in parts of Europe and Asia, and occasionally Africa. The population which migrates to Australia breeds in Russia, therefore only potential foraging habitat occurs within Australia. The Common Sandpiper has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. The species is often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags. Roost sites are typically on rocks or in roots or branches of vegetation, especially mangroves. The species is known to perch on posts, jetties, moored boats and other artificial structures, and to sometimes rest on mud or 'loaf' on rocks. **Low – the species is associated with coastal habitat, however is occasionally found occupying inland wetlands. No such wetlands exist within the subject land.**	Unlikely, Negligible

Threatened species	Common Name	Commonwealth Status	Description and habitat suitability at the site	Potential Impact
Calidris acuminata	Sharp-tailed Sandpiper	Migratory	The Sharp-tailed Sandpiper is a summer migrant from Arctic Siberia, being found on wetlands throughout Australia. It is also found in Indonesia, Papua New Guinea, the Solomon Islands, New Caledonia and New Zealand. It is a vagrant to India, Europe, western North America, Fiji and other parts of the central Pacific region. The species predominant threats are global habitat loss, reduction of water quality, disturbance, climate change and hunting practises. Within Australia the species is impacted by habitat loss and degradation. The Sharp-tailed Sandpiper spends the non-breeding season in Australia with small numbers occurring regularly in New Zealand. Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. Many inland records are of birds on passage, taking advantage of Australia's boom-and-bust ecology (BirdLife Australia). The Sharp-tailed Sandpiper prefers the grassy edges of shallow inland freshwater wetlands. It is also found around sewage farms, flooded fields, mudflats, mangroves, rocky shores and beaches. They forage at the edge of the water of wetlands or intertidal mudflats, either on bare wet mud or sand, or in shallow water. They also forage among inundated vegetation of saltmarsh, grass or sedges. They forage in sewage ponds, and often in hypersaline environments. After rain, they may forage in paddocks of short grass, well away from water. **Low – the species is associated with coastal habitat, however is occasionally found occupying inland wetlands and flooded fields. The Barren Box Swamp is listed as predicted habitat for the species, 12km from subject land. The subject land does not have suitable aquatic habitat.**	Unlikely, Negligible

Threatened species	Common Name	Commonwealth Status	Description and habitat suitability at the site	Potential Impact
Calidris ferruginea	Curlew Sandpiper	CE Migratory	The Curlew Sandpiper is distributed around most of the Australian coastline (including Tasmania). It 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. The Curlew Sandpiper breeds in Siberia and migrates to Australia (as well as Africa and Asia) for the non-breeding period, arriving in Australia between August and November, and departing between March and mid-April. Generally, the species occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes inland. **Low – The subject land does not contain any bodies of water and is outside predicted range. The Barren Box Swamp, partially within the 10km search area is within the species predicted range, however there are no records there.**	Unlikely, Negligible
Calidris melanotos	Pectoral Sandpiper	Migratory	The Pectoral Sandpiper breeds in northern Russia and North America. Within Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. In New South Wales (NSW), the Pectoral Sandpiper is widespread, but scattered. Records exist east of the Great Divide, from Casino and Ballina, south to Ulladulla. West of the Great Divide, the species is widespread in the Riverina and Lower Western regions. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. The species has also been recorded in swamp overgrown with lignum. They forage in shallow water or soft mud at the edge of wetlands. **Low – the species is associated with coastal habitat, however is occasionally found occupying inland wetlands. No records within 10 km. No such wetlands exist within the subject land.**	Unlikely, Negligible

Threatened species	Common Name	Commonwealth Status	Description and habitat suitability at the site	Potential Impact
Calidris tenuirostris	Great Knot	CE Migratory	In Australasia, the species typically prefers sheltered coastal habitats, with large intertidal mudflats or sandflats. This includes inlets, bays, harbours, estuaries and lagoons. They are occasionally found on exposed reefs or rock platforms, shorelines with mangrove vegetation, ponds in saltworks, at swamps near the coast, saltlakes and non-tidal lagoons. The Great Knot rarely occurs on inland lakes and swamps (Higgins & Davies 1996). Typically, the Great Knot roosts in large groups in open areas, often at the waters edge or in shallow water close to feeding grounds (Higgins & Davies 1996; Rogers 2001). It is known that in hot conditions, waders prefer to roost where a damp substrate lowers the local temperature (Rogers 1999b). A group of approximately 8610 birds have been recorded roosting at an inland claypan near Roebuck Bay in north-west Western Australia (Collins et al. 2001). **Low – The subject land does not contain any bodies of water and is outside predicted range. The Barren Box Swamp, partially within the 10km search area is within the species predicted range, however there are no records there.**	Unlikely, Negligible
Gallinago hardwickii	Latham's Snipe, Japanese Snipe	Migratory	Latham's Snipe breed in Japan and far eastern Russia during the northern hemisphere summer. They migrate south after the breeding season, travelling across Papua New Guinea to winter in eastern Australia. They're range extends throughout Queensland and west of the Great Dividing Range in NSW and Tasmania. Within Australia, Latham's Snipe occurs in permanent and ephemeral wetlands up to 2000 m above sea-level. They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies). However, they can also occur in habitats with saline or brackish water, in modified or artificial habitats, and in habitats located close to humans or human activity. Latham's Snipe does not breed within Australian jurisdiction. The breeding range is confined to Japan and far eastern Russia. **Low – the species is associated with coastal habitat, however is occasionally found occupying inland wetlands and disturbed areas.**	Unlikely, Negligible

Threatened species	Common Name	Commonwealth Status	Description and habitat suitability at the site	Potential Impact
Limosa lapponica baueri	Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit	Migratory	The bar-tailed godwit has been recorded in the coastal areas of all Australian states. It is widespread in the Torres Strait and along the east and south-east coasts of Queensland, NSW and Victoria. In Tasmania, the bar-tailed godwit has mostly been recorded on the south-east coast. In South Australia it has mostly been recorded around coasts from Lake Alexandrina to Denial Bay. In Western Australia it is widespread around the coast, from Eyre to Derby. Populations have also been recorded in the northern Australia, from Darwin east to the Gulf of Carpentaria. The bar-tailed godwit is a regular migrant to Christmas Island, Norfolk Island, Lord Howe Island. It has also been recorded on subantarctic islands such as Macquarie Island, Snares Islands, Auckland Islands and Campbell Islands (Higgins & Davies 1996). During the non-breeding period, the distribution of bar-tailed godwit (western Alaskan) is predominately New Zealand, northern and eastern Australia (Bamford et al. 2008). In Australia, *L. l. baueri* mainly occur along the north and east coasts (Garnett et al. 2011). **Low – The subject land does not contain any bodies of water and is outside predicted range. The Barren Box Swamp, partially within the 10km search area is within the species predicted range, however there are no records there.**	Unlikely, Negligible
Numenius madagascariensis	Eastern Curlew, Far Eastern Curlew	Migratory	Within Australia, the Eastern Curlew has a primarily coastal distribution. The species is found in all states, particularly the north, east, and south-east regions including Tasmania. Eastern Curlews are rarely recorded inland. In NSW the species occurs across the entire coast but is mainly found in estuaries such as the Hunter River, Port Stephens, Clarence River, Richmond River and ICOLLs of the south coast. The Eastern Curlew breeds in Russia and north-eastern China but its distribution is poorly known. During the non-breeding season a few birds occur in southern Korea and China, but most spend the non-breeding season in north, east and south-east Australia. The birds may delay breeding until three to four years of age. Within Australia, immature birds, which do not migrate, move northward in winter. **Low - The subject land is outside of the species known range. There are no records within 10 km of the subject land. The species is not associated with the PCTs present.**	Unlikely, Negligible

