BHP Mitsubishi Alliance

Appendix D

Terrestrial Ecology Survey and Impact Assessment Report

ENGENY

BMA

Grevillea Pit Continuation Project

Terrestrial Ecology Survey and Impact Assessment Report

QC1000_216-REP-001-8

16 MARCH 2026

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ACRONYMS AND ABBREVIATIONS

Acronym	Details
ALA	Atlas of Living Australia
ASL	Above Sea Level
BAAM	Biodiversity Assessment and Management Ecological Consultants
BMA	BM Alliance Coal Operations Pty Ltd
BD	Biodiversity
c.	circa
DAWE	Department of Agriculture, Water and Environment
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DEM	Digital Elevation Model
DESI	Department of Environment, Science and Innovation (Queensland)
DoEE	Department of Environment and Energy (Commonwealth)
DoR	Department of Resources (Queensland)
EA	Environmental Authority
ELA	Eco Logical Australia
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
EPC	Exploration Permit (Coal)
FRREMP	Fitzroy Regional Receiving Environment Monitoring Program
FY	Financial Year
GBR	Great Barrier Reef
GDE	Groundwater Dependent Ecosystem
ha	Hectare
HES	High Ecological Significance
HVR	High-value Regrowth
KoRV	Koala retrovirus
km	Kilometre
LoO	Likelihood of Occurrence
MAW	Mine Affected Water

Acronym	Details
ML	Mining Lease
MNES	Matters of National Environmental Significance
Mtpa	million tonnes per annum
OCE	Open Cut Examiner
PMST	Protected Matters Search Tool
RE	Regional Ecosystem
REDD	Regional Ecosystem Description Database
RoM	Run of Mine
SKM	Sinclair Knights Merz
SPRAT	Species Profile and Threats Database
SRM	Saraji Mine
TEC	Threatened Ecological Community
The Project	SRM Grevillea Pit Continuation Project
TSSC	Threatened Species Scientific Committee
VM Act	*Vegetation Management Act 1999* (Queensland)
WoNS	Weeds of National Significance

1. INTRODUCTION

1.1 Background

BM Alliance Coal Operations Pty Ltd (BMA) owns and operates the Saraji Mine (SRM), situated approximately 20 kilometres (km) north of Dysart, Queensland. The SRM has been in operation since 1974 and operates under an Environmental Authority (EA) EPML00862313, with current coal production at c.16 million tonnes per annum (Mtpa) of Run-of-Mine (RoM) coal.

Existing mining operations within the SRM Grevillea Pit will exhaust current resources within Mining Lease (ML) 1782 during financial year (FY) 2025. As such, BMA is seeking to continue mining operations by extending the footprint to the east into ML700021, referred to as the SRM Grevillea Pit Continuation Project (the Project).

An EA amendment to the existing SRM EA was granted in 2018, along with surface area rights shortly after, authorising mining operations in ML 700021 under State legislation. As part of this application process, and since then, numerous assessments and ecological surveys have been completed within the Project area and surrounds.

Engeny was commissioned to undertake a contemporary baseline terrestrial ecological survey and assessment for the Project to address potential changes in occurrence and status for Matters of National Environmental Significance (MNES) protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). For MNES identified as present or potentially present within or adjacent to the Project area, an assessment of the significance of potential Project related impacts was also undertaken. This report details the method and results of the terrestrial ecological assessment as well as the impact assessment.

1.2 Project Area

The Project area is located in Central Queensland, within the Northern Brigalow Belt. The Project area encompasses approximately 221 hectares (ha) within ML700021 and occurs adjacent to, and to the east of, the current mining operational area at SRM. Phillips Creek lies adjacent to the southern boundary of the Project area. Given the proximity of this waterway to the Project area, additional targeted fauna survey works were undertaken within remnant vegetation set in association with the Phillips Creek to identify and quantify any likely indirect impacts resulting from the Project.

The Project area is inclusive of areas which are currently disturbed by mining activities (e.g., roads and tracks, exploration activities, equipment laydown areas and mine water storage areas), and areas which have sustained impacts from historical land use activities, such as grazing. Vegetation communities which have been ground-truthed within the Project area are reflective of these impacts and are characterised by communities which are of remnant and high-value regrowth (HVR) condition (which are recovering following the cessation of broadscale or maintenance regrowth clearing), as well as communities which are non-remnant and young regrowth. The topography of the Project area is consistent across the entire area and has been identified as gently undulating rises on silty loam and clay loam substrates.

Figure 1 identifies the Project area, the existing mining operations, and the location of Phillips Creek.

1.3 Scope and Objectives

The purpose of this assessment is to validate the ecological values within the Project area, specifically relating to MNES. To achieve this purpose, the scope of work included the following tasks:

- Desktop assessments, including literature review of previous environmental studies and database searches to identify known or potentially occurring MNES.
- Ecological field survey to:
  - Document condition, extent and conservation value of vegetation communities, habitat types and other ecological values (watercourses, habitat connectivity) within the Project area,
  - Identify habitat resources for known and potentially occurring threatened flora, fauna and migratory species,
  - Detect presence of conservation significant species identified as potentially occurring from the desktop assessment through targeted surveys, including targeted fauna spotlighting and flora meanders; and,
  - Opportunistically record fauna utilisation, flora diversity and introduced species across the Project area.

- Likelihood of occurrence (LoO) assessment to identify known, likely or potentially present threatened flora, fauna and migratory species within the Project area,
- Ecological values mapping utilising field-based data in conjunction with aerial imagery to:
  - Determine the extent of vegetation communities and habitat types;
  - Classify identified threatened species habitat mapping in accordance with BHP's Central Queensland Threatened Species Habitat Descriptions (Kerswell *et al.*, 2020) and,
  - Identify other associated MNES values confirmed or potentially present across the Project area and allocate likely extent.
- Impact assessment for identified or potentially occurring ecological values, inclusive of mitigation and management measures.
- Significant impact assessments for likely or potentially occurring MNES in accordance with the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines – Matters of National Environmental Significance* (Department of the Environment, 2013b).
- Report on the methods and results of the ecological assessment and impact assessment.

FIGURE 1: PROJECT AREA

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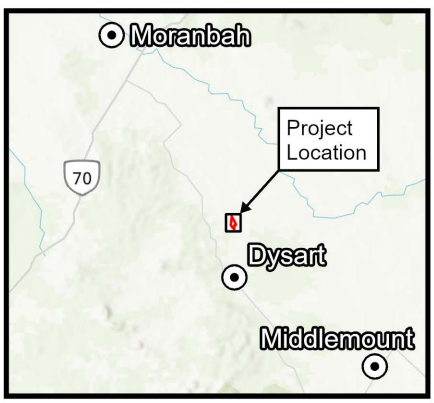
Legend

- Watercourse
- Project Area
- Mining Lease Boundary
- Exploration Permits (Coal)



DATA SOURCE
QSpatial, 2024; Data used is licensed under a Creative Commons Attribution 4.0 International Licence
Engeny, 2024; Data collected by Engeny during field survey

DISCLAIMER
Engeny has endeavoured to ensure accuracy and completeness of the data. Engeny assumes no legal liability or responsibility for any decisions or actions resulting from the information contained within this map.

2. METHODOLOGY

2.1 Desktop Assessment

A desktop assessment was undertaken to characterise and identify ecological values that are protected under Commonwealth legislation that may be supported in the Project area and surrounds that require field validation. This consisted of database searches and a literature review of previous ecological studies across the Project area and surrounds. The literature review also assisted in understanding previous assessment methodology and effort conducted across the Project area and surrounds, and where additional field assessment would be required to supplement previous work.

2.1.1 Database searches

Searches of publicly available datasets and online mapping were conducted to initially identify potential MNES protected under the EPBC Act. The following databases, were searched as part of the assessment:

- Department of Climate Change, Energy, the Environment and Water (DCCEEW) EPBC Act Protected Matters Search Tool (PMST) (DCCEEW, 2024c) (Appendix A) using a 20km radius.
- Atlas of Living Australia (ALA) (ALA, 2024) using a 60km radius.
- WildNet database (DESI, 2024) (Appendix A) using a 20km radius.
- Queensland Department of Resources (DoR) Vegetation Management Regulated Vegetation Management Map - version 7.04 (DoR, 2024c).
- DoR Vegetation Management Regional Ecosystem (RE) Map - version 13.00 (DoR, 2024b).
- DoR Vegetation Management Pre-clear RE Map - version 13.00 (DoR, 2023b).
- DoR Vegetation Management Essential Habitat Map - version 12.04 (DoR, 2024a).
- DoR Vegetation Management Watercourse and Drainage Feature Map (1:100000 and 1:250000) - Queensland except South East Queensland version 7.00 (DoR, 2023c).
- DoR Vegetation Management Wetlands Map – version 9.04 (DoR, 2024d).
- Map of Great Barrier Reef (GBR) Wetland Protection Areas (DES, 2022a).
- Map of Queensland Wetland Environmental Values (DES, 2022b).
- Wetland Protection Area - GBR High Ecological Significance (HES) Wetland (DES, 2022c).
- Flora Survey Trigger Map for Clearing Protected Plants in Queensland - Version 10.0 (DES, 2023).
- Detailed surface geology - Queensland (version 6.13) (DoR, 2023a).

2.1.2 Literature Review

A number of ecological assessments for other Project studies that have been inclusive of the Project area and/or surrounds have been undertaken to date. These include:

- Saraji Mine Grevillea Back Access Road Ecological Assessment (ELA, 2019a).
- Spring to Phillips Creek Diversion, Assessment of Matters of National Environmental Significance (ELA, 2019b).
- Spring Creek to Phillips Creek Diversion, EPBC Assessment (ESP, 2019).
- Ecological Baseline Assessment: Saraji Mine (BAAM, 2021).
- EPBC Act MNES Self-Assessment: Spring Creek Diversion - Saraji Pit Geometry Optimisation (BMA, 2018).
- Saraji East Mining Lease Project Baseline Environmental Studies, Terrestrial Ecology Technical Report (AECOM, 2023b).
- Saraji Mine Spring Creek Diversion – Stage 1: Ecological Assessment (ELA, 2018).

- Saraji Open Cut Extension Project: Environmental Assessment Report (BMA, 2016).
  - Terrestrial Ecology Baseline Report (AECOM, 2016).
- Matters of National Environmental Significance - Significant Impact Assessment, Grevillea Pit Continuation Project (AECOM, 2023a).

In addition to this, a number of ecological studies to support Project EPBC Referrals in the broader region are publicly available via the EPBC Act Referrals Lists website (DCCEEW, 2024b). These including the following that are listed on the PMST (Appendix A):

- Arrow Bowen Pipeline: Terrestrial Fauna Assessment (Ecological Survey & Management, 2011).
- BMA Peak Downs Mine, Ecological Assessment of Dysart Road: MC90 Realignment (Aurecon, 2013).
- BMA Peak Downs Terrestrial Ecology Assessment - Interim Memo (Ausecology, 2022).
- Dysart East: EPBC Referral (URS Australia, 2014).
- Ecology Technical Memo, BHP Peak Downs Expansion Project (ERM, 2022).
- Lake Vermont Northern Extension: Flora and Fauna Report (AARC, 2016).
- Olive Downs Project Mine Site and Access Road, EPBC Referral Submission (Pembroke Resources South Pty Ltd, 2017).
- Peak Downs East Mining Lease, Terrestrial Ecology Baseline Report (AECOM, 2020).
- Terrestrial Ecological Assessment for Vulcan South (METServe, 2023).
- Winchester South Project: Terrestrial Ecology Assessment (e2m, 2021).

All abovementioned previous ecological assessments and studies were reviewed as part of the literature review for the purpose of gaining an understanding of values both within and directly surrounding the Project area, as well as identifying any relevant information with regards to the presence of MNES values in the region (including confirmed conservation significant species records). Where appropriate, the findings of previous assessments identified from the literature review process have been considered in this assessment and incorporated within this report.

In addition to this, for previous ecological assessments undertaken across the area that involved field-based assessments, a gap analysis was undertaken to determine the supplementary field work required across the Project area for the Project. This assisted in the development of a contemporary field survey design as described in Section 2.2. The field survey methods and effort undertaken as outlined within the previous assessments, and the additional field methodologies required to confirm and update ecological knowledge of the Project area and surrounds are detailed in Table 1.

TABLE 1: LITERATURE REVIEW SUMMARY OF SUPPLEMENTARY FIELD SURVEY METHODOLOGY REQUIREMENTS FOR PROJECT

Report Title / Date	Data Source & Date of Field Survey Data	Methodologies, Assessments and Survey Effort	Project gap analysis outcomes	Supplementary field methodologies required
Saraji East Mining Lease Project Baseline Environmental Studies – Terrestrial Ecology Technical Report (AECOM, 2023)	AECOM: 2016 (two (2) surveys), 2017 and 2020.	This report included the review of data collected during field surveys over the period 2007 – 2023. To supplement these previous field surveys, four additional biodiversity surveys have been conducted across the Study area for Saraji East, which included the following assessments within the Project area: • Two (2) tertiary and one (1) quaternary assessments undertaken in 2017 to identify vegetation communities and REs. In addition to the assessments undertaken within the Project area, the following assessments were undertaken at the stretch of the Phillips creek located to the south of the Project area: • Three (3) tertiary and one (1) quaternary assessments undertaken in 2017 to identify vegetation communities and REs. • Two Anabat surveys undertaken in 2017. Finally, numerous field assessments were conducted within approximately 8km of the northern and eastern boundaries of the Project area, inclusive of: • Two (2) Threatened Ecological Community (TEC) assessment undertaken within 2020. • Nine (9) quaternary and four (4) tertiary assessments undertaken in 2017 to identify vegetation communities and REs. • Three (3) tertiary assessments undertaken in 2020 to identify vegetation communities and REs. • Two (2) Yakka skink habitat assessments undertaken in 2020. • Two (2) Greater glider habitat assessments undertaken in 2020. • Two (2) active fauna searches undertaken in 2020.	• Larger study area incorporated within this assessment that included the Project area, and therefore survey effort was spread out rather than concentrated within the Project area. • Whilst threatened fauna searches were completed north of the Project area; none were completed within the Project area. • Whilst vegetation assessments were completed within the Project area, habitat assessments for target threatened fauna were not a component of this assessment's scope. • Sufficient and current survey effort in surrounding areas i.e. north and east of the Project area.	• Infill vegetation and habitat assessments across the entirety of the Project area via additional tertiary and quaternary assessment (refer to Section 2.2.1.1). • TEC assessments within analogous REs to confirm the presence and/ or absence to TECs (refer to Section 2.2.1.4). • Random meander surveys within the Project area to determine the presence and/ or absence of threatened flora species (refer to Section 2.2.1.3). • Targeted surveys for the potentially occurring conservation significant species (refer to Section 2.2.2.3). • Targeted habitat assessments to determine the presence of habitat for threatened flora and fauna species (refer to Section 2.2.2.1).

Report Title / Date	Data Source & Date of Field Survey Data	Methodologies, Assessments and Survey Effort	Project gap analysis outcomes	Supplementary field methodologies required
Ecological Baseline Assessment – SRM (BAAM, 2021)	BAAM: 2020 and 2021	This assessment included a large study area, in which the current Project area was included. Within the current Project area, the following assessments were undertaken as part of baseline assessments: • Six (6) quaternary assessments.to identify vegetation communities and REs. • One (1) BioCondition assessment to collected data describing vegetation condition and identify the presence/ absence of TECs. In addition to the survey effort undertaken within the Project area, this assessment included an assessment of the stretch of Phillips Creek situated directly south of the Project area: • Six (6) habitat assessments to quantify the presence and extent of habitat features that may be suitable for a range of species. • Three (3) tertiary and seven (7) quaternary assessments to identify vegetation communities and REs. • Five (5) BioCondition assessments to collected data describing vegetation condition and identify the presence/ absence of TECs. Lastly, this assessment included field survey to the north of the Project area. Within approximately 8km of the northern boundary of the Project area, this assessment undertook: • Seven (7) tertiary and 35 quaternary assessments to identify vegetation communities and REs. • Seven (7) BioCondition assessments to collected data describing vegetation condition and identify the presence/ absence of TECs. • Five (5) targeted searches for the Ornamental snake. • Eight (8) habitat assessments to quantify the presence and extent of habitat features that may be suitable for a range of species.	• Larger study area incorporated within this assessment that included the Project area, and therefore survey effort was spread out rather than concentrated within the Project area. • Whilst habitat assessments were completed south of the Project area, at Phillips creek, none were completed within the Project area. • Study did not require targeted fauna surveys as part of its scope. • Sufficient and current survey effort in surrounding areas i.e. Phillips Creek, with the exception of targeted nocturnal survey for Koala and Greater glider.	• Infill vegetation and habitat assessments across the entirety of the Project area via additional tertiary and quaternary assessment (refer to Section 2.2.1.1). • TEC Assessments within analogous REs to confirm the presence and/ or absence to TECs (refer to Section 2.2.1.4). • Random meander surveys within the Project area to determine the presence and/ or absence of threatened flora species (refer to Section 2.2.1.3). • Targeted surveys for the potentially occurring conservation significant species, including nocturnal surveys for Koala and Greater glider along Phillips Creek (refer to Section 2.2.2.3)

Report Title / Date	Data Source & Date of Field Survey Data	Methodologies, Assessments and Survey Effort	Project gap analysis outcomes	Supplementary field methodologies required
Saraji Mine Grevillea Back Access Road Ecological Assessment - ELA 2019	Eco Logical (ELA):2017, 2018 and 2019.	This assessment incorporated a comprehensive field survey within a Study area which traverses a small portion of the Project area. Specifically, the survey effort within the Project area included: • Six (6) quaternary assessments to identify vegetation communities and REs. • Three (3) Ornamental snake habitat assessments were undertaken within the central aspect of the Project area. • One (1) Koala habitat assessment. • One (1) Squatter pigeon habitat assessment. • One (1) TEC assessment was undertaken. In addition to the survey effort undertaken within the Project area, this assessment included an assessment of the stretch of Phillips Creek situated to the south of the Project area: • 23 quaternary assessments to identify vegetation communities and REs. • Two (2) Greater glider habitat assessments. • Four (4) Koala habitat assessments. • Four (4) Squatter pigeon habitat assessments. • One (1) TEC assessment. • Four (4) BioCondition assessments to collected data describing vegetation condition. Finally, this assessment included one (1) habitat assessment for the Squatter pigeon, and one (1) quaternary assessment to the west of the northern aspect of the Project area.	• This assessment and associated survey effort and methodologies only overlapped with a small section of the Project area. • Whilst this assessment provides useful historical data with regard to the occurrence of vegetation communities and threatened species habitat within the Project area, a contemporary field survey is required to ground truth the present-day presence of ecological values. • Whilst habitat assessments for multiple threatened fauna were undertaken, the scope did not include targeted fauna surveys (i.e., no fauna trapping or spotlight surveys were undertaken).	• Contemporary and comprehensive ecological assessment across the entirety of the Project area, including: – detailed tertiary vegetation assessments (refer to Section 2.2.1.1). – infill habitat assessments (refer to Section 2.2.2.1). – TEC assessments (refer to Section 2.2.1.4). – random meander surveys within the to determine the presence and/ or absence of threatened flora species (refer to Section 2.2.1.3); and – targeted surveys for the potentially occurring conservation significant species (refer to Section 2.2.1.3).
Spring to Phillips Creek Diversion, Assessment of Matters of National	Eco Logical (ELA): 2018 and 2019.	• Comprehensive survey over a large Study area which lies adjacent to the Project area, to the west (the referral and impact area) and	• Whilst this assessment was comprehensive and included a detailed field survey effort, it is noted	• A comprehensive field survey targeting the Project area including:

Report Title / Date	Data Source & Date of Field Survey Data	Methodologies, Assessments and Survey Effort	Project gap analysis outcomes	Supplementary field methodologies required
Environmental Significance (ELA, 2019b)		to the east (assessments of the downstream reaches of Phillips Creek and One Mile Creek). • Field survey incorporated three (3) mobilizations undertaken during September 2018, February 2019 and April 2019. • A detailed flora assessment consisted of ground-truthing vegetation communities across the survey area for this assessment as well as validating the presence of TECs. – A total of 23 TEC assessments were undertaken during the assessment. • Site condition assessments were undertaken in accordance with the BioCondition Assessment Manual (Version 2.2). – A total of 18 site condition assessments were conducted during the surveys. • Tertiary and quaternary assessments were used to identify vegetation communities and REs across the survey area for this assessment. – A total of 28 tertiary surveys were conducted during the field surveys. – A total of 70 quaternary surveys were conducted during the field survey. • General habitat assessments were conducted to quantify the presence and extent of habitat features that may be suitable for a range of species. – A total of 58 general habitat assessments were conducted during the field surveys. • Targeted habitat assessments were conducted for threatened fauna species identified in the desktop assessment as potentially occurring. This included Koala, Greater glider, Squatter pigeon and Ornamental snake.	that all field survey effort was completed outside of the Project area. • This assessment provides a good indication of local environmental values and habitat mapping for target species at Phillips Creek downstream from the Project area, therefore providing insight into values which may be indirectly impacted by the Project. • This assessment does not ground truth values within the Project area and does not provide details on environmental values likely to be directly impacted by the Project.	– Detailed tertiary and quaternary assessments (refer to Section 2.2.1.1). – Threatened Ecological Community Assessments within analogous REs to confirm the presence and/ or absence to TECs (refer to Section 2.2.1.4). – Random meander surveys to determine the presence and/ or absence of threatened flora species (refer to Section 2.2.1.3). – Targeted habitat assessments to determine the presence of habitat for threatened flora and fauna species (refer to Section 2.2.2.1) – Targeted surveys for the potentially occurring conservation significant species (refer to Section 2.2.2.3).

Report Title / Date	Data Source & Date of Field Survey Data	Methodologies, Assessments and Survey Effort	Project gap analysis outcomes	Supplementary field methodologies required
		– A total of three (3) Koala, two (2) Squatter pigeon and 19 Ornamental snake and three Greater glider habitat assessments were conducted during the field surveys.		
Saraji Open Cut Extension Project: Environmental Assessment Report (BMA, 2016)	AECOM: 2016 SKM: 2010, 2008, 2007.	The Study area of this assessment was inclusive of both the current Project area and the stretch of the Phillips creek located adjacent to the southern boundary. Survey effort to inform this assessment included: • Targeted flora surveys undertaken in November 2007, November 2008, April 2010 and August 2016. These surveys included targeted surveys to determine the presence/ absence of threatened flora species, quaternary assessments to ground truth vegetation communities and assessments undertaken to map the presence and extent of TECs. – This included two (2) tertiary assessments undertaken in 2016, and two (2) quaternary assessments undertaken in 2007. Following the completion of each quaternary and tertiary assessment, approximately one (1) hectare around the site was searched via a random meander to identify flora species, search for threatened flora species and identify ecotones. – Targeted survey for occurrence of *Dichanthium queenslandicum*. – At Phillips creek, south of the Project area the survey effort included three (3) tertiary assessments and one (1) quaternary assessments undertaken in 2016, three secondary vegetation assessments undertaken in 2010 and two quaternary assessments undertaken in 2007. – Vegetation assessments within the Project area focussed on patches of remnant vegetation. • Comprehensive fauna surveys undertaken in November 2007, April 2010, July 2011 and 2016. These surveys included targeted fauna survey techniques: Elliot trapping, harp trapping, call playback, spotlighting assessments and bird surveys.	• Whilst this assessment provides useful historical data with regard to the occurrence of vegetation communities and threatened species habitat within the Project area and Phillips Creek, a contemporary field survey is required to ground truth the present-day presence of ecological values. • The focus of vegetation and fauna habitat assessments within remnant vegetation resulted in lower survey effort within non-remnant areas.	• A comprehensive field survey specifically targeting remnant and non-remnant vegetation communities within the Project area, including vegetation community stratification and habitat assessments (refer to Section 2.2). • Targeted surveys for the potentially occurring conservation significant species, inclusive of non-remnant vegetation communities (refer to Section 2.2.2.3). • TEC assessments within analogous REs to confirm the presence and/ or absence to TECs (refer to Section 2.2.1.4). • Random meander surveys to determine the presence and/ or absence of threatened flora species (refer to Section 2.2.1.3).

Report Title / Date	Data Source & Date of Field Survey Data	Methodologies, Assessments and Survey Effort	Project gap analysis outcomes	Supplementary field methodologies required
		– Within the Project area, three (3) fauna habitat assessments were undertaken within 2016. This included two located within remnant vegetation situated centrally within the Project area, and one in the northern aspect. – An additional four fauna habitat assessments were undertaken at Phillips creek during 2016. – Two (2) Anabat surveys were undertaken at Phillips creek in 2016. – A targeted survey for the Ornamental snake in January 2010, undertaken within EPC 837, with is located adjacent to the eastern boundary of the Project area. • In addition to the survey effort undertaken within the Project area and at Phillips creek, this assessment included two (2) quaternary assessments (one (1) undertaken in 2016 and one (1) undertaken in 2007), and one (1) habitat assessment (completed in 2016) to the east of the Project area.		

2.2 Field Survey

A five-day field survey was conducted by two ecologists across the Project area from 19th March to 23rd March 2024, inclusive. The intent of the field survey was to field validate the potential ecological (flora and fauna) values identified in previous studies and recent database searches / mapping as documented in the desktop assessment above. The following sections describe the survey techniques employed.

2.2.1 Flora

The field survey approach for validating the relevant floristic ecological values identified in the desktop assessment is illustrated in Figure 2 and described in the following sections.

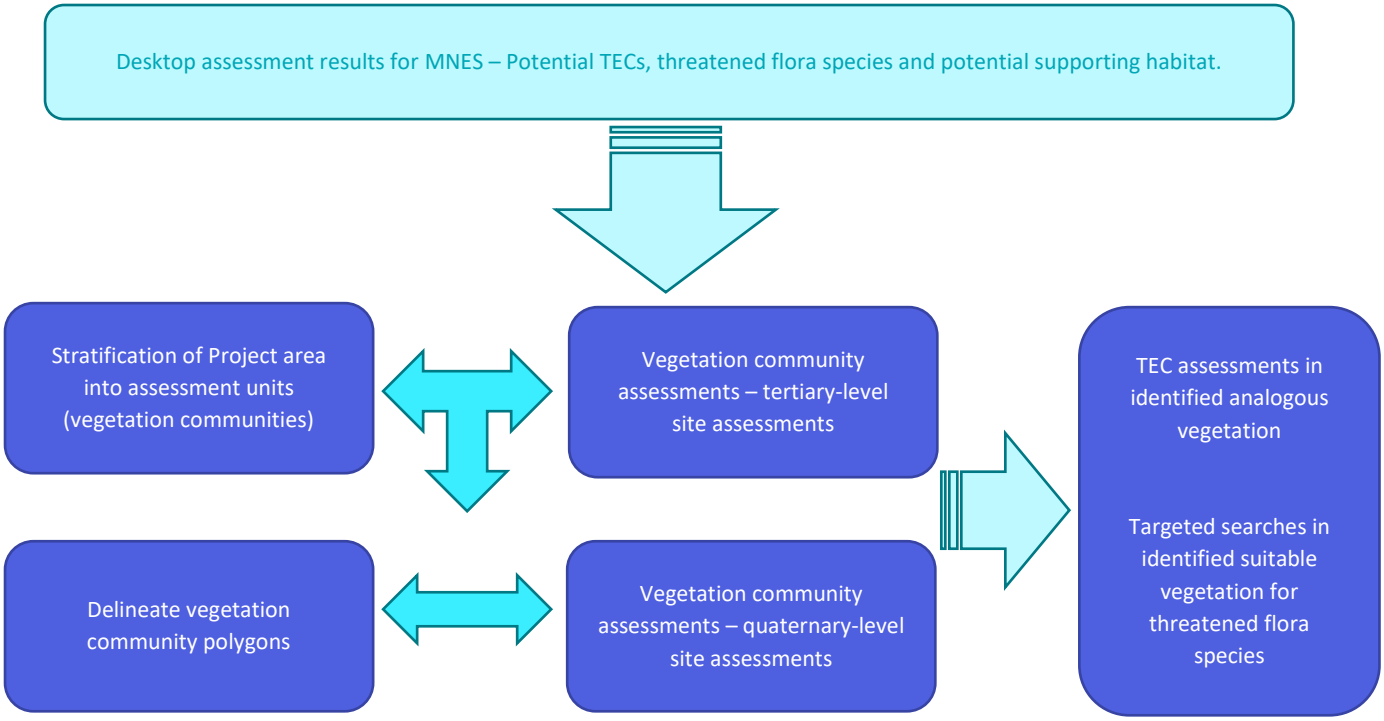


Figure 2: Flora Survey Methodology

2.2.1.1 Vegetation Community Assessment

Validation of ground-truthed vegetation communities within the Project area was undertaken in accordance with the Methodology for Surveying and Mapping Regional Ecosystem and Vegetation Communities in Queensland (Methodology for Surveying and Mapping REs) (Neldner *et al.*, 2022). This involved traversing the Project area undertaking tertiary-level and quaternary-level assessments.

Tertiary-level assessments are undertaken to collect detailed vegetation data to assist with identifying and subsequently stratifying the Project area into unique vegetation community types or assessment units. Vegetation community types or assessment units are based on a combination of unique floristic composition and structure, as well as condition. Aerial imagery, geology mapping, State vegetation mapping as well as previous ground-truthed RE mapping were used in the field to guide the survey locations and survey effort of tertiary-level assessments.

As per a modified form of the Methodology for Surveying and Mapping REs (Neldner *et al.*, 2022), tertiary-level assessments were undertaken within a 10 m by 50 m quadrat, collecting the following information as well as digital photographs:

- Vegetation structure (mean height and cover) and species composition for each structural layer;
- Soil type;
- Landform;
- Disturbance type and severity; and,
- RE classification and remnant status.

RE classification was determined based on the vegetation, soil and landform characteristics identified in the field, geological mapping for the region and the Regional Ecosystem Description Database (REDD). Condition status for woody vegetation was evaluated utilising the definitions of remnant vegetation and HVR vegetation under the VM Act. For the purposes of this assessment, vegetation was mapped into three categories:

- Remnant: woody vegetation that has not been cleared or vegetation that has been cleared but where the dominant canopy has greater than 70% of the height and greater than 50% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy.
- HVR: areas previously cleared or disturbed (e.g., by wildfire) over 15 years ago and containing woody vegetation floristically and structurally consistent with the RE but typically less than 70% of the height and less than 50% density of the RE.
- Regrowth or non-remnant: areas previously cleared or otherwise significantly disturbed and does not meet criteria for remnant or HVR.

Quaternary-level assessments were utilised to delineate the extent and boundaries of the unique vegetation community types identified from the tertiary-level assessment. This was done by confirming dominant species across the vegetation strata's and recording the height and cover of the ecologically dominant layer as per Neldner, *et al.* (2022). RE classification and remnant status were also recorded as part of quaternary-level assessment.

A total of 128 sites including 14 tertiary-level, 14 quaternary-level, and 57 general observation points were undertaken across the Project area (Figure 3).

2.2.1.2 BioCondition Assessments

BioCondition assessments were conducted to provide additional quantitative data at representative sites across the Project area's vegetation communities. This included more quantitative data particularly on introduced species incursion, presence and abundance of large trees and native perennial grass cover. This data will also be utilised at a later date as part of any offset assessment and calculations, if required.

BioCondition assessments were undertaken in accordance with the Queensland BioCondition Assessment Manual (Eyre, et al., 2015) within a 100m x 50m quadrat. The assessment involved the collection of data for 13 attributes, categorised as site-based, including:

- Large trees;
- Tree canopy height;
- Recruitment of canopy species;
- Tree canopy cover (%);
- Shrub layer cover (%);
- Coarse woody debris;
- Native plant species richness for four lifeforms;
- Non-native plant cover;
- Native perennial grass cover (%); and
- Litter cover.

A total of seven (7) BioCondition assessments were conducted across the Project area (Figure 3).

2.2.1.3 Targeted Flora Survey

Targeted flora surveys were undertaken across all sites where tertiary and quaternary assessments, as well as BioCondition assessments, were conducted (refer to Figure 3). These surveys aimed to confirm the presence or absence of threatened flora species identified through the LoO assessment, with particular emphasis on *Dichanthium setosum* and *D. queenslandicum*, due to recent records in the local area.

Vegetation community assessments were first used to validate ground-truthed REs and identify areas of potentially suitable habitat for target species. Habitat suitability was assessed based on species-specific ecological requirements, including land zone classification, soil texture and structure, vegetation composition and condition, and the presence of native grass species. Particular focus was placed on areas with well-structured clay or loamy soils and native ground-layer vegetation indicative of suitable habitat.

Where potentially suitable habitat was confirmed, targeted searches were undertaken using slow-paced, meandering transects (random meanders) to ensure thorough ground-layer inspection. Observations included identification of native and exotic species, assessment of

competition from invasive pasture grasses (e.g., *Cenchrus ciliaris*, *Megathyrsus maximus*), and the presence or absence of indicator species commonly associated with the target threatened flora.

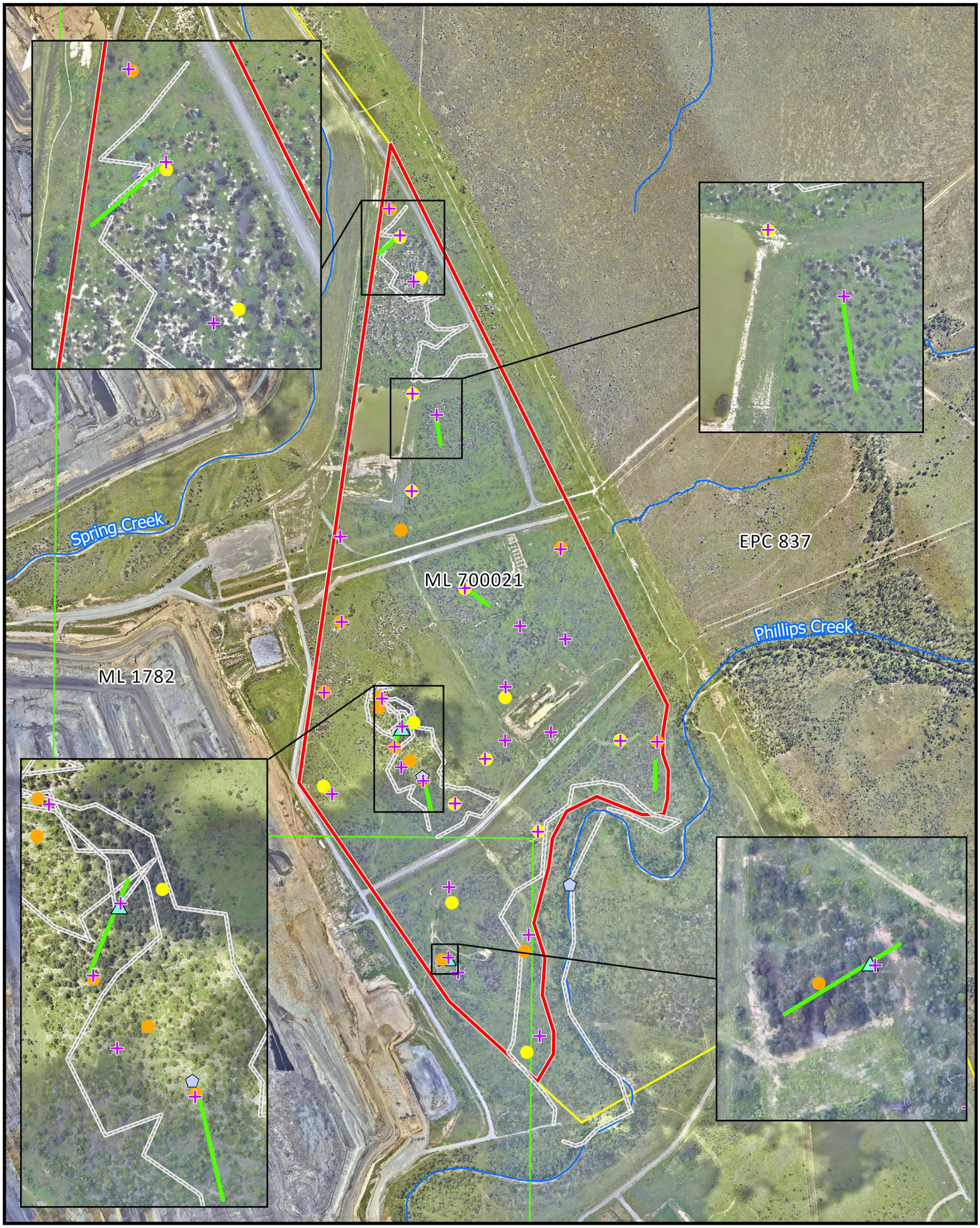


FIGURE 3: SURVEY SITE LOCATIONS

ENGENY

Legend

- General Habitat Assessment
- Call Playback Location (Koala)
- Tertiary Assessment
- Quaternary Assessment
- TEC Assessment
- BioCondition Transect
- Spotlighting Track
- Watercourse
- Roads and tracks
- Project Area
- Mining Lease Boundary
- Exploration Permits (Coal)

0 100 200 300 m

DATA SOURCE
QSpatial, 2024; Data used is licensed under a Creative Commons Attribution 4.0 International Licence Engeny, 2024; Data collected by Engeny during field survey.

2.2.1.4 Threatened Ecological Community Assessments

TEC assessments were undertaken across the Project area, where tertiary-level and quaternary-level assessments identified vegetation communities analogous to the TECs identified from the desktop assessment. This included:

- Brigalow (*Acacia harpophylla* dominated and co-dominated) TEC (Brigalow TEC).

TEC assessments involved confirming whether the identified analogous vegetation communities met the key diagnostic and condition threshold criteria as described for this TEC in the relevant Commonwealth Approved Conservation Advice or Species Profile and Threat Database (SPRAT) as outlined in Table 2. A total of two (2) TEC assessments were undertaken across the Project area (Figure 3).

TABLE 2: TEC CRITERIA AND THRESHOLDS UTILISED IN TEC ASSESSMENTS ACROSS THE PROJECT AREA

TEC	Key Diagnostic Criteria	Condition Thresholds
Brigalow TEC	• Dominance or co-dominance of Brigalow; AND • meets the Queensland REDD description of 16 Qld REs listed for the TEC; AND / OR • age of community, generally > 15 year regrowth.	• Non-native perennial cover <50% of total vegetation cover in a patch (sampled 0.5 ha) that is representative of the area; AND • patch size ≥ 0.5 ha.

2.2.2 Fauna

The field survey approach for validating the relevant fauna ecological values identified in the desktop assessment is illustrated in Figure 4 below and described in the following sections.

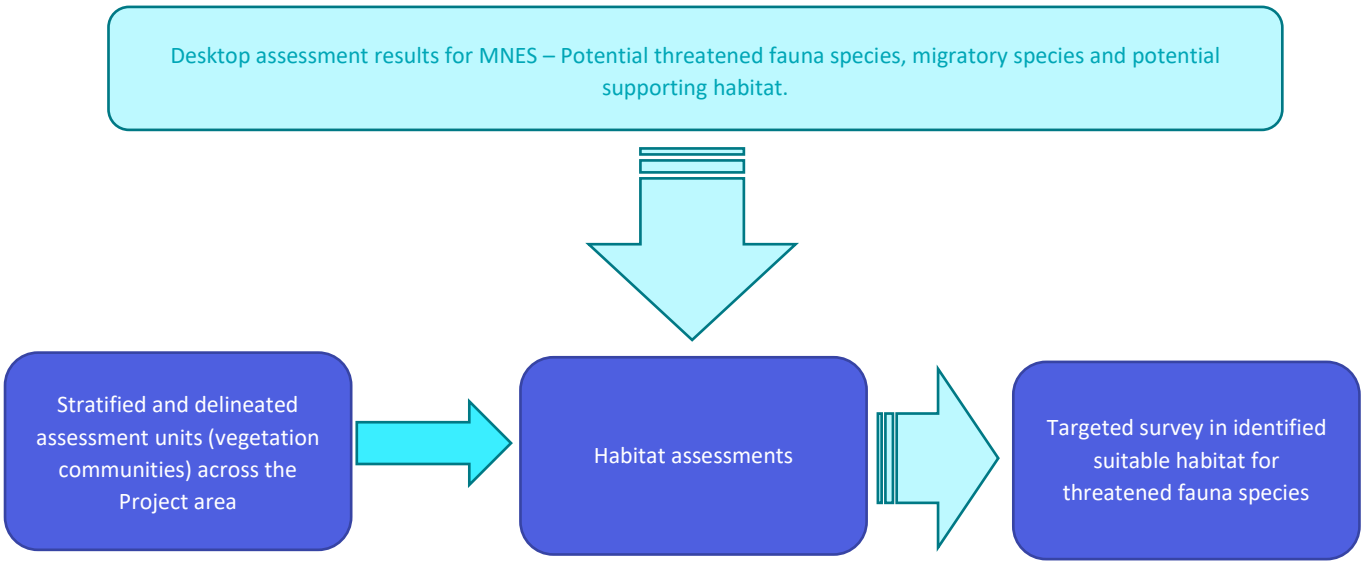


Figure 4: Fauna Survey Methodology

2.2.2.1 Habitat Assessments

Habitat assessments were undertaken to characterise the fauna habitat values supported by each unique vegetation community type identified in the Project area. These assessments provide an indication of likely fauna utilisation (breeding, foraging and dispersal), and suitability for fauna species, including conservation significant fauna. Habitat attributes recorded during the assessment included:

- Vegetation structure, including groundcover and composition;
- Presence, abundance and diameter (small <10cm, medium 10-20cm, large >20cm) of tree hollows within 0.5 ha plots;
- Presence, abundance and diameter (small <10cm, medium 10-20cm, large >20cm) of hollow logs within 0.5 ha plots;
- Presence and abundance of stags within 0.5 ha plots;
- Flowering or fruiting plants;

- Presence and abundance of woody debris such as habitat logs and ground timber;
- Cover and depth of leaf litter;
- Rocky habitat such as surface rocks, boulders, crevices, overhangs and caves;
- Presence and type of water (both permanent and ephemeral);
- Disturbance from invasive weeds/pests;
- Other disturbances such as grazing pressure, clearing, thinning or fire; and,
- Any other significant habitat features, or values present such as mistletoe, gilgai, soil cracks, Koala food trees, decorticating bark.

The presence and abundance of tree hollows was determined via inspections of the presence of dead limbs, trunk or branch scars and hollows from the ground level. This included both live trees and stags. Whilst confirmation of whether these features actually contained hollows was not undertaken (i.e. through the use of camera scopes, etc), it is considered sufficient and more likely a conservative approach for estimating hollow presence and abundance. This data was further supplemented through the collection of large tree data as part of the BioCondition assessments (refer to Section 2.2.1.2).

A total of 34 habitat assessment sites were conducted across the Project area (Figure 3).

2.2.2.2 Tree Hollow Assessment

Tree hollow presence and abundance were assessed from ground level and included both live trees and stags. Trees were assessed for visible indicators of hollows, such as entrance holes, branch scars, cavities, and dead limbs. Hollow diameters were estimated based on visual inspection and categorised as small (<10 cm), medium (10–20 cm), or large (>20 cm).

In addition to visual indicators, tree size was used as a supporting metric to assess the likelihood of hollow presence. Numerous studies have demonstrated a strong positive correlation between tree diameter and the probability of hollow formation in eucalypt species (Gibbons & Lindenmayer 2002; Mackowski 1984; Lindenmayer et al. 1991). Large, mature trees are more likely to contain hollows suitable for hollow-dependent fauna, particularly arboreal mammals, such as the Greater glider and bats, and hollow-nesting birds.

Accordingly, survey effort specifically targeted large trees and trees with structural features typically associated with hollow formation, such as basal swelling, dead limbs, and fire scars. Observers prioritised mature eucalypt species where diameter at breast height (DBH) exceeded thresholds commonly associated with hollow development (e.g. >50 cm DBH, per Gibbons & Lindenmayer 2002). This approach provided a precautionary and ecologically informed method of identifying likely hollow-bearing trees within the Project area.

While no tree-climbing or internal inspection techniques were employed, the combination of visual indicators and tree size provides a reliable, conservative estimate of potential hollow availability at a landscape scale. The approach aligns with standard ecological survey methodology for broad-scale habitat assessments and is supported by peer-reviewed literature linking tree size and external structural features to the likelihood of hollow presence. It is commonly applied in environmental impact assessments to evaluate potential habitat for hollow-dependent fauna where direct hollow inspection is not feasible.

Habitat data were also supplemented by large tree metrics recorded during BioCondition assessments (refer to Section 2.2.1.2), further supporting the assessment of structural habitat quality.

2.2.2.3 Targeted Survey

A number of target fauna species identified from the desktop assessment and literature review, were specifically surveyed to detect presence and abundance across the Project area. The identified target species were:

- Ornamental snake (*Denisonia maculata*).
- Squatter pigeon (*Geophaps scripta scripta*).
- Koala (*Phascolarctos cinereus*).
- Greater glider (southern and central) (*Petauroides volans*).

Fauna survey methods to detect these target species were in accordance with the species-specific Commonwealth survey guidelines, specified in Table 3, and other guidance material, as well as the Queensland Terrestrial Vertebrate Fauna Survey Guidelines (Eyre *et al.*, 2022a) and included:

- Roaming/meandering diurnal bird surveys throughout the survey;
- Spotlighting surveys, including call playback; and,

- Scat and sign searches.

A description of these surveys, survey effort achieved during the field survey and compliance with Commonwealth survey guidelines is outlined in Table 3. Location of spotlighting transects, and call playback locations, are also shown in Figure 3.

TABLE 3: TARGETED SURVEY METHODS, SURVEY EFFORT AND COMPLIANCE WITH SURVEY GUIDELINES

Fauna Survey Technique	Description	Target Species	Survey Effort	Survey Guideline & Requirements	Assessment of Survey Adequacy (Method, Effort and Timing)	Compliance with Guidelines
Bird Surveys	Roaming/meandering bird surveys using both visual and auditory identification.	**Squatter pigeon**	Approximately 32 person-hours over 4 days. Survey effort focused on flushing surveys, with additional effort including active searches and road driving. Given the area of potential habitat identified for this species (161 ha), 32 hours of flushing-based effort exceeds the minimum recommended survey effort.	**Survey guidelines for Australia's threatened birds (DEWHA, 2010)** The guidelines recommend the following survey methods and effort for Squatter pigeon (southern): • road driving during day (driving transects); • active searches: 15 hours over 3 days in areas <50 ha; • flushing surveys: 10 hours over 3 days in areas <50 ha; and • waterhole searches: survey effort not specified. **Seasonal considerations** No evidence of long-distance seasonal movements or seasonal considerations required.	**Adequate** The survey included flushing surveys as the primary method, which is considered effective and recommended for detecting this species. The total effort (32 person-hours) exceeded the minimum recommended survey time and was suitable for the 161ha survey area. Timing was appropriate, with no known seasonal restrictions.	**Compliant** Survey methods, effort, and timing are consistent with guideline recommendations and considered appropriate to detect the species within the Study Area.
Spotlighting Surveys	Roaming / meandering nocturnal searches were completed on foot in suitable habitat using headtorches, hand-held spotlights and binoculars for viewing arboreal species.	**Greater glider** **Ornamental snake** **Koala**	**Koala**: Three-night spotlighting survey (~20 person-hours) covering ~15 ha of identified koala habitat (eucalypt woodland). Surveys were done at night using handheld spotlights, with observers moving through the area (random meander) to locate koalas by	With consideration to Koala and Greater glider, no species-specific survey guidelines exist; however, both species are known to be readily detectable by spotlighting. The following spotlighting methodology outlined in the **Terrestrial Vertebrate Fauna Survey Guidelines for Queensland** (Eyre *et al.*, 2022) has been used:	**Adequate** **Koala:** Review of Koala habitat assessment criteria and methods (Youngentob, Marsh and Skewes, 2021) confirm that spotlighting is one of several accepted techniques for detecting koalas. While there is no fixed effort requirement in guidelines for koala surveys, conducting repeated night searches in ground truthed habitat is	**Compliant** Spotlighting surveys were conducted in line with relevant survey guidelines and best practices for each target species. For the **Koala,** spotlighting was completed across 15 ha of eucalypt woodland habitat over three nights during the peak detection period (September to January). Although

Fauna Survey Technique	Description	Target Species	Survey Effort	Survey Guideline & Requirements	Assessment of Survey Adequacy (Method, Effort and Timing)	Compliance with Guidelines
			eye-shine or silhouette in trees. **Greater glider:** Three-night spotlighting survey (~20 person-hours total) conducted via random meander searches across ~15 ha of potential habitat containing eucalypt woodland communities with hollow-bearing trees identified as present. Surveys for this species were done concurrently with other target species over the same nights. **Ornamental snake:** Three-night targeted spotlighting survey (~20 person-hours total) across ~133 ha of identified Ornamental Snake habitat. Surveys focused on transects through wet gilgai depressions and riparian zones and also included random meander searches to cover a broad area. Effort was concentrated in cracking clay soil areas where frogs were active.	• spotlighting transects (100 m x 100 m) per 30-person minutes. Survey effort not specified. **Seasonal considerations** Greater glider is known to have high site fidelity with relatively small home ranges. There are no seasonal considerations for this species. With consideration of the Ornamental snake, the **Survey Guidelines for Australia's Threatened Reptiles** (DSEWPC, 2004) and the **Draft Referral Guidelines for the Nationally Listed Brigalow Belt Reptiles** (DCCEEW, 2023) were both reviewed to determine suitable survey techniques. Recommended spotlighting methodology include: • spotlighting suitable gilgai habitat whilst frogs are active, including targeting water-inundated gilgais, wetlands, riparian habitats and the surrounding environment (e.g., roads) and large logs between dusk and early morning hours; • survey over a minimum of 1.5 person hours per hectare for habitats of average complexity per targeted species; • survey over a minimum of 3 nights. **Seasonal considerations**	considered good practice. The 3-night effort (total 20 hours) provided thorough survey coverage, increasing the likelihood identifying the species. Importantly, surveys were carried out during the koala's breeding season (approximately spring–summer), which is the optimal period for koala detection. **Greater glider:** No species-specific survey guideline exists for the Greater glider. However, nocturnal spotlighting in suitable eucalypt woodland is an accepted survey method for this species. The survey's coverage (~15 ha of habitat) and effort (3 nights) are appropriate given the Greater glider's high site fidelity and year-round detectability (no strong seasonal constraints). Multiple night surveys maximize the chance of detecting any resident gliders, as individuals often remain in a home range. **Ornamental snake**: Survey guidelines for the Ornamental Snake (DSEWPC 2004; DCCEEW 2023) recommend nocturnal spotlight searches in gilgai wetlands and riparian habitats when prey are active. They advise a minimum of ~1.5 person-hours per hectare in average complexity habitat and at least 3 nights of survey for reliable	no Koalas were recorded, the method is one of several accepted techniques under current guidance, and the survey timing and effort are suitable for detecting the species. For the **Greater glider**, surveys targeted suitable remnant eucalypt woodland containing hollow-bearing trees and were conducted over three nights using spotlighting, an accepted method for this species. While no individuals were recorded within the Project area, one was observed in adjacent habitat at Phillips Creek. The effort and timing are consistent with accepted approaches for detecting this species, which has no prescribed minimum effort. For the **Ornamental snake**, spotlighting was undertaken over three nights in suitable gilgai and cracking clay habitats during a period of high frog activity and surface water presence, consistent with the guidelines (DSEWPC 2004; DCCEEW 2023). The approach focused effort in core microhabitats and resulted in the detection of two individuals within the Project area. The method, timing, and habitat targeting align with survey recommendations. Overall, the spotlighting program is compliant with all relevant species-

Fauna Survey Technique	Description	Target Species	Survey Effort	Survey Guideline & Requirements	Assessment of Survey Adequacy (Method, Effort and Timing)	Compliance with Guidelines
				No survey methods are known to reliably detect the Ornamental snake during dry weather/seasons. Surveys should be undertaken during a period where water is present within gilgai and frogs are active as a result. The Draft Referral Guidelines for the Nationally Listed Brigalow Belt Reptiles indicates that surveys should be undertaken between late September to March. With consideration to the Koala, the Review of Koala habitat assessment criteria and methods (Youngentob, Marsh and Skewes, 2021) outlines various survey methods for detecting Koala presence, which includes: • diurnal transect and point surveys; • spotlighting; • trained Koala detection dogs; • mark-resight and mark-recapture; • thermal detection drones; • radio tracking; • camera traps; • scat surveys; • call playback; and • passive acoustics. No specific survey effort requirements are outlined.	detection. Our survey met the recommended survey duration (3 nights) and was timed during warm, humid conditions (after rainfall), which align with guidance to survey on nights of high frog activity. The total effort (20 hours) spread across 133 ha equates to ~0.15 person-hours/ha overall; however, in practice the team concentrated search effort in high-quality patches (water-inundated gilgais, creeks, and adjacent logs/roadways) rather than uniformly across all hectares. This targeted approach maximized encounter rates in the most likely habitats.	specific guidelines and recommendations.

Fauna Survey Technique	Description	Target Species	Survey Effort	Survey Guideline & Requirements	Assessment of Survey Adequacy (Method, Effort and Timing)	Compliance with Guidelines
				Seasonal considerations Optimal time period for direct observation surveys is between September and January, as this is when Koala activity is generally at its peak and resident breeding females with back-young are most easily observed.		
Call Playback	An audio recording of a Koala mating call was played using a portable speaker. After playing the recording for 3 minutes, field staff listened for return calls or movement for two minutes and then spotlighted surrounding trees.	**Koala**	Two call playback sessions were undertaken across two nights in different habitat areas containing potentially suitable Eucalypt woodland. Playback surveys were conducted in conjunction with spotlighting and opportunistic scat searches.	Referral guidance for Koala do not prescribe specific survey effort requirements. This is to be dependent on the size and nature of the action and the availability and quality of information already available. However, no single survey method is considered suitable in all situations. **The Review of Koala habitat assessment criteria and methods** (Youngentob, Marsh and Skewes, 2021) outlines various survey methods for detecting Koala presence, which includes: • diurnal transect and point surveys; • spotlighting; • trained Koala detection dogs; • mark-resight and mark-recapture; • thermal detection drones; • radio tracking; • camera traps;	**Adequate** Call playback was conducted alongside spotlighting and scat searches across areas of suitable Eucalypt woodland during the recommended seasonal window (September to January), when Koala detectability is maximised. While no Koalas were detected, the combination of multiple complementary methods across multiple nights improves detection probability and aligns with current best-practice recommendations. The method and timing are appropriate for assessing presence/absence in the project context.	**Compliant** The survey effort is consistent with the guidance in **The Review of Koala habitat assessment criteria and methods** (Youngentob, Marsh and Skewes, 2021), which supports the use of multiple complementary techniques, including call playback, to detect Koalas. Playback sessions were conducted over two nights in separate locations within suitable habitat during the peak activity season. These were undertaken in conjunction with repeated spotlighting and opportunistic scat searches, forming a comprehensive, multi-method survey approach. The timing, methods, and integration of playback into the broader survey effort are suitable and compliant with referral guidance for supporting impact assessment.

Fauna Survey Technique	Description	Target Species	Survey Effort	Survey Guideline & Requirements	Assessment of Survey Adequacy (Method, Effort and Timing)	Compliance with Guidelines
				• scat surveys; • call playback; and • passive acoustics. **Seasonal considerations** Optimal time period for direct observation surveys is between September and January, as this is when Koala activity is generally at its peak and resident breeding females with back-young are most easily observed. Direct observation surveys conducted outside of this period must take into account the potential for lower Koala activity (reduced detectability) and other relevant seasonal considerations. Presence/absence surveys in the inland context, conducted during dry periods, should be centred on riparian areas, upper/mid-slope areas and other dry period refugia in order to maximise detectability.		

2.2.3 Nomenclature

Taxonomic nomenclature used for the description of floral species is according to 2023 Census of the Queensland Flora and Fungi (Bean, 2024). Introduced flora species are signified within this report by an asterisk (*). Various resources and field guides were used for the identification and description of floral and fauna species (Lester, 2008; Menkhorst and Knight, 2011; Anderson, 2016; Wilson and Swan, 2021).

2.2.4 Survey Limitations

2.2.4.1 Data Accuracy

Vegetation composition across communities can have localised changes, including species dominance in the canopy layer. In addition, assessing landform at a localised scale without context of the broader landscape formation can reduce the accuracy of land zone classification. Attempt has been made to assess vegetation and landform patterns as accurately as possible within the accessible area for the field survey. This was done by utilising both field-based information, interpreting aerial imagery as well as considering previous ground-truthed vegetation mapping.

Field survey data collection to inform mapping was also conducted using a hand-held device with aerial imagery. The accuracy of these devices is generally <5 m and considered appropriate for the purpose of this assessment.

2.2.4.2 Detectability

The general limitations to this ecology assessment conducted in the Project area includes the following:

- Species with large home ranges may not be present within the portion of their home range that overlaps the Project area during the survey period.
- The difficulty in detecting certain species during the survey period (e.g., cryptic species and species present in the Project area in low densities).
- Biological factors such as sex, age-class, and breeding biology which may influence species' habitat use and detectability during different times of year.

For those species not detected and with records nearby, habitat assessments were undertaken to determine the value of the Project area to support such species. The absence of a species was not assumed because it was not detected.

A flora assessment has inherent limitations associated with the variability of vegetation communities across a survey location, and changes to the detectability and presence of species over time. Field studies undertaken over just one survey cannot always account for 100% of potential floral diversity present across a survey location. Notwithstanding, this is not the first ecological survey of the area, with previous survey and assessment results also being available.

2.2.4.3 Seasonality

The Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (Eyre *et al.*, 2022) identifies a suitable survey window for the Brigalow Belt as between March and mid-May, as temperatures decrease but prior to the onset of cold winter nights. This timing coincides with an active period including dispersal and migration of many fauna species as well as grass seeding, which is important for granivores (i.e., the Squatter pigeon).

This field survey was undertaken in late March and so met the recommended survey time for the Brigalow Belt region. Additionally, this survey occurred during a period following rainfall which resulted in inundation of gilgai. This resulted in the occurrence of a number of water dependent species including frogs and predatory snakes (i.e., the Ornamental snake).

Additionally, the conditions were conducive to most flora species identification and the detection of floral diversity across most vegetation communities within the Project area. It is considered that the field survey timing, and the environmental conditions of the period preceding the survey, were appropriate for the identification of target flora and fauna species.

2.3 Data Analysis

2.3.1 Likelihood of Occurrence

A LoO assessment for conservation significant species identified during the preliminary desktop review was undertaken following the completion of the field survey. The assessment considered known habitat and ecological requirements of the species identified in database results and the vegetation and habitat resources identified during the field survey.

Each species was assessed against the categories defined below.

- **Known**: Species was positively identified and recorded in the Project area during the field surveys; or previous, reliable records occur within the Project area.
- **Likely**: Species was not recorded during the field surveys or previously, however there are known records within the nearby surrounding area and suitable habitat exists in the Project area.
- **Potential**: Species was not recorded during the field surveys or previously, however known records occur in the surrounding area and habitat in the Project area is marginal or degraded.
- **Unlikely**: Habitat in the Project area might be marginally suitable; however, species was not recorded during the field surveys, and no known records of the species exist within the surrounding area.
- **Does not occur**: The species will not occur within the Project area (e.g., marine species or seabirds for terrestrial sites).

2.3.2 GIS Analysis and Mapping

Spatial data collected during the field survey was imported into ArcGIS Pro (Version 3.3). Vegetation community boundaries were mapped using spatial data collected in the field to produce ground-truthed vegetation mapping. Vegetation mapping was attributed with RE classification, vegetation remnant status (remnant, HVR, regrowth or non-remnant) and conservation status.

A Digital Elevation Model (DEM), which was a ground-only elevation model, was generated and interrogated to facilitate clear identification of the landforms within the Project area, specifically including areas of deep gilgai. Results from this DEM, combined with the mapped ground-truthed vegetation mapping following the field survey, were utilised to develop a 'mapping criteria' for each conservation significant species identified as known, likely or potentially occurring, as a result of the LoO assessment.

This 'mapping criteria' is based on the habitat information outlined in the relevant Species Profile and Threats Database (SPRAT), as well as species recovery plans (where available), referral guidelines and approved conservation advice. For the relevant species, the habitat definitions from the Central Queensland Threatened Species Habitat Descriptions (Kerswell *et al.*, 2020) produced for BHP were utilised for categorising and mapping threatened species habitat.

2.4 Impact Assessment

An impact assessment on field validated ecological values within the Project area was completed for all Project activities. The full scope of the Project was considered as well as the potential direct and indirect impacts that may arise from the Project. In determining the level of general ecological impact, the following four (4) characteristics of the potential impact were assessed:

- Frequency: how often the impact will occur, if it will be a once off impact or a re-occurring impact.
- Duration: how long the effects of the impact will last, will they be temporary or permanent and are there opportunities for recovery and rehabilitation.
- Magnitude: what is the extent of the impact, is the impact localised or will the effects occur at a larger spatial or population scale.
- Context: what is the receiving environment, will it be sensitive to change and impact, what proportion of the value will remain unaffected by impact.

For all MNES evaluated as a potential or known occurrence, significant impact assessments were undertaken in accordance with the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines: Matters of National Environmental Significance* (Department of the Environment, 2013b). A 'significant impact' is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts. Significance is tested through criteria stipulated in the

guideline, which are tailored to each MNES and for some values, the conservation status of the MNES. Some key definitions in the criteria utilised in the assessment include:

- 'Habitat critical to the survival of a species', which refers to areas that are necessary:
  - For activities such as foraging, breeding, roosting, or dispersal.
  - For the long-term maintenance of the species (including the maintenance of species essential to the survival of the species, such as pollinators).
  - To maintain genetic diversity and long-term evolutionary development; or,
  - For the reintroduction of populations or recovery of the species.
- 'Important population', which is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:
  - Key source populations either for breeding or dispersal.
  - Populations that are necessary for maintaining genetic diversity; and/or,
  - Populations that are near the limit of the species range.

To assist with the significant impact assessment as well as the application of these definitions for each specific MNES evaluated as a potential or known occurrence within the Project area, the following information sources were utilised and are referenced further in Section 4.2:

- Conservation Advice for target threatened species, as well as the SPRAT (Department of the Environment, 2024b);
- Draft Referral guidelines for the nationally listed Brigalow Belt reptiles (DCCEEW, 2023);
- National Recovery Plan for the Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) (DAWE, 2022b);
- A review of Koala habitat assessment criteria methods (Youngentob, Marsh and Skewes, 2021);
- Guide to national protected species significantly impacted by paddock tree removal (draft) (DoEE, 2021);
- Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*) (DoEE, 2017);
- Threat abatement plan for predation by feral cats (Department of the Environment, 2015);
- Threat abatement plan for competition and land degradation by rabbits (DoEE, 2016); and
- Threat abatement plan for predation by the European red fox (DEWH, 2008).

2.5 BHP Ecological Survey Procedure

The *BHP Coal Ecological Survey Procedure* (BMA, 2020) was followed for all stages of the Project to ensure that data was collected and presented in a standardised and consistent manner. This included:

- Desktop assessment;
- Field assessment, including field survey design, and methodology;
- Data analysis, including the completion of the BHP GIS proforma templates, and;
- Reporting.

3. ECOLOGICAL VALUES

3.1 Regional Context

3.1.1 Bioregion and Subregion

The Project area occurs within the Brigalow Belt bioregion, which covers approximately 365,281 km^2 from central Queensland through to the Queensland and New South Wales border. The sub-region of the Project area is Northern Bowen Basin situated in the Brigalow Belt North, which covers 13,169.6 km^2 and has land types ranging from undulating to rugged ranges and alluvial plains. The vegetation communities generally dominant within this sub-region are acacia open forests and eucalypt woodlands.

Broadscale clearing has extensively occurred across the bioregion, with the main rural land use being cattle grazing and pastoral leases as well as coal mining being the major regional economic driver. Given the land uses, the condition of the native vegetation has been impacted from agriculture, mining, weeds, and feral animals (DES, 2018; Trent *et al.*, 2018).

3.1.2 Climate

The Moranbah region is a semiarid climate with predominantly summer rainfall which averages 590 mm. Summer temperature ranges are 21.1 ^{0}C to 34 ^{0}C whilst winter temperature ranges are 9.9 ^{0}C to 23.7 ^{0}C (BoM, 2024).

3.1.3 Topography and Geology

The landforms across the Moranbah region consist of gently undulating plains, plains and hill slopes. The elevation of Moranbah is 249 m with the maximum elevation of the Moranbah region measuring at 550 m on the Carborough Range approximately 30 km east of the Project area (Geoscience Australia, 2020). Moranbah sits south of the Carborough Range (east) and Denham Range (west) which influences water to drain to the topographic low areas of the region, the Isaac River. Watercourses drain south into the Isaac River until its confluence with Mackenzie River near Mt Mackenzie (DoR, 2023c). The Project area reflects the topography of the region and predominantly consists of gently undulating rises and plains, with Phillips Creek running adjacent to the southern boundary of the Project area (Figure 1).

The geology of the region is a product of fluvial and lacustrine sediment as well as volcanic deposition events The lithology of the Project area has been identified as alluvium, as described in Table 4.

TABLE 4: GEOLOGY OF PROJECT AREA

Geological Unit	Rock Type	Location	Lithology[1]
TQa	Alluvium	The larger portion of the Project area, comprising the northern and central sections.	Locally brown to dark mottled, poorly consolidated sand, silt, clay, minor gravel; high-level alluvial deposits.
Qa-QLD	Alluvium	The southern aspect of the Project area, associated with Phillips Creek.	Clay, silt, sand, and gravel; flood-plain alluvium.

3.2 Vegetation Communities

The DoR RE mapping and pre-clear RE mapping, and DCCEEW PMST report was reviewed as part of the desktop assessment to identify the presence of vegetation within the Project area that may be analogous to potentially occurring TECs, which included:

- Brigalow TEC;
- Natural Grasslands of the Queensland Central Highlands and northern Fitzroy Basin;
- Poplar Box Grass Woodland on Alluvial Plains;
- Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions; and,
- Weeping Myall Woodlands.

Out of the five (5) identified TECs, vegetation potentially analogous to only one (1) TEC was identified within the Project area from the desktop assessment. This included areas of vegetation that aligned with REs that are listed specifically for the Brigalow TEC.

Field validation surveys within the Project area confirmed the presence of Brigalow TEC listed REs, namely RE11.3.1 and RE11.4.9 (Table 5) as well as a large extent of Brigalow dominated regrowth (Figure 5). Despite the presence of two (2) REs often indicative of this TEC and Brigalow dominated regrowth vegetation, further field assessment determined that the areas did not meet the key diagnostic criteria and/or condition thresholds to be considered the TEC. No other TECs were found to occur within the Project area. This is further discussed in Section 4.1.

TABLE 5: RES ANALOGOUS TO TECS IDENTIFIED WITHIN THE PROJECT AREA

EPBC Act TEC	EPBC Act Status	Analogous RE in Brigalow Belt Bioregion	Confirmed Analogous REs in the Project area
Brigalow TEC	Endangered	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, 11.12.21.	11.3.1, 11.4.9

In addition to identifying potential TECs, the DoR RE mapping and pre-clear RE mapping was also reviewed to identify the general vegetation values across the entirety of the Project area. The desktop assessment indicated the dominance of disturbed, non-remnant vegetation across the Project area, which was confirmed during the field survey along with the presence of mature but isolated vegetation patches.

Based on the field survey results and in accordance with the Queensland Methodology Surveying and Mapping Regional Ecosystem and Vegetation Communities in Queensland (Neldner *et al.*, 2022), the following six (6) vegetation communities were delineated across the Project area:

- *Eucalyptus populnea* open forest on sand plains (RE11.5.3 – remnant);
- *Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains (RE11.4.9 – remnant);
- *Acacia harpophylla* and/or *Casuarina cristata* low open forest on alluvial plains (RE11.3.1 – HVR);
- *Eucalyptus populnea* low open forest on sand plains (RE11.5.3 – HVR);
- Regrowth Brigalow (non-remnant); and,
- Disturbed and impacted areas with grass and forb regrowth lacking woody vegetation (non-remnant).

Non-remnant / regrowth vegetation communities within the Project area were found to equate to 190.80 ha (86.28%) of the total area. Whereas vegetation communities of remnant and HVR condition were found to total a combined area of approximately 14.02 ha (6.34%) of the Project area.

The extent, condition and dominant floristic composition of each vegetation community validated in the field is described below in Table 6 and illustrated on Figure 5. Vegetation communities mapped from previous assessments along Phillips Creek and surrounding areas are also shown on Figure 5.

