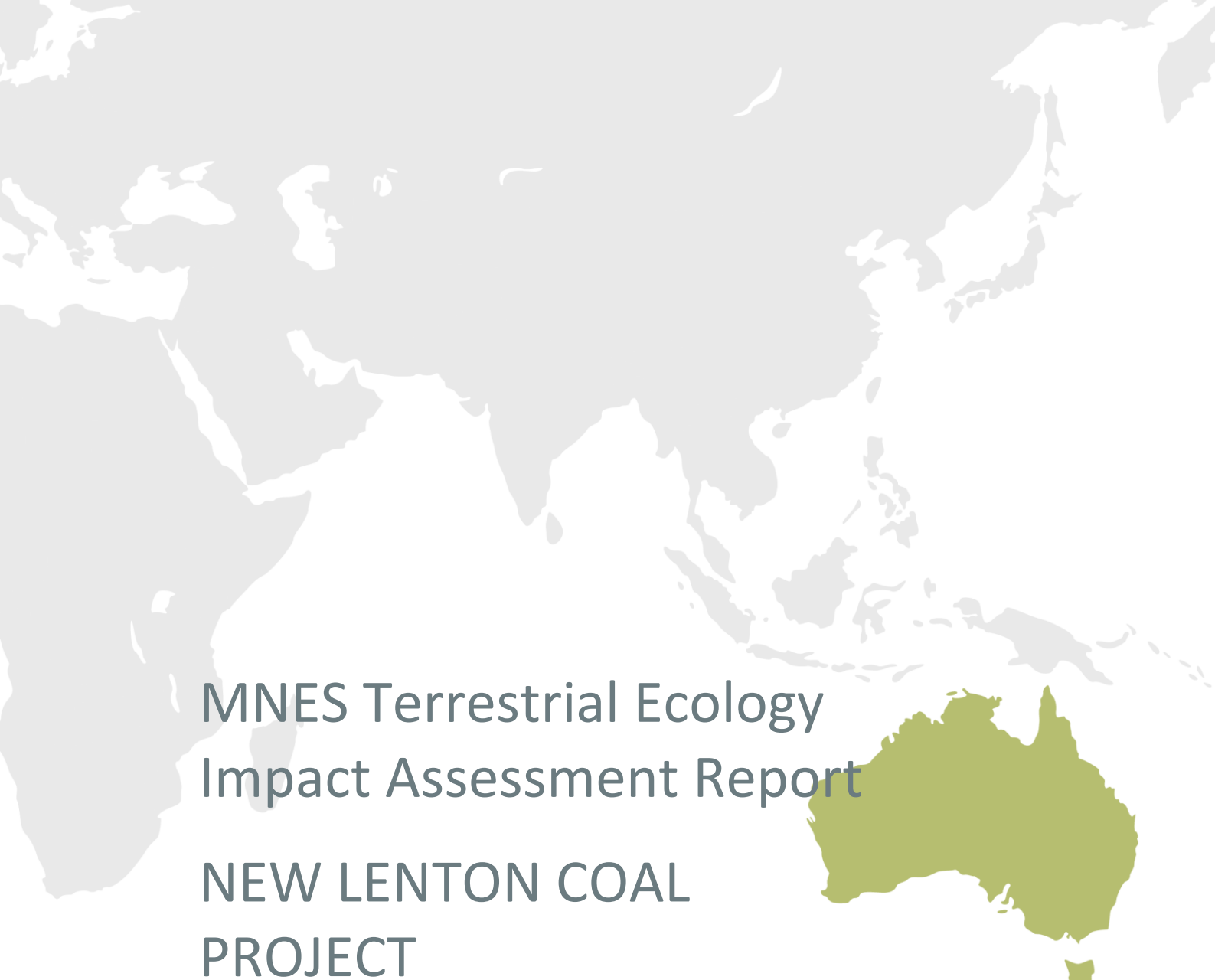




APPENDIX 12 – TERRESTRIAL ECOLOGY IMPACT ASSESSMENT

NEW LENTON COAL PTY LTD
NEW LENTON COAL PROJECT



MNES Terrestrial Ecology Impact Assessment Report

NEW LENTON COAL PROJECT

PREPARED FOR
BOWEN COKING COAL

OCTOBER 2024

Document Control

Project Name:	New Lenton Coal Project
Report Title:	MNES Terrestrial Ecology Impact Assessment Report
Client:	Bowen Coking Coal
Project Manager:	Gareth Bramston

Version	Comments	Author	Reviewer	Date
v1	Draft issued for client review	LL	GB	09/08/2023
v1	Final issued to client	LL	GB	14/12/2023
v2	Draft issued for client review following DCCEEW review	LL	HW	31/07/2024
v2	Final issued to client	LL	HW	09/10/2024

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1 Introduction

AARC Environmental Solutions Pty Ltd (AARC) was commissioned by Bowen Coking Coal (BCC) to prepare a Matters of National Environmental Significance (MNES) Terrestrial Ecology Impact Assessment for the New Lenton Coal Project (the Project).

1.1 Project background

The Project is located in the Brigalow Belt (north) bioregion and lies within the Northern Bowen Basin of central Queensland (Qld). It is located approximately 65 km north of Moranbah and 120 km southwest of Mackay (Figure 1), within the Isaac Regional Council local government area. The Project was granted State approval in January 2021 for the mining of 2 million tonnes per annum (Mtpa) of run of mine (ROM) coal. Mining activities are currently authorised by Environmental Authority (EA) EPML00475513.

In 2019, as part of the Commonwealth approval process, an *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) (EPBC Act) Referral for the Project was submitted to the Department of Agriculture, Water and the Environment (DAWE), currently the Department of Climate Change, Energy, the Environment, and Water (DCCEEW). The Referral decision in October 2020 states that the proposed action will be assessed via a Public Environment Report (PER).

This assessment has been undertaken in accordance with the 'Guidelines for the content of a draft Public Environment Report - New Lenton Coal Project, north of Moranbah, Queensland' (PER guideline). An update to previous flora and fauna assessment work was undertaken to meet the requirements of the PER guideline and to address any changes to proposed activities.

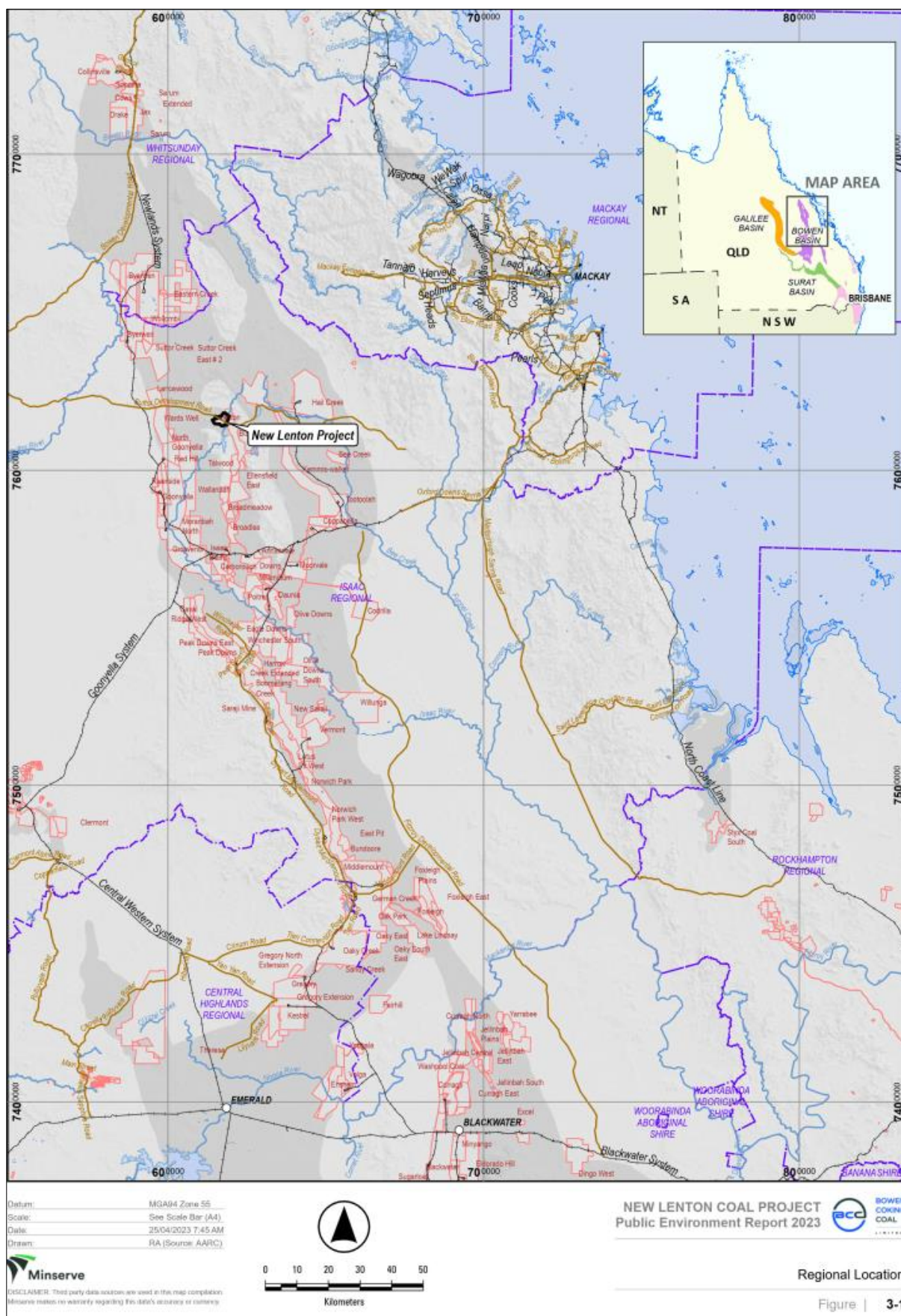


Figure 1: Regional Location

1.2 Project description

The Lenton Joint Venture (LJV) is an unincorporated joint venture between New Lenton Coal Pty Ltd (NLC) (ACN 095 390 079) and MPC Lenton Pty Ltd (MPC) (ACN 149 618 904). NLC is a wholly owned subsidiary of Bowen Coking Coal Ltd (BCC) as of July 2022.

LJV is the holder of mining lease (ML) 70337, ML 700053 and ML 700054 (Referred to as the New Lenton MLs) (Figure 2). The New Lenton MLs are subject to an existing State approved EA for all mining leases. LJV is also the holder of ML 70109 and ML 70260, referred to as the Burton Mine MLs, which adjoin the New Lenton MLs and which are subject to separate existing approvals. Burton Mine commenced operations around 1996.

The Project's proposed disturbance area, as shown in Figure 3, totals 886 ha, incorporating infrastructure and general mining disturbance.

The proposed Project activities are shown in Figure 3 and comprise:

- 2 mining pits, East Pit and West Pit;
- In-pit and out of pit overburden dumps;
- MIA;
- Haul roads, including haul road connection with the Burton Mine haul roads and a bed level crossing of the Isaac River;
- Suttor Developmental Road (a public road) realignment, with a new bridge over the Isaac River;
- Mine affected water dams;
- Clean water diversion drains;
- Mine affected water pipeline connecting with pipelines at Burton Mine;
- Diversion of Ti-Tree Creek;
- Levees along the Isaac River; and
- General infrastructure and construction working area.