Threatened species	Common Name	Commonwealth Status	Description and habitat suitability at the site	Potential Impact
Pandion haliaetus	Osprey	CE Migratory	The breeding range of the Eastern Osprey extends around the northern coast of Australia (including many offshore islands) from Albany in Western Australia to Lake Macquarie in NSW; with a second isolated breeding population on the coast of South Australia, extending from Head of Bight east to Cape Spencer and Kangaroo Island (Abbott 1982; Barrett et al. 2003; Bischoff 2001; Blakers et al. 1984; Clancy 1991; Condon 1969; Dennis 2007a; Johnstone & Storr 1998; Marchant & Higgins 1993). The total range (breeding plus non-breeding) around the northern coast is more widespread, extending from Esperance in Western Australia to NSW, where records become scarcer towards the south, and into Victoria and Tasmania, where the species is a rare vagrant (Barrett et al. 2003; Blakers et al. 1984; Johnstone & Storr 1998; Marchant & Higgins 1993; Morris et al. 1981). The distribution of the species around the northern coast (south-western Western Australia to south-eastern NSW) appears continuous except for a possible gap at Eighty Mile Beach (Barrett et al. 2003; Blakers et al. 1984). There are no published estimates of the extent of occurrence of the Eastern Osprey within Australia. The area of occupancy of the Eastern Osprey in Australia is estimated at 117 400 km². The range of the species has contracted in south-eastern Australia since settlement (Olsen 1995; White 1985). There is a single historical breeding report from Saint Georges Basin in NSW (North 1912). Historical reports suggest that Eastern Ospreys were probably once uncommon in Tasmania from Bass Strait south to Recherche Bay (Gould 1865; Hall 1924; Le Souëf 1902; Littler 1910a; North 1912); and in South Australia, pairs formerly bred along the eastern coast of Spencer Gulf and along the lower Murray River (Dennis 2007a). **Low – The species is commonly associated with inland waterways and has a large and widespread population around the inland waterways. The subject land is not close to any rivers.**	Unlikely , Negligible
Tringa nebularia	Common Greenshank	Migratory	The Common Greenshank does not breed in Australia, however, the species occurs in all types of wetlands and has the widest distribution of any shorebird in Australia (Higgins & Davies 1996). The species has been recorded in most coastal regions. It is widespread west of the Great Dividing Range, especially between the Lachlan and Murray Rivers and the Darling River drainage basin, including the Macquarie Marshes, and north-west regions (Higgins & Davies 1996). **Low –The species is commonly associated with inland waterways and has a large and widespread population. The subject land does not contain any bodies of water. Record 23 km to the south-east.**	Unlikely , Negligible

Threatened species	Common Name	Commonwealth Status	Description and habitat suitability at the site	Potential Impact
Tringa stagnatilis	Marsh Sandpiper	Migratory	It is recorded in all regions of NSW but especially the central and south coasts and (inland) on the western slopes of Great Divide and western plains. In Victoria, most are found in Port Phillip Bay, but also Gippsland, Westernport Bay and the Western Districts. Inland records exist for Murray Valley, round Barmah, Kerang-Swan Hill and Mildura; also some from around Shepparton, west to Rupanyup and Hindmarsh and Albacutya Lakes. The species is a vagrant to Tasmania. In South Australia, most records are east of 137° E. Occasionally the species has been recorded in the south-east, mostly from The Coorong to Yorke Peninsula, including inland along Murray Valley. **Low – The species is commonly associated with inland waterways and has a large and widespread population around the inland waterways. . The subject land does not contain any bodies of water.**	Unlikely , Negligible
Motacilla flava	Yellow Wagtail		Minimal ecological information is available regarding the species. The species utilises continental Europe and Asia as residence and breeding and is a non-breeding visitor to Africa, using parts of northern Africa as passage between these areas. It is considered migratory to Australia with minimal information available as to its use of the continent. **Low – Little is known about this species; however it does not breed in Australia and is only known from coastal habitat, therefore is unlikely to occur on the subject land.**	Unlikely , Negligible

Appendix G: EPBC Act Test of significance

EPBC Act-listed Vulnerable Entities

Bluegrass (*Dichanthium setosum*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of an important population of a species	**No.** As the species was not detected during the field survey, and as no prior records of the species with the subject land are known, it is unlikely that any important population occurs within the subject site. Consequently, the loss of up to 2.03 ha of highly modified potential habitat for this species is unlikely to impact an important population.
Reduce the area of occupancy of an important population	**No.** It is unlikely that an important population is present within the subject land. For this reason, the loss of up to 2.03 ha of potential habitat for this species is unlikely to reduce the area of occupancy of an important population.
Fragment an existing important population into two or more populations	**No.** It is unlikely that an important population occurs within the subject land. Any fragmentation that results from this proposal will therefore not impact an important population.
Adversely affect habitat critical to the survival of a species	**No.** The subject land is unlikely to constitute critical habitat for this species as the species is not known from the site.
Disrupt the breeding cycle of an important population	**No.** It is unlikely that an important population occurs within the subject land. Impacts on the breeding cycle of any local occurrence of this species would not impact an important population.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**No.** As the species is not known from the subject land, it is unlikely that the loss of potential habitat will significantly impact it such that it is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	**Potential.** Construction activities can introduce biosecurity threats. Mitigation measures to prevent this are given in **Section 5**.

Bluegrass (*Dichanthium setosum*)	
Introduce disease that may cause the species to decline	**Potential.** Construction activities can introduce biosecurity threats. Mitigation measures to prevent this are given in **Section 5**.
Interfere with the recovery of the species.	**No.** As there is no known population within the subject land, the proposal is unlikely to interfere with the recovery of the species.
Conclusion	**No significant impact.** This assumes that mitigation measures are followed.

Large-eared Pied Bat (*Chalinolobus dwyeri*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of an important population of a species	**No.** The subject land has not been identified as containing an important population of this species. The subject land is not close to the edge of the species' range. The species prefers wooded areas and the subject land has been historically cleared. As only 2.03 ha of modified habitat will be impacted, it is unlikely that this proposal will lead to a long-term decrease in the size of any important population, should one be present.
Reduce the area of occupancy of an important population	**No.** The subject land has not been identified as containing an important population of this species. The species prefers woodland and the subject land has been historically cleared. As only 2.03 ha of modified habitat will be impacted, it is unlikely that this proposal will lead to a long-term decrease in the size of any important population, should one be present.
Fragment an existing important population into two or more populations	**No.** The subject land has not been identified as containing an important population of this species. This species prefers woodland, and the subject land has been historically cleared. The subject land is not part of a large patch of native vegetation, as such, the proposal should not result in fragmentation of any important population, should one be present.
Adversely affect habitat critical to the survival of a species	**No.** The subject land has not been identified as containing an important population of this species. This species prefers woodland, and the subject land has been historically cleared. The subject site is unlikely to constitute critical habitat for this species.
Disrupt the breeding cycle of an important population	**No.** The subject land has not been identified as containing an important population of this species. This species prefers woodland, and the subject land has been historically cleared. Impacts to the breeding cycle of this species are likely to be minor or non-existent as the species would likely not be breeding in the rock quarry.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**No.** Owing to the small area of impact, the absence of trees and limited native vegetation in the subject site, the proposal is unlikely to cause this species to decline.

Large-eared Pied Bat (*Chalinolobus dwyeri*)	
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	**Potential.** Construction activities can introduce or encourage the establishment of invasive species. Mitigation measures to prevent this are given in **Section 5**.
Introduce disease that may cause the species to decline	**Potential.** Construction activities can introduce biosecurity threats. Mitigation measures to prevent this are given in **Section 5**.
Interfere with the recovery of the species.	**No.** As there is no known important population within the subject land, and the impact area is only a small area of modified habitat, the proposal is unlikely to interfere with the recovery of the species.
Conclusion	**No significant impact.** This assumes that mitigation measures are followed.

Corben's Long-eared Bat (*Nyctophilus corbeni*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of an important population of a species	**No.** The subject land has not been identified as containing an important population of this species. Whilst the subject land is within the eastern edge of the species' range, it is not at the range limit. This species occurs sparsely in mallee, Bulloke, box and Brigalow/Belah communities but is more common in box/ironbark/cypress pine woodland. The subject land has been historically cleared. As only 2.03 ha of modified habitat will be impacted, it is unlikely that this proposal will lead to a long-term decrease in the size of any important population, should one be present.
Reduce the area of occupancy of an important population	**No.** The subject land has not been identified as containing an important population of this species. The species prefers woodland and the subject land has been historically cleared. As only 2.03 ha of modified habitat will be impacted, it is unlikely that this proposal will lead to a long-term decrease in the size of any important population, should one be present.
Fragment an existing important population into two or more populations	**No.** The subject land has not been identified as containing an important population of this species. This species prefers woodland, and the subject land has been historically cleared. The subject land is not part of a large patch of native vegetation, as such, the proposal should not result in fragmentation of any important population, should one be present.
Adversely affect habitat critical to the survival of a species	**No.** The subject land has not been identified as containing an important population of this species. This species prefers woodland, and the subject land has been historically cleared. The subject site is unlikely to constitute critical habitat for this species.
Disrupt the breeding cycle of an important population	**No.** The subject land has not been identified as containing an important population of this species. This species prefers woodland, and the subject land has been historically cleared. Impacts to the breeding cycle of this species are likely to be minor or non-existent as the species would not be breeding in the rock quarry. Nearby dead trees may be utilized as maternity roosts but the species has been reported to use roosts for a single night and move on, so the proposal should not impact on breeding.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**No.** Owing to the small area of impact, the absence of trees and limited native vegetation in the subject site, the proposal is unlikely to cause this species to decline.