TABLE 6: FIELD-VALIDATED VEGETATION COMMUNITIES WITHIN THE PROJECT AREA

RE	Vegetation Community	Description	BD Status[1] / VM Class[2]	Area (ha)	Image
11.5.3 – Remnant	*Eucalyptus populnea* open forest on sand plains	This vegetation community occurs centrally within the Project area, on a gently undulating plain. The geology is old alluvial deposits, and the soil consists of brown silt loam. An emergent layer is not present within this community. This community contains a mid-dense (35% cover) canopy tree layer of medium height (18.0 m) dominated by *Eucalyptus populnea.* This community is co-dominated by *E. melanophloia* and *Corymbia clarksoniana*, with *C. dallachiana* and *Casuarina cristata* present as sub-dominant species. The mid-story tree layer has been identified as having a sparse (25% cover) structure which is approximately 10.0 m tall. The understory tree layer is mid-dense (40% cover) and approximately 5.0 m tall. This stratum is dominated by *E. populnea* with *Acacia salicina, Alphitonia excelsa, Alectryon oleifolius* and *Casuarina cristata* present as sub-dominant species. The shrub stratum of this community consists of a mid-dense (45% cover) shrub layer dominated by *Carissa ovata* and *Eremophila mitchellii*, approximately 2 m tall. *Grewia latifolia* and *Ehretia membranifolia* are present as sub-dominant species in this stratum. Ground cover is high (90%) and primarily consists of *Cenchrus ciliaris** and *Chloris gayana*, with Heteropogon contortus, Themeda triandra, Panicum effusum* and *Melinis repens** occurring as sub-dominant ground species. Disturbance to the integrity of this community has been recorded as a result of historic fragmentation, surrounding mining activities and the incursion of invasive flora species (generally within the ground stratum).	NCAP / LC	10.87	 

RE	Vegetation Community	Description	BD Status[1] / VM Class[2]	Area (ha)	Image
11.4.9 – Remnant	*Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains	This vegetation community occurs centrally within the Project area, adjoining the boundary of the remnant patch of RE11.5.3, on a gently undulating plain. The geology is old alluvial deposits, and the soil consists of dark clay loam. This vegetation community does not contain an emergent layer. This community contains a mid-dense (50% cover) canopy tree layer of medium height (13.0 m) heavily dominated by *Casuarina cristata* which has replaced *Acacia harpophylla* in the overstorey. *Eucalyptus populnea* is present within this stratum as a sub-dominant species. A mid-story tree layer is also present and dominated by *Terminalia oblongata*. *C. cristata* and *E. populnea* are present as sub-dominant species. The mid-story tree layer has been identified as having a mid-dense (30% cover) structure and is approximately 8.0 m tall. The shrub stratum of this community is sparse (20% cover) and is dominated by *Carissa ovata,* with species sub-dominance of *Enchylaena tomentosa, Dodonaea viscosa* and S*olanum parvifolium*. This stratum is approximately 2 m tall. Ground cover is low (25%) and primarily consists of *Megathyrsus maximus**, *Cenchrus ciliaris**, *Heteropogon contortus,* with *Themeda triandra* and *Bothriochloa pertusa** present as sub-dominant species. Disturbance to the integrity of this community has been recorded as a result of fragmentation and the incursion of invasive flora species (generally within the ground stratum).	NCAP / LC	2.73	 

RE	Vegetation Community	Description	BD Status[1] / VM Class[2]	Area (ha)	Image
11.3.1 – HVR	Acacia *harpophylla* and/or *Casuarina cristata* low open forest on alluvial plains	This vegetation community occurs towards the southern aspect of the Project area on a gently undulating floodplain of Phillips Creek. The geology is alluvial, and the soil consists of brown silt loam. This vegetation community does not contain an emergent layer. This community contains a mid-dense (30% cover) canopy tree layer of medium height (9.5 m) heavily dominated by C*asuarina cristata.* Species in this stratum determined to be sub-dominant include *Acacia harpophylla* and *Eucalyptus cambageana*. A mid-story tree layer is also present and dominated by *Terminalia oblongata*. Sub-dominant species within this community have been identified as *Acacia harpophylla, Acacia salicina, Eremophila mitchellii* and *Lysiphyllum carronii*. The mid-story tree layer has been identified as having a mid-dense (30% cover) structure which is approximately 8.0 m tall. The shrub stratum of this community is sparse (20% cover) and is dominated by *Carissa ovata,* with species sub-dominance of *Enchylaena tomentosa* and *Carissa ovata*. This stratum is approximately 2 m tall. Ground cover is relatively dense (50%) and primarily consists of *Megathyrsus maximus*, Cenchrus ciliaris*, Bothriochloa pertusa** and *Chloris gayana**. Disturbance to the integrity of this community has been recorded as a result of fragmentation (this is a small patch of mature regrowth vegetation isolated by large areas of non-remnant vegetation communities), surrounding mining activities and the incursion of invasive flora species (generally within the ground stratum).	E/ E	0.13	 

RE	Vegetation Community	Description	BD Status[1] / VM Class[2]	Area (ha)	Image
11.5.3 – HVR	*Eucalyptus populnea* low open forest on sand plains	This vegetation community occurs as a small, isolated patch approximately 255 m north of the remnant patch of RE11.5.3, on a gently undulating plain. The geology is old alluvial deposits, and the soil consists of brown silt loam. A sparse (10% cover) emergent layer is present within this community, of approximately 10 m in height. This layer is dominated by *Eucalyptus cambageana*. This community contains a sparse (20% cover) canopy tree layer of medium height (8.0 m) dominated by *Eucalyptus populnea*, with *Corymbia dallachiana* and *Acacia harpophylla* present as sub-dominant species. The understory tree layer is sparse (15% cover) and approximately 3.0 m tall and inclusive of *Acacia harpophylla, Terminalia oblongata* and *Ehretia membranifolia*. The shrub stratum of this community is mid-dense (40% cover) and is dominated by *Carissa ovata* and *Enchylaena tomentosa*. This stratum is approximately 1.5 m tall. Ground cover is moderate (40%) and primarily consists of *Megathyrsus maximus** and *Cenchrus ciliaris**, with *Heteropogon contortus* and *Cymbopogon refractus* present as sub-dominant species. Disturbance to the integrity of this community has been recorded as a result of fragmentation (this is a small and isolated patch of vegetation), surrounding mining activities and the incursion of invasive flora species (generally in the form of invasive grasses within the ground stratum).	NCAP / LC	0.29	 

RE	Vegetation Community	Description	BD Status[1] / VM Class[2]	Area (ha)	Image
Non-remnant	Brigalow Regrowth	This vegetation community occurs throughout the greater portion of the Project area (approximately 65% of the total Project area) on a gently undulating plain. The geology is old alluvial deposits, and the soil consists of brown clay loam. Due to its young age, this community does not contain T1 or T2 stratums. This community contains a mid-dense (25% cover) T3 stratum of approximately 3.8 m. This stratum is heavily dominated by *Acacia harpophylla* with *Terminalia oblongata, Acacia salicina* and *Atalaya hemiglauca* present as sub-dominant species. The shrub stratum of this community is sparse (20% cover) and is dominated by *Cassia brewsteri, Parthenium hysterophorus** (heavily dominant in areas)*, Carissa ovata,* and *Enchylaena tomentosa*. Sub-dominant species within this stratum include *Cryptostegia grandiflora*, Stylosanthes scabra** and *Acacia salicina.* This stratum is approximately 2 m tall. Ground cover is dense (84%) and primarily consists of *Cenchrus ciliaris**, *Bothriochloa pertusa** and *Chloris gayana**. Sub-dominant species within this stratum include *Heteropogon contortus, Melinis repens** and *Themeda triandra*. The ecological integrity of this vegetation community has been degraded as a result of historical clearing activities, historical agricultural activities and ongoing mining activities. This vegetation community is fragmented and has a high rate of incursion from invasive flora species.	N/A	147.69	 

RE	Vegetation Community	Description	BD Status[1] / VM Class[2]	Area (ha)	Image
Non-remnant	Disturbed and Cleared Areas	This vegetation community is highly impacted by broadscale clearing and historical land use activities and as a result is lacking all stratums apart from a sparse shrub stratum and a dense ground stratum and ground. Current impacts to this vegetation community include mowing and slashing to maintain and existing powerline easement and mining related infrastructure and equipment laydown areas. The shrub stratum of this community is dominated by *Parthenium hysterophorus*, Sesbania cannabina* and *Macroptilium lathyroides**. Other species occurring at lower densities within this stratum include *Cryptostegia grandiflora**, *Stylosanthes scabra* Opuntia tomentosa** and *Enchylaena tomentosa*. This stratum is approximately 38.3% cover. The ground stratum is dense (98%) and comprised mostly of *Cenchrus ciliaris**, *Bothriochloa pertusa*, Chloris gayana*, Megathyrsus maximus** and *Heteropogon contortus* with *Entolasia stricta, Panicum effusum* and *Themeda triandra* present in lower densities.	N/A	43.11	 

[1] Biodiversity (BD) status of the RE; NA = Not Applicable; NCAP=No Concern at Present; OC=Of Concern; E=Endangered

[2] Vegetation Management (VM) class of the RE under the VM Act; NA = Not Applicable; LC=Least Concern; OC=Of Concern; E=Endangered

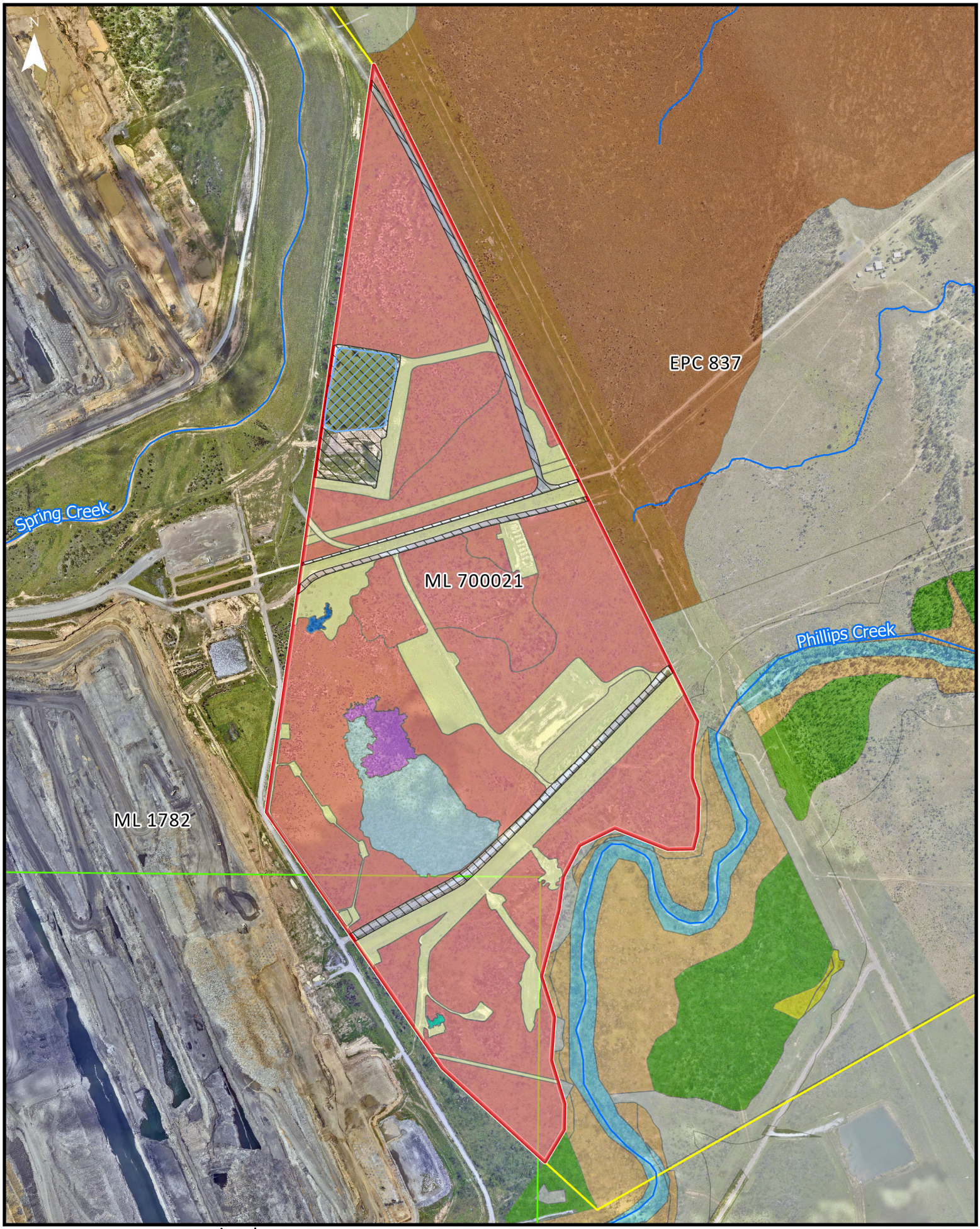


FIGURE 5: GROUND-TRUTHED REGIONAL ECOSYSTEMS

ENGENY

Legend

- WaterStorageFacility
- Infrastructure areas
- Watercourse
- Project Area
- Mining Lease Boundary
- Exploration Permits (Coal)

GTRE (Engeny, 2024)

- Acacia harpophylla shrubby woodland with Terminalia oblongata on Cainozoic clay plains (Remnant, RE11.4.9)
- Eucalyptus populnea low open forest on sand plains (HVR, RE11.5.3)
- Acacia harpophylla and/or Casuarina cristata low open forest on alluvial plains (HVR, RE11.3.1)
- Brigalow Regrowth (Regrowth)
- Disturbed and cleared areas with grass and forb regrowth lacking woody vegetation (Non-remnant)
- Eucalyptus populnea open forest on sand plains (Remnant, RE11.5.3)

GTRE (AECOM, 2023; BAAM, 2021)

- Remnant, RE11.3.1
- Remnant, RE11.3.4
- Remnant, RE11.3.25
- REM,11.3.27b
- REM,11.4.8
- Remnant, RE11.4.9
- REM,11.4.13
- Remnant, RE11.5.3
- HVR,11.4.9
- Non-remnant, Regrowth
- Non-remnant

0 100 200 300 m

3.3 Flora Diversity

The field survey across the Project area identified the presence of 70 flora species representing 29 families. The most commonly identified families during the field survey were Poaceae (17 species), Leguminosae (8 species), Myrtaceae (5 families), and Sapindaceae (4 families). The full flora species list is provided in Appendix B:.

3.3.1 Introduced Flora Species

The diversity of introduced species within the Project area was found to be low with a total of 16 introduced species recorded during the field survey (23% of species recorded). However, the coverage of introduced species was found to be high with *Cenchrus ciliaris**, *Bothriochloa pertusa** and *Megathyrsus maximus** often dominating the ground layer of all vegetation communities and *Parthenium hysterophorus** present in dense patches.

A total of five (5) introduced species listed as a 'Restricted Matter' under the Queensland *Biosecurity Act 2014* were also identified within the Project area during the field survey. These included *Cryptostegia grandiflora**, *Parthenium hysterophorus*, Harrisia martini*, Opuntia tomentosa** and *Lantana camara*. Cryptostegia grandiflora**and *Parthenium hysterophorus** are also listed as Weeds of National Significance (WoNS) (Australian Government, 2017).

*Parthenium hysterophorus** occurred frequently, often in high densities, in non-remnant regrowth communities and was the most abundant restricted weed within the Project area. *Harrisia martinii** additionally occurred within these same communities; however, was identified to be present in low densities. *Lantana camara** was identified as present within *Eucalyptus populnea* open forest on sand plains vegetation community in relatively low densities. Rare occurrences of *Cryptostegia grandiflora** and *Opuntia tomentosa** were identified throughout the Project area.

3.3.2 Threatened Flora Species

The PMST and Wild-Net database searches identified eight (8) threatened flora species as potentially occurring within the Project area and/or surrounds (Appendix A). Opportunistic searches were undertaken for threatened flora species where tertiary- or quaternary-level assessments identified potentially suitable habitat. The field survey did not confirm the presence of any threatened flora within the Project area.

The LoO assessment conducted for all species identified in the desktop assessment also determined that all threatened flora species are unlikely to occur within the Project area, based on the targeted flora search effort or due to the lack of a surrounding known populations and/or the absence of the following vegetation community types and characteristics:

- Geology substrate of sandstone and sandy derived soils or lateritic areas with minimal soil development;
- Presence of black, heavy clay derived soils from basalt geology;
- Riparian communities on higher order streams with clay soils; and
- Dry rainforest communities.

This result is consistent with previously completed ecological assessments that included the Project area.

It is noted that Phillips Creek, located to the south of the Project area, may provide potential habitat for the *Eucalyptus raveretiana* due to RE11.3.25 remnant vegetation mapped within the riparian zone (Figure 5). Vegetation associated with this creek has been surveyed numerous times (Table 1). During these surveys, *E. raveretiana* was not identified as present. Given the conspicuous habit of this species, it is considered that *E. raveretiana* is unlikely to be present within vegetation set in association with Phillips Creek.

It is also recognised that the literature review undertaken as a component of this assessment (Table 1) has identified previous ecological reports which identified potential habitat for *Dichanthium setosum* and *D. queenslandicum* within the Project area (AECOM, 2016, AECOM, 2023, BAAM, 2021). This is primarily attributed to a claimed positive identification of two *D. setosum* records approximately 600m south-east of the Project area, to the south of Phillips Creek by SKM in 2011 (AECOM, 2016). The records were identified within an area ground-truthed by SKM (2011) and later by AECOM (2016) as a grassland vegetation community analogous to RE11.4.4.

The grassland vegetation community was not identified within the Project area by AECOM in 2016. However, given that a similar land zone, land zone 4, occurs across the Project area, the ecological assessment assumed potential occurrence for *D. queenslandicum* and likely occurrence for *D. setosum.* Field surveys undertaken as part of the AECOM 2016 assessment both within the Project area and outside of the Project area where *D. setosum* was previously recorded, did not locate either species despite multiple targeted searches during suitable climatic conditions.

The AECOM 2016 likelihood of occurrence findings for both *D. queenslandicum* and *D. setosum* have been re-iterated in both the BAAM ecological baseline assessment (2021) and the most recent AECOM MNES impact assessment (2023). The BAAM ecological baseline

assessment did not identify the presence of either species during field investigations. However, potential habitat for both species within the Project area was still noted, but further refined in both assessments (BAAM, 2021 & AECOM, 2023) to the central patch of *Acacia harpophylla* shrubby woodland (analogous to RE11.4.9).

Given these findings, this assessment has thoroughly evaluated the potential presence of these species and their habitat within the Project area. Targeted field surveys were undertaken specifically within the 2.73 ha central patch of *Acacia harpophylla* shrubby woodland that has been previously identified as potential habitat for *D. queenslandicum* and *D. setosum* (Figure 3). This included the following survey assessments and specific methodologies that targets species identification in the groundlayer:

- BioCondition site – 100 m x 50 m quadrat with the following nested quadrats:
  - five 1 m x 1 m quadrats to collect data on native perennial grass cover;
  - 10 m x 50m quadrat to collect data on native plant species richness for four lifeforms, including grasses;
- Tertiary level-assessment – 10 m x 50 m quadrat to collect species composition for each structural layer, including ground layer; and
- Quaternary level-assessment – confirming dominant species across the vegetation strata, including the ground layer.

These survey approaches are consistent with established vegetation and threatened flora survey methodologies outlined in the Commonwealth Survey Guidelines for Australia's Threatened Plants (DCCEEW, 2013), which recommend systematic quadrat-based vegetation sampling and targeted searches within suitable habitat to detect threatened groundlayer flora species.

These target surveys did not detect the presence of either *D. queenslandicum* or *D. setosum* within that area. Such surveys were also undertaken across the broader Project area, which also did not detect the presence of either *D. queenslandicum* or *D. setosum*. Furthermore, detailed habitat assessments have not identified suitable habitat for these species within the Project area. Both species habitat requirements are more associated with clay soils derived from a basalt geology (DCCEEW, 2026a & 2026b) as opposed to 'old' alluvium clay deposited on bedrock, which occurs across the Project area.

Potential occurrence has been repeatedly assumed since 2016 whilst ongoing field survey across the Project area over the last 8 years have not confirmed presence. Based on this and the lack of suitable habitat, this assessment concludes that *D. queenslandicum* and *D. setosum* are unlikely to occur within the Project area.

The detailed LoO assessment is provided in Appendix C:

3.4 Fauna Habitat Types

A total of six (6) fauna habitat types are considered to occur within the Project area based on the results of the field survey (Table 7, Figure 6). A description of these habitats and the key fauna habitat opportunities as well as sightings are provided below.

TABLE 7: FAUNA HABITAT TYPES

Habitat No.	Habitat Type	Analogous REs	Area (ha)
1	Brigalow woodland	Remnant RE11.4.9	2.73
2	Eucalypt open forest	Remnant RE11.5.3	10.87
3	Eucalypt and Brigalow low open forest	HVR RE11.3.1, HVR RE11.5.3	0.42
4	Brigalow regrowth with frequent gilgai	Non-remnant	42.83
5	Brigalow regrowth with infrequent or absent gilgai	Non-remnant	104.86
6	Cleared and disturbed areas with grass and forb regrowth	Non-remnant	43.11

3.4.1 Brigalow Woodland

This habitat type occurs centrally within the Project area, on a gently undulating plain with dark, clay loam soil, and is associated with a vegetation community which has been ground-truthed as remnant RE11.4.9 (*Acacia harpophylla* or *Casuarina cristata* shrubby woodland

with *Terminalia oblongata* on Cainozoic clay plains). This habitat is considered to be in a relatively good condition, with the only threats to integrity identified as the presence of introduced grasses and forbs within the ground stratum, and the fragmentation of this habitat from nearby remnant vegetation as a result of broadscale vegetation clearing throughout the Project area.

Key habitat features identified within this habitat type include:

- Occasional gilgai identified as diverse in depth, and containing ponded water;
- Occasional cracking soils identified as diverse in depth;
- Common occurrence of microhabitat features, including fallen woody debris, hollow logs, and leaf litter;
- Intact canopy stratum and understorey vegetation providing higher structural complexity and predator avoidance opportunities to fauna; and
- Occasional small, medium and large sized hollow-bearing trees (with small and medium hollows being most prevalent).
  - Tree hollow surveys recorded an average density of 5 per 1ha, comprising small hollows (2 per 1ha), medium hollows (2 per 1ha) and large hollows (1 per 1ha).

Overall, this habitat type provides resources primarily for woodland birds, microbats, reptiles and arboreal mammals.

Specifically, the presence of gilgai and cracking soils, and the ponded water within, which were identified as providing active habitat for a number of native frog species, are considered to provide habitat for Brigalow belt specialist reptile species, including the Ornamental snake which was recorded within this habitat type during the field survey and is listed vulnerable under the EPBC Act (Figure 12) (refer to Section 4.2.3 for further information and assessment relevant to Ornamental snake habitat in the Project area). Frog densities within this habitat type were observed to be low to moderate and spatially variable, with higher activity and abundance associated with water-retaining gilgai and areas supporting moist microhabitats. Native species such as the Broad-palmed rocket frog (*Litoria latopalmata*) and Striped burrowing frog (*Cyclorana alboguttata*) were recorded, indicating that the habitat provides suitable conditions for amphibian use, particularly during wetter periods. Cane toad (*Rhinella marina*)* was identified as present within this community (in low densities), potentially posing a threat to the Ornamental snake.

The intact canopy status provides sheltering, perching and predator avoidance opportunities for arboreal mammal and bird species. The hollow-bearing tree resources within the canopy also provides nesting and sheltering resources for hollow-dependent fauna. This habitat is considered to provide adequate denning resources for Greater glider (i.e., the frequency of hollow bearing trees per hectare of habitat), however fragmentation from other patches of potentially suitable habitat likely excludes this species from utilising this habitat (refer to Section 4.2.4.3 for further information and assessment relevant to Greater glider habitat in context of the Project area).

This habitat type was particularly noted to lack or have very low abundance of the following habitat features:

- Koala food trees;
- Native grass species;
- Mistletoe foraging resources for mistletoe dependent bird species; and
- Rocky outcrops for rocky-dependent mammals such as quoll.

Given the lack of these habitat features, it is not considered to provide sufficient resources to support foraging Koalas, granivorous birds, rocky-dependent mammals and mistletoe feeding specialists.

Specifically, whilst ground cover within this habitat is less dense than other communities identified within the Project area (ground cover was determined to be approximately 35% within this habitat), the dominance of introduced species limits foraging suitability for species such as Squatter pigeon (refer to Section 4.2.2 for further information and assessment relevant to Squatter pigeon habitat in the Project area). Further, the low abundance (approximately 30%) of Koala food trees, and the fragmented and highly isolated state of the habitat is also likely to reduce utilisation of the habitat patch by Koala (refer to Section 4.2.1 for further information and assessment relevant to Koala habitat in the Project area).

The following fauna species were identified to be present within this habitat type at the time of survey:

- Apostlebird (*Struthidea cinerea*).
- Australian owlet-nightjar (*Aegotheles cristatus*).
- Broad-palmed rocket frog (*Litoria latopalmata*).
- Cane toad (*Rhinella marina*)*.

- Common brushtail possum (*Trichosurus vulpecula*).
- Dubious dtella (*Gehyra dubia*).
- Noisy friarbird (*Philemon corniculatus*).
- Ornamental snake (*Denisonia maculata*).
- Pale-headed snake (*Hoplocephalus bitorquatus*).
- Striped burrowing frog (*Cyclorana alboguttata*).
- Tawny frogmouth (*Podargus strigoides*).

A summary of the habitat values identified within this habitat type, including the associated opportunities and limitations to fauna utilisation are outlined within Table 8.

TABLE 8: HABITAT VALUES IDENTIFIED WITHIN BRIGALOW WOODLAND HABITAT

Habitat Attribute	Assessment Determination	Relevant Ecological Role of Habitat Attribute	Fauna Utilisation	
			Opportunities	Limitations
Ground Layer				
Vegetated Ground Cover Composition	Relatively low vegetation cover (35%). 65% introduced / 35% native.	Foraging, sheltering.	• N/A	• High abundance of invasive grasses (i.e., *Cenchrus ciliaris, Megathyrsus maximus*) reduces suitability for granivorous birds and native foraging fauna. • Low suitability of foraging and sheltering opportunities for the Squatter pigeon given high density of introduced grasses. • High exotic cover, combined with soil composition, indicates this habitat is not suitable for *Dichanthium setosum* or *D. queenslandicum.*
Gilgai Presence	Occasional, shallow.	Foraging, sheltering, seasonal water resource.	• Supports ephemeral frog activity and waterbird use. • Provides seasonal foraging opportunities for the Ornamental snake which predates on frogs associated with gilgai.	Shallow gilgai briefly hold water, limiting long-term frog breeding and value for water-dependent fauna.
Leaf Litter Cover and Depth	60% cover, <0.5cm depth (shallow).	Shelter.	• Provides refuge for small reptiles and mammals. • Ornamental snake may utilise woody debris for shelter opportunities.	Shallow litter reduces effectiveness for shelter.
Hollow Logs	Per 1ha of community: • Small: 5, • Medium: 2, • Large: 2.	Shelter.	• Moderate complexity of ground layer structure for small, ground-dwelling mammals and small reptiles to shelter. • The Ornamental snake may opportunistically, temporarily shelter under logs.	N/A.
Fallen Woody Debris	Common.	Shelter.	• Moderate complexity of ground layer structure for small, ground-dwelling mammals and small reptiles to shelter.	• N/A.
Cracking Soils	Occasional and diverse.	Shelter.	• Cracking clay soils provide habitat for Brigalow belt specialist reptile species that utilise cracking soil for shelter.	• Occasional and diverse nature of cracking soils may limit suitability for some species.

Habitat Attribute	Assessment Determination	Relevant Ecological Role of Habitat Attribute	Fauna Utilisation	
			Opportunities	Limitations
Rocky Outcrops	Absent.	Shelter and denning opportunities.	• N/A.	• No habitat for rocky-dependent mammals such as the quoll.
Upper Stratums				
Flowering and Fruiting Plants	Common.	Foraging.	• Supports nectar-feeding birds, mammals, and flying-foxes.	• N/A.
Mistletoe	Absent.	Foraging.	• N/A.	• No habitat resources for mistletoe dependent bird species.
Koala Food Trees	30% of canopy cover	Foraging.	• Potential stop-over or flyover site for migratory birds that use woodland habitat.	• Limited (30% of identified canopy cover) food tree coverage and abundance for Koala.
Decorticating Bark	Occasional	Shelter.	• Presence of resources for microbats and small reptiles (e.g., geckos) that use decorticating bark for sheltering.	• N/A.
Tree Hollows	Per 1ha of community: • Small: 2 • Medium: 2 • Large: 1	Shelter.	• Resources are present that could support small to large hollow-dependent birds (e.g., woodland birds) and mammals (e.g., gliders). • Potential stop-over or flyover site for migratory birds that use woodland habitat.	• N/A
Aquatic and Connectivity				
Aquatic features	• Shallow gilgai, • Phillips Creek (ephemeral) is located approximately 670 m south of this habitat patch and outside the boundary of the project area.	Foraging, shelter and dispersal.	• Nearby access to water source for fauna species that have a daily intake requirement e.g., some finch species. • Periodic habitat for frogs, which are prey for waterbirds, and Brigalow belt specialist reptile species, such as the Ornamental snake.	• Gilgai are shallow and therefore water holding capacity is lower. Opportunities of providing breeding habitat for frogs and foraging habitat for other species would be limited.
Patch Size	Small	Home range capacity	• Sufficient for small ground reptiles and birds.	• Too small to support Koala or Greater glider home ranges.

Habitat Attribute	Assessment Determination	Relevant Ecological Role of Habitat Attribute	Fauna Utilisation	
			Opportunities	Limitations
Patch Connectivity	Isolated and Fragmented	Dispersal	• May support limited local dispersal opportunities for large mammals (i.e., macropods) and birds.	• Fragmentation, 4m tall Brigalow regrowth, roads, and fences prevent arboreal movement.

Based on the identified habitat values, an evaluation of the Brigalow woodland community was undertaken to assess its suitability for conservation-significant species known or considered likely to occur within the Project area. The assessment determined that the Brigalow woodland community does not provide suitable habitat for the Koala, Greater glider, *Dichanthium setosum* or *D. queenslandicum* due to a combination of low resource availability, fragmentation, and lack of connectivity to higher-quality habitat. However, marginal habitat was identified for the Squatter pigeon, with moderate ground cover and partial open woodland structure providing limited foraging opportunities, despite dominance by introduced pasture species. Suitable habitat was confirmed for the Ornamental snake, with key habitat features including gilgai, cracking clay soils, and structural ground-layer elements such as leaf litter and woody debris. Table 9 summarises the outcomes of this assessment.

TABLE 9 ASSESSMENT OF BRIGALOW WOODLAND HABITAT SUITABILITY FOR CONSERVATION SIGNIFICANT SPECIES

Conservation Significant Species	Habitat ground truthed as present?	Habitat Type	Justification
Koala	No	N/A – no suitable habitat identified.	Although some large canopy trees of suitable Koala food species (such as *Eucalyptus populnea and E. cambageana*) are present within the Brigalow woodland habitat, they occur at low density, comprising approximately 10% of the canopy stratum, and are sparsely distributed across the area. This limited availability significantly reduces the foraging value of the habitat. In addition, the Brigalow woodland is highly fragmented and lacks a functional connection to known higher-quality Koala habitat along Phillips Creek. Dispersal from this known population to the woodland would require traversing approximately 400m through regrowth vegetation approximately 4m tall, dominated by low woody species that do not provide adequate predator protection. The landscape barriers between the Brigalow woodland and higher-value habitat include light vehicle tracks, disturbed ground layers dominated by exotic species, and a general absence of structurally complex vegetation, all of which further reduce its suitability. Crucially, the Brigalow woodland does not form part of a broader, connected network of habitat patches and does not function as a 'stepping stone' corridor to larger habitat areas to the north. Given the lack of resources and connectivity, this vegetation community does not meet the criteria to be considered Koala habitat.
Greater glider	No	N/A – no suitable habitat identified.	The Brigalow woodland contains mature eucalypt canopy trees and stag trees with medium to large hollows, however, these features occur at low densities, with eucalypt trees comprising approximately 10% of the canopy stratum and hollow-bearing stag trees present at an estimated density of just three per hectare. This low abundance of key resources indicates poor-quality habitat that is unlikely to support Greater glider use. In addition to limited resource availability, the woodland is highly fragmented and structurally disconnected from known Greater glider habitat at Phillips Creek. The species relies on gliding for dispersal and is typically limited to maximum glide distances of around 100m. The patch is separated from the higher-quality habitat along Phillips Creek by approximately 400m, a distance well beyond the gliding capacity of the species. These constraints are further compounded by significant movement barriers in the surrounding landscape, including young Brigalow regrowth (approximately 4 m tall) that does not provide sufficient shelter or canopy structure, as well as roads and mine infrastructure.

Conservation Significant Species	Habitat ground truthed as present?	Habitat Type	Justification
			Collectively, the poor structural condition, lack of connectivity, and limited availability of key habitat features indicate that this area does not provide suitable foraging, denning, or dispersal habitat for the Greater glider.
Squatter pigeon	Yes	Marginal dispersal and shelter habitat	This habitat patch supports moderate ground cover (~35%) and includes scattered open areas that may facilitate limited foraging. However, the ground layer is dominated by introduced pasture species (~65%), reducing the availability of native grasses and seed resources typically preferred by the Squatter pigeon. While not optimal, the partial presence of open woodland structure and limited native ground flora are consistent with marginal habitat for the species.
Ornamental snake	Yes	Suitable foraging, shelter and dispersal habitat	This habitat patch supports key features associated with Ornamental snake habitat, including cracking clay soils and shallow gilgai of variable depth that retain ponded water. These microhabitats support native frog species, a primary prey source. Additional structural elements such as leaf litter, ground cover, and fallen woody debris offer suitable shelter. The species was recorded during field surveys, confirming the patch as suitable habitat.
Dichanthium setosum	No	N/A – no suitable habitat identified.	The ground layer within this habitat patch is dominated by introduced pasture species (approximately 65%), including *Cenchrus ciliaris* and *Megathyrsus maximus*, which are known to suppress native grass diversity and outcompete *D. setosum*. No native grassland patches or associated indicator species were recorded during the survey. The structure, species composition, and disturbance level of the ground layer are inconsistent with habitat known to support this species.
Dichanthium queenslandicum	No	N/A – no suitable habitat identified.	The ground layer within this habitat patch is dominated by introduced pasture species (approximately 65%), including *Cenchrus ciliaris* and *Megathyrsus maximus*, which are known to suppress native grass diversity and outcompete *D. queenslandicum*. No native grassland patches or associated indicator species were recorded during the survey. Although the community occurs on land zone 4, the observed structure, species composition, and disturbance level are inconsistent with known habitat for this species. These limitations preclude the area from supporting *D. queenslandicum*.

3.4.2 Eucalypt Open Forest

This habitat type occurs centrally within the Project area, adjoining the Brigalow woodland habitat described above, on a gently undulating plain comprised of light coloured, loamy soils. It is associated with vegetation ground-truthed as remnant RE11.5.3 (*Eucalyptus populnea* open forest on sand plains). Threats to the integrity of this habitat include a moderate incursion of introduced species within the ground stratum and fragmentation from nearby remnant vegetation as a result of historic broadscale vegetation clearing throughout the Project area.

Key habitat features identified within this habitat type include:

- Abundance of Koala food trees;
- Intact canopy stratum and understorey vegetation providing higher structural complexity and predator avoidance opportunities to fauna;

- Common occurrence of microhabitat features, including fallen woody debris, hollow logs and leaf litter; and
- Occasional small, medium, and large sized hollow-bearing trees (with small hollows being most prevalent).
  - Tree hollow surveys recorded an average density of 6 per 1ha, comprising small hollows (3 per 1ha), medium hollows (1 per 1ha) and large hollows (2 per 1ha).

Overall, this habitat type provides resources primarily for woodland birds, microbats, reptiles and arboreal mammals.

Specifically, the high abundance of Koala food trees (comprising approximately 34% within the canopy stratum), does indicate that this habitat is suitable for foraging and sheltering. It is noted however, that this habitat patch is highly fragmented and isolated from other habitat areas, including Phillips Creek. Koala would need to overcome significant barriers to access this habitat. As a result, whilst the habitat resources are present within this habitat type, utilisation of the habitat patch by the Koala is considered unlikely (refer to Section 4.2.1 for further information and assessment relevant to Koala habitat in the Project area).

The intact canopy status provides sheltering, perching and predator avoidance opportunities for arboreal mammal and bird species. The hollow-bearing tree resources within this stratum also provides nesting and sheltering resources as well as roosting opportunities for hollow-dependent fauna, including Greater glider (based on the frequency of hollow bearing trees per hectare of habitat). However, fragmentation from other patches of mature, woody vegetation within the locality likely creates barriers in these species accessing, and therefore utilising, this habitat (refer to Section 4.2.3.4 for further information and assessment relevant to Greater glider habitat in the Project area).

This habitat type was particularly noted to lack or have very low abundance of the following habitat features:

- Gilgai and cracking soils;
- Native grass species;
- Mistletoe foraging resources for mistletoe dependent bird species; and
- Rocky outcrops rocky-dependent mammals such as the quoll.

Given the lack of these habitat features, it is not considered to provide sufficient resources to support Brigalow Belt reptile species, granivorous birds, rocky habitat and mistletoe feeding specialists. Specifically, the lack of native grass species within the ground layer and the abundance of introduced grass species, limits the foraging resources for Squatter pigeon. It also has a very dense ground layer, which inhibits nesting and dust bathing opportunities for the species (refer to Section 4.2.2 for further information and assessment relevant to Squatter pigeon habitat in the Project area). The lack of gilgai and cracking soils also means that the habitat does not provide resources for Ornamental snake (refer to Section 4.2.3 for further information and assessment relevant to Ornamental snake habitat in the Project area). In addition, no frog species were recorded within this habitat type during field surveys, likely due to the absence of water-holding features such as gilgai and cracking soils. This further limits the suitability of the habitat for the Ornamental snake by reducing the availability of key prey resources.

The following fauna species were identified to be present within this habitat type at the time of survey:

- Apostlebird (*Struthidea cinerea*).
- Australian owlet-nightjar (*Aegotheles cristatus*).
- Black striped snake (*Cryptophis nigrostriatal*).
- Common bearded dragon (*Pogona barbata*).
- Common brushtail possum (*Trichosurus vulpecula*).
- Dubious dtella (*Gehyra dubia*).
- Noisy friarbird (*Philemon corniculatus*).
- Shaded-litter rainbow-skink (*Carlia munda*).
- Squirrel glider (*Petaurus norfolcensis*).

It is noted that no fauna species listed as protected by the EPBC Act were identified within this habitat at the time of the field survey. A detailed description of the habitat values identified within this habitat type, including the associated opportunities and limitations to fauna utilisation, are outlined within Table 10.

TABLE 10: HABITAT VALUES IDENTIFIED WITHIN EUCALYPT OPEN FOREST HABITAT

Habitat Attribute	Assessment Determination	Relevant Ecological Role of Habitat Attribute	Fauna Utilisation	
			Opportunities	Limitations
Ground Layer				
Vegetated Ground Cover Composition	High vegetation cover (90%). 48% introduced / 52% native.	Foraging, sheltering.	• Foraging resources for macropods.	• Approximately half of the identified ground cover is introduced, reducing suitability for granivorous birds. • Dense ground cover limits foraging and dust bathing for Squatter pigeon.
Gilgai Presence	Absent	Foraging, sheltering, seasonal water resource.	• N/A.	• Absence of gilgai results in no habitat resources for waterbird and reptile species that utilise ponded in gilgai for foraging.
Leaf Litter Cover and Depth	30% cover, <0.5cm depth (shallow).	Shelter.	• Provides refuge and shelter opportunities for small reptiles and mammals.	• Shallow litter reduces effectiveness for shelter and refuge.
Hollow Logs	Per 1ha of community: • Small: 4, • Medium: 4, • Large: 3.	Shelter.	• Adequate complexity of ground layer structure for small, ground-dwelling mammals and small reptiles to shelter.	• N/A.
Fallen Woody Debris	Common.	Shelter.	• Moderate complexity of ground layer structure for small, ground-dwelling mammals and small reptiles to shelter.	• N/A.
Cracking Soils	Absent.	Shelter.	• N/A.	• Absence of cracking clay soils results in an absence of habitat for Brigalow belt specialist reptile species that utilise cracking soil for shelter.

Habitat Attribute	Assessment Determination	Relevant Ecological Role of Habitat Attribute	Fauna Utilisation	
			Opportunities	Limitations
Rocky Outcrops	Absent.	Shelter and denning opportunities.	• N/A.	• No habitat for rocky-dependent mammals such as the quoll.
Upper Stratums				
Flowering and Fruiting Plants	Common - abundant.	Foraging.	• Supports nectar-feeding birds, mammals, and flying-foxes.	• N/A.
Mistletoe	Absent.	Foraging.	• N/A.	• No habitat resources for mistletoe dependent bird species.
Koala Food Trees	34% of canopy cover	Foraging.	• Potential stop-over or flyover site for migratory birds that use woodland habitat.	• Limited (34% of identified canopy cover) food tree coverage and abundance for Koala.
Decorticating Bark	Occasional.	Shelter.	• Presence of resources for microbats and small reptiles (e.g., geckos) that use decorticating bark for sheltering.	• N/A.
Tree Hollows	Per 1ha of community: • Small: 3 • Medium: 1 • Large: 2	Shelter.	• Resources are present that could support small to large hollow-dependent birds (e.g., woodland birds) and mammals (e.g., gliders). • Potential stop-over or flyover site for migratory birds that use woodland habitat.	• N/A
Aquatic and Connectivity				
Aquatic features	Phillips Creek (ephemeral) is located approximately 360 m south of the habitat patch and outside the boundary of the Project area.	Foraging, shelter and dispersal.	• Water source for fauna species located approximately 360m from the habitat patch.	• No aquatic habitat for frogs, which are prey for Brigalow belt specialist reptile species, such as the Ornamental snake.

Habitat Attribute	Assessment Determination	Relevant Ecological Role of Habitat Attribute	Fauna Utilisation	
			Opportunities	Limitations
Patch Size	Small	Home range capacity	• Sufficient for small ground reptiles and birds.	• Too small to support Koala or Greater glider home ranges.
Patch Connectivity	Isolated and Fragmented	Dispersal	• May support limited local dispersal opportunities for large mammals (i.e., macropods) and birds.	• Fragmentation, 4m tall Brigalow regrowth, roads, and fences prevent arboreal movement.

Based on the identified habitat values, an evaluation of the Eucalypt open forest community was undertaken to assess its suitability for conservation-significant species known or considered likely to occur within the Project area. The assessment determined that this community provides marginal habitat for the Koala and Squatter pigeon, due to the presence of key resources such as abundant food trees and a grassy understorey, but is constrained by fragmentation, isolation, and high cover of introduced pasture species. The area does not provide suitable habitat for the Greater glider, Ornamental snake, *Dichanthium queenslandicum* or *Dichanthium setosum*, due to the absence of essential habitat features including canopy connectivity, gilgai or cracking clay soils, and suitable soil substrates. Table 11 summarises the outcomes of this assessment.

TABLE 11 ASSESSMENT OF EUCALYPT OPEN FOREST HABITAT SUITABILITY FOR CONSERVATION SIGNIFICANT SPECIES

Conservation Significant Species	Habitat ground truthed as present?	Habitat Type	Justification
Koala	Yes.	Marginal dispersal habitat	The canopy is dominated by Koala food trees (~98% of total recorded canopy cover), and the tall, mature structure offers potential for foraging and sheltering. However, the patch is relatively small, fragmented, and isolated from known habitat along Phillips Creek. Dispersal would require movement through low-stature vegetation and disturbed areas that do not provide predator cover. Despite the presence of key resources, significant barriers to access result in the patch being classified as marginal Koala habitat.
Greater glider	No.	N/A – no suitable habitat identified.	The Eucalypt open forest habitat contains mature canopy trees and occasional stag trees with medium-sized hollows that may offer limited shelter opportunities for the Greater glider. However, the distribution of these hollow-bearing trees is sparse, and lacks sufficient continuity to support the species. Importantly, this habitat patch is structurally disconnected and physically isolated from known Greater glider habitat at Phillips Creek, where the species is known to occur. The patch is separated by approximately 400m, a distance that exceeds the Greater glider's typical gliding capacity of approximately 100m. Movement between the known habitat at Phillips Creek and this community is further restricted by significant barriers in the surrounding landscape, including extensive areas of young Brigalow regrowth (approximately 4 m tall) that do not provide canopy cover or refuge, as well as roads and mine infrastructure. These features, combined with the fragmented and isolated nature of the habitat, are likely to exclude the species from accessing or utilising the area completely. Accordingly, the lower quality structural condition, lack of connectivity, and presence of landscape-scale barriers indicate that this patch does not provide suitable foraging, denning, or dispersal opportunities for the Greater glider and is not considered to constitute habitat for the species.
Squatter pigeon	Yes.	Marginal dispersal and shelter habitat	The habitat supports moderate ground cover (~65%) with a mix of native (~52%) and introduced pasture grasses. However, the dense ground layer and high abundance of introduced species do not support the open tussock structure preferred for breeding and foraging. The area may offer limited shelter or be used in transit but does not meet criteria for preferred habitat.
Ornamental snake	No.	N/A – no suitable habitat identified.	Essential microhabitat features, including gilgai, cracking clay soils, and suitable frog prey species, are absent. Although woody debris is present, it does not substitute for the critical shelter and foraging resources required by the species. The area is not considered to constitute habitat for the Ornamental snake.

Conservation Significant Species	Habitat ground truthed as present?	Habitat Type	Justification
Dichanthium setosum	No.	N/A – no suitable habitat identified.	While some native grasses are present, there is no evidence of open grassland structure or indicator species associated with *D. setosum*. The vegetation community occurs on light loamy soils, not the basaltic or stony red-brown loams preferred by the species. Habitat structure and composition are inconsistent with known *D. setosum* habitat.
Dichanthium queenslandicum	No.	N/A – no suitable habitat identified.	While some native grasses are present, there is no evidence of open grassland structure or indicator species associated with *D. queenslandicum*. The vegetation community occurs on light loamy soils rather than the fertile, well-structured clay or basaltic soils preferred by the species. Habitat structure and composition are inconsistent with known *D. queenslandicum* habitat.

3.4.3 Eucalypt and Brigalow Low Open Forest

This habitat type occurs as two small patches in the west of the Project area on light coloured, loamy soils and is associated with vegetation ground truthed as HVR RE11.3.1 (*Acacia harpophylla* and/or *Casuarina cristata* low open forest on alluvial plains) and HVR RE11.5.3 (*Eucalyptus populnea* low open forest on sand plains). The integrity and value of this habitat is considered to be impacted as a result of the incursion of introduced ground cover species in high densities, as well as the small and fragmented nature of the patch due to historical clearing activities.

Key habitat features identified within this habitat type include the common occurrence of Koala food trees (comprising approximately 47% of the canopy stratum) and occasional to common fallen woody debris. An overstorey vegetation layer has regenerated, although not fully mature, which would provide structural complexity and predator avoidance opportunities to fauna. Overall, this habitat type provides resources primarily for woodland birds and reptiles.

The abundance of Koala food trees does indicate that this habitat could be suitable for foraging and sheltering Koalas. However, it is noted, that this habitat occurs as two small and highly fragmented and isolated vegetation patches. Given that low connectivity values, it is considered that access and utilisation by the Koala is unlikely refer to Section 4.2.1 for further information and assessment relevant to Koala habitat in the Project area).

This habitat type was particularly noted to lack or have very low abundance of the following habitat features:

- Gilgai and cracking soils;
- Native grass species;
- Hollow-bearing trees (large hollows were identified to occur at an average density of 1 hollow per 1ha of community);
- Mistletoe foraging resources for mistletoe dependent bird species; and
- Rocky outcrops rocky-dependent mammals such as quoll.

Given the lack of these habitat features, it is not considered to provide sufficient resources to support Brigalow Belt reptile species, granivorous birds, hollow-dependent fauna, rocky habitat and mistletoe feeding specialists.

Although other microhabitat features, including fallen woody debris, hollow logs and leaf litter have been identified as occasionally to commonly present within this habitat type, the lack of gilgai and/or soils cracks are considered to limit habitat suitability specifically for Ornamental snake (refer to Section 4.2.3 for further information and assessment relevant to Ornamental snake habitat in the Project area). Additionally, no frog species were recorded within this habitat type during field surveys. The absence of frog activity is likely due to the lack of permanent or ephemeral water-holding features and moist microhabitats, further reducing the suitability of this habitat for the Ornamental snake by limiting availability of key amphibian prey.

The high percentage of ground cover (approximately 72%) and lack of native grasses (approximately 85% of ground stratum flora species identified to be introduced) also provides limited foraging opportunity for Squatter pigeon (refer to Section 4.2.2 for further information and assessment relevant to Squatter pigeon habitat in the Project area). The infrequency of hollow-bearing trees within this habitat also reduces

its suitability for Greater glider (refer to Section 4.2.3.4 for further information and assessment relevant to Greater glider habitat in the Project area).

The following fauna species were identified to be present within this habitat at the time of survey:

- Black-faced woodswallow (*Artamus cinereus*).
- Blue-winged kookaburra (*Dacelo leachii*).
- Mistletoebird (*Dicaeum hirundinaceum*).
- Pied butcherbird (*Cracticus nigrogularis*).
- Red-backed fairy wren (*Malurus melanocephalus*).
- Spangled drongo (*Dicrurus bracteatus*).
- Willie wagtail (*Rhipidura leucophrys*).

It is noted that no fauna species listed as protected by the EPBC Act were identified within this habitat at the time of the field survey. A detailed description of the habitat values identified within this habitat type, including the associated opportunities and limitations to fauna utilisation are outlined within Table 12.

TABLE 12: HABITAT VALUES IDENTIFIED WITHIN EUCALYPT AND BRIGALOW LOW OPEN FOREST HABITAT

Habitat Attribute	Assessment Determination	Relevant Ecological Role of Habitat Attribute	Fauna Utilisation	
			Opportunities	Limitations
Ground Layer				
Vegetated Ground Cover Composition	Moderate vegetation cover (~55%). 85% introduced / 15% native.	Foraging, sheltering.	• Foraging resources for macropods.	• High abundance of invasive grasses (i.e., *Cenchrus ciliaris, Megathyrsus maximus*) reduces suitability for granivorous birds and native foraging fauna. • Low suitability of foraging and sheltering opportunities for the Squatter pigeon given high density of introduced grasses.
Gilgai Presence	Absent	Foraging, sheltering, seasonal water resource.	• N/A.	• Absence of gilgai results in no habitat resources for waterbird and reptile species that utilise ponded in gilgai for foraging.
Leaf Litter Cover and Depth	20% cover, <0.5cm depth (shallow).	Shelter.	• Provides refuge and shelter opportunities for small reptiles and mammals.	• Shallow litter reduces effectiveness for shelter and refuge.
Hollow Logs	Per 1ha of community: • Small: 5, • Medium: 3, • Large: 3	Shelter.	• Adequate complexity of ground layer structure for small, ground-dwelling mammals and small reptiles to shelter.	• N/A.
Fallen Woody Debris	Occasional – common.	Shelter.	• Moderate complexity of ground layer structure for small, ground-dwelling mammals and small reptiles to shelter.	• N/A.
Cracking Soils	Absent.	Shelter.	• N/A.	• Absence of cracking clay soils results in an absence of habitat for Brigalow belt specialist reptile species that utilise cracking soil for shelter.
Rocky Outcrops	Absent.	Shelter and denning opportunities.	• N/A.	• No habitat for rocky-dependent mammals such as the quoll.
Upper Stratums				

Habitat Attribute	Assessment Determination	Relevant Ecological Role of Habitat Attribute	Fauna Utilisation	
			Opportunities	Limitations
Flowering and Fruiting Plants	Common.	Foraging.	• Supports nectar-feeding birds, mammals, and flying-foxes.	• N/A.
Mistletoe	Absent.	Foraging.	• N/A.	• No habitat resources for mistletoe dependent bird species.
Koala Food Trees	47% of canopy cover	Foraging.	• Potential stop-over or flyover site for migratory birds that use woodland habitat. • Moderate (47% of identified canopy cover) food tree coverage and abundance for Koala and Greater glider foraging.	• Although some sheltering structure is present, including regenerating canopy, the small, isolated nature of the patch limits predator avoidance opportunities and significantly reduces the likelihood of Koalas using this habitat for shelter.
Decorticating Bark	Occasional.	Shelter.	• Presence of resources for microbats and small reptiles (e.g., geckos) that use decorticating bark for sheltering.	• N/A.
Tree Hollows	Per 1ha of community: • Small: 0 • Medium: 0 • Large: 1	Shelter.	• Resources are present that could support small to large hollow-dependent birds (e.g., woodland birds) and mammals (e.g., gliders). • Potential stop-over or flyover site for migratory birds that use woodland habitat.	• The very low occurrence of hollow-bearing trees, combined with the small size and fragmentation of the patch, indicates that this habitat does not support sheltering opportunities for the Greater glider.
Aquatic and Connectivity				
Aquatic features	Phillips Creek (ephemeral) is located approximately 420 m south of the habitat patches at its closest point and lies outside the boundary of the project area. No other aquatic values are considered relevant to this habitat patch.	Foraging, shelter and dispersal.	• Nearby access to water source for fauna species that have a daily intake requirement e.g., some finch species.	• No aquatic habitat for frogs, waterbirds, and other water-dependent fauna, which are prey for Brigalow belt specialist reptile species, such as the Ornamental snake.
Patch Size	Small	Home range capacity	• Sufficient for small ground reptiles and birds.	• Too small to support Koala or Greater glider home ranges.

Habitat Attribute	Assessment Determination	Relevant Ecological Role of Habitat Attribute	Fauna Utilisation	
			Opportunities	Limitations
Patch Connectivity	Isolated and Fragmented	Dispersal	• May support limited local dispersal opportunities for large mammals (i.e., macropods) and birds.	• Fragmentation, 4m tall Brigalow regrowth, roads, and fences prevent arboreal movement. • The vegetation is highly fragmented and lacks structural connectivity to nearby mature forest, effectively excluding the Greater glider from accessing or utilising this patch. • Although Koala food trees are present, the small, fragmented nature of the patch and lack of connectivity to larger habitat areas present significant barriers to access. As a result, the habitat is unlikely to be utilised by the species.

Based on the identified habitat values, an evaluation of the Eucalypt and Brigalow low open forest community was undertaken to assess its suitability for conservation-significant species known or considered likely to occur within the Project area. The assessment determined that this community provides marginal habitat for the Koala and Squatter pigeon, due to the presence of some food trees, woody debris, and a moderately complex ground layer. However, habitat suitability is limited by high levels of fragmentation, isolation from higher-quality habitat, and dominance of introduced ground cover species. The area does not provide suitable habitat for the Greater glider, Ornamental snake, *Dichanthium queenslandicum* or *Dichanthium setosum*, due to the absence of key features such as hollow-bearing trees, gilgai or cracking clay soils, and appropriate grassland structure or soil conditions. Table 13 summarises the outcomes of this assessment.

TABLE 13 ASSESSMENT OF EUCALYPT AND BRIGALOW LOW OPEN FOREST HABITAT SUITABILITY FOR CONSERVATION SIGNIFICANT SPECIES

Conservation Significant Species	Habitat ground truthed as present?	Habitat Type	Justification
Koala	Yes.	Marginal dispersal habitat.	Koala food trees comprise approximately 47% of the canopy stratum, and the vegetation provides limited foraging and sheltering resources. However, the patch is small, highly fragmented, and lacks connectivity to higher-quality habitat, significantly reducing accessibility and likelihood of use.
Greater glider	No.	N/A – no suitable habitat identified.	This patch is highly fragmented from the known Greater glider habitat, separated by a minimum of approximately 350m of non-remnant vegetation from Phillips Creek. It lacks continuous canopy structure, which is critical for supporting Greater glider movement and gliding. While some mature eucalypt trees are present, hollow-bearing trees are rare and sparsely distributed, significantly limiting the availability of essential denning and sheltering resources. This structural discontinuity, combined with the low density of key habitat features and the absence of functional connectivity, means the patch does not support the conditions required for Greater glider foraging, denning, or movement. As such, it is not considered to constitute habitat for the species.
Squatter pigeon	Yes.	Marginal dispersal and shelter habitat.	The ground layer is dense (~72% cover) and heavily dominated by introduced grasses (~85%), which limits foraging suitability. However, some structural complexity and open areas offer limited sheltering and foraging opportunities, aligning with marginal habitat definitions.
Ornamental snake	No.	N/A – no suitable habitat identified.	The absence of gilgai, cracking soils, and frog prey precludes foraging and sheltering opportunities essential for this species. Occasional woody debris is insufficient to support habitat use.
Dichanthium setosum	No.	N/A – no suitable habitat identified.	The community lacks the open grassland structure and soil characteristics (e.g., basaltic or stony red-brown loams) typically associated with *D. setosum*. Although native grasses are present, they occur at low abundance, and no floristic indicators of suitable habitat were recorded.
Dichanthium queenslandicum	No.	N/A – no suitable habitat identified.	The vegetation community is dominated by introduced pasture species (~85%), including *Cenchrus ciliaris* and *Megathyrsus maximus*, which suppress native grass diversity. While some native grasses are present (~15%), they occur in low abundance and are not arranged in an open grassland structure. The absence of clay soils typically associated with *D. queenslandicum* further reduces the likelihood of this habitat supporting the species.

3.4.4 Brigalow Regrowth with Frequent Gilgai

This habitat type occurs in the northern aspect of the Project area and has been identified as situated on clay deposits which have formed gently undulating plains. It is associated with a portion of the vegetation community ground-truthed as Brigalow regrowth. This habitat has been significantly impacted as a result of broadscale vegetation clearing and historical land uses, including cattle grazing and the development of mine associated infrastructure, and the incursion of invasive species.

Key habitat features identified within this habitat type include:

- Abundant to common occurrence of deep gilgai;
- Occasional cracking soils identified as diverse in depth; and
- Common occurrence of microhabitat features, including fallen woody debris, hollow logs, and leaf litter.

Overall, this habitat type provides resources primarily for woodland birds, foraging raptors, frogs and Brigalow belt reptile species.

Specifically, the abundant gilgai within this habitat were frequently observed to contain ponded water, aquatic vegetation, and a variety of frog species. The depth of these features enables them to retain water for extended periods following rainfall, thereby supporting prolonged breeding opportunities for amphibians. This, in turn, enhances the availability of foraging resources for the Ornamental snake, which was recorded within this habitat during spotlighting surveys (Figure 6) (refer to Section 4.2.3 for further information and assessment relevant to Ornamental snake habitat in the Project area). Field surveys confirmed the presence of several frog species, including the Broad-palmed rocket frog (*Litoria latopalmata*), Bumpy rocket frog (*Litoria inermis*), Green tree frog (*Litoria caerulea*), and Striped burrowing frog (*Cyclorana alboguttata*). These species were recorded in relatively high densities, predominantly in or near gilgai containing ponded water. The consistent amphibian activity observed indicates that the habitat supports a relatively robust frog population under suitable seasonal conditions, further contributing to its value as foraging habitat for the Ornamental snake.

This habitat type was particularly noted to lack or have very low abundance of the following habitat features:

- Koala food trees;
- Intact canopy stratum and understorey vegetation providing higher structural complexity and predator avoidance opportunities to fauna;
- Canopy layer containing hollow-bearing trees;
- Native grass species;
- Semi-aquatic vegetation fringing across ephemeral wetland gilgai habitat;
- Mistletoe foraging resources for mistletoe dependent bird species; and
- Rocky outcrops rocky-dependent mammals such as the quoll.

Given the lack of these habitat features, it is not considered to provide sufficient resources to support Koala, granivorous birds, cryptic wetland and wader bird species, hollow-dependent fauna, rocky habitat and mistletoe feeding specialists.

Specifically, the ecologically dominant vegetation layer of the vegetation community comprising this habitat has been identified as the T3 stratum, which is heavily dominated by *A. harpophylla* at approximately 4 m in height. Tree hollows are therefore absent. The low abundance of Koala food trees (accounting for approximately 2% of the vegetation identified), are also young (approximately 3m in height on average). Resultingly, resources for Koala and Greater glider are absent (refer to Section 4.2.1 and Section 4.2.3.4 for further information and assessment relevant to Greater glider and Koala habitat in the Project area).

In addition, ponded water within gilgai does provide foraging habitat for wetland bird species; however, due to the absence of fringing semi-aquatic vegetation and muddy margins, the likelihood of providing suitable habitat for threatened and migratory birds species is low, such as the Australian painted snipe (*Rostratula australis*) and Latham's snipe (*Gallinago hardwickii*).

The high percentage of ground cover (approximately 94%) and lack of native grasses (approximately 89% of ground stratum flora species identified to be introduced) also provides limited foraging opportunity for Squatter pigeon. The regenerating T3 stratum could provide some perching opportunities for the species (refer to Section 4.2.2 for further information and assessment relevant to Squatter pigeon habitat in the Project area.

The following fauna species were identified to be present within this habitat at the time of survey:

- Australian bustard (*Ardeotis australis*).
- Black kite (*Milvus migrans*).

- Broad-palmed rocket frog (*Litoria latopalmata*).
- Bumpy rocket frog (*Litoria inermis*).
- European rabbit (*Oryctolagus cuniculus*)*.
- Green tree frog (*Litoria caerulea*).
- Little eagle (*Hieraaetus morphnoides*).
- Ornamental snake (*Denisonia maculata*).
- Pig (*Sus scrofa*)*.
- Spotted bowerbird (*Chlamydera maculata*).
- Spotted pardalote (*Pardalotus punctatus*).
- Striped burrowing frog (*Cyclorana alboguttata*).
- Striped honeyeater (*Plectorhyncha lanceolata*).
- Torresian crow (*Corvus orru*).
- Yellow-throated miner (*Manorina flavigula*).

A detailed description of the habitat values identified within this habitat type, including the associated opportunities and limitations to fauna utilisation are outlined within Table 14.

TABLE 14: HABITAT VALUES IDENTIFIED WITHIN BRIGALOW REGROWTH WITH FREQUENT GILGAI HABITAT

Habitat Attribute	Assessment Determination	Relevant Ecological Role of Habitat Attribute	Fauna Utilisation	
			Opportunities	Limitations
Ground Layer				
Vegetated Ground Cover Composition	Dense vegetation cover (~84%). 89% introduced / 11% native.	Foraging, sheltering.	• Potential foraging resource for macropods.	• High abundance of invasive grasses (i.e., *Cenchrus ciliaris, Megathyrsus maximus*) reduces suitability for granivorous birds and native foraging fauna. • Low suitability of foraging and sheltering opportunities for the Squatter pigeon given high density of introduced grasses. • Based on ground layer structure and floristics, this vegetation community does not support suitable habitat for *D. setosum*. The species was not recorded during field surveys. Although occasional native grasses are present, the ground layer is dominated by introduced species (~89%) and lacks the open grassland structure typically associated with the species. The absence of basaltic or stony red-brown loam soils further reduces habitat suitability for *D. setosum*. • Foraging habitat for Squatter pigeon is limited due to dense ground cover and dominance of introduced grasses. These conditions do not provide the open, native grass-dominated understorey preferred by the species for foraging and nesting and likely reduce access to native seed resources.
Gilgai Presence	Abundant - common and diverse - deep.	Foraging, sheltering, seasonal water resource.	• Good periodic habitat resources for waterbird and reptile species that utilise gilgai for foraging. Gilgai identified to be deep, therefore likely providing a good resource of ponded water, although ephemeral. • The general deep nature of the gilgai in this habitat likely results in water being held for longer periods and a greater abundance of prey species of the Ornamental snake, such as frogs.	• N/A
Leaf Litter Cover and Depth	10% cover, <0.5cm depth.	Shelter.	• Provides refuge and shelter opportunities for small reptiles and mammals.	• Shallow litter reduces effectiveness for shelter and refuge.

Habitat Attribute	Assessment Determination	Relevant Ecological Role of Habitat Attribute	Fauna Utilisation	
			Opportunities	Limitations
Hollow Logs	Per 1ha of community: • Small: 6, • Medium: 3, • Large: 0.	Shelter.	• Adequate complexity of ground layer structure for small, ground-dwelling mammals and small reptiles to shelter.	• N/A.
Fallen Woody Debris	Rare – Occasional.	Shelter.	• N/A	• Limited complexity of ground layer structure for small, ground-dwelling mammals and small reptiles to shelter.
Cracking Soils	Shallow – Diverse.	Shelter.	• Cracking clay soils result in the presence of habitat for Brigalow belt specialist reptile species that utilise cracking soil for shelter. • The presence of cracking soils and frequent deep gilgai indicates that this community provides suitable shelter and foraging habitat for the Ornamental snake.	• N/A
Rocky Outcrops	Absent.	Shelter and denning opportunities.	• N/A.	• No habitat for rocky-dependent mammals such as the quoll.
Upper Stratums				
Flowering and Fruiting Plants	Common.	Foraging.	• Supports nectar-feeding birds, mammals, and flying-foxes.	• N/A.
Mistletoe	Absent.	Foraging.	• N/A.	• No habitat resources for mistletoe dependent bird species.
Koala Food Trees	2%	Foraging.	• Very limited opportunity for stop-over or flyover site for migratory birds that use woodland habitat.	• Low sparse (2% of identified canopy cover) food tree coverage and abundance for Koala and Greater glider foraging. • This community is not considered to provide sheltering opportunities for the Koala due to the low canopy height, limited structural complexity, and absence of mature food trees

Habitat Attribute	Assessment Determination	Relevant Ecological Role of Habitat Attribute	Fauna Utilisation	
			Opportunities	Limitations
Decorticating Bark	Absent.	Shelter.	• N/A	• No resources for microbats and small reptiles (e.g., geckos) that use decorticating bark for sheltering.
Tree Hollows	Absent	Shelter.	• N/A	• No resources are present that could support small to large hollow-dependent birds (e.g., woodland birds) and mammals (e.g., gliders). • The absence of tree hollows and the immature canopy structure exclude this community from providing suitable sheltering habitat for the Greater glider.
Aquatic and Connectivity				
Aquatic features	• Gilgai providing seasonal water source. • Phillips Creek (ephemeral) is located approximately 750 m south of the habitat patch and lies outside the boundary of the Project area.	Foraging, shelter and dispersal.	• Nearby access to water source for fauna species that have a daily intake requirement e.g., some finch species. • Aquatic habitat for frogs, which are prey for waterbirds and Brigalow belt specialist reptile species, such as the Ornamental snake.	• N/A
Patch Size	The area is contiguous, however, the vegetation structure is unlikely to provide meaningful connectivity or dispersal opportunities for most fauna.	Home range capacity	• Sufficient for small ground reptiles and birds.	• Vegetation structure is not sufficient to support Koala or Greater glider.
Patch Connectivity	While the area is contiguous, connectivity is restricted to the ground and shrub stratums, reflecting limited structural continuity for fauna.	Dispersal	• May support limited local dispersal opportunities for large mammals (i.e., macropods) and birds. • This habitat is considered to be contiguous with other surrounding regrowth areas and areas with gilgai and therefore provides dispersal opportunities for Ornamental snake.	• Historical broadscale clearing within the Project area creates a dispersal barrier for some species, particularly arboreal mammals (e.g., Greater glider and Koala). • Fragmentation, 4m tall Brigalow regrowth, roads, and fences prevent arboreal movement. • This habitat may provide limited dispersal opportunities for Squatter pigeon due to its broad connectivity with adjacent regrowth areas and moderate ground cover. However, the dominance of introduced grasses and absence of native seed-bearing flora reduce its overall suitability for sustained movement or use as a foraging corridor.

Based on the identified habitat values, an evaluation of the Brigalow regrowth with frequent gilgai community was undertaken to assess its suitability for conservation-significant species known or considered likely to occur within the Project area. The assessment determined that this community provides suitable habitat for the Ornamental snake due to the presence of key habitat features, including deep, ponded gilgai, cracking soils, and an abundant frog prey base. Marginal habitat was identified for the Squatter pigeon, with dense ground cover and high exotic species presence reducing foraging suitability despite moderate structural shelter opportunities. The community does not provide suitable habitat for the Koala, Greater glider, *Dichanthium queenslandicum* or *Dichanthium setosum* due to the absence of mature Eucalypts, hollow-bearing trees, native grassland structure, and appropriate soil types. Table 15 summarises the outcomes of this assessment.

TABLE 15 ASSESSMENT OF BRIGALOW REGROWTH WITH FREQUENT GILGAI HABITAT SUITABILITY FOR CONSERVATION SIGNIFICANT SPECIES

Conservation Significant Species	Habitat ground truthed as present?	Habitat Type	Justification
Koala	No.	N/A – no suitable habitat identified.	Koala food trees comprise only ~2% of the canopy and are immature (~3 m high). The habitat lacks mature Eucalypts, hollow-bearing trees, and connectivity to other suitable patches. These limitations preclude the area from providing Koala habitat.
Greater glider	No.	N/A – no suitable habitat identified.	Tree hollows are absent, and vegetation is dominated by young regrowth with low canopy height (~4 m). The patch is fragmented and lacks vertical or horizontal connectivity, excluding the area from supporting Greater glider habitat.
Squatter pigeon	Yes.	Marginal dispersal and shelter habitat.	The habitat includes a high proportion of introduced grasses (~89%) and dense ground cover (~94%), limiting availability of native seeds and preferred open ground structure. However, moderate patch size and some sheltering structure offer limited opportunities for marginal use.
Ornamental snake	Yes.	Preferred breeding, foraging, shelter and dispersal habitat.	This habitat contains abundant, deep gilgai with ponded water, aquatic vegetation, and a robust frog prey base. Cracking soils and structural ground-layer features further enhance suitability. The species was recorded during field survey. While the habitat may support localised movement within the Project area, landscape barriers to the south and west limit broader dispersal.
Dichanthium setosum	No.	N/A – no suitable habitat identified.	The ground layer is dominated by exotic species (~89%) with no evidence of native grassland structure or associated indicator species. The absence of stony or basaltic red-brown loam soils further excludes this area from supporting *D. setosum*.
Dichanthium queenslandicum	No.	N/A – no suitable habitat identified.	The vegetation community is dominated by introduced pasture species (~89%), with native grasses occurring at low abundance (~11%). The ground layer lacks the open structure and species composition typically associated with *D. queenslandicum* habitat. These factors preclude the area from supporting *D. queenslandicum*.