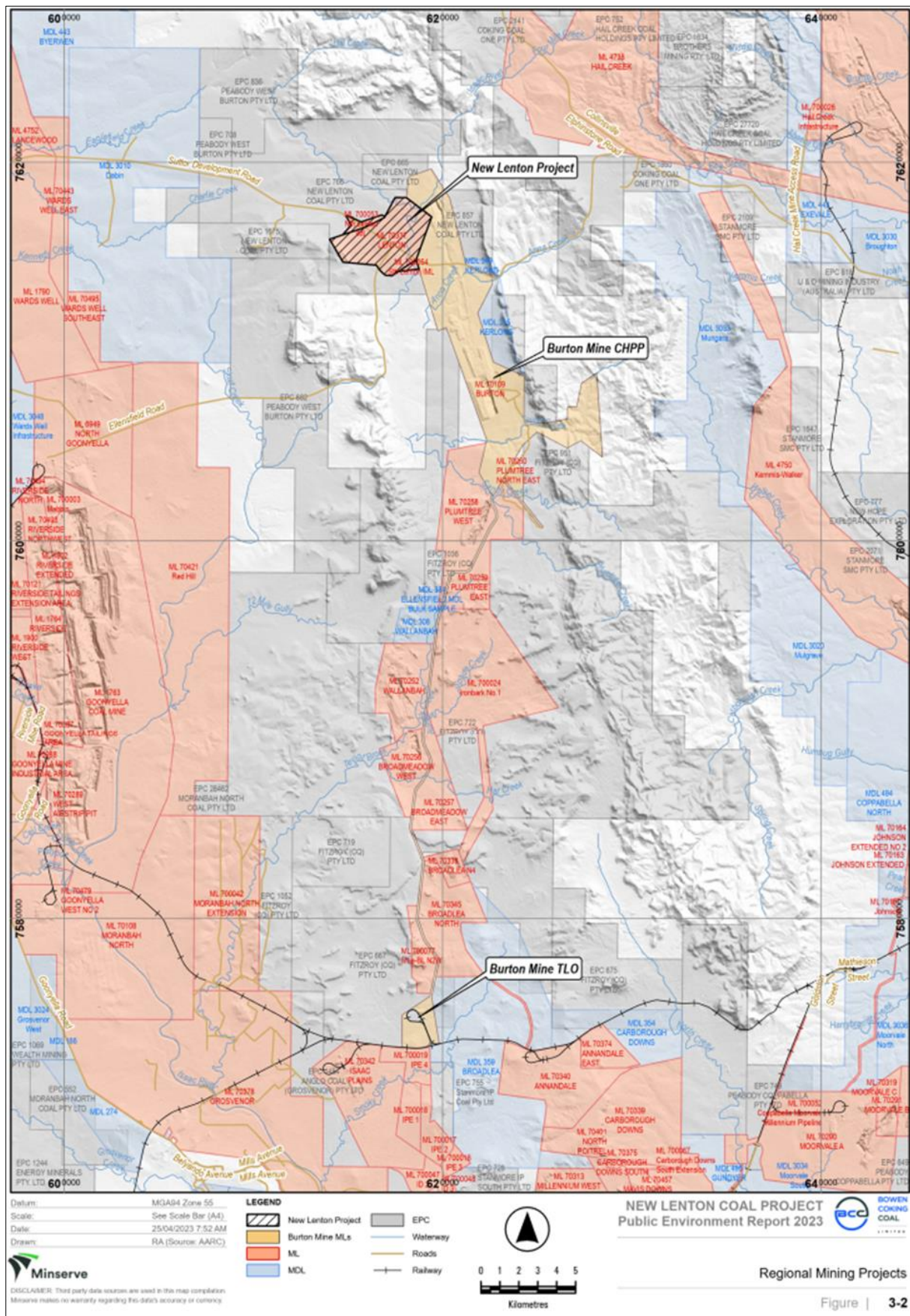


Figure 2: Regional mining projects

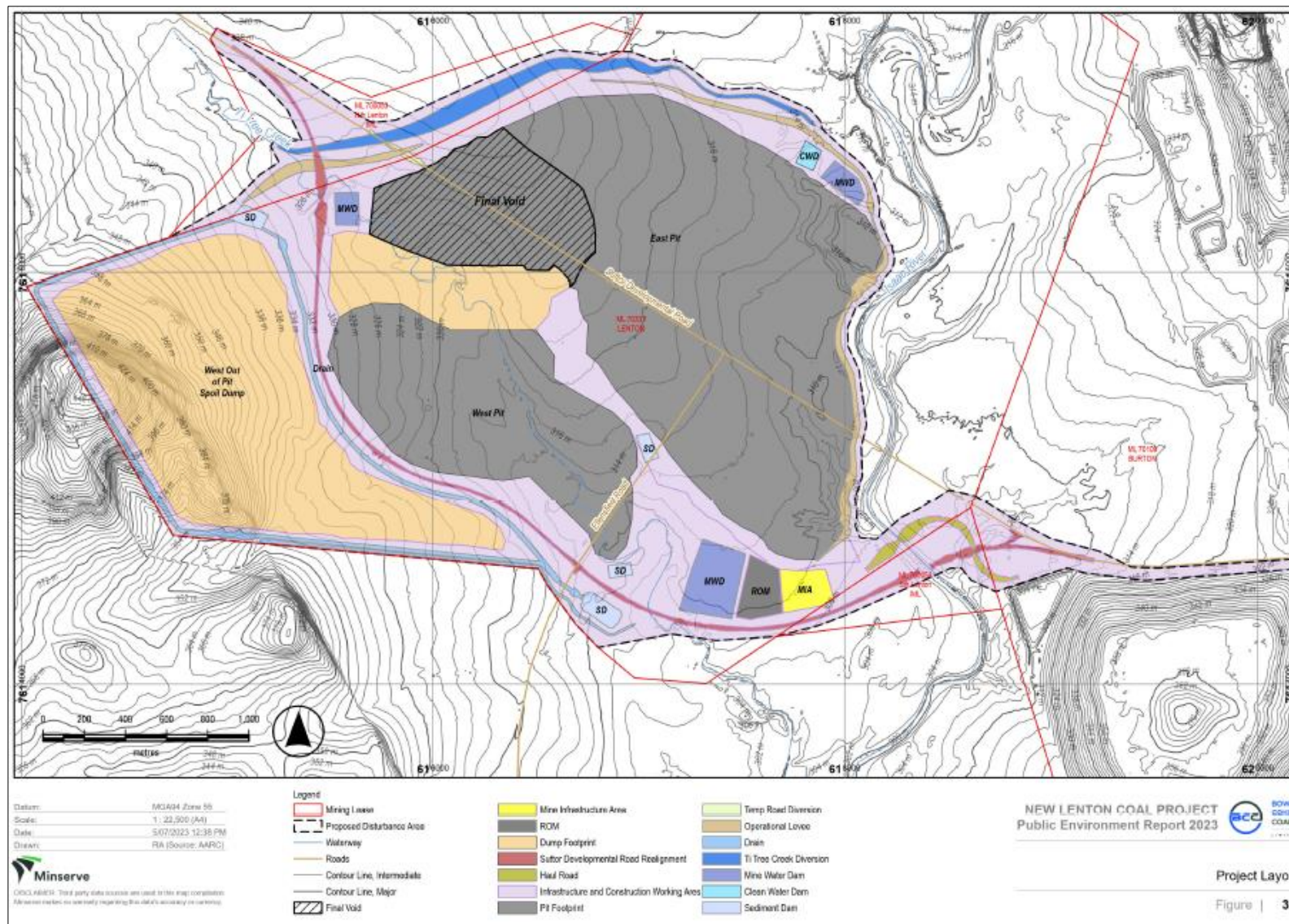


Figure 3: Project layout

1.3 Study objectives and scope

The purpose of this report is to assess the terrestrial ecological MNES values of the survey area as listed at the time of the controlled action decision for the Project in September 2020, and the potential impacts of the Project on these values.

Following the referral decision, a PER guideline was issued with the following requirements relevant to terrestrial ecology:

- The description of MNES should focus on the following controlling provisions:
 - Listed threatened species and ecological communities (sections 18 & 18A).
- The assessment must address, at a minimum, the following listed threatened species and ecological communities:
 - Poplar Box Grassy Woodland on Alluvial Plains (Poplar Box TEC)- Endangered
 - Greater Gilder (*Petauroides volans*)- Vulnerable
 - Koala (*Phascolarctos cinereus*) (combined populations of Queensland, New South Wales and the Australian Capital Territory) - Vulnerable
 - Squatter Pigeon (Southern) (*Geophaps scripta scripta*) – Vulnerable
 - Ornamental Snake (*Denisonia maculata*) – Vulnerable
 - Bluegrass (*Dichanthium setosum*) – Vulnerable
 - King Bluegrass (*Dichanthium queenslandicum*) – Endangered

As indicated in the PER guideline, the assessment must also include any other listed threatened species and ecological communities at the time of the controlled action decision which will be impacted or likely to be impacted by the Project. The reconciliation table in Appendix A, details how this report addresses the relevant sections of the Project PER guideline.

The PER guideline note that changes to threatened status on species listed under the EPBC Act won't be taken into account if published after the referral decision for the Project was made. However, the assessment will require to consider all current conservation advice and recovery plans for the species (e.g. Koala uplisted from Vulnerable to Endangered in 2022 and new conservation advice for the Koala published 12 February 2022).

To address this scope, this report has compiled information from all the terrestrial ecology surveys undertaken for the Project since spring 2004, including an additional survey undertaken in February 2023. This report is intended to build on and replace all previous studies prepared for the Project and it will be submitted with the PER report.

Table 1 provides a summary of all the terrestrial ecology surveys for the Project considered in this report.

Table 1: Summary of the Project terrestrial ecological assessments

Year	Season	Description	Conducted By	Referred to in this Report
2004	Spring	Baseline assessment of flora and fauna to support the EMOS.	Central Queensland University	Spring (2004) survey
2017	Autumn	Assessment of EPBC Act threatened and migratory species to support the EPBC Act Referral.	AARC	Autumn (2017) survey

Year	Season	Description	Conducted By	Referred to in this Report
2018	Summer	Assessment of aquatic ecological values (Riparian birds and bats component)	AARC	Summer (2018) survey
2018	Autumn	Assessment of ecological values identified during road realignment assessment, to support the change in Project design.	AARC	Autumn (2018) survey
2018	Spring	Assessment of the greater glider to support the EPBC Act Referral.	AARC	Spring (2018) survey
2019	Autumn	Assessment of ecological values to support the change in Project design and condition assessment of potential groundwater dependant ecosystems.	AARC	Autumn (2019) survey
2023	Autumn	Threatened Ecological Community (TEC) and habitat quality assessment survey within proposed disturbance area	AARC	Autumn (2023) survey

Specifically, this report:

- identifies legislation and policies relevant to the Project and terrestrial flora and fauna;
- describes the desktop assessments conducted for the Project to identify conservation significant species and ecological communities that have potential to occur within and adjacent the New Lenton MLs;
- describes the seasonal and targeted terrestrial flora and fauna surveys conducted for the Project and the results of the surveys;
- identifies the presence of the relevant MNES and provides habitat mapping for the relevant MNES identified as known, likely or potentially occurring within the survey area;
- assesses the potential direct and indirect impacts of the Project on the relevant MNES, and proposes measures to avoid, minimise or mitigate the impacts
- assess the potential for significant residual impacts on relevant MNES in accordance with the EPBC Act Significant Impact Guidelines; and
- identifies the likely requirements for any offsets under the EPBC Act.

1.4 Regional context

The climate in the Project region is characterised by sub-tropical conditions with warm humid summers and mild winters. Long-term climate data (2004 to current) for the region was retrieved from SILO/LongPaddock for 148.15 °E, -21.55 °S (Queensland Government n.d.). Mean annual rainfall for the region is 669.5 mm, typically between the months of November and March. The hottest months of the year typically occur between October and April, with mean monthly maximums above 30 degrees Celsius (°C). The coldest months occur between June and August when mean monthly minimums are approximately 10°C.

The Project is located in the headwaters of the Isaac River. The Isaac River Catchment is part of the Isaac-Connors sub-catchment which is part of the Fitzroy River Basin. The Isaac Connor's sub catchment is approximately 22,000 km² and the Fitzroy Basin catchment area is approximately 140,000 km². The catchment landform is relatively flat at an elevation of between 300 metres (m) and 340 m Australian Height Datum (AHD). Some minor undulations occur across the majority of the survey area, whilst a sedimentary rock escarpment is located on the south west corner of the New Lenton MLs, at the edge of the Burton Range.

In addition to the Isaac River, there are two other waterways passing through the New Lenton MLs; Hill Creek (a designated watercourse under the *Water Act 2000* (Water Act)) and Ti-Tree Creek (a drainage feature under

the Water Act) - both are tributaries of the Isaac River. Ti-Tree Creek crosses the New Lenton MLs diagonally further south, where it joins the Isaac River approximately 2 km downstream of the New Lenton MLs. All three watercourses are ephemeral, and after dry periods a significant rainfall event is typically required to restore flows in the creeks.

Waterways and topography of the Project are shown in Figure 4.

The predominant land uses in the region are cattle grazing and coal mining. Within the New Lenton MLs, cattle grazing of native and introduced pastures is the dominant agricultural enterprise on areas cleared of remnant vegetation. Within the survey area, three soil map units (SMUs) have been identified based on the dominant soil types. The three SMUs were identified as Brown Sodosol, Black Vertosol and Brown Vertosol.

The Burton Mine MLs and TLO, and other regional mining projects (Figure 2), have been considered in the assessment of potential cumulative impacts by the Project, as detailed in Section 6.2.10. Mining activities at Burton Mine to the immediate east and south have the most potential for cumulative impacts with the Project. After Burton Mine, the nearest mining activities are further to the south. To the east is Hail Creek Mine which is approximately 25 km west and separated from the Project by the Carborough Range. Other mines to the north and west are approximately 15 – 25 km away and separated by the Burton Range and other ranges.

No World Heritage Areas or other conservation areas are located in the region.