Corben's Long-eared Bat (*Nyctophilus corbeni*)	
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	**Potential.** Construction activities can introduce or encourage the establishment of invasive species. Mitigation measures to prevent this are given in **Section 5**.
Introduce disease that may cause the species to decline	**Potential.** Construction activities can introduce biosecurity threats. Mitigation measures to prevent this are given in **Section 5**.
Interfere with the recovery of the species.	**No.** As there is no known important population within the subject land, and the impact area is only a small area of modified habitat, the proposal is unlikely to interfere with the recovery of the species.
Conclusion	**No significant impact.** This assumes that mitigation measures are followed.

Five-clawed Worm-skink (*Anomalopus mackayi*)	
Significant Impact Guideline	**Assessment**
Lead to a long-term decrease in the size of an important population of a species	**No.** The subject land has not been identified as containing an important population of this species. Whilst the subject land is close to the south-eastern most distribution of the species' range, it is not at the range limit. This species prefers woodland but also occurs in cropped lands on black soil. The subject land has been historically cleared and the majority of this proposal will focus on extracting rock, rather than disturbing black soil. As only 2.03 ha of modified habitat will be impacted, it is unlikely that this proposal will lead to a long-term decrease in the size of any important population, should one be present.
Reduce the area of occupancy of an important population	**No.** The subject land has not been identified as containing an important population of this species. This species prefers woodland, and the subject land has been historically cleared. As only 2.03 ha of modified habitat will be impacted, it is unlikely that this proposal will lead to a long-term decrease in the size of any important population, should one be present.
Fragment an existing important population into two or more populations	**No.** The subject land has not been identified as containing an important population of this species. This species prefers woodland, and the subject land has been historically cleared. The subject land is not part of a large patch of native vegetation, as such, the proposal should not result in fragmentation of any important population, should one be present.
Adversely affect habitat critical to the survival of a species	**No.** The subject land has not been identified as containing an important population of this species. This species prefers woodland, and the subject land has been historically cleared. The subject site is unlikely to constitute critical habitat for this species.
Disrupt the breeding cycle of an important population	**No.** The subject land has not been identified as containing an important population of this species. This species prefers woodland, and the subject land has been historically cleared. Impacts to the breeding cycle of this species are likely to be minor as the burrowing species would not be breeding in the rock quarry.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**No.** Owing to the small area of impact, and the rocky substrate, the proposal is unlikely to cause this species to decline.

Five-clawed Worm-skink (*Anomalopus mackayi*)	
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	**Potential.** Construction activities can introduce or encourage the establishment of invasive species. Mitigation measures to prevent this are given in **Section 5**.
Introduce disease that may cause the species to decline	**Potential.** Although there are no specific diseases of concern known for this species, construction activities can introduce biosecurity threats. Mitigation measures to prevent this are given in **Section 5**.
Interfere with the recovery of the species.	**No.** As there is no known important population within the subject land, and the impact area is only a small area of modified habitat, the proposal is unlikely to interfere with the recovery of the species.
Conclusion	**No significant impact.** This assumes that mitigation measures are followed.

EPBC Act-listed Migratory Species

Satin Flycatcher (*Myiagra cyanoleuca*)	
Significant Impact Guideline	**Assessment**
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	**No.** The subject land is unlikely to constitute important habitat for this migratory species. As the species is widely distributed, and the subject land is heavily modified, no significant impact of the proposal on this species is anticipated.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	**No.** It is unlikely that an area of important habitat occurs within the subject land. Construction activities can introduce invasive species. Mitigation measures to prevent this are given in **Section 5**.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	**No.** It is unlikely that an ecologically significant proportion of the population of this species occurs within the subject land. As the species is widely distributed, and the subject land is small and heavily modified, it is unlikely that the subject land is important for breeding, feeding, migrating, or resting. No significant impact of the proposal on this species is anticipated.
Conclusion	**No significant impact.**

Appendix H: Terms and abbreviations

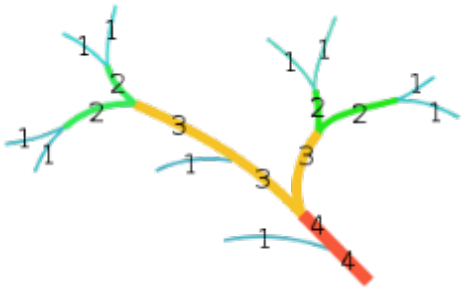
Terms and abbreviations used in this report

Abbreviation	Terminology	Description
BC Act	Biodiversity Conservation Act 2016 (NSW)	The purpose of this Act is to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development. This Act contains schedules relating to the listing of threatened species, populations and communities in NSW. It also outlines the framework regulating development impact assessments in relation to biodiversity.
	Biosecurity Act 2015 (NSW)	The broad objectives for biosecurity in NSW are to manage biosecurity risks from animal and plant pests and diseases, weeds and contaminants by • Preventing their entry into NSW • Quickly finding, containing and eradicating any new entries • Effectively minimising the impacts of those pests, diseases, weeds and contaminants that cannot be eradicated through robust management arrangements. The *Biosecurity Act 2015* provides a statutory framework to help achieve these objectives.
CAMBA	China-Australia Migratory Bird Agreement	A bilateral migratory bird agreement with China entered into in 1986. It provides an important mechanism for pursuing conservation outcomes for migratory birds, including migratory waterbirds.
	Cumulative impacts	Impacts, when considered together, lead to a stronger impact than any impact in isolation.
	Direct impacts	Directly affect the habitat and individuals. They include, but are not limited to, death through predation, trampling, poisoning of the animal/plant itself and the removal of suitable habitat. When applying each factor, consideration must be given to all of the likely direct impacts of the proposed activity or development.
DoEE	Australian Government Department of Environment and Energy	The Department of the Environment designs and implements the Australian Government's policies and programmes to protect and conserve the environment, water and heritage and promote climate action.
DP	Deposited Plan	A plan of land deposited in Land and Property Information (part of the Land Management Authority) and used for legal identification purposes. They most commonly depict a subdivision of a parcel of land.
EEC	Endangered Ecological Community	An ecological community identified by relevant legislation likely to become extinct or is in immediate danger of extinction.
EP&A Act	Environmental Planning and Assessment Act 1979 (NSW).	Provides the legislative framework for land use planning and development assessment in NSW.
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999	Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.