3.4.5 Brigalow Regrowth with Infrequent or Absent Gilgai

This habitat type occurs centrally and at the southern aspect of the Project area on clay-loam and silt-loam deposits which have formed gently undulating plains. It is associated with a portion of the vegetation community ground-truthed as Brigalow regrowth. This habitat has

also been significantly impacted as a result of broadscale vegetation clearing and historical land uses, including cattle grazing and the development of mine associated infrastructure, and the incursion of invasive species, particularly in the ground stratum (where they comprise approximately 89%).

Subsequently, this habitat type provides limited habitat resources to fauna. Rare occurrences of gilgai were identified, generally shallow in depth and infrequently containing ponded water. Gilgai are absent from the southern extent of this habitat, where the soil type is considered to be consistent with sandy alluvium soils (land zone 3). Other macro habitat features, including fallen woody debris, fallen logs, and leaf litter, are considered rare to occasional in occurrence. The rare occurrence of gilgai and cracking soils are considered to limit habitat suitability for species reliant on moisture-dependent microhabitats. As a result, frog species were recorded only in low numbers and restricted to isolated, moisture-retaining areas in the northern portion of the habitat. This low amphibian activity further reduces the suitability of this habitat for Brigalow Belt specialist reptile species such as the Ornamental snake, which relies on amphibians as a primary prey source (refer to Section 4.2.3 for further information and assessment relevant to Ornamental snake habitat in the Project area). Overall, this habitat type is more suited for woodland birds and foraging raptors.

Habitat feature found to be in very low abundance or even absent from this habitat type as a result of previous disturbance includes:

- Koala food trees;
- Intact canopy stratum and understorey vegetation providing higher structural complexity and predator avoidance opportunities to fauna;
- Canopy layer containing hollow-bearing trees;
- Native grass species;
- Mistletoe foraging resources for mistletoe dependent bird species; and
- Rocky outcrops rocky-dependent mammals such as the quoll.

Given the lack of these habitat features, the habitat type is not considered to provide sufficient resources to support Koalas, granivorous birds, hollow-dependent fauna, rocky habitat, and mistletoe feeding specialists.

Specifically, the ecologically dominant vegetation layer of the vegetation community comprising this habitat has been identified as the T3 stratum, which is heavily dominated by *A. harpophylla* at approximately 4 m in height. Tree hollows are therefore absent. The low abundance of Koala food trees (accounting for approximately 2% of the vegetation identified), are also young (approximately 3m in height on average). Resultingly, resources for Koala and Greater glider are absent (refer to Section 4.2.1 and Section 4.2.3.4 for further information and assessment relevant to Greater glider and Koala habitat in the Project area).

The foraging opportunity for granivorous birds is limited as a result of the abundance of introduced flora species, which would include species such as Squatter pigeon. The regenerating T3 stratum could provide some perching opportunities for the species (refer to Section 4.2.2 for further information and assessment relevant to Squatter pigeon habitat in the Project area.

The following fauna species were identified to be present within this habitat at the time of survey:

- Australian bustard (*Ardeotis australis*).
- Black kite (*Milvus migrans*).
- Golden-headed cisticola (*Cisticola exilis*).
- European rabbit (*Oryctolagus cuniculus*)*.
- Green tree frog (*Litoria caerulea*).
- Little eagle (*Hieraaetus morphnoides*).
- Pig (*Sus scrofa*)*.
- Spotted bowerbird (*Chlamydera maculata*).
- Spotted pardalote (*Pardalotus punctatus*).
- Striped burrowing frog (*Cyclorana alboguttata*).
- Striped honeyeater (*Plectorhyncha lanceolata*).
- Torresian crow (*Corvus orru*).
- Yellow-throated miner (*Manorina flavigula*).

It is noted that no fauna species listed as protected by the EPBC Act were identified within this habitat at the time of the field survey. A detailed description of the habitat values identified within this habitat type, including the associated opportunities and limitations to fauna utilisation are outlined within Table 16.

TABLE 16: HABITAT VALUES IDENTIFIED WITHIN BRIGALOW REGROWTH WITH INFREQUENT OR ABSENT GILGAI HABITAT

Habitat Attribute	Assessment Determination	Relevant Ecological Role of Habitat Attribute	Fauna Utilisation	
			Opportunities	Limitations
Ground Layer				
Vegetated Ground Cover Composition	Dense vegetation cover (~84%). 89% introduced / 11% native.	Foraging, sheltering.	• Potential foraging resource for macropods.	• High abundance of invasive grasses (i.e., *Cenchrus ciliaris, Megathyrsus maximus*) reduces suitability for granivorous birds and native foraging fauna. • Low suitability of foraging and sheltering opportunities for the Squatter pigeon given high density of introduced grasses. • Based on ground layer structure and floristics, this vegetation community does not support suitable habitat for *D. setosum*. The species was not recorded during field surveys. Although occasional native grasses are present, the ground layer is dominated by introduced species (~89%) and lacks the open grassland structure typically associated with the species. The absence of basaltic or stony red-brown loam soils further reduces habitat suitability. • Foraging habitat for Squatter pigeon is limited due to dense ground cover and dominance of introduced grasses. These conditions do not provide the open, native grass-dominated understorey preferred by the species for foraging and nesting and likely reduce access to native seed resources.
Gilgai Presence	Absent in the southern extent of the habitat. Occasional-to-rare in the central and northern extent and shallow where present.	Foraging, sheltering, seasonal water resource.	• N/A	• Very few resources for waterbird and reptile species that utilise gilgai for foraging. • Due to the infrequent and shallow nature of gilgai this vegetation community is not considered to provide suitable habitat for the Ornamental snake.
Leaf Litter Cover and Depth	10% cover, <0.5cm depth.	Shelter.	• Provides refuge and shelter opportunities for small reptiles and mammals.	• Shallow litter reduces effectiveness for shelter and refuge.
Hollow Logs	Per 1ha of community: • Small: 6, • Medium: 3, • Large: 0.	Shelter.	• Adequate complexity of ground layer structure for small, ground-dwelling mammals and small reptiles to shelter.	• N/A.
Fallen Woody Debris	Rare – Occasional.	Shelter.	• N/A	• Limited complexity of ground layer structure for small, ground-dwelling mammals and small reptiles to shelter.

Habitat Attribute	Assessment Determination	Relevant Ecological Role of Habitat Attribute	Fauna Utilisation	
			Opportunities	Limitations
Cracking Soils	Shallow – Diverse where present (rare).	Shelter.	• Cracking clay soils result in the presence of habitat for Brigalow belt specialist reptile species that utilise cracking soil for shelter. • The presence of cracking soils and frequent deep gilgai indicates that this community provides suitable shelter and foraging habitat for the Ornamental snake.	• N/A
Rocky Outcrops	Absent.	Shelter and denning opportunities.	• N/A.	• No habitat for rocky-dependent mammals such as the quoll.
Upper Stratums				
Flowering and Fruiting Plants	Common.	Foraging.	• Supports nectar-feeding birds, mammals, and flying-foxes.	• N/A.
Mistletoe	Absent.	Foraging.	• N/A.	• No habitat resources for mistletoe dependent bird species.
Koala Food Trees	2%	Foraging.	• Very limited opportunity for stop-over or flyover site for migratory birds that use woodland habitat.	• Low sparse (2% of identified canopy cover) food tree coverage and abundance for Koala and Greater glider foraging. • This community is not considered to provide sheltering opportunities for the Koala due to the low canopy height, limited structural complexity, and absence of mature food trees.
Decorticating Bark	Absent.	Shelter.	• N/A	• No resources for microbats and small reptiles (e.g., geckos) that use decorticating bark for sheltering.
Tree Hollows	Absent.	Shelter.	• N/A	• No resources are present that could support small to large hollow-dependent birds (e.g., woodland birds) and mammals (e.g., gliders). • The absence of tree hollows and the immature canopy structure exclude this community from providing suitable sheltering habitat for the Greater glider.
Aquatic and Connectivity				

Habitat Attribute	Assessment Determination	Relevant Ecological Role of Habitat Attribute	Fauna Utilisation	
			Opportunities	Limitations
Aquatic features	Phillips Creek (ephemeral) is located south of the habitat patch, outside the project area boundary.	Foraging, shelter and dispersal.	• Nearby access to water source for fauna species that have a daily intake requirement e.g., some finch species.	• Absence of habitat for frogs, which are prey for waterbirds and Brigalow belt specialist reptile species, such as the Ornamental snake.
Patch Size	The area is contiguous, however, the vegetation structure is unlikely to provide meaningful connectivity or dispersal opportunities for most fauna.	Home range capacity	• Sufficient for small ground reptiles and birds.	• Vegetation structure is not sufficient to support Koala or Greater glider.
Patch Connectivity	While the area is contiguous, connectivity is restricted to the ground and shrub stratums, reflecting limited structural continuity for fauna.	Dispersal	• May support limited local dispersal opportunities for large mammals (i.e., macropods) and birds. • This habitat is considered to be contiguous with other surrounding regrowth areas and areas with gilgai and therefore provides dispersal opportunities for Ornamental snake.	• Historical broadscale clearing within the Project area creates a dispersal barrier for some species, particularly arboreal mammals (e.g., Greater glider and Koala). • Fragmentation, 4m tall Brigalow regrowth, roads, and fences prevent arboreal movement. • This habitat may provide limited dispersal opportunities for Squatter pigeon due to its broad connectivity with adjacent regrowth areas and moderate ground cover. However, the dominance of introduced grasses and absence of native seed-bearing flora reduce its overall suitability for sustained movement or use as a foraging corridor.

Based on the identified habitat values, an evaluation of the Brigalow Regrowth with Infrequent or Absent Gilgai community was undertaken to assess its suitability for conservation-significant species known or considered likely to occur within the Project area. The assessment determined that this community does not provide suitable habitat for the Koala, Greater glider, *Dichanthium queenslandicum* or *Dichanthium setosum* due to the absence of essential structural features such as mature food trees, tree hollows, and native grassland composition. Marginal habitat was identified for the Squatter pigeon, with limited sheltering opportunities available despite dominance by introduced grasses and dense ground cover. While the habitat does not meet the criteria for suitable Ornamental snake habitat, infrequent cracking soils and isolated moisture-retaining areas in the northern portion of the patch support a classification of marginal habitat. Table 17 summarises the outcomes of this assessment.

TABLE 17 ASSESSMENT OF BRIGALOW REGROWTH WITH INFREQUENT OF ABSENT GILGAI HABITAT SUITABILITY FOR CONSERVATION SIGNIFICANT SPECIES

Conservation Significant Species	Habitat ground truthed as present?	Habitat Type	Justification
Koala	No.	N/A – no suitable habitat identified.	Koala food trees occur at very low abundance (~2%) and are immature (~3 m high). The patch lacks structural complexity, mature canopy, and connectivity to other suitable areas. These deficiencies exclude the area from meeting minimum criteria for Koala habitat.
Greater glider	No.	N/A – no suitable habitat identified.	Hollow-bearing trees are absent, and the vegetation is dominated by low-stature regrowth with no intact canopy or vertical connectivity. These limitations preclude use by Greater glider.
Squatter pigeon	Yes.	Marginal dispersal and shelter habitat.	Despite dense ground cover (~94%) and dominance of introduced grasses (~89%), the habitat provides some open ground and patchy structure that may allow limited foraging and sheltering opportunities. These limited attributes align with marginal suitability
Ornamental snake	Yes.	Marginal dispersal habitat.	Gilgai are rare, shallow, and infrequently retain water, while cracking soils and frog prey are limited. These constraints reduce habitat quality; however, occasional moisture-retaining microhabitats in the northern portion of the patch may offer limited seasonal foraging or sheltering opportunities, supporting classification as marginal habitat
Dichanthium setosum	No.	N/A – no suitable habitat identified.	The ground layer is dominated by exotic species (~89%) and lacks the open native grassland structure or floristic indicators associated with *D. setosum*. These factors preclude the area from being considered suitable habitat.
Dichanthium queenslandicum	No.	N/A – no suitable habitat identified.	The vegetation community is dominated by introduced pasture species (~89%), with native grasses occurring at low abundance (~11%). The ground layer lacks the open structure and species composition typically associated with *D. queenslandicum* habitat. These factors preclude the area from supporting *D. queenslandicum*.

3.4.6 Cleared and Disturbed Areas with Grass and Forb Regrowth

This habitat type is associated with areas which have been recently cleared and disturbed, including powerline easements and laydown areas. Historical impacts including cattle grazing, development of mine associated infrastructure, and incursion of invasive species (comprising approximately 98% of the ground stratum), have severely reduced habitat integrity.

Similarly to the Brigalow regrowth habitat with infrequent or absent gilgai, this habitat was found to provide limited habitat resources to fauna. Rare occurrences of gilgai were identified to be shallow in depth and infrequently containing ponded water. No frog species were recorded during field surveys, likely due to the lack of suitable breeding habitat such as persistent ponded water and moist refuges. The rare occurrence of gilgai and cracking soils, combined with the absence of amphibian prey species, are considered to limit habitat suitability for Brigalow belt specialist reptile species, including Ornamental snake (refer to Section 4.2.3 for further information and assessment relevant to Ornamental snake habitat in the Project area).

Habitat feature found to be in very low abundance or even absent from this habitat type as a result of previous disturbance includes:

- Koala food trees.
- Overstorey woody vegetation for sheltering for most fauna species;
- Canopy layer containing hollow-bearing trees;
- Native grass species;
- Mistletoe foraging resources for mistletoe dependent bird species; and
- Rocky outcrops rocky-dependent mammals such as the quoll.

Given the lack of these habitat features, the habitat type is not considered to provide sufficient resources to support Koalas, granivorous birds such as Squatter pigeon, hollow-dependent fauna such as Greater glider, rocky habitat and mistletoe feeding specialists.

The following fauna species were identified to be present within this habitat at the time of survey:

- Australian bustard (*Ardeotis australis*).
- European rabbit (*Oryctolagus cuniculus*)*.
- Pig (*Sus scrofa*)*.
- Torresian crow (*Corvus orru*).
- Yellow-throated miner (*Manorina flavigula*).

It is noted that no fauna species listed as protected by the EPBC Act were identified within this habitat at the time of the field survey. A detailed description of the habitat values identified within this habitat patch are outlined within Table 18.

TABLE 18: HABITAT VALUES IDENTIFIED WITHIN NON-REMNANT CLEARED AND DISTURBED AREAS WITH GRASS AND FORB REGROWTH HABITAT

Habitat Attribute	Assessment Determination	Relevant Ecological Role of Habitat Attribute	Fauna Utilisation	
			Opportunities	Limitations
Ground Layer				
Vegetated Ground Cover Composition	Dense vegetation cover (~80%). 98% introduced / 2% native.	Foraging, sheltering.	• Potential foraging resource for macropods.	• Large percentage of ground cover is introduced, reducing suitability for granivorous birds. • Based on ground layer structure and floristics, this vegetation community does not support suitable habitat for *D. setosum*. The species was not recorded during field surveys. Although occasional native grasses are present, the ground layer is dominated by introduced species (~98%) and lacks the open grassland structure typically associated with the species. The absence of basaltic or stony red-brown loam soils further reduces habitat suitability. • Foraging habitat for Squatter pigeon is limited due to dense ground cover and dominance of introduced grasses. These conditions do not provide the open, native grass-dominated understorey preferred by the species for foraging and nesting and likely reduce access to native seed resources.
Gilgai Presence	Infrequent and shallow.	Foraging, sheltering, seasonal water resource.	• N/A	• Low density of gilgai results in reduced habitat resources for waterbird and reptile species that utilise ponded water, generally ponded in gilgai, for foraging.
Leaf Litter Cover and Depth	0% cover.	Shelter.	• N/A	• Low complexity of ground layer structure for small, ground-dwelling mammals and small reptiles to shelter.
Hollow Logs	Per 1ha of community: • Small: 1, • Medium: 0, • Large: 0.	Shelter.	• N/A	• Low complexity of ground layer structure for small, ground-dwelling mammals and small reptiles to shelter.
Fallen Woody Debris	Absent – Rare.	Shelter.	• N/A	• Low complexity of ground layer structure for small, ground-dwelling mammals and small reptiles to shelter.
Cracking Soils	Rare.	Shelter.	• Cracking clay soils result in the presence of habitat for Brigalow belt specialist reptile species that utilise cracking soil for shelter.	• N/A

Habitat Attribute	Assessment Determination	Relevant Ecological Role of Habitat Attribute	Fauna Utilisation	
			Opportunities	Limitations
			• The presence of cracking soils and frequent deep gilgai indicates that this community provides suitable shelter and foraging habitat for the Ornamental snake.	
Rocky Outcrops	Absent.	Shelter and denning opportunities.	• N/A.	• No habitat for rocky-dependent mammals such as the quoll.
Upper Stratums				
Flowering and Fruiting Plants	Absent.	Foraging.	• N/A	• No foraging habitat for nectar-feeding birds, mammals and flying-foxes.
Mistletoe	Absent.	Foraging.	• N/A.	• No habitat resources for mistletoe dependent bird species.
Koala Food Trees	0%	Foraging.	• N/A	• Absence of suitable food trees for Koala and Greater glider foraging. • This community is not considered to provide sheltering opportunities for the Koala due to the low canopy height, limited structural complexity, and absence of mature food trees
Decorticating Bark	Absent.	Shelter.	• N/A	• No resources for microbats and small reptiles (e.g., geckos) that use decorticating bark for sheltering.
Tree Hollows	Absent	Shelter.	• N/A	• No resources are present that could support small to large hollow-dependent birds (e.g., woodland birds) and mammals (e.g., gliders). • The absence of tree hollows and the immature canopy structure exclude this community from providing suitable sheltering habitat for the Greater glider.
Aquatic and Connectivity				
Aquatic features	Phillips Creek (ephemeral) is located south of the habitat patch and lies outside the project area boundary.	Foraging, shelter and dispersal.	• Nearby access to water source for fauna species that have a daily intake requirement e.g., some finch species.	• Limited aquatic habitat for frogs, which are prey for waterbirds and Brigalow belt specialist reptile species, such as the Ornamental snake.

Habitat Attribute	Assessment Determination	Relevant Ecological Role of Habitat Attribute	Fauna Utilisation	
			Opportunities	Limitations
Patch Size	While the area is contiguous, connectivity is restricted to the ground stratum, reflecting limited structural continuity for fauna.	Home range capacity	• Sufficient for small ground reptiles and birds.	• Vegetation structure is not sufficient to support Koala or Greater glider.
Patch Connectivity	The area is contiguous, however, the vegetation structure is unlikely to provide meaningful connectivity or dispersal opportunities for most fauna.	Dispersal	• May support limited local dispersal opportunities for large mammals (i.e., macropods) and birds. • This habitat is considered to be contiguous with other surrounding regrowth areas and areas with gilgai and therefore provides dispersal opportunities for Ornamental snake.	• Historical broadscale clearing within the Project area created a dispersal barrier for some species, particularly arboreal mammals (e.g., Greater glider and Koala). • This habitat lacks key structural and microhabitat features required for dispersal, including cracking soils, deep gilgai, and continuous ground-layer connectivity. As such, it is not considered to facilitate movement or dispersal of the Ornamental snake. • Due to the dominance of introduced ground cover and the absence of native grassland structure, this habitat does not provide suitable conditions to support dispersal by the Squatter pigeon.

Based on the identified habitat values, an evaluation of the Cleared and Disturbed Areas with Grass and Forb Regrowth was undertaken to assess its suitability for conservation-significant species known or considered likely to occur within the Project area. The assessment determined that this community does not provide suitable habitat for any of the conservation-significant species assessed, due to the absence of essential features such as native vegetation structure, Koala food trees, hollow-bearing trees, gilgai, cracking soils, and native ground layer flora. The ground stratum is heavily dominated by introduced species and lacks the structural and floristic diversity required to support foraging, sheltering, or breeding for target species. Table 19 summarises the outcomes of this assessment.

TABLE 19 ASSESSMENT OF CLEARED AND DISTURBED AREAS WITH GRASS AND FORB REGROWTH HABITAT SUITABILITY FOR CONSERVATION SIGNIFICANT SPECIES

Conservation Significant Species	Habitat ground truthed as present?	Habitat Type	Justification
Koala	No.	N/A – no suitable habitat identified.	Koala food trees are absent and the area lacks any overstorey vegetation suitable for foraging or shelter. The vegetation is highly disturbed, with no structural features that meet Koala habitat criteria.
Greater glider	No.	N/A – no suitable habitat identified.	The absence of hollow-bearing trees, canopy connectivity, and mature eucalypt structure excludes this area from supporting shelter or foraging resources for Greater glider.
Squatter pigeon	No.	N/A – no suitable habitat identified.	Ground cover is dense (~80%) and dominated by introduced species (~98%). The lack of native grasses and open structure limits foraging and nesting, excluding this area as habitat.
Ornamental snake	No.	N/A – no suitable habitat identified.	Gilgai are rare and shallow, cracking soils are largely absent, and amphibian prey is lacking. The site does not support foraging, sheltering, or dispersal needs of the Ornamental snake.
Dichanthium setosum	No.	N/A – no suitable habitat identified.	The ground layer is almost entirely composed of exotic grasses (~98%) and lacks the open native grassland structure required to support *D. setosum*. No indicator species were recorded.
Dichanthium queenslandicum	No.	N/A – no suitable habitat identified.	The ground layer is almost entirely composed of exotic grasses (~98%) and lacks the open native grassland structure required to support *D. queenslandicum*. No indicator species were recorded.

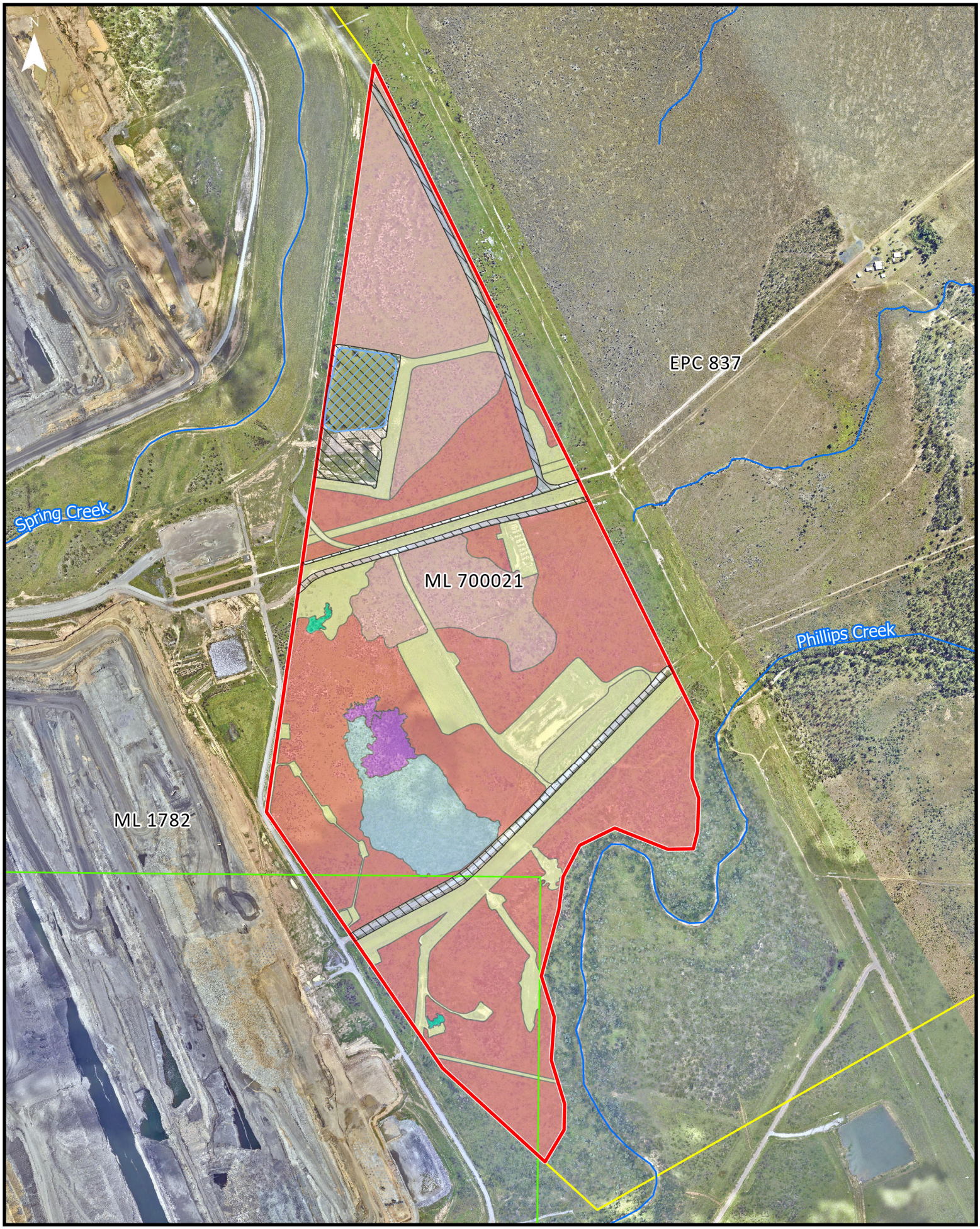


FIGURE 6: FAUNA HABITAT TYPES

ENGENY

Legend

- WaterStorageFacility
- Infrastructure areas
- Watercourse
- Project Area
- Mining Lease Boundary
- Exploration Permits (Coal)

Habitat Type

- Brigalow Regrowth with Frequent Gilgai
- Brigalow Regrowth with Infrequent Gilgai
- Brigalow woodland
- Eucalypt and Brigalow low open forest
- Eucalypt open forest
- Cleared and Disturbed Areas with Grass and Forb Regrowth

0 100 200 300 m

DATA SOURCE
QSpatial, 2024; Data used is licensed under a Creative Commons Attribution 4.0 International Licence Engeny, 2024; Data collected by Engeny during field survey.

DISCLAIMER
Engeny has endeavoured to ensure accuracy and completeness of the data. Engeny assumes no legal liability or responsibility for any decisions or actions resulting from the information contained within this map.

3.5 Fauna Diversity

A total of 62 native fauna species, including 43 birds, eight (8) reptiles, six (6) mammals and five (5) amphibians were recorded opportunistically and during targeted surveys across the Project area.

Woodland birds were the most commonly recorded species out of the fauna groups, reflecting the main habitat values across the Project area. Other bird groups such as raptors, waterbirds, nectar-feeding birds, granivorous bird species and smaller woodland birds (wrens and thornbills) represented a lower diversity across the Project area. Targeted spotlighting surveys identified a number of nocturnal bird of prey species, including Australian owlet-nightjar (*Aegotheles cristatus*) and Southern boobook owl (*Ninox boobook*).

Two (2) species listed as threatened under the EPBC Act were observed during the field survey and are further discussed in Section 3.5.2, below.

The full fauna species list is provided in Appendix B.

3.5.1 Introduced Fauna

A total of three (3) introduced fauna species were recorded during the field survey; being Rabbit (*Oryctolagus cuniculus*), Feral pig (*Sus scrofa**) and Cane toad (*Rhinella marina**). Rabbit and Feral pig are listed as restricted matters under the *Biosecurity Act 2014*. Based on desktop assessment results of introduced fauna identified in the surrounding area, the condition of the Project area identified during the field survey and previous ecological survey results, there is the potential for the area to support other introduced fauna such as Feral dogs (*Canis sp.**), Feral cats (*Felis catus**) and House mouse (*Mus musculus**).

In addition, introduced fauna species can threaten conservation significant fauna. The following key threatening processes are listed under the EPBC Act:

- Biological effects, including lethal toxic ingestion, caused by Cane toads*;
- Predation by the European red fox*;
- Predation by Feral cats*;
- Predation, habitat degradation, competition and disease transmission by Feral pigs*; and
- Competition and land degradation by Rabbits*.

3.5.2 Conservation Significant Fauna Species

The PMST report and WildNet online database search identified 32 conservation significant fauna species, listed by the EPBC Act, as potentially occurring within the Project area and/or surrounds.

Two (2) fauna species listed as threatened under the EPBC Act were observed during the field survey effort, as follows:

- Greater glider (listed as endangered under the EPBC Act) was identified outside to the south of the Project area within remnant vegetation associated with Phillips Creek (Figure 14). This species was not identified as present within the Project area.
- Ornamental snake (listed as vulnerable under the EPBC Act) was identified within the Project area (Figure 12) within two (2) habitat types:
  - Brigalow regrowth with frequent gilgai; and,
  - Brigalow woodland.

A LoO assessment (refer Appendix C) was undertaken for the remaining species identified in the desktop assessment and based on the results of the field assessment. The assessment identified a further two (2) threatened fauna species as potential occurrences within the Project area, and three (3) migratory species as a potential fly-over. These are:

- Squatter pigeon listed as vulnerable under the EPBC Act;
- Koala listed as endangered under the EPBC Act; and,
- Oriental cuckoo (*Cuculus optatus*), Fork-tailed swift (*Apus pacificus*) and Satin flycatcher (*Myiagra cyanoleuca*) listed as migratory under the EPBC Act.

Whilst foraging and sheltering resources for Koala were found to occur in the Project area, which is the main driver for the potential occurrence assessment, it is considered that the actual likelihood of the species utilising this habitat is low. However, vegetation associated with Phillips Creek directly adjacent to the Project area is considered to provide better quality habitat that is likely to be utilised by Koala.

Further discussion and associated maps of individual species records and habitats both within and directly surrounding the Project area is provided in Section 4.2.

The remaining 36 conservation significant fauna species assessed in the LoO were considered unlikely to occur within the Project area due to the lack of a surrounding known population and/or the absence of the following habitat characteristics:

- Waterbodies with fringing muddy margins, supporting shallow water areas and/or emergent semi-aquatic vegetation;
- Permanent flowing watercourses or watercourses supporting deep pools with a diversity of aquatic habitat structural features;
- Abundance of foraging resources such as mistletoe and native grasses;
- Caves, mine shafts, rocky features supporting crevices and overhangs; and
- Large and contiguous vegetation tracts.

The detailed LoO assessment is provided in Appendix C.

3.6 Landscape Connectivity

The Project area is located within a region which has historically been intensively utilised for cattle grazing, crop cultivation and mining activities. These activities have been facilitated by, and resulted in, broadscale clearing of remnant vegetation, culminating in significant vegetation fragmentation. Isolated patches of 'steppingstone' retained vegetation, set in association with waterways, or incidentally retained as isolated tree stands and/ or young regrowth, provide connectivity across cleared paddocks and provide potential movement opportunities for fauna, such as the Squatter pigeon (Figure 10), within the broader landscape.

Vegetation associated with Phillips Creek (south of the Project area) is considered to provide connectivity within the locality of the Project area and facilitate important dispersal opportunities towards the Isaac River, particularly for species such as the Greater glider (Figure 14) and Koala (Figure 8). Phillips Creek is recognised on Statewide Corridor mapping to be a regionally significant corridor, which connects to the State significant corridor along the Isaac River (Figure 7).

Vegetation communities present within the Project area (specifically those ground-truthed remnant or HVR) may provide opportunistic steppingstone connectivity for some fauna moving northward from Phillips Creek. However, it is noted that given the highly impacted and fragmented nature of vegetation within and north of the Project area, dispersal opportunities are very limited. In addition, connectivity to the west of the Project area is highly compromised by the existing Saraji Mine and areas to the east of the Project area are predominantly cleared and lack any patches of vegetation. The Project area is therefore not considered to form an important fauna movement corridor. In-fact, this assessment considers that steppingstone connectivity from Phillips Creek to the Project area likely results in a 'dead-end' for most fauna species, particularly the Koala (Figure 8).

The spatial desktop assessment (Section 2.3.2) indicates that gilgai landscapes extend through the central and northern parts of the Project area, to gilgai situated north-east of the Project area. The indicative connectivity from the Project area to large extents of gilgai landscapes located north-east of the Project area (connecting through to Spring Creek, One Mile Creek and the Isaac River floodplain) is likely highly important for dispersal opportunities for fauna utilising gilgai, including Ornamental snake (Figure 7). However, gilgai do not extend to the southern boundary of the Project area and therefore, do not provide connectivity to Phillips Creek (Figure 11).

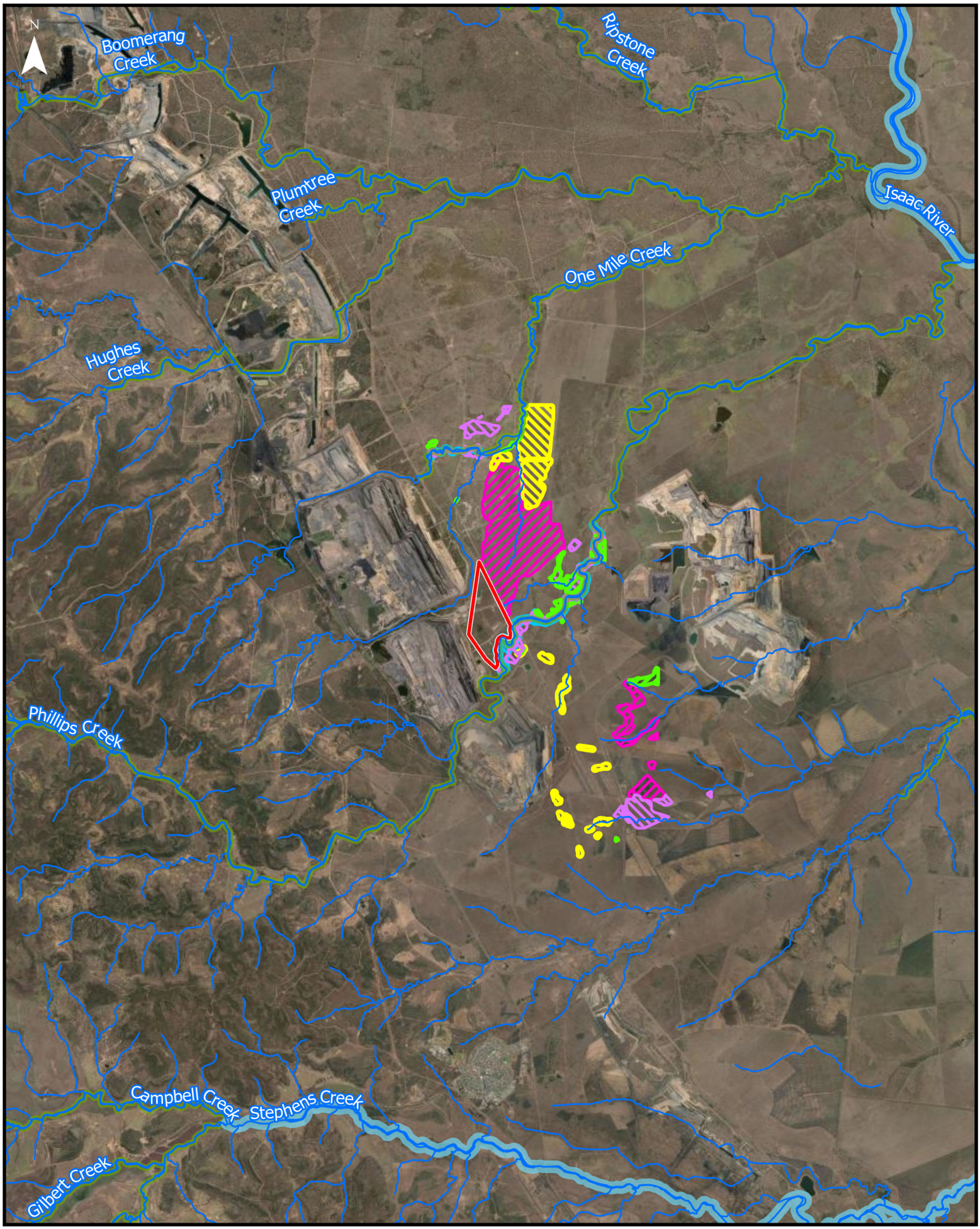


FIGURE 7: LANDSCAPE CONNECTIVITY

ENGENY

Legend

- Project Area
- Watercourse

Statewide Corridors (DES, 2019)

- Riparian centrelines

Significance

- Regional
- State

Koala and Greater Glider Habitat Type (AECOM, 2023; BAAM, 2021)

- Preferred
- Suitable
- Marginal

Ornamental Snake Habitat Type (AECOM, 2023; BAAM, 2021)

- Preferred
- Suitable
- Marginal

0 1 2 3 km

4. MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

Based on the ecological values described in Section 3, both within the Project area and surrounds, a summary of the MNES values relevant to this assessment is outlined in Table 20. MNES confirmed or considered to have the potential to occur within the Project area and surrounds are further discussed in the following sections, with the exception of values that are only considered transient / flyover (e.g., species that are almost exclusively aerial). Transient or flyover only species rarely land and/or utilise terrestrial environments. The Project is not expected to impact aerial spaces and as such, these species are considered irrelevant for further discussion.

TABLE 20: MNES CONFIRMED OR POTENTIALLY PRESENT WITHIN THE PROJECT AREA THAT ARE RELEVANT TO THE ASSESSMENT

MNES Value	Comments
Listed threatened species and ecological communities	41 threatened species and ecological communities were identified in desktop searches as potentially occurring within the Project area or surrounds. This included: • 19 birds; • Six (6) reptiles; • Five (5) mammals; • Seven (7) flora species; and • Four (4) TECs. During the field survey, one (1) threatened species, Ornamental snake (vulnerable), was identified within the Project area. Refer to Section 4.2.3 for further details. Greater glider (endangered) was identified south of the Project area, within remnant vegetation set in association with Phillips Creek. It is noted that Greater glider was not identified within the Project area, and the fragmented nature of potential habitat likely deters this species from inhabiting the Project area. Refer to Section 4.2.3.4 for further details. Of the remaining threatened species, a LoO assessment identified an additional two (2) species as potentially or likely to occur, including: • Squatter pigeon (vulnerable) (refer to Section 4.2.2); and • Koala (endangered) (refer to Section 4.2.1). No threatened flora species have been identified within the Project area or considered to potentially occur. Of the five (5) TECs identified in the desktop assessment to potentially be present within the Project area or surrounds, REs analogous with one (1), the Brigalow TEC, were ground-truthed during the field survey. A discussion on the results of the Bigalow TEC assessment is included within Section 4.1.1. This assessment determined that the patch of Brigalow did not meet the key diagnostic and / or condition threshold for the TECs and as a result no TECs are present within the Project area.
Migratory species	10 migratory species were identified in desktop searches as potentially occurring within the Project area or surrounds. No migratory species were identified during the field survey. Based on the LoO assessment, three (3) species are considered potential or likely occurrences; Oriental cuckoo, considered a likely flyover species only, and Fork-tailed swift and Satin flycatcher which are considered potential flyover species. Therefore, these species are not discussed in the subsequent sections.

4.1 Threatened Ecological Communities

Vegetation potentially analogous to one (1) potentially occurring TEC was identified within the Project area from the desktop assessment. This included areas of vegetation that aligned with REs that are listed specifically for the Brigalow TEC. Field validation surveys within the Project area confirmed the presence of Brigalow TEC listed REs, namely RE11.3.1 and RE11.4.9, as well as a larger extent of Brigalow dominated regrowth vegetation.

Assessments in accordance with the approved conservation advice for the Brigalow TEC (Department of the Environment, 2013a) were undertaken within identified analogous REs and Brigalow regrowth vegetation to confirm if the Brigalow TEC was present. These assessments indicated that no TECs are present within the Project area as outlined below (Section 4.1.1).

4.1.1 Brigalow TEC

An assessment of vegetation within the Project area against the key diagnostics and condition thresholds for Brigalow TEC is provided in Table 22 below. Approximately 150 ha of vegetation within the Project area was identified to potentially represent Brigalow TEC, including the following vegetation communities:

- *Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains (Remnant RE11.4.9) – 2.73 ha
- *Acacia harpophylla* and/or *Casuarina cristata* low open forest on alluvial plains (HVR RE11.3.1) – 0.13 ha
- Brigalow Regrowth (Non-remnant) – 147.69 ha

To support this assessment, key vegetation attributes were reviewed for each community, including dominant flora species composition, extent of non-native vegetation cover, community age and clearing history, patch size, and overall ecological condition.

Community age and disturbance history were assessed using historical aerial imagery available via QImagery (DNRMMRRD, 2025). While the precise timing of all clearing events could not be determined, due to the non-recurring nature of image capture, the imagery was reviewed to identify the most recent and observable disturbance events. As such, the clearing dates presented in Table 21 are considered approximate.

Importantly, the QImagery review clearly indicates that the Brigalow regrowth community has been subject to ongoing disturbance over time. The imagery shows evidence of repeated clearing, slashing, and surface degradation likely associated with grazing and trampling, which has inhibited natural regeneration and structural development.

Field survey results confirm that non-native vegetation cover is present across all three assessed vegetation communities, to varying degrees:

- The *Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains (RE11.4.9) was assessed as having approximately 25% non-native vegetation cover, with frequently occurring species including *Megathyrsus maximus*, *Cenchrus ciliaris*, and *Bothriochloa pertusa*.
- The *Acacia harpophylla* and/or *Casuarina cristata* low open forest on alluvial plains (HVR RE11.3.1) contained an estimated 50% non-native vegetation cover, dominated by *Megathyrsus maximus*, *Cenchrus ciliaris*, *Bothriochloa pertusa*, and *Chloris gayana*.
- The Brigalow regrowth community is the most heavily degraded, with approximately 84% non-native species cover in the ground layer. Dominant species include *Cenchrus ciliaris*, *Bothriochloa pertusa*, and *Chloris gayana*, with *Melinis repens* present as a sub-dominant. The shrub layer also supports high weed diversity, including *Parthenium hysterophorus* (locally dominant), *Cryptostegia grandiflora*, and *Stylosanthes scabra*. Notably, *Parthenium hysterophorus* and *Cryptostegia grandiflora* are listed as Category 3 Restricted Matter under the *Biosecurity Act 2014*. The high density and diversity of invasive species has substantially reduced the ecological integrity of this regrowth community and limits its capacity to develop the structural complexity required to meet Brigalow TEC condition thresholds.

This information, summarised in Table 21, formed the basis for evaluating each community against the key diagnostic characteristics and condition thresholds for Brigalow TEC (results presented in Table 22).

Following this assessment, it has been determined that none of the communities meet the criteria to be considered Brigalow TEC:

- RE11.4.9 did not meet the key diagnostic criteria, as *Acacia harpophylla* was absent as a dominant or co-dominant species.
- HVR RE11.3.1 met the diagnostic criteria but failed the condition thresholds, primarily due to insufficient patch size and high non-native species cover.
- Brigalow regrowth, although dominated by *Acacia harpophylla*, is too young (<15 years) and lacks the mature structure, canopy stratification, and ecological complexity typical of remnant Brigalow communities. Ongoing disturbance and high weed incursion have further impeded natural recovery.

TABLE 21: REVIEW OF DIAGNOSTIC CRITERIA PER VEGETATION COMMUNITY

RE	Vegetation Community	Dominant Tree Species	Non-native vegetation cover	Historical Clearing	Patch Approximate Age	Condition Assessment	Ground truthed patch Size (ha)
11.4.9 (Remnant)	*Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains.	Heavily dominated by *Casuarina cristata*. *Eucalyptus populnea* is present as a sub-dominant species.	~25%	Cleared ~1978 as part of broadscale clearing across the wider area.	~47 years.	Fragmented, with disturbance from invasive flora species in the ground layer.	2.73
11.3.1 (HVR)	Acacia *harpophylla* and/or *Casuarina cristata* low open forest on alluvial plains.	Heavily dominated by *Casuarina cristata. Acacia harpophylla* identified as a sub-dominant species.	~50%	Initially cleared ~1966; subsequent clearing ~1978 and ~2004.	~21 years.	Small patch of mature regrowth isolated by non-remnant vegetation; disturbance from mining and ground-layer weed incursion.	0.13
Non-remnant	Brigalow Regrowth.	Heavily dominated by *Acacia harpophylla.*	>84%	Broadscale clearing observed in ~1978, ~1985, ~2000, ~2004, and ~2017.	~8 years.	Highly fragmented and degraded by repeated clearing, agriculture, and mining; high weed invasion.	147.69

TABLE 22: BRIGALOW TEC ASSESSMENT RESULTS ACROSS THE PROJECT AREA

Criteria	Area of Project area where criteria was met	Area of Project area where criteria was not met
Key Diagnostic Characteristics		
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*).	147.69 ha (Brigalow regrowth) 0.13 ha (HVR RE11.3.1)	2.73 ha (Remnant RE11.4.9)
2) AND is in the Brigalow Belt, Southeast Queensland or Mulga Lands bioregion and meets the REDD description of 16 Qld REs listed for the TEC. AND / OR age of community, generally > 15-year regrowth.	0.13 ha (HVR RE11.3.1)	147.69 ha (Brigalow regrowth)
KEY DIAGNOSTIC CHARACTERISTICS OUTCOME	**0.13 ha of HVR RE11.3.1 meets all key diagnostic criteria**	**150.42 ha of RE11.4.9 & Brigalow regrowth do not meet all key diagnostic criteria – not further assessed**

Criteria	Area of Project area where criteria was met	Area of Project area where criteria was not met
Condition Thresholds		
1) The patch is 0.5 ha or more in size.	0.00 ha	0.13 ha (HVR RE11.3.1)
2) AND non-native 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.	0.00 ha	0.00 ha
CONDITION THRESHOLD OUTCOME	**No areas meet all condition threshold criteria**	**0.13 ha of RE11.3.1 HVR**
OVERALL BRIGALOW TEC OUTCOME	**No areas meet all key diagnostic and condition threshold criteria**	**150.55 ha of Remnant RE11.4.9, HVR RE11.3.1 and Brigalow Regrowth do not meet criteria.**

4.2 Threatened Fauna Species

4.2.1 Koala

Koala is listed as endangered under the EPBC Act. Species presence was not detected during the field survey (i.e., no evidence was recorded of Koala individuals, scats, or scratches). However, foraging and sheltering habitat resources have been identified within the Project area.

Multiple ecological assessments completed over the period from 2007 to 2021 also did not identify the species within the Project area. Recorded sightings and mapped potential Koala habitat exist in remnant vegetation associated with Phillips Creek (outside the Project area) (Figure 8). This includes records observed less than 150m south (BAAM, 2021) and about 200m east (ELA, 2019b) from the Project area, as well as confirmed scat recordings in association with Phillips Creek (Figure 8). Many other records occur in proximity to the Project area (Appendix C). This includes 17 records of Koala directly west of the Saraji Mine along the tributaries of Phillips Creek and One Mile Creek within a large and contiguous vegetation tract (Figure 8) (ELA, 2018). Majority of these records occur within 240 m of the mine site.

It is considered that Koala is likely to consistently utilise and inhabit vegetation along Phillips Creek.

Notwithstanding the presence of Koala individuals and habitat at Phillips Creek, the likelihood that Koalas will utilise potential habitat resources within the Project area is considered low. As described in more detail below, this potential habitat is considered marginal as it is fragmented and highly isolated.

The following sections provide an overview of the species' ecology and threats, and further describes the habitat within the Project area.

4.2.1.1 Species Ecology and Habitat Requirements

For combined Koala populations within Queensland, New South Wales and the Australian Capital Territory, the range extends from approximately the latitude of Cairns to the New South Wales-Victoria border. Although the species is often more abundant in coastal areas, inland populations do occur. The distribution of Koala is also affected by altitude (limited to <800 m above sea level (ASL)), temperature and, at the western and northern ends of the range, leaf moisture. It is noted that the species' distribution is not continuous within its range with a number of populations isolated by cleared land or unsuitable habitat. Koalas in Central Queensland occur in low densities and have large home ranges (Ellis *et al.*, 2002).

Koala is a specialist folivore that browses predominantly on the leaves of *Eucalyptus*, *Corymbia* and *Lophostemon* species. As a result, the Koala resides most commonly in forests and woodlands. Across New South Wales and Queensland alone, it is associated with over 600 species of food and shelter tree, though in a given region or site only a few species might be used (DAWE, 2022a).

In addition to the Koala food trees described above, non-food tree species are an essential resource to Koalas. Koalas use these shelter trees to thermoregulate, especially during hot days, and to avoid contact with predators. Koalas have been noted as preferring larger trees with a dense, intact canopy which provide more shade. Notwithstanding these preferences, they use a wide range of tree species for shelter, including rainforest trees, *Callitris glaucophylla*, *Acacia harpophylla* and *Melaleuca bracteata*. Individual Koalas move daily between food and shelter trees (DAWE, 2022a).

Over a longer timescale, individuals' use of habitat is influenced by seasonal changes in food quality, changes in habitat caused by drought, disturbance history, the long-term results of a changing climate and competition with other species. Typically, Koala home range will encompass a range of vegetation communities and landform elements, with Koalas in central Queensland moving around considerably. Subadults in particular, are known to disperse across large distances, sometimes 10 km or more, in search of new territory and resources (DAWE, 2022a).

4.2.1.2 Threats and Impacts

As per the EPBC Act Recovery Plan — *Phascolarctos cinereus* (combined populations of Queensland, New South Wales and the Australian Capital Territory (DCCEEW, 2022), the primary threats to this species include:

- Direct threats, including:
  - Climate change, resulting in drought, heatwaves and changes to fire regimes which lead to increased mortality of the species.
  - Land use change, including land use policy and practices which cause the loss, modification and fragmentation of native vegetation cover.
  - Natural system changes, including impacts occurring as a result of the native forestry industry and altered fire regimes including prescribed burning practices.
  - Mortality resulting from domesticated animals, vehicle strike and an increase in disease prevalence.
- Ecological threatening processes, including:
  - Habitat loss and fragmentation, as a result of land use activities which favour fertile soils which support Koala habitat.
  - Habitat degradation, often as a result of timber harvesting, agricultural activities, altered hydrological regimes and vegetation clearing.
  - Genetic effects, resulting from the increased isolation of small, disconnected habitat patches which limit genetic diversity and increase opportunity for inbreeding.

Land use policy and practices causing the loss, modification and fragmentation of native vegetation cover is considered a significant threat to Koala populations in Australia (DCCEEW, 2022). The main cause of habitat loss is as a result of clearing for agricultural activities, resource extraction and urbanisation.

4.2.1.3 Potential Habitat within the Project Area

Eucalypt dominated open forest communities were ground-truthed to occur within the Project area. Three (3) patches of open forest were delineated into two (2) habitat categories (Figure 8) during field survey and are described as:

- Eucalypt open forest; and,
- Eucalypt and Brigalow low open forest.

All eucalypt dominated open forest areas comprise a mature and tall canopy layer, potentially suitable for Koalas to utilise for sheltering and predator avoidance. These forest patches were found to be dominated by Koala food trees and therefore provide limited foraging resources. Koala food trees identified across these habitats were restricted to two species, *Eucalyptus populnea* and *E. cambageana*. Despite these features, the identified patches are limited in extent, highly fragmented, and significantly isolated from habitat known to support a Koala population along Phillips Creek to the south.

Dispersal from Phillips Creek to the eucalypt dominated vegetation patches identified within the Project area would require traversing a distance of 260m to 1 km through young Brigalow regrowth (approximately 4 m tall) including light vehicle mine access tracks. This would present a high-risk movement opportunity for individuals as the height of Brigalow regrowth is not considered sufficient for predator avoidance. Additionally, it is considered that the motivation for Koalas to move from preferred vegetation along Phillips Creek into this disturbed landscape would be minimal given the marginal quality of the vegetation available.

Additionally, two (2) of the three (3) open forest patches identified by this assessment have been calculated to be less than 1 ha in size. Patches less than 1 ha are considered too small to support the home range of a Koala individual without a well-connected network of supporting habitat patches (Ellis *et al.* 2002). The small patches are isolated and do not lead to other large, forested areas to the north of the Project area and therefore do not provide 'stepping stone' habitat value. The potential habitat within the Project area is essentially a 'dead end' for individuals and unlikely to be utilised by the species that are inhabiting Phillips Creek.

Therefore, while the Phillips Creek riparian corridor provides east–west dispersal opportunities for Koalas within the broader locality, there is no viable northward dispersal pathway into the Project area. The Project area is a habitat dead-end for Koalas, and clearing within it will not sever or further fragment existing Koala movement corridors or functional habitat patches. The absence of records north of Phillips Creek reinforces this aspect.

As per BHP's Central Queensland Threatened Species Habitat Descriptions (Kerswell *et al.*, 2020), areas of identified Koala habitat are categorised into 'Preferred', 'Suitable' and 'Marginal'. As detailed previously, open forest areas within the Project area are highly fragmented and significant barriers restricting Koala dispersal exist, including presence of vegetation communities dominated by low woody vegetation not suitable for predator avoidance as well as introduced flora (i.e., *Panicum effusum*) species in the ground stratum, roads and fence lines. Therefore, open forest areas within the Project area have been classified as sparsely distributed woodlands and therefore meets the definition of 'Marginal' habitat.

Vegetation associated with Phillips Creek (situated outside of the Project area to the south) has been determined from previous assessments in the surrounding area, as 'Preferred' habitat, predominantly within the riparian zone. On the adjacent floodplains, the vegetation has been categorised as 'Suitable' (Figure 8). This previous determination has been based on the findings of previous recorded presence of Koala within this vegetation, and the association of vegetation with the identified waterway of Phillips Creek.

Known records of Koala across the area also supports this habitat classification. No sightings of Koala or evidence of Koalas were detected in current field survey or in previous ecological surveys across the Project area. All records of Koala across the area occur along Phillips Creek as well as its tributaries and the extensive and contiguous vegetated tract directly west of Saraji Mine (Figure 8). Majority of these records occur in close proximity (approximately 240 m) to the active mine site.

Areas of identified Koala habitat within the Project area and their respective habitat category are summarised in Table 23 and depicted in Figure 8.

TABLE 23: KOALA HABITAT WITHIN THE PROJECT AREA

Habitat Category	Definition	Area (ha)
Preferred	Contiguous remnant and high-value regrowth *Eucalyptus* open forest to woodlands on alluvial and/or cracked rock groundwater where palatable food tree species occur frequently (and are usually dominant). This specifically includes stream-fringing open forest, open forest or woodland on alluvial terraces where *Eucalyptus tereticornis* and/or *E. camaldulensis* are dominant or common subdominant elements. Other important food species on the alluvial terraces can include *E. coolabah, E. crebra, E. melanophloia* and *E. populnea*. These listed Eucalyptus species comprise a subsample of locally important Koala habitat trees in the Brigalow Belt across various geological contexts. These habitats typically provide the full suite of habitat requirements for the Koala, including reliable breeding, foraging, sheltering, and dispersal opportunities. The Project area does not support any vegetation meeting this description.	0.0
Suitable	Remnant and regrowth Eucalyptus open forest to woodlands with more variable aquifers (often seasonal) and that have connectivity to other areas of suitable or preferred habitat. Must incorporate one or more palatable food tree species of relative abundance. These areas are connected to broader habitat networks and therefore support foraging, shelter, and dispersal, and may be used by Koalas moving between higher-quality areas. No such habitat has been identified within the Project area.	0.0
Marginal	All other fragmented and sparsely distributed woodlands and open woodlands, shrub lands and forests, with some food trees and which experience significant seasonal water deficits and/or are subject to periodic high intensity fires. These areas may support rare, opportunistic sheltering and dispersal, but are unlikely to support breeding or foraging opportunities due to their small size, isolation, and surrounding barriers.	11.29
Total		**11.29**

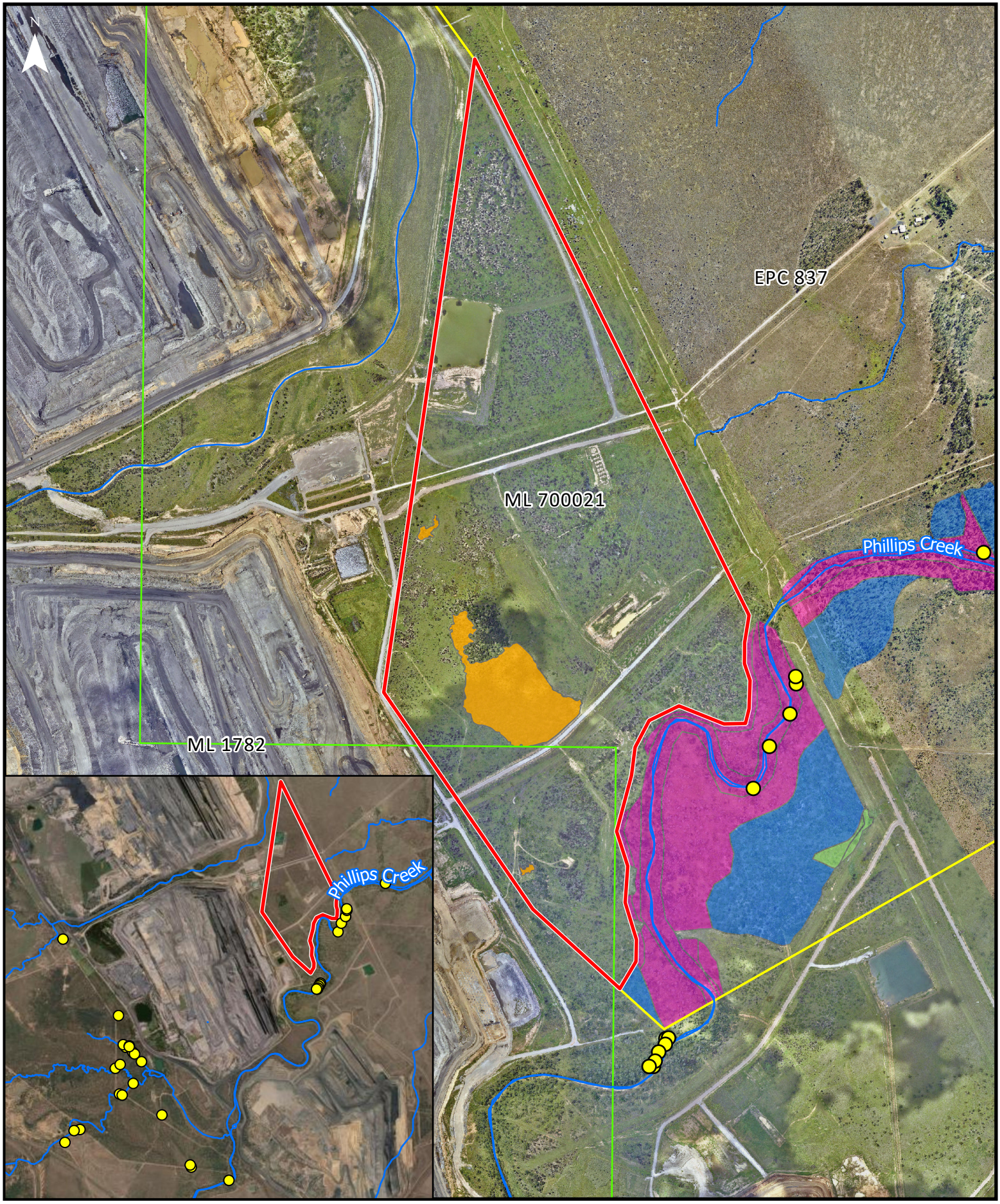


FIGURE 8: KOALA HABITAT WITHIN THE PROJECT AREA AND SURROUNDS

Legend

- Koala Sightings
- Watercourse
- Project Area
- Mining Lease Boundary
- Exploration Permits (Coal)

Koala Habitat Type

- Marginal

Koala Habitat Type (AECOM, 2023; BAAM, 2021)

- Preferred
- Suitable
- Marginal

0 250 500 m

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4.2.1.4 Habitat Critical to the Survival of the Species

The Commonwealth provides species-specific guidance on habitat considered to be critical to the survival of Koala. As outlined in the Conservation Advice (DAWE, 2022a), factors to consider in identifying critical habitat include:

- Whether the habitat is used during periods of stress (examples: flood, drought or fire);
- Whether the habitat is used to meet essential life cycle requirements (examples: foraging, breeding, nesting, roosting, social behaviour patterns or seed dispersal processes);
- The extent to which the habitat is used by important populations;
- Whether the habitat is necessary to maintain genetic diversity and long-term evolutionary development;
- Whether the habitat is necessary for use as corridors to allow the species to move freely between sites used to meet essential life cycle requirements;
- Whether the habitat is necessary to ensure the long-term future of the species or ecological community through reintroduction or re-colonisation; and,
- Any other way in which habitat may be critical to the survival of a listed threatened species.

Habitat critical to the survival of Koala can include habitat that is occupied as well as unoccupied, and could accommodate future population increase, reintroduction and climate refugia. It is noted that, as per the Register of Critical Habitat (DCCEEW, 2022b), no critical habitat for the Koala has been previously identified within the Project area by the Threatened Species Scientific Committee.

To provide a structured assessment against the Commonwealth criteria, the potential Koala habitat within the Project area was evaluated against each of the factors outlined in the Conservation Advice. The results of this assessment are summarised in Table 24.

Table 24: Assessment of Potential Koala Habitat within the Project Area against Commonwealth Criteria for Habitat Critical to the Survival of the Koala

Criteria for Habitat Critical to the Survival of Koala	Ground truthed results for the Project area	Assessment Result
Habitat used during periods of environmental stress (e.g. drought, flood, fire).	The Project area is not associated with any known Groundwater Dependent Ecosystems and there is no evidence that vegetation accesses groundwater or provides drought refuge conditions.	**Criteria not met.** Vegetation does not function as a climate refuge. Vegetation communities within the Project area rely on surface water and rainfall, and there is no evidence of groundwater access or persistent water availability that would support Koalas during periods of environmental stress.
Habitat is necessary to maintain genetic diversity and long-term evolutionary development.	Eucalypt open forest patches within the Project area contain Koala food trees; *Eucalyptus populnea* and *E. cambageana* present at densities of approximately 30%. Three eucalypt dominated vegetation patches were identified during field surveys, two of which are less than 1ha in size and one approximately 10.87ha. These patches are fragmented and isolated from the larger areas of suitable Koala habitat associated with Phillips Creek. Koalas in central Queensland occur at low densities and occupy relatively large home ranges (Ellis *et al.,* 2002), with reported home ranges ranging from approximately 10–30ha for females and up to 100 ha for males (Ellis *et al.,* 2002; Melzer *et al.*, 2000). The largest habitat patch within the Project area (10.87ha) occurs in isolation from other suitable habitat and is unlikely to support a resident population or contribute to population processes that maintain genetic diversity at a regional scale.	**Criteria not met.** Habitat extent, structure, and food tree density are insufficient to support essential life cycle requirements such as foraging territories, breeding habitat, or long-term occupancy.

Criteria for Habitat Critical to the Survival of Koala	Ground truthed results for the Project area	Assessment Result
	This is further supported by the fact that no Koala individuals or evidence of use (scats, scratches) were recorded during the 2024 field surveys or previous surveys.	
The extent to which the habitat is used by important populations.	No Koala individuals or evidence of occupancy have been recorded within the Project area during multiple ecological surveys conducted between 2007 and 2021, or during the most recent 2024 field survey. Known Koala records occur along Phillips Creek and its tributaries, outside the Project area (Figure 8). This suggests the Koala within the locality do not require the habitat within the Project area, and that it is lacking characteristics and/or requirements that would support Koala.	**Criteria not met.** The Project area does not support a known Koala population and there is no evidence of regular use by the species, even though it is noted Koala are present in wider locality.
Habitat is necessary for use as corridors to allow the species to move freely between sites used to meet essential life cycle requirements.	Movement from Phillips Creek into the Project area would require Koalas to traverse 260m to 1km of disturbed landscape, including young Brigalow regrowth (~4 m tall), cleared areas and vehicle tracks. These areas do not provide adequate canopy cover for predator avoidance or sheltering (reduced thermoregulation ability).	**Criteria not met.** The Project area does not function as a movement corridor and represents a habitat dead-end, rather than a connection between functional habitat areas.
Habitat is necessary to ensure the long-term future of the species or ecological community through reintroduction or re-colonisation.	Habitat within the Project area occurs as three small and isolated patches of Eucalypt open forest and Eucalypt and Brigalow low open forest, two of which are less than 1ha in size and one approximately 10.87ha. Although Koala food trees (*Eucalyptus populnea* and *E. cambageana*) are present, the patches are fragmented and separated from known Koala habitat along Phillips Creek by distances of approximately 260 m to 1 km of disturbed landscape, including young Brigalow regrowth, cleared areas and vehicle access tracks. The fragmented and isolated nature of the habitat within the Project area is evidenced by the absence of Koala individuals or usage within the Project area. A number of threatening processes to Koala are present within the Project area as a result of historical land use, namely the loss, modification and fragmentation of native vegetation cover. These conditions have resulted in marginal habitat that lacks connectivity to the broader habitat network associated with Phillips Creek. These land uses and associated threatening processes would continue regardless of the Project approval. Subsequently, the Project area is not considered appropriate for reintroduction or promoting recolonisation.	**Criteria not met.** Habitat lacks the size, quality, and connectivity required to support recolonisation or establishment of a viable Koala population.
Any other way in which habitat may be critical to the survival of a listed threatened species.	No additional ecological attributes were identified that would elevate the importance of the habitat for Koalas. The area does not provide key landscape functions such as refuge habitat, core population habitat, or a regional movement corridor.	**Criteria not met.** The habitat does not provide any additional characteristics that would make it critical to the survival of the species.

Field surveys conducted within the Project area confirmed that all potential Koala habitat is in marginal ecological value. Consistent with the assessment outlined within Table 24, this conclusion is based on several key limitations of the habitat area:

- The fragmented and isolated nature of the habitat patches within the Project area (three patches were identified during field surveys, two of which are less than 1ha in size and one approximately 10.87ha),
- Patch isolation from known Koala habitat by distances ranging from 260 m to 1 km,
- Habitat structure is limited, with canopy trees occurring within fragmented patches of Eucalypt open forest dominated by Eucalyptus populnea and E. cambageana, which are separated from known Koala habitat by areas of young Brigalow regrowth (approximately 4 m tall), cleared land and light vehicle access tracks that do not provide adequate canopy cover for predator avoidance,
- No functional connectivity to known Koala habitat at Phillips Creek to the south, and
- The presence of threatening processes associated with historical land use, including the clearing, modification and fragmentation of native vegetation, which have reduced habitat quality and connectivity across the Project area.

These patches of marginal habitat within the Project area are separated from higher-quality habitat at Phillips Creek by multiple barriers, including cleared land, young, Brigalow regrowth vegetation, fencing, and light vehicle tracks. Movement between these patches and known Koala habitat would require individuals to traverse distances of 260m to 1km of unsuitable and high-risk terrain. Given the presence of more viable and lower-risk movement corridors elsewhere in the locality (i.e., at Phillips Creek), it is highly unlikely that Koalas would utilise habitat within the Project area for dispersal or other essential life cycle functions.

Additionally, the Project area is not associated with any known Groundwater Dependent Ecosystems (GDEs), and there is no evidence that the vegetation present accesses groundwater or provides drought resilience. These areas are therefore not expected to function as climate refugia. No Koala individuals have been recorded within the Project area in either current or previous surveys.

Given the above, the potential habitat within the Project area:

- Cannot support essential life cycle requirements such as breeding or permanent occupancy;
- Cannot sustain important Koala populations or maintain regional genetic diversity;
- Does not offer safe or functional dispersal opportunities to support recolonisation or connectivity; and
- Does not support climate resilience.

As such, areas within the Project area does not meet the Commonwealth's criteria for habitat critical to the survival of the Koala.

In contrast, Phillips Creek, located south of the Project area, satisfies several criteria for critical Koala habitat. The riparian corridor supports confirmed Koala populations (e.g. BAAM, 2021), provides foraging and shelter resources, and may function as a terrestrial GDE during dry periods. It also forms an important east–west movement corridor linking habitat along the Harrow Ranges and Isaac River, facilitating dispersal, gene flow, and access to resources during environmental stress. As such, Phillips Creek is considered to meet the Commonwealth's definition of critical Koala habitat, unlike the marginal and isolated patches within the Project area. The Project will not directly impact or result in the loss of habitat at Phillips Creek.

4.2.2 Squatter pigeon

Squatter pigeon is listed as vulnerable under the EPBC Act. Species presence was not detected during the field survey; however, potential habitat was identified.

Previous ecological assessments across the area also did not identify the species within the Project area but have identified this species in the adjacent areas. This includes two (2) sightings of Squatter pigeon approximately 4km north/northwest (recorded by SKM in 2012) and about six (6) records 8km northwest of the Project area during the field assessments previously conducted (as identified in BAAM (2021)). Given this, and other nearby recent records identified in the desktop assessment, Squatter pigeon is considered likely to occur in the surrounds and potentially utilise the habitat within the Project area for dispersal purposes.

The following sections provide an overview of the species' ecology and threats and further describes the habitat within the Project area.

4.2.2.1 Species Ecology and Habitat Requirements

Squatter pigeon is now largely (if not wholly) restricted to Queensland, from the New South Wales border, north to the Burdekin River, west to Charleville and Longreach, and east to the coast to Townsville and Proserpine (TSSC, 2015). In southern Queensland, only small, isolated and sparsely distributed sub-populations of the sub-species occur in this part of its range. Overall, the subspecies' known distribution is estimated to occur within the latitudes, 17° to 30° S, and the longitudes, 141° to 153° 30' E (Department of the Environment, 2024a).

Squatter pigeon occurs in dry grassy woodland and open forest (typically dominated by *Eucalyptus*, *Corymbia*, *Acacia* or *Callitris* in the canopy), mostly in sandy areas close to water (generally within 3 km). The species is also known to inhabit grasslands with scattered remnant trees, disturbed areas (such as roads, railways, settlements, and stockyards), scrubland, and *Acacia* regrowth. This species is unlikely to

move far from woodland trees that provide protection from predatory birds. Where scattered trees still occur, and the distance of cleared land between remnant trees or patches of habitat does not exceed 100 m, individuals may be found foraging in, or moving across modified or degraded environments (Department of the Environment, 2024a).