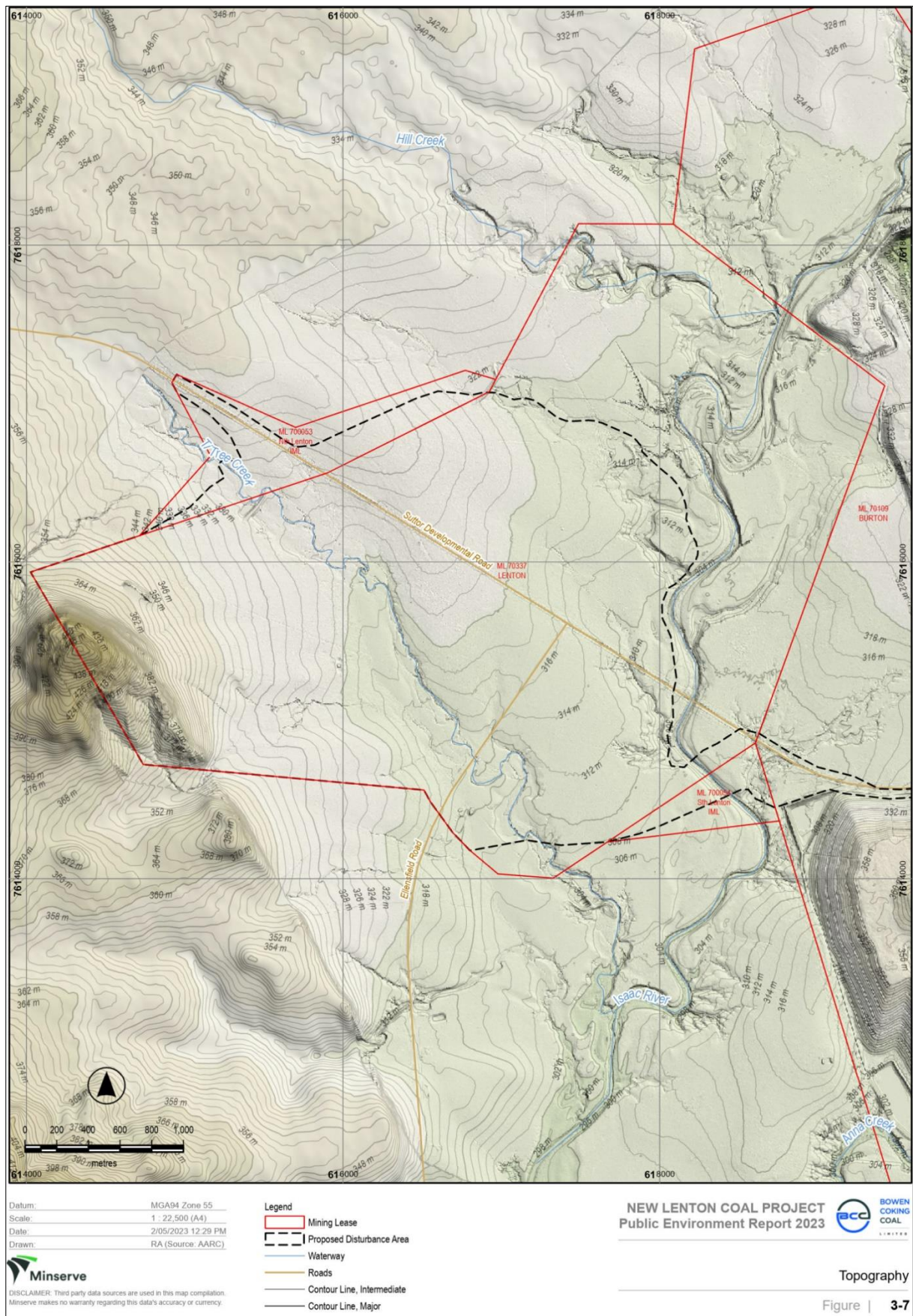


Figure 4: Project topography

2 Relevant legislation and policy

2.1 Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth EPBC Act provides a framework to protect and manage nationally and internationally important flora, fauna, ecological communities, and heritage places, which are defined in the EPBC Act as MNES. The EPBC Act applies to nine MNES:

- 1) world heritage properties;
- 2) national heritage places;
- 3) wetlands of international importance (Ramsar wetlands);
- 4) nationally listed threatened species and ecological communities;
- 5) migratory species;
- 6) Commonwealth marine areas;
- 7) the Great Barrier Reef Marine Park;
- 8) nuclear actions (including uranium mines); and
- 9) a water resource, in relation to coal seam gas development and large coal mining development.

The EPBC Act requires assessment and approval for any activity that has, or is likely to have, a significant impact on a MNES. As indicated in the PER guideline, there are relevant controlling provisions for the Project under the Act. As detailed in Section 1.3, this report addresses the listed controlling provisions described in the PER guideline, nationally listed threatened species and communities (sections 18 and 18A).

2.2 Commonwealth environmental offsets policy

The 'Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy' (DSEWPac 2012) outlines the Australian Government's position on the use of environmental offsets. Environmental offsets can be used under the EPBC Act to maintain or enhance the health, diversity and productivity of the environment as it relates to matters protected by the EPBC Act.

Offsets under the EPBC Act are required if proposed impacts to MNES are assessed to be significant (DSEWPac 2012). The 'Matters of National Significance Significant Impact Guidelines 1.1' provides overarching guidance on determining whether an action is likely to have a significant impact on a matter of national environmental significance protected by the EPBC Act (DoE 2013).

The 'Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy' provides guidance on the role of offsets in environmental impact assessments and DCCEW considers the suitability of a proposed offset package (DSEWPac 2012).

3 Methodology

As indicated in Section 1.3, this report provides a consolidated and updated MNES terrestrial ecology assessment for the Project in accordance with the PER guideline. Section 3.1 to Section 3.2 compile the methodology (desktop assessment and field surveys) from all surveys undertaken.

3.1 Desktop assessment

The EPBC Act Protected Matters Search Tool has been used to identify MNES with the potential to occur in the survey area (DCCEEW 2017-2023, DCCEEW 2023a). The results of the search are provided in Appendix A.

Additional desktop assessments have also been conducted to collate information on the terrestrial ecological values within the survey area. A review of Queensland government mapping, database searches and available literature has been conducted to update the terrestrial ecology assessment and field survey techniques to be used to target conservation of significant flora and fauna known from the region:

- **The Department of Environment and Science (DES) Vegetation map - Regional Ecosystems Biodiversity Status** (DES 2017–2019, DoR 2023);
- **The Department of Resources (DoR, previously the Department of Natural Resources Mines and Energy, DNRME) Regulated Vegetation Map** to identify areas of regulated vegetation, Vegetation Management Regional Ecosystems mapping (*Vegetation Management Act 1999* (Queensland) (VM Act)) and essential habitat for protected wildlife (*Nature Conservation Act 1992* (Queensland) (NC Act)) within the survey area (DoR 2017–2023, DoR 2023).
- **The DES Protected Plants Flora Survey Trigger Map** to identify any high-risk areas where the NC Act protected plants that are present or are likely to be present (searches based on the New Lenton MLs) (DES 2017-2023, DoR 2023).

Searches of databases have also been conducted to identify known records. These searches included:

- **The DES Wildlife Online search and WildNet Wildlife Records results** to identify Endangered, Vulnerable, Near Threatened (EVNT) and Special Least Concern (SLC) species records (Queensland Government 2017-2019, DoR 2023).
- **The Atlas of Living Australia Occurrence Records** to identify EVNT and SLC species records (ALA 2017–2023).
- **The Australian Virtual Herbarium (AVH)** to identify flora EVNT species records (AVH 2017-2023).

The findings of the desktop assessment are described in Section 4.1.

3.2 Field surveys

This section describes the terrestrial flora and fauna survey methodology, including survey timing and prevailing climatic conditions, the selection of survey sites and survey techniques utilised.

The field surveys have been conducted in accordance with the following guidelines¹:

- ‘Survey guidelines for Australia’s threatened reptiles’ (DSEWPaC 2011a);
- ‘Survey guidelines for Australia’s threatened birds’ (DEWHA 2010);
- ‘Survey guidelines for Australia’s threatened mammals’ (DSEWPaC 2011b);

¹ Only the latest versions of the guidelines used during the surveys have been included in this report.

- 'Survey guidelines for Australia's threatened bats' (DEWHA 2010b);
- 'Draft Referral guidelines for the nationally listed Brigalow Belt reptiles' (DSEWPaC 2011c);
- 'Methodology for surveying and mapping regional ecosystems and vegetation communities in Queensland (V6.0)' (Neldner *et al.* 2022);
- 'Flora Survey Guidelines–Protected Plants (V2.01)' (DES 2020a);
- Site examination for threatened and endangered plant species (Goff, Dawson & Rochow 1982);
- 'Management of endangered plants' (Cropper 1993);
- 'Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (V3.0)' (Eyre *et al.* 2018); and
- 'Guide to determining terrestrial habitat quality: Methods for assessing habitat quality under the Queensland Environmental Offsets Policy, Version 1.3' (DES 2020b);
- 'A review of koala habitat assessment criteria and methods' (ANU 2021);
- 'Conservation Advice for *Phascolarctos cinereus* (Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory' (DAWE 2022a); and
- 'Conservation advice for *Petauroides volans* (greater glider (southern and central))' (DCCEEW 2022).

Field surveys for EPBC Act listed species considered likely to occur or have the potential to occur have also been conducted with consideration of the requirements outlined within the 'Species Profile and Threats Database' (SPRAT Database).

The survey area of the Project has varied throughout the surveys, most of the surveys were limited to the New Lenton MLs. However, the survey in Autumn 2018, was undertaken to the south and west of the New Lenton MLs (Figure 5 and Figure 6). This data has been used to map the vegetation and habitat values for the relevant MNES adjacent to the Project, as requested in the PER guideline. For the purposes of this report the term 'survey area' refers to the consolidated area of all surveys undertaken, unless otherwise specified.

3.2.1 Survey timing and conditions

Desktop assessment of conservation of significant species, their known ranges, preferred habitats and ecology (refer to Section 4.1) indicates autumn and spring surveys were appropriate to detect the species to be targeted. This survey timing also corresponds with the recommended survey timing for Brigalow Belt Bioregion terrestrial vertebrate fauna in the 'Terrestrial Vertebrate Fauna Survey Guidelines for Queensland V3.0' (Eyre *et al.* 2018) to account for temporal and seasonal changes in faunal assemblages.

Terrestrial flora and fauna surveys have been conducted for the Project in:

- spring 2004 – Generic baseline assessment (30 August – 7 September);
- autumn 2017 – Targeted EPBC threatened species (14-22 March);
- summer 2018 – Aquatic ecology survey with a component of terrestrial ecology survey (22-27 February 2018);
- autumn 2018 – Across proposed road alignment corridors (30 April – 4 May 2018);
- spring 2018 – Targeted Greater Glider survey (29 October – 1 November);
- autumn 2019 – targeted ecological values identified during gap analysis following changes on Project description (2-8 April); and
- autumn 2023 – Targeted habitat assessments for threatened EPBC species and targeted Poplar Box Grassy Woodland on Alluvial Plains TEC assessment (28th February – 9 March).

Weather data was sourced from the Queensland Government's climate database SILO (Scientific Information for Land Owners), which operates by interpolating data from the Commonwealth Bureau of Meteorology (BoM) into a single point data drill. Table 2 shows temperature and rainfall data from the SILO grid

point -21.55, 148.10 (SILO 2024) which is located within the western part of the survey area). It should be noted that while this data is the closest available in the absence of a local weather station, it may not necessarily reflect the rainfall and temperatures experienced during the surveys (e.g. the data indicates a rainfall of 12.4 mm during the spring 2018 survey and 21.3 mm during the autumn 2023 surveys, however, no rainfall was recorded within the survey area during the surveys).

SILO data indicates that no significant weather conditions, unseasonably high or low temperatures or significant rainfall events were recorded during or prior to any of the surveys. Occasional showers resulted in restricted vehicle access to portions of the survey area during the autumn 2017 survey and the summer 2018 survey, but not to a degree that the conditions were not suitable for the surveys.

When looking at the monthly and long-term data from SILO, March 2017 was recorded as especially wet. This is due to the Tropical Cyclone Debbie, that reached Queensland on the 28th of March, a week after the survey was completed and therefore did not influence the survey.

Table 2: Temperatures and rainfall for the survey periods

Survey Date	Minimum Temperature	Maximum Temperature	Rainfall
Spring 2004			
30 August 2004	11.8°C	28.7°C	0.0 mm
31 August 2004	16.1°C	26.3°C	0.0 mm
1 September 2004	12.8°C	21°C	10.4 mm
2 September 2004	7.1°C	23.6°C	0.3 mm
3 September 2004	7.8°C	24.5°C	0.0 mm
4 September 2004	13.6°C	25.5°C	0.0 mm
5 September 2004	12.6°C	25°C	0.0 mm
6 September 2004	15.7°C	26.1°C	1.1 mm
7 September 2004	14.4°C	28.2°C	0.0 mm
Autumn 2017			
14 March 2017	23.2°C	37.2°C	0.0 mm
15 March 2017	23.6°C	34.7°C	4.6 mm
16 March 2017	21.1°C	34.6°C	23.2 mm
17 March 2017	22.2°C	36.0°C	2.7 mm
18 March 2017	21.1°C	33.4°C	8.7 mm
19 March 2017	22.0°C	31.5°C	5.0 mm
20 March 2017	21.7°C	30.5°C	10.9 mm
21 March 2017	21.2°C	27.7°C	14.6 mm
22 March 2017	20.9°C	29.8°C	0.0 mm

Survey Date	Minimum Temperature	Maximum Temperature	Rainfall
Summer 2018			
22 February 2018	19.8°C	29.0°C	7.2 mm
23 February 2018	20.5°C	28.7°C	6.3 mm
24 February 2018	21.1°C	29.9°C	0.9 mm
25 February 2018	21.1°C	30.3°C	4.0 mm
26 February 2018	22.0°C	30.9°C	2.4 mm
27 February 2018	21.9°C	31.4°C	0.4 mm
Autumn 2018			
30 April 2018	12.5°C	28.0°C	0.1 mm
1 May 2018	13.3°C	27.2°C	0.0 mm
2 May 2018	15.0°C	27.0°C	0.9 mm
3 May 2018	14.9°C	27.6°C	0.7 mm
4 May 2018	17.7°C	29.5°C	0.0 mm
Spring 2018			
29 October 2018	21.4°C	36.9°C	0.0 mm
30 October 2018	21.8°C	34.6°C	0.0 mm
31 October 2018	19.6°C	32.5°C	8.5 mm
1 November 2018	20.7°C	31.7°C	3.9 mm
Autumn 2019			
2 April 2019	18.5°C	27.8°C	0.0 mm
3 April 2019	18.7°C	29.1°C	0.0 mm
4 April 2019	18.4°C	28.9°C	0.0 mm
5 April 2019	18.8°C	28.3°C	0.0 mm
6 April 2019	18.0°C	28.4°C	0.0 mm
7 April 2019	17.6°C	28.4°C	0.5 mm
8 April 2019	15.9°C	28.4°C	0.0 mm
Autumn 2023			
28 February 2023	17.8°C	32.8°C	0.1 mm
1 March 2023	15.5°C	33.9°C	0.0 mm
2 March 2023	19.2°C	35.4°C	0.0 mm
3 March 2023	21.6°C	32.5°C	1.2 mm
4 March 2023	21.9°C	27.7°C	7.1 mm

Survey Date	Minimum Temperature	Maximum Temperature	Rainfall
5 March 2023	19.5°C	31.5°C	4.5 mm
6 March 2023	18.3°C	32.0°C	0.0 mm
7 March 2023	19.7°C	31.2°C	0.0 mm
8 March 2023	21.4°C	31.1°C	0.0 mm
9 March 2023	22.3°C	30.5°C	8.4 mm

3.2.2 Assessment personnel

The personnel and their contributions to the survey and reporting is presented in Table 3. The personnel included suitably qualified ecologists demonstrated by the experience of the team.