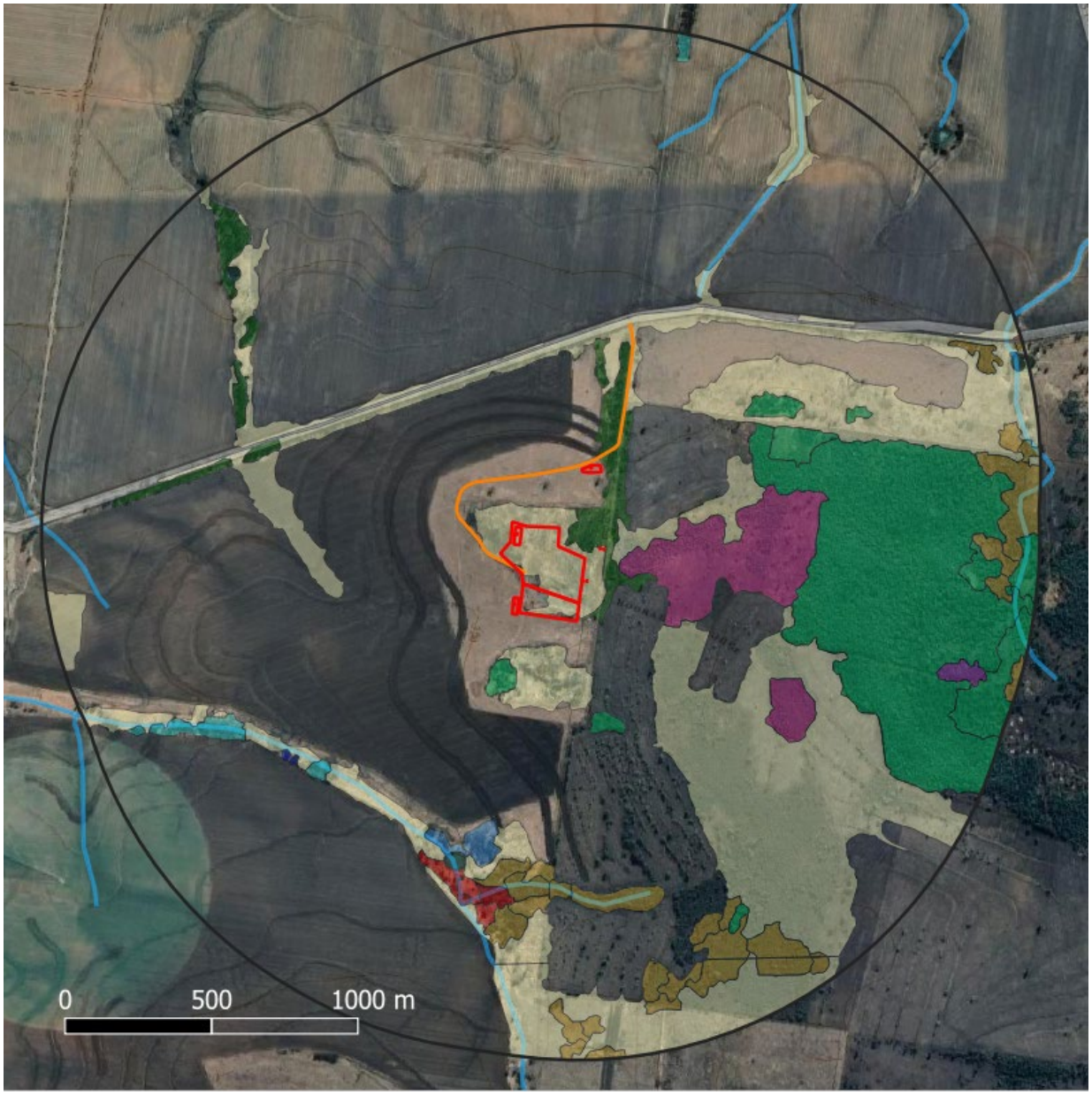
	(Commonwealth).	
FM Act	Fisheries Management Act 1994 (NSW)	The objects of this Act are to conserve, develop and share the fishery resources of the State for the benefit of present and future generations. This Act protects aquatic habitats and species which are not protected under the BC Act.
IBRA	Interim Biogeographic Regionalisation of Australia	The Interim Biogeographic Regionalisation for Australia (IBRA) is a biogeographic regionalisation of Australia developed by the Australian Government's Department of the Environment. Each region is a land area made up of a group of interacting ecosystems repeated in similar form across the landscape.
	Indirect impacts	Occur when project-related activities affect species, populations or ecological communities in a manner other than direct loss. Indirect impacts can include loss of individuals through starvation, exposure, predation by domestic and/or feral animals, loss of breeding opportunities, loss of shade/shelter, deleterious hydrological changes, increased soil salinity, erosion, inhibition of nitrogen fixation, weed invasion, fertiliser drift, or increased human activity within or directly adjacent to sensitive habitat areas. As with direct impacts, consideration must be given, when applying each factor, to all of the likely indirect impacts of the proposed activity or development.
JAMBA	Japan-Australia Migratory Bird Agreement	A bilateral migratory bird agreement with Japan entered into in 1974. It provides an important mechanism for pursuing conservation outcomes for migratory birds, including migratory waterbirds.
KTP	Key Threatening Process	A key threatening process is defined as a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities. A requirement of their listing on the TSC Act is that the process adversely affects two or more threatened species, populations or ecological communities, or may cause species, populations or ecological communities not threatened to become threatened.
	Local population (species)	A local population of a threatened plant species comprises those individuals occurring in a defined area or a cluster of individuals extend into habitat adjoining and contiguous with the study area where the individuals could reasonably be expected to cross-pollinate. A local population of fauna species comprises those individuals known or likely to occur in in a defined area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area. The local population of migratory or nomadic fauna species comprises those individuals likely to occur in the study area from time to time.
	Local occurrence (EEC)	The ecological community present within the study area. However, the local occurrence may include adjacent areas if the ecological community on the study area forms part of a larger contiguous area of the ecological community and the movement of individuals and exchange of genetic material across the boundary of the study area can be clearly demonstrated.

	Low condition (vegetation)	Vegetation in low condition means: a) woody native vegetation with native over-storey percent foliage cover less than 50% of the lower value of the over-storey percent foliage cover benchmark for that vegetation type, and where either: – less than 50% of ground cover vegetation is indigenous species, or – greater than 90% of ground cover vegetation is cleared OR b) native grassland, wetland or herbfield where either: – less than 50% of ground cover vegetation is indigenous species, or – more than 90% of ground cover vegetation is cleared If native vegetation is not in low condition, it is in moderate to good condition. The percentages for the ground cover calculations must be made in a season when the proportion of native ground cover vegetation compared to non-native ground cover vegetation in the area is likely to be at its maximum. NOTE: Clearing the habitat of threatened species, populations or communities for the purposes of reducing its condition prior to assessment under the methodology may be a breach of environmental legislation, including sections 118A and 118D of the *National Parks and Wildlife Act 1974* (NPW Act), the *Native Vegetation Act 2003* (NV Act) and/or the *Environmental Planning and Assessment Act 1979* (EP&A Act).
MNES	Matters of national environmental significance	Refers to the seven matters of national environmental significance outlined under the EPBC Act.
NPW Act	National Parks and Wildlife Act 1974 (NSW)	The objects of this Act are as follows: • The conservation of nature, including, but not limited to, the conservation of: • habitat, ecosystems and ecosystem processes, and • biological diversity at the community, species and genetic levels, and • landforms of significance, including geological features and processes, and • landscapes and natural features of significance including wilderness and wild rivers, The conservation of objects, places or features (including biological diversity) of cultural value within the landscape, including, but not limited to: • places, objects and features of significance to Aboriginal people, and • places of social value to the people of New South Wales, and • places of historic, architectural or scientific significance, • Fostering public appreciation, understanding and enjoyment of nature and cultural heritage and their conservation, • Providing for the management of land reserved under this Act in accordance with the management principles applicable for each type of reservation. The objects of this Act are to be achieved by applying the principles of ecologically sustainable development.
OEH	Office of Environment and Heritage	The Office of Environment and Heritage (OEH) is a separate agency within the Planning and Environment cluster. OEH was formed on 4 April 2011 and works to protect and conserve the NSW environment, including the natural environment, Aboriginal country, culture and heritage and our built heritage, and manages NSW national parks and reserves.
PoEO Act	Protection of the Environment Operations Act 1997	The objects of this Act are as follows: • to protect, restore and enhance the quality of the environment in New South Wales, having regard to the need to maintain ecologically sustainable development, • to provide increased opportunities for public involvement and participation in environment protection, • to ensure the community has access to relevant and meaningful information about pollution,

		• to reduce risks to human health and prevent the degradation of the environment by the use of mechanisms promoting: • pollution prevention and cleaner production, • the reduction to harmless levels of the discharge of substances likely to cause harm to the environment, • the elimination of harmful wastes, • the reduction in the use of materials and the re-use, recovery or recycling of materials, • the making of progressive environmental improvements, including the reduction of pollution at source, • the monitoring and reporting of environmental quality on a regular basis, • to rationalise, simplify and strengthen the regulatory framework for environment protection, • to improve the efficiency of administration of the environment protection legislation, • to assist in the achievement of the objectives of the *Waste Avoidance and Resource Recovery Act 2001*.
RAMSAR	Convention on Wetlands of International Importance	The Ramsar Convention's broad aims are to halt the worldwide loss of wetlands and to conserve, through wise use and management, those remaining. This requires international cooperation, policy making, capacity building and technology transfer.
	Risk of extinction	The likelihood that the local population will become extinct either in the short-term or in the long-term as a result of direct or indirect impacts on the viability of that population.
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement	A bilateral migratory bird agreement with the Republic of Korea entered into in 2007. It provides an important mechanism for pursuing conservation outcomes for migratory birds, including migratory waterbirds.
RF Act	Rural Fires Act 1997	The objects of this Act are to provide: • for the prevention, mitigation and suppression of bush and other fires in local government areas (or parts of areas) and other parts of the State constituted as rural fire districts, and • for the co-ordination of bush firefighting and bush fire prevention throughout the State, and • for the protection of persons from injury or death, and property from damage, arising from fires, and • for the protection of infrastructure and environmental, economic, cultural, agricultural and community assets from damage arising from fires, and • for the protection of the environment by requiring certain activities referred to in paragraphs (a)-(c1) to be carried out having regard to the principles of ecologically sustainable development described in section 6 (2) of the *Protection of the Environment Administration Act 1991*.
SEPP 44	State Environmental Planning Policy No.44 – Koala Habitat	This Policy aims to encourage the proper conservation and management of areas of natural vegetation with habitat for koalas to ensure a permanent free-living population over their present range and reverse the current trend of koala population decline: • by requiring the preparation of plans of management before development consent can be granted in relation to areas of core koala habitat, and • by encouraging the identification of areas of core koala habitat, and • by encouraging the inclusion of areas of core koala habitat in environment protection zones.
Significant impact		A 'significant impact' is an impact which is important, notable, or of consequence, having regard to its context or intensity.
SIS	Species Impact Statement	A document included with an Environmental Impact Statement which details a full description of the action proposed, including its nature, extent, location, timing and layout and, to the fullest extent reasonably practicable, the information referred to in this section. The requirements as to the contents of an SIS for different categories of protected species are given in section 110 of the TSC

	Act.
Strahler stream order	Strahler stream order and are used to define stream size based on a hierarchy of tributaries. 