Foraging and breeding habitat for this species is known to occur on well-draining, sandy or loamy soils on low, gently sloping, flat to undulating plains and foothills. Squatter pigeon is known to forage for seeds among sparse and low grass, in improved pastures, and disturbed habitats such as road reserves. Dispersal habitat is any forest or woodland occurring between patches of foraging or breeding habitat, and suitable waterbodies. Such patches of vegetation tend not to be suitable for the species' foraging or breeding but facilitate the local movement of the species between patches of foraging habitat, breeding habitat and/or waterbodies, or the wider dispersal of individuals in search of reliable water sources during the dry season or during droughts (Department of the Environment, 2024a).

Squatter pigeon nests on the ground, and usually lays two eggs under vegetation, a fallen tree or log. This species will breed throughout the year; however, breeding is influenced by rainfall patterns and most commonly occurs during the dry season between May to June (TSSC, 2015).

4.2.2.2 Threats

The following threats are contributing to the continued decrease of Squatter pigeon population:

- Overgrazing during times of drought of both livestock and feral species, which has been contributed to changing climatic patterns;
- Habitat clearing reducing habitat for the species;
- Introduction of weeds;
- Inappropriate fire regimes resulting in reduction in viable habitat;
- Predation by feral species such as cats and foxes;
- Introduction of stock into prime habitat areas resulting in trampling of nests; and
- Illegal shooting.

4.2.2.3 Potential Habitat within the Project Area

Vegetation areas with a grassy understorey that can be utilised by Squatter pigeon were ground-truthed across the majority of the Project area (i.e., approximately 73% of the total area). One habitat type (marginal) was ground truthed across the Project area (Figure 10) and comprises a multiple ecosystem types including:

- Brigalow woodland;
- Eucalypt open forest;
- Eucalypt and Brigalow low open forest;
- Brigalow regrowth with frequent gilgai; and
- Brigalow regrowth with infrequent or absent gilgai.

Of these, Brigalow woodland, Eucalypt open forest, and Eucalypt and Brigalow low open forest, contain a defined overstorey of trees that provides sufficient roosting and sheltering opportunities for the species. Others are in regrowth form and contain a regenerating tree layer that can still provide some cover for the species in transit.

The areas described as marginal Squatter pigeon habitat (Figure 10) do not occur within 1km of reliable water sources, which is a typical requirement of fitting ‘preferred’ habitat classification. A mine water storage dam is situated within the Project area and has been heavily modified by activities associated with its construction. It is surrounded by a dense ground stratum dominated by invasive species, particularly *Parthenium hysterophorus*, and is bound by steep banks limiting access. These factors indicate that the dam is unlikely to be utilised by Squatter pigeon and does not provide a suitable or accessible water source. Further, while Phillips Creek is within 1km of these areas, it is a highly ephemeral and seasonal system that is not a reliable water source. Beyond these limited water sources, no permanent waterbodies or watercourses occur within 3 km of the disturbance footprint that could support foraging habitat.

No areas meet the combined vegetation structure, soil and water criteria required for ‘Preferred’ or ‘Suitable’ habitat under Kerswell *et al.* (2020). A detailed assessment against each habitat criterion and the reasoning behind the marginal habitat classification for Squatter pigeon is provided in Table 25.

Table 25: Evaluation of Project Area Habitat Characteristics Against Habitat Criteria (Kerswell *et al.* 2020)

Habitat Criterion	Assessment against criterion.		
	Preferred	**Suitable**	**Marginal**
Vegetation structure	Remnant or regrowth grassy open forest to woodland dominated by Eucalyptus, Corymbia, Callitris or Acacia with patchy, relatively sparse ground cover (<33%) and sparse shrub layer. **Does not meet criteria.** Ground cover exceeds the <33% threshold across the entire Project area. Structural characteristics therefore do not meet Preferred or suitable habitat criteria.	Remnant or regrowth grassy open forest to woodland with patchy, relatively sparse ground cover (<33%). **Does not meet criteria.** Ground cover exceeds the <33% threshold across the entire Project area. Structural characteristics therefore do not meet Preferred or suitable habitat criteria.	Non-remnant, regrowth or modified woodland or forest areas with dense grass cover or altered structure. **Meets criteria** 161.71ha of the Project area has been ground truthed as containing woodland communities dominated by Brigalow and mixed eucalypt species. Ground cover ranges from 35% to 90%. Lowest recorded value was 35% in land zone 4. This dense ground cover and modified structure may provide marginal habitat.
Soil and substrates	Well-draining sandy, loamy or gravelly soils suitable for nesting and dust bathing, typically associated with land zones 3, 5, 7, 8, 9 or 10. **Meets criteria** 11.3ha of land zones 3 and 5 confirmed through ground truthing.	Well-draining sandy, loamy or gravelly soils suitable for nesting and dust bathing, typically associated with land zones 3, 5, 7, 8, 9 or 10. **Meets criteria** 11.3ha of land zones 3 and 5 confirmed through ground truthing.	No soil or substrate criteria specified in the Central Queensland habitat definition for marginal habitat. **Meets criteria** Remaining 209.8ha comprises clay dominated (land zone 4) or unsuitable substrates.
Distance to reliable water sources	Within 1 km of a suitable permanent waterbody, including artificial water sources where there is gently sloping, bare ground access for drinking **Does not meet criteria.** No permanent waterbodies within 1km. Phillips Creek is ephemeral. Artificial dams have steep banks limiting access.	Between 1 and 3 km of a suitable permanent or seasonal waterbody, including artificial sources that are functionally accessible. **Meets criteria.** The entire Project area is within 3km of Phillips Creek, which is highly ephemeral and seasonal.	More than 3km from a permanent or seasonal waterbody that facilitates movement between patches of preferred or suitable habitat. **Meets criteria.** The entire Project area is within 3km of Phillips Creek, which is highly ephemeral and seasonal.
Assessment Summary	**Does not meet criteria.** Only one of the three habitat criteria for 'Preferred' is satisfied by the Project area. Whilst the Project area contains the appropriate soil and substrates (land zones 3 and 5), it does not have the vegetation structure and the required distance to permanent water sources that is necessary for the area to be categorised as 'Preferred' habitat for Squatter Pigeon.	**Does not meet criteria.** Only two of the three habitat criteria for 'Suitable' is satisfied by the Project area. Whilst the Project area contains the appropriate soil and substrates (land zones 3 and 5) and the required distance to ephemeral water sources it does not have the vegetation structure that is necessary for the area to be categorised as 'Suitable' habitat for Squatter Pigeon.	**Meets criteria.** All three habitat criteria for 'Marginal' is satisfied by the Project area. Vegetation structure is the limiting factor, with ground cover consistently exceeding the <33% threshold required for Preferred and Suitable habitat Kerswell *et al.* (2020). The Project area contains the appropriate vegetation structure, soil and substrates (land zones 3 and 5) and the required distance to ephemeral water sources that is necessary for the area to be

Habitat Criterion	Assessment against criterion.		
	Preferred	Suitable	Marginal
			categorised as 'Marginal' habitat for Squatter Pigeon.
Total Area	0.0ha	0.0ha	161.71ha

The classification of habitat as 'Marginal' reflects:

- The absence of reliable and accessible permanent water sources within 1km of the Project area, a requirement for breeding and nesting activities aligned with 'Preferred' habitat; and
- Consistently dense ground cover (>33%), dominated by non-native grasses, resulting in ground vegetation composition and structure that does not provide breeding, foraging and dust-bathing opportunities that align with either 'Preferred' or 'Suitable' habitat criterion.

Marginal habitat within the Project area is therefore considered to provide resources primarily for sheltering and dispersal. Squatter pigeon may utilise the Project area while moving between higher value habitats in the surrounding landscape, including habitats associated with the Isaac River to the east, Spring Creek to the north and the Harrow Ranges to the west. This finding is consistent with previous ecological assessments undertaken in the broader area (AECOM, 2016; BAAM, 2021).

Vegetation associated with Phillips Creek, located directly south of the Project area, has previously been mapped by BAAM (2021) and AECOM (2016) as supporting Preferred and Suitable habitat for Squatter pigeon (Figure 10). The habitat mapped within the Project area as Marginal occurs immediately adjacent to this previously mapped habitat. The difference in habitat classification across this boundary reflects differences in ground truthed vegetation structure at the time of each survey and land management history between the two areas.

The Project area has been subject to historical disturbance including vegetation clearing, exploration activities, vegetation slashing and the installation of mine infrastructure. These activities have altered the vegetation structure and ground layer composition across the Project area. Field survey results identified dense ground cover dominated by introduced grasses across much of the site, with ground cover consistently exceeding the <33% threshold required for Preferred and Suitable habitat under Kerswell et al. (2020). This modified ground structure reduces the suitability of the habitat for Squatter pigeon, particularly for foraging and nesting activities which require relatively open ground conditions.

In contrast, the Phillips Creek corridor has not been cleared or subject to the same land management activities that have occurred within the Project area. The creek and associated riparian zone are extant communities that have been retained within a property utilised for cattle grazing. As a result, vegetation structure and ground layer composition within the creek corridor have developed under different disturbance regimes.

Unlike the Marginal habitat within the Project area, the Preferred and Suitable habitat along Phillips Creek also comprises of all three habitat characteristics that are of preference to Squatter pigeon, namely that habitat:

- occurs on land zone 3 soils;
- is in close proximity to a suitable water source provided by the watercourse system; and
- has the appropriate vegetation structure. .

Notwithstanding the above, observations made during the current field survey indicate that sections of the Phillips Creek corridor now supports a dense ground cover dominated by introduced grasses, suggesting that parts of the area may no longer satisfy the sparse ground cover criterion required for Preferred habitat. However, the Phillips Creek corridor was not subject to the same detailed ground truthing and quantitative vegetation assessment undertaken within the Project area. A review of the analysis of the potential Squatter pigeon habitat at Phillips Creek is included in Table 26.

Accordingly, the previously mapped Preferred and Suitable habitat associated with the Phillips Creek corridor has been retained and has not been revised as part of this assessment.

Table 26: Interpretation of Previously Mapped Squatter Pigeon Habitat Adjacent to the Project Area

Location	Previous Habitat Mapping	Current Observations	Interpretation within this Assessment
Phillips Creek corridor south of the Project area	Preferred and Suitable habitat mapped by BAAM (2021) and AECOM (2016)	Vegetation associated with Phillips Creek occurs on land zone 3 soils and is associated with a highly seasonal and ephemeral drainage line. Field observations during the current survey identified dense ground cover dominated by introduced grasses along sections of the corridor, with ground cover appearing to exceed the <33% threshold required for Preferred and Suitable habitat under Kerswell *et al.* (2020).	The previous habitat mapping has been retained. Differences in habitat classification between the Phillips Creek corridor and adjacent areas within the Project area reflect differences in disturbance history and vegetation condition across the landscape. The creek corridor represents a separate ecological setting that has not been subject to the same disturbance regime as the Project area.

Areas of identified Squatter pigeon habitat within the Project area and their respective habitat category are summarised in Table 27 and depicted on Figure 10.

TABLE 27: SQUATTER PIGEON HABITAT WITHIN THE PROJECT AREA

Habitat category	Definition	Area (ha)
Preferred	Remnant or high-value regrowth grassy open forest to woodland dominated by *Eucalyptus*, *Corymbia*, *Callitris* or *Acacia* species, with sparse shrub layers and open groundcover (<33% cover), on well-draining sandy, loamy or gravelly soils. Located within 1 km of a suitable permanent waterbody, these habitats provide the optimal structure and soil conditions for breeding, foraging, sheltering, and dispersal. Preferred habitat may occur on land zones 3, 5, 7, 8, 9, and 10. No preferred habitat was recorded within the Project area.	0.00
Suitable	Remnant or regrowth grassy open forest or woodland dominated by *Eucalyptus*, *Corymbia*, *Callitris* or *Acacia* species, with relatively sparse groundcover vegetation (<33% cover), on well-draining sandy, loamy or gravelly soils. Located 1–3 km from a permanent or seasonal waterbody, or within 100 m of Preferred habitat. Suitable habitat may be located on land zones 3, 5, 7, 8, 9 and 10, and will support foraging, sheltering, and dispersal, but provide limited opportunity for breeding due to distance from water or slight deviations in structure. No suitable habitat was identified within the Project area.	0.00
Marginal	Non-remnant areas, regrowth and remnant woodland or forest areas more than 3 km from a permanent or seasonal waterbody that facilities the movement of the species between patches of preferred or suitable habitat. This habitat category is considered sufficient to support shelter and dispersal opportunities but are unlikely to support foraging or breeding.	161.71
Total		**161.71**

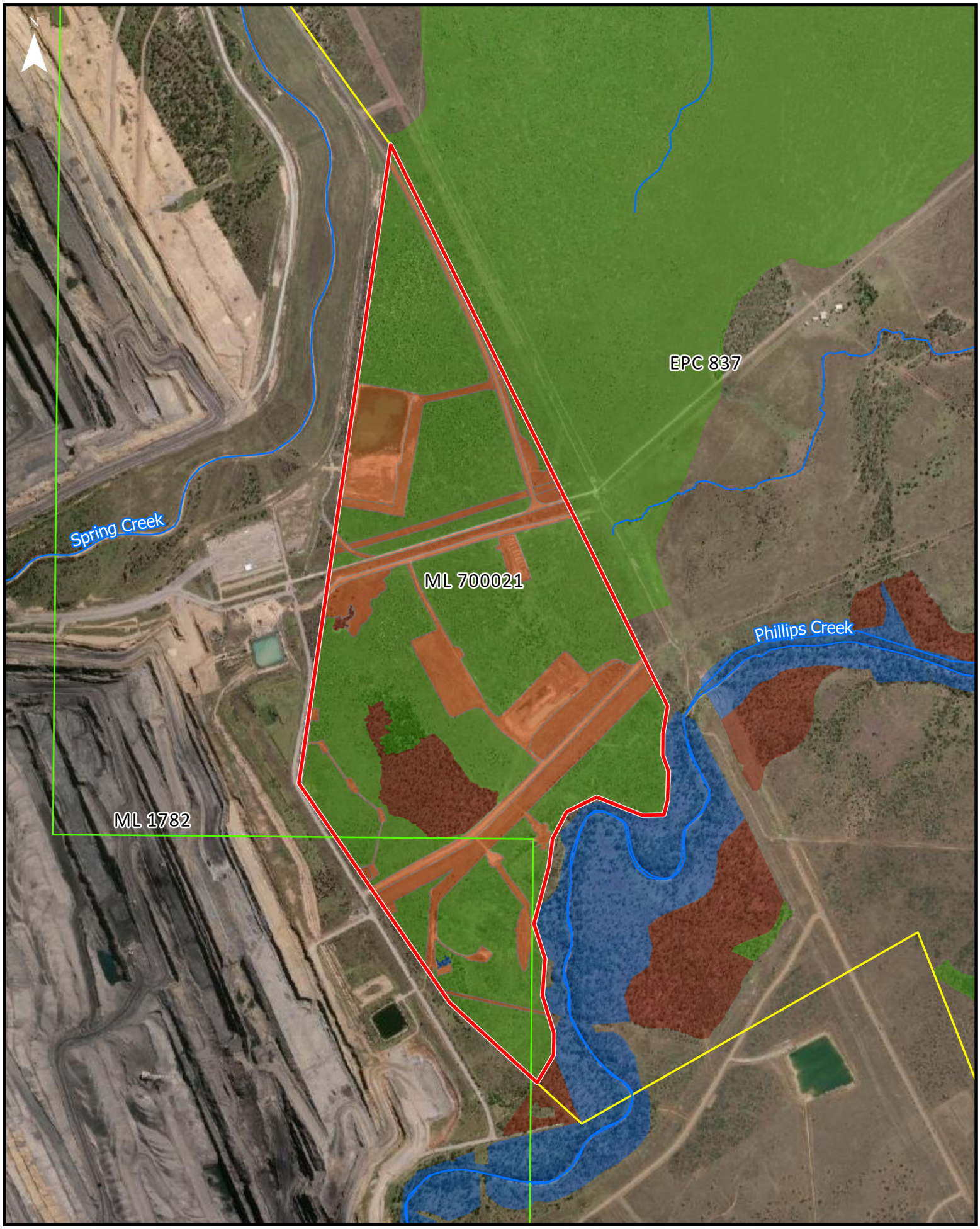

FIGURE 9: LAND ZONES IDENTIFIED WITHIN THE PROJECT AREA AND SURROUNDS

Legend

- Watercourse
- Project Area
- Mining Lease Boundary
- Exploration Permits (Coal)

Land Zone

- 3 (Recent Quaternary alluvial systems)
- 4 (Tertiary-early Quaternary clay plains)
- 5 (Tertiary-early Quaternary loamy and sandy plains and plateaus)
- Modified and disturbed

0 100 200 300 m

DATA SOURCE
QSpatial, 2024; Data used is licensed under a Creative Commons Attribution 4.0 International Licence Engeny, 2024; Data collected by Engeny during field survey.

DISCLAIMER
Engeny has endeavoured to ensure accuracy and completeness of the data. Engeny assumes no legal liability or responsibility for any decisions or actions resulting from the information contained within this map.

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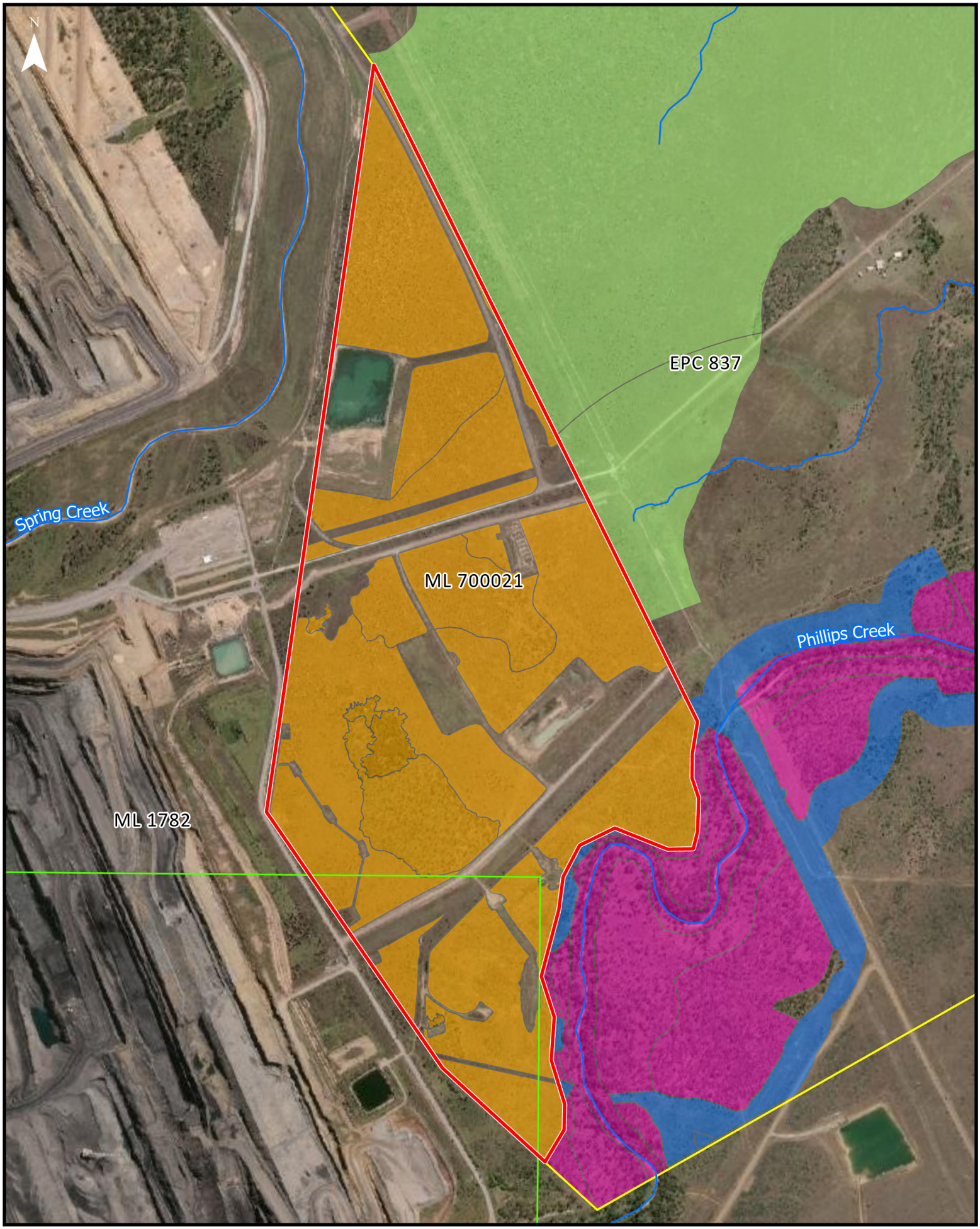

FIGURE 10: SQUATTER PIGEON HABITAT WITHIN THE PROJECT AREA AND SURROUNDS

Legend

- Watercourse
- Project Area
- Mining Lease Boundary
- Exploration Permits (Coal)

Squatter Pigeon Habitat Type

- Marginal (dispersal and shelter)

Squatter Pigeon Habitat Type (AECOM, 2023; BAAM, 2021)

- Preferred (foraging, breeding, dispersal and shelter)
- Suitable (foraging, dispersal and shelter)
- Marginal (dispersal and shelter)

0 100 200 300 m

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4.2.2.4 Habitat Critical to the Survival of the Species

There is no species-specific guidance on what is considered habitat critical to the survival of Squatter pigeon, however the definition of 'habitat critical to the survival of the species' as outlined in the Commonwealth MNES Significant Impact Guidelines 1.1 (Department of the Environment, 2013b) has been considered by this assessment.

All potential Squatter pigeon habitat within the Project area is in marginal condition predominantly due to its degraded state from historical clearing practices and the following combination of factors:

- Habitats occurring on less favourable soil substrates i.e. heavy clay soils on land zone 4 that are not well-draining and therefore not suitable for breeding or dust bathing; and/or
- Habitats containing a high density of introduced grass species within the Project area, with overall ground cover exceeding 33 %, which is not the open tussock structure the species prefers for breeding and foraging.

Therefore, the Project area does not support the habitat characteristics or resources to provide areas for the species to breed or forage. The function of potential habitat is limited to dispersal only. As potential utilisation of the Project area is restricted to dispersal and does not include breeding and foraging, occurrence of the species is likely to be in the form of a few transient individuals. This is supported by no previous records of the species within the Project area out of numerous field survey undertaken across the area. The species was not detected during the current field survey.

This habitat within the Project area is therefore not considered to play a role in the long-term maintenance of the species or the maintenance of genetic diversity and long-term evolutionary development. It would not be habitat to support the reintroduction of populations to assist in the recovery of the species. Furthermore, given that Squatter pigeon is a relatively mobile species and migrates across the landscape utilising a variety of habitats with ranging connectivity values, marginal habitat for dispersing is not considered to be a vital habitat component for this species. Habitat within the Project area is not considered habitat critical to the survival of the species.

4.2.2.5 Important Populations

Specific guidance is provided by the Commonwealth on important populations of the Squatter pigeon. As the southern boundary of the known distribution of Squatter pigeon is contracting northwards, all of the relatively isolated sub-populations occurring south of the Carnarvon Ranges are considered to be important populations (Department of the Environment, 2024a). This includes:

- Populations occurring in the Condamine River catchment and Darling Downs of southern Queensland;
- The populations known to occur in the Warwick-Inglewood-Texas region of southern Queensland; and
- Any populations potentially occurring in northern NSW.

The Project area does not occur within any of these distributions. Therefore, any transient individuals that may sporadically occur within the Project area are not considered to be a part of an important population.

4.2.3 Ornamental snake

Ornamental snake is listed as vulnerable under the EPBC Act. Targeted surveys (i.e., spotlighting surveys) undertaken to detect species presence confirmed two (2) individuals within the Project area in areas of identified habitat (Figure 12). Previous fauna management activities conducted on site have also recorded sightings of this species both within and directly north of the Project area (pers. comms. BMA, 2019).

The following sections provide an overview of the species' ecology and threats and further describes the habitat within the Project area.

4.2.3.1 Species Ecology and Habitat Requirements

Ornamental snake inhabits *Acacia harpophylla*, *Acacia cambagei*, *Acacia argyrodendron* or *Eucalyptus coolabah* dominated vegetation communities, or grassland associated with gilgais. Potential habitat for the Ornamental snake includes low-lying areas with deep-cracking clay soils that are subject to seasonal flooding, and in adjacent areas of clay and sandy loams (Department of the Environment, 2014).

Ornamental snake is known to prefer woodlands and open forests associated with moist areas, particularly gilgai (melon-hole) mounds and depressions in Queensland RE Land Zone 4, but also lake margins and wetlands. Gilgai formations are found where deep-cracking alluvial soils with high clay contents occur. The species is found in woodlands and shrublands, such as Brigalow, and in riverine habitats, and lives in soil cracks and under fallen timber. It is also known to persist in cleared, disturbed habitats, particularly where Brigalow communities have been cleared but microhabitat features are still present (Department of the Environment, 2014).

Ornamental snakes are nocturnally active, sheltering during the day under fallen timber, rocks, bark and in deep soil cracks. The species is likely active year-round with the exception of the cooler months, with peak activity likely to be early summer through to the wet season. During dry times the snake can remain inactive in suitable shelter sites for months. The species is known to disperse between 1-3 km to access better quality foraging resources (Department of the Environment, 2014).

The diet of this species consists predominantly of frogs. The following frog species are most commonly recorded in the same locations where Ornamental snakes have been recorded (DCCEEW, 2024a):

- Striped burrowing frog (*Cyclorana alboguttata*).
- Short-footed frog (*Cyclorana breviceps*).
- Wide-mouthed frog (*Cyclorana novaehollandiae*).
- Water-holding frog (*Cyclorana platycephala*).
- Spotted marsh frog (*Limnodynastes tasmaniensis*).
- Green tree frog (*Litoria caerulea*).
- Floodplain frog (*Litoria inermis*).
- Broad-palmed frog (*Litoria latopalmata*).
- Desert tree frog (*Litoria rubella*).
- Ornate burrowing frog (*Opisthodon ornatus*).

4.2.3.2 Threats

Whilst it is not thought that the species has experienced range declines, the extent of habitat clearance in the region suggests that long-term survival of the species is threatened (DCCEEW, 2024a). Primary threats to the species include:

- Habitat degradation to the Brigalow Belt Bioregion through modification for agricultural and urban development;
- Destruction of wetland habitat through the presence of Feral pigs (*Sus scrofa*), which also impacts food availability (frogs) for the species; and
- Introduction of Cane toad (*Rhinella marina*) resulting in Ornamental snake death through ingestion.

These factors collectively contribute to the decline in habitat quality and availability, posing significant challenges to the conservation of the Ornamental Snake.

4.2.3.3 Potential Habitat within the Project Area

Gilgai landforms and cracking soils have been identified across the majority of the Project area, where soil consists of a dark clay-loam. The field survey identified that the frequency and depth of gilgai is variable across the Project area, with gilgai generally occurring most frequently, and at a greater depth, towards the northern parts of the Project area. This trend was also identified for soil cracks (with depth and frequency identified as greater towards the north). Microhabitat features, including fallen woody debris and leaf litter, were additionally variable across the field survey, and identified to occur at a greater frequency within remnant and HVR vegetation, as compared to non-remnant vegetation patches.

It is considered that the occurrence and nature of habitat features, specifically gilgai, soil cracks and microhabitat features, is highly consequential to identify the ecological value of potential Ornamental snake habitat patches. As a result, a detailed analysis, which included review of field survey data and a rigorous desktop assessment, has been undertaken to accurately define areas of the Project area where gilgai, cracking soils and microhabitat features are rare, occasional or common.

To do this, a DEM (which was a ground-only elevation model) of the Project area was interrogated to allow clear identification of areas of the Project area where deep gilgai were common. The DEM, combined with the field survey data (identifying the presence and frequency of soil cracks and microhabitat features) allowed stratification of the Project area into the following categories:

- Common, deep gilgai (which are considered to facilitate the long-term ponding of water following precipitation events) and commonly occurring diverse-to-deep cracking soils, with a high abundance and density of invasive ground stratum flora species and microhabitat features (including fallen woody debris and leaf litter) occurring infrequently. This community has been classified as the Brigalow regrowth with frequent gilgai habitat type (Section 3.4.4).

- Shallow gilgai and cracking soils each occurring at a frequency of occasional, with a moderate abundance and density of invasive ground stratum flora species and microhabitat features (including fallen woody debris and leaf litter) occurring occasionally to frequently. This community has been classified as the Brigalow woodland habitat type (Section 3.4.1).
- Shallow gilgai and cracking soils each occurring at a frequency of rare to occasional, with a high abundance and density of invasive ground stratum flora species and microhabitat features (including fallen woody debris and leaf litter) occurring infrequently or absent. This community has been classified as the Brigalow regrowth with infrequent or absent gilgai habitat type (Section 3.4.5) and non-remnant cleared and disturbed areas with grass and forb regrowth habitat type (Section 3.4.6).
- Gilgai and cracking soils are absent, generally as a result of the vegetation community occurring on light coloured, loamy soils (i.e., land zones 3 and 5). This community falls within the Eucalypt open forest, Eucalypt and Brigalow low open forest, and Brigalow regrowth with infrequent or absent gilgai habitat types (Section 3.4.2, Section 3.4.3, and Section 3.4.5).

The DEM incorporated within this review is included within Figure 11.

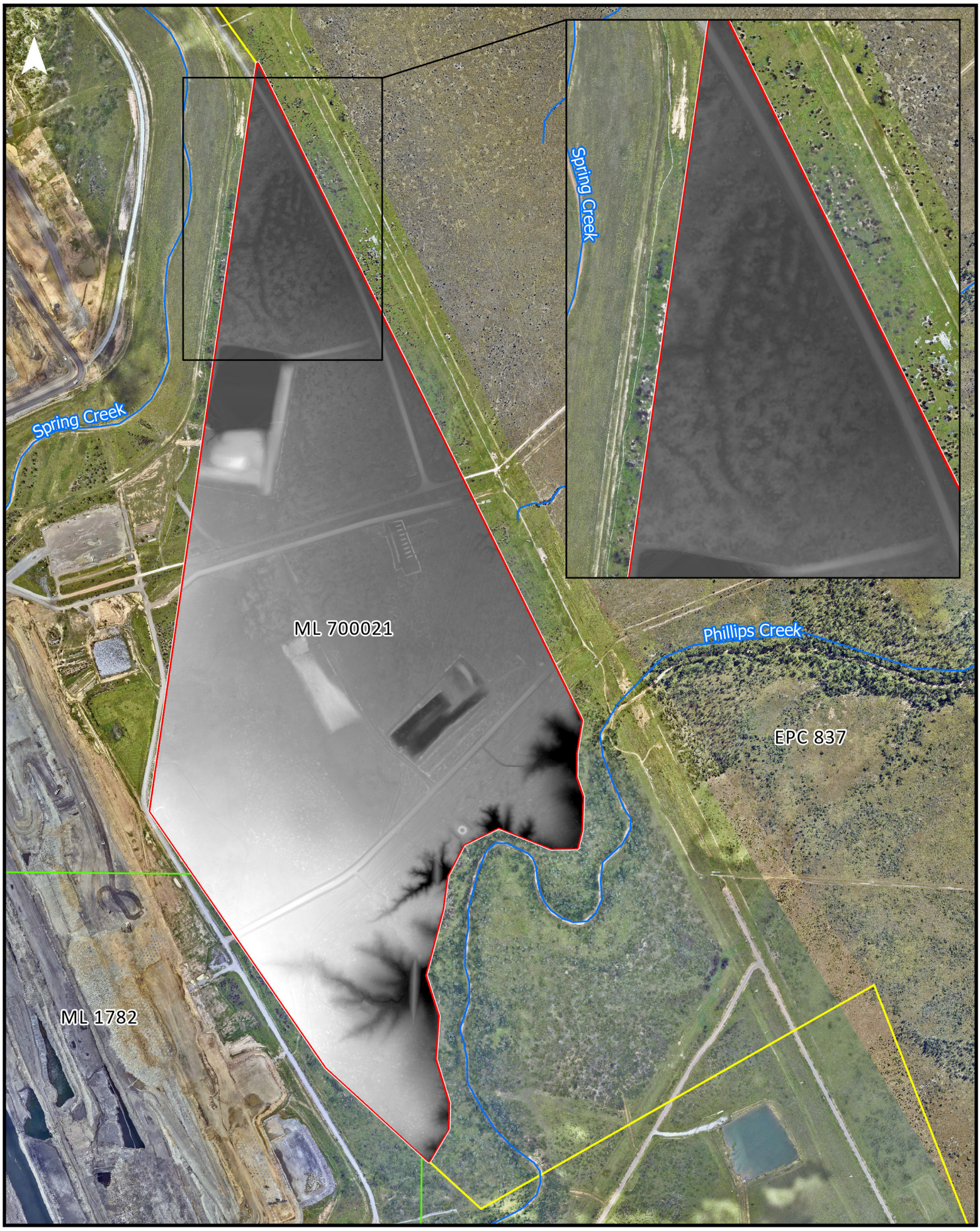

FIGURE 11: GROUND ONLY DIGITAL ELEVATION MODEL TO IDENTIFY GILGAI OCCURRENCE

ENGENY

Legend

Elevation (mAHD)

Value

204.794

190.442

Watercourse

Project Area

Mining Lease Boundary

Exploration Permits (Coal)

0 100 200 300 m

DATA SOURCE
QSpatial, 2024; Data used is licensed under a Creative Commons Attribution 4.0 International Licence Engeny, 2024; Data collected by Engeny during field survey.

DISCLAIMER
Engeny has endeavoured to ensure accuracy and completeness of the data. Engeny assumes no legal liability or responsibility for any decisions or actions resulting from the information contained within this map.

Due to the varying quality and availability of microhabitat features across the Project area as discussed above, the habitat values for Ornamental snake differ. As such, this assessment has identified three (3) habitat categories within the Project area. In accordance with BHP's Central Queensland Threatened Species Habitat Descriptions (Kerswell *et al.*, 2020) these habitats have been defined as 'Preferred', 'Suitable' and 'Marginal'.

'Preferred' habitat within the Project area has been identified within the Brigalow regrowth with frequent gilgai habitat type, located at the northern and central aspect of the site (Figure 12). This habitat contains common, diverse-to-deep gilgai, which were identified both during the field survey and through analysis of the DEM. During the field survey it was determined that these gilgai frequently contained ponded water and provided breeding and foraging habitat for numerous native frog species. Given the depth of these gilgai and their ability to hold ponded water for a substantial period, it is considered that they will facilitate foraging resources for a prolonged period following precipitation events. Resultingly, these gilgai are considered to provide good, reliable foraging habitat for Ornamental snake.

Diverse-to-deep cracking soils were additionally identified as common within this habitat, providing sheltering and breeding habitat for the species. The field survey identified Ornamental snake as present within this 'Preferred' habitat, actively hunting frogs in wet gilgai and utilising cracking soils for shelter.

Microhabitat features, including fallen woody debris and leaf litter, occurred occasionally throughout the 'Preferred' habitat and it is noted that introduced grass species were relatively abundant, including within gilgai. Whilst it is considered that the abundance of invasive flora species within the ground stratum may reduce the overall ecological value of the habitat for Ornamental snake, the species is still currently persisting in this habitat with an abundance of foraging resources and availability of breeding and sheltering resources.

In addition, regrowth vegetation directly to the north-east of this 'Preferred' habitat, and outside of the Project area, has been identified by previous assessments as containing habitat values for Ornamental snake (Figure 12). Previous ecological assessments (AECOM, 2023; BAAM, 2021) mapped this area as supporting 'Suitable' habitat for the species, with the mapped habitat forming part of a larger contiguous band extending further north-east of the Project area. Review of LiDAR data indicates that this landscape supports a high density and frequency of gilgai landforms, which create depressions capable of retaining seasonal surface water following rainfall events. These conditions support frog breeding habitat and therefore provide reliable foraging resources for Ornamental snake.

However, only a relatively small patch (i.e., 2.73 ha) of 'Suitable' Ornamental snake habitat has been identified to occur within the Project area and associated with the Brigalow woodland habitat type (Figure 12). This habitat patch has been ground-truthed as RE11.4.9 and contains occasional gilgai which range in depth. As compared to the 'Preferred' habitat, this habit patch contains gilgai which occur at a lesser frequency (a determination which was made through analysis of field survey data and review of the DEM) and are generally shallower, however ponded water in gilgai does occur and prey (e.g., native frog species) were found to be present. It is noted that, as compared to 'Preferred' habitat, the depth of these gilgai will result in a shorter period of ponded water following precipitation, and therefore shorter periods of good foraging habitat for the Ornamental snake.

The soil of this community is a dark clay loam, and cracks are present at a lower abundance and depth than within the Brigalow regrowth with frequent gilgai habitat. Despite this finding, it was determined that this value is compensated by a higher abundance of fallen woody debris and leaf litter, providing sheltering and breeding habitat for the species. One (1) Ornamental snake was identified as utilising cracking soils for shelter within this 'Suitable' habitat during the field survey. As compared to the three (3) non-remnant habitats identified within the Project area, this remnant habitat patch contains a lower abundance of introduced grass species and therefore less threatening processes for Ornamental snake.

Remaining gilgai areas within the Project area have been identified as 'Marginal' habitat, which consists of two (2) habitat types:

- Brigalow regrowth with infrequent or absent gilgai; and
- Non-remnant cleared and disturbed areas with grass and forb regrowth.

'Marginal' habitat has been identified on dark clay-loam soil (i.e., land zone 4) with a lower frequency and depth of gilgai, as compared to 'Preferred' habitat, which was determined through analysis of the DEM and field survey data. It is noted that the shallower nature of the gilgai present within this habitat will reduce the period of ponding of water following precipitation events, reducing the availability of foraging habitat to only during periods when rainfall has been high. In such instances, higher quality foraging habitat would be available regardless in the 'Preferred' and 'Suitable' habitat. Individuals would therefore preferentially inhabit the 'Preferred' and 'Suitable' habitat that provide more frequent and deeper gilgai areas. Additionally, other snake species have not been recorded in these habitats and review of the field data indicates that the 'Marginal' habitat contains a higher density and abundance of introduced ground stratum species, resulting in an increased threat to the habitat value of this area.

The marginal habitat mapped within the Project area occurs directly adjacent to the more extensive areas of 'Suitable' habitat identified outside the Project area to the north-east (Figure 12). While these habitats appear contiguous, review of LiDAR data and field observations indicates that the marginal areas within the Project area support very different ground conditions with a lower density and frequency of gilgai compared with the adjoining suitable habitat. This reduction in gilgai density reduces the persistence and spatial extent of seasonal ponding habitat and therefore limits the availability of reliable frog prey resources within these areas.

This marked difference in gilgai depth and abundance may be associated with natural soil variation and/or due to differing land management practices across this boundary. A BMA boundary fence separates the Project area from land immediately to the north-east, and review of historical aerial imagery indicates that these areas have been subject to different management regimes. Areas outside the Project area appear to have retained the current ground conditions i.e. more intact gilgai topography and regrowth vegetation structure over the last 20 years, whereas the Project area has been subject to disturbances over this period that are associated with exploration activities, vegetation slashing and the establishment of mine infrastructure. These disturbances may have contributed to localised modification of soil structure and gilgai expression within the Project area.

Accordingly, the difference in habitat classification between the marginal habitat within the Project area and the suitable habitat mapped outside the Project area reflects variation in the density and distribution of gilgai landforms and associated habitat function for Ornamental snake.The water storage dam located at the north-western aspect of the Project area, as well as the associated access tracks and construction pad, is not considered to provide suitable habitat for the Ornamental snake. The landform in this area has been substantially modified to facilitate dam construction, resulting in highly compacted and disturbed soils that lack the natural cracking or gilgai formations critical to the species. The steep slopes surrounding the dam and the depth of permanent water further limit the formation of seasonal wet microhabitats, such as shallow gilgai or ephemeral frog-breeding areas. In addition, dense shrub encroachment, including the presence of *Parthenium hysterophorus*, reduces habitat suitability by limiting ground-level structural complexity and impeding snake movement. As a result, this area is not considered to meet the structural requirements of Ornamental snake habitat.

A record of Ornamental snake was identified in 2019 during pre-clearance fauna spotter-catcher surveys undertaken prior to construction of the dam. Although this record now appears to fall within the current dam footprint, it reflects habitat conditions that existed prior to the area being inundated. The presence of this historical record does not indicate that the existing dam and its modified landform provide habitat for the species. Accordingly, the dam area is not considered to support suitable or functional Ornamental snake habitat.

It is noted that the habitat communities stratified by this report (i.e., Brigalow regrowth with infrequent or absent gilgai and non-remnant cleared and disturbed areas with grass and forb regrowth) extend to the southern boundary of the Project area. The DEM assessment, combined with the analysis of the field survey data, have identified that these areas did not contain gilgai or soil cracks (generally due to the prevalence of silty, alluvial soils identified as land zone 3). This also includes the Eucalypt open forest habitat and the Eucalypt and Brigalow low open forest habitat. As a result, these habitat types are not considered to provide habitat value for Ornamental snake. Previous assessments in the surrounding area also did not map Ornamental snake habitat extending to the riparian zone of Phillips Creek (Figure 12).

The total area of each of the described habitat categories, as well as the description of the habitat categories, are summarised in Table 28 and depicted on Figure 12.

TABLE 28: ORNAMENTAL SNAKE HABITAT WITHIN THE PROJECT AREA

Habitat category	Definition	Area (ha)
Preferred	Gilgai depressions (with or without the presence of Brigalow or other canopy vegetation), mounds and wetlands on cracking clays (predominantly land zone 4), where essential microhabitat features are present. These include an abundance of deep and diverse soil cracks, which provide sheltering and breeding opportunities, and seasonal inundation that supports frog prey availability for foraging. Other features such as fallen woody debris and leaf litter may also be present, further contributing to shelter and thermal buffering. This habitat type offers the full suite of requirements for breeding, foraging, shelter and dispersal.	42.83
Suitable	Dispersal areas within 1 km of preferred habitat, which are currently or previously dominated by Brigalow or coolibah communities where gilgais or soil cracks are infrequent and/or shallow, including non-remnant areas. Given shallow/ infrequent nature of gilgais and / or cracking soils, this habitat is not considered to provide opportunity for breeding and provides reduced shelter opportunities. This habitat is considered to support foraging following rainfall due to temporary frog presence. Occasional woody debris and litter may offer some sheltering potential, and proximity to preferred habitat increases the likelihood of use for dispersal.	2.73
Marginal	Areas currently or previously dominated by Brigalow or coolibah communities where gilgais or soil cracks are infrequent or are shallow or non-remnant areas where threats are high (high abundance of weed incursion and cattle compacting soils) but the species still have potential to occur, especially in times where water is present and prey abundance (frogs) is high. Some movement may occur through these patches, providing limited value for dispersal only.	86.76

Habitat category	Definition	Area (ha)
Total		132.32

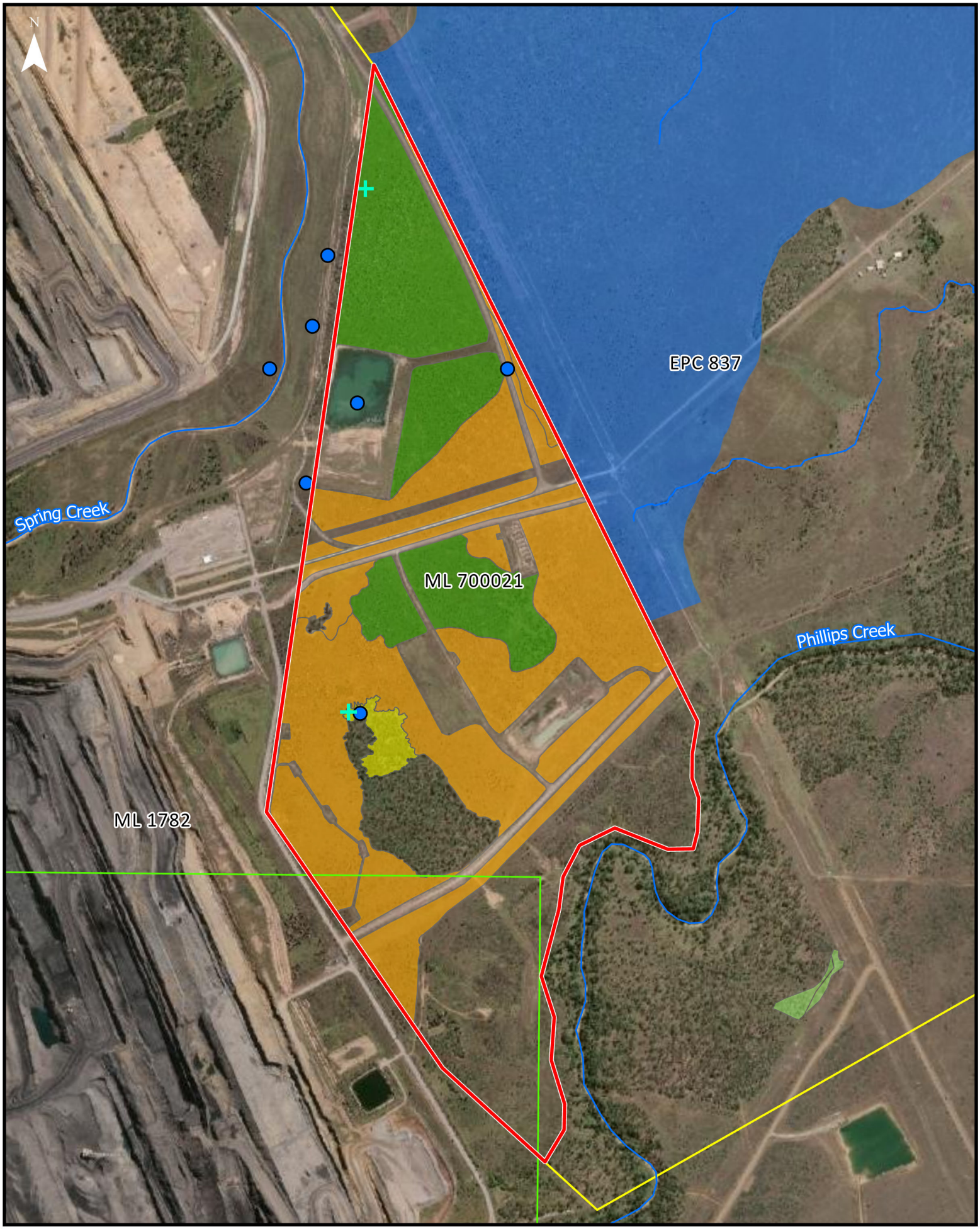

FIGURE 12: ORNAMENTAL SNAKE HABITAT WITHIN THE PROJECT AREA AND SURROUNDS

ENGENY

Legend

- Watercourse
- Project Area
- Mining Lease Boundary
- Exploration Permits (Coal)

Fauna Observations

- Ornamental Snake (Engeny, 2024)

Previous Sightings

- Ornamental Snake (pers. comms. BMA, 2019)

Ornamental Snake Habitat Type

- Preferred (breeding, foraging, shelter and dispersal)
- Suitable (foraging, shelter and dispersal)
- Marginal (dispersal)

Ornamental Snake Habitat Type (AECOM, 2023; BAAM, 2021)

- Suitable (foraging, shelter and dispersal)
- Marginal (dispersal)

0 100 200 300 m

4.2.3.4 Assessment of Adjacent Areas for Ornamental snake Habitat

An assessment of areas immediately adjacent to the Project area was undertaken to determine the potential for the presence of Ornamental snake habitat. This assessment considered critical habitat determinants including soil type, gilgai presence and quality, availability of microhabitat features (e.g., fallen woody debris, cracking soils), vegetation structure, and known historical records.

4.2.3.4.1 Phillips Creek

The riparian corridor of Phillips Creek, located directly south of the Project area, was assessed for its potential to support Ornamental snake habitat. Vegetation in this area occurs on well-draining sandy, loamy, and gravelly soils associated with land zone 3. These soil types are not conducive to the formation of gilgai or deep soil cracks, both of which are essential for Ornamental snake sheltering and foraging.

The topography of Phillips Creek is undulating and well-drained, further limiting opportunities for water retention or the formation of seasonal wet areas that support frog populations, a primary prey item for the species. Historical ecological assessments have consistently confirmed the absence of gilgai and cracking soils, aligning with this land zone mapping and supporting the conclusion that this area lacks the physical features to support the Ornamental snake.

Based on the lack of key habitat attributes, unsuitable soil profile, and absence of previous records, Phillips Creek is not considered to provide habitat for the Ornamental snake. As no habitat has been identified within the Phillips Creek corridor, there is considered to be very limited opportunity for Ornamental snake to access the Project area from the south. Consequently, the southern boundary of the Project area is unlikely to support dispersal or movement in a south–north direction or contribute meaningfully to Ornamental snake habitat connectivity or persistence.

4.2.3.4.2 North-Western Extent – Area of Historical Records

Historical records of Ornamental snake have been documented adjacent to the north-western boundary of the Project area (most recent record within this area is dated 2019). However, these records predate significant landscape modification associated with relatively recent construction activities, including the realignment and diversion of Spring Creek.

These activities have removed or significantly degraded key habitat features such as gilgai landforms and fallen woody debris. This assessment considers that this landscape is now devoid of these features, and compacted, disturbed soils in the area no longer contain the natural cracks and crevices required by the species for shelter.

Given these landscape changes, the historical records are no longer considered representative of current ecological conditions, and the area is now assessed as unsuitable to support Ornamental snake habitat. No individuals have been recorded from this area in any surveys conducted post-development.

As suitable habitat is absent from this area, the Project area is not considered to facilitate dispersal or movement of Ornamental snake from west to east. While habitat has been identified to the east of the Project area, adjacent to areas of 'Preferred' habitat within the Project boundary, the lack of habitat to the west removes the potential for the Project area to function as a movement corridor or stepping-stone between habitat areas. The Project area is therefore not considered to support east–west connectivity for the species.

4.2.3.4.3 North-Eastern Extent – Historical Suitable Habitat Mapping

Habitat values in areas north-east of the Project area were informed by review of previous ecological assessments (AECOM, 2023; BAAM, 2021) together with analysis of spatial datasets, including a ground-only DEM and LiDAR data, to assess the distribution and density of gilgai landforms. Analysis of the LiDAR data indicates that areas immediately north-east of the Project area support a high density and frequency of gilgai. These gilgai landforms create depressions capable of retaining seasonal surface water following rainfall events, which can support frog breeding habitat and therefore provide reliable foraging resources for Ornamental snake. Subsequently, the adjacent areas were previously mapped as supporting 'Suitable' habitat for the species (AECOM, 2023; BAAM, 2021).

As illustrated on Figure 12 and Figure 13, areas mapped as 'Marginal' habitat within the Project area occur directly adjacent to these areas mapped as 'Suitable' habitat. In contrast, to the surrounding areas, the Project area contains fewer and shallower gilgai and more variable microtopography (see Figure 13). The reduced density and depth of gilgai limits the persistence and spatial extent of seasonal ponding habitat and therefore reduces the availability of reliable foraging resources. Smaller areas classified as 'Preferred' habitat do occur within the Project area, which contain well-developed gilgai depressions and associated shelter features that provide breeding, foraging and shelter resources for the species. However, the more extensive areas mapped as 'Marginal' habitat contain fewer gilgai and therefore provide limited habitat value beyond occasional dispersal and opportunistic foraging during favourable conditions.

The difference in habitat classification across this boundary therefore reflects variation in the density and distribution of gilgai landforms and the associated availability of foraging habitat for Ornamental snake. The Project area has been subject to historical disturbance associated with exploration activities, vegetation slashing and the establishment of mine infrastructure, which has influenced vegetation condition and landform characteristics.

It is also noted that the habitat mapping completed to the east by AECOM was undertaken as part of the broader Saraji East Underground Project assessment, which covered a substantially larger assessment area. Consequently, the mapping undertaken for that assessment did not incorporate the same level of fine scale terrain analysis used in the current study, including detailed interrogation of LiDAR data to assess the presence and density of gilgai landforms. Review of the LiDAR data undertaken for this assessment indicates that some areas mapped by AECOM as 'Suitable' habitat extend into portions of the landscape where gilgai presence appears limited or absent, particularly toward the southern extent of the mapped habitat. As illustrated in Figure 13, these areas lack the dense gilgai depressions that characterise preferred and suitable habitat for Ornamental snake. This suggests that, if a similar fine scale terrain analysis were applied across the broader landscape east of the Project area, portions of the previously mapped 'Suitable' habitat may be refined to align more closely with the 'Marginal' habitat groundtruthed by this assessmetn within the Project area.

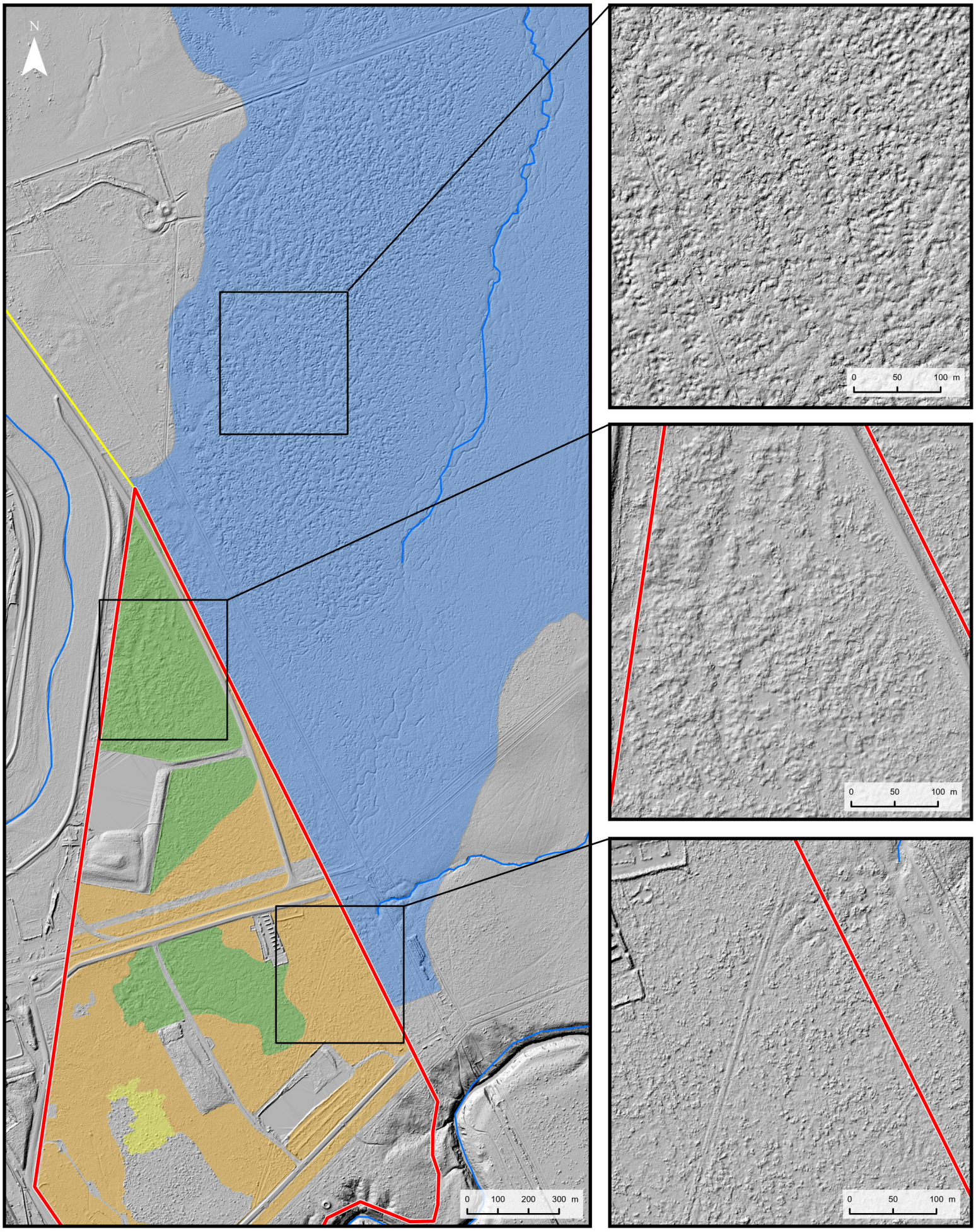

FIGURE 13: GROUND ONLY DIGITAL ELEVATION MODEL FOR COMPARISON OF ORNAMENTAL SNAKE HABITAT WITHIN AND EXTERNAL TO THE PROJECT AREA

ENGENY

Legend

- Watercourse
- Project Area
- Mining Lease Boundary

Elevation (mAHD)

Value

204
190

Ornamental Snake Habitat Type

- Preferred (breeding, foraging, shelter and dispersal)
- Suitable (foraging, shelter and dispersal)
- Marginal (dispersal)

Ornamental Snake Habitat Type (AECOM, 2023)

- Preferred
- Suitable (foraging, shelter and dispersal)

4.2.3.5 Habitat Critical to the Survival of the Species

There is no species-specific guidance on what is considered habitat critical to the survival of Ornamental snake. However, the definition of 'habitat critical to the survival of the species' as outlined in the Commonwealth MNES Significant Impact Guidelines 1.1 (Department of the Environment, 2013b) applies.

Habitat within the Project area that was identified to support permanent habitat values (foraging and breeding) for Ornamental snake was classified as 'Preferred' and 'Suitable' habitat. 'Marginal' habitat within the Project area provides limited habitat value, with higher threatening processes evident and shallower gilgai meaning that potential foraging habitat is restricted to only periods of high rainfall. In such instances, higher quality foraging habitat would be available in the 'Preferred' and 'Suitable' habitat, and individuals would therefore preferentially inhabit areas that provide more frequent and deeper gilgai.

Although the Ornamental snake was recorded twice during field surveys within the Project area, once in 'Preferred' and once in 'Suitable' habitat, this is not considered indicative of the area being critical to the survival of the species. The species is known to be cryptic and difficult to detect, however, its detectability limitations do not override the ecological context in which these records occurred. The presence of individuals confirms use of the area, but not the ecological importance of the habitat at a population or species level. The relatively small size and isolated nature of these habitat patches, coupled with evidence of degradation from historical grazing, further reduce their strategic value to the species' long-term viability.

As compared to the 'Marginal' habitat identified within the Project area, the 'Preferred' and 'Suitable' habitat patches are relatively small in size and are positioned at the southern end of a larger band of gilgai Brigalow regrowth that continues further north-east (as identified from previous assessments and depicted in Figure 12) and connects to Hughes Creek, One Mile Creek, and eventually the Isaac River. Evidence of threatening processes (e.g., exotic grass incursion, pest species) were noted during the field survey in habitat within the Project area from previous grazing activities that have resulted in a level of habitat degradation.

Whilst the records within the Project area suggest that the habitat is still able to support foraging and potential breeding activities of individuals from a population in the broader area, it is considered to be at the outer edge of suitable habitat. Core habitat areas are located in the much larger, more contiguous patches associated with this band, particularly those extending up to the Isaac River floodplain.

This core habitat in the surrounding area to the north-east of the Project area is considered important for the long-term maintenance of the species, by being the 'source' habitat for the population—allowing the population to grow, maintain genetic diversity, and support long-term evolutionary development (Sinclair *et al.*, 2005). This habitat is considered habitat critical to the survival of Ornamental snake within the region, as determined in previous ecological assessments (i.e., Saraji East Mining Lease Project).

The outer extent of habitat that occurs within the Project area is considered to be 'sink' habitat, providing foraging and possible breeding resources for an overflow of individuals from the core source habitat to the north-east, forming part of an overall population (Sinclair *et al.*, 2005). Habitat within the Project area alone would not be able to support a population indefinitely without the interaction and connection with the larger core habitat north-east of the Project area. Based on this, whilst the Project area does provide habitat values for Ornamental snake that are considered to be 'Preferred' and 'Suitable', and can be utilised by individuals of a population, it is not considered habitat critical to the survival of the species.

4.2.3.6 Important Populations

The occurrence of 'important habitat' for the Ornamental snake is used as a surrogate for an 'important population' when assessing potential impacts to this species. The Draft Referral Guidelines for the Nationally Listed Brigalow Belt Reptiles (DCCEEW, 2023) defines 'important habitat' for any species listed in the guideline if it is:

- Habitat where the species has been identified during a survey;
- Near the limit of the species' known range;
- Large patches of contiguous, suitable habitat and viable landscape corridors (necessary for the purposes of breeding, dispersal or maintaining the genetic diversity of the species over successive generations); or
- A habitat type where the species is identified during a survey, but which was previously thought not to support the species.

Specifically, for Ornamental snake, known important habitat is defined as:

- Gilgai depressions and mounds and habitat connectivity between gilgais and other suitable habitat; or,
- Open forests to woodlands associated with gilgai formations and wetlands (commonly mapped as Qld REs 11.3.3, 11.4.3, 11.4.6, 11.4.8, 11.4.9, 11.5.16 or mapped as cleared but where the above REs formerly occurred).

The 'Suitable' and 'Preferred' habitat identified within the Project area are not considered to be located near the limit of the species' known range or habitat not previously thought to support the species. The patches are not considered large and contiguous and are located at the southern end of a possible landscape corridor for the species that extends further north-east, as illustrated from previous ecological assessments in the surrounding area (Figure 12). Therefore, the habitat is not functioning as an important link for dispersal. However, individuals of Ornamental snake were located during the field survey within both the 'Suitable' and 'Preferred' habitat within the Project area. Other previous records, particularly surrounding the northern-western section of the 'Preferred' habitat within the Project area, suggest utilisation of this habitat by the species. Based on this factor, both the 'Preferred' and 'Suitable' habitat within the Project area are considered to meet the definition for important habitat for Ornamental snake.

'Marginal' habitat within the Project area does not meet any of the listed criteria for important habitat as defined in the Draft Referral Guidelines for the Nationally Listed Brigalow Belt Reptiles (DCCEEW, 2023). Whilst this area may have previously supported the commonly mapped REs for Ornamental snake, gilgai frequency and connectivity was found to be low and overall, the habitat was found to be degraded. Importantly, no individuals of the species were identified within this area during targeted surveys, which further supports and demonstrates that this area is not considered important habitat for Ornamental snake.

4.2.4 Greater glider (Southern and Central)

Greater glider (southern and central) is listed as Endangered under the EPBC Act. Targeted surveys, including spotlighting of Eucalypt dominated woodland, were undertaken to detect species presence which confirmed the presence of Greater glider within remnant vegetation south of the Project area, associated with Phillips Creek (Figure 14). The survey did not confirm the presence of the species within the Project area.

Previous ecological assessments also did not identify the species within the Project area, but have identified Greater glider along Phillips Creek (Figure 14). For instance, four (4) records have been identified less than 500m east of the Project area (ELA, 2019b) and a further two (2) records were identified by BAAM (2021) about 200m south of the Project area, all in association with Phillips Creek (Figure 14). Other known sightings of Greater glider in the broader region also occur along the main waterways, including a further four (4) records upstream along Phillips Creek and one (1) record along One Mile Creek, located approximately 3.1km north of the Project area (ELA, 2018) (Figure 14).

It is noted that the presence of greater glider at One Mile Creek indicates the persistence of the species in habitat located in close proximity to existing mining operations.

The following sections provide an overview of the species' ecology and threats and further describes the habitat within the Project area.

4.2.4.1 Species Ecology and Habitat Requirements

Greater glider is an arboreal, nocturnal marsupial which is largely restricted to eucalypt forests and woodlands of eastern Australia. It is typically found in highest abundance in taller, montane, moist eucalypt forests on fertile soils, with relatively old trees and abundant hollows, but also occurs in drier habitats in south-eastern Qld (DCCEEW, 2022a).

During the day, Greater glider shelter in tree hollows, with a particular preference for hollows with a diameter >10 cm in large, old trees. Both live and standing dead trees are used for denning, however the species prefers to use live hollow-bearing trees when adequate numbers are available. Multiple dens are used by an individual. Resultingly, remnant vegetation is of particular importance to the habitat requirements of Greater glider.

Greater glider is primarily folivorous, with a diet mostly comprising eucalypt leaves supplemented by buds and flowers. It feeds from a restricted range of eucalypt species, such as *E. moluccana* in south-eastern Queensland. This species favours forests with a diversity of eucalypt species, due to seasonal variation in growth and nutrient content of its preferred tree species. Approximately 85% of Greater glider's water requirements are provided by consumed leaves. Free water is presumably obtained from dew condensation on leaf surfaces.

Whilst Greater glider is the largest of the glider species and can glide up to 100m, it is highly sensitive to fragmented landscapes and disperse poorly across vegetation that does not consist of remnant native forests (DCCEEW, 2022a).

4.2.4.2 Threats

The Greater glider is threatened by a range of interrelated and compounding factors. The key threats to the species are identified as:

- Frequent and intense bushfires including inappropriate prescribed burning and high intensity wildfire;
- Climate change, leading to increased ambient temperatures, reduced water availability and altered fire regimes; and,
- Habitat loss and fragmentation as a result of vegetation clearing and timber harvesting.

There are strong synergies between these threats, which collectively increase the vulnerability of the species and reduce habitat resilience. Loss and fragmentation of habitat has already occurred across much of the species' range, and the unprecedented 2019–20 bushfires further intensified pressures. An estimated 40% of the Greater glider's range was affected by the fires, with population declines of up to 24% recorded one-year post-fire (Legge *et al.* 2021).

4.2.4.3 Potential Habitat within the Project Area

Eucalypt dominated open forest habitats were ground-truthed to occur within the Project area, in both remnant and HVR conditions. These vegetation communities have been described within this report as the following:

- Eucalypt open forest; and
- Eucalypt and Brigalow low open forest.

These areas comprise a mature canopy layer or emergent mature trees, inclusive of stag trees with medium sized hollows, which may provide suitable shelter, foraging and breeding for Greater glider.

Notwithstanding the above, and whilst Greater glider habitat resources (i.e. frequent medium to large (>10 cm) sized hollow-bearing trees) are present in the Project area, this assessment has determined that these habitat patches are not considered to constitute current or potential future habitat for Greater glider as they are too fragmented and isolated from more suitable habitat along Phillips Creek where the species is known to occur.

The Greater glider is an arboreal, nocturnal mammal that disperses and moves primarily by tree-to-tree gliding (DCCEEW, 2022a). The species typically glides approximately 30-40m and up to 120m in extreme and uncommon situations (DESI, 2024). To move through the landscape, the species requires either continuous or near continuous canopy structure (Eyre et al., 2022b), or the opportunity to glide at greater distances through the presence of adequate launch height, a substantial vertical drop and a landing point, which is provided by very tall canopy trees and/or downslope gliding conditions (Kerle, 2001; Jackson, 2000; NSW Scientific Committee, 2015). Movement between habitat patches is therefore constrained by glide distance, glide trajectory, and the availability of sufficiently tall and connected canopy structure (Kerle, 2001; Jackson, 2000; NSW Scientific Committee, 2015).

'Preferred' Greater glider habitat has been identified as present at Phillips Creek, outside of the Project area, and the species has been previously recorded along the waterway from previous ecological assessments (refer to Figure 14). This habitat is located approximately 247m from the 'Eucalypt open forest' and 'Eucalypt and Brigalow low open forest' within the Project area (Figure 14). The area between habitat along Phillips Creek and the eucalypt dominated vegetation communities in question within the Project area comprises Brigalow regrowth and Disturbed and Cleared Areas associated with historical clearing, powerline easements and mining-related infrastructure. The vegetation communities in this area lack emergent and canopy strata and are dominated by vegetation of limited height, with the Brigalow regrowth averaging approximately 3.8m in height and the Disturbed and Cleared Areas lacking woody vegetation entirely (Figure 14). If a Greater glider were to glide north from Phillips Creek toward the Project area, it would land within this disturbed and regrowth vegetation. In the absence of woody vegetation of sufficient height, this intervening vegetation does not provide the elevated substrates required to facilitate further gliding or canopy-based movement toward the eucalypt-dominated vegetation within the Project area. It therefore represents a functional barrier to movement.

Historical aerial imagery indicates that the intervening vegetation between Phillips Creek and the Project area has been maintained in a cleared or regrowth state for several decades under existing land uses and management practices. Therefore, the condition of this vegetation is unlikely to change and fragmentation across the Project area will likely persist regardless of the Project being approved. Even under a scenario where Brigalow regrowth vegetation is allowed to mature within the Project area, Brigalow dominated communities are naturally characterised by relatively low to moderate canopy height, dense structure and low density of tree hollows. Such vegetation does not provide the tall emergent canopy or vertical drop required to facilitate extended gliding. The potential for the Project area to provide future Greater glider habitat is not considered feasible.