Table 3 Personnel and experience of survey and reporting team

Role	Personnel	Experience	Contribution
Field and assessment personnel	Wayne Houston (CQU)	>10 years	Spring 2004 survey
	Gail Tucker (CQU)	>7 years	Spring 2004 survey
	Robert Black (CQU)	-	Spring 2004 survey
	Jason Raguse	12 years	Autumn 2017 survey, assistance on preparation the Autumn 2023 survey
	Silverio Oliveira	11 years	Autumn 2019 survey
	Caitlin Phillips	3 years	Autumn 2017, summer 2018 survey
	Peter Splatt	2 years	Summer 2018, autumn 2018, spring 2018, autumn 2019 surveys
	Lucia Lopez	12 years	Autumn 2017, spring 2018, autumn 2019, autumn 2023 surveys (suitably qualified by the Queensland government to undertake Protected Plant surveys)
	Simon Danielsen	>20 years	Autumn 2023 survey (suitably qualified by the Queensland government to undertake Protected Plant surveys)
Report authors	Lucia Lopez	12 years	Report author
Report reviewers	Gareth Bramston	17 years	Principal review of assessment report
	Richards Oldham	>20 years	Principal review of assessment report

3.2.3 Flora surveys

The flora survey regime was designed to meet the following objectives:

- Obtain a detailed floristic summary of the survey area, through the compilation of a flora species list;
- Detect and identify conservation significant flora species and threatened ecological communities;
- Define distinct vegetation communities and describe their composition;
- Produce a comprehensive field verified vegetation map; and
- Assess the composition and condition of identified MNES habitat (BioCondition assessment).

3.2.3.1 Site selection

Aerial imagery and a review of Government RE mapping were used to identify suitable sites in all past assessments to survey the vegetation communities present, target threatened flora species and communities and provide a comprehensive flora species list. Sites were selected to appropriately survey the spatial coverage

of each vegetation community. The location and number of flora survey sites have been modified in the field to allow for the identification of REs not mapped by the Government, to modify vegetation community boundaries and sample representative sites of the vegetation communities.

3.2.3.2 Flora survey methods

Vegetation communities have been mapped and described in accordance with the 'Methodology for surveying and mapping regional ecosystems and vegetation communities in Queensland (V6.0)' (Neldner *et al.* 2022). In some cases vegetation mapping was modified between surveys to account for improved scale and intensity of ground-truthing. The methodology was generally consistent across surveys, utilising different types of sites to survey, map and validate Government RE mapping. Secondary and quaternary survey sites have been used to determine the vegetation communities and their corresponding REs within the survey area.

Additionally, during the March 2023 survey, habitat quality transects were surveyed within the proposed disturbance area (see Section 3.2.5.1). The vegetation information from these transects was also used to refine the vegetation mapping in that area and to provide important habitat condition data to support the impact assessment and any future offset calculation, if required.

All REs described in this report are classified in accordance with the Queensland Regional Ecosystem Description Database (REDD) (DES 2023). Vegetation community boundaries were validated in the field using a Global Positioning System (GPS) and refined using the latest aerial imagery available for the survey area. Data from the flora survey has been used in conjunction with topographical and geological maps to produce a field verified vegetation map.

Secondary sites

A total of 54 secondary sites have been surveyed in accordance with the 'Methodology for surveying and mapping regional ecosystems and vegetation communities in Queensland (V6.0)' (Neldner *et al.* 2022). The locations of the secondary sites are shown in Figure 5.

Secondary level flora assessments have been undertaken to classify and provide detailed descriptions of the vegetation communities (and associated REs) present within the survey area. Typical information collected across the multiples surveys includes:

- site identifier information (e.g. GPS location, site name, collector, corresponding photographs);
- site photographs (including start and end transect photos and central orientation photos to the north, east, south and west);
- field verified REs;
- remnant status of the vegetation (e.g. non-remnant, remnant, regrowth);
- vegetation structural formation (e.g. woodland, open woodland, forest);
- vegetation stratum details (including list of species present, their dominance and stratum height);
- vegetation structure details (including foliage projection cover percentage, ground cover species percentage composition, stem density counts, diameter at breast height assessments);
- identification of ecologically dominant layer;
- land zone descriptions (including landform, slope and aspect and soil characteristics); and
- disturbance notes (e.g. presence of weed species, cattle grazing etc.).

Quaternary sites

A total of 417 quaternary sites have been sampled across the multiple surveys, following the methods detailed in Neldner *et al.* (2022). Survey site locations are shown in Figure 5.

Quaternary level flora assessments have been undertaken to verify the mapped vegetation communities and associated REs and inform the mapping of vegetation community boundaries.

The following information was typically recorded across surveys at each quaternary site:

- site identifier information (e.g. GPS location, site name, collector, corresponding photographs);
- site photographs (taken of the vegetation at north, east, south and west orientations);
- remnant status of the vegetation (e.g. non-remnant, remnant, regrowth);
- vegetation structural formation (e.g. woodland, open woodland, forest);
- vegetation stratum details (including list of main species present, their dominance and stratum height);
- identification of ecologically dominant layers;
- land zone descriptions (including landform and soil characteristics); and
- disturbance notes (e.g. presence of weed species, cattle grazing).

Flora was sampled in both the autumn and spring seasons, to best account for both annual and perennial species assemblages. A minimum density of 25 observations per 100 ha was achieved across all surveys, providing for mapping at the 1:10,000 scale, or greater. Subsequently, the flora sites were projected on a Geographical Information System (GIS), and used in conjunction with satellite images, aerial photographs, topographical and geological maps to effectively produce a ground verified vegetation map.

Threatened ecological community mapping

As described in Section 4.1.1, the desktop assessment identified five Endangered TECs listed under the EPBC Act with the potential to occur within the survey area.

When the field surveys identified vegetation communities containing vegetation that could represent a TEC, the vegetation was assessed against the key diagnostic characteristics and condition thresholds described in the relevant Commonwealth listing advice to determine whether the vegetation community meets the TEC status. The field verified vegetation mapping and the assessment conducted to determine TEC status is provided in Section 5.1.

Targeted surveys for conservation significant species

To gain an understanding of each threatened species, and their preferred habitat and ecology, several resources were consulted to pre-determine habitat to be targeted during the field surveys. This included, but was not limited to:

- Commonwealth Listing Advice;
- Commonwealth Approved Conservation Advice;
- Species Profile and Threats Database (SPRAT);
- Australian Virtual Herbarium (AVH); and
- WetlandInfo: Plants, Animals, Soils, Water and More Search Tool.

Field surveys for EPBC Act listed species considered to have the potential to occur were conducted in consideration of the requirements outlined within the SPRAT Database and relevant guidelines:

- 'Methodology for surveying and mapping regional ecosystems and vegetation communities in Queensland (V6.0)' (Neldner *et al.* 2022);
- 'Flora Survey Guidelines–Protected Plants (V2.01)' (DES 2020a); and
- 'Management of endangered plants' (Cropper 1993).

Traverses (meanders) (Cropper 1993; Goff *et al.* 1982; DES 2020a) of potentially suitable habitat have been undertaken within the survey area. Targeted searches were undertaken by suitably qualified ecologists, including two experienced botanists (suitably qualified by the Queensland government to undertake Protected Plant surveys), in each vegetation community spanning several years and seasons.

Field observations for threatened flora species have also been conducted along with all the flora field survey methods described above. The timing of the numerous field surveys was appropriate to provide a relatively high level of confidence regarding species presence if it occurred.

Flora species list

A comprehensive flora species list, including native and introduced species, has been compiled for the survey area. The flora species list incorporates all species positively identified during the assessments of secondary sites, quaternary sites, targeted searches and from incidental observations whilst traversing the site. The complete flora species list is provided in Appendix E.

When a flora species could not be positively identified to a species level in the field, a voucher specimen was collected for identification by the Queensland Herbarium.

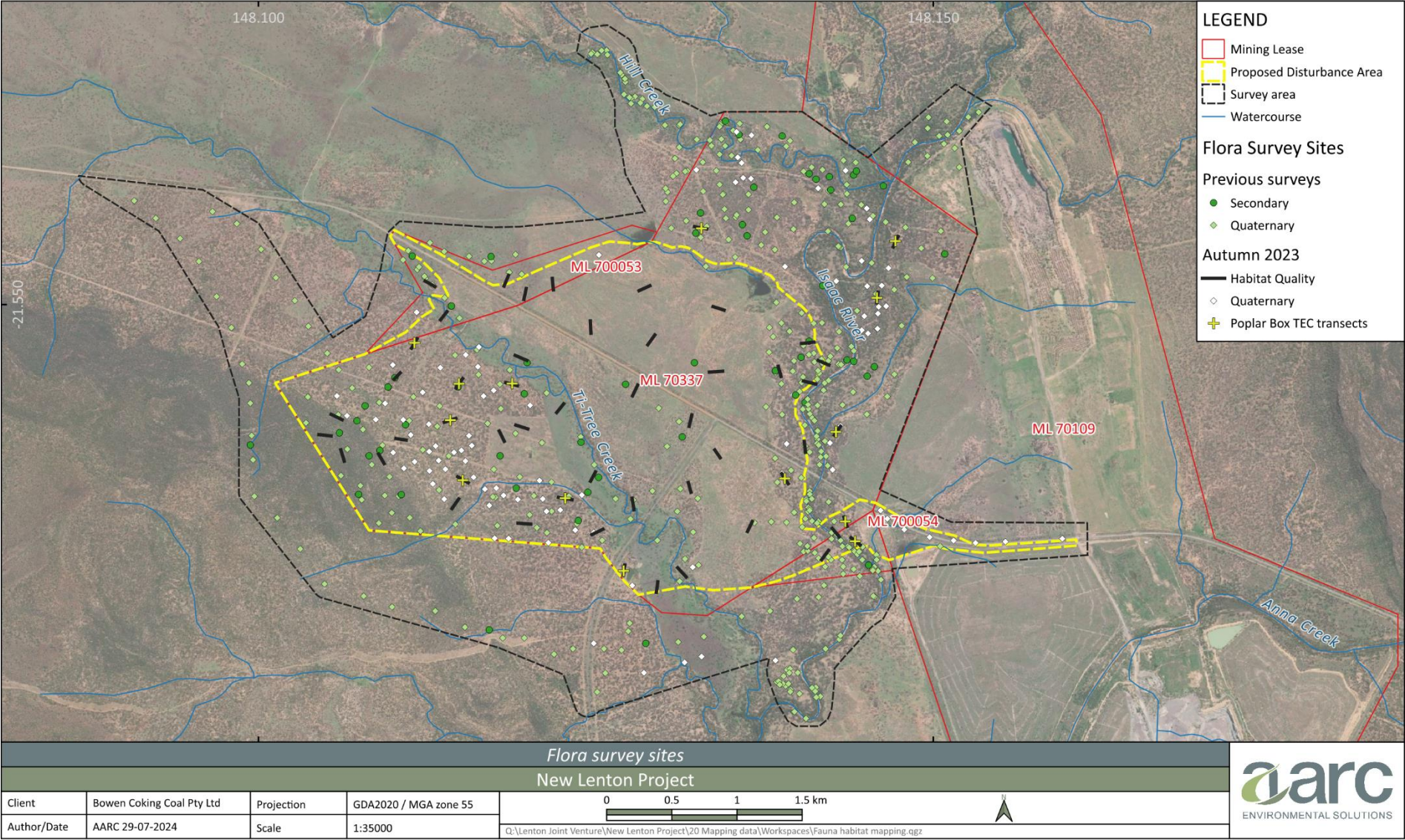


Figure 5: Flora survey sites

3.2.4 Fauna surveys

3.2.4.1 Site selection

Aerial imagery and a review of Government RE and broad vegetation group mapping were used to identify potential habitat types and suitable survey site locations.

The desktop assessment and initial site assessment identified five major habitat types occurring within the survey area. These major habitat types formed the design basis for the initial fauna surveys:

- 1) Eucalypt open forest to woodlands along main creeks;
- 2) Eucalypt dry woodlands on floodplains and fine sedimentary rocks;
- 3) Eucalypt dry woodlands on sandstone escarpment;
- 4) Acacia woodlands; and
- 5) Cleared agricultural areas.

A full description of the characteristics of each of these major habitat types is provided in Section 4.3.1 and shown in Figure 10.