Appendix I: State Vegetation Type Map: Border Rivers Gwydir / Namoi Regional Native Vegetation Mapping



BRG_NamoiSVM_clipto1500m

- Belah - Wilga +/- White Box dry viney scrub woodland the NSW Brigalow Belt South Bioregion
- Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions
- Brigalow - Belah open forest / woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion
- Candidate Native Grasslands
- Carbeen - White Box +/- Silver-leaved Ironbark grassy tall woodland on basalt hills, Brigalow Belt South Bioregion
- Mock Olive - Wilga - Peach Bush - Carissa semi-evergreen vine thicket (dry rainforest) mainly on basalt soils in the Brigalow Belt South Bioregion
- Not Native
- Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion
- Western Rosewood - Wilga - Wild Orange - Belah low woodland of the Brigalow Belt South Bioregion and eastern Darling Riverine Plains Bioregion
- White Box - cypress pine - Silver-leaved Ironbark shrub grass open forest / woodland of the northern Brigalow Belt South Bioregion and Nandewar Bioregion
- White Cypress Pine - Silver-leaved Ironbark - Wilga shrub grass woodland of the Narrabri-Yetman region, Brigalow Belt South Bioregion

Appendix J: EPBC Act referral guidelines for Koala

Site assessment as per Table 4 from the EPBC Act referral guidelines for the vulnerable Koala

Table 4: Koala habitat assessment tool

Attribute	Score	Inland	Coastal
Koala occurrence	+2 (high)	Evidence of one or more koalas within the last 5 years.	Evidence of one or more koalas within the last 2 years.
	+1 (medium)	Evidence of one or more koalas within 2 km of the edge of the impact area within the last 10 years.	Evidence of one or more koalas within 2 km of the edge of the impact area within the last 5 years.
	0 (low)	None of the above.	None of the above.
Vegetation composition	+2 (high)	Has forest, woodland or shrubland with emerging trees with 2 or more known koala food tree species, **OR** 1 food tree species that alone accounts for >50% of the vegetation in the relevant strata.	Has forest or woodland with 2 or more known koala food tree species, **OR** 1 food tree species that alone accounts for >50% of the vegetation in the relevant strata.
	+1 (medium)	Has forest, woodland or shrubland with emerging trees with only 1 species of known koala food tree present.	Has forest or woodland with only 1 species of known koala food tree present.
	0 (low)	None of the above.	None of the above.
Habitat connectivity	+2 (high)	Area is part of a contiguous landscape ≥ 1000 ha.	Area is part of a contiguous landscape ≥ 500 ha.
	+1 (medium)	Area is part of a **contiguous landscape** < 1000 ha, but ≥ 500 ha.	Area is part of a contiguous landscape < 500 ha, but ≥ 300 ha.
	0 (low)	None of the above.	None of the above.
Key existing threats	+2 (high)	Little or no evidence of koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence. Areas which score 0 for koala occurrence and have no dog or vehicle threat present	
	+1 (medium)	Evidence of infrequent or irregular koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence, **OR** Areas which score 0 for koala occurrence and are likely to have some degree dog or vehicle threat present.	
	0 (low)	Evidence of frequent or regular koala mortality from vehicle strike or dog attack in the study area at present, **OR** Areas which score 0 for koala occurrence and have a significant dog or vehicle threat present.	
Recovery value	+2 (high)	Habitat is likely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	
	+1 (medium)	Uncertain whether the habitat is important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	
	0 (low)	Habitat is unlikely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	

Koala occurrence: There are five records for Koala within 10 km of the subject land, from 2006 to 2019; all of the records have minimal location notes, so it is not possible to determine exactly where the records were made beyond 'Suburb only, North Star'.

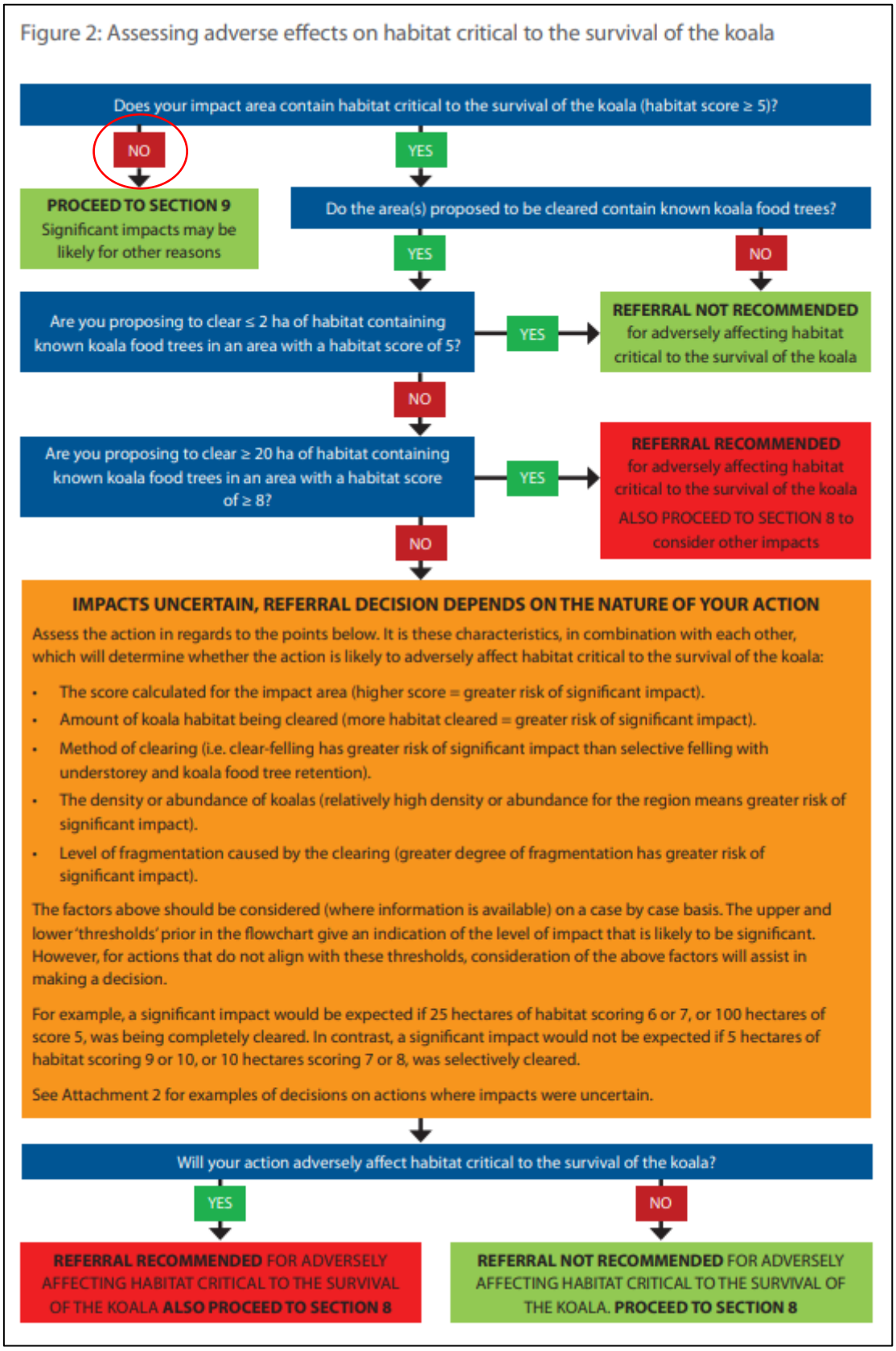
Vegetation composition: Some food tree species present within the subject land or nearby: *Eucalyptus melanophloia* is present within the subject land, *Eucalyptus populnea* is present adjacent the subject land.