Habitat fragmentation and canopy disconnection are identified as key threats to the species (DCCEEW, 2022a). Greater gliders disperse poorly across vegetation that is not native forest and do not readily recolonise isolated habitat patches from which they have been lost (DCCEEW, 2022a). Consistent evidence indicates that isolated and structurally disconnected patches are unlikely to support viable populations or facilitate dispersal (Youngentob et al. 2013). Phillips Creek supports the nearest known Greater glider habitat and provides the structurally connected riparian corridor that facilitates movement and dispersal opportunities for a local population. In contrast, the eucalypt dominated habitat patches within the Project area do not, due to:

1. its separation of a minimum distance of approximately 247m from known habitat at Phillips Creek, which is greater than the species' known maximum gliding distance,
2. the presence of intervening non-remnant Brigalow regrowth averaging approximately 3.8m in height, which provides a much lower launching point for the species to glide effectively,

3. the species' natural movement habits and subsequent constraints on the species' capacity to traverse this intervening landscape via gliding in the absence of continuous or sufficiently tall canopy structure, and

4. the persistence of theses limiting habitat values across the Project area as a result of historic and continuing land uses across the Project area

It is noted that as per BHP's Central Queensland Threatened Species Habitat Descriptions (Kerswell *et al.*, 2020) 'Preferred' Greater glider habitat has been identified as present at Phillips Creek, outside of the Project area from previous ecological assessments that have occurred in the surrounding area (refer to Figure 14). Previous assessments also identified 'Suitable' habitat on the upper floodplain areas of Phillips Creek. However, from habitat observations undertaken along Phillips Creek during this current field survey, as well as previous ecological assessment experience in the Central Queensland region, the extent of species utilisation is likely to be more restricted to the fringing riparian zone of Phillips Creek. As such 'Preferred' habitat is considered to be limited to the riparian corridor, with 'Suitable' habitat occurring on the top of banks / adjacent floodplain (i.e. within a 120 m area from the riparian corridor).

Greater glider habitat definitions are included within Table 29.

TABLE 29: GREATER GLIDER (SOUTHERN AND CENTRAL) HABITAT WITHIN THE PROJECT AREA

Habitat category	Definition	Area (ha)
Preferred	Preferred Greater glider habitat in central Queensland is defined as: • Remnant connected eucalypt woodlands containing one or more feed tree species and more than two hollow bearing trees/ ha, with hollows medium-large in size (>10cm entrance), usually on fertile, wetter soils of riparian zones. • In central Queensland, preferred foraging and den trees include *E. camaldulensis, E. tereticornis, E. fibrosa* and *Corymbia citriodora*. The species has also been observed in *Angophora floribunda, E. cambageana, E. coolabah, E. crebra, E. laevopinea, E. molucanna, E. orgadophila, E. populnea, E. melanophloia* and *C. tessellaris* in which it may use for foraging and/ or denning. This habitat supports denning (breeding), foraging, sheltering, and dispersal across the landscape.	0.00
Suitable	Remnant eucalypt woodlands containing one or more feed tree species connected to areas of denning habitat that does not contain more than two hollow bearing trees/ ha, medium-large in size (>10cm entrance). Generally, within about 120m of breeding / denning habitat, reflecting the home range of the species. This habitat category would likely support foraging, shelter and dispersal of the species.	0.00
Marginal	Defined as: • Remnant or HVR eucalypt vegetation adjacent to preferred Greater glider habitat where hollows are small and/ or less frequent. Isolated patches of marginal habitat >100m from adjacent habitat do not provide habitat for the species due to gliding capabilities. • Remnant or HVR eucalypt vegetation on low fertile and low moisture soils, regardless of hollow densities. This habitat category would likely support foraging and dispersal for the species.	0.00
Total		**0.00**

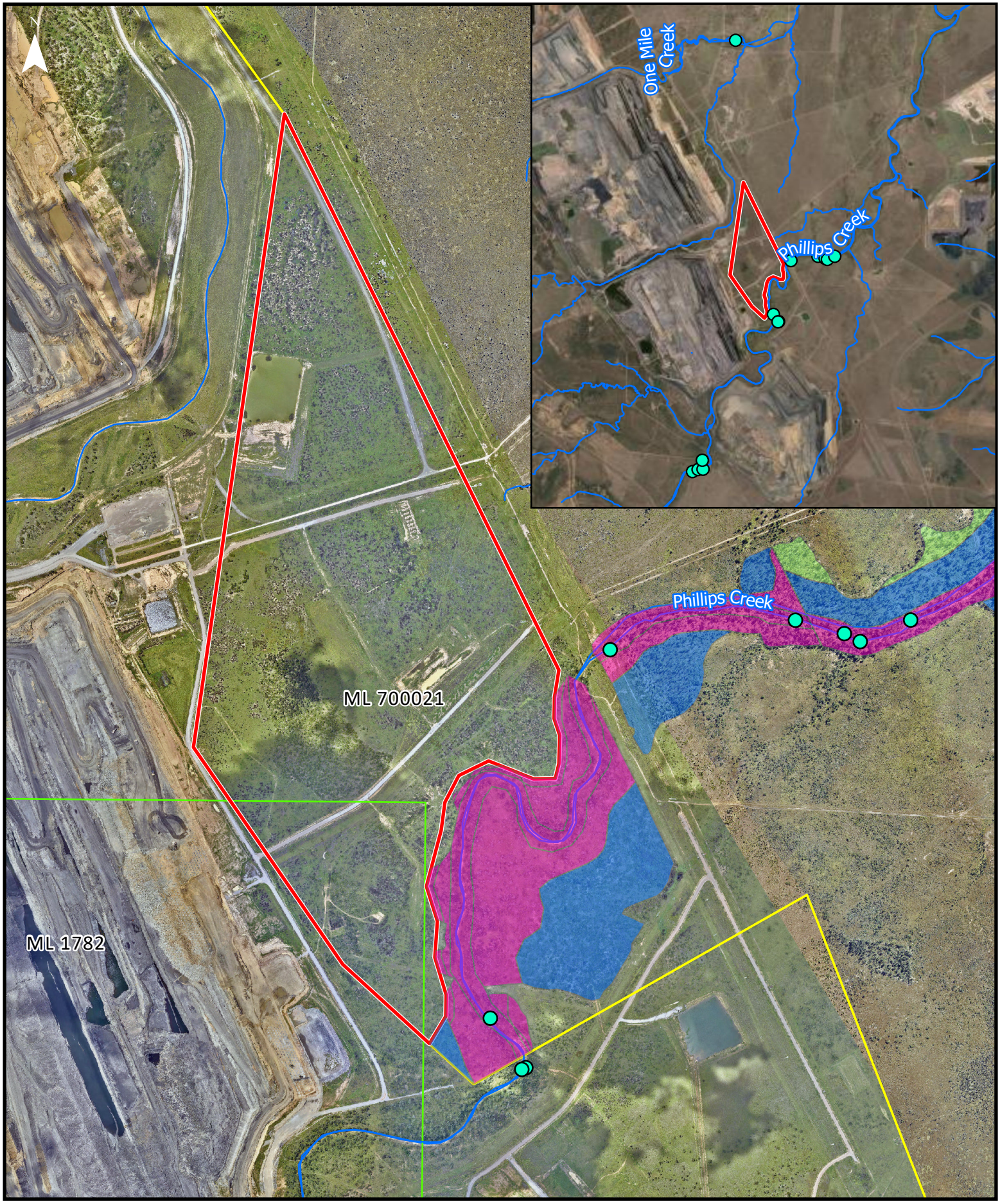

FIGURE 14: GREATER GLIDER HABITAT SURROUNDING THE PROJECT AREA

Legend

- Greater Glider Sightings
- Watercourse
- Project Area
- Mining Lease Boundary
- Exploration Permits (Coal)

Greater Glider Habitat Type (AECOM, 2023; BAAM, 2021)

- Preferred
- Suitable
- Marginal

0 250 500 m

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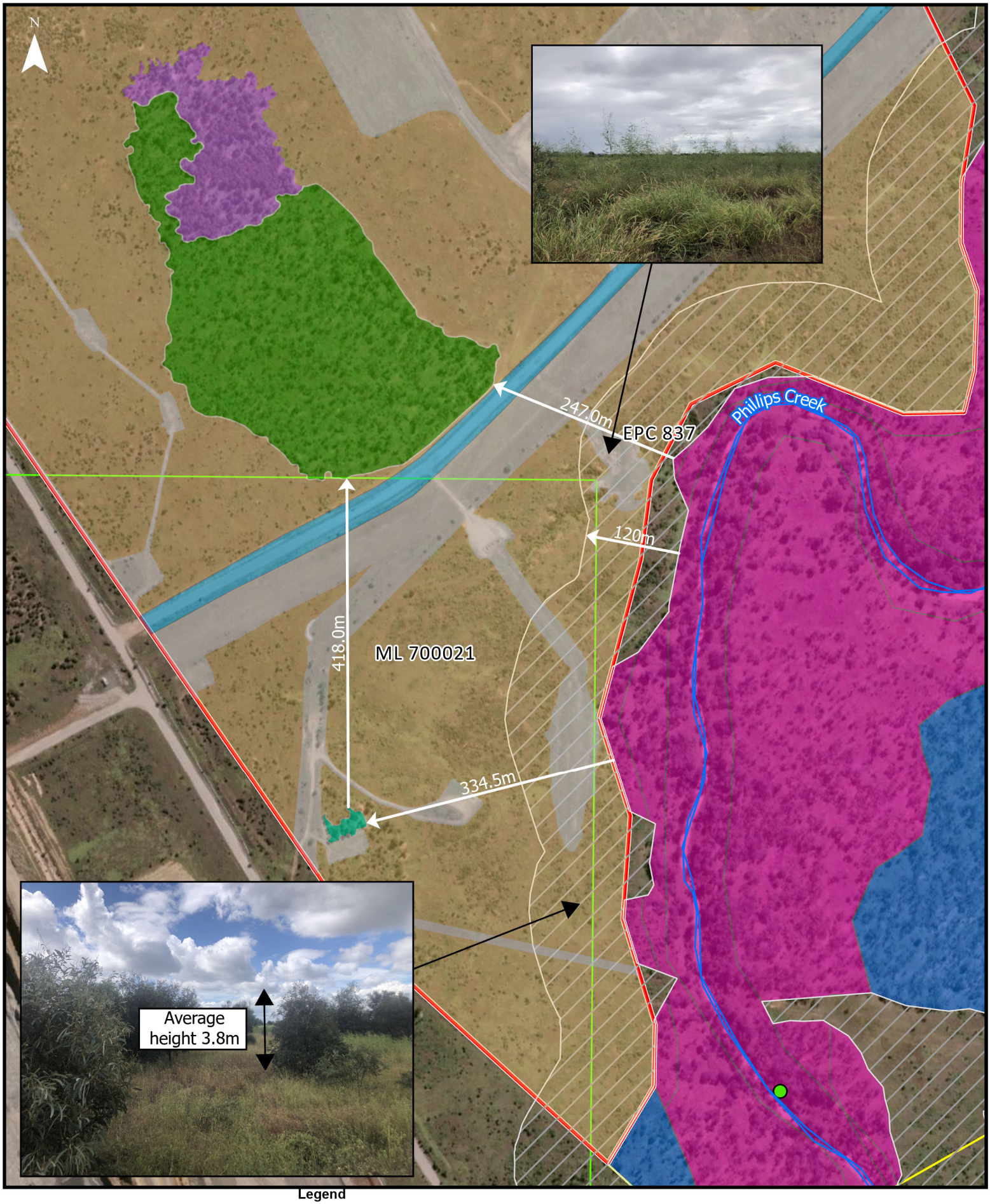

FIGURE 15: MAXIMUM POTENTIAL GLIDE DISTANCE OF GREATER GLIDER AND VEGETATION FRAGMENTATION

ENGENY

Legend

- Project Area
- Watercourse
- Maximum Potential Glide Distance

GTRE (Engeny, 2024)

- Acacia harpophylla shrubby woodland with Terminalia oblongata on Cainozoic clay plains (Remnant, RE11.4.9)
- Eucalyptus populnea open forest on sand plains (Remnant, RE11.5.3)
- Acacia harpophylla and/or Casuarina cristata low open forest on alluvial plains (HVR, RE11.3.1)
- Brigalow Regrowth (Regrowth)
- Disturbed and cleared areas (Infrastructure)
- Disturbed and cleared areas with grass and forb regrowth lacking woody vegetation (Non-remnant)
- Mining Lease Boundary
- Exploration Permits (Coal)

Previous Sightings

- Greater Glider (BAAM, 2021)

Greater Glider Habitat Type (AECOM, 2023; BAAM, 2021)

- Preferred (breeding, foraging, shelter and dispersal)
- Suitable (foraging, dispersal and shelter)

0 50 100 m

4.2.4.4 Habitat Critical to the Survival of the Species

The Commonwealth provides species-specific guidance on habitat considered to be critical to the survival of Greater glider. As outlined in the Conservation Advice (DCCEEW, 2022a), critical habitat can be broadly defined as (noting that geographic areas containing habitat critical to the survival needs to be defined by forest type on a regional basis):

- Large contiguous areas of Eucalypt Forest, which contain mature hollow-bearing trees and a diverse range of the species' preferred food species in a particular region;
- Smaller or fragmented habitat patches connected to larger patches of habitat, that can facilitate dispersal of the species and/or that enable recolonisation;
- Cool microclimate forest/woodland areas (e.g. protected gullies, sheltered high elevation areas, coastal lowland areas, southern slopes);
- Areas identified as refuges under future climate changes scenarios; and
- Short-term or long-term post-fire refuges (i.e. unburnt habitat within or adjacent to recently burnt landscapes) that allow the species to persist, recover and recolonise burnt areas.

Forest areas currently unoccupied by the greater glider (southern and central) may still represent habitat critical to survival, if the recruitment of hollow-bearing trees as the forest ages could allow the species to colonise these areas and ensure persistence of a subpopulation.

As the Project area does not contain any habitat to support Greater glider, it does not contain habitat critical to the survival of the species. However, habitat has been identified as present at Phillips Creek, outside of the Project area, which has also been confirmed in previous ecological assessments. In addition to providing foraging and breeding habitat for individuals (as identified through the recent record of the species in the current field survey), Phillips Creek is one of a number of east-west landscape linkages that connects larger tracts of vegetation to the west along the Harrow Ranges to the Isaac River. This facilitates the dispersal of the species across the region and allows the species to potentially move from source habitat areas and colonise new territories. As such, habitat along Phillips Creek, outside of the Project area, is considered habitat critical to the survival of the species.

4.2.4.5 Important Populations

As outlined in the Conservation Advice for *Petauroides volans* (Greater glider – southern and central), all populations of the species are considered important for its conservation across its range. This is due to the species' low fecundity, reliance on multiple den sites, and extremely limited capacity for dispersal across fragmented landscapes. Where local extinctions have occurred, recolonisation is rare and typically only possible when continuous or connected forest habitat is available (DCCEEW, 2022a).

Greater gliders have been confirmed south of the Project area in vegetation associated with Phillips Creek (Figure 14) but no individuals have been recorded within the Project area despite targeted surveys. The Project area is dominated by immature Brigalow regrowth that lacks the canopy height and hollow-bearing trees required for gliding and denning. Movement from Phillips Creek is further restricted by cleared areas at least 350 m wide, exceeding the species' typical gliding capacity of up to 100m, and by fencing that increases open ground exposure and potential predator risk. These factors, combined with the highly fragmented vegetation, prevent dispersal into the Project area. Consequently, the Project area is not considered to support an important population of Greater glider, nor is it likely to facilitate recolonisation or movement between known habitat areas.

In contrast, habitat associated with Phillips Creek, which contains hollow-bearing trees and provides for foraging, is considered to support an important local population of Greater glider. This habitat forms part of a broader east–west corridor that connects large, intact vegetation communities between the Harrow Ranges and the Isaac River.

5. POTENTIAL PROJECT IMPACTS

5.1 Direct Impacts

5.1.1 Vegetation Clearing and Habitat Loss

Vegetation clearing and the associated loss of habitat will be a direct and permanent impact of the proposed pit development for the life of the mine. For the purpose of this impact assessment, it is assumed that the entirety of the Project area will be progressively cleared and disturbed to facilitate the mine design.

Mining operations will be staged and proceed in a west-to-east direction across the mining lease, with each mining strip expected to take approximately 1 to 3 years to complete before advancing to the next zone. As a result, the extent of clearing impacts will increase progressively over time.

The maximum extent of direct impacts to identified ecological values within the Project area is outlined in Table 30 and represents the total clearing footprint associated with the Project. These impacts will not be fully realised until the final stage of mining has commenced.

TABLE 30: DIRECT IMPACTS TO ECOLOGICAL & MNES ASSOCIATED VALUES WITHIN THE PROJECT AREA

Ecological Value	Associated Habitat Type / Category	Area of Direct Impact (ha)
Commonwealth values		
Koala	Marginal	11.29
Squatter pigeon	Marginal	161.71
Ornamental snake	Preferred	42.83
	Suitable	2.73
	Marginal	86.76
General ecological values		
Eucalyptus populnea open forest on sand plains (RE11.5.3)	Eucalypt open forest	10.87
Acacia harpophylla shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains (RE11.4.9)	Brigalow woodland	2.73
Acacia *harpophylla* and/or *Casuarina cristata* low open forest on alluvial plains (RE11.3.1 HVR)	Eucalypt and brigalow low open forest	0.42
Eucalyptus populnea low open forest on sand plains (RE11.5.3 HVR)		
Regrowth Brigalow	Brigalow regrowth with frequent gilgai	42.83
	Brigalow regrowth with infrequent or absent gilgai	104.86
Disturbed and impacted areas with grass and forb regrowth lacking woody vegetation	Non-remnant cleared and disturbed areas with grass and forb regrowth	43.11
Total general ecological values impacted		**204.81**

The majority of the vegetation communities and habitat types across the Project area are highly disturbed and degraded from previous grazing activities and other disturbance. Whilst regeneration and the recovery of ecosystems are occurring, the current floristic and habitat values are a reflection of this general regrowth state. Therefore overall, habitat features such as tree hollows, leaf litter, ground timber, etc are generally low across the Project area, along with floristic diversity and the associated foraging resources that this provides. Where these features and values do occur within extant areas of more mature vegetation, the patches are isolated, small and their viability and subsequent use by fauna is already compromised. Furthermore, threatening process are noted to be persisting across the Project area such as weed and pest incursion. Subsequently, potential general ecological impacts that can occur as a result of vegetation clearing across the Project area will generally be minor and likely to include the following:

- Loss of habitat causing a reduction in individual fauna numbers that inhabit the area;
- Minimal overall loss of or disturbance to microhabitat features such as tree hollows, leaf litter, ground timber, dense shrubs and hollows;
- Minimal overall loss of floristic diversity and the food resources this provides such as foliage, flowers, nectar, fruit and seeds;
- Removal of abiotic features currently supporting degraded but regenerating vegetation communities and habitat types.

Nonetheless, there are MNES values associated with identified vegetation communities and habitat types across the Project area in the form of potential habitat for conservation significant species as outlined in Table 30. The majority of MNES habitat to be removed is in marginal condition as a result of its degraded (i.e., high weed incursion), fragmented and regrowth state. Subsequently, marginal habitat provides limited value to these species. In the case of Koala, these factors severely compromise the ability for the Project area to be utilised by the species, and for Squatter pigeon, it limits its functionality to only providing dispersal habitat for vagrant individuals.

It is noted that Greater glider was identified along Phillips Creek, however, no direct impacts will occur to this waterway. Similarly, areas considered to be 'Preferred' habitat for Koala that occur along Phillips Creek have also been avoided by the Project footprint. Therefore, no direct impacts to this species will occur as a result of the Project. Consideration of indirect impacts are further considered in Section 5.2.

For Ornamental snake, this species is known to be able to utilise and persist within environments that are regenerating but have still retained important microhabitat features such as gilgai to support the species. However, in areas where the microhabitat features are reduced in frequency and connectivity and are degraded with high weed incursion and compacted soils, habitat functionality is also significantly reduced to only providing periodic foraging habitat for vagrant individuals. Marginal habitat within the Project area was found to be in such condition and is expected to be rarely used by the species. It is not considered to provide relevant habitat resources to support permanent individuals.

As such, clearing of MNES values associated with identified marginal habitat for conservation significant species will result in permanent loss of these values, but the severity of this impact is considered to be low due to the limited value and role that these areas play in maintaining these species.

The Project area does, however, contain 'Preferred' and 'Suitable' habitat for Ornamental snake. This is the main area of value within the Project area to conservation significant species. Unlike marginal habitat, these areas provide the relevant habitat resources that can support foraging and possible breeding opportunities to permanent individuals. Removal of this habitat will therefore permanently reduce the extent of available habitat to Ornamental snake in the area. It should be noted that this habitat is not considered 'core' habitat for the species, but rather habitat providing foraging and possible breeding resources for an overflow of individuals from core source habitat (refer to Section 4.2.3). A total of 42.83 ha and 2.73 ha of 'Preferred' and 'Suitable' Ornamental snake habitat will be directly impacted by the Project. The location of Ornamental snake habitat within the proposed Project layout design is illustrated in Figure 16. The significance of direct impacts in accordance with the criteria outlined in the EPBC Act Policy Statement 1.1 Significant Impact Guidelines: Matters of National Environmental Significance (Department of the Environment, 2013b), and in consideration of mitigation measures is further discussed in Section 7.

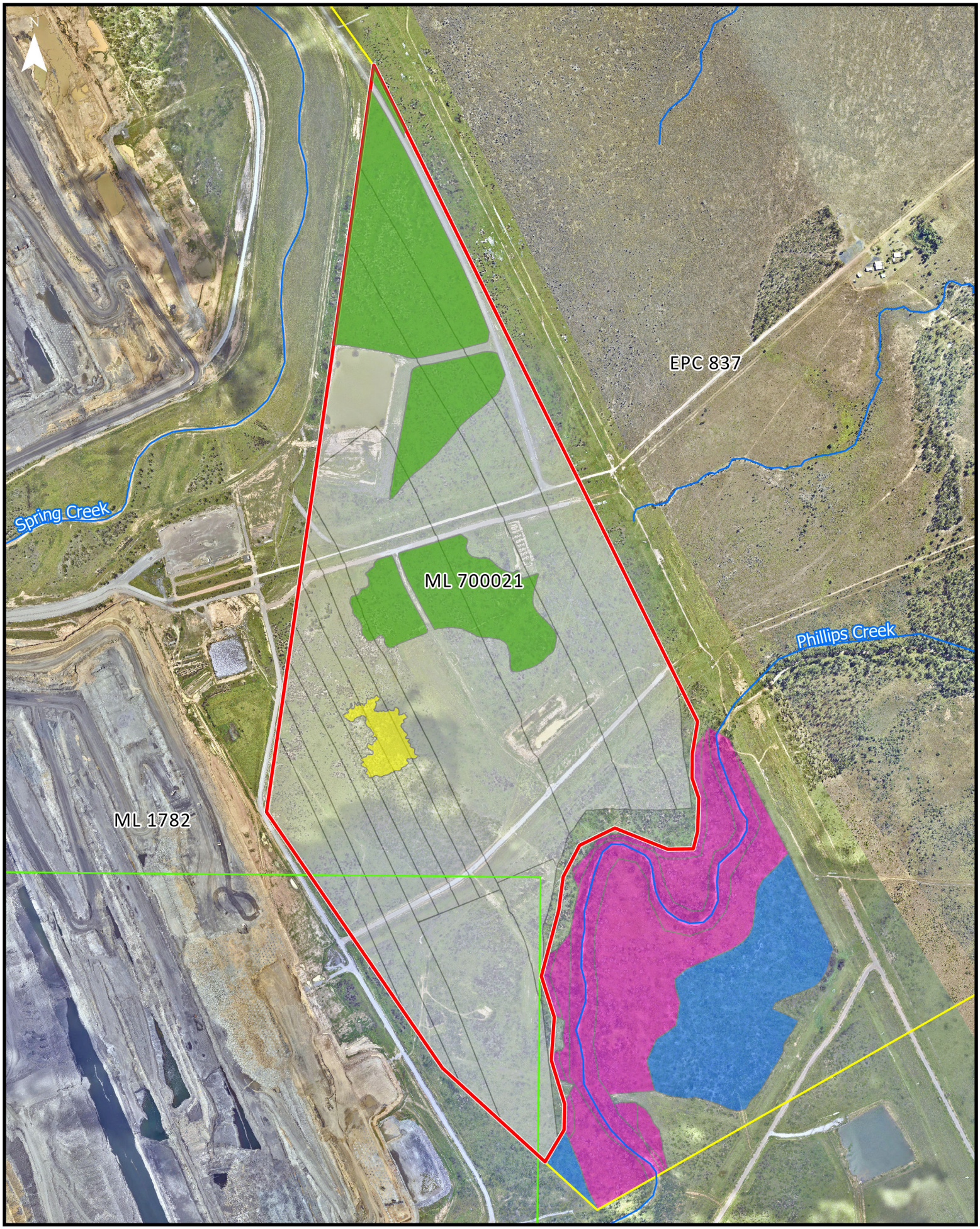

FIGURE 16: POTENTIAL DIRECT IMPACTS ON MNES VALUES

ENGENY

Legend

- Watercourse
- Project Area
- Mining Lease Boundary
- Exploration Permits (Coal)
- Project Design Extent LOA25

Ornamental Snake Habitat Type

- Preferred (breeding, foraging, shelter and dispersal)
- Suitable (foraging, shelter and dispersal)

Koala and Greater Glider Habitat Type (BAAM, 2021)

- Preferred
- Suitable

0 100 200 300 m

5.1.2 Fragmentation

The entirety of the Project area will be cleared and disturbed to facilitate the mine design. No partial clearing will occur within vegetation communities or habitat types within the Project area to cause fragmentation impacts on these ecosystems. Potential direct impacts for these ecosystems relate more to vegetation / habitat loss (Section 5.1.1) and fauna mortality (Section 5.1.3). Therefore, the focus of Project related fragmentation impacts is on broader landscape issues with the complete removal of vegetation and habitats with the Project area.

Connectivity values of the Project area and the role that it plays in providing movement opportunities across the landscape are already impacted by historical clearing activities. A number of fauna movement barriers also occur within and surrounding the Project area that present either a physical hard barrier or high-risk movement scenario for most species. These include cleared open areas (including pipeline and transmission easements), dense regrowth areas with no emergent woody vegetation, gravelled light vehicle tracks, mine pits and cleared creek diversions. The small patches of extant vegetation within the Project area may provide opportunistic steppingstone connectivity northwards from the Phillips Creek or westwards from the existing One Mile Creek diversion (Figure 7); however, this would mainly be restricted to more highly mobile fauna species (birds and macropods).

It is noted that given the highly impacted and / or fragmented nature of vegetation north, west and east of the Project area (excluding Phillips Creek), the Project area and this 'stepping stone' habitat is not considered to form an important fauna movement corridor. In-fact, this assessment considers that stepping stone connectivity within the Project area from Phillips Creek is likely to lead to a 'dead-end' for most fauna species moving north, west or east (excluding Phillips Creek).

Overall, the Project area is considered to play a very minor role in landscape connectivity within the region. For this reason, fragmentation impacts at a broader spatial scale due to the complete removal of vegetation within the Project area are considered to be low.

For MNES values and specifically conservation significant species that are known or may potentially occur within the Project area, this assessment of low fragmentation impacts as a result of the Project is also applicable. Current connectivity values and movement barriers within the Project area are likely to impede Koala movement from Phillips Creek. Squatter pigeon may disperse through the Project area but given its habitat values and condition, is likely to be restricted to transient individuals. For Ornamental snake, aerial imagery, the DEM and previous ecological assessments indicates that gilgai connectivity extends north-east from the Project area towards the Isaac River. This level of gilgai connectivity likely provides dispersal opportunities for Ornamental snake from the Project area towards One Mile Creek and the Isaac River floodplain. Gilgai connectivity does not extend to the southern boundary of the Project area or to Phillips Creek. Therefore, the Project area is positioned at the southern end of a larger contiguous band of gilgai Brigalow regrowth that continues further north-east and connects to Hughes Creek, One Mile Creek and the Isaac River (Figure 7). Based on this landscape context, the habitat is not functioning as an important link for the dispersal of the species throughout the area. Whilst the Project area provides habitat for Ornamental snake, impacts relate more to habitat loss rather than impacts associated with fragmentation.

5.1.3 Fauna Mortality

Fauna mortality is another direct impact that may occur during the Project and may occur principally through:

- Strike from moving vehicles/machinery – key issue for ground-dwelling species, particularly those with poor mobility.
- Entrapment in habitat during removal – key issue during tree felling for species that use tree hollows or hollow logs for roosting and denning.
- Entrapment in unsealed holes or trenches – key issue for ground dwelling species (reptiles and small mammals), particularly those that are active at night and cannot detect holes to avoid.

The Project area is highly disturbed and degraded from previous grazing activities and the majority of the area is in a regrowth state with a lower structural complexity and lower diversity of habitat resources to support a range of fauna groups. Where habitat resources such as leaf litter and ground timber occur within extant areas of more mature vegetation, the patches are small in size and as such availability is limited. The Project area would therefore support a smaller proportion of ground-dwelling and less mobile fauna species that could be impacted by vehicles or become entrapped in trenches. These small and more mature habitat patches within the Project area were also found to contain some hollow-bearing trees and logs, but again abundance of these habitat features was limited. Therefore, risks of fauna entrapment of hollow-dependent species in such habitat features during clearing is moderate. Based on the limited extent and diversity of habitat within the Project area, it is unlikely that potential impacts of fauna mortality will be at a level significant enough to cause local population decline across common fauna species.

Potential habitat for conservation significant species identified within the Project area includes Koala, Squatter pigeon and Ornamental snake. The likelihood of individual Koalas traversing the Project area to access patches supporting food and shelter trees is considered to be very low due to the level of fragmentation and movement barriers present in the area, with Koala utilisation and dispersal likely to be restricted to Phillips Creek as the main fauna corridor across the surrounding area for this species. Potential habitat patches within the Project area do not provide stepping stone movement opportunities for the species. As such, the risk of Koala fauna strike is low. In addition,

no construction activities will be occurring within Phillips Creek. During the operational phase, the Project area would present a hostile environment to the species and therefore the likelihood of Koalas entering the area and being at risk of fauna strike is also low.

Habitat for the Squatter pigeon and Ornamental snake has been identified as present within the Project area and both species are considered to be susceptible to fauna strike from moving vehicles/machinery. This is due to their ground-dwelling nature, nocturnal activity or behavioural responses to a threat (i.e. Squatter pigeon 'squatting' when approached). Ornamental snake is also susceptible to entrapment.

For Squatter pigeon, habitat within the Project area is marginal and utilisation is likely to be in the form of transient individuals dispersing through the area to better quality habitat in the surrounding region. Therefore, the number of individuals likely to be encountered and interact with construction activities is considered to be low. In addition, no breeding habitat is present within the Project area for the species, as such there is no potential for nests and fledglings to be crushed by operational activities, as this species is known to nest on the ground. During the operational phase, the Project area would present a hostile environment to the species and therefore the likelihood of Squatter pigeon entering the area is also low. Based on this, the risk of fauna strike and mortality for this species is considered low.

For Ornamental snake the risk of fauna strike and mortality is higher due to the presence of relevant habitat values supporting known individuals across key habitat areas for the species. Areas of 'preferred' and 'suitable' habitat have the ability to support individuals on a more permanent basis for foraging and potential breeding. The likelihood of encountering this species during operation or construction is therefore high and without the implementation of mitigation measures, could result in mortalities. Measures to minimise this impact are available and effective and are to be implemented to significantly reduce this risk.

5.2 Indirect Impacts

The loss of vegetation and habitat as well as construction and operational activities, can potentially result in indirect or secondary impacts to the associated fauna and floristic values in the form of habitat degradation. This includes the potential for:

- Increased edge effects reducing the condition of quality of remaining vegetation communities and habitat types.
- Establishment and spread of introduced species that may displace native species, native habitat resources and alter fire regimes.
- Increased anthropogenic activity and disturbance that may lead to increased pest levels.
- Soil exposure resulting in an increased risk of erosion and sedimentation of water bodies, reducing water quality and degrading aquatic habitats.
- Increased risk of contamination associated with activities such as refuelling or storage of chemicals, as well as the releases of mine effected waste.
- Changes in hydrology such as from infrastructure traversing watercourses, increasing stormwater run-off or changing surface levels both adjacent and within a floodplain.
- Generation of dust emissions leading to excessive deposition of dust on leaves of plants suppressing photosynthesis and growth.
- Increased noise and light affecting foraging, breeding and/or nocturnal behaviour for some fauna species or resulting in complete avoidance and displacement from habitats.
- Periodic burst of elevated noise levels such as during blasts that may startle and disorientate fauna species within proximity.

In relation to MNES values, the identified potential or known habitat for Ornamental Snake, Koala and Greater glider along Phillips Creek and the gilgai Brigalow regrowth to the north-east of the Project area are considered the only MNES values susceptible to these indirect impacts. Due to the lack of higher quality habitat for Squatter pigeon that was assessed at the time of the field survey within the areas surrounding the Project area, an assessment of indirect impacts for this species is not considered relevant. Specifically, habitat along Phillips Creek was found to contain a high incursion of introduced grasses, which substantially impedes the suitability of this habitat for breeding and foraging does not contain the open tussock structure that the species requires for nesting and dustbathing. The lack of good quality habitat automatically precludes the species from being at risk to a higher level of impact as a result of potential indirect Project impacts. This is due to the limited value and role that the surrounding areas would play in maintaining this species and supporting individuals.

Indirect impacts that may arise during the construction and operational phases of the Project, both generally and in relation to these susceptible MNES values is further detailed in the following sections. A summary of the assessment of potential indirect impacts is outlined in Table 31 below.

TABLE 31: ASSESSMENT OF PROJECT INDIRECT IMPACTS FOR CONSTRUCTION AND OPERATIONAL PHASE

Indirect impact	MNES values susceptible to impact	Frequency	Duration	Magnitude	Context	Overall assessment
Weed and pest incursion	• Koala • Greater glider • Ornamental snake	**Infrequent / periodic** – this risk will be managed in accordance with BMA's weed and feral animal management procedure (e.g. vehicle hygiene protocols). Weed and pest incursions may occur periodically during each stage of the mine in response to rainfall, dispersal vectors, or other seasonal conditions. As mining progresses between stages, there is potential for repeated incursions to occur. Vehicle and machinery will be inspected prior to first entry into SRM.	**Temporary** – Weed outbreaks will be detected and treated through ongoing monitoring and management undertaken as part of the SRM program. As mining progresses in a west-to-east direction across the ML, each stage is expected to last approximately 1 to 3 years. The risk of weed establishment will vary depending on proximity to active mining zones, with adjacent areas subject to temporary exposure before mining advances to the next zone. Weed management efforts will continue throughout the life of the mine to address emerging issues and prevent long-term establishment.	**Localised** – area at risk of potential weed incursion is approximately the 3 km stretch of Phillips Creek that abuts the Project area boundary. Area at risk of potential pest species incursion also includes the 3 km stretch of Phillips Creek as well as the northern gilgai Brigalow regrowth that shares approximately 1 km of the Project area boundary.	**Low to moderate sensitivity –** weed incursion, particularly exotic pasture grass species, has already degraded threatened species habitat. For Ornamental snake further incursion is unlikely from indirect Project impacts with the main influencing factor being any direct clearing of Brigalow regrowth in adjacent habitat areas (not associated with the Project). Koala and Greater glider habitat could be susceptible to the introduction / increase of exotic species - Lantana (*Lantana camara*) and Rubber vine (*Cryptostegia grandiflora*). Pest incursion is likely already present in surrounding habitats due to the identified presence of a number of pest species within the Project area. Pest species are a listed threat to Ornamental snake, Koala and Greater glider. These species are therefore susceptible and sensitive to further proliferation of pest species in the area.	**Low impact** – Koala and Greater glider habitat along Phillips Creek would be susceptible and sensitive to weed incursion. Albeit this would be for specific exotic species. These species, as well as Ornamental snake would also be susceptible and sensitive to increased pest incursion. Whilst the receiving environment is considered sensitive to this indirect impact, the potential impact is likely to be infrequent, temporary and localised during all Project phases as any increased weed or pest incursion would be associated with a breach in site procedures.

Indirect impact	MNES values susceptible to impact	Frequency	Duration	Magnitude	Context	Overall assessment
Erosion & sedimentation of waterways	• Ornamental snake	**Infrequent / periodic** – this risk will be managed in accordance with BMA's erosion and sediment management procedure (e.g. inadequate erosion and sediment control design measures, missed inspections). Erosion and sedimentation of waterways is not expected to recur during a given stage of the mine.	**Temporary** – Mining activities will progress across the ML in a west-to-east direction, with each stage typically lasting 1 to 3 years. The risk of erosion and sedimentation to adjacent waterways will vary depending on their proximity to active mining zones and is generally limited to areas near current operations. Failures resulting in erosion or sedimentation will be identified and addressed through scheduled inspections undertaken as part of the SRM program.	**Localised** – area at risk of erosion and production of sedimentation is the 1km interface along the Project area boundary and the northern gilgai Brigalow regrowth habitat that is potential Ornamental snake habitat.	**Low to moderate sensitivity –** degradation of water quality in gilgai habitat is a listed threat to Ornamental snake. Surrounding habitat areas have been previously degraded and are not considered pristine environments. However, erosion and sedimentation processes via active grazing no longer occurs within these areas. Therefore, the species would be susceptible and sensitive to erosion and sedimentation if this occurred as a result of the Project.	**Low impact** – Whilst the receiving environment is considered sensitive to this indirect impact, the potential impact is likely to be infrequent, temporary and localised during all Project phases as any incidents of erosion and sedimentation would be associated with a breach in site procedures. It is considered that the setback between mining activities and Phillips Creek, including the establishment of a flood levee, will significantly reduce likelihood of erosion and sedimentation to Phillips Creek.

Indirect impact	MNES values susceptible to impact	Frequency	Duration	Magnitude	Context	Overall assessment
Soil and water contamination	• Ornamental snake	**Infrequent / periodic** – this risk will be managed in accordance with the BMA erosion and sediment management procedure, SRMs Water Management Plan (inadequate Mine Affected Water (MAW) Dam design or maintenance measures).	**Temporary** – Mining activities will progress across the ML in a west-to-east direction, with each stage typically lasting 1 to 3 years. The risk of soil and water contamination will vary depending on proximity to active mining zones and is generally confined to areas near current operations. Failures resulting in contamination will be identified and addressed through FRREMP monitoring, scheduled inspections undertaken as part of SRM EA requirements, and event investigations and response procedures.	**Localised** – area at risk of soil and water contamination is the 1km interface along the Project area boundary and the northern gilgai Brigalow regrowth habitat that is potential Ornamental snake habitat.	**Low to moderate sensitivity –** degradation of water quality in gilgai habitat is a listed threat to Ornamental snake. Surrounding habitat areas have been previously degraded and are not considered pristine environments. However, potential contamination sources from agricultural activities no longer occurs within these areas. Therefore, the species would be susceptible and sensitive to soil and water contamination if this occurred as a result of the Project.	**Low impact** – Whilst the receiving environment is considered sensitive to this indirect impact, the potential impact is likely to be infrequent, temporary and localised during all Project phases as any incidents of soil and water contamination would be associated with a breach in site procedures.
Altered hydrology	• Koala • Greater glider	**Not anticipated to occur** – Project does not propose to construct or operate any infrastructure that will be within or bisect Phillips Creek. Therefore, there will be no instream barriers or changes to surface levels that could alter the hydrology of Phillips Creek. Vegetation within the Project area will be removed, and bulk earthworks will substantially alter the adjacent topography during the construction phase. This substantially altered topography will remain throughout the operational phase to support the extraction of coal resources. Flood protection levees (earth bunds) will also be constructed and will remain in place throughout the entire operational phase along the Project's boundary. Surface water modelling of these changes has identified only minor variations in the baseline hydrological characteristics and flooding extents of Phillips Creek.					**Low to negligible impact -** only minor changes in the hydrological characteristics and flooding extents of Phillips Creek. No impacts anticipated on the condition and quality of Koala and Greater glider habitat along Phillips Creek.

Indirect impact	MNES values susceptible to impact	Frequency	Duration	Magnitude	Context	Overall assessment
Elevated dust	• Koala • Greater glider	**Infrequent** – this risk will be managed in accordance with the SRM Dust Management Plan (infrequent water carts and changes in weather conditions (dry and windy, excessive dust)).	**Temporary** - Mining activities will progress across the ML in a west-to-east direction, with each stage typically lasting 1 to 3 years; however, the exact mining sequence is not yet confirmed. Dust impacts will vary based on proximity to active mining zones and are generally confined to areas near current operations. Failures resulting in excessive dust generation will be identified and addressed through regular inspections of the work area conducted by site personnel (e.g. Open Cut Examiner (OCE)) in accordance with the SRM EA. Where appropriate, potential dust impacts may be mitigated through natural processes such as rainfall.	**Localised** - area at risk of elevated dust deposition is the 1km interface along the Project area boundary and the northern gilgai Brigalow regrowth vegetation.	**Low to moderate sensitivity –** Koala and Greater glider are both folivore species and therefore would be impacted by vegetation dieback that could be caused by dust deposition. Both species would also be impacted by reduced canopy cover either due to reduced predation cover or thermoregulation abilities. Nonetheless, vegetation in surrounding habitats is dominated by Eucalypt and Acacia species, which have narrow and glabrous leaves with a downward orientation. As such, are likely to have a lower dust retention capacity. Furthermore, the persistence of the Koala and Greater glider in habitats immediately adjacent to long-term mining operations in the region indicates that vegetation communities exposed to background operational dust levels can continue to support these species where impacts are localised and managed under standard site procedures.	**Low impact** – Whilst the receiving environment is considered sensitive to this indirect impact, the potential impact is likely to be infrequent, temporary and localised during all Project phases as any incidents of excessive dust deposition would be associated with a breach in site procedures or short-term weather conditions. The continued presence of the Koala and Greater glider in habitat directly adjacent to active operational areas in the surrounding mining landscape further indicates that localised dust deposition is unlikely to result in displacement or long-term degradation of habitat suitability.

Indirect impact	MNES values susceptible to impact	Frequency	Duration	Magnitude	Context	Overall assessment
Noise disturbance	• Greater glider • Koala • Ornamental snake	**Frequent –** whilst blasts will occur infrequently, general mining activity noise will occur consistently throughout the Project's duration.	**Permanent** – While blasting and associated noise will be intermittent and short-term in nature, general construction and operational noise will occur consistently throughout the life of the mining operations.	**Localised –** noise associated with mining activities is generally found to be restricted to the in-pit area, with noise levels dropping substantially from pit area to edge of pit and surrounding adjacent areas. Mining noise is generally described to be non-tonal, which reduces the audibility of mining related noise.	**Moderate to high sensitivity** – Koala and Greater glider are considered to be susceptible to noise impacts due to their nocturnal nature. Whilst Ornamental snake is nocturnal, reptiles generally respond more to vibration rather than noise. Greater glider is considered the most susceptible due to its relatively small home range (1-4 ha) (DCCEEW, 2022a), lack of tolerance to general disturbance, reliance on specific habitat requirements (i.e., large tree hollows in large, old trees) and use of Phillips Creek for all critical behaviours, including refuge. Notably, records from the surrounding landscape demonstrate that both Koala and Greater glider persist within habitat directly adjacent to active mining operations, including multiple recent Greater glider records (2018–2024) within close proximity to operational areas and numerous Koala records occurring adjacent to the mine footprint. These observations indicate a degree of behavioural tolerance and habituation to ongoing operational noise and disturbance in comparable habitat settings.	**Low impact** - noise levels associated with the Project are not considered to be of a high magnitude (i.e. substantially above the current background levels along Phillips Creek and other areas to the north-east of the Project area). Blasting will occur, which at the source will generate significant noise levels. However, this will only occur periodically and for a short duration. Species behavioural responses could be possible, but most likely temporarily as species habituate. This low level of impact is demonstrated by previous species records, including Greater glider within 150m of active operations on mine sites. At Saraji Mine, there have been multiple recent sightings (2018-2024) of the species in close proximity to active operational areas (Figure 14). Similarly, a high number of Koala records also occur directly adjacent to the Saraji Mine (Figure 8). These records and ongoing sightings indicate that both species and a local population are able to persist in areas of habitat directly adjacent to the mine site whilst mining occurs. The documented persistence of both Koala and Greater glider in habitat immediately surrounding active mining operations supports the conclusion that behavioural disturbance is likely to be minor and temporary, with local populations capable of utilising adjacent habitat despite ongoing operational noise.

Indirect impact	MNES values susceptible to impact	Frequency	Duration	Magnitude	Context	Overall assessment
Light disturbance	• Greater glider • Koala • Ornamental snake	**Infrequent** – lighting will occur within the pit and shielded by the pit walls and flood levee bund. Any required lighting along the Project boundary near adjacent habitats will occur infrequently and only when light vehicle access is required.	**Temporary** - Light disturbance to adjacent habitats will be temporary and will vary based on the location of mining activities. As mining progresses in a west-to-east direction across the ML, each stage is expected to last approximately 1 to 3 years before operations move to a new zone. Accordingly, adjacent areas will only be subject to light disturbance for a limited period. Lighting used along the Project boundary will be temporary in nature and primarily consist of mobile fixtures that can be relocated as mining advances. The exact mining sequence is not yet confirmed.	**Localised** - lighting will occur within the pit and shielded by the pit walls and flood levee bund. This may create an ambient glow above the Project area; however natural darkness within adjacent habitats will be maintained. Any required lighting along the Project boundary near adjacent habitats will be sporadically placed to illuminate only access for light vehicles.	**Moderate to high sensitivity** – adjacent habitat's baseline light levels, are considered to be equivalent to that of natural ambient levels, with dark refuge sites present. Greater glider and Ornamental snake are both nocturnal species and therefore susceptible to lighting impacts. While Koala can forage and disperse during the day, they are predominantly nocturnal / crepuscular but can forage and disperse during the day and so are still considered susceptible. Greater glider is considered the most susceptible due to its relatively small home range (generally about 1-4 ha) (DCCEEW, 2022a) and reliance on specific habitat requirements (i.e., large tree hollows in large, old trees at Phillips Creek for all critical behaviours, including refuge). Koala and Ornamental snake are considered less susceptible due to their higher dispersal capability, availability of higher quality habitat within the area and higher tolerance to disturbance. However, existing species records from the surrounding mining landscape indicate that Koala and Greater glider continue to utilise habitat in close proximity to active	**Low impact** – given the infrequency as well as temporary and localised nature of potential lighting impacts, natural darkness within surrounding habitats should be maintained. In addition, mitigation measures can be applied to any temporary lights that may be periodically used along the Project area boundary to further reduce impacts. Based on all these factors, and despite the consideration that the Koala, Ornamental snake and Greater glider would be susceptible to impacts from light disturbance, given proposed mitigation methods and impact timeframes, potential lighting impacts are considered low for all species. This low level of impact is demonstrated by previous species records, including Greater glider within 150m of active operations on mine sites. At Saraji Mine, there have been multiple recent sightings (2018-2024) of the species in close proximity to active operational areas (Figure 14). Similarly, a high number of Koala records also occur directly adjacent to the Saraji Mine (Figure 8). These records and ongoing sightings indicate that both species and a local population are able to persist in areas of habitat directly adjacent to the mine site whilst mining occurs. The continued persistence of Koala and Greater glider in habitats immediately adjacent to active mining infrastructure further supports that localised light disturbance is unlikely to result in

Indirect impact	MNES values susceptible to impact	Frequency	Duration	Magnitude	Context	Overall assessment
					operational areas where artificial lighting is present, suggesting that localised, shielded and temporary lighting does not preclude habitat use.	displacement or long-term reduction in habitat use.
Uncontrolled burn	• Greater glider • Koala • Ornamental snake • Squatter pigeon	**Highly Infrequent / Rare** – associated with accidental ignition however will be managed in accordance with fire management procedures. Uncontrolled fire is not expected under standard operating conditions. Fire weather conditions are seasonal, typically occurring between August and November in the northern Brigalow Bioregion, characterised by dry, hot conditions. While uncontrolled fire is rare, the potential for repeated events exists due to seasonal fire risk.	**Temporary** – an uncontrolled fire event itself would be short-term, but ecological recovery may take years depending on the location of the fire event, fire severity, post-burn conditions, and availability of undisturbed refugia.	**Localised –** in the unlikely event of occurrence, the extent of burn would likely be limited to vegetated areas directly adjacent to the Project area boundary, including the Phillips Creek corridor and Brigalow regrowth to the east. These areas support habitat for multiple MNES species, including Greater glider, and Koala along Phillips Creek, and Ornamental snake within the Brigalow regrowth. These habitats would be the primary areas at risk from an uncontrolled burn.	**High sensitivity** – uncontrolled burns are a listed threat to all identified MNES values. • **Greater glider** and **Koala** are vulnerable to canopy loss, thermal injury, and displacement due to fire, especially in areas with hollow-bearing trees and limited refugia. • **Ornamental snake** and **Squatter pigeon** rely on ground-level vegetation and habitat features which may be destroyed or degraded. Despite this sensitivity, surrounding habitats adjacent to active mining areas continue to support persistent populations of Koala and Greater glider, indicating that these species are capable of persisting within a disturbed landscape where high-quality riparian and woodland refugia (e.g. Phillips Creek corridor) remain intact.	**Low impact** – while an uncontrolled burn could have ecological consequences, the likelihood of such an event is low and effective mitigation measures are in place. The Project area and adjacent habitats are susceptible due to vegetation type and past disturbance; however, the implementation of proactive fire prevention protocols and rapid response procedures significantly reduces both the risk and potential severity of impact. As such, the overall impact to MNES values is considered low. Given the demonstrated persistence of Koala and Greater glider in adjacent operational landscapes, the risk of long-term population-level impacts from an isolated, localised fire event is considered low provided refugia habitats remain unaffected.

5.2.1 Weed Incursion

Mining activities which involve the clearing of vegetation and the disturbance of soil can promote the germination of introduced species, particularly when these species already exist within the vegetation community. If areas remain bare and unrehabilitated for extended periods of time during the mining operations, these introduced species can become well established and mature to then reproduce and spread further. The use of machinery or light vehicles contaminated by weed seed can also harbour the incursion of introduced species.

Increased introduced species incursion can present a high risk to adjacent and retained vegetation communities and habitats either directly from construction or operational activities occurring within these habitats, or by creating a point source for seed to spread from disturbed areas to retained areas. The proliferation of introduced species can:

- Increase fuel loads (with the potential to alter fire regimes);
- Reduce floristic diversity and availability of native foraging resources;
- Alter the vegetation structure, remove habitat niches and impact on fauna movement or the ability for fauna to effectively predate on species; and
- Smother native vegetation, causing dieback and reduce the availability of habitat resources.

Specifically for the Project, the Phillips Creek riparian corridor occurs within 100m – 150m of the proposed boundary of the Project footprint. In relation to MNES values, Phillips Creek is known to provide habitat for Greater glider and likely to provide habitat for Koala. In addition, Ornamental snake habitat occurs to the north-east of the Project area, within 150m – 200m of the proposed boundary of the Project footprint.

Extensive introduced species incursion in the form of exotic pasture grasses already exists within the ground layer of adjacent habitat areas for Koala, Greater glider and Ornamental snake. For Ornamental snake, the key risk for this species and ongoing habitat degradation is the increase of introduced pasture grass coverage, particularly in gilgai and areas of soil cracks. However, the key influencing factor of this in adjacent habitat areas is not considered to be potential indirect impact risks from the Project but would be the removal of Brigalow regrowth in these areas. Brigalow regrowth shades out introduced pasture grasses and prevents further establishment and spread. The clearing of Brigalow regrowth in adjacent habitat areas will not occur as a result of the Project. On the other hand, for Koala and Greater glider, the key risk for these species and ongoing habitat degradation, is the increase of introduced species such as Lantana (*Lantana camara*) and Rubber vine (*Cryptostegia grandiflora*) that can hinder species movement and severely impact on key canopy habitat resources.

The Project will involve construction and operational activities that can result in further weed incursion. All phases of the Project will be undertaken in accordance with conditions outlined in EA EPML00862313, effective 29 June 2023. The EA conditions as well as the development and implementation of several management plans, document the potential risk to the environment from activities, control measures and procedures to be implemented, managing incidents and performance indicators. These measures are relevant to the introduced species that particularly present a risk to Koala and Greater glider habitat (Lantana and Rubber vine). As a result, potential weed incursion impacts associated with the Project are already regulated and should remain low. That is, that any potential weed incursion impact should be infrequent, temporary and localised. It is not anticipated that the extent of weed proliferation would reach a level to cause impacts as listed above, particularly to MNES values.

5.2.2 Pest Incursion

Construction works and operational activities can create environments that favour pest species habitat requirements or behavioural characteristics, thus allowing them to spread into new habitats or proliferate in areas where they already exist. This can include the creation of additional aquatic habitats (ponding or water points) that may support breeding and areas to ambush prey, or additional access tracks that provide an easy conduit for pest species to disperse and forage.

An increase in pest species incursion can have the following impacts on native fauna:

- Prey on native species and compete for food and other habitat resources (i.e. shelter);
- Carry disease or toxins that may affect native animals; and
- Act as the primary prey for other exotic predators such as feral cats or foxes, which in turn then threaten native species.

Specifically for the Project, areas of fauna habitat will remain in the surrounding area, including Greater glider, Koala and Ornamental snake in relatively close proximity (i.e. Phillips Creek riparian corridor and gilgai Brigalow regrowth within 100m – 200m). Pest species were recorded during the field survey within the Project area and therefore are known to already exist in the area. These include Rabbit, Feral pig and Cane toad. Based on the condition of the Project area, there is the potential for the area to support other pest species such as Feral dog, Feral cat and House mouse. Given the proximity of Phillips Creek and gilgai Brigalow regrowth habitats to the Project area, it is likely

that these habitats are already impacted by these pest species. Nonetheless, pest species are a key threat to all of the threatened species that may occur or are known to occur in surrounding habitats. Therefore, further proliferation could cause further impact.

The Project area will be completely cleared and developed as a pit to support coal extraction activities. This environment is not considered favourable to pest species, but rather a more hostile environment due to the lack of any remaining vegetation or habitat resources, high use of the area by machinery and the high noise and light levels. No additional water points will be created. No infrastructure or access tracks will be constructed within the surrounding habitat areas or bisect Phillips Creek. Subsequently, the Project should not alter this surrounding habitat in favour of pest species. In addition, all phases of the Project will be undertaken in accordance with conditions outlined in EA EPML00862313, effective 29 June 2023, which regulate the potential impacts from the Project. The EA conditions as well as the development and implementation of several management plans, document the potential risk to the environment from activities, control measures and procedures to be implemented, managing incidents and performance indicators. These measures are relevant to the pest species that particularly present a risk to Koala, Greater glider and Ornamental snake (Feral dog, Cane toad, Feral cat and Feral pig).

Based on all these factors, pest incursion impacts associated with the Project are expected to remain low. That is, that any potential pest incursion impact should be infrequent, temporary and localised. It is not anticipated that the extent of pest species proliferation would reach a level to cause impacts as listed above, particularly to MNES values.

5.2.3 Erosion and Sedimentation

Project works that involve the clearing of vegetation and the disturbance of soil can expose areas to erosional processes. If areas remain bare and unrehabilitated for extended periods of time during both the construction and operational phase, surface erosion can continue and lead to the transportation of sediments to surrounding areas. Some surfaces are required to remain bare for operational purposes and if not appropriately stabilised or managed, could erode, become highly unstable and result in ongoing and large movements of sediments.

Erosion and sedimentation can present a high risk to adjacent and retained vegetation communities and habitats, particularly aquatic habitats, either directly from construction or operational activities occurring within these habitats, or indirectly if a pathway is established between these environments and the erosion point source. Erosion and sedimentation can:

- Increase turbidity and reduce water quality of adjacent aquatic habitats,
- Reduce the breeding success and abundance of aquatic species (e.g. frogs) that may provide important foraging resources for terrestrial fauna species, and
- Cause sediment build-up in waterways, altering the hydrology and potentially removing areas of ponded water within ephemeral systems or resulting in extensive flooding / inundation of areas.

Specifically for the Project, the Phillips Creek riparian corridor is an aquatic habitat that occurs within 100m – 150m of the proposed boundary of the Project footprint, which in relation to MNES values, is known to provide habitat for Greater glider and likely to provide habitat for Koala. In addition, Ornamental snake habitat that contains gilgai and is within 150m – 200m of the proposed boundary of the Project footprint exists to the north-east of the Project area. This gilgai can be a wetland ecosystem during periods of inundation. Whilst Koalas and Greater gliders utilise riparian habitats, they are not considered susceptible or sensitive to changes in aquatic condition that may result from potential erosion and sediment impacts. On the other hand, reduced water quality in gilgai habitat is a key threat to Ornamental snake, due to frogs being the predominant foraging resource for the species. Whilst this adjacent habitat has been previously degraded from historical clearing and it not considered a pristine environment, previous erosion and sedimentation processes from active grazing have ceased. Surrounding Ornamental snake habitat would therefore be sensitive and susceptible to this type of indirect impact.

The Project will create a pit with a high wall progressing in an easterly direction towards areas of surrounding retained Ornamental snake habitat. Areas prone to erosion with the potential to generate sediment along this interface include access roads, cleared laydown areas, pre-strip material and safety earth berms. These features are standard components of pit design and operation. All phases of the Project will be undertaken in accordance with conditions outlined in EA EPML00862313, effective 29 June 2023, which regulate the potential impacts from the Project The EA conditions as well as the development and implementation of several management plans, document the potential risk to the environment from activities, control measures and procedures to be implemented, managing incidents and performance indicators. As a result, potential erosion and sediment impacts associated with the Project should remain low. That is, that any potential erosion and sedimentation impact should be infrequent, temporary and localised as an impact would be a result of a breach in site protocol. It is not anticipated that the extent of erosion and sedimentation would reach a level to cause impacts as listed above, particularly to Ornamental snake.

5.2.4 Soil and Water Contamination

Soil and water contamination can occur during refuelling activities, coal extraction and transportation and the release of MAWs. Soil and water contamination can present a high risk to adjacent and retained vegetation communities and habitats, particularly aquatic habitats,

either directly from operational activities occurring within these habitats, or indirectly if a pathway is established between these environments and the contamination point source.

Similarly to erosion and sedimentation, ecological impacts associated with this include reduced water quality of aquatic habitats and the flow on effects to the abundance of foraging resources for terrestrial fauna species. This is unlikely to substantially affect Koalas and Greater gliders that may occur along Phillips Creek but is relevant to Ornamental snake habitat that occurs to the north-east of the Project area. Whilst this adjacent habitat has been previously degraded from historical clearing and it not considered a pristine environment, previous potential contamination sources from agricultural activities have ceased. Surrounding Ornamental snake habitat would therefore be sensitive and susceptible to this type of indirect impact.

Project activities that present a soil and water contamination risk will occur within the Project area. Contamination sources will be contained within the pit and mine disturbed areas through the implementation of conditions outlined in EA EPML00862313, effective 29 June 2023, which regulate the potential impacts from the Project. The EA conditions as well as the development and implementation of several management plans, document the potential risk to the environment from activities, control measures and procedures to be implemented, managing incidents and performance indicators. This includes the interaction of contaminants with water and soil on site (i.e. separating runoff from disturbed and undisturbed areas), detailing the infrastructure required to contain and manage contaminants on site (i.e. diversion channels, pumps and mine water storages) and manage any required water releases to the external environment within appropriate contaminant parameters. In addition, the Fitzroy Regional Receiving Environment Monitoring Program (FRREMP) is undertaken at the SRM, which includes monitoring of water quality at specific locations along Phillips Creek in order to detect any impacts associated with mine waste contamination. As such the risk of release of contaminants to surrounding habitat areas should remain low. It is not anticipated that the extent of contaminant release would reach a level to degrade gilgai habitat and foraging resources to the north-east of the Project area and cause impacts to Ornamental snake.

5.2.5 Altered Hydrology

Continued operational activities that change the surface levels and roughness either instream, within a floodplain or adjacent to a floodplain can alter the hydrology of nearby watercourses. This may result in changes to natural flow regimes either through an increase or decrease in volume and velocity, or flood patterns. Subsequent effects of this can include:

- Increased streambank erosion and instability;
- Increased water turbidity;
- Reduced water availability for riparian vegetation communities, aquatic habitats and fauna; and
- Vegetation dieback and habitat degradation from increased inundation or reduced nutrient input from flooding.

Specifically for the Project, the Phillips Creek riparian corridor occurs within 100m – 150m of the proposed boundary of the Project footprint, which in relation to MNES values, is known to provide habitat for Greater glider and likely to provide habitat for Koala. It should be noted that flood modelling of Phillips Creek undertaken as part of the Project's Surface Water Assessment (Engeny, 2024), does not show any interaction of floodwaters with Ornamental snake habitat within the Project area. That is, that flooding of Phillips Creek does not inundate and provide an input of water to gilgai areas and therefore has no effect on maintaining this habitat (Engeny, 2024). However, drought refugia habitat, like the riparian communities along Phillips Creek is very important to Koala and therefore changes to water availability for riparian communities or vegetation dieback is a relevant impact to this species. In addition, Greater glider denning trees could be susceptible to streambank instability. Therefore, both species could be susceptible to altered hydrology impacts.

The Project will not result in the disturbance of Phillips Creek and does not propose to construct or operate any infrastructure that will occur within or bisect Phillips Creek. As such there will be no instream barriers or changes to surface levels that could alter the hydrology of Phillips Creek directly. The Project proposes to clear all vegetation within the Project area (and up to ML boundary), up to a setback of 100m – 150m from Phillips Creek and associated riparian corridor, as well as substantially alter the Project area topography to support the pit design and extraction of coal resources. In addition, to prevent potential flooding of the proposed pit, flood protection levees (earth bunds), will be constructed within and along the Project's southern boundary, and will remain in place through the entire operational phase of the Project. Regardless of these alterations, surface water modelling has identified only minor changes in the hydrological characteristics and flooding extents of Phillips Creek. Therefore, potential impacts arising from altered hydrology are not anticipated to occur and is highly unlikely to affect Koala or Greater glider habitat that occurs along Phillips Creek.

5.2.6 Elevated Dust

Vegetation clearing, earthworks and blasting during the operational phase as well as overburden stripping, coal extraction, transportation and blasting during the operational phase will produce elevated levels of airborne dust, including coal dust. Elevated airborne dust can result in excessive deposition on the surface of plant foliage, reducing the amount of light penetration on the leaf surface, block and damage stomata and slow rates of gas exchange and water loss. This overall can reduce the photosynthetic ability of plants and if deposition is

sustained over extended periods of time, it can reduce growth rates of vegetation, decrease floral vigour and overall reduce vegetation community health. Subsequent effects of this can include:

- Reduced structural complexity in vegetation communities, reducing availability and diversity of habitat niches, particularly for fauna that are cryptic and prefer complex habitats;
- Reduced thermoregulation ability of shelter trees;
- Reduced foliage coverage for predator avoidance;
- Reduced foraging resources for folivores; and
- Greater competition from introduced grass species that prefer an open understorey, promoting proliferation of introduced species and potentially displacing native foraging grass species.

In addition, elevated airborne dust resulting in excessive deposition can impact on water quality and degrade adjacent aquatic habitats.

Specifically for the Project, the Phillips Creek riparian occurs within 100m – 150m of the proposed boundary of the Project footprint, which provides habitat for two folivore arboreal mammals, Koala and Greater glider. Both species could be susceptible to elevated dust impacts if dust emissions were to deleteriously affect the riparian vegetation. Koalas could be affected by reduced thermoregulation abilities of shelter trees and Greater glider could be affected by reduced foliage cover and the protection this provides from nocturnal predators, were such impacts to occur.

Project activities that can generate large dust volumes will occur within the Project area and in close proximity to surrounding habitat areas. All phases of the Project will be undertaken in accordance with conditions outlined in EA EPML00862313, effective 29 June 2023. The EA conditions as well as the development and implementation of several management plans, document the potential risk to the environment from activities, control measures and procedures to be implemented, managing incidents and performance indicators. This includes the management of dust from activities. Therefore, dust levels and associated environmental impacts are already regulated and should remain low. It is not anticipated that the extent of dust deposition would reach a level to degrade riparian habitat along Phillips Creek and gilgai habitat to the north-east of the Project area and cause impacts to Koala, Greater glider and Ornamental snake.

5.2.7 Noise and Light Disturbance

Mine site operations have the potential to generate high levels of noise and light over sustained periods due to the 24-hour operational timeframes. Sudden bursts of very high-level noise can also be generated through blasting activities. When activity, noise and additional lighting occur in areas adjoining retained habitat, potential impacts may include:

- Reduced foraging ability by auditory predators due to increased background noise;
- Interference with territorial vocalisations reducing breeding success and altering social behaviours;
- Reduced foraging and dispersal time due to artificial light delaying ‘cues’ for nocturnal activities;
- Increased risk of predation of nocturnal species by visual predators or from diurnal predators due to increased brightness;
- Misleading seasonal cues that are associated with natural light changes (i.e. length of day or monthly lunar cycles), which prevents nocturnal species from adapting behaviour and potentially impact survival (reduced reproductive rates and individual fitness); and
- Reduce availability of food sources such as nocturnal insects that might be drawn away from habitats and towards light sources.

All of these impacts can reduce the use of habitat by fauna or disrupt critical behaviours to the point where fauna are displaced and that habitat functionality is lost.

Specifically for the Project, the Phillips Creek riparian corridor occurs within 100m – 150m of the proposed boundary of the Project footprint and Brigalow regrowth gilgai habitat is within 150m – 200m, all of which provides habitat for Koala and Greater glider and potential habitat for Ornamental snake, respectively. In terms of species susceptibility to noise impacts, there are no government policies or other widely-accepted guidelines which outline thresholds that may be acceptable to wildlife. Generally, nocturnal species and birds have been identified to react to elevated noise and scientific studies have been conducted on these wildlife responses. As such Koala and Greater glider are considered to be susceptible to noise impacts. Whilst Ornamental snake is nocturnal, reptiles generally respond more to vibration rather than noise. For light impacts, nocturnal species will be most susceptible to light impacts. Both Greater glider and Ornamental snake are nocturnal whilst Koalas are mostly nocturnal and crepuscular but can disperse and forage during the day.

Based on these factors, all three species would be susceptible to noise and light impacts at varying degrees. However, Greater glider is likely to be the most susceptible out of the three species due to its smaller home range (naturally remains in a smaller area rather than utilising a larger area across the landscape), lack of tolerance to disturbance and utilisation of Phillips Creek for all critical behaviours including refuge in hollow-bearing trees, which are a finite resource in the broader landscape.

The Project will involve the continuation of mine site operational activities that will generate noise permanently in the area. Noise associated with mining activities is generally found to be restricted to the in-pit area, with noise levels dropping substantially from pit area to edge of pit and surrounding adjacent areas. In addition, mining noise is generally described to be non-tonal, which reduces the audibility of mining related noise. Mining activities for the Project will be consistent with the current operational noise that occurs at Saraji Mine and will not consist of noise sources that would elevate it above general mining noise encountered across sites. In addition to the in-pit topography, the surrounding flood levee bunding will also likely assist with noise attenuation. As such, noise levels associated with the Project are not considered to be substantially above the current background levels along Phillips Creek and other areas to the north-east of the Project area. Blasting will occur, which at the source will generate significant noise levels. This again will likely create noise levels well above the ambient background levels within surrounding habitats but will only occur periodically, during the day and for a short duration.

Whilst Koala and Greater glider are considered to be sensitive to noise, potential noise impacts are considered to be low. Responses such as changes to foraging behaviours or habitat utilisation could be possible, but most likely temporarily as species habituate. This low level of impact is demonstrated by previous species records occurring along Phillips Creek and in other areas in close proximity to existing mining operations at Saraji, suggesting an overall level of tolerance to noise to mining operations. In particular, fauna management activities conducted at Goonyella Riverside Mine have also recorded Greater glider within 150 m of active on-site operations (pers. comms. BMA, 2024). At Saraji Mine, there have been multiple recent sightings (2018-2024) of Greater glider in close proximity to active operational areas (Figure 14). Similarly, a high number of Koala records over a period of 6 years also occur directly adjacent to the Saraji Mine (Figure 8). These records and ongoing sightings indicate that both species and a local population are able to persist in areas of habitat directly adjacent to the mine site whilst mining occurs.

Similarly, the Project will require lighting to allow for 24-hour operation across the area. All lighting will occur within the pit, with only temporary lighting periodically utilised along the boundary of the Project area including along the interface of adjacent habitat areas. This lighting will be placed at sporadic intervals to only provide minimum lighting for light vehicle access. Whilst all species, particularly Greater glider are susceptible to light impacts, with the lighting restricted within pit, light impacts will be lower than the natural ground level and shielded by the pit walls and flood levee bunds. This may create an ambient light glow above the Project area; however, natural darkness within surrounding habitats should be maintained. In addition, mitigation measures can be applied to any temporary lights that may be periodically used along the Project area boundary to further reduce impacts. Based on all these factors, potential lighting impacts as described above are not considered to occur at such a severe level, particularly to MNES values.

6. MITIGATION MEASURES

6.1 Avoidance and Minimisation

The location and extent of the Project footprint is constrained by the underlying coal resource and therefore opportunities to avoid, relocate to an alternative location or minimise are limited. Avoidance of Phillips Creek and associated riparian corridor, however, has been achieved in the Project footprint design and a setback of 100m – 150m has also been provided between the Project area boundary and the watercourse and vegetation. This has ensured that no direct impacts on adjacent values, namely Koala and Greater glider 'Preferred' habitat will occur as a result of the Project.