Subsequent surveys were designed in consideration of the vegetation communities and habitat features identified on site during the initial surveys.

Standard trap sites

A total of twelve standard trap sites were established during the field surveys on the survey area (Figure 6) across all major habitat types. All standard trap sites included camera traps, bird surveys, spotlighting, call playback, and habitat searches. The majority of standard trap sites consisted of:

- 20 Elliott A traps;
- 5 pitfall traps;
- 6 funnel traps;
- an automated camera trap; and
- an echolocation call detector.

Some standard trap sites did not include Elliott trapping, funnel trapping or pitfall trapping (e.g. pitfalls not included in standard trap sites in sandstone escarpments, where Elliot (type B) or cage traps were used).

Supplementary survey sites

Across the surveys, ecologists undertook targeted surveys within various habitats on cryptic fauna species and species of conservation significance. These surveys were conducted at suitable locations, often at flora survey sites (Figure 6). Additionally, incidental bird surveys, habitat searches and spotlight were undertaken during the surveys.

Targeted survey for conservation significant fauna

Conservation significant fauna species identified by the desktop assessment and/or included in the PER guideline for MNES as requiring assessment, and their habitats, were targeted during the surveys.

The survey effort implemented for each MNES assessed is outlined in Appendix E and detailed in Section 5. These sections describe the survey effort undertaken and how the survey effort compares to relevant Commonwealth and State guidelines and best practice survey guidelines.

3.2.4.2 Fauna survey methods

The fauna survey methods utilised across the multiple surveys (described below) are consistent with applicable Commonwealth and State fauna survey guidelines, including the 'Terrestrial Vertebrate Fauna Survey Guidelines for Queensland' (Eyre *et al.* 2018).

Elliott trapping

Elliott A traps (8 x 10 x 33 cm) were used to target small ground-dwelling mammals in all surveys involving trapping. Generally, 20 baited Elliott traps were installed at 10 m intervals at each standard trap sites in all surveys. Traps remained set for a duration of four days and nights. Traps were strategically positioned under shrubs or beside logs to reduce exposure of trapped animals to the sun, wind and rain and maximise trap success.

Cage trapping or Elliot (Type B) trapping

Cage traps are made from wire-mesh and shaped to form a rectangular box with a door triggered by a floor treadle. Larger in size than Eliot (Type A) traps, they were used to target the MNES species Northern Quoll, a medium-sized carnivorous marsupial) during autumn (2017) survey period. Traps were baited with chicken necks. Traps were deployed at approximately 10 m intervals in suitable rocky habitat in the western area of the Project. Traps were strategically positioned against logs or rock formations that would guide fauna towards the trap and maximise capture rates. Traps were also placed under shrubs, trees, or rocky overhangs, and covered with a hessian sack to reduce exposure to the elements and packed with grass and leaf litter for bedding.

Elliot (Type B) traps are similar in size to cage traps and were used during the spring (2004) survey to target medium-sized ground-dwelling mammals across the survey area, with two traps deployed at each fauna trapping site.

Pitfall trapping

Pitfall traps were established at standard trap sites to target small ground-dwelling taxa (e.g. amphibians, reptiles and small terrestrial mammals) in all fauna trapping surveys completed. Pitfall trapping is one of the survey methods recommended for the MNES species Ornamental Snake. Generally, four 20-litre buckets were buried with their rims flush with the soil surface at 7.5 m intervals along a pitfall trap line constructed in a T-shape design with a 45 m drift fence. A small amount of soil, vegetation litter, a damp sponge and a small plastic pipe were placed in the bottom of each bucket to provide shelter and moisture for captured wildlife.

Funnel trapping

Across all fauna surveys, funnel traps were installed at standard trap sites to catch amphibians and medium to large reptiles. Funnel trapping is one of the survey methods recommended for the Ornamental Snake. Typically, 6 funnel traps were positioned approximately 3 m from the ends of the pitfall trap drift fence. The traps were covered with a hessian bag and contained a damp sponge to provide protection and moisture for captured wildlife.

Automated camera trapping

During each fauna survey, automated camera traps baited with raw chicken were installed at standard trap sites for four consecutive nights for the purpose of detecting medium and large-sized nocturnal terrestrial species as a less invasive method than cage trapping (Eyre *et al.* 2018).

Diurnal bird surveys

Across the multiple surveys, bird detection surveys were conducted at standard trap sites during early mornings, during peak avian activity, to provide a direct census of diurnal bird species occurrence and an indication of relative abundance. Bird surveys included observations of all bird taxa visible or audible from the survey site, including aerial hunters, feeders and scavengers such as raptors, wood swallows and bee-eaters. Bird surveys were mostly undertaken on two separate occasions at each site, for a minimum of 30 minutes (for a total of 1 person/hour).

Bird surveys were also conducted within the survey area where high avian diversity is likely (e.g. vegetated watercourses or dams) or where cryptic species or threatened species are more likely to occur.

Spotlighting

Spotlighting was carried out across all surveys in the early evenings and before midnight for the purpose of identifying nocturnal wildlife such as amphibians, reptiles, nocturnal birds, and nocturnal arboreal mammals. Spotlight searches were undertaken on two occasions at each location (less than one hour after dusk and more than one hour after dusk) for a minimum of 60 minutes at each site in total. Additional spotlight searches were undertaken within the survey area according to habitat suitability. The survey sites were randomly traversed with spotlights and binoculars consistent with the methodology outlined in the 'Terrestrial Vertebrate Fauna Survey Guidelines for Queensland' (Eyre *et al.* 2018). Where survey site habitat was suitable for species likely to be detected through call playback, spotlighting was undertaken following call playback to maximise the chance of detecting these species. At suitable locations within the survey area, spotlighting was also conducted from a slow-moving vehicle.

During the spring 2018 survey targeting the Greater Glider, extensive spotlighting was undertaken across preferred and potential habitat, traversing large areas, typically in association with linear riparian zones, at a slow pace. Given the Koala and Greater Glider habitat mostly overlap, this effort is also applicable to the Koala.

Call playback

Call playback was used to detect nocturnal bird species that are highly cryptic, call infrequently, are wide-ranging and occur at naturally low population densities.

Call playback was undertaken prior to spotlighting foot traverses to minimise the chance of spooking species capable of leaving the area undetected. A series of species call would be selected depending on the surrounding habitat suitability, and each would be played for three minutes, followed by a two-minute listening period, with the cycle repeated three times for each species. Calls were played using a megaphone and loud enough so that the softest call (e.g. grass owl) could be heard 100-200 m away. Following the completion of all playback cycles, the area would then be spotlighted as described above.

Habitat searches

Diurnal habitat searches were conducted at standard trap sites and elsewhere within the survey area based on habitat suitability to detect fauna that are active during the day. This survey method was used to target diurnal reptiles, amphibians, and large mammals. Diurnal searches were conducted where preferred habitat was located (e.g. dense ground debris for reptiles and areas with hollow-bearing trees for arboreal mammals).

These habitat searches included recording evidence of fauna through the detection of tracks, scats and traces (e.g. tree trunk scratches). When targeting reptiles, habitat searches were typically undertaken during the late morning to allow for reptile activity to increase with rising temperatures but before the maximum heat of the day. Searches were mostly undertaken on two separate occasions for a minimum of 30 minutes. Within the survey area, additional searches were undertaken according to habitat suitability.

During the spring 2018 survey, several hours of continuous habitat searches were undertaken across several days. The primary objective was identifying suitable key habitat features of the Greater Glider, however any

fauna species of significance direct observations or traces encountered were recorded and location marked with a GPS. Given the Koala and Greater Glider habitat mostly overlap, this effort is also applicable to the Koala.

Micro bat echolocation detection surveys

Micro bats rely primarily on echolocation for orientation and navigation in flight and to hunt for food. The use of echolocation call detectors is a non-invasive method used to record the echolocation calls. In all past surveys, one Anabat was set at each trap site for three to four nights. Additional micro bat echolocation detection was conducted at supplementary micro bat survey sites.

Supplementary micro bat surveys

All micro bat species identified by desktop searches as potentially occurring within the survey area or surrounds are identifiable to sufficient taxonomic level by electronic detection of echolocation calls, with the exception of species of the *Nyctophilus* genus. Supplementary trapping sites were established during the autumn 2017 survey to target the Corben's Long-eared Bat (*Nyctophilus corbeni*) listed as Vulnerable under the EPBC Act and NC Act. Survey methods conducted at the supplementary survey sites during the 2017 Autumn survey included harp trapping, mist netting and additional echolocation call detection.

Harp trapping

Harp traps (two-bank 4.2 m²) were deployed at survey sites in areas of likely micro bat flyways within suitable habitat. These flyways were typically narrow, clear sections of vegetated areas along creeks or tracks. The harp traps were deployed shortly before dusk and retrieved at dawn or early morning. Traps were checked several hours after dusk and again before dawn each day.

Mist netting

Mist nets were deployed at survey sites of likely micro bat habitat. Mist nets approximately 12 m wide by 5 m tall were deployed simultaneously to spotlighting searches. The nets were continuously monitored while deployed.

Opportunistic observations

All incidental and opportunistic observations of fauna made during the field surveys were recorded.

3.2.4.3 Fauna survey effort

The consolidated fauna survey effort across the spring 2004, autumn 2017, summer 2018, autumn 2018, spring 2018 and autumn 2019 is summarised in Table 4 and detailed in Table 5.

Table 4: Summary of fauna survey effort

Sampling Technique	Total Fauna Survey Effort
Camera	56 total trap nights (TTN)
Cage Trap or Elliot (Type B)	90 TTN
Elliot (Type A)	620 TTN
Pitfall	208 TTN
Funnel	237 TTN
ANABAT	51 TTN
Harp	50 TTN

Sampling Technique	Total Fauna Survey Effort
Mist Net	6 active net hours
Bird Survey (<i>Incidental Bird Survey</i>)	39 total person hours (TPH) (390 TPH ¹)
Habitat Search (<i>Incidental Diurnal Survey</i>)	53 TPH (390 TPH ¹)
Spotlight (<i>Incidental Nocturnal Survey</i>)	52 TPH (176 TPH ²)
Call Playback	3.5 hours

¹ 39 survey days x 5 hours per day x 2 ecologists

² 8 survey nights x 6 hours per night x 2 ecologists (autumn 2017 survey that included a dedicated nocturnal team) plus 20 survey nights x 2 hours per night x 2 ecologists (all other surveys)

Table 5: Total survey site survey effort

Technique	Spring (2004)	Autumn (2017)	Summer (2018)	Autumn (2018)	Spring (2018)	Autumn (2019)
Camera	-	28 TTN 5 sites x 3-6 N x 1-2 traps ¹	-	20 TTN 5 sites x 4 N x 1 trap	-	8 TTN 2 sites x 4 N x 1 trap
Cage or Elliot (B)	40 TTN 5 sites x 4 N x 2 traps	50 TTN 2 sites x 5 N x 5 traps	-	-	-	-
Elliot (A)	460 TTN 5 sites x 4 N x 23 traps	-	-	-	-	160 TTN 2 sites x 4 N x 20 traps
Pitfall	120 TTN 5 sites x 4 N x 6 traps	88 TTN 5 sites x 3-5 N x 3-5 traps ²	-	-	-	-
Funnel	-	141 TTN 7 sites x 3-6 N x 2-8 traps ³	-	-	-	96 TTN 2 sites x 4 N x 12 traps
ANABAT	7 TTN 7 sites x 1 N x 1 ANABAT	11 TTN 5 sites x 2-3 N x 1 ANABAT ⁴	12 TTN 4 sites x 3 N x 1 ANABAT	15 TTN 5 sites x 3 N x 1 ANABAT	-	6 TTN 2 sites x 3 N x 1 ANABAT
Harp	-	50 TTN 9 sites x 2-9 N x 1 trap ⁵	-	-	-	-
Mist Net	-	6 hours 3 sites x 2 active net hours	-	-	-	-
Bird Survey	14 TPH 7 sites x 2 PH (min. 2/per site)	14 TPH 7 sites x 2 PH (min. 2/site)	4 TPH 4 sites x 1 PH (min. 2/site)	5 TPH 5 sites x 1 PH (min. 2/site)	-	2 TPH 2 sites x 1 PH (min. 2/site)
Habitat Search	14 TPH 7 sites x 2 PH	14 TPH 7 sites x 2 PH	-	5 TPH 5 sites x 1 PH	18 TPH 9 PH x 2 habitat types	2 TPH 2 sites x 1 PH
Spotlight	7 TPH 7 sites x 1 PH	14 TPH 7 sites x 2 PH	-	5 TPH 5 sites x 1 PH	24 TPH 12 PH x 2 habitat	2 TPH 2 sites x 1 PH
Call Playback	3.5 hours 7 sites x 30 mins	-	-	-	-	-

N nights TTN total trap nights PH person hours TPH total person hours

1 LF05 two cameras deployed (northern quoll habitat); LF03 & LF05 = 5 nights; LF04 = 6 nights; LF06 = 4 nights; LF07 = 3 nights.

2 LF01 = 5 traps x 4 nights; LF02 = 3 traps x 4 nights; LF03 = 5 traps x 5 nights; LF06 = 4 traps x 4 nights; LF07 = 5 traps x 3 nights.

3 LF01 & LF02 = 2 traps x 4 nights; LF03 = 8 traps x 5 nights; LF04 = 8 traps x 6 nights; LF05 = 5 traps x 5 nights; LF06 & LF07 = 2 traps x 3 nights.