Habitat connectivity: Vegetation within the subject land is fragmented and not connected to any large patches.

Key existing threats: There is likely to be some risk of vehicle strike and dog attack, though only minor.

Total score: 1. The subject land does not qualify as critical koala habitat (score < 5).

Site assessment as per Figure 2 from the EPBC Act referral guidelines for the vulnerable Koala



As per section 9 of the referral guidelines, the project was not found to adversely affect the habitat critical to the survival of the koala (**see above**), nor was the project found to interfere

substantially with the recovery of the koala through the introduction or exacerbation of key threats in areas of habitat critical to the survival of the koala.

The project will not increase the risks of dog attack as it will not be increasing access of dogs to any woodland area, since these areas are already highly fragmented in the landscape.

Vehicle strikes could be increased to some degree as a result of the project due to the site being a quarry and requiring truck access through the remnant woodland corridor north of the subject site. The recommended environmental safeguards in **Section 5.2** of this report include a speed limit of no more than 40 km/per hour for trucks entering and exiting the site.

The project will not increase the spread of disease or pathogens through a koala population. Additionally, the proposal will not cause fragmentation or a significant decline in available habitat for the species. The hydrological process of the habitat will not be impacted by the project.

There are five records for Koala within 10 km of the subject land, from 2006 to 2019; all of the records have minimal location notes, so it is not possible to determine exactly where the records were made beyond ‘Suburb only, North Star’. Considering the subject land is devoid of feed trees and shelter trees, it is unlikely to support a population of koalas. Based on the listed considerations the project is not found to interfere substantially with the recovery of the species.

No referral to the Commonwealth is considered to be required for potential impacts to the Koala.

Groundwork Plus Pty Ltd Resources Environment Planning Laboratories
Phone: 1800 GW PLUS (1800 497 587)
Email: info@groundwork.com.au
Website: groundwork.com.au
ABN 13 609 422 791

3 November 2021
TfNSW Ref: NTH11/00032/04
Council Ref: DA34/2021
GW+ Ref: 2542 DA1 014

Matt Adams
Team Leader, Development Services, Region North
Transport for NSW
Via: NSW Planning Portal

Attention: Katrina Wade, Development Services Case Officer

Dear Matt

RE: North Star Quarry, Response to request for additional information from TfNSW

Groundwork Plus Pty Ltd continue to act on behalf of Regional Quarries Australia Pty Ltd in relation to the proposed North Star Quarry (the proposal). Gwydir Shire Council (Council), provided us with a copy of the letter from Transport for NSW (TfNSW) dated 18 October 2021 in relation to the proposal.

We have reviewed the points raised by TFNSW and liaised with Peter Taylor at SMK, the author of the Traffic Impact Assessment (TIA) for the proposal which formed part of the Environmental Impact Statement (EIS).

It is noted that the TfNSW letter has been provided by the Northern regional office of TfNSW, whereas we understand that the Western regional office of TfNSW has provided input into the assessment of the Inland Rail Project and continues to be involved in the delivery of that project.

The points raised by TfNSW have been summarised below (in bold and italics) with a subsequent response provided.

Item 1
The Consent Authority has referred this modification application to TfNSW requesting comment under Clause 104 of the State Environmental Planning Policy (Infrastructure), 2007 (ISEPP), as a traffic generating development listed under Schedule 3. However, the EIS does not directly address this clause.

Response
The development is not a traffic generating development pursuant to Schedule 3 of the Infrastructure SEPP as it does not generate 200 or more motor vehicles per hour. This is addressed in Section 3.4 of the EIS. In our view no further action is required by the proponent in relation to this matter.

Item 2
The handling, transport and use of explosives required for onsite blasting shall be carried out in accordance with Australian Standard AS 2187, the Explosives Act 2003 and Explosives Regulation 2013

Response
Noted. In our view no further action is required by the proponent in relation to this matter.

Item 3
Where signage is proposed along the haulage route, TfNSW recommends that the Consent Authority seek the endorsement of the Local Traffic Committee prior to approval of the signage. Please refer to 'A guide to the delegation to councils for the regulation of traffic'.

Response
For Council consideration. In our view no further action is required by the proponent in relation to this matter.

Item 4
The development application proposes a number of haulage route options, with the primary intention to supply quarry materials to two main infrastructure projects, the Inland Rail Project and the Newell Highway upgrades, in addition to servicing smaller scale local needs. The haulage routes include key intersection connections to the classified road network. TfNSW then identify those intersections with the Newell Highway and Bruxner Highway and advised that:

- *Any road works identified and conditioned within the road reserve of the Newell Highway will require the consent of TfNSW under a Works Authority Deed (WAD) or similar agreement with TfNSW. Refer to the "Advice to the Consent Authority and / or relevant Roads Authority" section at the back of this letter for further information on WAD / TfNSW agreements.*
- *Any road works proposed and conditioned within the road reserve of the Bruxner Highway will require TfNSW concurrence prior to any approval issued by GSC under a Section 138 Roads Act application.*

Response
For Council consideration. In our view no further action is required by the proponent in relation to this matter.

Item 5
Section 2.3.1 – Road Condition Assessment addresses the primary roads for the proposed haulage routes, however turn movements at the key intersections, in particular for heavy vehicles, do not appear to have been sufficiently assessed to demonstrate the impacts of the development on the road network. TfNSW then discuss:

- *Austroads turn treatment warrant assessments.*
- *Comprehensive road safety assessments.*
- *Assessment for the AM / PM peak hours.*
- *Subsequently identifying upgrades and sufficient mitigation measures accordingly.*

Response
Impacts of the development on the road network is addressed in Section 5 of the TIA. Section 6 of the TIA identifies works on Gwydir roads. The TIA does not identify any works on TfNSW roads.

It is also noted that the potential traffic impacts of Stage 1 of the North Star Quarry (i.e. delivery to the Inland Rail Project), which would have the highest likelihood of potential traffic impacts, has

already been assessed as part of the Inland Rail Project (IRP) Environmental Impact Statement for the Narrabri to North Star Stage and then the North Star to the Border stage as well as the traffic impact assessments conducted for the approved Tikitere and Pearlman Quarries. The impacts of heavy vehicle movements for delivery of quarry materials to the IRP from various quarries were considered as part of the construction phases of the IRP. The Tikitere Quarry is identified by the IRP as a potential source of quarry material and the IRP assessed the haul routes from the quarries to the construction alignment of the project. The North Star Quarry would have the same haulage routes as the Tikitere and Pearlman quarries. Therefore, the traffic impacts from haulage of quarry materials to the IRP have been adequately assessed and no required upgrades have been identified.

SMK the author of the traffic impact assessment have provided the following additional comments.

Intersection – Croppa – Moree Road onto Newell Highway
This intersection has in the past several years been subject to an upgrade by TfNSW as it is located at the southern end of a Highway upgrade project. The outcome of this project was that the intersection was upgraded to include a Basic Right Turn Treatment (BAR) on the Newell Highway. This provides a right turning lane for vehicles travelling north and turning into Croppa-Moree Road.

The left shoulder was widened but no additional lane was created. This is possibly due to the issue of the passing lane which finishes approximately 400m north of the intersection. This left turning lane would provide an opportunity for traffic that is turning left to slow and provide opportunity for through traffic to continue.

Figure 1: Newell Highway-Croppa-Moree Road Intersection looking south along Newell Highway

The left turning radius from the Highway onto Croppa Creek Road is approximately 20m. The road shoulder has been widened to approximately 2m to create a total left lane width of approximately 6.2m of bitumen seal for vehicles to continue forward and a vehicle to slow and turn left.

For vehicles turning out of Croppa-Moree Road, sight distance to the south (left) is in excess of 200m, subject vehicle height and grass verge height. If the western grass verge is kept short, additional sight distance is available. The sight distance to the north is in excess of 300m for vehicles exiting Croppa-Moree Road onto the highway.

Croppa-Moree Road joins the Newell Highway at an angle. The intersection has been widened in the final 30m to allow for this alignment. The Croppa-Moree Road is approximately 26-degrees off the perpendicular with the Newell Highway. The effects of this are limited in that the available sight distance from Croppa-Moree Road is significantly greater than minimum distances. (150m to 180m).

These sight distances are also available for trucks turning left from the Highway into Croppa-Moree Road.