6.2 Mitigation and Management

The following measures are to be implemented during the operation of the Project to mitigate and manage potential ecological impacts (both direct and indirect), including the identified MNES values:

- Vegetation clearing and habitat loss
  - Areas of vegetation and habitat adjacent to the Project area (i.e. Phillips Creek and Brigalow regrowth to the north-east) is to be demarcated to avoid accidental disturbance. This is to be done with temporary fencing (or barrier tape or similar) and/or signage as necessary.
  - Any microhabitat features such as large fallen logs that may occur within the Project area are be relocated to adjacent areas of undisturbed vegetation prior to ground disturbance where practicable.
  - Topsoil is to be stockpiled appropriately for future use. Topsoil will be managed in accordance with the Topsoil Management Plan and SRM EA.
  - Vegetation clearing to be undertaken in a sequential manner to allow fauna to relocate under their own accord towards areas of surrounding retained habitat.
  - BMA's internal permit to disturb procedure to be followed to ensure all vegetation clearing works are undertaken across the designated footprint and appropriate measures have been put in place. The BMA Permit to Disturb is a key control that helps the Project appropriately manage vegetation clearing requirements.
  - Progressive rehabilitation to be undertaken in accordance with the SRM EA.
  - Habitat fragmentation as a result of the proposed disturbance is not expected to occur, as the Project area represents a 'dead end' for species dispersal. The site is situated adjacent to a larger existing mine complex, and dispersal pathways for populations in nearby habitats are already significantly constrained. Importantly, key dispersal corridors such as Phillips Creek and riparian zones remain unaffected by the proposed impacts within the Project area.
- Fauna mortality
  - Pre-clearance surveys are to be undertaken by suitably qualified personnel to detect the presence of fauna species prior to the commencement of disturbance within the Project area. Any fauna detected are to be relocated to a suitable and undisturbed location.
  - All vegetation clearing and ground disturbance work within the Project area is to be conducted under the supervision of a suitably qualified spotter catcher.
  - The suitably qualified fauna spotter catcher will be responsible for the identification, relocation and management of impacted fauna detected during clearing activities, with the authority to cease work where MNES species individual/s, such as the ornamental snake, are directly at risk of being injured or killed. Spotter-catchers are standard industry practice during clearing activities and are highly effective at minimising harm to impacted fauna.
  - Speed reduction measures will be implemented to avoid fauna mortality on internal roads, particularly within areas traversing or adjacent to known threatened fauna habitat. Speed reduction measures are currently implemented at SRM and will continue to be adhered to for the life of the Project. These measures are effective in reducing vehicle speed and include the provision of fauna crossing signs to warn drivers and speed reduction measures (i.e. speed humps), where practical.

- Weed and pest incursion
  - Current weed management protocols and procedures for the SRM that will be implemented for the life of the Project are detailed within the Weed and Feral Animal Management Procedure (BHP-PRO-0088. 2023). These protocols and procedures have been highly effective in the control of both weed and feral animals. Mitigation measures detailed within the plan include:
    - Vehicle hygiene:
      - All vehicles, machinery and equipment shall be cleaned at designated wash down bays/pads prior to entering site.
      - When moving around onsite, vehicles, machinery and equipment should be re-inspected when:
        I. Entering undisturbed areas of vegetation;
        II. Entering vegetated areas within proximity to rehabilitated areas; and
        III. Leaving areas with known established weed populations.
    - Disturbance and topsoil management:
      - All rehabilitation amendments (e.g., seed, straw and hay) brought to site will be declared weed free and recorded in the site's document management system; and
      - Movement of sand, gravel, rock, soil and organic matter must be controlled to ensure that it does not result in contamination by weed seeds.
    - Weed monitoring, treatment and reporting:
      - Conduct quarterly weed monitoring of disturbed areas to identify new weed outbreaks as well as verify the effectiveness of ongoing weed management controls;
      - Weed treatment chemical controls and herbicide application rates are conducted by an appropriately licensed person using the Department of Agriculture and Fisheries declared pest species fact sheet;
      - Infestations will be recorded using GIS/mapping to ensure effective management can be achieved; and
      - Weed material disposed appropriately.
    - Feral animals:
      - A feral animal control program will continue to be implemented when monitoring confirms there is an increasing trend in population (e.g., increase in the number of sightings), there is evidence feral animals are impacting on threatened species or neighbouring landholders raise valid concerns in regard to feral animals;
      - Feral animal monitoring will reflect suitable survey locations such as water sources (pigs) or crib huts (cats), suitable time of day (e.g. diurnal/nocturnal species) and the location of indirect sign of feral animal activity (e.g., scats, diggings);
      - Feral cat and pig populations will be controlled using traps in accordance with the existing BHP Weed and Feral Animal Management procedure; and
      - Feral dog and pig populations will be controlled using poison baits in accordance with the existing BHP Weed and Feral Animal Management procedure.
- Erosion and sedimentation
  - Erosion and sediment control devices are to be installed along the interface of the Project area boundary and Phillips Creek.
  - Progressive rehabilitation of disturbed areas becoming available in accordance with the SRM EA.
  - Ensure implementation of conditions outlined in EA EPML00862313, specifically including the following controls:
    - Implement erosion, drainage and sediment control design standards and catchment separation standards are implemented as part of the Project design.
    - Inspection, monitoring and maintenance protocols are implemented across the Project area.

- All refuelling, chemical storage and maintenance activities to occur within the designated areas at SRM.
- These best practice erosion and sediment control measures will be implemented at the commencement of land disturbance during the Project. These measures are widely used throughout the mining industry and aim to reduce the amount of sediment laden run-off entering downstream environments and potentially impacting threatened species habitat.

- Proliferation of Dust, Noise and Light
  - Dust suppression (water carts) will be undertaken across roads within the Project area when required.
  - All equipment and machinery to be regularly maintained and in good working order to avoid unnecessary noise.
  - Any artificial lighting required along the Project area boundary is to be:
    - Directed downwards, fitted with light shields and away from adjacent habitats;
    - The minimum number and height required to illuminate the area for access purposes; and
    - Consist of the minimum lumen required to sufficiently illuminate the area for access purposes.

7. SIGNIFICANT IMPACT ASSESSMENT

7.1 Koala

7.1.1 Project Impacts, Mitigation and Management Measures

The Project is anticipated to have both direct and indirect impacts on Koala. All potential direct impacts, including habitat loss, fauna mortality and fragmentation are considered to be low due to the presence of relatively small patches (less than 1 ha) of highly fragmented habitat within the Project area that provides marginal value. Such habitat is considered to play a very limited role, if any, in maintaining the species and therefore the potential outcome of impacting such low valued habitat is not considered to be noteworthy.

Existing movement barriers within the Project area (such as fence lines, roads, tracks, and large cleared areas devoid of woody vegetation) severely compromises the ability for the Project area to be utilised by Koala. Given the historical fragmentation of potential Koala habitat to the north and west of the Project area, the Project area is not considered to be an important movement corridor for Koalas. In fact, any steppingstone connectivity that could be provided by the Project area from Phillips Creek or the One-mile Creek diversion is likely to lead to a 'dead-end' for Koalas attempting to disperse north or west. As such, in addition to having a low-level consequence of impact on the species due to the low habitat value, the likelihood of the Project having a direct impact due to the very low utilisation rates is considered to be extremely low.

With these factors combined, the overall risk of direct impacts on the species, whilst permanent, is considered to be very low.

Indirect Project impacts have the potential to affect Koala habitat adjacent to the Project area, particularly at Phillips Creek and along the associated riparian corridor. This habitat is located between 50 m – 150 m from the Project area boundary, is of higher quality and has been evaluated as ‘Preferred’ habitat for the species (Figure 17). Indirect impacts to this habitat could include:

- The establishment and spread of introduced species (including flora and fauna), specifically:
  - Predation by Feral dogs, which is listed as current threats in the Approved Conservation Advice for the Koala (DAWE, 2022a) and is considered to already potentially occur in the region due to the existing condition of the area.
  - Lantana and Rubber vine, which occurs within the Project area and could hinder species movement and severely impact on key canopy habitat resources if high incursion was to occur along Phillips Creek.
- Alteration of hydrology, which could change the water availability for riparian communities that provide a refuge habitat for the species.
- The generation of dust emissions, leading to excessive deposition on plant leaves, thereby suppressing photosynthesis and growth. This could subsequently impact on the thermoregulation abilities of shelter trees as well as abundance of foraging resources for Koala.
- Increased noise and light, which could affect behaviours of individuals utilising Phillips Creek.
- Periodic bursts of elevated noise levels, which may startle and disorient individuals in proximity.

For most of these indirect impacts, the level of impact is expected to be of low significance due to their infrequent, temporary, and localised nature. This is because numerous existing site procedures and protocols are in place to specifically manage these indirect impacts, particularly those associated with incursion of introduced species and dust. Therefore, the likelihood of any incidents resulting in an indirect impact would be low and should be quickly rectified through standard site inspections.

Whilst it is noted that indirect noise impacts will occur on a more frequent and permanent basis due to the Project’s 24-hour operating period, and Koalas can be susceptible to indirect noise impacts, these impacts associated with the Project are still considered to be low. Noise associated with mining activities is generally found to be restricted to the in-pit area, with noise levels dropping substantially from pit area to edge of pit and surrounding adjacent areas. In addition, mining noise is generally described to be non-tonal, which reduces the audibility of mining related noise. As such, the Project is not considered to substantially elevate noise above the current background levels along Phillips Creek. Blasting will also only occur periodically, during the day and for a short duration.

Koala is a relatively nomadic species, moving throughout its range to utilise habitat and is therefore not restricted to Phillips Creek. Responses such as changes to foraging and social behaviours or habitat utilisation could be possible, but most likely temporarily as species

habituate. This low level of impact is demonstrated by previous species records occurring in close proximity to existing mining operations, including the:

- existing mine pits of the Saraji Mine (ELA, 2019b; BAAM, 2021);
- Dysart East mine (URS Australia, 2014);
- Vulcan South Mine (METServe, 2023);
- Winchester South Mine (e2m, 2021);
- Olive Downs Mine (Pembroke Resources South Pty Ltd, 2017); and
- Peak Downs Mine (AECOM, 2020).

Similarly, for potential indirect lighting impacts, all lighting for the Project will occur within the pit, with only temporary lighting periodically utilised along the boundary of the Project area including along the interface of adjacent habitat areas. With lighting restricted within pit, light impacts will be lower than the natural ground level and shielded by the pit walls and flood levee bunds. This may create an ambient light glow above the Project area; however, natural darkness within surrounding habitats should be maintained. Whilst Koalas are nocturnal species and susceptible to light impacts, the Project is not considered to create light impacts. In the case of potential altered hydrology of Phillips Creek, surface water modelling as part of the Project's Surface Water Assessment (Engeny, 2024) indicates only minor changes in the hydrological characteristic and flooding extents of Phillips Creek. Therefore, no impacts are anticipated.

Regardless of the anticipated low level of direct and indirect impacts, several key mitigation measures have been specifically tailored in accordance with the National Recovery Plan for the Koala (*Phascolarctos cinereus*) (DCCEEW, 2022). These actions align with the Recovery Plan's strategic directions, particularly:

- National Recovery Strategy 1: Build and share knowledge
- National Recovery Strategy 4: Integrate Koala conservation into land use planning
- National Recovery Strategy 5: Strategically restore and maintain Koala habitat
- National Recovery Strategy 6: Actively manage Koala metapopulations

Each strategy includes a series of recovery actions, which are assigned a priority level (Priority 1 – urgent, Priority 2 – essential, Priority 3 – beneficial). The Project has already addressed several of the high-priority actions identified under these strategies. These include:

- Completion of a detailed field survey to validate the extent and quality of Koala habitat within the Project area (Strategy 1; Priority 1), including ground-truthing of vegetation communities to confirm the presence or absence of Koala food and shelter trees.
- Development of detailed Koala habitat mapping within and adjacent to the Project area (Strategy 1; Priority 1), which has informed mitigation measure design.
- As a result of this mapping and assessment, it has been determined that the Project will not result in direct impacts to preferred or suitable Koala habitat. Habitat within the Project area comprises small (<1 ha), highly fragmented patches of marginal value with limited connectivity and food resources. Therefore, the potential for impacts such as habitat loss, fragmentation, or fauna mortality is considered low (Strategy 4; Priority 2).

To further reduce the likelihood and severity of any potential impacts, the following mitigation measures will be implemented in alignment with Strategy 5 and Strategy 6 of the Recovery Plan:

- Pre-clearance surveys must be conducted by suitably qualified ecologists to confirm the absence of Koalas within the vegetation proposed for clearing. Surveys should incorporate active searches for Koalas and Koala scats, and include the use of handheld thermal imaging cameras where feasible. These surveys are to be undertaken immediately prior to clearing, and results documented to ensure individuals are not present or at risk of harm.
- All vegetation clearing works are to be supervised by a suitably qualified spotter catcher. In the event that an individual is located within the Project area, works in the immediate vicinity are to cease, and an exclusion zone is the be established, including a pathway for the individual to disperse from the Project area. The individual is to be allowed to move out of the Project area on its own accord. No works are to commence within the exclusion zone until the individual has relocated.
- Restrict vehicle movement to designated access tracks within the Project area prior to completion of all vegetation clearing and ground disturbance. Speed limits on access roads should not exceed 40 km / hr to reduce risk of Koala strike. The requirement to enter and traverse the Project area during this time will be minimised where possible and limited to those required for essential construction activities. Signage should be erected to alert works to potential Koala presence.

- Adopt sequential, directional clearing techniques that progress towards identified Koala habitat located outside the Project area (e.g., along Phillips Creek). Prior to clearing, remove any temporary barriers (e.g., fencing, debris) to allow Koalas safe and unimpeded movement away from works. This approach increases the likelihood that any individuals present can detect and avoid oncoming machinery and disturbance.
- Monitor and manage outbreaks of introduced species listed as a restricted matter under the *Biosecurity Act 2014* (e.g., *Lantana camara*) which degrade Koala habitat structure and reduce opportunity for Koala dispersal. Focus should be particularly given the boundary of the Project area, particularly along the interface of Phillips Creek, to prevent introduced species encroachment into this area. Any identified outbreaks to be appropriately treated.
- Ongoing feral animal management controls to be undertaken in accordance with the conditions outlined in EA EPML00862313, effective 29 June 2023 and associated several management plans.
- All equipment and machinery should be regularly maintained and in good working order to avoid excessive noise.
- Temporary lighting required along the Project area boundary should be minimised and wildlife-sensitive:
  - Directed downwards, fitted with light shields and away from adjacent habitats;
  - The minimum number and height required to illuminate the area for access purposes;
  - Consist of the minimum lumen required to sufficiently illuminate the area for access purposes;
  - Motion triggered, where possible.

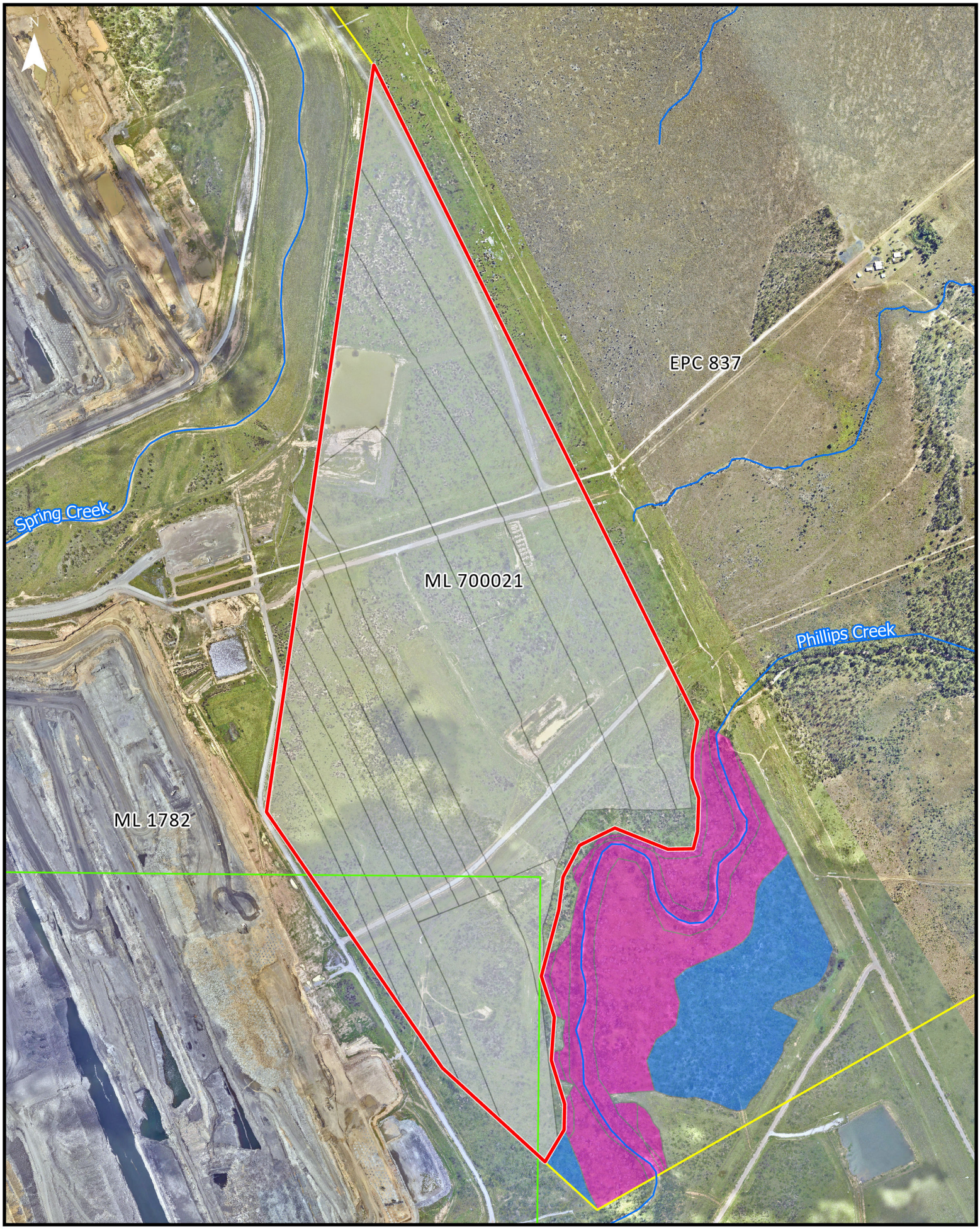

FIGURE 17: POTENTIAL INDIRECT IMPACTS ON KOALA HABITAT

ENGENY

Legend

- Watercourse
- Project Area
- Mining Lease Boundary
- Exploration Permits (Coal)
- Project Design Extent LOA25

Koala Habitat Type (BAAM, 2021)

- Preferred (foraging, breeding, dispersal and shelter)
- Suitable (foraging, dispersal and shelter)

0 100 200 300 m

7.1.2 Significant Impact Assessment

An assessment of the significance of impacts to this species under the Significant Impact Guidelines Policy Statement 1.1 (Department of the Environment, 2013b) is provided in Table 32. The outcome of this assessment is that the Project is unlikely to result in a significant impact to the Koala.

TABLE 32: SIGNIFICANT IMPACT ASSESSMENT – KOALA

EPBC Act criteria	Assessment of significance
Lead to a long-term decrease in the size of a population of a species.	**Unlikely** Due to the small size of woodland patches identified within the Project area, the extent of habitat resources available to the species is very limited. In addition, due to the high level of fragmentation and presence of fauna movement barriers between these patches and surrounding habitat, the potential for Koalas to access and utilise this limited amount of habitat is also low. Additionally, the woodland patches present do not form a corridor of connectivity between higher-value habitats adjacent to the Project area. Subsequently, potential habitat within the Project area is marginal and is unlikely to support individuals or provide a role in maintaining a local population. This is supported by the lack of sighting both from previous assessments and current field surveys of Koalas within the Project area. Direct impacts will therefore not lead to a long-term decrease in the size of a population. It is recognised that higher quality habitat for Koala does occur within 100 m – 150 m of the Project area boundary and as such could be indirectly impacted by the Project. This habitat is considered to provide breeding, foraging and dispersal resources to Koalas that would be utilised by a local population. However, it is considered that all potential indirect impacts present either a low or moderate only risk and are not expected to have an impact that could be at a level to reduce a population size. Effective mitigation measures are also available for majority of indirect impacts to ensure no further impacts occur along Phillips Creek.
Reduce the area of occupancy of the species.	**Unlikely** Due to the small size of woodland patches identified within the Project area, the extent of habitat resources available to the species is very limited. In addition, due to the high level of fragmentation and presence of fauna movement barriers between these patches and surrounding habitat, the potential for Koalas to access and utilise this limited amount of habitat is also low. Additionally, the woodland patches present do not form a corridor of connectivity between higher-value habitats adjacent to the Project area. Subsequently, potential habitat within the Project area is marginal and is unlikely to be occupied by individuals. Direct impacts on this marginal habitat will therefore not reduce the area of occupancy of the species. It is recognised that higher quality habitat for Koala does occur within 100 m – 150 m of the Project area boundary and as such could be indirectly impacted by the Project. This habitat is considered to provide breeding, foraging and dispersal resources to Koalas that would be utilised by the species, with previous assessments indicating species presence within this habitat. The Project will not remove any of this habitat. In addition, it is considered that all potential indirect impacts present a low risk and are not expected to have an impact that could displace the species from this area or render it inhabitable to the point where it would reduce the area of occupancy of the species. Effective mitigation measures are also available for majority of indirect impacts to ensure no further impacts occur along Phillips Creek.
Fragment an existing population into two or more populations.	**Unlikely** Given the current highly impacted and fragmented nature of habitat, the Project area is not considered to form an important fauna movement corridor for the Koala. Any steppingstone connectivity within the Project area from Phillips Creek or the One-mile Creek diversion is also likely to lead to a 'dead-end' for Koalas attempting to disperse north or west. Therefore, the removal of existing vegetation from the Project area is not expected to reduce existing dispersal opportunities for Koalas. As a result, the Project area is considered to play a minimal role in landscape connectivity for the Koala within the region. Therefore, the risk of additional fragmentation impacts on a broader spatial scale due to the complete removal of vegetation within the Project area to facilitate the project is considered low. The remnant vegetation associated with Phillips Creek likely supports a local Koala population and provides dispersal opportunities within the broader landscape. Given that the indirect impacts to this habitat are expected to be of low significance due to their infrequent, temporary, and localized nature, the Project is not considered to fragment this habitat. Whilst potential noise impacts along Phillips Creek interface present a potential risk to the species, it is

EPBC Act criteria	Assessment of significance
	expected that the species would still disperse along the creek and that complete avoidance or displacement will not occur.
Adversely affect habitat critical to the survival of a species.	**Unlikely** All potential Koala habitat identified within the Project area is marginal in condition due to the small patch sizes and fragmentation from adjacent habitat patches. These patches lack the resources to independently support a Koala population. In addition, due to the presence of fauna movement barriers between these patches and surrounding habitat, the potential for even individuals Koalas to access and utilise this limited amount of habitat is also low. The Project area does not function as a movement corridor from Phillips Creek to the north or west. Any steppingstone connectivity within the Project area from Phillips Creek or the One-mile Creek diversion is also likely to lead to a 'dead-end' for Koalas attempting to disperse north or west. Marginal habitat patches within the Project area do not overlay any aquifers that would support vegetation during drought periods. Consequently, the Project area is not considered to provide habitat resources that would form part of a habitat cluster offering climate refugia. Based on all these factors, habitat within the Project area is not deemed critical to the survival of the Koala. In the broader area, Phillips Creek does occur on an alluvial plain that could provide vegetation access to groundwater during periods of drought. This habitat could be utilised by the local population during periods of stress such as drought and fire. It is also considered to facilitate important Koala dispersal patterns, allowing movement east and west across the landscape. As such habitat along Phillips Creek outside of the Project area is considered habitat critical to the survival of the species. The Project boundary does occur within 100 m – 150 m of Phillips Creek riparian corridor and as such could be indirectly impacted by the Project. The Project will not remove any of this habitat. The Project is generally considered to result in infrequent, temporary, and localized indirect impacts on this habitat, and will not adversely affect the habitat at Phillips Creek. Effective mitigation measures are also available for majority of indirect impacts to ensure no further impacts occur along Phillips Creek. Whilst potential noise impacts along Phillips Creek interface present a potential risk to the species, this will be limited to the possible disruption of foraging behaviours and vocalisation within a defined area of habitat rather than a complete avoidance or displacement along Phillips Creek. If impacts do occur the species is still likely to utilise Phillips Creek for critical behaviours such as dispersal to access other foraging and refuge habitat.
Disrupt the breeding cycle of a population.	**Unlikely** All potential Koala habitat identified within the Project area is deemed marginal in condition due to small patch sizes and fragmentation from adjacent habitat patches. These patches lack the resources necessary to independently support a Koala population or sustain breeding individuals. Moreover, barriers to movement within the Project area, such as fences, roads and areas cleared of woody vegetation, are expected to hinder Koala dispersal from adjacent suitable habitat patches, such as those identified at Phillips Creek. Consequently, the vegetation clearing required to facilitate the Project is not anticipated to disrupt the breeding cycle of a local Koala population. It is noteworthy that indirect impacts may occur to vegetation adjacent to the Project area, particularly at Phillips Creek, which likely supports breeding Koala individuals. These impacts are generally expected to be of low significance due to their infrequent, temporary, and localized nature. Potential noise impacts along Phillips Creek interface present a potential risk to the species, which could result in the disruption of vocalisation within a defined area of habitat rather than a complete avoidance or displacement along Phillips Creek. Males vocalise during breeding season to occupy and control territories, and females utilise vocalisations to locate males to mate. During breeding season, Koala movement increases, and the species is likely to still utilise Phillips Creek for critical behaviours such as dispersal during this time. Subsequently, the Project is not considered to disrupt the breeding cycle of a local Koala population.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that	**Unlikely** All potential Koala habitat identified within the Project area is marginal in condition due to the small patch sizes and fragmentation from adjacent habitat patches. These patches lack the resources to independently support a Koala population. In addition, due to the presence of fauna movement barriers between these patches and surrounding habitat, the potential for even individuals Koalas to access and utilise this limited amount of habitat is also low.

EPBC Act criteria	Assessment of significance
the species is likely to decline.	The Project area does not function as a movement corridor from Phillips Creek to the north or west. Any steppingstone connectivity within the Project area from Phillips Creek or the One-mile Creek diversion is also likely to lead to a 'dead-end' for Koalas attempting to disperse north or west. Subsequently, potential habitat within the Project area is unlikely to play an important role in maintaining the species in the region. This is supported by the lack of sighting both from previous assessments and current field surveys of Koalas within the Project area. Direct impacts will therefore not decrease habitat to the extent that the species is likely to decline. It is recognised that higher quality habitat for Koala does occur within 100 m – 150 m of the Project area boundary and as such could be indirectly impacted by the Project. This habitat is considered to provide breeding, foraging and dispersal resources to Koalas that would be utilised by a local population. However, it is considered that all potential indirect impacts present a low risk and are not expected to have an impact that could be at a level that would result in species decline. Effective mitigation measures are also available for majority of indirect impacts to ensure no further impacts occur along Phillips Creek.
Result in invasive species that are harmful to an Endangered species becoming established in the Endangered species' habitat.	**Unlikely** Predation by Dingoes (*Canis lupus dingo*) and Feral dogs (*Canis lupus familiaris*) are listed as current threats in the Approved Conservation Advice for the Koala (DAWE, 2022a). Populations of Feral dogs are expected to exist in the area. Activities related to the Project are not expected to exacerbate populations of these species within the Project area, nor adjacent habitats. This includes the development of infrastructure or access tracks bisecting Phillips Creek that may provide an easy conduit for Dingoes or Feral dogs to disperse and forage.
Introduce disease that may cause the species to decline.	**Unlikely** Koala retrovirus (KoRV) and Chlamydia (*Chlamydia pecorum*) represent significant health threats to Koala populations. There are no Project related activities that will exacerbate the spread or prevalence of these diseases among affected Koalas. Habitat degradation to adjacent areas along Phillips Creek could result in reduced species fitness or stress, which in turn may make individuals prone to disease. However, the risk of this via indirect impacts, is considered low. Myrtle rust (*Uredo rangelii*) is a fungal pathogen targeting soft, actively growing foliage, shoot tips, and young stems of plants within the Myrtaceae family, including Eucalyptus trees, which are integral to Koala habitat. Its spread can lead to diminished foraging, breeding, and sheltering habitat for Koalas. Given the proposed complete removal of vegetation within the Project area, the risk of Myrtle rust transmission within this zone is negligible. Furthermore, indirect impacts on vegetation adjacent to the Project area are unlikely to contribute significantly to the spread of Myrtle rust. Myrtle rust is also more associated with ecosystems east of the Great Dividing Range with very few outbreaks recorded further west. However, as a precautionary measure, the implementation of comprehensive weed and pest control measures during the Project will ensure adherence to appropriate site hygiene.
Interfere substantially with the recovery of the species.	**Unlikely** A national recovery program has been developed for the Koala **(DAWE, 2022a)**. This program lists two on-ground strategies as goals: • strategic restoration of listed Koala habitat; and • active management of listed Koala metapopulations. This is to address current threats to Koalas that are acknowledged in the National Recovery Plan, namely: • Climate change – heatwaves and drought. • Land use change – urban development, agriculture, transport, mining and energy. • Natural systems modification – native forestry and altered fire regimes. • Disease, dogs and vehicles

EPBC Act criteria	Assessment of significance
	• Habitat loss, fragmentation and degradation – refugia loss, altered hydrology, loss of connectivity, carry capacity change. • Changes to fecundity, recruitment and mortality from stress, disease impacts and gene flow. Given that the Project area does not contain listed Koala habitat, and this assessment has determined that potential marginal habitat patches present within the Project area are unlikely to support individuals or a population, it is not considered that the Project will interfere with the national recovery goals. In addition, due to this much lower quality habitat and its limited value overall to the species, direct clearing impacts are not considered to enhance these listed threats to the species. Further, indirect impacts to higher quality habitat along Phillips Creek are of low risk or are not considered to be at a level that would result in threats listed in the recovery plan.

7.2 Squatter Pigeon

7.2.1 Project Impacts, Mitigation and Management Measures

All potential Project impacts, including habitat loss and fauna mortality on Squatter pigeon are considered to be low due to the presence of only marginal habitat, which limits the Project area's ecological function to providing only dispersal habitat for transient individuals. Particularly for this relatively mobile species and its ecological requirements to disperse, the availability of dispersal habitat across the region is not limited in extent, especially dispersal habitat in the same degraded regrowth condition that occurs in the Project area. Therefore, the habitat is not considered to be a vital habitat component for this species or play an important role in maintaining the species in the region.

The number of individuals likely to be encountered and interact during operational activities is also considered to be low due to the presence of marginal habitat. With the absence of breeding habitat there is no potential for nests and fledglings to be crushed by operational activities. No fragmentation impacts are anticipated due to the Project area only providing 'stepping stone' habitat and not within an important fauna movement corridor, which for a relatively mobile species like Squatter Pigeon, is of less value.

All indirect impacts on the species are considered to be negligible. The lack of good quality adjacent habitat precludes the species from being at risk to a higher level of impact as a result of potential indirect Project impacts.

While indirect impacts are also considered negligible due to the poor quality and isolation of adjacent habitat, mitigation measures have been developed to ensure that the severity and likelihood of impacts remain low and consistent with the Conservation Advice. These include:

- Pre-clearance surveys prior to vegetation clearing to confirm that no individuals of Squatter pigeon are utilising the Project area. This is to be undertaken by suitably qualified personnel.
- All vegetation clearing and ground disturbance works are to be supervised by a suitably qualified spotter. In the event that an individual is injured or killed, all clearing works are to cease. Any injured individuals are to be taken to a local vet or wildlife carer. Review of the incident and clearing practices is to be undertaken to understand the cause of injury or death, and corrective actions are to be implemented, where required.
- In the unlikely event that an active breeding place for the species is identified within the Project area (i.e, ground nest), an exclusion zone is to be established around the site with no mining activities permitted. The exclusion zone is to remain in place until the breeding individual and offspring have left the area on their own accord.
- Vehicle movement within the Project area prior to completion of all vegetation clearing and ground disturbance will be via approved access tracks only. Speed limits on access roads should not exceed 40 km / hr to reduce risk of fauna strike. The requirement to enter and traverse the Project area during this time will be minimised where possible and limited to those required for essential activities.

Although the Project area is not considered to support an identified sub-population of high conservation value, these management measures reflect the priorities outlined in the Conservation Advice.

7.2.2 Significant Impact Assessment

An assessment of the significance of impacts to this species under the Significant Impact Guidelines Policy Statement 1.1 (Department of the Environment, 2013b) is provided is provided in Table 33. The outcome of this assessment is that the Project is unlikely to result in a significant impact to the species.

TABLE 33: SIGNIFICANT IMPACT ASSESSMENT – SQUATTER PIGEON

EPBC Act criteria	Assessment of significance
Lead to a long-term decrease in the size of an important population of a species.	**Unlikely** The Project area does not occur within the three southern distributions that are listed by the Commonwealth as containing important populations. It does not support or play a role in supporting an important population and therefore any potential Project related impacts would not influence nor lead to a long-term decline in important population numbers.
Reduce the area of occupancy of an important population.	**Unlikely** The Project area does not occur within the three southern distributions that are listed by the Commonwealth as containing important populations. It does not support or play a role in supporting an important population and therefore any potential Project related impacts would not influence nor reduce the area of occupancy of an important population.
Fragment an existing important population into two or more populations.	**Unlikely** The Project area does not occur within the three southern distributions that are listed by the Commonwealth as containing important populations. It does not support or play a role in supporting an important population and therefore any potential Project related impacts would not influence nor fragment an existing important population.
Adversely affect habitat critical to the survival of a species.	**Unlikely** All potential Squatter pigeon habitat within the Project area is in marginal condition predominantly due to its degraded state from historical clearing practices and extent of exotic pasture grass incursion. The Project area does not support the habitat characteristics or resources to provide areas for the species to breed or forage. The function of potential habitat is limited to dispersal only. As potential utilisation of the Project area is restricted to dispersal, is in a degraded state and does not include breeding and foraging, occurrence of the species is likely to be in the form of a few transient individuals. Given that Squatter pigeon is a relatively mobile species and migrates across the landscape utilising a variety of habitats with ranging connectivity values, marginal habitat for dispersing is not considered to be a vital habitat component for this species. Based on these factors, habitat within the Project area is not considered to play a role in the long-term maintenance of the species or the maintenance of genetic diversity and long-term evolutionary development. It would not be habitat to support the reintroduction of populations to assist in the recovery of the species. Therefore, it is not considered habitat critical to the survival of the species. For this reason, any potential Project related impacts would not adversely affect habitat critical to the survival of the species. In addition, potential Project impacts on the species overall is considered to be low.
Disrupt the breeding cycle of an important population.	**Unlikely** The Project area does not occur within the three southern distributions that are listed by the Commonwealth as containing important populations. It does not support or play a role in supporting an important population and therefore any Project related impacts would not influence nor disrupt the breeding cycle of 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.	**Unlikely** Habitat within the Project area for Squatter pigeon is marginal, providing only dispersal habitat for vagrant individuals. It only provides 'stepping stone' habitat and not within an important fauna movement corridor for the area. Particularly for this relatively mobile species and its ecological requirements to disperse, the availability of dispersal habitat across the region is not limited in extent, especially dispersal habitat in the same degraded regrowth condition that occurs in the Project area. Potential Project impacts on the species, including habitat loss and fragmentation are considered to be low as this marginal habitat is not considered to be a vital habitat component for this species or play an important role in maintaining the species in the region. Furthermore, due to its marginal condition providing only dispersal habitat for vagrant individuals means, the risk of fauna strike is low, with low number of individuals likely to be encountered and interact from operational activities. With the absence of breeding habitat there is no potential for nests and fledglings to be crushed by operational activities. Implementation of effective mitigation measures can also further reduce the risk of impact to the species. Therefore, whilst this marginal habitat will be removed / decrease in availability across the Project area, based on its low value to Squatter pigeon, it will not cause a decline in the species.

EPBC Act criteria	Assessment of significance
Result in invasive species that are harmful to a Vulnerable species becoming established in the Vulnerable species' habitat.	**Unlikely** Predation by Fox (*Vulpes vulpes*) and Feral cat (*Felis catus*) are listed as current threats in the Approved Conservation Advice for Squatter Pigeon (Threatened Species Scientific Committee, 2014). Overgrazing by feral herbivores such as Rabbits (*Oryctolagus cuniculus*) are also listed as a threat to the species. Populations of these species are expected to exist in the area. Field surveys confirmed the already existing presence of Rabbits within the Project area. Activities related to the Project are not expected to exacerbate populations of these species, such as creating additional watering points, access tracks through habitat areas or habitats that could favour the construction of warrens, foraging behaviours (i.e. open habitats to catch prey) or additional foraging resources (i.e. grass and herbaceous cover).
Introduce disease that may cause the species to decline.	**Unlikely** Disease is not listed as a threatening process in the Approved Conservation Advice for Squatter pigeon (Threatened Species Scientific Committee, 2014). Implementation of weed and pest controls measures for the Project will ensure appropriate site hygiene.
Interfere substantially with the recovery of the species.	**Unlikely** The Commonwealth has listed a national recovery plan for the Squatter pigeon as 'not required'. The approved conservation advice for the species is considered to provide sufficient direction to implement priority actions and mitigate against key threats. Current threats to this species include loss and fragmentation of habitat (agricultural-related activities), habitat degradation by overgrazing of stock and invasive weeds such as Buffel grass, as well as the predation by avian and terrestrial predators (birds of prey, snakes, dingo, fox and feral cats). Priority recovery and threat abatement actions to support the recovery of Squatter pigeon include: • protection of habitat critical to the survival of the subspecies throughout its range; • restoration of habitat which is potentially critical to the survival of the subspecies, especially in northern NSW and southern Queensland where there is a greater threat of a further contraction in the subspecies' range; • alleviation of mortality caused by predators, particularly cats and foxes; • monitor selected sub-populations throughout the distribution of the subspecies to identify rates of population change; and • development of a greater understanding of the subspecies' ecology and use of modified landscapes for foraging, breeding and dispersal. The Project is not considered to enhance these threatening processes and interfere with the recovery of Squatter pigeon due to the following: • Project will impact only on poor quality habitat for the species that would play a minor role in supporting any local population of the species; • no anticipated fragmentation impacts as a result of the Project; • all indirect impacts on the species are considered to be negligible. The lack of good quality habitat in adjacent areas precludes the species from being at risk to a higher level of impact as a result of potential indirect Project impacts; and • Project related activities not anticipated to exacerbate invasive fauna and flora in the area.

7.3 Ornamental snake

7.3.1 Project Impacts, mitigation and management measures

Main potential impacts on Ornamental snake are the direct loss of habitat and high risk of fauna mortality during clearing activities. The extent of vegetation removal for the Project within Ornamental snake habitat considered to result in an impact to the species is outlined in Table 34 and illustrated in Figure 18. Marginal habitat is not considered to provide relevant habitat resources to support permanent individuals. The severity of the impact associated with the clearing of this marginal habitat is considered to be low due to the limited value and role that these areas play in maintaining this species.

TABLE 34: DIRECT IMPACTS ON ORNAMENTAL SNAKE HABITAT

Habitat category	Area of potential impact (ha)
Preferred	42.83
Suitable	2.73
TOTAL	**45.56**

It is recognised that potential Ornamental snake habitat occurs 150m – 200m north-east of the Project area boundary within gilgai Brigalow regrowth habitat. All potential indirect impacts that the species could be susceptible to are predominantly considered to present a low risk to the species. This includes weed and pest incursion and soil and water contamination, which could specifically degrade gilgai microhabitat features within areas of habitat and potentially impede on the foraging capabilities of the species or reduce the quality and abundance of foraging resources. These indirect impacts are considered to present a low risk as they are likely to only occur infrequently or periodically as a result of Project activities and in the event that they do occur, are likely to be temporary and localised. Numerous existing site procedures and protocols are in place to specifically manage these indirect impacts. Therefore, the likelihood of any incidents resulting in an indirect impact would be low and should be quickly rectified through standard site inspections.

Whilst it is noted that indirect noise impacts will occur on a more frequent and permanent basis due to the Project's 24-hour operating period, Ornamental snake is not considered susceptible to noise. The species is considered to be more susceptible to vibration, which is associated with proposed blasting activities. Blasting will only occur periodically, during the day and for a short duration and is therefore considered to present a low risk to the species. This low level of impact is demonstrated by previous species records occurring in close proximity to existing mining operations.

Being nocturnal, Ornamental snake is considered potentially susceptible to lighting impacts. All lighting for the Project will occur within the pit, with only temporary lighting periodically utilised along the boundary of the Project area including along the interface of adjacent habitat areas. With lighting restricted within pit, light impacts will be lower than the natural ground level and shielded by the pit walls and flood levee bunds. This may create an ambient light glow above the Project area; however, natural darkness within surrounding Ornamental snake habitat should be maintained, presenting a low risk to the species.

Avoidance or minimisation of impacts to Ornamental snake are not available due to the extent and configuration of the coal resource driving the required pit design. However, several species specific mitigation measures will be implemented to reduce the likelihood and severity of potential impacts to the Ornamental snake, particularly in relation to mortality, displacement and degradation of habitat as a result of indirect impacts. These measures reflect known habitat preferences and behaviours of the species and are consistent with the Approved Conservation Advice (DCCEEW 2014C). These include:

- Pre-clearance surveys are to be undertaken prior to vegetation clearing to find and safely relocate Ornamental snake individuals from the Project area. This is to be undertaken by suitably qualified personnel and during optimal conditions to detect the species (i.e. between September and March, when water is present within gilgai and frog species are actively breeding).
- Sequential clearing of Ornamental snake habitat moving from west to east and south to north, to allow for individuals to relocate to adjacent habitat areas under their own accord. This method aligns with the species' known site fidelity and preference for low-relief, cracking clay habitats with remnant microhabitat features (e.g., fallen logs, gilgai systems).
- All vegetation clearing and ground disturbance works are to be supervised by a suitably qualified spotter. If an Ornamental snake is injured or killed during works, clearing in the vicinity will cease immediately. Injured individuals will be taken to a local veterinarian or wildlife carer. An internal incident review will be triggered to assess the cause and implement corrective actions where required.
- Timing of vegetation clearing to occur post-wet season when surface water in gilgai features has receded and frog breeding activity, a key attractant for the species, has subsided. It is considered that this will reduce reduces the likelihood of active foraging individuals being present within the disturbance area.
- Any trenches or holes created during the vegetation clearing that may result in fauna entrapment need to be inspected daily by a suitably qualified spotter catcher. Escape ramps or fauna egress points will be installed where appropriate.
- Vehicle movement within the Project area prior to completion of all vegetation clearing and ground disturbance will be via approved access tracks only. Speed limits on access roads should not exceed 40 km / hr to reduce risk of fauna strike. The requirement to enter and traverse the Project area during this time will be minimised where possible and limited to those required for essential activities.
- Any microhabitat features such as large fallen logs that may occur within the Project area are be relocated to adjacent areas habitat areas where practicable.

- Erosion and sediment control devices are to be installed along the interface of the Project area boundary and adjacent habitat and regularly inspected / maintained until rehabilitation and stabilisation of adjacent areas are complete.
- Any temporary lighting required along the Project area boundary should be:
  - Directed downwards, fitted with light shields and away from adjacent habitats;
  - The minimum number and height required to illuminate the area for access purposes;
  - Consist of the minimum lumen required to sufficiently illuminate the area for access purposes; and,
  - Motion triggered, where possible.

FIGURE 18: POTENTIAL DIRECT AND INDIRECT IMPACTS ON ORNAMENTAL SNAKE

ENGENY

Legend

- Watercourse
- Project Area
- Mining Lease Boundary
- Exploration Permits (Coal)
- Project Design Extent LOA25

Ornamental Snake Habitat Type

- Preferred (breeding, foraging, shelter and dispersal)
- Suitable (foraging, shelter and dispersal)

Ornamental Snake Habitat Type (AECOM, 2023)

- Suitable (foraging, shelter and dispersal)

0 100 200 300 m

7.3.2 Significant Impact Assessment

An assessment of the significance of impacts to this species under the Significant Impact Guidelines Policy Statement 1.1 (Department of the Environment, 2013b) is provided is provided in Table 35. The outcome of this assessment is that the Project is likely to result in a significant impact to the species based on the clearing of 45.56 ha of 'suitable' and 'preferred' habitat within the Project area.

TABLE 35: SIGNIFICANT IMPACT ASSESSMENT – ORNAMENTAL SNAKE

EPBC Act criteria	Assessment of significance
Lead to a long-term decrease in the size of an important population of a species.	**Likely** The Project area was identified to contain the relevant habitat features to support Ornamental snake, with individuals recorded during the field survey in areas classified as 'Suitable' and 'Preferred' habitat. These areas are considered to meet the definition for important habitat for Ornamental snake, which is a surrogate used to define important populations for this species. It is likely that the 'Suitable' and 'Preferred' habitat areas within the Project area function as 'sink habitat' (Sinclair *et al.*, 2005), providing foraging and possible breeding resources for an overflow of individuals from the core source habitat further to the north-east of the Project area, in the gilgai Brigalow regrowth habitat that extends to the Isaac River floodplain. This core habitat is also considered important habitat based on the definition in the Draft Referral Guidelines for the Nationally Listed Brigalow Belt Reptiles (DCCEEW, 2023), and therefore represents an important population in the area. The connection of Project area 'sink habitat' with the core 'source' habitat directly to the north-east, is likely to allow for ongoing migration of individuals and the persistence of these individuals in the Project area. In doing so, important habitat both within this core habitat area and the 'Suitable' and 'Preferred' habitat within the Project are likely to form part of an overall important population. A total of 45.56 ha of important habitat will be cleared as a result of the Project. It is considered that all potential indirect impacts present a low risk and therefore are not considered to have an impact that could reduce population size. Effective mitigation measures are also available for majority of indirect impacts to ensure no further impacts to surrounding important habitat areas further north-east of the Project area. Whilst the clearing for the Project will not impact on the core 'source' habitat, which is the area of growth for an important population, it will remove a large extent of the 'sink' habitat area within the Project area that is an importer of migrating individuals as a result of population growth. Without this area, it is anticipated that this growth will be hindered, and overall population numbers will be lower in comparison. As such, given the extent of clearing (45.56 ha) the Project may result in a localised long-term decline in the size of an important population.
Reduce the area of occupancy of an important population.	**Unlikely** The Project area was identified to contain the relevant habitat features to support Ornamental snake, with individuals recorded during the field survey in areas classified as 'Suitable' and 'Preferred' habitat. These areas are considered to meet the definition for important habitat for Ornamental snake, which is a surrogate used to define important populations for this species. Similarly, habitat further to the north-east of the Project area is also considered important habitat based on the definition in the Draft Referral Guidelines for the Nationally Listed Brigalow Belt Reptiles (DCCEEW, 2023), and therefore represents an important population in the area. This includes the gilgai Brigalow regrowth habitat that extends to the Isaac River floodplain. The Project area and habitat further to the north-east, contribute to the area of occupancy of an important population for Ornamental snake in the area. Although a total of 45.56 ha of important habitat (surrogate for important population) will be cleared as a result of the Project, no clearing will occur in habitat further to the north-east. It is considered that all potential indirect impacts present a low risk only and therefore are not considered to have an impact that could reduce population size. Effective mitigation measures are also available for majority of indirect impacts to ensure no further impacts to surrounding important habitat areas further north-east of the Project area. Therefore, the area of occupancy of an important population will be maintained via the retained important habitat areas to the north-east of the Project area.
Fragment an existing important population into two or more populations.	**Unlikely** The Project area was identified to contain the relevant habitat features to support Ornamental snake, with individuals recorded during the field survey in areas classified as 'Suitable' and 'Preferred' habitat. These areas are considered to meet the definition for important habitat for Ornamental snake, which is a surrogate used to define important populations for this species. Similarly, habitat further to the north-east of the Project area is also considered important habitat based on the definition in the Draft Referral Guidelines for the Nationally Listed Brigalow Belt Reptiles(DCCEEW, 2023), and

EPBC Act criteria	Assessment of significance
	therefore represents an important population in the area. This includes the larger band of gilgai Brigalow regrowth that continues further north-east and connects to One Mile Creek, Spring Creek and the Isaac River floodplain. Historical records of Ornamental snake have been documented adjacent to the north-western boundary of the Project area, with the most recent sighting dated 2019. However, these records predate substantial landscape modification associated with recent construction activities, including the realignment and diversion of Spring Creek. These activities have significantly degraded key habitat features, such as gilgai formations, fallen woody debris, and soil structure. The area now comprises compacted, disturbed soils lacking the natural cracking and crevices required by the species for shelter. Given these changes, the historical records are no longer considered representative of current habitat condition. The area is now assessed as unsuitable to support Ornamental snake, and no individuals have been recorded post-development. As such, the Project area is not expected to facilitate dispersal or movement of the species into this north-western patch. Gilgai connectivity and other habitat features to support Ornamental snake does not extend to the southern boundary of the Project area or to Phillips Creek. Therefore, the Project area is positioned at the southern end of a corridor for the species and at the southern end of an area of important habitat. Based on this landscape context, the habitat within the Project area is not functioning as an important link for the dispersal of the species throughout the area and in particular to other important habitat areas. Although a total of 45.56 ha of important habitat will be cleared as a result of the Project, impacts relate more to habitat loss rather than impacts associated with fragmentation. The removal will not sever any link or connection to other surrounding important habitat areas from important habitat to the north-east. Therefore, the Project will not fragment an existing important population into two or more populations.
Adversely affect habitat critical to the survival of a species.	**Unlikely** The extent of Ornamental snake 'Suitable' and 'Preferred' habitat patches within the Project area are moderate in size and are positioned at the southern end of a larger band of gilgai Brigalow regrowth that continues further north-east and connects to One Mile Creek, Spring Creek and the Isaac River floodplain. Evidence of threatening processes (exotic grass incursion, pest species) were noted in the Project area from previous grazing activities that has resulted in a level of habitat degradation across Ornamental snake habitat. Whilst the records of individuals within the Project area suggests that the habitat is still able to support foraging and potential breeding activities of individuals from a population in the broader area, it is considered to be the outer edge of habitat, with the core habitat areas located in the much larger contiguous patches that occur in this band to the north-east. This outer edge habitat within the Project area is considered to be the 'sink' habitat providing foraging and possible breeding resources for an overflow of individuals from the core 'source' habitat directly to the north-east(Sinclair *et al.*, 2005). Habitat within the Project area allows for the net immigration from adjacent source habitat. Habitat within the Project area alone would not be able to support a population indefinitely without this source habitat interaction. It therefore does not assist with maintaining genetic diversity, and long-term evolutionary development or population persistence, which are all characteristics of habitat critical to the survival of the species. Whilst the Project area does provide habitat values for Ornamental snake that are considered to be 'Preferred' and 'Suitable', and can be utilised by individuals of a population, it is not considered habitat critical to the survival of the species. Subsequently, the Project will not adversely affect habitat critical to the survival of the species through any direct impacts. It is considered that all potential indirect impacts present a low risk and therefore are not considered to have an impact that could adversely affect habitat critical to the survival of the species. Effective mitigation measures are also available for majority of indirect impacts to ensure no further impacts to surrounding habitat areas further north-east of the Project area.
Disrupt the breeding cycle of an important population.	**Unlikely** The Project area was identified to contain the relevant habitat features to support Ornamental snake, with individuals recorded during the field survey in areas classified as 'Suitable' and 'Preferred' habitat. These areas are considered to meet the definition for important habitat for Ornamental snake, which is a surrogate used to define important populations for this species. It is likely that the 'Suitable' and 'Preferred' habitat areas within the Project area function as 'sink habitat', providing possible breeding resources for an overflow of individuals from the core source habitat further to the north-east of the Project area, in the gilgai Brigalow regrowth habitat that extends to the Isaac River floodplain. This core habitat would provide breeding opportunities and contribute to the overall growth in species numbers. It is also considered important habitat based on the definition in the Draft Referral Guidelines for the Nationally Listed Brigalow Belt Reptiles (DCCEEW, 2023), and therefore represents an important population in the area. Important habitat both

EPBC Act criteria	Assessment of significance
	within this core habitat area and the 'Suitable' and 'Preferred' habitat within the Project are likely to form part of an overall important population. The breeding cycle of individuals that are an overflow and form part of an important population will be disrupted due to the removal of 45.56 ha of habitat. However, breeding cycles of the important population within adjacent 'source' habitat will not be disrupted by the Project, which is considered to play the more important role in the replacement and growth of species numbers. Therefore overall, the breeding cycle of the important population across the area will continue uninterrupted throughout the duration of the Project.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	**Unlikely** A total of 45.56 ha of 'Suitable' and 'Preferred' habitat will be cleared as a result of the Project. No habitat either within or surrounding the Project area will be fragmented. It is considered that all potential indirect impacts present a low risk and therefore are not considered to have an impact that could cause fragmentation. Effective mitigation measures are also available for majority of indirect impacts to ensure no further impacts to surrounding habitat areas further north-east of the Project area. The removal of habitat will be areas considered 'sink' habitat, which is likely to be providing foraging and possible breeding resources for an overflow of individuals from the core 'source' habitat to the north-east. Habitat within the Project area allows for the net immigration from adjacent source habitat. It is the source habitat that is considered to play the more important role in the replacement and growth of species numbers. Habitat within the Project area alone would not be able to support a population indefinitely without this source habitat interaction. Whilst the Project will remove 'sink' habitat it will not impact on the core 'source' habitat, which is the area of growth for a likely population in the area. It is recognised that this may reduce the size of the population in the area but overall, this habitat loss impact is not considered to be of an extent that the entirety of the species is likely to decline.
Result in invasive species that are harmful to a Vulnerable species becoming established in the Vulnerable species' habitat.	**Unlikely** Poisoning resulting from ingestion of Cane toads (*Rhinella marina*) and destruction of wetland habitat by feral pigs (*Sus scrofa*) are listed as major threats in the Approved Conservation Advice for ornamental snake (Threatened Species Scientific Committee, 2014). Populations of these species are expected to exist in the area. Field surveys confirmed the already existing presence of Cane toads in 'suitable' and 'preferred' habitat areas as well as feral pigs within the Project area. Activities related to the Project are not expected to exacerbate populations of these species, such as creating ponded areas that could provide additional breeding habitat for cane toads or areas for feral pigs to congregate.
Introduce disease that may cause the species to decline.	**Unlikely** Disease is not listed as a threatening process in the Approved Conservation Advice for Ornamental snake (Threatened Species Scientific Committee, 2014). Implementation of weed and pest controls measures for the Project will ensure appropriate site hygiene.
Interfere substantially with the recovery of the species.	**Unlikely** The Commonwealth has listed a national recovery plan for the Ornamental snake as 'not required'. The approved conservation advice for the species is considered to provide sufficient direction to implement priority actions and mitigate against key threats. Current threats to this species include loss and fragmentation of habitat (roads, ploughing, railways, mining-related activities, pipeline constructions), habitat degradation by overgrazing of stock, alteration of landscape hydrology in and around gilgai environments, and alteration of water quality through chemical and sediment pollution of wet areas, contact with cane toad, predation by feral species and invasive weeds. Priority recovery and threat abatement actions to support the recovery of Ornamental snake include: • identifying populations of high conservation priority; • minimising adverse impacts from land use at known sites; • investigating formal conservation arrangements, management agreements and covenants; • controlling introduced pests such as pigs to manage threats at known sites; • developing and implementing a management plan to control Cane toads in the region; and • raise awareness within the local community. The Project is not considered to enhance these threatening processes and interfere with the recovery of Ornamental snake due to the following:

EPBC Act criteria	Assessment of significance
	• habitat loss restricted to moderate sized habitat patches considered to be outer edge 'sink' habitat for nearby core 'source' habitat. Values are therefore restricted to foraging and potential breeding opportunities for individuals overflowing from core population; • no anticipated fragmentation impacts as a result of the Project; • all potential indirect impacts present a low risk and therefore are not considered to severely degrade adjacent habitat. Effective mitigation measures are also available for majority of indirect impacts to ensure no further impacts to surrounding habitat areas further north-east of the Project area; and • Project related activities not anticipated to exacerbate invasive fauna and flora in the area.

7.4 Greater Glider

7.4.1 Project Impacts, Mitigation and Management Measures

No Greater Glider habitat has been identified within the Project area, therefore no direct impacts to the species will occur. It is recognised that potential Greater glider habitat occurs 100m – 150m of the Project area boundary along Phillips Creek (Figure 19). Consequently, the Project has the potential to indirectly impact on this habitat, which is of higher quality and has been evaluated as 'Preferred' habitat for the species. These indirect impacts may include:

- The establishment and spread of introduced species (including flora and fauna), specifically:
  - Predation by Feral cats (*Felis catus*) and European red fox (*Vulpes vulpes*), both which are identified in the Conservation Advice (DCCEEW, 2022a) as current threats to the Greater glider. Feral cat is considered to already potentially occur in the region due to the existing condition of the area. These species may exploit edge habitats or disturbed areas and increase predation risk.
  - The spread of Rubber vine (*Cryptostegia grandiflora*), which occurs within the Project area and could severely impact on key canopy habitat resources if high incursion was to occur along Phillips Creek, reducing available foraging and nesting habitat.
- Alteration of hydrology, which could change the water availability for riparian communities resulting in dieback, or increasing erosion and contributing to streambank instability of denning trees.
- The generation of dust emissions, leading to excessive deposition on plant leaves, thereby suppressing photosynthesis and growth. This could subsequently reduce foliage cover for predator avoidance as well as abundance of foraging resources for Greater glider.
- Increased noise and light, which could affect foraging, breeding, and nocturnal behaviours of individuals utilising Phillips Creek. The Greater glider's sensitivity to disturbance is well documented, and the species' limited home range and site fidelity increase vulnerability to changes in ambient conditions.
- Periodic bursts of elevated noise levels, which may startle and disorient individuals in proximity.

Like for all other MNES species, most of these indirect impacts are expected to be of low significance due to their infrequent, temporary, and localised nature. The numerous existing site procedures and protocols that are in place will specifically manage these indirect impacts, particularly those associated with incursion of introduced species and dust. Therefore, the likelihood of any incidents resulting in an indirect impact would be low and should be quickly rectified through standard site inspections. Furthermore, as previously described, surface water modelling as part of the Project's Surface Water Assessment (Engeny, 2024) indicates only minor changes in the hydrological characteristic and flooding extents of Phillips Creek. Therefore, no impacts are anticipated.

Greater glider has been assessed to be susceptible to potential noise and light impacts associated with the Project. This is due to its nocturnal nature, smaller home range (naturally remains in a smaller area rather than utilising a larger area across the landscape), lack of tolerance to disturbance and utilisation of Phillips Creek for all critical behaviours including refuge in hollow-bearing trees, which are a finite resource in the broader landscape.

For potential indirect lighting impacts, all lighting for the Project will occur within the pit, with only temporary lighting periodically utilised along the boundary of the Project area including along the interface of adjacent habitat areas. With lighting restricted within pit, light impacts will be lower than the natural ground level and shielded by the pit walls and flood levee bunds. This may create an ambient light glow above the Project area; however, natural darkness within surrounding habitats should be maintained. For the use of any temporary lighting along the interface of Phillips Creek, mitigation measures are available to effectively reduce the risk of impact to the species.

Indirect noise impacts are likely to occur on a more frequent and permanent basis due to the Project's 24-hour operating period. Noise associated with mining activities is generally found to be restricted to the in-pit area, with noise levels dropping substantially from pit area to edge of pit and surrounding adjacent areas. In addition, mining noise is generally described to be non-tonal, which reduces the audibility of mining related noise. As such, the Project is not considered to substantially elevate noise above the current background levels along Phillips Creek. Blasting will also only occur periodically, during the day and for a short duration.

Due to the susceptibility of the species to noise impacts, responses such as changes to foraging behaviours or habitat utilisation could be possible, but most likely temporarily as species habituate. However, overall potential noise impacts on the species are considered to be low. This low level of impact is demonstrated by previous records occurring in close proximity to mining operations. In particular, fauna management activities conducted at Goonyella Riverside Mine have recorded Greater glider inhabiting areas within 150 m of active on-site operations (pers. comms. BMA, 2024).

While avoidance of all potential impacts is not feasible, the following measures will be implemented to reduce the severity and likelihood of indirect impacts to the Greater glider. These actions are consistent with the current Conservation Advice for *Petauroides volans* (DCCEEW, 2022), noting that a Recovery Plan for the species has not yet been developed.

- Pre-clearance surveys of all hollow-bearing trees prior to vegetation clearing to confirm that no individuals of Greater glider are utilising the Project area. This is to be undertaken by suitably qualified personnel.
- Monitoring and treatment of restricted invasive species under the *Biosecurity Act 2014*, particularly along the Phillips Creek interface where introduced flora could alter canopy structure.
- Ongoing feral animal management controls to be undertaken in accordance with the conditions outlined in EA EPML00862313, effective 29 June 2023 and associated several management plans.
- All equipment and machinery should be regularly maintained and in good working order to avoid excessive noise.
- Any temporary lighting required along the Project area boundary should be:
  - Directed downwards, fitted with light shields and away from adjacent habitats;
  - The minimum number and height required to illuminate the area for access purposes;
  - Consist of the minimum lumen required to sufficiently illuminate the area for access purposes; and
  - Motion triggered, where possible.

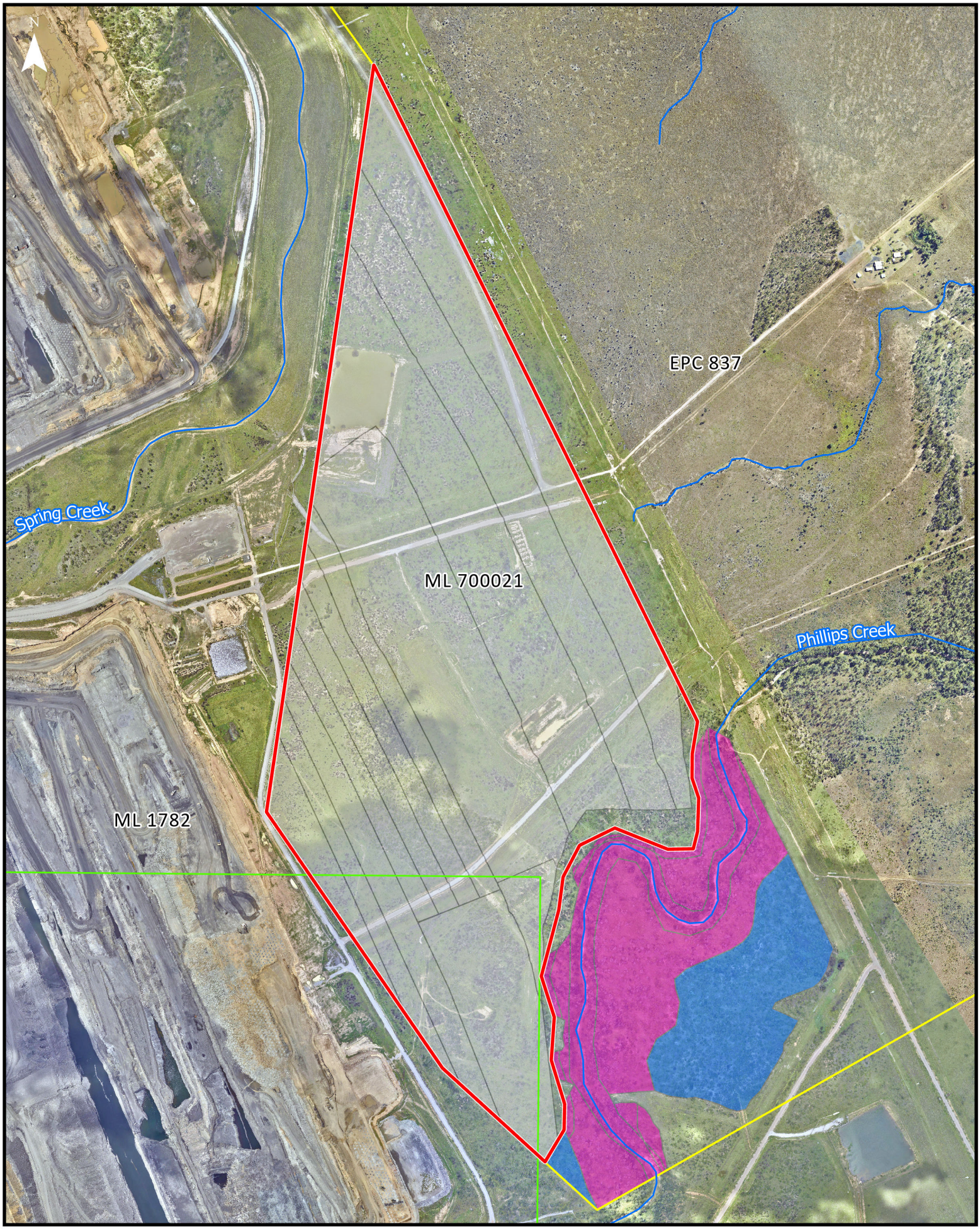

FIGURE 19: POTENTIAL INDIRECT IMPACTS ON GREATER GLIDER HABITAT

ENGENY

Legend

- Watercourse
- Project Area
- Mining Lease Boundary
- Exploration Permits (Coal)
- Project Design Extent LOA25

Greater Glider Habitat Type (BAAM, 2021)

- Preferred (foraging, breeding, dispersal and shelter)
- Suitable (foraging, dispersal and shelter)

0 100 200 300 m

7.4.2 Significant Impact Assessment

An assessment of the significance of impacts to this species under the Significant Impact Guidelines Policy Statement 1.1 (Department of the Environment, 2013b) is provided is provided in Table 36. The outcome of this assessment is that the Project is unlikely to result in a significant impact to the species.

TABLE 36: SIGNIFICANT IMPACT ASSESSMENT – GREATER GLIDER

EPBC Act criteria	Assessment of significance
Lead to a long-term decrease in the size of a population of a species.	**Unlikely** No habitat suitable for the Greater glider has been identified within the Project area, therefore the Project will not directly reduce the total area of habitat area for this species within its vicinity. Indirect impacts to Greater glider habitat identified to be present at Phillips Creek are expected to be of low significance due to their infrequent, temporary, and localized nature, and will be appropriately managed through mitigation strategies. These indirect impacts are not considered to lead to a long-term decrease in the size of a population of the Greater glider. Indirect noise impacts are likely to occur on a more frequent and permanent basis, but are not anticipated to be substantially above the current background levels along Phillips Creek. Noise associated with mining activities is generally found to be restricted to the in-pit area, with noise levels dropping substantially from pit area to edge of pit and surrounding adjacent areas. Blasting will also only occur periodically, during the day and for a short duration. Whilst the species can be susceptible to noise impacts, any species response to Project noise is likely to be temporary as the species habituates. Risk of impact is considered to be low as supported by previous records showing the species will inhabit areas within 150m of active mining activities. It is not considered that Project impacts will be of a magnitude that would result in a long-term decrease in the overall size of the population of Greater glider in the region.
Reduce the area of occupancy of the species.	**Unlikely** No habitat suitable for the Greater glider has been identified within the Project area, therefore the Project will not directly reduce the area of occupancy of the species. Indirect impacts to Greater glider habitat identified to be present at Phillips Creek are expected to be of low significance due to their infrequent, temporary, and localized nature, and will be appropriately managed through mitigation strategies. These indirect impacts are not considered to be of a level that will reduce the area of occupancy of Greater glider in the region.
Fragment an existing population into two or more populations.	**Unlikely** This assessment has determined that vegetation communities within the Project area is highly fragmented. As a result, it is considered that the Greater glider is effectively excluded from accessing habitat resources within the Project area. Consequently, it is considered that the Project area currently represents a fragmented landscape for this species and does not serve as a movement corridor or provide 'stepping stone' connectivity. Despite targeted surveys Greater gliders have not been recorded in the Project area. It has also been noted that the Project area does not contain habitat that meets the structural or ecological requirements of the species, and contains significant barriers to movement which isolate it from preferred and suitable habitat along Phillips Creek. Remnant vegetation associated with Phillips Creek, to the south of the Project area, likely supports a local Greater glider population and provides dispersal opportunities within the broader landscape. Given that the indirect impacts to this habitat are expected to be of low significance due to their infrequent, temporary, and localized nature, the Project is not considered to fragment this habitat. Indirect noise impacts are likely to occur on a more frequent and permanent basis, but are not anticipated to be substantially above the current background levels along Phillips Creek. The species is still considered to be able to transit through the area to access habitat both east and west along Phillips Creek. In addition, Phillips Creek is not the only linkage but one of a few east-west landscape corridors in the area that connects vegetation to the west to the Isaac River. It is therefore considered that the Project will not fragment an existing Greater glider population.