4 LF005 was deployed for 3 nights, all other sites deployed for 2 nights.

5 Bat01 = 6 nights; Bat02 & Bat07 = 4 nights; Bat03 = 8 nights; Bat04 = 9 nights; Bat05 & Bat06 = 7 nights; Bat08 = 3 nights; Bat09 = 2 nights

3.2.5 Habitat quality assessment

Habitat assessment and mapping was undertaken in autumn 2023 for the relevant threatened fauna species and ecological communities in accordance with the 'Guide to Determining Terrestrial Habitat Quality Version 1.3' (DES 2020b). The results of this assessment support the production of threatened species habitat maps and inform the calculation of habitat quality for the Project's Biodiversity Offset Strategy (BOS). Habitat assessments were conducted for the following MNES:

- Poplar Box Grassy Woodland on Alluvial Plains TEC;
- Greater Glider;
- Koala; and
- Squatter Pigeon.

The following assessments were conducted to inform the calculation of habitat quality:

- site based attributes (BioCondition methodology);
- landscape context attributes; and
- species habitat attributes.

Site based attributes, species habitat attributes and landscape context attributes were assessed at 35 habitat transects (Figure 6) throughout the proposed disturbance area, in areas or group of areas within the matter area that is relatively homogenous in condition. Results of the habitat quality assessment assist in the calculation of biodiversity offsets for the Project (CO2 2023).

3.2.5.1 Site based attributes assessment (BioCondition assessment)

Site based attributes (i.e. BioCondition assessment) were surveyed at each habitat quality site in accordance with the 'Queensland Herbarium 'BioCondition Condition Assessment Framework for Terrestrial Biodiversity in Queensland' Version 2.2. (BioCondition Assessment Manual) (Eyre et al. 2015). The attributes collected at each assessment site were as follows:

- 100 m transect;
 - Tree canopy cover;
 - Tree sub-canopy cover;
 - Native shrub cover; and
 - Photographs at each transect end.
- 100 m x 50 m plot;
 - Number of large eucalypt trees;
 - Number of large non-eucalypt trees;
 - Tree canopy height – median canopy height (m);
 - Recruitment of canopy species – proportion of dominant canopy species that are regenerating (%); and
 - Native tree species richness – number of species present.
- 50 m x 20 m plot;
 - Coarse woody debris – length of all logs >10 cm diameter and 0.5 m in length.
- 50 m x 10 m plot; and
 - Native shrub, grass and forbs/other species richness; and

- Non-native plant cover – cover of exotic species as a component of the overall vegetation cover (%).
- 1 m x 1 m quadrats.
 - Native perennial grass cover (%);
 - Organic litter cover (%);
 - Native forbs and other species (%);
 - Native shrubs (<1 m in height) (%);
 - Non-native grass (%); and
 - Non-native forbs and shrubs (%).

The site-based attributes were described according to DES (2020b) with comparison against reference site BioCondition benchmarks (DES 2022a). The attribute scores were incorporated into the BioCondition assessment using weightings described in Eyre et al. (2015).

3.2.5.2 Landscape context attributes assessment

Landscape scale attributes were assessed and scored at each transect site in accordance with the BioCondition Assessment Manual (Eyre et al. 2015). This assessment was undertaken using GIS and included:

- **size of patch:** an estimate of patch area, including any remnant or regrowth vegetation that is contiguous with the assessment unit;
- **context:** the amount of native vegetation that is retained in the landscape proximal to the site being assessed; and
- **connectivity:** the degree to which the assessment unit is connected with adjacent native vegetation.

3.2.5.3 Species habitat attributes assessment

Assessment of species habitat attributes provides an indication of the ability of the habitat to support fauna species.

In accordance with the 'Guide to determining terrestrial habitat quality' (DES 2020b) the relevant species habitat attributes are:

- **Foraging:** quality and availability of food and habitat required for foraging;
- **Shelter and breeding:** quality and availability of habitat required for shelter and breeding;
- **Mobility:** quality and availability of habitat required for mobility; and
- **Threats:** absence of threats.

A literature review was undertaken to determine the relevant indicators for each species habitat attribute including the SPRAT profiles and available published research. Species habitat attributes assessment was undertaken within areas identified from desktop searches and field surveys of potential suitable habitat for the species. The habitat indicators assessed for each relevant species within the assessment is shown below.

Koala

- Foraging
 - Presence and abundance of forage tree
- Shelter and breeding
 - Presence and abundance of refugial habitat

- Mobility
 - Habitat patch size
 - Connectivity to suitable habitat
- Threats
 - Potential for predator species
 - Roads or adverse infrastructure

Greater Glider

- Foraging
 - Presence and abundance of forage tree
- Shelter and breeding
 - Presence and abundance of refugial habitat
- Mobility
 - Habitat patch size
 - Connectivity to suitable habitat
- Threats
 - Presence of adverse infrastructure

Squatter Pigeon

- Foraging
 - Within 3 km of a water source
 - Grass species richness
 - Percentage of bare ground
- Shelter and breeding
 - Within 1 km of a water source
 - Presence of underlying suitable geology
 - Percentage of vegetation cover
- Mobility
 - Connectivity to suitable habitat
- Threats
 - Risk of habitat loss and fragmentation
 - Presence of weeds
 - Overstocking
 - Predation risk

Ornamental Snake

- Foraging
 - Presence, abundance, and variety of gilgai and wetland

- Shelter and breeding
 - Presence, abundance, and variety of cracks in gilgais and wetlands
 - Presence of micro habitat features (woody debris and leaf litter and tussock grass)
- Mobility
 - Vegetation structure
- Threats
 - Risk of habitat loss and fragmentation
 - Presence and abundance of cane toads
 - Presence and abundance of livestock or feral pigs

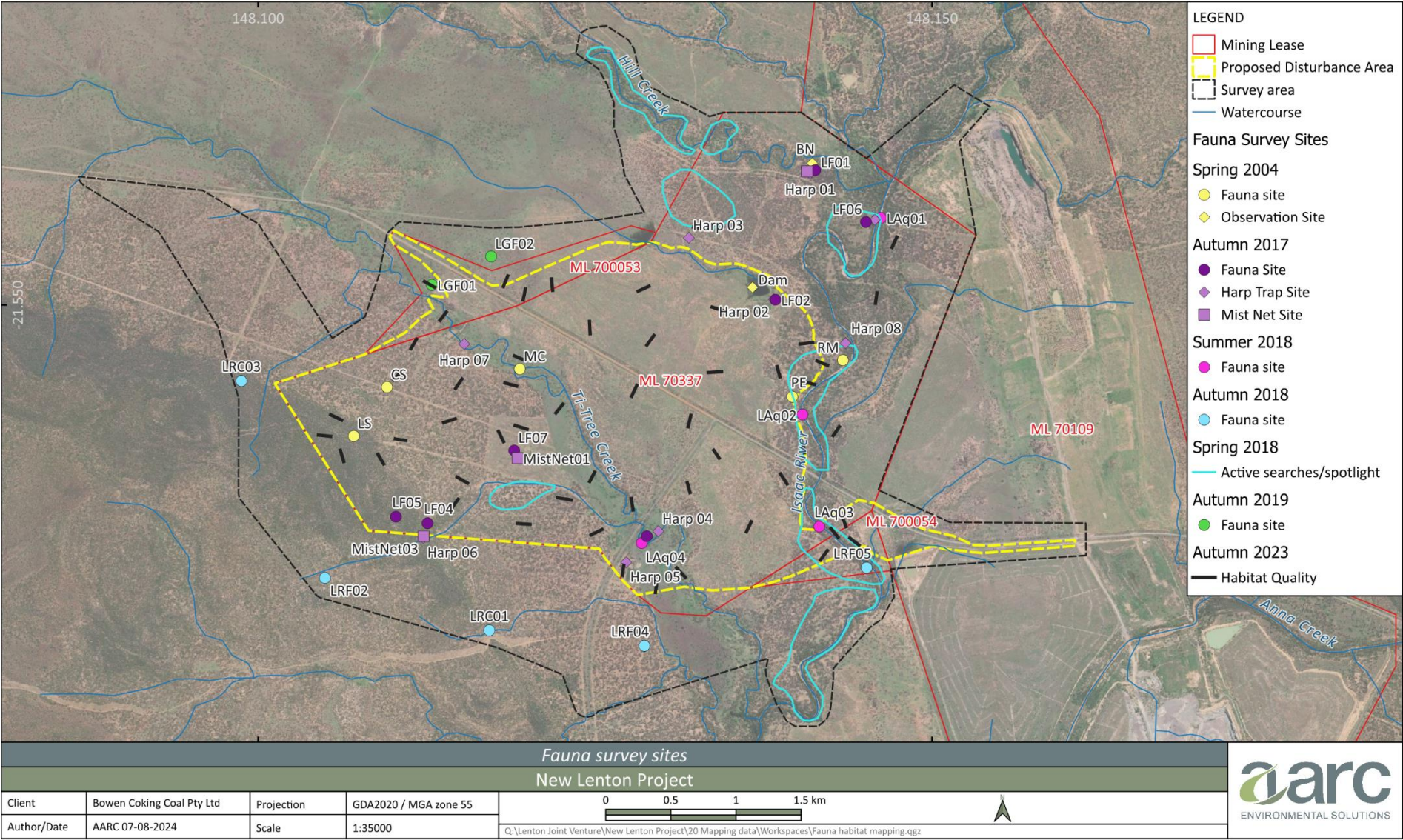


Figure 6: Fauna and habitat quality survey sites

4 Combined terrestrial flora and fauna assessment results

Section 4 consolidates the findings of all past ecological surveys in terms of potential impacts to the MNES threatened ecological communities and species listed in September 2020 or as identified in the PER guideline.

4.1 Desktop results

4.1.1 EPBC Listed threatened ecological communities

In Australia, three categories exist for the listing of Threatened Ecological Communities (TECs) under the EPBC Act; they are Critically Endangered, Endangered and Vulnerable.

Four communities listed as Endangered under the EPBC Act have been identified as potentially occurring within the New Lenton MLs or surrounds, namely:

- Brigalow (*Acacia harpophylla* dominant and co-dominant) (Brigalow TEC);
- Poplar Box Grassy Woodland on Alluvial Plains;
- Natural grasslands of the Queensland Central Highlands and northern Fitzroy Basin (Natural Grasslands TEC); and
- Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions (SEVT TEC).

No TECs listed as Critically Endangered or Vulnerable have been identified within the New Lenton MLs or surrounds.

Two TECs (Brigalow and Natural Grasslands) are known to be present in areas surrounding the New Lenton MLs, as reported by URS (2013b) whilst no SEVT was identified within the survey area. Poplar Box Grassy Woodland on Alluvial Plains (Poplar Box Grassy Woodland on Alluvial Plains TEC) has been the only TEC identified within the proposed disturbance area (AARC 2019).

As described in Section 3.2.3, field surveys have been conducted to determine the presence and extent of the Poplar Box Grassy Woodland on Alluvial Plains TEC.

4.1.2 EPBC Listed threatened flora and fauna species

Ten flora and 24 fauna species listed as Critically Endangered, Endangered or Vulnerable under the EPBC Act were identified by the desktop assessment as potentially occurring within the survey area. These species, identified by the desktop assessment, were assigned a likelihood of occurrence based on the knowledge of ecologists, species' distribution, potential habitat suitability, known records and scientific literature prior to each survey to inform of the species requiring targeted surveys. The likelihood of occurrence of the threatened species, based on desktop analysis (i.e. prior to incorporating results of field surveys) within the survey area is provided in Appendix C (flora) and Appendix D (fauna).

The desktop likelihood assessment concluded that four EPBC Act listed flora and six fauna species were classed as known, likely or potentially to occur within the proposed disturbance area. Additionally, due to the specific requirement of the PER to address particular threatened species, two more flora species and one fauna species were explicitly identified to be addressed on this report. These four flora and seven fauna species are listed in Table 6, and were targeted by the flora and fauna surveys. Desktop records of these species are shown in Figure 7 (flora) and Figure 8 (fauna).

An assessment of likelihood of these species, taking into consideration the field assessments results is included in Section 4.3.4. All species identified to be known, likely or potentially occurring within the proposed disturbance area following the field surveys are assessed for significant impact in accordance with the Commonwealth 'Significant Impact Guidelines 1.1: Matters of National Environmental Significance' (DoE 2013), in Section 7.

As specified in the PER guideline (Section 1.3), this assessment takes into consideration new conservation advice published for the EPBC Act listed species (e.g. updates on species habitat requirements) but will assess the species with the EPBC Act status current at the time when the referral decision was made for the Project, September 2020.