No work is proposed for this intersection on the basis of sight distances and the presence of a BAR treatment and the widened shoulder which meets the Austroad standards (6.2m lane available) for a BAL.

Buckie Road – Newell Highway Intersection

The use of Buckie Road for hauling gravel to the Newell Highway from North Star Quarry will be subject to Council approvals. This has been identified as a necessary agreement between Council and the quarry operator due to the poor condition because of the lack of gravel pavement on parts of the eastern section of this road. Recent improvements (Mid-2021) have been made to a section of the western bitumen sealed section of this road due to pavement failure from the March 2021 rainfall/flood event.

Similar to the Croppa-Moree Road, this intersection has a BAR but no formal (road markings) BAL from the highway into the Buckie Road. The total seal width from the centre line to the left edge of the bitumen seal is approximately 7.5m. The conforms to a BAL turn treatment is presented in Figure 8.2 from Austroads Guide to Road Design Part 4A: Unsignalised and Signalised Intersections.

The Buckie Road alignment is not perpendicular to the Newell Highway other than the final 20m.

Sight distance from Buckie Road to the north is more than 300m. Sight distance to the south is more than 450m. This exceeds the minimum required sight distance substantially. The terrain is flat and no tall vegetation is present along the western 150m or more of Buckie Road which may obstruct a driver's vision to the north or south of the intersection. The driver exiting Buckie Road has a significantly safe time frame to identify vehicles on the highway and slow to an appropriate speed to stop or roll onto the highway.

For traffic turning right off the highway into Buckie Road, the BAR is considered the appropriate safety requirement. For traffic turning left off the highway into Buckie Road, the highway provides sufficient width to meet a BAL treatment for a rural road.

No upgrade works are proposed for this intersection.

IB Bore Road and Newell Highway Intersection

The IB Bore Road is a potential main haul road to be used to supply gravel to Newell Highway projects. However, it is noted that this road was heavily utilised over the past 2-years or more for the recent upgrade of the Newell Highway from Boggabilla to Mungle Creek and the road suffered significant pavement failure. This has been recognised by NSW Government who have provided funding to the Gwydir Shire to upgrade this road to a two-lane bitumen sealed road which is planned for 2021-22. Once this work is done, IB Bore Road may provide the preferred haul route for access to Highway upgrades between IB Bore Road and south to Croppa-Moree Road.

Figure 2: IB Bore Road - Newell Highway Intersection looking south

This intersection services a rest area constructed by TfNSW and the IB Bore Road entry onto the highway. The intersection has a BAR, and a BAL. Full line marking is present and recent. The intersection is considered to meet all standards for left and right turning vehicles as it has been subject to recent upgrades by TfNSW during both highway projects and rest area projects.

No work is identified for this intersection to be acceptable for quarry truck use.

Newell Highway Upgrade Projects

Based on information provided by TfNSW tenders, highway upgrade work other than standard maintenance is targeted to the south between Moree and Narrabri over the next year or more. No additional works have been identified for north of Moree in the next year or more.

Item 6

TfNSW notes, Section 5.5 attempts to address these impacts by proposing the development of a separate cumulative Transport Management Plan (TMP) in conjunction with the relevant quarries and Road Authorities, to address the cumulative impacts of the local quarry developments on the road network. However, it is unclear how existing developments would be required to commit to or comply with the proposal, where it has the potential to impose further restrictions which may not exist in their own consent conditions and management plans.

Response

The two (2) other quarries identified by the TIA are operated by Regional Quarries Australia Pty Ltd, the proponent for the North Star Quarry and as discussed in the assessment of those quarries are also focused on supply of material to the IRP and therefore Council can be confident that cumulative impacts can be managed by the proponent who will operate the three (3) quarries in a coordinated manner.

Item 7

TfNSW identifies upgrades to key TfNSW intersections are anticipated and note that:

- *The upgrades may not align with the peak proposed haulage timelines.*
- *Prior to any upgrade / rehabilitation works being completed it is unclear how the existing road geometry and turn treatments will be able to successfully and safely accommodate any additional turn movements generated by an increase in heavy vehicles. This further applies to IB Bore Road, which is has no upgrades planned.*

- *TfNSW recommend the Consent Authority require the proponent to consult with the relevant Roads Authorities and TfNSW to address the impacts the proposed development will have on the key intersections, classified road/s and the planned highway projects. A dilapidation report is further recommended to be produced to clearly identify the existing condition of the road geometry and pavement of the key intersections and inform any baseline assessment.*

Response

The TIA did not identify that the development triggered any works on TfNSW roads. Therefore, there is no need for any further consultation or preparation of a dilapidation report or additional assessments. Please refer to the discussion provided in response to Item 5 for further detail.

Item 8 & 9

Prior to the commencement of any haulage, TfNSW recommended the Consent Authority condition the preparation and implementation of a Traffic Management Plan. The TMP should be prepared by a suitably qualified person in consultation with the relevant Road Authorities and TfNSW and be approved by the Consent Authority. Evidence is to be provided to the Consent Authority of consultation with the relevant Road Authorities, TfNSW and local bus service providers. The TMP should include a Driver Code of Conduct, inclusive of processes for induction of relevant persons, regular tool box meetings, complaint and disciplinary procedures.

Response

The EIS and TIA already commit to implementation of a Traffic Management Plan and Driver Code of Conduct. No objection is held to a condition of consent addressing this matter.

Item 10

TfNSW recommend, the Consent Authority be satisfied that heavy vehicles will not adversely impact the condition of the passive rail crossings, in particular after the Inland Rail Project has been completed and the rail corridor is in use. Where applicable, the Consent Authority may wish to consult with, Mark Ozinga, Manager of TfNSW Land Use Planning & Development, for rail related matters.

Response

In relation to the passive rail crossings, the Croppa Creek/Buckie Road level crossing project has started. This involves a significant upgrade of the level crossing which will then be fitted with boom gates/flashing lights/pedestrian crossing. We understand that the same will be occurring for two level crossings near North Star, one in town and one about 3km toward Croppa Creek as part of the Inland Rail Project.

The proposal is for delivery of quarry materials to the IRP and therefore will not adversely impact the condition of the passive rail crossings. ARTC and the construction contractor will instruct the haulage providers delivering the quarry materials as to any relevant requirements regarding the passive rail crossings during construction of the IRP.

After completion of the IRP it is assumed that the passive rail crossings would have been constructed to the relevant standard to accept heavy vehicle movements in accordance with the requirements of that project approval.

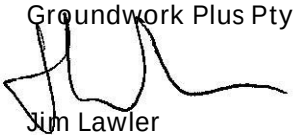
In our view no further action by the proponent is required in relation to this matter.

Conclusion

As discussed above, it is our understanding that the matters raised by TfNSW have been addressed in the TIA and by this letter and could be adequately regulated through conditions.

If you require any further information, please do not hesitate to contact me.

Yours faithfully
Groundwork Plus Pty Ltd



Jim Lawler
Associate

Groundwork Plus Pty Ltd Resources Environment Planning Laboratories
Phone: 1800 GW PLUS (1800 497 587)
Email: info@groundwork.com.au
Website: groundwork.com.au
ABN 13 609 422 791

3 November 2021
EPA Ref: CNR-28134 A-32844
Council Ref: DA34/2021
GW+ Ref: 2542 DA1 013

Rebecca Scrivener
Head, Regional Operations Unit
Regulatory Operations Regional West
NSW Environment Protection Authority
Via: NSW Planning Portal

Dear Rebecca

RE: North Star Quarry, Response to request for additional information from the EPA

Groundwork Plus Pty Ltd continue to act on behalf of Regional Quarries Australia Pty Ltd in relation to the proposed North Star Quarry (the proposal). Gwydir Shire Council (Council), provided us with a copy of the request for additional information issued by the NSW Environment Protection Authority (EPA) dated 19 October 2021 in relation to the proposal.

We have reviewed the points raised by the EPA and liaised with Martin Doyle at North Star Air Quality, the author of the Air Quality Impact Assessment (AQIA) for the proposal which formed part of the Environmental Impact Statement (EIS). Subsequently, we provide the following comments in response to the points raised by the EPA.

The points raised by the EPA are reproduced below and in summary relate to:
1. Water availability for control of dust; and
2. Pit retention emission reduction factors; and
3. Feasible and reasonable mitigation measures.

Request: Water availability for control of dust
The emissions inventories used in the preparation of the modelling scenarios adopt emissions controls that rely on the use of water for dust suppression purposes. These controls were assumed for activities such as crushing, screening and truck movements within the premises.