EPBC Act criteria	Assessment of significance
Adversely affect habitat critical to the survival of a species.	**Unlikely** No Greater glider habitat has been delineated within the Project area, indicating that the Project will not result in direct impacts to any habitat resources, inclusive of habitat which area considered critical to the survival of the species. Phillips Creek, outside of the Project area, provides foraging and breeding habitat for individuals (as identified through the recent record of the species in the current field survey), and is one of a number of east-west landscape linkages that connects larger tracts of vegetation to the west along the Harrow Ranges to the Isaac River. This facilitates the dispersal of the species across the region and allow the species to potentially move from source habitat areas and colonise new territories. As such habitat along Phillips Creek outside of the Project area is considered to meet the criteria for habitat critical to the survival of the species, as outlined in the conservation advice for the species i.e. *smaller or fragmented habitat patches connected to larger patches of habitat, that can facilitate dispersal of the species and/or that enable recolonization.* Indirect impacts to Greater glider habitat identified at Phillips Creek are anticipated to be of low significance, due to their infrequent, temporary, and localized nature.
Disrupt the breeding cycle of a population.	**Unlikely** No Greater glider habitat has been delineated within the Project area, indicating that the Project will not result in direct impacts to any habitat resources, inclusive of breeding habitat. Indirect impacts to Greater glider habitat identified to be present at Phillips creek are expected to be of low significance due to their infrequent, temporary, and localized nature, and will be appropriately managed through mitigation strategies. These indirect impacts are not considered to be of a level that will disrupt the breeding cycle of a local population of Greater glider in the region.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	**Unlikely** No habitat suitable for the Greater glider has been identified within the Project area, therefore the Project will not directly reduce the total area of habitat area for this species within its vicinity. Majority of indirect impacts to Greater glider habitat identified to be present at Phillips Creek are expected to be of low significance due to their infrequent, temporary, and localized nature, and will be appropriately managed through mitigation strategies. These indirect impacts are not considered to lead to a decline of the Greater glider.
Result in invasive species that are harmful to an Endangered species becoming established in the Endangered species' habitat.	**Unlikely** Predation by Feral cats and European red foxes are listed as current threats in the Approved Conservation Advice for the Greater glider (DCCEEW, 2022a). Activities related to the Project are not expected to exacerbate populations of these species within the Project area, nor adjacent habitats. This includes the development of infrastructure or access tracks adjacent to Phillips Creek that may provide an easy conduit for Feral cats or foxes to disperse and forage.
Introduce disease that may cause the species to decline.	**Unlikely** Disease is not listed as a threatening process in the Approved Conservation Advice for Greater glider. Implementation of weed and pest controls measures for the Project will ensure appropriate site hygiene.
Interfere substantially with the recovery of the species.	**Unlikely** The Commonwealth has listed a national recovery plan for the Greater glider as 'not required'. The approved conservation advice for the species is considered to provide sufficient direction to implement priority actions and mitigate against key threats.

EPBC Act criteria	Assessment of significance
	Current threats to this species include inappropriate fire regimes, habitat clearing and fragmentation, timber harvesting, barbed wire fencing, climate change, hyper-predation by owls, competition from Sulphur-crested cockatoos, predation by Feral cats and European red foxes. Summary of priority recovery and threat abatement actions to support the recovery of Greater glider include: • In the aftermath of bushfires, protect any unburnt habitat. • Review prescribed burning techniques. • Protect hollow-bearing trees in private property and road reserves. • Avoid fragmentation and habitat loss due to development of new transport corridors. • Establish, maintain and enforce effective prescriptions in production forests. • Consider the use of nest boxes in habitats with limited hollows. • Avoid the use of barbed wire. • Restore habitat connectivity in fragmented landscapes. • Protect sufficient areas of denning and foraging habitat as well as climate refugia habitat to sustain viable sub-populations. • Implement control measures where threats from introduced predators are locally significant. • Investigate feasibility of reintroductions to areas where the species has recently ben extirpated. The Project is not considered to enhance these threatening processes and interfere with the recovery of Greater glider due to the following: • Avoiding habitat along Phillips Creek and having no direct impacts (clearing, fragmentation and habitat loss) on species habitat; and • Effectively manage indirect impacts, particularly associated with weed and pest incursion.

8. CONCLUSION

An ecological assessment was undertaken across the Project area to identify MNES protected under the EPBC Act. This assessment included:

- Desktop assessments, including literature review of previous environmental studies and database searches to identify known or potentially occurring MNES.
- Ecological field survey to:
  - Document condition, extent and conservation value of vegetation communities, habitat types and other ecological values (watercourses, habitat connectivity) within the Project area;
  - Identify habitat resources for known and potentially occurring threatened flora, fauna and migratory species;
  - Detect presence of conservation significant species identified as potentially occurring from the desktop assessment through targeted surveys, including targeted flora meanders; and
  - Opportunistically record fauna utilisation, flora diversity and introduced species across the Project area.

The ecological field survey identified the following MNES values within the Project area, or at Phillips Creek, adjacent to the southern boundary of the Project area:

- The presence of one (1) listed threatened fauna species (Ornamental snake) within the Project area.
- The presence of one (1) listed threatened fauna species (Greater glider) located outside of the Project area, along Phillips Creek.
- The presence of Ornamental snake habitat, comprising 42.83 ha 'Preferred', 2.73 ha 'Suitable', and 86.76 ha 'Marginal' habitat within the Project area.
- The presence of 11.29 ha of 'Marginal' Koala habitat within the Project area.
- The presence of 161.71 ha of 'Marginal' Squatter pigeon habitat within the Project area.
- Habitat for Koala and Greater glider along Phillips Creek outside the Project area.

An impact assessment was conducted to identify the level of impact on MNES values as a result of the Project. This impact assessment confirmed generally low direct and indirect impacts due to the overall degraded condition of the Project area, existing site procedures and protocols that are in place to specifically manage environmental impacts, and the Project's avoidance of habitat along Phillips Creek. However, the following impact likely to be significant was identified:

- Direct loss of 45.56 ha of Ornamental snake habitat that is considered to be 'sink habitat' and support an overflow of individuals that form part of an important population in the area.

Based on the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines: Matters of National Environmental Significance* (Department of the Environment, 2013b), the above impact is considered to trigger the criteria for a likely significant impact.

In order to ensure significant impacts are restricted, the following key mitigation measures are proposed:

- Clearly delineated clearance areas within the Project area prior to disturbance activities.
- Timing of vegetation clearing to occur post-wet season.
- Pre-clearance surveys are to be undertaken by suitably qualified personnel to detect the presence of fauna species immediately prior to the commencement of disturbance within the Project area. For target MNES values, this is to specifically occur during optimal times of detection. Any fauna detected should be relocated to suitable areas that will not be disturbed by the Project.
- All vegetation clearing and ground disturbance work within the Project area is to be conducted under the supervision of a suitably qualified spotter catcher.
- All equipment and machinery should be regularly maintained and in good working order to avoid excessive noise.
- Any temporary lighting required along the Project area boundary is to be:
  - Directed downwards, fitted with light shields and away from adjacent habitats,
  - The minimum number and height required to illuminate the area for access purposes,
  - Consist of the minimum lumen required to sufficiently illuminate the area for access purposes,
  - Motion triggered, where possible.

9. QUALIFICATIONS

(a) In preparing this document, including all relevant calculation and modelling, Engeny Water Management (Engeny) has exercised the degree of skill, care and diligence normally exercised by members of the engineering profession and has acted in accordance with accepted practices of engineering principles.

(b) Engeny has used reasonable endeavours to inform itself of the parameters and requirements of the project and has taken reasonable steps to ensure that the works and document is as accurate and comprehensive as possible given the information upon which it has been based including information that may have been provided or obtained by any third party or external sources which has not been independently verified.

(c) Engeny reserves the right to review and amend any aspect of the works performed including any opinions and recommendations from the works included or referred to in the works if:

  (i) Additional sources of information not presently available (for whatever reason) are provided or become known to Engeny; or

  (ii) Engeny considers it prudent to revise any aspect of the works in light of any information which becomes known to it after the date of submission.

(d) Engeny does not give any warranty nor accept any liability in relation to the completeness or accuracy of the works, which may be inherently reliant upon the completeness and accuracy of the input data and the agreed scope of works. All limitations of liability shall apply for the benefit of the employees, agents and representatives of Engeny to the same extent that they apply for the benefit of Engeny.

(e) This document is for the use of the party to whom it is addressed and for no other persons. No responsibility is accepted to any third party for the whole or part of the contents of this Report.

(f) If any claim or demand is made by any person against Engeny on the basis of detriment sustained or alleged to have been sustained as a result of reliance upon the Report or information therein, Engeny will rely upon this provision as a defence to any such claim or demand.

(g) This Report does not provide legal advice.

10. REFERENCES

AARC (2016) Lake Vermont Northern Extension: Flora and Fauna Report, Prepared for Bowen Basin Coal Pty Ltd, Version 4.

AECOM (2016) Terrestrial Ecology Baseline Report, Revision 1, prepared for BMA.

AECOM (2020) Peak Downs East Mining Lease, Terrestrial Ecology Baseline Report.

AECOM (2023a) Matters of National Environmental Significance - Significant Impact Assessment, Grevillea Pit Continuation Project, Doc No. 60712195, Revision 3.

AECOM (2023b) Saraji East Mining Lease Project Baseline Environmental Studies, Terrestrial Ecology Technical Report, Revision 7, Prepared for BM Alliance Coal Operations Pty Ltd.

ALA (2024) Atlas of Living Australia. Available at: https://www.ala.org.au.

Anderson, E. (2016) Plants of central Queensland: identification and uses of native and introduced species. 2nd edition. Clayton, Vic.: CSIRO Publishing.

Aurecon (2013) BMA Peak Downs Mine, Ecological Assessment of Dysart Road: MC90 Realignment, Revision 3, Prepared for BMA.

Ausecology (2022) BMA Peak Downs Terrestrial Ecology Assessment - Interim Memo on Surveys Conducted in November and December 2021, Prepared for BMA, Version 1.

Australian Government (2017) Australian Weeds Strategy 2017-2027. Available at: https://weeds.org.au/weeds-profiles/.

BAAM (2021) Ecological Baseline Assessment: Saraji Mine, Version 0, Prepared for BM Alliance Coal Operations Pty Ltd.

Bean, A. (2024) 'Census of the Queensland Flora and Fungi 2023, Queensland Department of Environment, Science and Innovation (DESI), Queensland Government.'

BMA (2016) Saraji Open Cut Extension Project: Environmental Assessment Report.

BMA (2018) EPBC Act MNES Self-Assessment: Spring Creek Diversion - Saraji Pit Geometry Optimisation.

BMA (2020) BHP Procedure: QLD Coal Ecological Survey, Document Number: BHP-PRO-0007.

BoM (2024) Climate Data Online, Bureau of Meteorology (BoM). Available at: http://www.bom.gov.au/climate/data/index.shtml.

DAWE (2022a) Conservation Advice for Phascolarctos cinereus (Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory. Canberra: Department of Agriculture, Water and the Environment.

DAWE (2022b) National Recovery Plan for the Koala Phascolarctos cinereus (combined populations of Queensland, New South Wales and the Australian Capital Territory).

DCCEEW (2022a) Conservation Advice for Petauroides volans (greater glider (southern and central)). Canberra: Department of Climate Change, Energy, the Environment and Water.

DCCEEW (2022b) Register of Critical Habitat. Available at: https://www.environment.gov.au/cgi-bin/sprat/public/publicregisterofcriticalhabitat.pl.

DCCEEW (2023) Draft Referral Guidelines for the Nationally Listed Brigalow Belt Reptiles v1.1. Canberra: Department of Climate Change, Energy, the Environment and Water (DCCEEW).

DCCEEW (2024a) Denisonia maculata — Ornamental Snake, Species Profile and Threats Database. Available at: https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=1193.

DCCEEW (2024b) EPBC Act Public Portal - All referrals, Department of Climate Change, Energy, the Environment and Water. Available at: https://epbcpublicportal.awe.gov.au/all-referrals/.

DCCEEW (2024c) Protected Matters Search Tool (PMST). Available at: https://www.dcceew.gov.au/environment/epbc/protected-matters-search-tool.

DCCEEW (2026a) *Dichanthium setosum* — bluegrass, Species Profile and Threats Database. Available at: https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=1193.

DCCEEW (2026b) *Dichanthium queenslandicum* — King Blue-grass, Species Profile and Threats Database. Available at: https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=5481.

Department of the Environment (2013a) Approved Conservation Advice for the Brigalow (Acacia harpophylla dominant and co-dominant) ecological community. Canberra: Department of the Environment. Available at: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/028-conservation-advice.pdf.

Department of the Environment (2013b) Matters of National Environmental Significance, Significant impact guidelines 1.1, Environment Protection and Biodiversity Conservation Act 1999.

Department of the Environment (2014) Approved Conservation Advice for Denisonia maculata (Ornamental Snake). Canberra: Department of the Environment.

Department of the Environment (2015) Threat abatement plan for predation by feral cats. Commonwealth of Australia, Department of the Environment.

Department of the Environment (2024a) Geophaps scripta scripta — Squatter Pigeon (southern) in Species Profile and Threats Database. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=64440.

Department of the Environment (2024b) Species Profile and Threat (SPRAT) Database. Available at: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl.

DES (2018) 'Biodiversity planning assessment - Brigalow Belt - version 2.1'. QSpatial.

DES (2022a) 'Map of Great Barrier Reef wetland protection areas'. QSpatial.

DES (2022b) 'Map of Queensland wetland environmental values'. QSpatial.

DES (2022c) 'Wetland protection area - GBR high ecological significance wetland'. QSpatial.

DES (2023) 'Flora Survey Trigger Map for Clearing Protected Plants in Queensland - Version 10.0'. QSpatial.

DESI (2024) WildNet, Request a species list. Available at: https://apps.des.qld.gov.au/report-request/species-list/.

DEWH (2008) Threat abatement plan for predation by the European red fox. Commonwealth of Australia, Department of the Environment, Water, Heritage (DEWH).

DEWHA (2010) Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999. Department of the Environment, Water, Heritage and the Arts.

DoEE (2016) Threat abatement plan for competition and land degradation by rabbits. Commonwealth of Australia, Department of the Environment and Energy (DoEE).

DoEE (2017) Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (Sus scrofa). Commonwealth of Australia, Department of the Environment and Energy (DEE).

DoEE (2021) Guide to nationally protected species significantly impacted by paddock tree removal (draft). Commonwealth of Australia, Department of the Environment and Energy (DoEE).

DoR (2023a) 'Detailed surface geology - Queensland (version 6.13)'. QSpatial, Department of Resources (DoR).

DoR (2023b) 'Vegetation management pre-clear regional ecosystem map - version 13.00'. QSpatial.

DoR (2023c) 'Vegetation management watercourse and drainage feature map (1:100000 and 1:250000) - Queensland except South East Queensland Version 7.00'. QSpatial.

DoR (2024a) 'Vegetation management essential habitat map no attribute - version 12.04'. QSpatial.

DoR (2024b) 'Vegetation management regional ecosystem map - version 13.00 - By Area Of Interest'. QSpatial.

DoR (2024c) 'Vegetation management regulated vegetation management map - version 7.04'. QSpatial.

DoR (2024d) 'Vegetation management wetlands map – version 9.04'. QSpatial.

DSEWPC (2004) Survey guidelines for Australia's threatened reptiles.

e2m (2021) Winchester South Project: Terrestrial Ecology Assessment, Version 3.

Ecological Survey & Management (2011) Arrow Bowen Pipeline: Terrestrial Fauna Assessment, Version 2.

ELA (2018) Saraji Mine Spring Creek Diversion – Stage 1, Ecological Assessment, Version 2, Prepared for BHP. Eco Logical Australia Pty Ltd.

ELA (2019a) Saraji Mine Grevillea Back Access Road Ecological Assessment. Eco Logical Australia Pty Ltd.

ELA (2019b) Spring to Phillips Creek Diversion, Assessment of Matters of National Environmental Significance, Version 6, Prepared for SLR Consulting. Eco Logical Australia Pty Ltd.

Ellis, W.A.H., Melzer, A., Carrick, F.N. and Hasegawa, M. (2002) 'Tree use, diet and home range of the koala (Phascolarctos cinereus) at Blair Athol, central Queensland', Wildlife Research, 29(3), p. 303. Available at: https://doi.org/10.1071/WR00111.

Engeny (2024) Saraji Mine Grevillea Pit Continuation Project, Surface Water Assessment.

ERM (2022) Ecology Technical Memo, BHP Peak Downs Expansion Project. Environmental Resources Management Australia Pty Ltd (ERM).

ESP (2019) Spring Creek to Phillips Creek Diversion, EPBC Assessment, Version 4, Prepared for: SLR Consulting Australia. Ecological Service Professionals Pty Ltd.

Eyre, T., Ferguson, D., Smith, G., Mathieson, M., Venz, M., Hogan, L., Hourigan, C., Kelly, A. and Rowland, J. (2022a) Terrestrial Vertebrate Fauna Survey Guidelines for Queensland, Version 4.0. Brisbane: Department of Environment and Science.

Eyre, T.J., Vanderduys, E., Taylor, J., Johnson, J., and Koch, P (2022b) Guide to Greater Glider Habitat in Queensland. Queensland Herbarium, Department of Environment and Science, Queensland Government. Available at: https://www.dcceew.gov.au/sites/default/files/documents/guide-greater-glider-habitat-qld.pdf

Geoscience Australia (2020) Elevation and Depth - Foundation Spatial Data, Elvis. Available at: https://elevation.fsdf.org.au/.

Jackson, S.M (2000) Glide angle in the genus Petaurus and a review of gliding in mammals. Mammal Review 30: 9–30.

Kerle, J.A (2001) Possums: The Brushtails, Ringtails and Greater Glider. University of New South Wales Press, Sydney.

Kerswell, A., Kaveney, T., Evans, C. and Appleby, L. (2020) Habitat descriptions for 12 threatened species, specific to central Queensland, version 5. Report commissioned by BHP.

Lester, N.C. (2008) Woodland to weeds: Southern Queensland brigalow belt. 2nd ed. Brisbane: CopyRight Pub.

Menkhorst, P. and Knight, F. (2011) A field guide to the mammals of Australia. 3rd ed. Australia ; New York: Oxford University Press.

METServe (2023) Terrestrial Ecological Assessment for Vulcan South. Mining and Energy Technical Services Pty Ltd (METServe).

Neldner, V.J., Wilson, B.A., Dillewaard, H.A., Ryan, T., Butler, D.W., McDonald, W.J.F., Addicott, E. and Appelman, C.N. (2022) Methodology for surveying and mapping regional ecosystems and vegetation communities in Queensland. Version 6. Brisbane, Queensland: Department of Environment and Science.

NSW Scientific Committee (2015) Final determination: Greater glider population. New South Wales Government. Available at: https://www.environment.nsw.gov.au/sites/default/files/greater-glider-population-nsw-scientific-committee-final-determination.pdf

Pembroke Resources South Pty Ltd (2017) Olive Downs Project Mine Site and Access Road, EPBC Referral Submission.

pers. comms. BMA (2019) 'Pers. comms. BMA Animal Observations'.

Sinclair, A.R.E., Fryxell, J.M., Caughley, G. and Caughley, G. (2005) Wildlife ecology, conservation, and management. 2nd ed. Malden, MA ; Oxford: Blackwell Pub.

Threatened Species Scientific Committee (2014) Approved Conservation Advice for Denisonia maculata (ornamental snake).

Trent, S., Jones, L., McFarland, D., Chemello, S., Goudkamp, S., Hewavisenthi, S. and Duncan, C. (2018) A biodiversity planning assessment for the Brigalow Belt bioregion: summary report. Version 2.1. Brisbane, Queensland: Department of Environment and Science.

TSSC (2015) Conservation Advice for Geophaps scripta scripta squatter pigeon (southern). Threatened Species Scientific Committee (TSSC), Canberra: Department of the Environment.

URS Australia (2014) Dysart East: EPBC Referral, Prepared for Bengal Coal Pty Ltd.

Wilson, S. and Swan, G. (2021) A complete guide to reptiles of Australia. 6th edn. Sydney: Reed New Holland Publishers.

Youngentob KN, Wood JT & Lindenmayer DB (2013) The response of arboreal marsupials to landscape context over time: a large-scale fragmentation study revisited. Journal of Biogeography. 40:2082-2093.

Youngentob, K.N., Marsh, K.F. and Skewes, J. (2021) A review of koala habitat assessment criteria and methods. Canberra: Department of Agriculture, Water and the Environment.

APPENDIX A: DESKTOP SEARCH RESULTS

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 23-Feb-2024

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	5
Listed Threatened Species:	33
Listed Migratory Species:	11

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	16
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	1
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	16
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Brigalow (Acacia harpophylla dominant and co-dominant)	Endangered	Community known to occur within area	In feature area
Natural Grasslands of the Queensland Central Highlands and northern Fitzroy Basin	Endangered	Community likely to occur within area	In feature area
Poplar Box Grassy Woodland on Alluvial Plains	Endangered	Community likely to occur within area	In feature area
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	Endangered	Community likely to occur within area	In buffer area only
Weeping Myall Woodlands	Endangered	Community likely to occur within area	In buffer area only

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Erythrotriorchis radiatus Red Goshawk [942]	Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat may occur within area	In feature area
Geophaps scripta scripta Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat known to occur within area	In feature area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area	In feature area
Neochmia ruficauda ruficauda Star Finch (eastern), Star Finch (southern) [26027]	Endangered	Species or species habitat likely to occur within area	In feature area
Poephila cincta cincta Southern Black-throated Finch [64447]	Endangered	Species or species habitat may occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area	In feature area
Stagonopleura guttata Diamond Firetail [59398]	Vulnerable	Species or species habitat may occur within area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat may occur within area	In buffer area only
MAMMAL			
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat likely to occur within area	In feature area
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Nyctophilus corbeni			
Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat may occur within area	In feature area
Petauroides volans			
Greater Glider (southern and central) [254]	Endangered	Species or species habitat known to occur within area	In feature area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)			
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat known to occur within area	In feature area
Pteropus poliocephalus			
Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area	In buffer area only
PLANT			
Aristida annua			
[17906]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Cadellia pentastylis			
Ooline [9828]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Daviesia discolor			
[3567]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Dichanthium queenslandicum			
King Blue-grass [5481]	Endangered	Species or species habitat likely to occur within area	In feature area
Dichanthium setosum			
bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Eucalyptus raveretiana			
Black Ironbox [16344]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Polianthion minutiflorum			
[82772]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Samadera bidwillii			
Quassia [29708]	Vulnerable	Species or species habitat may occur within area	In buffer area only
REPTILE			
Denisonia maculata			
Ornamental Snake [1193]	Vulnerable	Species or species habitat known to occur within area	In feature area
Egernia rugosa			
Yakka Skink [1420]	Vulnerable	Species or species habitat may occur within area	In feature area
Elseya albagula			
Southern Snapping Turtle, White-throated Snapping Turtle [81648]	Critically Endangered	Species or species habitat may occur within area	In feature area
Furina dunmalli			
Dunmall's Snake [59254]	Vulnerable	Species or species habitat may occur within area	In feature area
Hemiaspis damelii			
Grey Snake [1179]	Endangered	Species or species habitat may occur within area	In feature area
Lerista allanae			
Allan's Lerista, Retro Slider [1378]	Endangered	Species or species habitat may occur within area	In feature area
Rheodytes leukops			
Fitzroy River Turtle, Fitzroy Tortoise, Fitzroy Turtle, White-eyed River Diver [1761]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Listed Migratory Species		[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
Cuculus optatus			
Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Motacilla flava](#) Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area
[Myiagra cyanoleuca](#) Satin Flycatcher [612]		Species or species habitat may occur within area	In buffer area only
Migratory Wetlands Species			
[Actitis hypoleucos](#) Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area	In feature area
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
[Gallinago hardwickii](#) Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat may occur within area	In feature area
[Pandion haliaetus](#) Osprey [952]		Species or species habitat likely to occur within area	In buffer area only
[Tringa nebularia](#) Common Greenshank, Greenshank [832]	Endangered	Species or species habitat may occur within area	In buffer area only

Other Matters Protected by the EPBC Act

Listed Marine Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area overfly marine area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat may occur within area overfly marine area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat may occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat may occur within area overfly marine area	In buffer area only
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area	In buffer area only
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat may occur within area overfly marine area	In buffer area only

Extra Information

State and Territory Reserves			[Resource Information]
Protected Area Name	Reserve Type	State	Buffer Status
Coolibah	Nature Refuge	QLD	In buffer area only

EPBC Act Referrals				[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Lake Vermont Meadowbrook Coal Mine Project, Qld	2019/8485		Assessment	In buffer area only
Olive Downs Project Mine Site and Access Road	2017/7867		Post-Approval	In buffer area only
Peak Downs Mine Continuation Project	2022/09350		Assessment	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Saraji East Mining Lease Project, Qld	2016/7791		Assessment	In buffer area only
Vulcan South Coal Mine	2023/09708		Referral Decision	In buffer area only
Winchester South Project Mine Site and Access Road, near Moranbah, Qld	2019/8460		Assessment	In buffer area only
Controlled action				
Arrow Bowen Pipeline (CSG), QLD	2012/6459	Controlled Action	Post-Approval	In buffer area only
Bowen Gas Project	2012/6377	Controlled Action	Post-Approval	In feature area
install & operate gas pipeline	2005/2059	Controlled Action	Post-Approval	In buffer area only
Lake Vermont open cut coal northern extension project, central Qld	2016/7701	Controlled Action	Post-Approval	In buffer area only
New Saraji Coal Mine Project	2007/3845	Controlled Action	Completed	In feature area
Norwich Park & Blackwater CSG Fields & supporting infrastructure Bowen Basin	2011/6032	Controlled Action	Completed	In buffer area only
Norwich Park to Blackwater Gas Pipeline	2011/6031	Controlled Action	Completed	In buffer area only
Spring Creek to Phillips Creek Diversion	2019/8576	Controlled Action	Post-Approval	In buffer area only
Not controlled action				
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
Not controlled action (particular manner)				
Dysart East multi seam open cut coal mine project, Qld	2014/7224	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

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

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

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

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

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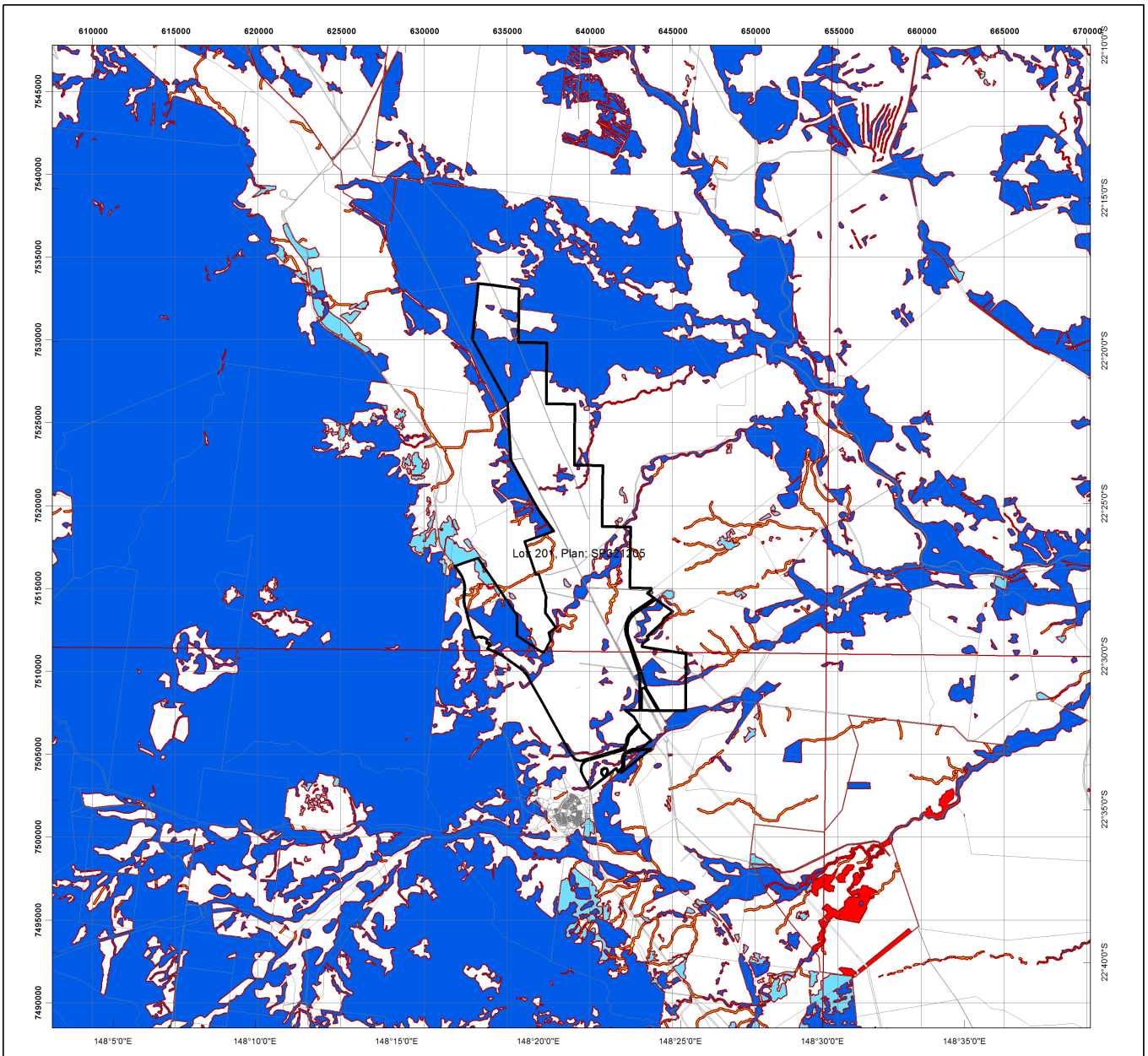
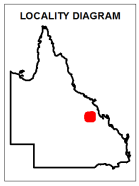


Regulated Vegetation Management Map

Legend

- Selected Lot and Plan
- Category A area (Vegetation offsets/compliance notices/VDecs)
- Category B area (Remnant vegetation)
- Category C area (High-value regrowth vegetation)
- Category R area (Reef regrowth watercourse vegetation)
- Category X area (Exempt clearing work on Freehold, Indigenous and Leasehold land)
- Water
- Other land parcel boundaries



N

0 3,300 6,600 9,900 13,200 16,500 m

This product is projected into:
GDA 1994 MGA Zone 55

Disclaimer:
While every care is taken to ensure the accuracy of this product, the Department of Resources makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incur as a result of the product being inaccurate or incomplete in any way and for any reason.

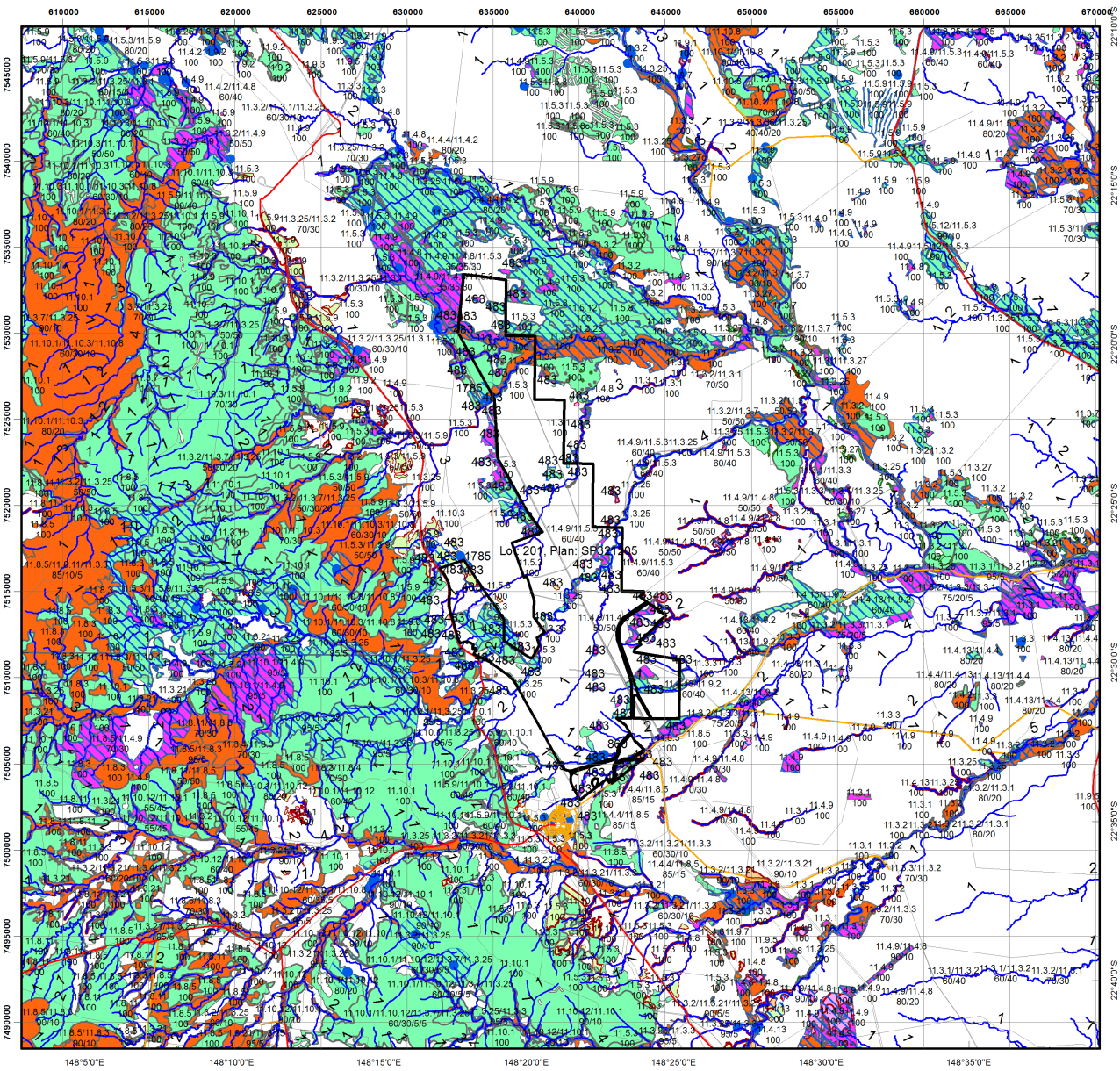
Additional information required for the assessment of vegetation values is provided in the accompanying "Vegetation Management Supporting map". For further information go to the web site: www.resources.qld.gov.au or contact the Department of Resources.

Digital data for the regulated vegetation management map is available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

Land parcel boundaries are provided as locational aid only.

This map is updated on a monthly basis to ensure new PMAVs are included as they are approved.

Queensland Government



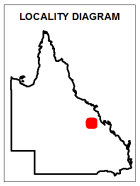
Vegetation Management Supporting Map

Legend

- Selected Lot and Plan
- Category A or B area containing endangered regional ecosystems
- Category A or B area containing of concern regional ecosystems
- Category A or B area that is a least concern regional ecosystem
- Category C or R area containing endangered regional ecosystems
- Category C or R area containing of concern regional ecosystems
- Category C or R area that is a least concern regional ecosystem
- Category X area
- Water
- Wetland on the vegetation management wetlands map
- Essential habitat on the essential habitat map
- Essential habitat species record
- Watercourses and drainage features on the vegetation management watercourse and drainage features map (Stream order shown as black number against stream where available)
- Highway
- Connector
- Street/Local Road
- National Parks, State Forest and other reserves
- Other land parcel boundaries

Queensland Government

LOCALITY DIAGRAM



N

0 2,400 4,800 7,200 9,600 12,000 m

This product is projected into:
GDA 1994 MGA Zone 55

Labels for Essential Habitat are centred on the area of enquiry.

Regional ecosystem linework has been compiled at a scale of 1:100 000, except in designated areas where a compilation scale of 1:50 000 is available. Linework should be used as a guide only. The positional accuracy of RE data mapped at a scale of 1:100 000 is +/- 100 metres.

Disclaimer:
While every care is taken to ensure the accuracy of this product, the Department of Resources makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incur as a result of the product being inaccurate or incomplete in any way and for any reason.

Additional information may be required for the purposes of land clearing or assessment of a regional ecosystem map or PMAV applications. For further information go to the web site: www.resources.qld.gov.au or contact the Department of Resources.

Digital data for the vegetation management watercourse and drainage feature map, vegetation management wetlands map, essential habitat map and the vegetation management remnant and regional ecosystem map are available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

Land parcel boundaries are provided as locational aid only.

Vegetation Management Act 1999 - Extract from the essential habitat database

Essential habitat is required for assessment under the:

- State Development Assessment Provisions - State Code 16: Native vegetation clearing which sets out the matters of interest to the state for development assessment under the *Planning Act 2016*; and
- Accepted development vegetation clearing codes made under the *Vegetation Management Act 1999*

Essential habitat for one or more of the following species is found on and within 1.1 km of the identified subject lot/s on the accompanying essential habitat map.

This report identifies essential habitat in Category A, B and Category C areas.

The numeric labels on the essential habitat map can be cross referenced with the database below to determine which essential habitat factors might exist for a particular species.

Essential habitat is compiled from a combination of species habitat models and buffered species records.

The Department of Resources website (http://www.resources.qld.gov.au) has more information on how the layer is applied under the State Development Assessment Provisions - State Code 16: Native vegetation clearing and the *Vegetation Management Act 1999*.

Regional ecosystem is a mandatory essential habitat factor, unless otherwise stated.

Essential habitat, for protected wildlife, means a category A area, a category B area or category C area shown on the regulated vegetation management map-

1) that has at least 3 essential habitat factors for the protected wildlife that must include any essential habitat factors that are stated as mandatory for the protected wildlife in the essential habitat database; or

2) in which the protected wildlife, at any stage of its life cycle, is located.

Protected wildlife includes critically endangered, endangered, vulnerable or near-threatened native wildlife prescribed under the *Nature Conservation Act 1992*.

Essential habitat in Category A and/or Category B and/or Category C

Label	Scientific Name	Common Name	NCA Status	Vegetation Community	Altitude	Soils	Position in Landscape
483	Denisonia maculata	ornamental snake	V	Riparian woodland/open forest and shrub/woodland including Brigalow Acacia harpophylla; into drier habitats in summer.	100-450m.	Cracking clay with gilgai/soil crack microrelief and sandy loam substrates.	Near freshwater waterholes/creeks and low lying poorly drained areas that are frequently inundated by freshwater.
860	Phascolarctos cinereus	koala	E	Open forests and woodlands containing Eucalyptus, Corymbia, Lophostemon or Melaleuca trees having a trunk of a diameter of more than 10cm at 1.3m above the ground. Tree species used for food and habitat varies across the state and can include: Corymbia citriodora, Corymbia henryi, Corymbia intermedia, Eucalyptus acmenoides, Eucalyptus bancroftii, Eucalyptus biturbinata, Eucalyptus blakelyi, Eucalyptus brownii, Eucalyptus camaldulensis, Eucalyptus carnea, Eucalyptus chloroclada, Eucalyptus coolabah, Eucalyptus crebra, Eucalyptus dealbata, Eucalyptus drepanophylla, Eucalyptus dunnii, Eucalyptus eugenioides, Eucalyptus exserta, Eucalyptus fibrosa, Eucalyptus grandis, Eucalyptus helidonica, Eucalyptus latisinensis, Eucalyptus longirostrata, Eucalyptus major, Eucalyptus melanophloia, Eucalyptus melliodora, Eucalyptus microcarpa, Eucalyptus microcorys, Eucalyptus microtheca, Eucalyptus moluccana, Eucalyptus montivaga, Eucalyptus orgadophila, Eucalyptus papuana, Eucalyptus pilularis, Eucalyptus platyphylla, Eucalyptus populnea, Eucalyptus portuensis, Eucalyptus propinqua, Eucalyptus racemosa, Eucalyptus resinifera, Eucalyptus robusta, Eucalyptus saligna, Eucalyptus seeana, Eucalyptus siderophloia, Eucalyptus sideroxylon, Eucalyptus tereticornis, Eucalyptus thozetiana, Eucalyptus tindaliae, Eucalyptus umbra, Lophostemon confertus, Melaleuca leucadendra, Melaleuca quinquenervia.	Sea level to 1000m.	None	Riparian areas, plains and hill/escarpment slopes.
1785	Geophaps scripta scripta	squatter pigeon (southern subspecies)	V	Dry eucalypt woodland (including poplar box, spotted gum, yellow box, acacia and callitris), with sparse short grass, often on sandy areas near to permanent water; grassy eucalypt woodlands. Nest on ground near or under grass tussock, log or low bush.	None	None	Gravelly ridges, traprock and river flats.

Label	Regional Ecosystem (mandatory unless otherwise specified)
483	10.3.2, 10.3.3, 10.3.4, 10.3.7, 10.3.13, 10.3.14, 10.3.15, 10.3.16, 10.3.27, 10.3.30, 10.3.31, 10.4.1, 10.4.2, 10.4.3, 10.4.4, 10.4.5, 10.4.6, 10.4.7, 10.4.8, 10.5.5, 10.9.1. 10.9.6. 10.9.7, 11.3.1, 11.3.2, 11.3.3, 11.3.4, 11.3.6, 11.3.9, 11.3.10, 11.3.12, 11.3.15, 11.3.21, 11.3.23, 11.3.24, 11.3.25, 11.3.27, 11.3.28, 11.3.31, 11.3.34, 11.3.37, 11.3.38, 11.3.40, 11.4.2, 11.4.3, 11.4.4, 11.4.6, 11.4.7, 11.4.8, 11.4.9, 11.4.11, 11.5.2, 11.5.3, 11.5.16, 11.8.11, 11.9.1, 11.9.2, 11.9.3, 11.9.5, 11.9.7, 11.9.11, 11.9.12, 11.9.14, 11.11.15, 11.12.6
860	4.3.1, 4.3.2, 4.3.3, 4.3.4, 4.3.5, 4.3.6, 4.3.8, 4.3.10, 4.3.11, 4.5.3, 4.5.5, 4.5.6, 4.5.8, 4.5.9, 4.7.1, 4.7.7, 4.7.8, 4.9.6, 4.9.10, 4.9.12, 4.9.17, 6.3.1, 6.3.2, 6.3.3, 6.3.4, 6.3.5, 6.3.7, 6.3.8, 6.3.9, 6.3.11, 6.3.12, 6.3.17, 6.3.18, 6.3.22, 6.3.24, 6.3.25, 6.4.1, 6.4.2, 6.4.3, 6.4.4, 6.5.1, 6.5.2, 6.5.3, 6.5.5, 6.5.6, 6.5.7, 6.5.8, 6.5.9, 6.5.10, 6.5.11, 6.5.13, 6.5.14, 6.5.15, 6.5.16, 6.5.17, 6.5.18, 6.5.19, 6.6.2, 6.7.1, 6.7.2, 6.7.5, 6.7.6, 6.7.7, 6.7.9, 6.7.11, 6.7.12, 6.7.13, 6.7.14, 6.7.17, 6.9.3, 7.2.3, 7.2.4, 7.2.7, 7.2.11, 7.3.7, 7.3.8, 7.3.9, 7.3.12, 7.3.13, 7.3.14, 7.3.16, 7.3.19, 7.3.20, 7.3.21, 7.3.25, 7.3.26, 7.3.39, 7.3.40, 7.3.42, 7.3.43, 7.3.44, 7.3.45, 7.3.47, 7.3.48, 7.3.50, 7.5.1, 7.5.2, 7.5.3, 7.5.4, 7.8.7, 7.8.8, 7.8.10, 7.8.15, 7.8.16, 7.8.17, 7.8.18, 7.8.19, 7.11.5, 7.11.6, 7.11.13, 7.11.14, 7.11.16, 7.11.18, 7.11.19, 7.11.20, 7.11.21, 7.11.31, 7.11.32, 7.11.33, 7.11.34, 7.11.35, 7.11.37, 7.11.41, 7.11.42, 7.11.43, 7.11.44, 7.11.45, 7.11.46, 7.11.47, 7.11.48, 7.11.49, 7.11.50, 7.11.51, 7.12.4, 7.12.5, 7.12.17, 7.12.21, 7.12.22, 7.12.23, 7.12.24, 7.12.25, 7.12.26, 7.12.27, 7.12.28, 7.12.29, 7.12.30, 7.12.33, 7.12.34, 7.12.35, 7.12.51, 7.12.52, 7.12.53, 7.12.54, 7.12.55, 7.12.56, 7.12.57, 7.12.58, 7.12.59, 7.12.60, 7.12.61, 7.12.62, 7.12.63, 7.12.65, 7.12.66, 7.12.69, 8.1.5, 8.2.3, 8.2.6, 8.2.7, 8.2.8, 8.2.11, 8.2.12, 8.2.13, 8.2.14, 8.3.1, 8.3.2, 8.3.3, 8.3.5, 8.3.6, 8.3.8, 8.3.10, 8.3.11, 8.3.13, 8.5.1, 8.5.2, 8.5.3, 8.5.5, 8.5.6, 8.5.7, 8.9.1, 8.10.1, 8.11.1, 8.11.3, 8.11.4, 8.11.5, 8.11.6, 8.11.8, 8.11.10, 8.11.12, 8.12.4, 8.12.5, 8.12.6, 8.12.7, 8.12.8, 8.12.9, 8.12.12, 8.12.14, 8.12.20, 8.12.22, 8.12.23, 8.12.25, 8.12.26, 8.12.27, 8.12.29, 8.12.31, 8.12.32, 9.3.1, 9.3.2, 9.3.3, 9.3.4, 9.3.5, 9.3.6, 9.3.7, 9.3.8, 9.3.10, 9.3.11, 9.3.13, 9.3.14, 9.3.15, 9.3.16, 9.3.17, 9.3.19, 9.3.20, 9.3.21, 9.3.22, 9.3.27, 9.4.1, 9.4.2, 9.5.1, 9.5.3, 9.5.4, 9.5.5, 9.5.6, 9.5.7, 9.5.8, 9.5.9, 9.5.10, 9.5.11, 9.5.12, 9.5.15, 9.5.16, 9.5.17, 9.7.1, 9.7.2, 9.7.3, 9.7.4, 9.7.5, 9.7.6, 9.8.1, 9.8.2, 9.8.3, 9.8.4, 9.8.5, 9.8.9, 9.8.10, 9.8.11, 9.8.13, 9.10.1, 9.10.3, 9.10.4, 9.10.5, 9.10.7, 9.10.8, 9.11.1, 9.11.2, 9.11.3, 9.11.4, 9.11.5, 9.11.7, 9.11.10, 9.11.12, 9.11.13, 9.11.14, 9.11.15, 9.11.16, 9.11.17, 9.11.18, 9.11.19, 9.11.21, 9.11.22, 9.11.23, 9.11.24, 9.11.25, 9.11.26, 9.11.28, 9.11.29, 9.11.30, 9.11.31, 9.11.32, 9.12.1, 9.12.2, 9.12.3, 9.12.4, 9.12.5, 9.12.6, 9.12.7, 9.12.10, 9.12.11, 9.12.12, 9.12.13, 9.12.14, 9.12.15, 9.12.16, 9.12.17, 9.12.18, 9.12.19, 9.12.20, 9.12.21, 9.12.22, 9.12.23, 9.12.24, 9.12.25, 9.12.26, 9.12.27, 9.12.28, 9.12.29, 9.12.30, 9.12.31, 9.12.32, 9.12.33, 9.12.35, 9.12.36, 9.12.37, 9.12.38, 9.12.39, 9.12.44, 10.3.2, 10.3.3, 10.3.4, 10.3.5, 10.3.6, 10.3.8, 10.3.9, 10.3.10, 10.3.11, 10.3.12, 10.3.13, 10.3.14, 10.3.15, 10.3.16, 10.3.17, 10.3.20, 10.3.22, 10.3.27, 10.3.28, 10.4.2, 10.4.3, 10.4.5, 10.4.8, 10.4.9, 10.5.1, 10.5.2, 10.5.4, 10.5.5, 10.5.7, 10.5.8, 10.5.9, 10.5.10, 10.5.11, 10.5.12, 10.7.1, 10.7.2, 10.7.3, 10.7.4, 10.7.5, 10.7.7, 10.7.9, 10.7.10, 10.7.11, 10.7.12, 10.7.13, 10.9.2, 10.9.3, 10.9.5, 10.10.1, 10.10.3, 10.10.4, 10.10.5, 10.10.7, 11.2.1, 11.2.5, 11.3.1, 11.3.2, 11.3.3, 11.3.4, 11.3.5, 11.3.6, 11.3.7, 11.3.9, 11.3.10, 11.3.12, 11.3.13, 11.3.14, 11.3.15, 11.3.16, 11.3.17, 11.3.18, 11.3.19, 11.3.21, 11.3.23, 11.3.25, 11.3.26, 11.3.27, 11.3.28, 11.3.29, 11.3.30, 11.3.32, 11.3.33, 11.3.35, 11.3.36, 11.3.37, 11.3.38, 11.3.39, 11.4.2, 11.4.3, 11.4.7, 11.4.8, 11.4.9, 11.4.10, 11.4.12, 11.4.13, 11.5.1, 11.5.2, 11.5.3, 11.5.4, 11.5.5, 11.5.7, 11.5.8, 11.5.9, 11.5.12, 11.5.13, 11.5.14, 11.5.17, 11.5.18, 11.5.20, 11.5.21, 11.7.1, 11.7.2, 11.7.3, 11.7.4, 11.7.6, 11.7.7, 11.8.1, 11.8.2, 11.8.4, 11.8.5, 11.8.8, 11.8.11, 11.8.12, 11.8.14, 11.8.15, 11.9.1, 11.9.2, 11.9.3, 11.9.5, 11.9.6, 11.9.7, 11.9.9, 11.9.10, 11.9.11, 11.9.13, 11.9.14, 11.10.1, 11.10.2, 11.10.3, 11.10.4, 11.10.5, 11.10.6, 11.10.7, 11.10.9, 11.10.11, 11.10.12, 11.10.13, 11.11.1, 11.11.2, 11.11.3, 11.11.4, 11.11.6, 11.11.7, 11.11.8, 11.11.9, 11.11.10, 11.11.11, 11.11.12, 11.11.13, 11.11.14, 11.11.15, 11.11.16, 11.11.17, 11.11.19, 11.11.20, 11.12.1, 11.12.2, 11.12.3, 11.12.5, 11.12.6, 11.12.7, 11.12.8, 11.12.9, 11.12.10, 11.12.13, 11.12.14, 11.12.15, 11.12.16, 11.12.17, 11.12.19, 11.12.20, 12.2.5, 12.2.6, 12.2.7, 12.2.8, 12.2.10, 12.3.2, 12.3.3, 12.3.4, 12.3.5, 12.3.6, 12.3.7, 12.3.9, 12.3.10, 12.3.11, 12.3.14, 12.3.18, 12.3.19, 12.3.20, 12.5.1, 12.5.2, 12.5.3, 12.5.4, 12.5.6, 12.5.7, 12.5.10, 12.5.12, 12.8.1, 12.8.8, 12.8.9, 12.8.11, 12.8.12, 12.8.14, 12.8.16, 12.8.17, 12.8.20, 12.8.24, 12.8.25, 12.9-10.1, 12.9-10.2, 12.9-10.3, 12.9-10.4, 12.9-10.5, 12.9-10.7, 12.9-10.8, 12.9-10.11, 12.9-10.12, 12.9-10.14, 12.9-10.17, 12.9-10.18, 12.9-10.19, 12.9-10.21, 12.9-10.25, 12.9-10.26, 12.9-10.27, 12.9-10.28, 12.9-10.29, 12.11.2, 12.11.3, 12.11.5, 12.11.6, 12.11.7, 12.11.8, 12.11.9, 12.11.14, 12.11.15, 12.11.16, 12.11.17, 12.11.18, 12.11.22, 12.11.23, 12.11.24, 12.11.25, 12.11.26, 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Label	Regional Ecosystem (mandatory unless otherwise specified)
1785	8.2.1, 8.2.7, 8.2.8, 8.2.12, 8.3.2, 8.3.3, 8.3.5, 8.3.6, 8.3.13, 8.5.2, 8.5.3, 8.5.5, 8.5.6, 8.9.1, 8.11.1, 8.11.3, 8.11.4, 8.11.5, 8.11.6, 8.11.8, 8.12.6, 8.12.7, 8.12.9, 8.12.12, 8.12.14, 8.12.20, 8.12.22, 8.12.23, 8.12.25, 9.3.1, 9.3.2, 9.3.3, 9.3.4, 9.3.5, 9.3.6, 9.3.7, 9.3.8, 9.3.9, 9.3.11, 9.3.13, 9.3.14, 9.3.15, 9.3.16, 9.3.17, 9.3.18, 9.3.19, 9.3.20, 9.3.21, 9.3.22, 9.3.23, 9.4.1, 9.4.2, 9.4.3, 9.5.3, 9.5.4, 9.5.5, 9.5.6, 9.5.7, 9.5.8, 9.5.9, 9.5.10, 9.5.11, 9.5.12, 9.5.16, 9.7.1, 9.7.2, 9.7.3, 9.7.5, 9.7.6, 9.8.1, 9.8.2, 9.8.4, 9.8.5, 9.8.6, 9.8.9, 9.8.10, 9.8.11, 9.10.1, 9.10.3, 9.10.6, 9.10.7, 9.10.8, 9.11.1, 9.11.2, 9.11.3, 9.11.4, 9.11.5, 9.11.7, 9.11.10, 9.11.11, 9.11.12, 9.11.13, 9.11.15, 9.11.16, 9.11.17, 9.11.18, 9.11.19, 9.11.23, 9.11.26, 9.11.28, 9.11.29, 9.11.31, 9.11.32, 9.12.1, 9.12.3, 9.12.4, 9.12.5, 9.12.6, 9.12.7, 9.12.10, 9.12.11, 9.12.12, 9.12.13, 9.12.16, 9.12.17, 9.12.18, 9.12.19, 9.12.20, 9.12.21, 9.12.22, 9.12.23, 9.12.24, 9.12.26, 9.12.28, 9.12.30, 9.12.31, 9.12.33, 9.12.35, 9.12.37, 9.12.39, 10.3.1, 10.3.2, 10.3.3, 10.3.4, 10.3.5, 10.3.6, 10.3.8, 10.3.9, 10.3.10, 10.3.11, 10.3.12, 10.3.13, 10.3.14, 10.3.15, 10.3.16, 10.3.19, 10.3.20, 10.3.22, 10.3.27, 10.3.28, 10.3.30, 10.3.31, 10.4.1, 10.4.2, 10.4.3, 10.4.5, 10.4.8, 10.5.1, 10.5.2, 10.5.4, 10.5.5, 10.5.7, 10.5.8, 10.5.9, 10.5.10, 10.5.11, 10.5.12, 10.7.1, 10.7.2, 10.7.3, 10.7.4, 10.7.5, 10.7.7, 10.7.9, 10.7.10, 10.7.11, 10.7.12, 10.7.13, 10.9.1, 10.9.2, 10.9.3, 10.9.5, 10.10.1, 10.10.3, 10.10.4, 10.10.5, 10.10.7, 11.2.1, 11.2.5, 11.3.1, 11.3.2, 11.3.3, 11.3.4, 11.3.6, 11.3.7, 11.3.8, 11.3.9, 11.3.10, 11.3.12, 11.3.13, 11.3.14, 11.3.15, 11.3.16, 11.3.17, 11.3.18, 11.3.19, 11.3.23, 11.3.25, 11.3.27, 11.3.28, 11.3.29, 11.3.30, 11.3.35, 11.3.36, 11.3.37, 11.3.38, 11.3.39, 11.4.2, 11.4.3, 11.4.5, 11.4.8, 11.4.10, 11.4.12, 11.4.13, 11.5.1, 11.5.2, 11.5.3, 11.5.4, 11.5.5, 11.5.8, 11.5.9, 11.5.12, 11.5.13, 11.5.14, 11.5.17, 11.5.20, 11.5.21, 11.7.1, 11.7.2, 11.7.4, 11.7.6, 11.8.2, 11.8.4, 11.8.5, 11.8.8, 11.8.9, 11.8.11, 11.8.12, 11.8.14, 11.8.15, 11.9.2, 11.9.3, 11.9.7, 11.9.9, 11.9.14, 11.10.1, 11.10.4, 11.10.6, 11.10.7, 11.10.11, 11.10.12, 11.10.13, 11.11.1, 11.11.3, 11.11.4, 11.11.6, 11.11.7, 11.11.8, 11.11.9, 11.11.10, 11.11.11, 11.11.15, 11.11.16, 11.11.19, 11.11.20, 11.12.1, 11.12.2, 11.12.3, 11.12.5, 11.12.6, 11.12.7, 11.12.8, 11.12.9, 11.12.10, 11.12.11, 11.12.12, 11.12.13, 11.12.14, 11.12.17, 11.12.20, 12.2.5, 12.2.6, 12.2.7, 12.2.10, 12.2.11, 12.3.3, 12.3.6, 12.3.10, 12.3.12, 12.3.14, 12.3.18, 12.3.19, 12.5.1, 12.5.2, 12.5.4, 12.5.5, 12.5.7, 12.5.8, 12.5.11, 12.5.12, 12.7.1, 12.7.2, 12.8.14, 12.8.16, 12.8.17, 12.8.19, 12.9-10.5, 12.9-10.7, 12.9-10.8, 12.9-10.12, 12.9-10.13, 12.9-10.25, 12.9-10.26, 12.9-10.28, 12.11.5, 12.11.7, 12.11.8, 12.11.14, 12.11.15, 12.11.20, 12.11.21, 12.11.22, 12.11.24, 12.11.25, 12.11.26, 12.11.27, 12.11.28, 12.12.7, 12.12.8, 12.12.9, 12.12.12, 12.12.14, 12.12.21, 12.12.22, 12.12.23, 12.12.24, 12.12.25, 12.12.27, 13.3.1, 13.3.4, 13.3.7, 13.11.1, 13.11.3, 13.11.4, 13.11.8, 13.12.2, 13.12.3, 13.12.5, 13.12.8, 13.12.9, 13.12.10.

APPENDIX B: FLORA AND FAUNA SPECIES LIST

Table B1: Flora Species List

Family	Species	Common Name	QLD Status[1]	Cmwlth Status[2]
Amaranthaceae	*Achyranthes aspera*	Chaff flower	LC	Not listed
Amaranthaceae	*Alternanthera nana*	Hairy joyweed	LC	Not listed
Apocynaceae	*Carissa ovata*	Currantbush	LC	Not listed
Apocynaceae	*Cryptostegia grandiflora*	Rubber vine	R	WoNS
Asteraceae	*Parthenium hysterophorus*	Parthenium	R	WoNS
Boraginaceae	*Ehretia membranifolia*	Weeping koda	LC	Not listed
Cactaceae	*Harrisia martinii*	Harrisia cactus	R	Not listed
Cactaceae	*Opuntia tomentosa*	Common prickly pear	R	Not listed
Capparaceae	*Apophyllum anomalum*	Warrior Bush	LC	Not listed
Capparaceae	*Capparis lasiantha*	Nipan	LC	Not listed
Casuarinaceae	*Casuarina cristata*	Belah	LC	Not listed
Celastraceae	*Denhamia oleaster*	Stiff denhamia	LC	Not listed
Chenopodiaceae	*Enchylaena tomentosa*	Ruby saltbush	LC	Not listed
Chenopodiaceae	*Sclerolaena tetracuspis*	Brigalow Burr	LC	Not listed
Combretaceae	*Terminalia oblongata*	Yellow wood	LC	Not listed
Convolvulaceae	*Evolvulus alsinoides*	Baby blue eyes	LC	Not listed
Erythroxylaceae	*Erythroxylum australe*	Cocaine Tree	LC	Not listed
Fabaceae	*Macroptilium lathyroides*	Phasey bean	I	Not listed
Lamiaceae	*Clerodendrum floribundum*	Lolly bush	LC	Not listed
Leguminosae	*Acacia excelsa*	Ironwood wattle	LC	Not listed
Leguminosae	*Acacia harpophylla*	Brigalow	LC	Not listed
Leguminosae	*Acacia salicina*	Sally wattle	LC	Not listed
Leguminosae	*Cassia brewsteri*	Leichardt bean	LC	Not listed
Leguminosae	*Lysiphyllum carronii*	Bauhinia	LC	Not listed
Leguminosae	*Rhynchosia minima*	Rhynchosia	LC	Not listed
Leguminosae	*Sesbania cannabina*	Sesbania pea	LC	Not listed
Leguminosae	*Stylosanthes scabra*	Shrubby stylo	I	Not listed
Malvaceae	*Malvastrum americanum*	Malvestrum	I	Not listed
Malvaceae	*Sida cordifolia*	Flannelweed	I	Not listed
Malvaceae	*Sida trichopoda*	Creeping sida	LC	Not listed
Meliaceae	*Owenia acidula*	Emu apple	LC	Not listed
Myrtaceae	*Corymbia dallachiana*	Dallachy's ghost gum	LC	Not listed
Myrtaceae	*Corymbia erythrophloia*	Variable-barked bloodwood	LC	Not listed
Myrtaceae	*Eucalyptus cambageana*	Dawson gum	LC	Not listed
Myrtaceae	*Eucalyptus populnea*	Poplar box	LC	Not listed
Myrtaceae	*Eucalyptus tereticornis*	Forest red gum	LC	Not listed
Phyllanthaceae	*Breynia oblongifolia*	Coffee bush	LC	Not listed
Poaceae	*Bothriochloa pertusa*	Indian bluegrass	I	Not listed
Poaceae	*Cenchrus ciliaris*	Buffel grass	I	Not listed

Family	Species	Common Name	QLD Status[1]	Cmwlth Status[2]
Poaceae	*Chloris gayana*	Rhodes grass	I	Not listed
Poaceae	*Dichanthium fecundum*	Curly bluegrass	LC	Not listed
Poaceae	*Enteropogon acicularis*	Curly windmill grass	LC	Not listed
Poaceae	*Entolasia stricta*	Wiry panic	LC	Not listed
Poaceae	*Eriochloa crebra*	Spring grass	LC	Not listed
Poaceae	*Heteropogon contortus*	Black speargrass	LC	Not listed
Poaceae	*Iseilema vaginiflorum*	Small flinders grass	LC	Not listed
Poaceae	*Megathyrsus maximus*	Guinea grass	I	Not listed
Poaceae	*Melinis repens*	Red natal grass	I	Not listed
Poaceae	*Panicum decompositum*	Native millet	LC	Not listed
Poaceae	*Panicum effusum*	Hairy panic	LC	Not listed
Poaceae	*Paspalidium caespitosum*	Brigalow Grass	LC	Not listed
Poaceae	*Sporobolus caroli*	Fairy grass	LC	Not listed
Poaceae	*Themeda triandra*	Kangaroo grass	LC	Not listed
Poaceae	*Urochloa mosambicensis*	Sabi grass	I	Not listed
Pteridaceae	*Cheilanthes sieberi*	Mulga fern	LC	Not listed
Rhamnaceae	*Alphitonia excelsa*	Soap tree	LC	Not listed
Rhamnaceae	*Ventilago viminalis*	Supplejack	LC	Not listed
Rutaceae	*Citrus glauca*	Desert lime	LC	Not listed
Rutaceae	*Flindersia dissosperma*	Leopardwood	LC	Not listed
Santalaceae	*Santalum lanceolatum*	Tropical sandalwood	SLC	Not listed
Sapindaceae	*Alectryon diversifolius*	Scrub boonaree	LC	Not listed
Sapindaceae	*Alectryon oleifolius*	Boonaree	LC	Not listed
Sapindaceae	*Atalaya hemiglauca*	Whitewood	LC	Not listed
Sapindaceae	*Dodonaea viscosa*	Sticky hopbush	LC	Not listed
Scrophulariaceae	*Eremophila deserti*	Ellangowan poison bush	LC	Not listed
Scrophulariaceae	*Eremophila mitchellii*	Bastard sandalwood	LC	Not listed
Solanaceae	*Solanum parvifolium*	Small-leaved nightshade	LC	Not listed
Sparrmanniaceae	*Grewia latifolia*	Dysentery plant	LC	Not listed
Verbenaceae	*Lantana camara*	Lantana	R	Not listed
Verbenaceae	*Verbena bonariensis*	Purpletop	I	Not listed

[1]LC = Least Concern, SLC = Special least concern, V = Vulnerable under the NC Act. I = Introduced as per the 2021 QLD Flora Census. R = Restricted Matter under the *Biosecurity Act 2014.*

[2]E = Endangered under the EPBC Act. WoNS = Weed of National Significance under the Australian Weeds Strategy (2017-2027). Not listed = Not listed under the EPBC Act.

Table B2: Fauna Species List

Fauna Group	Species	Common Name	QLD Status[1]	Cmwlth Status[2]
Amphibian	*Cyclorana alboguttata*	Greenstripe frog	LC	Not listed
Amphibian	*Litoria caerulea*	Common green tree frog	LC	Not listed
Amphibian	*Litoria latopalmata*	Broad palmed rocket frog	LC	Not listed
Amphibian	*Litoria inermis*	Bumpy rocketfrog	LC	Not listed
Amphibian	*Rhinella marina**	Cane Toad	I	Not listed
Aves	*Accipiter fasciatus*	Brown goshawk	LC	Not listed
Aves	*Acrocephalus australis*	Australian reedwarbler	LC	Not listed
Aves	*Aegotheles cristatus*	Australian owlet-nightjar	LC	Not listed
Aves	*Anas superciliosa*	Pacific black duck	LC	Not listed
Aves	*Aquila audax*	Wedge-tailed eagle	LC	Not listed
Aves	*Ardea alba*	Great egret	LC	Not listed
Aves	*Ardea pacifica*	White-necked heron	LC	Not listed
Aves	*Ardeotis australis*	Australian bustard	LC	Not listed
Aves	*Artamus cinereus*	Black-faced woodswallow	LC	Not listed
Aves	*Cacatua galerita*	Sulphur-crested cockatoo	LC	Not listed
Aves	*Centropus phasianinus*	Pheasant coucal	LC	Not listed
Aves	*Chlamydera maculata*	Spotted Bowerbird	LC	Not listed
Aves	*Cisticola exilis*	Golden-headed cisticola	LC	Not listed
Aves	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	LC	Not listed
Aves	*Corvus orru*	Torresian crow	LC	Not listed
Aves	*Cracticus nigrogularis*	Pied Butcherbird	LC	Not listed
Aves	*Cracticus torquatus*	Grey Butcherbird	LC	Not listed
Aves	*Cracticus tibicen*	Australian Magpie	LC	Not listed
Aves	*Dacelo leachii*	Blue-winged Kookaburra	LC	Not listed

Fauna Group	Species	Common Name	QLD Status[1]	Cmwlth Status[2]
Aves	*Dicaeum hirundinaceum*	Mistletoebird	LC	Not listed
Aves	*Dicrurus bracteatus*	Spangled Drongo	LC	Not listed
Aves	*Eolophus roseicapilla*	Galah	LC	Not listed
Aves	*Eurystomus orientalis*	Dollarbird	LC	Not listed
Aves	*Gallinula tenebrosa*	Dusky moorhen	LC	Not listed
Aves	*Gavicalis virescens*	Singing Honeyeater	LC	Not listed
Aves	*Geopelia placida*	Peaceful Dove	LC	Not listed
Aves	*Malurus melanocephalus*	Red-backed Fairy-wren	LC	Not listed
Aves	*Manorina flavigula*	Yellow-throated Miner	LC	Not listed
Aves	*Merops ornatus*	Rainbow Bee-eater	LC	Not listed
Aves	*Milvus migrans*	Black kite	LC	Not listed
Aves	*Neochmia modesta*	Plum-headed finch	LC	Not listed
Aves	*Ninox boobook*	Southern Boobook	LC	Not listed
Aves	*Ocyphaps lophotes*	Crested Pigeon	LC	Not listed
Aves	*Pachycephala rufiventris*	Rufous Whistler	LC	Not listed
Aves	*Pardalotus striatus*	Striated Pardalote	LC	Not listed
Aves	*Phalacrocorax varius*	Australian pied cormorant	LC	Not listed
Aves	*Philemon corniculatus*	Noisy friarbird	LC	Not listed
Aves	*Platycercus adscitus*	Pale-headed Rosella	LC	Not listed
Aves	*Plectorhyncha lanceolata*	Striped Honeyeater	LC	Not listed
Aves	*Podargus strigoides*	Tawny Frogmouth	LC	Not listed
Aves	*Rhipidura leucophrys*	Willie wagtail	LC	Not listed
Aves	*Smicrornis brevirostris*	Weebill	LC	Not listed
Aves	*Struthidea cinerea*	Apostlebird	LC	Not listed
Mammalia	*Macropus giganteus*	Eastern Grey Kangaroo	LC	Not listed

Fauna Group	Species	Common Name	QLD Status[1]	Cmwlth Status[2]
Mammalia	*Oryctolagus cuniculus**	Rabbit	R (Cat 3,4,5,6)	Not listed
Mammalia	*Petauroides volans / Petauroides volans sensu lato*	Greater glider	E	E
Mammalia	*Petaurus norfolcensis*	Squirrel Glider	LC	Not listed
Mammalia	*Sus scrofa**	Feral Pig	R (Cat 3,4,5,6)	Not listed
Mammalia	*Trichosurus vulpecula*	Common Brushtail Possum	LC	Not listed
Reptilia	*Carlia munda*	Shaded-litter rainbow-skink	LC	Not listed
Reptilia	*Cryptophis nigrostriatus*	Black-striped snake	LC	Not listed
Reptilia	*Denisonia maculata*	Ornamental snake	V	V
Reptilia	*Gehyra dubia*	Dubious dtella	LC	Not listed
Reptilia	*Heteronotia binoei*	Bynoe's Gecko	LC	Not listed
Reptilia	*Hoplocephalus bitorquatus*	Pale-headed snake	LC	Not listed
Reptilia	*Morelia spilota*	Carpet python	LC	Not listed
Reptilia	*Pogona barbata*	Common bearded dragon	LC	Not listed

[1]LC = Least Concern under NC Act. I = Introduced species as per the WildNet Database. R (Cat 3,4,5,6) = Category 3,4,5,6 Restricted Matter under the *Biosecurity Act 2014.*

[2] E = Endangered; V = Vulnerable; Not listed = Not listed under the EPBC Act.