Table 6: EPBC Act listed species classed through desktop assessment as likely and potentially occurring within the survey area

Family	Scientific Name	Common Name	EPBC Act Status ¹	Likelihood of occurrence within the proposed disturbance area, based on desktop assessment
Flora				
Euphorbiaceae	<i>Bertya opposens</i>		V	Potential
Poaceae	<i>Dichanthium queenslandicum</i>	King Bluegrass*	E	Potential
Poaceae	<i>Dichanthium setosum</i>	Bluegrass*	V	Potential
Rhamnaceae	<i>Polianthion minutiflorum</i>		V	Potential
Fauna				
Reptiles				
Elapidae	<i>Denisonia maculata</i>	Ornamental Snake*	V	Unlikely, but listed in the PER guideline
Birds				
Apodidae	<i>Hirundapus caudacutus</i>	White-throated Needletail	V, Mi	Known
Columbidae	<i>Geophaps scripta scripta</i>	Squatter Pigeon (Southern)	V	Likely
Mammals				
Dasyuridae	<i>Dasyurus hallucatus</i>	Northern Quoll	E	Potential
Phascolarctidae	<i>Phascolarctos cinereus</i>	Koala^	V	Likely
Pseudocheiridae	<i>Petauroides volans</i>	Greater Glider^	V	Known
Megadermatidae	<i>Macroderma gigas</i>	Ghost Bat	V	Potential

¹ E = Endangered; V = Vulnerable; Mi = migratory

^ Koala and Greater Glider status was Vulnerable at the time of the Referral decision

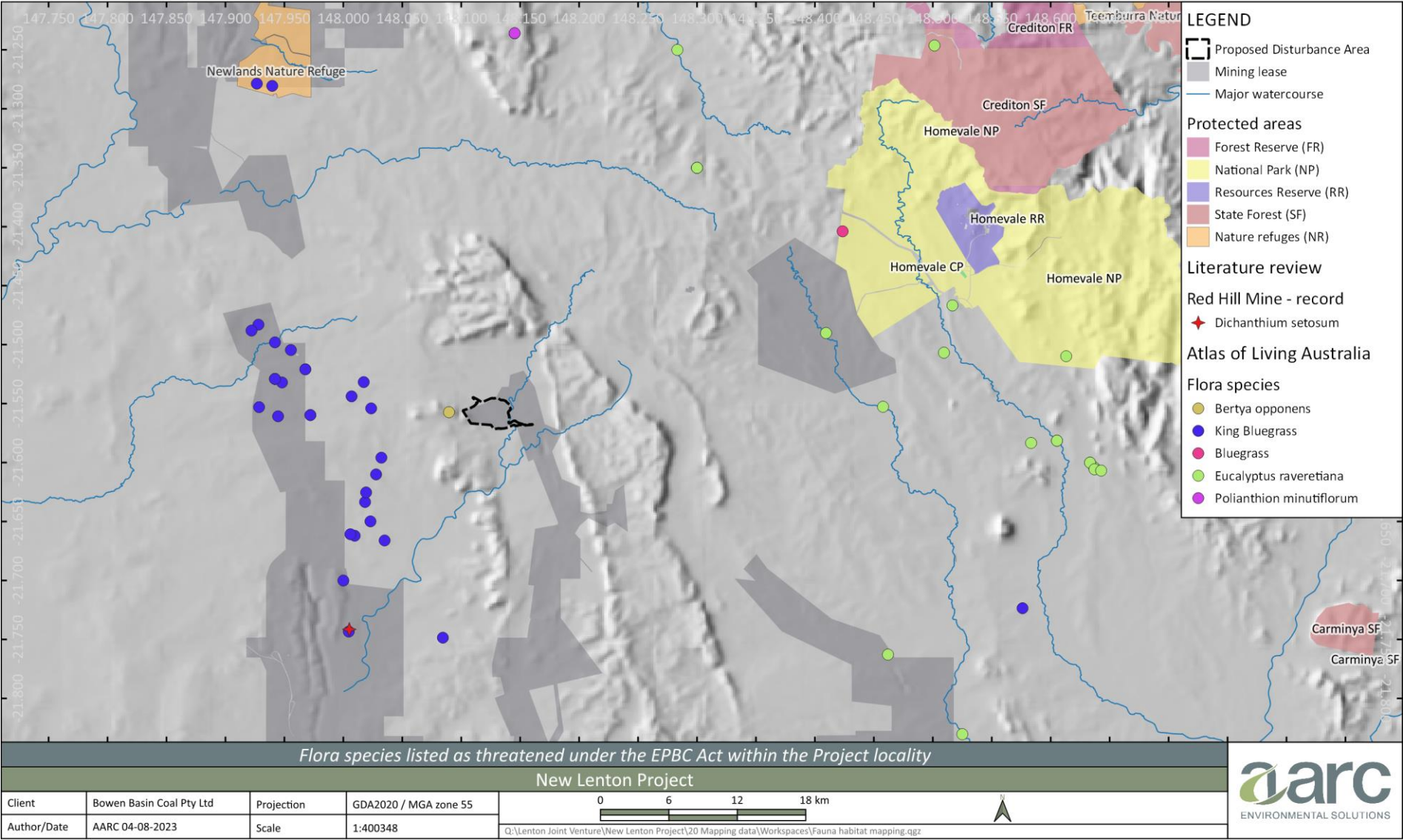


Figure 7: Threatened flora species records within the Project locality

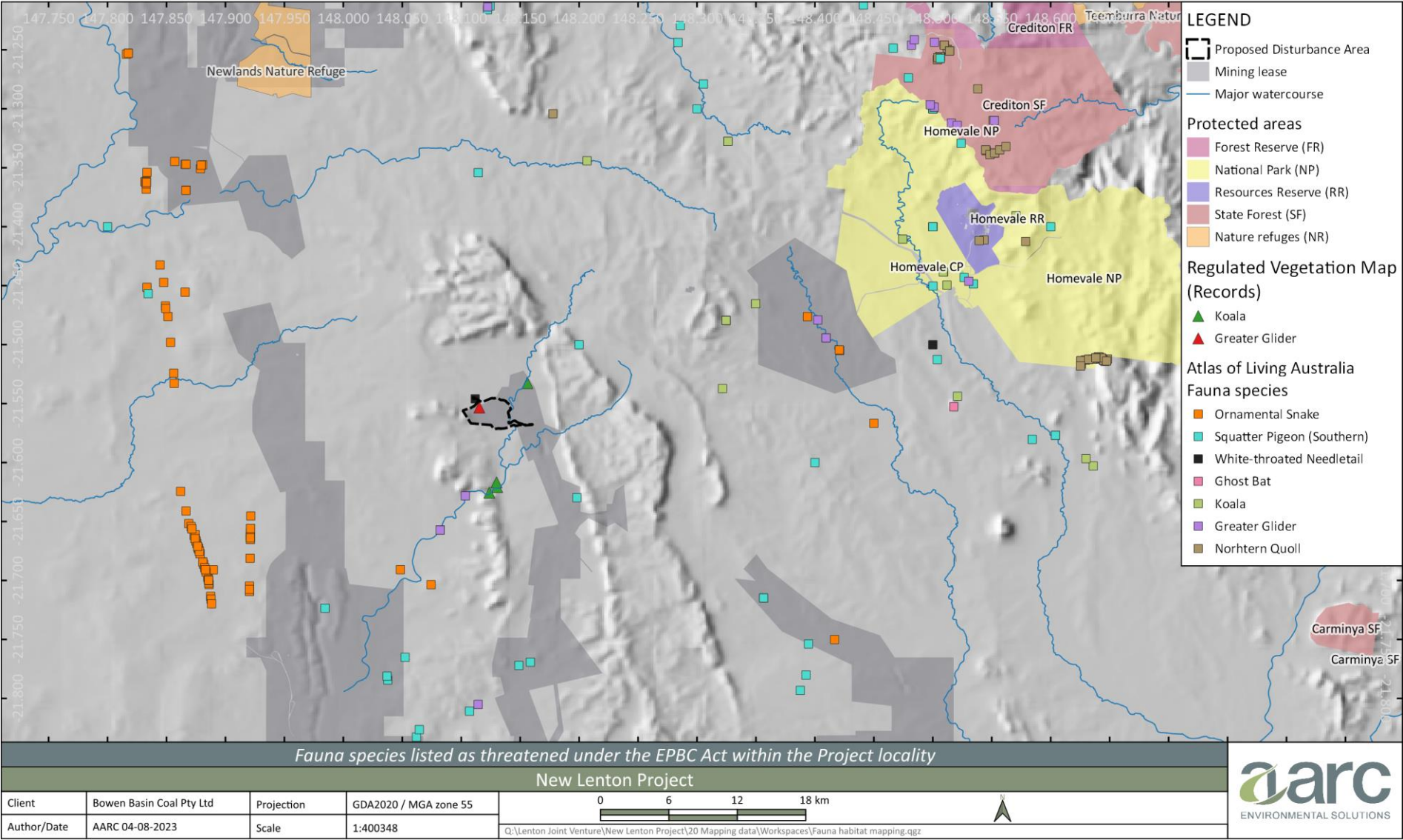


Figure 8: Threatened fauna species records within the Project locality

4.2 Combined flora results

4.2.1 Vegetation communities

As part of this assessment, updates were made to the 2019 field verified vegetation mapping based on additional data and an improved scale of mapping obtained during the Autumn 2023 - TEC and habitat quality assessment survey.

Fourteen vegetation communities have been identified across the survey area during the field surveys based on field results and state government vegetation mapping. The vegetation communities within the survey area are summarised in Table 7 and shown on Figure 9. Nine out of these 14 vegetation communities are located within the proposed disturbance area and have been described in more detail. Full description of the vegetation communities within the proposed disturbance area can be found in Sections 4.2.1.1 to 4.2.1.10.

Approximately 490 ha in the proposed disturbance area is not associated with remnant or high-value regrowth (HVR) vegetation. Instead, there are cleared areas with a sparse, shrubby layer of tree species below 1m such as Brigalow, *Terminalia oblongata* or Poplar Box and a ground layer of introduced pasture species (predominantly Buffel Grass). These areas are actively grazed by landholders and regularly cleared. This report describes these areas as cleared agricultural areas and includes grassland areas dominated by introduced pasture species.

Table 7: Field verified vegetation communities within the survey area

Map unit	Vegetation community	Associated RE	VM Act status ¹	EPBC status ²
<i>Vegetation communities within the proposed disturbance area</i>				
VC1	Poplar box (<i>Eucalyptus populnea</i>) woodland on alluvial plains	11.3.2	Of Concern	Endangered
VC2	Moreton Bay ash (<i>Corymbia tessellaris</i>) woodland on alluvial plains	11.3.4	Of Concern	-
VC3	<i>Corymbia</i> spp. woodland with sparse shrub layer on sandy duplex soils	11.3.7	Least Concern	-
VC4	Blue gum (<i>Eucalyptus tereticornis</i>) open woodland fringing drainage lines on sandy-loam soils	11.3.25	Least Concern	-
VC5	Narrow-leaved ironbark (<i>Eucalyptus crebra</i>) woodland on alluvial plains	11.3.36	Of Concern	-
VC6	Mountain coolibah (<i>Eucalyptus orgadophila</i>) open woodland on basaltic clays	11.8.5	Least Concern	-
VC7	Shrubby Poplar box open woodland on fine-grained sedimentary soils	11.9.7a	Of Concern	-
VC8	Lancewood (<i>Acacia shirleyi</i>) low forest on sandstone escarpment	11.10.3	Least Concern	-
VC9	<i>Eucalyptus</i> and <i>Corymbia</i> spp. with <i>Acacia</i> spp. woodland on coarse-grained sedimentary rocks	11.10.4a	Least Concern	-
NA	Cleared agricultural land	NA	NA	-

Map unit	Vegetation community	Associated RE	VM Act status ¹	EPBC status ²
<i>Vegetation communities outside of the proposed disturbance area</i>				
VC10	Brigalow (<i>Acacia harpophylla</i>) open woodland with emergent Dawson River Blackbutt (<i>Eucalyptus cambageana</i>) on weathered brown clays	11.9.1	Endangered	-
VC11	Mountain Coolibah woodland to open woodland on fine-grained sedimentary rocks	11.9.2	Least Concern	-
VC12	Poplar box open forest on weathered brown clays	11.9.10	Of Concern	-
VC13	Brigalow sucker regrowth on undulating clay soils	Non remnant (NR) 11.9.5	NA	-
VC14	<i>Dichanthium sericeum</i> grassland on Cainozoic igneous rocks.	11.8.11	Of Concern	-