The AQIA indicates that there may be periods of time where water availability is limited. As emissions controls (i.e. watering) were assumed to be constantly implemented during operating hours, the predicted modelling results are not considered representative of worst-case impacts associated with the proposal.

The EPA requires the proponent to confirm that design of the project has adequately accounted for the water demand associated with the on-going implementation of the mitigation measures as assumed in the AQIA. Alternatively, the AQIA must be updated to address modelling scenarios representative of the worst-case impacts, that is when there is limited or nil water available.

Response
The AQIA Section 7.1 states,

NSW EPA has requested that consideration be given to dust management techniques that can be used when water is limited or unavailable. It is respectfully considered that this assessment has demonstrated that impacts can be managed even when water is limited, through the adoption of alternative control techniques. It is noted that the model predictions assume that no control is applied to exposed areas, and therefore the impacts presented represent a potential worst-case scenario in that regard.

Section 5.3.6 of the EIS states,

It is noted that the proponent proposes to continually apply water to all exposed areas of the quarry using the water truck. These emissions reductions have not been applied in any stage of construction or operation in the air quality modelling assessment. The continual application of water to large areas is likely to be unmanageable in periods of water shortage, and therefore the assessment seeks to provide assurances that the air quality criteria can be met at all surrounding sensitive receptor locations, without this additional level of control.

Watering of unpaved haulage routes on site has been assumed to occur continuously and an emission reduction of 50 % has been applied. Should water availability become an issue at the quarry, or should visible dust be observed to be emitted from haulage routes, the proponent would implement additional management measures such as reducing the speeds of vehicles along those routes. In this way, the emission reduction efficiencies associated with haulage route watering applied within this assessment can be maintained, even in conditions of water shortage.

On this basis, the AQIA and EIS did model the worst case scenario of water not being available for watering of all exposed areas and confirmed compliance in those circumstances.

Request: Pit retention emission reduction factors
Pit retention emission reduction factors (50% for TSP, 5% for PM10 and 5% for PM2.5) were used to estimate emissions from blasting and material handling (loading and unloading). The EPA notes these emission reduction factors apply for deep pits, where there is limited exchange between the air above the pit rim.

The EPA considers that during the initial stages of the project (that is when the maximum annual operational activity is proposed to be 490,000 t.p.a.), the pit may not have the required depth to achieve the assumed levels of control. This may in turn increase the likelihood of dust emissions and visible dust to occur at the premises.

The AQIA should be updated to address modelling scenarios representative of the worst-case impacts.

Response
Pit retention emission reduction factors were applied in the air quality modelling assessment on sources associated with drilling, blasting, and loading of haul truck with blasted and overburden material. Removal of those control factors results in an increase in the total site PM_{10} budget of 0.1 % on an annual basis (32 398 kg per year with pit retention factors, 32 423 kg per year without), and less than 0.1 % on a peak 24-hour basis (247.3 kg per day with pit retention factors, 247.4 kg per day without). This would have a negligible impact on the incremental concentrations of PM_{10} predicted and would not materially affect the conclusions of the report.

In relation to TSP emissions, removal of the pit retention factor results in an increase in annual TSP emissions of 0.5 % (105 747 kg per year with pit retention factors, 106 270 kg per year without). Again, this would result in a negligible impact on the incremental impacts of annual average TSP concentrations, and no material change to the conclusions of the report would be anticipated.

Request: Feasible and reasonable mitigation measures

The AQIA should be updated to include an evaluation of, and commitment to, reasonable and feasible mitigation measures to prevent and minimise air pollution, including but not limited to:

1. *Application of low silt aggregate along internal roads as a proactive rather than a reactive mitigation measure.*
2. *Sealing or applying chemical suppressant on roads inside the premises to minimise wheel generated dust emissions.*
3. *Implementing specific speed limits to minimise wheel generated dust emissions as a proactive rather than a reactive mitigation measure.*
4. *Conducting processing activities (i.e. crushing and screening) inside the pit.*
5. *Enclosing or partially enclosing storage areas (i.e. stockpiles).*
6. *Land stabilisation measures (apart from watering) to prevent or minimise emissions from exposed areas.*

Response

The AQIA assessed the potential impacts of the development with the implementation of management measures outlined in Table 14 of the AQIA and the assessment concluded the development would comply with the relevant requirements.

Based on the AQIA it is understood that implementation of the measures nominated by the EPA are not required to achieve compliance with the relevant requirements. However, it is agreed that those measures could be proactively implemented for times when water is limited.

The EIS and AQIA committed that a Trigger Action Response Plan (TARP) will be developed as part of the Environmental Management Plan (EMP) for the development. On that basis, the proponent commits to inclusion of the following measures in the TARP for implementation if water supply becomes limited or unavailable:

1. Application of low silt aggregate along internal roads as a proactive rather than a reactive mitigation measure.
2. Sealing or applying chemical suppressant on roads inside the premises to minimise wheel generated dust emissions.
3. Implementing specific speed limits to minimise wheel generated dust emissions as a proactive rather than a reactive mitigation measure.
4. Conducting processing activities (i.e. crushing and screening) inside the pit.
5. Enclosing or partially enclosing storage areas (i.e. stockpiles).
6. Land stabilisation measures (apart from watering) to prevent or minimise emissions from exposed areas.

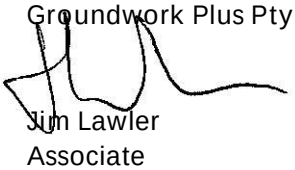
No objection is held to a condition of development consent requiring the inclusion of the above in the EMP that is to be prepared and implemented for the proposal.

Conclusion

As discussed above, it is our understanding that the matters raised by the EPA have been addressed in the AQIA or would not materially affect the conclusions of the AQIA and could be adequately regulated through conditions.

If you require any further information, please do not hesitate to contact me.

Yours faithfully
Groundwork Plus Pty Ltd



Jim Lawler
Associate

Blasting Management

Purpose

Blasting will be required to fragment rock to a manageable size that can be transported and fed into the on-site crushing and screening plant. Blasting practice has the potential to generate excessive noise and vibration impacts that may cause nuisance for sensitive receptors.

Performance Targets

Blasting activities must not exceed the limits for peak particle velocity and air blast specified in the EPL (extracted below for reference) when measured at any sensitive place or commercial place.

Parameter	Limit*
Airblast Overpressure	120 dB (Linear Peak) at any noise sensitive location at any time.
	115dB (Linear Peak) at any noise sensitive place for more than 5% of the total number of blasts in the reporting period.
Ground Vibration	5mm/second peak particle velocity at any noise sensitive place for more than 5% of the total number of blasts in the reporting period.
	10mm/second peak particle velocity at any noise sensitive place at any time.

Notes:
*Error margins associated with any monitoring equipment used to measure the blasting limits are not to be taken into account in determining whether or not the limit has been exceeded.

Management Strategies

The following control measures may be implemented to assist in mitigating potential noise nuisance from blasting associated with the site activities:

- Notify the owner of Lot 11 DP755984, 24hrs prior to a blast.
- Blasting must be carried out in accordance with the current edition of *Australian Standard 2187*.
- Unless prior approval is obtained from Council and the EPA; blasting is only permitted during the hours of 9am to 3pm Monday to Friday. Blasting is not permitted at any time on Saturdays, Sundays or Public Holidays
- Handling, transport and use of explosives shall be carried out in accordance with the requirements of *AS 2187.2-2006 Explosives - Storage and use - Use of explosives*.
- Only suitably experienced and qualified blasting personnel shall be employed or contracted to provide blasting services.
- The maximum instantaneous charge or charge mass per delay will be limited to the lowest possible level.
- Blast areas may be dampened down prior to blasting to minimise dispersion of dry and fine materials where practicable, or where it is identified as a source of potential dust nuisance.

Monitoring

Airblast overpressure and ground vibration levels must be measured and recorded for all blasts carried out at the site at the nearest residence that is not owned by the landowner for the site or subject to a private agreement relating to airblast overpressure and ground vibration levels.

The method of measurement and reporting of blasting must comply with AS 2187.2·2006. Measurements are to be conducted by suitably qualified person using appropriate equipment. Equipment must be calibrated on a regular basis in accordance with the manufacturers recommendations or other appropriate standards.

Contingency Plan

Any complaint received regarding nuisance at a sensitive or commercial place caused by blasting activities must be recorded and investigated by the Quarry Manager.

If blast monitoring determines an exceedance of the approved limits, the Quarry Manager may engage the services of a suitably qualified person to determine additional management strategies to mitigate impacts.

Additional blast monitoring will be undertaken where necessary to determine the efficacy of the additional management strategies.