APPENDIX C: LIKELIHOOD OF OCCURRENCE ASSESSMENT

Table C1: Likelihood of Occurrence of Fauna Species

Species	Status[1]	Distribution and habitat requirements	Potential habitat in Project Area			Records	LOO
			Preferred	Suitable	Marginal		
Aves							
Sharp-tailed Sandpiper (*Calidris acuminata*)	V	In Queensland, the sharp-tailed sandpiper is widespread and recorded in most regions along much of the coast. They are very sparsely scattered inland, particularly in the central and southwestern regions. The sharp-tailed sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline salt lakes inland.	**No** The Project area does not contain waterbodies with muddy margins and shallow water areas with emergent semi-aquatic vegetation.			**Yes** An ALA record occurs, sourced from BirdLife Australia, 27km from the Project area, recorded in 2001.	**Unlikely**
Curlew Sandpiper (*Calidris ferruginea*)	CE	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 occur in both fresh and brackish waters. In Australia, curlew sandpipers occur around the coasts and are also quite widespread inland, though in smaller numbers.	**No** The Project area does not contain mudflat areas surrounding wetlands, waterholes or farm dams.			**No** No ALA records occur within a 60km search radius from the Project area. The closest ALA record exists 75km towards the coast, sourced from the Ocean Biodiversity Information System, recorded in 2019. A number of other ALA records exist along the coast over 130km east of the Project area.	**Unlikely**

Species	Status[1]	Distribution and habitat requirements	Potential habitat in Project Area			Records	LOO
			Preferred	Suitable	Marginal		
Red Goshawk (*Erythrotriorchis radiatus*)	E	The red goshawk occurs mostly in extensive areas of coastal and subcoastal open forest and woodland that support a mosaic of vegetation types. The vegetation types include eucalypt woodland, open forest, tall open forest, gallery rainforest, swamp sclerophyll forest, and rainforest margins. Permanent water (watercourses and wetlands) is usually present in close proximity, with tall emergent trees used for nesting. The red goshawk is thought to have a very large home range covering between 50 and 220 square kilometres. Sparsely distributed across coastal and sub-coastal Australia, from the western Kimberly to northern New South Wales. Appears to have been a contraction in range in recent years. Occasionally recorded from gorge country in central Australia and western Queensland.	**No** The Project area does not contain vegetation communities which include large nesting trees (e.g., vegetation of approximately 30m in height). The proximity of the Phillips Creek to these vegetation communities may provide habitat for this species.		**Yes** The Project area may provide marginal habitat in the form of a mosaic of degraded habitats for individuals to forage.	**No** No records have been identified within a 60 km search radius of the Project area. This search extent was adopted to account for the potential presence of highly mobile or wide-ranging species and align with standard desktop assessment practices. The absence of records within this radius supports a low likelihood of occurrence within the Project area.	**Unlikely**
Grey Falcon (*Falco hypoleucos*)	V	The grey falcon is endemic to mainland Australia, occurring in arid and semi-arid regions including the Murray-Darling Basin, Eyre Basin, central Australia and Western Australia. The species occurs at low densities across its range and is reported to be absent from the Cape York Peninsula, as well as areas east of the Great Dividing Range in Queensland and New South Wales. The grey falcon occurs in timbered lowland plains, particularly Acacia shrublands that are crossed by tree-lined water courses. It has also been observed foraging in treeless areas, tussock grassland and open woodland. At night, roosting may occur on areas of bare ground. When breeding this species utilises the	**No** The Project area contains low shrubland and open plain areas and the Phillips creek is adjacent, which is more likely to be utilised by this	**No** The Project area contains low shrubland and open plain areas, and the Phillips Creek is adjacent which is more likely to be utilised by this species. Moranbah does	**No** The Project area contains low shrubland and open plain areas, however no recent records to support the occurrence of this species in the local area.	**No** No ALA records have been identified within a 60km search radius from the Project area. Species was recorded at Saraji Mine by EcoServe in 2005, as noted by AECOM (2023b), however	**Unlikely**

Species	Status[1]	Distribution and habitat requirements	Potential habitat in Project Area			Records	LOO
			Preferred	Suitable	Marginal		
		disused nests of other raptors or corvids. Nests that occur in the tallest trees along watercourses, particularly *Eucalyptus camaldulensis* and *E. coolabah*, are preferred. However, like other falcons this species may also nest in telecommunication towers. ***Preferred grey falcon habitat in central Queensland is defined as:*** *Riparian or wetland-fringing woodland occurring west of the Great Dividing Range and in areas which experience 500 mm of average annual rainfall or less (breeding and foraging).* ***Suitable grey falcon habitat in central Queensland is defined as:*** *Eucalyptus or Acacia-dominated open woodlands and shrublands and grasslands occurring west of the Great Dividing Range and in areas which experience 500 mm of average annual rainfall or less (foraging).* ***Marginal grey falcon habitat in central Queensland is defined as:*** *Riparian or wetland-fringing woodland in areas with less than 750 mm of average annual rainfall, east and west of the Great Dividing Range, within landscapes in which grey falcon has previously been detected.*	species. Moranbah does not receive less than 500 mm of rainfall and is not suited to the grey falcon.	not receive less than 500 mm of rainfall and is not suited to the grey falcon.		further details to confirm this record, including location is not provided.	
Latham's Snipe, Japanese Snipe (*Gallinago hardwickii*)	V/ MI	The Latham's snipe is a non-breeding visitor to southeastern Australia and is a passage migrant through northern Australia. It has been recorded along the east coast of Australia from Cape York Peninsula through to southeastern South Australia. In Queensland, the range extends inland over the eastern tablelands in southeastern Queensland. In Australia, the 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 such as swamps, flooded grasslands or heathlands, around bogs and other water bodies.	**No** The Project area does not contain waterbodies with muddy margins and shallow water areas with fringing vegetation. Areas of gilgai contain a high coverage of grass that makes it suitable for the species.			**Yes** Previous records have been recorded at Saraji Mine by EcoServe in 2005, as noted by AECOM (2023b). Additionally, an ALA record, sourced from eBird Australia, occurs about 29km north of	**Unlikely**

Species	Status[1]	Distribution and habitat requirements	Potential habitat in Project Area			Records	LOO
			Preferred	Suitable	Marginal		
						the Project area, recorded in 2025.	
Squatter pigeon (*Geophaps scripta scripta*)	V	This sub-species is now largely (if not wholly) restricted to Queensland, from the New South Wales border, north to the Burdekin River, west to Charleville and Longreach, and east to the coast to Townsville and Proserpine. The Squatter pigeon occurs in dry grassy woodland and open forest, mostly in sandy and gravel areas close to water. Breeding and foraging habitat is centralised around water resources such as dams and creeks (1-3 km). This sub-species is ground-dwelling that inhabits the grassy understorey of open eucalypt woodland, as well as sown grasslands with scattered remnant trees, disturbed areas (such as roads, railways, settlements and stockyards), scrubland, and Acacia regrowth. ***Preferred Squatter pigeon habitat in central Queensland is defined as:*** *Remnant or regrowth grassy open forest to woodland dominated by Eucalyptus, Corymbia, Callitris or Acacia with patchy, relatively sparse ground cover vegetation (33 %) and sparse shrub layer on well-draining sandy, loamy or gravelly soils within 1 km of a suitable permanent waterbody. Preferred habitat may be located on land zones 3, 5, 7, 8, 9 and 10.* ***Suitable Squatter pigeon habitat in central Queensland is defined as:*** *Remnant or regrowth grassy open forest to woodland dominated by Eucalyptus, Corymbia, Callitris or Acacia with patchy, relatively sparse ground cover vegetation (<33 %) on well-draining sandy, loamy or gravelly soils between 1 and 3 km of a suitable permanent or seasonal waterbody. Non-remnant areas are within 100 m of preferred habitat. Suitable habitat may be located on land zones 3, 5, 7, 8, 9 and 10.*	**No** The Project area contains Eucalypt woodland with grassy understorey; however, it is considered that the abundance of introduced grass species as well as the high coverage of vegetated groundcover within these habitats limits the suitability of habitat to meet preferred habitat definition. The Project area occurs within 1km of permanent	**No** The Project area contains Eucalypt woodland with grassy understorey; however, it is considered that the abundance of introduced grass species as well as the high coverage of vegetated groundcover within these habitats limits the suitability of habitat to meet preferred habitat definition. The Project area occurs within 1km of permanent artificial dams and the Phillips Creek.	**Yes** The Project area contains regrowth, remnant and non-remnant areas of vegetation that facilitate dispersal between other areas of preferred habitat within the Project area.	**Yes** Two (2) sightings of Squatter pigeon occur approximately 4km northwest and about six (6) records occur 8km northwest of the Project area as identified in BAAM (2021). Many other records occur nearby, identified as a result of ecological surveys undertaken (URS Australia, 2014; Pembroke Resources South Pty Ltd, 2017; AECOM, 2020; METServe, 2023).An additional ALA record occurs 11km from the Project area, sourced from eBird Australia in 2019.	**Potential**

Species	Status[1]	Distribution and habitat requirements	Potential habitat in Project Area			Records	LOO
			Preferred	Suitable	Marginal		
		Marginal Squatter pigeon habitat in central Queensland is defined as: *Non-remnant areas, regrowth and remnant woodland or forest areas more than 3 km from a permanent or seasonal waterbody that facilities the movement of the species between patches of preferred or suitable habitat.*	artificial dams and the Phillips Creek.				
Painted honeyeater (*Grantiella picta*)	V	The species is sparsely distributed from southeastern Australia to northwestern Queensland and eastern Northern Territory. The greatest concentrations and almost all records of breeding come from south of 26º S, on inland slopes of the Great Dividing Range between the Grampians, Victoria and Roma, Queensland. The painted honeyeater occurs in dry forests and woodlands, where its primary food is mistletoes in the genus *Amyema*, though it will also take some nectar and insects. It is also known to occur in riparian woodland communities dominated by eucalypt species such as *Eucalyptus camaldulensis*, although its breeding distribution is dictated by the presence of mistletoes which are largely restricted to older trees. ***Preferred painted honeyeater habitat in central Queensland is defined as:*** *Acacia-dominated woodlands, primarily Acacia pendula, Acacia harpophylla and Acacia homalophylla, infected with the grey mistletoe (Amyema quandang). These features are required to establish breeding territories, which are generally located south of Roma.* ***Suitable painted honeyeater habitat in central Queensland is defined as:*** *Eucalypt and Acacia-dominated Forest/woodlands (remnant and regrowth), with moderate to high abundance of mistletoes provide foraging resources (fruit & nectar) across the species' migratory range.*	**No** The Project area does not occur within the species breeding territory and does not contain a high abundance of mistletoe to support nesting individuals.	**No** The Project area does contain vegetation which consists of Eucalypt and Acacia dominated woodland (remnant and regrowth) however these vegetation communities do not contain a high abundance of mistletoe to support foraging individuals.	**No** No occurrences of mistletoe, which could be used by foraging individuals dispersing through the area, have been identified as present within the Project area.	**No** No records by ALA occur within a 60km search radius from the Project area. A record of the species was reported to occur in a property adjacent to Saraji Mine (AECOM, 2023b); however further details to confirm this record are not provided.	**Unlikely**

Species	Status[1]	Distribution and habitat requirements	Potential habitat in Project Area			Records	LOO
			Preferred	Suitable	Marginal		
		Marginal painted honeyeater habitat in central Queensland is defined as: *Remnant and regrowth forest/woodlands with a low to infrequent mistletoe.*					
Star Finch (eastern), Star Finch (southern) (*Neochmia ruficauda ruficauda*)	E	The star finch (eastern) occurs mainly in grasslands and grassy woodlands that are located close to bodies of fresh water. It also occurs in cleared or suburban areas such as along roadsides and in towns. Studies at nine former sites of the star finch (eastern) found that the habitat consisted mainly of woodland. These habitats are dominated by trees that are typically associated with permanent water or areas that are regularly inundated; the most common species are *Eucalyptus coolabah, E. tereticornis, E. tessellaris, E. camaldulensis, Melaleuca leucadendra* and *Casuarina cunninghamii.* Based on the small number of accepted records, the distribution of this species formerly extended from Bowen in central Queensland, south to the Namoi River in northern New South Wales, and west to the Blackall Range. Recent records have been obtained only from scattered sites in central Queensland (i.e. between 21°S and 25°S, and 141°E and 150°E) and, consequently, the star finch (eastern) now appears to be extinct in both southeastern Queensland and northern New South Wales.	**No** The Project area contains grassy woodlands, in remnant and high value regrowth condition. It is noted, however, that these habitats do contain an abundance of introduced grass species. The woodland habitats identified do fall within proximity of freshwater bodies, including the Phillips Creek and mine water storage facilities.		**Yes** The Project area contains grassy woodlands within close proximity of freshwater bodies, including the Phillips Creek and mine water storage facilities.	**No** No records have been identified within a 60 km search radius of the Project area. This search extent was adopted to account for the potential presence of highly mobile or wide-ranging species and align with standard desktop assessment practices. The absence of records within this radius supports a low likelihood of occurrence within the Project area.	**Unlikely**
Southern Black-throated Finch (*Poephila cincta cincta*)	E	The black-throated finch (southern) occurs at the Townsville region, where it is considered to be locally common, and at scattered sites in central-eastern Queensland (between Aramac and Great Basalt Wall National Park). Since 1998, birds likely to be of the southern subspecies have been recorded at the following sites and surrounding: • Townsville	**No** The Project area contains grassy open woodlands; however, there is a relatively low abundance of native grasses required by Southern black-throated finch.		**Yes** The Project area contains grassy woodlands. Additionally, these vegetation	**No** No records have been identified within a 60 km search radius of the Project area.	**Unlikely**

Species	Status[1]	Distribution and habitat requirements	Potential habitat in Project Area			Records	LOO
			Preferred	Suitable	Marginal		
		• Ingham • Scattered sites in central-eastern Queensland (Great Basalt Wall, Yarrowmere Station, Moonoomoo Station, Doongmabulla Station, Fortuna Station and Aramac). The black-throated finch (southern) occurs mainly in grassy, open woodlands and forests, typically dominated by Eucalyptus (*E. crebra, E. camaldulensis, E. melanophloia, E. brownie, E. similis, E. tereticornis*) Corymbia and Melaleuca species. It occasionally occurs in tussock grasslands or other habitats, such as freshwater wetlands, along or near watercourses and waterbodies. Almost all recent records of the finch from south of the tropics have been in riparian habitat. The subspecies is thought to require a mosaic of different habitats in which it can find seed during the wet season. It occasionally occurs in Melaleuca woodlands, or in grasslands comprised of *Astrebla*, *Dichanthium* or *Panicum* spp. In NSW, the most recent records have been in riparian vegetation dominated by River sheoak (*Casuarina cunninghamiana*) and Rough-barked Apple (*Angophora floribunda*). Around Inverell, the subspecies was formerly recorded in riparian vegetation consisting of thickets of Yellow Tea-tree (*Leptospermum flavescens*) and Melaleuca, and dense stands of River Sheoak. In southeastern Queensland, it was formerly recorded in open forest on ridges, grassy hillsides, and mountain flats.			communities are located near freshwater waterbodies, including mine water storage facilities and the Phillips Creek.	This search extent was adopted to account for the potential presence of highly mobile or wide-ranging species and align with standard desktop assessment practices. The absence of records within this radius supports a low likelihood of occurrence within the Project area.	
Australian Painted Snipe (*Rostratula australis*)	E	This species has been recorded from wetlands in all Australian states, however, is most common in eastern Australia, especially the Murray-Darling Basin. Individuals are nomadic, and there is some evidence of partial migration from southeastern wetlands to coastal central and northern Queensland in autumn and winter.	**No** Shallow ephemeral or freshwater wetlands occur within	**No** Shallow ephemeral or freshwater wetlands occur within the Project	**N/A**	**Yes** A record occurs about 4km north of the Project area as identified in AECOM, 2023b. The closest	**Unlikely**

Species	Status[1]	Distribution and habitat requirements	Potential habitat in Project Area			Records	LOO
			Preferred	Suitable	Marginal		
		Preferred habitat includes shallow inland wetlands, brackish or freshwater, that are permanently or temporarily inundated. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of lignum Muehlenbeckia canegrass or Melaleuca. Breeding habitat requirements may be quite specific: shallow wetlands with areas of bare wet mud and both upper and canopy cover nearby. ***Preferred Australian painted snipe habitat in central Queensland is defined as:*** *Shallow, permanent or ephemeral, freshwater wetlands which provide areas of bare, exposed wet mud and a mosaic of ground cover (tufted grasses, sedges, small woody plants).* ***Suitable Australia painted snipe habitat in central Queensland is defined as:*** *Shallow permanent or ephemeral freshwater or brackish wetlands and other inundated/waterlogged areas with a variable ground cover (e.g. grasses, shrubs and rushes).*	the Project area in the form of gilgai. The associated areas of bare, exposed wet mud and mosaic of ground cover is not present.	area in the form of giglai. The Project area does not exhibit inundated or waterlogged areas with variable groundcover.		ALA record occurs 18km to the west, however this source is unreliable and recorded in 1984. The next closest record exists 22km to the east, recorded with photographic evidence through OzAtlas in 2017.Further, another record occurs about 55 km north of the Project area (Pembroke Resources South Pty Ltd, 2017).	
Diamond Firetail (*Stagonopleura guttata*)	V	The diamond firetail (*Stagonopleura guttata*) can be found across the southeastern corner of Australia, in Qld, NSW, Victoria and South Australia. They prefer sparse forest types such as acacia or casuarina woodlands, open forests, grasslands, farmland and vegetated watercourses. High grass cover with few large logs and low leaf litter cover is favoured. However, they roost in dense shrubs or nests built specifically for roosting. Nests are often built into the base of bird of prey stick nests, including whistling kite (*Haliastur sphenurus*), white-bellied seaeagle (*Haliaeetus leucogaster*), wedge-tailed eagle (*Aquila audax*), brown falcon (*Falco berigora*), nankeen kestrel (*Falco cenchroides*) or a square-tailed kite (*Lophoictinia isura*) or among prickly shrubs.	**Yes** The Project area contains open woodlands which are dominated by *Acacia harpophylla* and *Casuarina cristata*. The Project area additionally includes grassy open woodlands, with regrowth *Acacia harpophylla.*			**No** No records have been identified within a 60 km search radius of the Project area. This search extent was adopted to account for the potential presence of highly mobile or wide-ranging species and align with standard desktop assessment practices. The absence	**Unlikely**

Species	Status[1]	Distribution and habitat requirements	Potential habitat in Project Area			Records	LOO
			Preferred	Suitable	Marginal		
		Feeding occurs predominantly at ground level and dispersal appears sedentary, although local movement may occur.				of records within this radius supports a low likelihood of occurrence within the Project area.	
Common Greenshank, Greenshank (*Tringa nebularia*)	E/ MI	In Queensland, the common greenshank is widespread in the Gulf country and eastern Gulf of Carpentaria. It has been recorded in most coastal regions, possibly with a gap between north Cape York Peninsula and Cooktown. Inland, there have been a few records south of a line from near Dalby to Mount Guide, and sparsely scattered records elsewhere. It is found in a wide variety of inland wetlands and sheltered coastal habitats of varying salinity, typically within large mudflats, saltmarshes, mangroves or seagrass. This can include embayments, harbours, river estuaries, deltas and lagoons and, to a lesser extent, tidal pools, rock-flats and rock platforms.	**No** The Project area does not contain large, vegetated waterbodies.			**Yes** An ALA record, sourced from BirdLife Australia, occurs 27km northwest from the Project area, recorded in 2001.	**Unlikely**
Mammal							
Northern Quoll (*Dasyurus hallucatus*)	E	In Queensland, the northern quoll is known to occur as far south as Gracemere and Mount Morgan, south of Rockhampton, as far north as Weipa in Queensland and extends as far west into central Queensland to the vicinity of Carnarvon Range National Park. The northern quoll occupies a diversity of habitats across its range which includes rocky areas, eucalypt forest and woodlands, rainforests, sandy lowlands and beaches, shrubland, grasslands and desert. The northern quoll is also known to occupy non rocky lowland habitats such as beach scrub communities in central Queensland. Northern quoll habitat generally encompasses some	**No** The Project area contains eucalypt and acacia forest however these habitat types do not contain an abundance of hollow logs for denning and does not contain or occur within proximity to rocky areas for denning and foraging purposes.			**No** No records have been identified within a 60 km search radius of the Project area. This search extent was adopted to account for the potential presence of highly mobile or wide-ranging species and	**Unlikely**

Species	Status[1]	Distribution and habitat requirements	Potential habitat in Project Area			Records	LOO
			Preferred	Suitable	Marginal		
		form of rocky area for denning purposes with surrounding vegetated habitats used for foraging and dispersal.				align with standard desktop assessment practices. The absence of records within this radius supports a low likelihood of occurrence within the Project area.	
Ghost Bat (*Macroderma gigas*)	V	*Macroderma gigas* is endemic to Australia. In Queensland this species is currently distributed in only 4-5 highly disjunct populations along the coast and inland from the McIlwraith Range in Cape York to Rockhampton. The major colony of *M. gigas* occurs at Mount Etna, but also occurs in the northern Pilbara and Kimberley in Western Australia, and the top end of the Northern Territory. Regional populations of *M. gigas* are centred on permanent maternity roosts that are genetically isolated from each other. Roost sites are deep natural caves or disused mines with a specific microclimate, that have a relatively stable temperature, a moderate to high relative humidity, and ceilings at least 2 m above the floor. In the cooler months, *M. gigas* use large numbers of caves, rock shelters, overhangs, vertical cracks, and mines as day roosts. It occurs in a wide range of habitats from rainforest, monsoon and vine scrub in the tropics to open woodlands and arid areas. **Suitable ghost bat habitat in central Queensland is defined as:** • Roosting – any disused mine tunnels or escarpments with caves and crevices within ~200 km of the breeding roosts at Mt Etna and Cape Hillsborough. Roost sites are likely to be restricted to deeper caves and abandoned tunnels in the	**N/A**	**No** The Project area does not support the habitat types and roosting sites required by the Ghost Bat. There are no mine tunnels, escarpments, caves or crevices suitable for roosting in the Project area.	**N/A**	**No** No records have been identified within a 60 km search radius of the Project area. This search extent was adopted to account for the potential presence of highly mobile or wide-ranging species and align with standard desktop assessment practices. The absence of records within this radius supports a low likelihood of occurrence within the Project area.	**Unlikely**

Species	Status[1]	Distribution and habitat requirements	Potential habitat in Project Area			Records	LOO
			Preferred	Suitable	Marginal		
		central Queensland region, where cool winter nights would make more exposed, shallow overhangs unsuitable for at least the early part of the day. • Foraging – woodland, forest, wetland and cleared agricultural/pastoral land within ~3 km of daytime roosts.					
Corben's Long-eared Bat (*Nyctophilus corbeni*)	V	The southeastern long-eared bat is found in southern central Queensland, central western New South Wales, northwestern Victoria and eastern South Australia, where it is patchily distributed, with most of its range in the Murray Darling Basin. Most records are from inland of the Great Dividing Range. It is found in a wide range of inland woodland vegetation types, including box, ironbark and cypress pine woodlands, *Allocasuarina luehmannii* woodlands, *Acacia harpophylla* woodland, *Casuarina cristata* woodland, *Angophora costata* woodland, *Eucalyptus camaldulensis* forest, *E. largiflorens* woodland, and various types of tree mallee. This species is more abundant in extensive stands of vegetation in comparison to smaller woodland patches. Roosting occurs in tree hollows, crevices, and under loose bark. ***Preferred Corben's long-eared bat habitat in central Queensland is defined as** areas that comprise the following features in combination:* • *Woodland or open forest with a complex understorey, typically on land zones 5 and 7; occasionally land zones 3 and 10 and characterised by the following floristic associations: Canopy layer of Eucalyptus fibrosa subsp. nubilus and/or E. crebra and/or E. populnea and/or E. microcarpa/E. moluccana, often with Angophora leiocarpa and/or Corymbia spp., over a low tree layer of Callitris spp. and/or Allocasuarina luehmannii.* • *Centred around three key groups of regional ecosystems, including:*	**No** The Project area does not support habitat types with a complex understorey analogous to the key REs for the species.	**No** The Project area does not support the habitat types required by the Corben's Long-eared Bat. Due to lack of preferred habitat presence in the Project area, there is no adjacent suitable habitat.	**N/A**	**No** No records have been identified within a 60 km search radius of the Project area. This search extent was adopted to account for the potential presence of highly mobile or wide-ranging species and align with standard desktop assessment practices. The absence of records within this radius supports a low likelihood of occurrence within the Project area.	**Unlikely**

Species	Status[1]	Distribution and habitat requirements	Potential habitat in Project Area			Records	LOO
			Preferred	Suitable	Marginal		
		– *11.5.1 / 11.5.4 – cypress/bulloak/eucalypt on sandy or duplex soils; undulating plains.* – *11.7.4 / 11.7.7 – cypress/bulloak/eucalypt on shallow soils; low hills o 11.3.18 / 11.3.2 – poplar box/cypress/bulloak on sands and duplex soils; alluvial plains.* • *Large tract size i.e., greater than ~500 ha.* • *High stem-density of the low tree layer.* • *High density of dead trees especially Bulloak, cypress and eucalypts, which are critical for providing abundant roost microhabitat.* • *High abundance of hollows (especially in small diameter dead trees) is particularly important as they are used to a greater extent than fissures & loose bark.* ***Suitable Corben's long-eared bat habitat in central Queensland is defined as:** Areas adjacent and connected to areas of preferred habitat (noting particularly the requirement for large tract size), where vegetation is structurally and floristically similar to that of preferred habitat*.					
Greater glider (southern and central) (Petauroides volans)	E	Greater glider is restricted to eastern Australia, occurring from the Windsor Tableland in north Queensland through to central Victoria, with an elevational range from sea level to 1200 m above sea level. An isolated inland subpopulation occurs in the Gregory Range west of Townsville, and another in the Einasleigh. During the day, this species spends most of its time denning in hollowed trees, with each animal inhabiting up to twenty different dens within its home range. It is primarily folivorous, with a diet mostly comprising the leaves and flowers of Eucalyptus spp. The Greater glider is typically found in highest abundance in taller,	**No** Whilst the Project area does support the habitat types required by Greater glider, it is considered that these are too	**No** Denning habitat was identified with remnant RE11.5.3, due to the presence of hollow bearing trees. It is considered, however, that this vegetation	**No** The Project area does not exhibit marginal habitat as no preferred habitat was identified.	**Yes** Greater glider was identified during the field survey, located south of the Project area, within remnant vegetation set in association with Phillips Creek (refer to	**Unlikely within the Project area.** Known at Phillips Creek (south of Project area).

Species	Status[1]	Distribution and habitat requirements	Potential habitat in Project Area			Records	LOO
			Preferred	Suitable	Marginal		
		montane, moist eucalypt forests with relatively old trees and abundant hollows. ***Preferred Greater glider habitat in central Queensland is defined as:*** *Remnant, connected eucalypt woodlands containing one or more feed tree species and more than two hollow-bearing trees/ha, with hollows medium-large in size (> 10 cm entrance), usually on fertile, wetter soils of riparian zones. Preferred foraging and den trees include E. camaldulensis, E. tereticornis, E. fibrosa and Corymbia citriodora. The species has also been observed in Angophora floribunda, Eucalyptus cambageana, E. coolabah, E. crebra, E. laevopinea, E. moluccana, E. orgadophila, E. populnea, E. melanophloia and C. tessellaris in which it may use for foraging and/or denning.* ***Suitable Greater glider habitat in central Queensland is defined as:*** *Remnant eucalypt woodlands containing one or more feed tree species connected to areas of denning habitat that does not contain more than two hollo- bearing trees/ha, medium-large in size (> 10 cm entrance). Generally, within ~ 120 m of breeding / denning habitat, reflecting the home range of the species.* ***Marginal Greater glider habitat in central Queensland is defined as:*** *Remnant or high-value regrowth eucalypt vegetation adjacent to preferred Greater glider habitat where hollows are smaller and/or less frequent. Isolated patches of marginal habitat >100 m from adjacent habitat do not provide habitat for the species due to gliding capabilities. Remnant or high-value regrowth eucalypt vegetation on low fertility and low moisture soils, regardless of hollow-densities*.	fragmented to facilitate preferred habitat. This is further discussed in Section 4.2.4.3.	community is too fragmented to form suitable habitat.		Figure 14 for location sighted). About 4 records have been identified less than 500m east of the Project area (ELA, 2019b). Another 2 records were identified by BAAM (2021) about 200m south of the Project area, in association with Phillips Creek. Greater glider have also been identified in other ecological assessments undertaken in proximity to the Project area (Pembroke Resources South Pty Ltd, 2017; AECOM, 2020; METServe, 2023).	
Koala (*Phascolarctos cinereus*)	E	Koalas are found in eastern Australia, particularly along the coastline. In Queensland, their population extends from the wet	**No** The Project area supports	**No** The Project area supports the	**Yes** The Project area contains	**Yes** Records made less than 150m south	**Potential within the Project area.**

Species	Status[1]	Distribution and habitat requirements	Potential habitat in Project Area			Records	LOO
			Preferred	Suitable	Marginal		
		tropics in the north and as far west as Barcaldine and is highly concentrated in southeast Queensland. Koalas inhabit a range of temperate, sub-tropical and tropical forest, woodland and semi-arid communities dominated by *Eucalyptus* spp. Koalas eat a variety of eucalypt leaves and a few other related tree species, including *Lophostemon, Melaleuca* and *Corymbia* species. Koalas are found in higher densities where food trees are growing on more fertile soils and along watercourses. They do, however, remain in areas where their habitat has been partially cleared and in urban areas. ***Preferred Koala habitat in central Queensland is defined as:*** *contiguous remnant and high-value regrowth Eucalyptus open forest to woodlands on alluvial and/or cracked rock groundwater where palatable food tree species occur frequently (and are usually dominant). This specifically includes stream-fringing open forest, open forest or woodland on alluvial terraces where Eucalyptus tereticornis/camaldulensis are dominant or common subdominant elements. Other important food species on the alluvial terraces can include E. coolabah, E. crebra, E. melanophloia and E. populnea. These listed Eucalyptus species comprise a subsample of locally important Koala habitat trees in the Brigalow Belt across various geological contexts.* ***Suitable Koala habitat in central Queensland is defined as:*** *Remnant and regrowth Eucalyptus open forest to woodlands with more variable aquifers (often seasonal) and that have connectivity to other areas of suitable or preferred habitat. Must incorporate one or more palatable food tree species of relative abundance.* ***Marginal Koala habitat in central Queensland is defined as:*** *All other fragmented and sparsely distributed woodlands and open woodlands, shrub lands and forests, with some food trees and*	vegetation communities which contain Koala food trees; however, these communities do not occur on alluvial or cracked rock groundwater aquifer. Additionally, it is considered that the fragmented nature of these vegetation communities reduces accessibility by the Koala.	habitat community of the Koala and hosts a variety of Koala food trees. Additionally, it is considered that the fragmented nature of these vegetation communities reduces accessibility by Koala.	fragmented and sparsely distributed woodlands and open woodlands with some Koala food tree species.	(BAAM, 2021) and about 200m east (ELA, 2019b) from the Project area, in association with Phillips Creek. More than 5 records were observed on the western side of SRM (ELA, 2019b). Numerous other records have been made within about 20km of the Project area (URS Australia, 2014; Pembroke Resources South Pty Ltd, 2017; AECOM, 2020) There are ten (10) ALA records within 10km of the Project area, these have mixed reliability and are recorded between 2018 and 2023. The closest ALA record is roughly 750m west of the Project area, recorded with photographic evidence through the	Likely at Phillips Creek (south of Project area).

Species	Status[1]	Distribution and habitat requirements	Potential habitat in Project Area			Records	LOO
			Preferred	Suitable	Marginal		
		which experience significant seasonal water deficits and/or are subject to periodic high intensity fires.				BioCollect platform in 2021.	
Grey-headed Flying-fox *(Pteropus poliocephalus)*	V	Grey-headed flying-foxes occupy the coastal lowlands and slopes of eastern Australia, from Rockhampton in central Qld to Melbourne in Victoria. Areas of repeated occupation extend inland to the tablelands and western slopes in northern NSW and the tablelands in southern Qld. The areas of Brisbane, Newcastle, Sydney and Melbourne are occupied continuously. The grey-headed flying-fox roosts in camps in exposed tree branches, in vegetation ranging from continuous forest to small patches (1 ha). Major food sources for the grey-headed flying-fox includes the fruit and blossom of rainforest species, particularly Ficus spp., blossoms of Eucalyptus, Corymbia and Angophora, melaleucas, banksias and the fruit and flowers of Syzygium spp. They can disperse across various habitats and fragmented and degraded landscapes	**No** Although flowering and fruiting trees were identified during the field survey, the vegetation communities supporting these resources are disconnected. No roosting sites identified within the Project area or surrounds.	**N/A**	**Yes** Across the Project area, flowering and fruiting tree species were present.	**No** A record occurs more than 250km from the Project area, as identified from the Arrow Bowen Pipeline Referral (Ecological Survey & Management, 2011). No records have been identified within a 60 km search radius of the Project area.	**Unlikely**
Reptile							
Ornamental snake (*Denisonia maculata*)	V	Ornamental snake is known only from the Brigalow Belt North and parts of the Brigalow Belt South biogeographical regions. The core of the species distribution occurs within the drainage system of the Fitzroy and Dawson Rivers.	**Yes** The Project area has been ground truthed to	**Yes** One vegetation community (identified as Brigalow	**Yes** The Project area has been identified as containing two	**Yes** This species was recorded within the Project area twice during the 2024 field	**Known**

Species	Status[1]	Distribution and habitat requirements	Potential habitat in Project Area			Records	LOO
			Preferred	Suitable	Marginal		
		Ornamental snake is known to prefer woodlands and open forests associated with moist areas, particularly gilgai mounds and depressions in Queensland RE Land Zone 4, but also lake margins and wetlands. *D. maculata* habitat is likely to be found in *Acacia harpophylla, A. cambagei, A. argyrodendron* or Eucalyptus coolabah-dominated vegetation communities, or pure grassland associated with gilgais. ***Preferred Ornamental snake habitat in central Queensland is defined as:*** *Gilgai depressions (with or without the presence of Brigalow or other canopy vegetation), mounds and wetlands on cracking clays (predominantly land zone 4) where essential microhabitat features are present including an abundance of deep soil cracks. Other microhabitat features such as fallen woody debris may or may not be present. Seasonal flooding of habitat areas is a requirement.* ***Suitable Ornamental snake habitat in central Queensland is defined as:*** *Dispersal areas within 1 km of preferred habitat, which are currently or previously dominated by Brigalow or coolibah communities where gilgais or soil cracks are infrequent and/or shallow, including non-remnant areas.* ***Marginal Ornamental snake habitat in central Queensland is defined as:*** *Areas currently or previously dominated by Brigalow or coolibah communities where gilgais or soil cracks are infrequent or are shallow or non-remnant areas where threats are high (high abundance of weed incursion and cattle compacting soils) but the species still have potential to occur, especially in times where water is present and prey abundance (frogs) is high*.	contain one vegetation community (identified as Brigalow regrowth with frequent gilgai) which contains frequent, deep gilgai and with abundant, deep cracking soils. Numerous native frog species were identified as present within ponded water. The field survey identified the Ornamental snake this habitat.	woodland) has been identified located within 1km of preferred habitat, and as containing infrequent gilgai and cracking soils. This habitat contains a lower abundance of introduced ground stratum flora species than habitat identified as marginal.	vegetation communities which contain and infrequent or rare abundance of soil cracks and gilgai. Additionally, these habitat patches contain a relatively high abundance of introduced ground stratum flora species.	survey effort (refer to Figure 12 for sighting locations). Other fauna observations from BMA supplied data recorded seven (7) instances within or adjacent to the Project area. Other ecological assessments completed nearby have also identified records of Ornamental snake (Pembroke Resources South Pty Ltd, 2017; AECOM, 2020, 2023b) Additionally, ten (10) ALA records occur roughly 7km from the Project area recorded in between 2002 and 2010. No sources are provided for these records.	
Yakka Skink (*Egernia rugosa*)	V	The known distribution of the Yakka skink extends from the coast to the hinterland of sub-humid to semi-arid eastern Queensland. This vast area covers portions of the Brigalow Belt, Mulga Lands,	**No** Areas of remnant and	**N/A**	**Yes** The Project area exhibits marginal	**No** No records have been identified within a 60	**Unlikely**

Species	Status[1]	Distribution and habitat requirements	Potential habitat in Project Area			Records	LOO
			Preferred	Suitable	Marginal		
		Southeast Queensland, Einasleigh Uplands, Wet Tropics and Cape York Peninsula Biogeographical Regions. The Yakka skink is known from rocky outcrops, sand plain areas and dense ground vegetation, in association with open dry sclerophyll forest (ironbark) or woodland, Brigalow forest and open shrubland. In the Brigalow Belt bioregion, core habitat includes poplar box (*Eucalyptus populnea*) woodland, mulga (*Acacia aneura*) woodland, white cypress pine (*Callitris glaucophylla*); usually in association with eucalypt species such as *E. populnea*, *E. melanophloia* or *Corymbia tessellaris*, ironbark (typically *E. melanophloia*) woodland, and disturbed, treated and cleared areas of suitable habitat, grazed or ungrazed, where suitable microhabitat features still remain. Colonies have been found in large hollow-logs, cavities or burrows under large fallen trees, tree stumps, logs, stick-raked piles, large rocks and rock piles, dense ground-covering vegetation, and deeply eroded gullies, tunnels and sinkholes. ***Preferred yakka skink habitat in central Queensland is defined as:*** *Areas of remnant and regrowth woodlands and open woodlands, as well as non-remnant vegetation, with suitable light clay loam, loam and sandy loam substrates on land zones 3, 5, 7, 9 and 10 supporting microhabitat features including large hollow-logs, cavities or burrows under large fallen trees and/or tree stumps, log piles, large rocks and rock piles, deep rock crevices, deeply eroded gullies or sinkholes/areas of tunnel erosion. Preferred habitat may also be further constrained to areas within 10 km of a known occurrence.* ***Marginal yakka skink habitat in central Queensland is defined as:*** *Areas of remnant and regrowth woodlands and open woodlands, as well as non-remnant vegetation, with suitable light clay loam,*	regrowth woodlands, as well as non-remnant vegetation, with suitable clay loam and sandy loam substrates on land zones 3 and 5 have been identified within the Project area. These habitats do not support microhabitat features including hollow-logs, burrows and areas of tunnel erosion in densities high enough to support this species.		habitat for the Yakka skink on areas with light clay loam, loam and silty loam substrates.	km search radius of the Project area. This search extent was adopted to account for the potential presence of highly mobile or wide-ranging species and align with standard desktop assessment practices. The absence of records within this radius supports a low likelihood of occurrence within the Project area.	

Species	Status[1]	Distribution and habitat requirements	Potential habitat in Project Area			Records	LOO
			Preferred	Suitable	Marginal		
		loam and sandy loam substrates on land zones 3, 5, 7, 9 and 10 with only rare occurrences of microhabitat features.					
Southern Snapping Turtle, White-throated Snapping Turtle (*Elseya albagula*)	CE	The white-throated snapping turtle occurs only in Queensland in three catchments (Burnett, Mary and Fitzroy) and is considered a habitat specialist. It prefers clear, flowing, well-oxygenated water associated with their ability to extract oxygen from the water via cloacal respiration. The preferred habitat for this species is the permanent flowing reaches of the rivers that are characterised by steep sides, a sand-gravel substrate and an abundance of underwater refuge (e.g. rocks, logs and undercut banks). Populations occur at much lower densities where flow is reduced (upstream of dams, weirs etc.). Nesting in is primarily restricted to sand and loam alluvial deposits.	**No** The Project area does not support the habitat types required by the Southern Snapping Turtle or White-throated Snapping Turtle due to lack clear, flowing water.			**No** No records have been identified within a 60 km search radius of the Project area. This search extent was adopted to account for the potential presence of highly mobile or wide-ranging species and align with standard desktop assessment practices. The absence of records within this radius supports a low likelihood of occurrence within the Project area.	**Unlikely**
Dunmall's Snake (*Furina dunmalli*)	V	The Dunmall's snake occurs primarily in the Brigalow Belt region in the southeastern interior of Queensland. Records indicate sites at elevations between 200–500 m above sea level. It has been found in a broad range of habitats, including forests and woodlands on black alluvial cracking clay and clay loams dominated by *Acacia harpophylla*, *A. burrowii*, *A. deanei*, *A. leiocalyx*, *Callitris spp.* or *Allocasuarina luehmannii*; and various	**No** Remnant vegetation dominated by *Acacia harpophylla* on clay loam soils	**No** No preferred habitat identified within the Project area to support dispersal.	**No** The Project area does not support the habitat types required by the Dunmall's Snake due to lack of	**No** No records have been identified within a 60 km search radius of the Project area. This search extent was adopted to account	**Unlikely**

Species	Status[1]	Distribution and habitat requirements	Potential habitat in Project Area			Records	LOO
			Preferred	Suitable	Marginal		
		Corymbia citriodora, *Eucalyptus crebra* and *E. melanophloia*, *Callitris glaucophylla* and *Allocasuarina luehmannii* open forest and woodland associations on sandstone derived soils. Little is known about the ecological requirements of the Dunmall's snake; however, the species has been found sheltering under fallen timber and ground litter. ***Preferred Dunmall's snake habitat in central Queensland is defined as:*** *Areas of remnant vegetation dominated by Brigalow (Acacia harpophylla), lemon-scented gum (Corymbia citriodora) and/or ironbark (Eucalyptus crebra and E. melanophloia) occuring on alluvium, cracking clay soils or clay loam soils, supporting microhabitat features including large hollow-logs and other organic ground litter, at an elevation between 200 and 500 m above sea level.* ***Suitable Dunmall's snake habitat in central Queensland is defined as:*** *Dispersal areas (including regrowth) within 1 km of preferred habitat, dominated by Brigalow (Acacia harpophylla), lemon-scented gum (Corymbia citriodora) and/or ironbark (Eucalyptus crebra and E. melanophloia), but with few occurrences of fallen timber and deep soil cracks. Remnant vegetation dominated by Acacia species other than Brigalow, cypress pine (Callitris spp.), buloke (Allocasuarina luehmannii) or dry vine scrub, on Land Zones 3, 4, 5, 7, 9 and 10 and supporting microhabitat features including large hollow-logs and other organic ground litter, at an elevation between 200 and 500 m above sea level.* ***Marginal Dunmall's snake habitat in central Queensland is defined as:*** *Dispersal areas (including regrowth) connecting patches of preferred or suitable habitat, dominated by Acacia species other than Brigalow, cypress pine (Callitris species), buloke (Allocasuarina luehmannii) or dry vine scrub, on Land Zones 3, 4, 5,*	does not occur in the Project area. Additionally, the habitats identified as present within the Project area do not support microhabitat features including hollow-logs, burrows and areas of tunnel erosion in densities high enough to support this species.	Remnant vegetation dominated by *Acacia harpophylla* on clay loam soils does not occur in the Project area.	preferred or suitable habitat present.	for the potential presence of highly mobile or wide-ranging species and align with standard desktop assessment practices. The absence of records within this radius supports a low likelihood of occurrence within the Project area.	

Species	Status[1]	Distribution and habitat requirements	Potential habitat in Project Area			Records	LOO
			Preferred	Suitable	Marginal		
		7, 9 and 10, but with few occurrences of fallen timber and deep soil cracks, at an elevation between 200 and 500 m above sea level.					
Grey Snake *(Hemiaspis damelii)*	E	Grey snake is distributed throughout the eastern interior, from central inland NSW, north to coastal areas near Rockhampton, Qld. Within Qld, records are known from near Goondiwindi and the adjacent Darling-Riverine Plain, from the Darling Downs and from the Lockyer Valley. The core area for the grey snake in the Brigalow Belt is south of the Great Dividing Range between Dalby and Glenmorgan. Grey snake favours woodlands (typically *Acacia harpophylla* and *Casuarina cristata*), usually on heavier, cracking clay soils, particularly in association with water bodies or in areas with small gullies and ditches (gilgais).	**Yes** The Project area has been ground truthed to contain one vegetation community (identified as Brigalow regrowth with frequent gilgai) which contains frequent, deep gilgai and with abundant, deep cracking soils.	**Yes** One vegetation community (identified as Brigalow woodland) has been identified located within 1km of preferred habitat, and as containing infrequent gilgai and cracking soils. This habitat contains a lower abundance of introduced ground stratum flora species than habitat identified as marginal.	**Yes** The Project area has been identified as containing two vegetation communities which contain and infrequent or rare abundance of soil cracks and gilgai. Additionally, these habitat patches contain a relatively high abundance of introduced ground stratum flora species.	**No** A record occurs more than 250km from the Project area, as identified from the Arrow Bowen Pipeline Referral (Ecological Survey & Management, 2011). No records have been identified within a 60 km search radius of the Project area.	**Unlikely**
Allan's Lerista, Retro Slider (*Lerista allanae*)	E	The Retro Slider is known only from black soil downs (undulating plains formed on basalt, shale, sandstone and unconsolidated sediments) of the Oxford land system in the Brigalow Belt North Biogeographic Region, in eastern Central Queensland.	**No** Sediments including basalt, shale and sandstone are not present in the Project area.			**Yes** An ALA record, sourced from the South Australian	**Unlikely**

Species	Status[1]	Distribution and habitat requirements	Potential habitat in Project Area			Records	LOO
			Preferred	Suitable	Marginal		
		L. allanae are known to occur several centimetres under the surface of black-red soil, under tussocks of grass on farmland and from leaf litter and friable soils beneath trees and shrubs. Habitats found in association with the species includes; Mountain Coolibah (*Eucalyptus orgadophila*)/Red Bloodwood (*E. erythrophloia*) open woodlands and Black Tea-tree (*Melaleuca bracteata*) closed scrub to low closed-forest gravely hills, ridges and gullies or scattered *Bauhinia* spp. on plains.				Museum, occurs approximately 46km west of the Project area, recorded in 1948.	
Fitzroy River Turtle, Fitzroy Tortoise. Fitzroy Turtle, White-eyed River Diver (*Rheodytes leukops*)	V	The Fitzroy River turtle is largely associated with the primary streams of the Fitzroy River system: the Nogoa, Comet, MacKenzie, Connors, Isaac, Dawson and Fitzroy Rivers. The Fitzroy River turtle is generally attributed to fast-flowing clear freshwater rivers and rivers with large deep pools with rocky, gravelly or sandy substrates, connected by shallow riffles, commonly in association with *Eucalyptus tereticornis, Casuarina cunninghamiana, Callistemon viminalis, Melaleuca linariifolia* and *Vallisneria* sp. The Fitzroy River turtle appears to prefer alluvial sand/loam banks with a relatively steep slope, low density of ground/understorey vegetation and partial shade cover for nesting. Due to the species' ability to respire aerially and aquatically, it can also inhabit fast flowing riffle zones where primarily air-breathing species such as the white-throated snapping turtle may be excluded.	**No** The Project area does not support the habitat types required by the Fitzroy River Turtle/Fitzroy Tortoise/Fitzroy Turtle/White-Eyed River Diver due to lack clear, flowing water or large deep pools.			**No** No records have been identified within a 60 km search radius of the Project area. This search extent was adopted to account for the potential presence of highly mobile or wide-ranging species and align with standard desktop assessment practices. The absence of records within this radius supports a low likelihood of occurrence within the Project area.	**Unlikely**

[1]V=Vulnerable; E = Endangered; CE = Critically Endangered under the EPBC Act.

Table C2: Likelihood of Occurrence of Flora Species

Species	Status[1]	Distribution and habitat requirements	Potential habitat in Project area	Records	LOO
Flora					
Aristida annua	V	*Aristida annua* is an annual loosely tufted grass with a flowering stem growing to approximately 50 cm in height. This species is restricted to central Queensland in Emerald and Springsure districts. The species is very poorly understood and there appears to be no survey data. *Aristida annua* occurs in eucalypt woodland. It is restricted to black clay soils, basalt soils and possibly disturbed sites. The species occurs in the Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin ecological community, which is listed as Endangered under the EPBC Act (Qld DERM 2011).	**No** The Project area contains eucalypt woodland in remnant and high value regrowth condition; however, these communities do not occur on black clay soils. These communities have some disturbance from fragmentation and the occurrence of invasive species.	**Yes** An ALA record, sourced from the Queensland Herbarium, occurs approximately 35km southwestfrom the Project area, recorded in 1999.	**Unlikely**
Cadellia pentastylis	V	*Cadellia pentastylis* occurs on the western edge of the NSW north-west slopes, from Mt Black Jack near Gunnadah to west of Tenterfield, and extends into Queensland to Carnarvon Range and Callide Valley, south-west of Rockhampton. This species is conserved within various National Parks (NP) (Tregole, Sundown, Carnarvon Gorge, Mt Kaputar), Nature and Forest Reserves (Gamilaroi, Gibraltar, Bunal, Mehi) and State Forests (Campbell and Deriah). Both Sundown NP and Carnarvon Gorge NP have more than 1000 individuals. Some existing stands are on private property. *Cadellia pentastylis* grows in dry rainforest, semi-evergreen vine thickets and sclerophyll ecological communities, often locally dominant or as an emergent. This includes *Acacia harpophylla*, *Casuarina cristata, Eucalyptus populnea* and *Acacia catenulate* vegetation communities. *Cadellia pentastylis* often occurs on the edge of sandstone or basalt escarpments and prefers moderately fertile soils favoured by agriculture.	**Yes** The Project area contains vegetation communities (in remnant, high value regrowth and non-remnant conditions) which are dominated by *Acacia harpophylla*, *Casuarina cristata* and *Eucalyptus populnea.* The Project area has historically been utilised for agricultural activities.	**No** No records have been identified within a 60 km search radius of the Project area. This search extent was adopted to account for the potential presence of highly mobile or wide-ranging species and align with standard desktop assessment practices. The absence of records within this radius	**Unlikely** Targeted flora searches also did not detect this species within the Project area.

Species	Status[1]	Distribution and habitat requirements	Potential habitat in Project area	Records	LOO
				supports a low likelihood of occurrence within the Project area.	
Daviesia discolor	V	*Daviesia discolor* is found in three widely separated areas in Queensland: near Blackwater on the Blackdown Tableland, in the Mount Walsh area near Biggenden, and north of Mount Playfair within Carnarvon National Park. On the Blackdown Tableland, it grows on sandy and lateritic clay soils at altitudes of 600 to 900 meters, in open eucalypt forests dominated by *Eucalyptus sphaerocarp* and *Eucalyptus nigra*. In the Mount Walsh area, it thrives in tall open forests of *Corymbia trachyphloia* and *Eucalyptus acmenoides* on hillcrests and slopes at 500 to 580 meters altitude, on well-drained, shallow sandy loam to sandy clays. In Carnarvon National Park, it is found on brown sandy loam along creek banks, in mixed shrubland with scattered Triodia hummocks and Angophora trees. The species is protected in Blackdown Tableland National Park, Mount Walsh National Park, and Carnarvon National Park. Surveys in 1997 in the Mount Walsh area revealed two populations with about 17,800 mature plants over 2.5 hectares, 90% of which were in Mount Walsh National Park. There is no survey data for the Blackdown Tableland, but herbarium records suggest it was locally common in 1977, 1990, and 1997.	**No** The Project area contains open eucalypt woodland in remnant and high value regrowth condition. However, the canopy tree species dominating do not consist of species from preferred woodland habitat. In addition, the Project area does not support to required soil substrate that this species has been found to occur on.	**No** No records have been identified within a 60 km search radius of the Project area. This search extent was adopted to account for the potential presence of highly mobile or wide-ranging species and align with standard desktop assessment practices. The absence of records within this radius supports a low likelihood of occurrence within the Project area.	**Unlikely**
King Blue-grass (*Dichanthium queenslandicum*)	E	*Dichanthium queenslandicum* occurs from the Dalby region north to about 90 km north of Hughenden and west as far as Clermont. The main population concentrated in central	**No** The Project area does not contain heavy black, clay soils derived from	**Yes** An ALA record, Sourced from the	**Unlikely**

Species	Status[1]	Distribution and habitat requirements	Potential habitat in Project area	Records	LOO
		Queensland is in the Emerald region, however, it is also found in Gemini Peaks NP northeast of Clermont and Alpinia NP near Rolleston. *D. queenslandicum* predominantly occurs on heavy black clay soils (basalt downs, basalt cracking clay, open downs) on undulating plains in natural tussock grasslands, mainly in association with other species of blue grasses (*Dichanthium* spp. and *Bothriochloa* spp.). It can also be in association with other grasses restricted to this soil type including *Aristida leptopoda, Bothriochloa erianthoides, Moorochloa eruciformis, Corchorus trilocularis, Cyperus bifax, Dichanthium sericeum, Digitaria brownii, D. divaricatissima, Eulalia fulva, Ipomoea lonchophylla, Iseilema vaginiflorum, Panicum decompositum, Panicum queenslandicum, Paspalidium globoideum, Parthenium hysterophorus* and *Thellungia advena*. Other communities where *Dichanthium queenslandicum* can be found include *Acacia salicina* thickets and in grassland and eucalypt woodlands (i.e. *Corymbia dallachiana, C. erythrophloia, E. orgadophila*).	basalt geology. *Dichanthium* spp. and *Bothriochloa* spp. have been identified as present within the Project area.	Queensland Herbarium, occurs approximately 28km north of the Project area, recorded in 2022. Further, two (2) ALA records occur approximately 35km to the west of the project area, recorded in 2011 and 2025.	
Bluegrass (*Dichanthium setosum*)	V	*Dichanthium setosum* is often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture. It is often collected from disturbed open grassy woodlands on the northern tablelands, where the habitat has been variously grazed, nutrient-enriched and water-enriched. The species may tolerate or benefit from disturbance, otherwise, disturbance is indicative of threatening processes in its habitat. *D. setosum* has been reported from inland NSW and Queensland. There are also reports from Western Australia and Tasmania although other sources do not support similar claims.	**No** Potential habitat is present in the non-remnant Brigalow regrowth vegetation; however, the Project area does not contain heavy black, clay soils derived from basalt geology. Additionally, vegetation communities within the Project area have been impacted by historical land use activities including agriculture and slashing and is moderately disturbed. It is noted that this community contains a high density of introduced grass species.	**Yes** Two (2) records occur less than 1km east of the Project area, as identified in AECOM, 2016.	**Unlikely**

Species	Status[1]	Distribution and habitat requirements	Potential habitat in Project area	Records	LOO
Black Ironbox (*Eucalyptus raveretiana*)	V	*Eucalyptus raveretiana* occurs in scattered and disjunct populations in Queensland along the central and sub-coast from Charters Towers, south to Bundaberg. The black ironbox generally occurs along watercourses, on river flats and open forest or woodland communities. It prefers moderately fertile and moist soil or sandy, loamy or clayey alluvial soil.	**No** No watercourses or river flats are present within the Project area. Additionally, field surveys conducted at the Phillips Creek over the period of 2007 to 2021 did not identify this species as present within adjacent vegetation.	**No** No records have been identified within a 60 km search radius of the Project area. This search extent was adopted to account for the potential presence of highly mobile or wide-ranging species and align with standard desktop assessment practices. The absence of records within this radius supports a low likelihood of occurrence within the Project area.	**Unlikely**
Polianthion minutiflorum	V	*Polianthion minutiflorum* is known from Redcliffe Vale, about 110 km west of Mackay, south to Kingaroy from Redcliffe Vale, Callide Range, Coominglah SF and in the Kingaroy area north of Nanango, northeast of Jandowae and near Goodger. *Polianthion minutiflorum* is usually found in forest and woodland on sandstone slopes and gullies with skeletal soil, or sometimes deeper sands adjacent to deeply weathered laterite. Associated species and vegetation includes: open woodland of *Acacia shirleyi, Lysicarpus angustifolius, Corymbia aureola*; woodland of *Eucalyptus corynodes, Corymbia trachyphloia, E. cloeziana* on sandy soil over sandstone plateau with *Eucalyptus dura, E. fibrosa, Angophora leiocarpa, E. major*.	**No** There have been no sandstone slopes and gullies with skeletal soil identified as present within the Project area. Additionally, the associated species have not been identified as present.	**No** No records have been identified within a 60 km search radius of the Project area. This search extent was adopted to	**Unlikely**

Species	Status[1]	Distribution and habitat requirements	Potential habitat in Project area	Records	LOO
				account for the potential presence of highly mobile or wide-ranging species and align with standard desktop assessment practices. The absence of records within this radius supports a low likelihood of occurrence within the Project area.	
Samadera bidwillii	V	*Samadera bidwillii* is endemic to Queensland and is currently known to occur in several localities between Scawfell Island, near Mackay, and Goomboorian, north of Gympie. It commonly occurs adjacent to watercourses up to 510 m altitude, in lowland rainforest, rainforest margins, open forests and woodlands on lithosols, skeletal soils, loam soils, sands, silts and sands with clay subsoils. It is commonly associated with *Corymbia citriodora, C.intermedia, Eucalyptus propinqua, E.acmenoides, E.tereticornis, E.siderophloia, E.cloeziana, E.moluccana* and *E.fibrosa.*	**No** There have been no watercourses and no skeletal soils identified as present within the Project area or adjacent on Phillips Creek.	**No** No records have been identified within a 60 km search radius of the Project area. This search extent was adopted to account for the potential presence of highly mobile or wide-ranging species and align with standard desktop assessment practices. The absence of records within this radius	**Unlikely**

Species	Status[1]	Distribution and habitat requirements	Potential habitat in Project area	Records	LOO
				supports a low likelihood of occurrence within the Project area.	

[1]V=Vulnerable; E = Endangered; CE = Critically Endangered under the EPBC Act.

Table C3: Likelihood of Occurrence of Migratory Species

Species	Status[1]	Distribution and habitat requirements	Potential habitat in Project Area			Records	LOO
			Breeding/ nesting/ roosting	Foraging	Dispersal		
Migratory Birds							
Marine							
Fork-tailed swift (*Apus pacificus*)	MI	The fork-tailed swift is recorded generally east of the Great Dividing Range from Cooktown to the New South Wales border but extends further west in southern Queensland. The fork-tailed swift is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground and probably much higher. It mostly occurs over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. They are also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes.	**No** Non-breeding migrant to Australia	**Yes** Species is predominantly aerial and therefore could be foraging and dispersing above the Project area.		**Yes** A record occurs about 27km north of the Project area, at Peak Downs Mine (AECOM, 2020).	**Likely flyover**
Terrestrial							
Oriental Cuckoo, (*Cuculus optatus)*	MI	The oriental cuckoo is a regular migrant to Australia during the non-breeding season (Sept- May) in coastal regions across northern and eastern Australia. It also inhabits Australia's offshore islands and are much more widespread in the Top End and coastal Queensland with the odd vagrant records south to the Pilbara. The oriental cuckoo uses a range of vegetated habitats such as monsoon rainforest, wet sclerophyll forest, open woodlands and appears quite often along edges of forests, or ecotones between forest types. It mainly	**No** Non-breeding migrant to Australia	**Yes** Eucalypt woodland habitat fragments may be used by the species on transit.		**Yes** An ALA record occurs 32km north of from the Project area, recorded in 2023. This record was sourced through eBird Australia.	**Likely fly-over**

Species	Status[1]	Distribution and habitat requirements	Potential habitat in Project Area			Records	LOO
			Breeding/ nesting/ roosting	Foraging	Dispersal		
		inhabits coniferous, deciduous and mixed forests. It feeds mainly on insects and their larvae, foraging for them in trees and bushes as well as on the ground.					
Yellow Wagtail (*Motacilla flava*)	MI	The yellow wagtail is a regular wet season visitor to northern Australia. In Queensland, it regularly visits Mossman south to Townsville and is a vagrant further south, particularly on Heron Island. Habitat requirements for the yellow wagtail are highly variable, but typically include open areas with low vegetation such as grasslands, airstrips, pastures, sports fields and damp open areas such as muddy or grassy edges of wetlands, rivers, irrigated farmland, dams, waterholes, sewage farms, tidal mudflats and edges of mangroves.	**No** Non-breeding migrant to Australia	**Yes** The Project area does contain shallow inundated areas in the form of gilgai landscapes.		**No** No records have been identified within a 60 km search radius of the Project area. This search extent was adopted to account for the potential presence of highly mobile or wide-ranging species and align with standard desktop assessment practices. The absence of records within this radius supports a low likelihood of occurrence within the Project area.	**Unlikely**
Satin Flycatcher *(Myiagra cyanoleuca)*	MI	The satin flycatcher is widespread in southeast Qld from K'gari (Fraser Island), west to Goombi, and south to the NSW border. It is found scattered in the east, recorded on a few islands in the western Torres Strait and can be	**No** Species breeds in	**No** This species prefers	**Yes** Eucalypt woodland habitat fragments may be used by the species on transit.	**Yes** A record occurs about 10km south of the Project area as	**Potential flyover**

Species	Status[1]	Distribution and habitat requirements	Potential habitat in Project Area			Records	LOO
			Breeding/ nesting/ roosting	Foraging	Dispersal		
		found extensively along the Great Dividing Range. Satin flycatcher breed in southeast Australia, predominantly in Tasmania and Victoria. They typically return to the same locality each year, and sometimes the same tree. Satin flycatchers occur in eucalypt forest and woodland, particularly in tall wet sclerophyll forest, often in gullies or along watercourses. When present in woodlands, they prefer open, grassy areas. During migration, they can inhabit a wider variety of habitats, including mangroves and paperbark swamps. They typically nest in forks of outer branches of trees, such as paperbarks, eucalypts, and banksias in southeast Australia, before migrating to northern Australia and New Guinea. They feed primarily on insects high in the canopy and subcanopy of trees.	southeast Australia.	tall wet sclerophyll forest and vine-thicket forest which is not present within the Project area.		identified in the Dysart East Coal Mine Referral (URS Australia, 2014). An undated ALA record occurs about 40km from the Project area, sourced through BirdLife Australia.	
Wetland							
Common Sandpiper (*Actitis hypoleucos*)	MI	The common sandpiper's population is widespread in small numbers, typically found along all coastlines and in inland areas of Australia. When in Australia, the population is usually concentrated in the north and west regions. It is known to occur in a range of wetland environments, both coastal and inland. Their primary habitat is rocky shorelines and narrow muddy margins of billabongs, lakes, estuaries and mangroves. It has also been recorded on banks further upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties.	**No** Non-breeding migrant to Australia	**No** The Project area does not contain waterbodies with muddy margins and shallow water areas with emergent semi-aquatic vegetation.		**Yes** An undated record occurs approximately 51km from the Project area, sourced from BirdLife Australia. No other record has been recorded within a 60km search radius of the Project area.	**Unlikely**

Species	Status[1]	Distribution and habitat requirements	Potential habitat in Project Area			Records	LOO
			Breeding/ nesting/ roosting	Foraging	Dispersal		
Sharp-tailed Sandpiper (*Calidris acuminata*)	MI	In Queensland, the sharp-tailed sandpiper is widespread and recorded in most regions along much of the coast. They are very sparsely scattered inland, particularly in the central and southwestern regions. The sharp-tailed sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline salt lakes inland.	**No** Non-breeding migrant to Australia	**No** The Project area does not contain waterbodies with muddy margins and shallow water areas with emergent semi-aquatic vegetation.		**No** No records have been identified within a 60 km search radius of the Project area. This search extent was adopted to account for the potential presence of highly mobile or wide-ranging species and align with standard desktop assessment practices. The absence of records within this radius supports a low likelihood of occurrence within the Project area.	**Unlikely**
Pectoral Sandpiper (*Calidris melanotos*)	MI	In Queensland, most records for the pectoral sandpiper occur around Cairns. There are scattered records elsewhere, mainly from east of the Great Divide between Townsville and Yeppoon. Records also exist in the southeast of the state as well as a few inland records at Mount Isa, Longreach and Oakley. The pectoral sandpiper prefers shallow fresh to saline wetlands. This species is usually found in coastal or near	**No** Non-breeding migrant to Australia	**No** The Project area does not contain waterbodies with muddy margins.		**No** No records have been identified within a 60 km search radius of the Project area. This search extent was adopted to	**Unlikely**

Species	Status[1]	Distribution and habitat requirements	Potential habitat in Project Area			Records	LOO
			Breeding/ nesting/ roosting	Foraging	Dispersal		
		coastal habitat, including; coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. It is very occasionally found further inland.				account for the potential presence of highly mobile or wide-ranging species and align with standard desktop assessment practices. The absence of records within this radius supports a low likelihood of occurrence within the Project area.	
Osprey (*Pandion haliaetus*)	MI	The breeding range of the osprey extends around the northern coast of Australia (including many offshore islands) from Albany in Western Australia to Lake Macquarie in New South Wales. A second isolated breeding population on the coast of South Australia extends from the Head of Bight east to Cape Spencer and Kangaroo Island. Ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia. They are mostly found in coastal areas but occasionally travel inland along major rivers, particularly in northern Australia. They require extensive areas of open fresh, brackish or saline water for foraging.	**No** The Project area is not coastal	**No** The Project area does not support extensive areas of fresh, saline or brackish water for foraging		**No** No records have been identified within a 60 km search radius of the Project area. This search extent was adopted to account for the potential presence of highly mobile or wide-ranging species and align with standard desktop assessment practices. The absence of records within this	**Unlikely**

Species	Status[1]	Distribution and habitat requirements	Potential habitat in Project Area			Records	LOO
			Breeding/ nesting/ roosting	Foraging	Dispersal		
						radius supports a low likelihood of occurrence within the Project area.	

[1]MI=Migratory under the EPBC Act

Table C4: Likelihood of Occurrence of Threatened Ecological Communities

Community	Status[1]	Description	Likelihood of occurrence
Threatened Ecological Communities			
Brigalow (Acacia harpophylla dominant and co-dominant)	E	In Queensland, the listed ecological community occurs predominantly within the Brigalow Belt North, Brigalow Belt South, Darling Riverine Plains and Southeast Queensland bioregions, with smaller amounts in the Mitchell Grass Downs, Mulga Lands and Einasleigh Uplands bioregions. Brigalow communities are characterised by the presence of Brigalow (*Acacia harpophylla*) as one of the three most abundant tree species. Brigalow is usually either dominant in the tree layer or co-dominant with other species such as *Casuarina cristata* (Belah), other *Acacia* spp. or *Eucalyptus* spp. Occasionally Belah, *Acacia* or *Eucalyptus* spp. 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. Brigalow vegetation is usually associated with deep gilgai clays, sedentary clays, alluvial clays, miscellaneous deep clays and loamy red soils. The soils usually have a clay field-texture throughout the profile, are relatively fertile and tend to have high salt content. In Queensland, the soils are predominantly cracking clays where Brigalow is dominant, but texture contrast soils are common where *Eucalyptus* sp. are co-dominant.	Does not occur within the Project area
Natural Grasslands of the Queensland Central Highlands and northern Fitzroy Basin	E	The grasslands of the Queensland Central Highlands are endemic to Queensland. It occurs where the Fitzroy River Basin and the Brigalow Belt North bioregion coincide, extending from Collinsville in the north to Carnarvon National Park in the south. It is bounded to the south by the Expedition, Carnarvon, Great Dividing, Drummond and Narrien ranges; and to the north by the Clark, Denham, Connors and Broadsound ranges. The grasslands of the Queensland Central Highlands typically occur on fine-grained, cracking clay soils that are often deep and dark in colour, derived from basalt or fine-grained sedimentary rocks. This community usually lies on flat or gently undulating ground, or on extensive alluvial plains, along historic and flood-prone watercourses. Shrubs are typically spare, however, some areas can have extensive *Acacia* spp. It is typically dominated by bluegrasses (*Dichanthium* spp.) although tropical three-awned grasses (*Aristida* spp.) and panic grasses (*Panicum* spp.) are also significant contributors, as well as Mitchell grasses (*Astrebla* spp.) in drier areas.	Does not occur within the Project area

Community	Status[1]	Description	Likelihood of occurrence
Threatened Ecological Communities			
Poplar box Grassy Woodland on Alluvial Plains	E	Popular box communities are located west of the Great Dividing Range, typically at less than 300 m above sea level. The ecological community is scattered across a broad distribution within an area that is roughly: • South of Charters Towers in Queensland • North of Leeton in NSW • West of Ipswich in Queensland and Armidale in NSW • East of Longreach in Queensland and Hillston in NSW It is typically a grassy woodland with a canopy dominated by *Eucalyptus populnea* and an understorey mostly of grasses and other herbs. The ecological community mostly occurs in gently undulating to flat landscapes and occasionally on gentle slopes on a wide range of soil types of alluvial and depositional origin.	Does not occur within the Project area
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	E	In Queensland, Semi-evergreen vine thicket (SEVT) occurs in the Brigalow Belt bioregion. SEVT is considered an extreme form of dry seasonal subtropical rainforest, occurring in areas with a subtropical, seasonally dry climate on soils of high to medium fertility. It is generally characterised by the prominence of trees with microphyll sized leaves (2.5–7.5cm long) and the frequent presence of emergent swollen-stemmed bottle trees (*Brachychiton australis, B. rupestris*). The thickets typically have an uneven canopy 4–9m high with mixed evergreen, semi-evergreen and deciduous emergent tree species 9–18m high with prominent vines, twining or scrambling plants a presence of rock.	Does not occur within the Project area
Weeping Myall Woodlands	E	Weeping Myall Woodlands occurs in small pockets on the inland alluvial plains west of the Great Dividing Range in NSW and Queensland. It typically occurs as open woodlands to woodlands, 4-12 m high, dominated by Weeping Myall (*Acacia pendula*) trees in the overstorey. Weeping Myall Woodlands occur on black, brown, red-brown or grey clay or clay loam soils situated on flat areas, shallow depressions or gilgais on raised (relict) alluvial plains. These areas are not associated with active drainage channels and are rarely if ever flooded.	Does not occur within the Project area

[1]E = Endangered under the EPBC Act.