¹ Endangered; Of Concern; Least Concern

² Endangered TEC - If meets the TEC thresholds

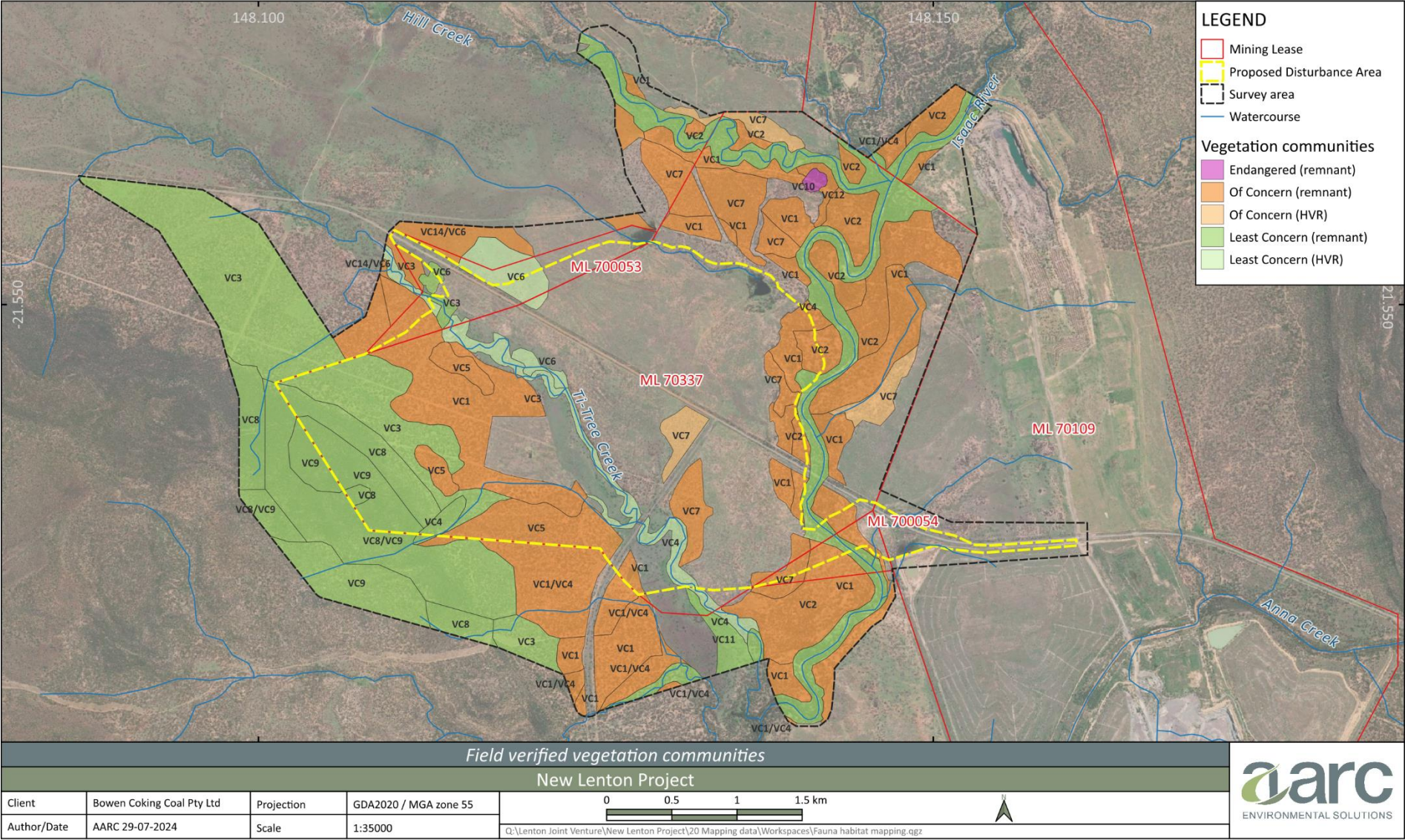


Figure 9: Field verified vegetation communities

4.2.1.1 Poplar Box woodland on alluvial plains (VC1)

VC1 is characterised by Poplar Box (*Eucalyptus populnea*) with occasional *Eucalyptus brownii* (Brown's Box) woodlands with little mid-storey and sparse grass cover on sandy-duplex soils. It is generally consistent with RE 11.3.2 (Plate 1).

Poplar box dominated the canopy layer, with a mix of other *Eucalyptus* spp. and *Corymbia* spp. occasionally present. The Ecological Dominant Layer (EDL) had a 28% to 46% crown cover and height of 12 m to 15 m, with an emergent tree layer of 18 m. A continuous shrub layer is present at a height of 2.3 m and 15% crown cover. Species such as Whitewood (*Atalaya hemiglauca*), *Cassia brewsteri*, Sally Wattle (*Acacia salicina*), and Cocaine Bush (*Erythroxylum australe*) comprise this layer.

The ground layer is dominated by *Aristida calycina*, and the exotic pasture species Indian Bluegrass (*Bothriochloa pertusa*) and Buffel Grass (*Cenchrus ciliaris*). On average, bare ground comprises 21% to 39% of the total area, whilst organic litter comprises 42% to 64%.



Plate 1: Poplar Box woodland on alluvial plains

This vegetation community is widely represented across the Project with different degrees of disturbance, likely due to edge effects of pastoral clearing. The REDD describes this RE as extensively cleared or modified by grazing (DES 2023). There is minor to moderate evidence of cattle grazing and impacts of introduced pasture species in the ground layer such as Buffel Grass and Indian Bluegrass. Five 'restricted' invasive species were recorded within this community.

VC1 is most consistent with RE 11.3.2, which is an associated RE of the Poplar Box Grassy Woodland on Alluvial Plains TEC. If determined to be a TEC, impacts of the Project on this community may be subject to assessment under the EPBC Act. The assessment of this community against the key characteristics and condition threshold criteria to determine its eligibility as a TEC is included in Section 5.1. Results of the assessment determine whether the species is a TEC.

4.2.1.2 Moreton Bay Ash woodland on alluvial plains (VC 2)

VC2 is characterised by open woodland forests on alluvial plains, river terraces with dense tall grasses and sandy-loam soils. It is consistent with RE 11.3.4 and dominated by Moreton Bay Ash (*Corymbia tessellaris*) with a mix of other associated *Corymbia* and *Eucalyptus* spp. The EDL height reaches 14-20 m and up to 20 m in the emergent tree layer with an average canopy cover of 18% (Plate 2).

The shrub layer is moderately absent, with species recorded in highest abundance being Quinine Tree (*Petalostigma pubescens*), *Cassia brewsteri* and Currantbush (*Carissa ovata*). The shrub layer height, when present, averages 4 m and 8% crown coverage.

A dense ground layer is dominated by both exotic and native grasses, predominantly *Aristida* spp. in some areas or Buffel Grass in others. On average, bare ground comprises 5% of the total area, whilst organic litter comprises 31%.



Plate 2: Moreton Bay Ash woodland on alluvial plains

This community is subject to pressures from grazing, exotic species invasion, dieback and lack of natural regeneration. Further disturbance from previous selective logging over the years is evident.

Areas of this community such as to the north of Hill Creek and to the east of the Isaac River (north of the Suttor Developmental Road), present a highly disturbed condition, likely associated to the edge effects of pastoral clearing practices.

Despite no listed weed species identified in this community during the field studies, exotic pasture grasses such as Buffel Grass, Green Panic (*Megathyrsus maximus*), *Urochloa mosambicensis* (Sabi Grass), and *Melinis repens* (Red Natal) were abundant in the ground layer.

The presence of occasional large, remnant, hollow-bearing trees such as Blue Gum (*Eucalyptus tereticornis*) provides denning and breeding habitat for a variety of arboreal mammals and birds.

4.2.1.3 *Corymbia* spp. woodland with sparse shrub layer on sandy duplex soils (VC3)

VC3 is characterised by scattered, mixed woodlands with a sparse to mid-dense shrub layer and a grassy understory on sandy duplex soils. It is primarily consistent with the RE 11.3.7 (Plate 3).

The dominant tree layer consists of *Corymbia* spp. and *Eucalyptus* spp., including *Corymbia clarksoniana*, Moreton Bay ash, *Corymbia dallachiana*, Narrow-leaved Ironbark (*Eucalyptus crebra*) and Poplar Box. The EDL has a 36% – 45% crown cover and reaches a height of 14 m – 18 m. The emergent tree species varies throughout the community with the *Eucalyptus* spp. registered in most cases up to 20 m. The subcanopy layer commonly consists of Sally Wattle, and Quinine Tree with occasional patches of dense *Melaleuca nervosa* in the mid-understory low lying areas. The subcanopy layer height was 8 m with 16% crown cover.

The ground layer comprises of a wide variety of grasses and forbs, predominantly Indian Bluegrass and *Eragrostis* sp. On average, bare ground comprises 11% of the total area, whilst organic litter comprises 59%.



Plate 3: *Corymbia* spp. woodland with sparse shrub layer

The remnant areas of VC3 are in moderately good condition with minor evidence of selective logging, grazing and the introduction of pasture species such as Buffel Grass and Indian Bluegrass. This community is subject to total grazing pressure and native species have been displaced from the ground layer by the dominance by Buffel Grass in many areas.

The vegetation condition has been heavily disturbed and subject to extensive clearing to generate pasture grasslands for grazing in the area around Ti-Tree Creek. Where small patches of wooded vegetation occur, it is recorded in a very poor condition, and reflective of typical waterway fringing vegetation. To the north of the Ellensfield Road, the trees present are mostly *Corymbia dallachiana* and Sally Wattle, corresponding with non-remnant RE 11.3.7.

4.2.1.4 Blue Gum open woodland fringing drainage lines on sandy-loam soils (VC 4)

VC4 is characterised by tall open woodlands, fringing drainage lines on deep alluvial sandy-loam soils. It comprises mostly riparian habitat, fringing the Isaac River and Hill Creek. The community is consistent with RE 11.3.25 (Plate 4).

The community is dominated by emergent Blue Gum, *Casuarina cunninghamiana* and *Melaleuca* spp. The sub-canopy layer is formed by *Corymbia clarksoniana*, Moreton Bay Ash and occasional Yellow-wood (*Terminalia oblongata*) and Queensland Ebony (*Bauhinia hookeri*). The ecologically dominant layer (EDL) canopy height reaches 18 m, and 24 m in the emergent tree layer, with an average canopy cover of 55%. The shrub layer features dominant species of Queensland Ebony, *Ficus opposita* and *Grewia latifolia*.

A dense ground layer is dominated by a combination of native and exotic grasses, primarily Indian Bluegrass and/or Green Panic, whilst species such as *Enteropogon ramosus* and Buffel Grass are associated with the riparian banks. Commonly occurring herb and forb species include *Sida rhombifolia*, *Rhynchosia minima* and *Sida corrugata*. On average, bare ground comprises 57% of the total area, whilst organic litter comprises 30%.



Plate 4: Blue Gum woodland along the Isaac River

VC4 is impacted by selective clearing, gully erosion, cattle grazing, and exotic flora species. The spread of weeds is likely due to alluvial transport as well as the presence of either native, pastoral and exotic animals. Weed species *Lantana camara* (Lantana), *Parthenium hysterophorus* (Parthenium), *Vachellia nilotica* (Prickly Acacia) and *Xanthium occidentale* (Nagoora Burr) were recorded throughout this community.

The presence of large, remnant, hollow-bearing trees such as Blue Gum provides denning and breeding habitat for a variety of arboreal mammals and birds.

There is an area of riparian vegetation that connects the Ti-Tree Creek to the Isaac River, south of Ellensfield Road, where Blue Gum and Moreton Bay Ash are present, but the trees are of a smaller size and/or without hollows when compared to remnant vegetation. This area presents a very sparse canopy, with large bare patches.

4.2.1.5 Narrow-leaved Ironbark (*Eucalyptus crebra*) woodland on alluvial plains (VC5)

VC5 is characterised by Narrow-leaved Ironbark and *Corymbia* spp. dominated woodlands with grassy ground layer and very spare shrub layer, occurring on alluvial plains on higher terraces. The community is consistent with RE 11.3.36 (Plate 5).

Narrow-leaved ironbark dominates the canopy layer, with a mix of *Corymbia* spp. present. The EDL had a 24% to 47% crown cover and height of 18 m. A very sparse shrub layer is present at a height of 2.3 m and 1.5% crown cover. Species such as Soap Tree, Whitewood, and Cocaine Bush comprises this layer.

The ground layer has a high diversity of species, dominated by native grass species, namely *Aristida* spp., *Chrysopogon fallax*, Black speargrass, *Digitaria brownii* and Kangaroo Grass (*Themeda triandra*). On average, bare ground cover was recorded as 6% to 15%, whilst organic litter typically comprises 8% to 20%.

There is minor to moderate evidence of cattle grazing and impacts of introduced pasture species in the ground layer such as Grass and Indian Bluegrass. Five 'restricted' invasive species were also recorded within this community.



Plate 5: Narrow-leaved Ironbark woodland on alluvial plains

4.2.1.6 Mountain Coolibah open woodland on basaltic clays (VC6)

VC6 is characterised by open woodlands with a very sparse tree layer typically occurring on undulating plains, rises, or low hills formed from basalt with generally shallow to moderately shallow clays. This community is most consistent with RE 11.8.5 (Plate 6).

The EDL consisted primarily of Mountain Coolibah (*Eucalyptus orgadophila*) and occasional *Corymbia dallachiana*, while Soap Tree (*Alphitonia excelsa*) and *Cassia brewsteri* were dominant in a lower canopy layer. The EDL has a 30% crown cover and height of 18 m. A discontinuous shrub layer is present and comprised of two levels, the upper; co-dominated by Sally Wattle, Ironwood Wattle (*Acacia excelsa*), and *Archidendropsis basaltica*, and the lower; populated by Currantbush, *Grewia latifolia* and Nipan (*Capparis lasiantha*).

The ground layer is moderately dense and contains several tall grass species, including Black Speargrass (*Heteropogon contortus*) and Feathertop Wiregrass (*Aristida latifolia*). On average, bare ground comprises 22% of the total area, whilst organic litter comprises 54%.

This RE has been extensively thinned, cleared and cultivated in many areas (DES 2023), and only one small, isolated patch of remnant vegetation remains within the survey area. There are two more patches dominated by Mountain Coolibah which present highly disturbed condition, and despite presenting some mature and tall trees, they are characterised by an extremely sparse canopy and abundant dieback and regrowth vegetation. In addition to exotic grasses such as Indian Bluegrass recorded as dominant on the ground layer, Parthenium was present in localised infestations.



Plate 6: Mountain Coolibah open woodland

4.2.1.7 Shrubby Poplar Box open woodland on fine-grained sedimentary soils (VC7)

VC7 is characterised by Poplar Box woodlands with a moderately dense mid-storey occurring on fine-grained sedimentary soils. It is consistent with RE 11.9.7 (Plate 7).

The EDL predominately comprised of poplar box, False Sandalwood (*Eremophila mitchellii*), Leopardwood (*Flindersia dissosperma*), and Whitewood, ranging in height from 12 m to 17 m with an average crown cover of 58%. The shrub layer was characterised by False Sandalwood, Yellow-wood, Currantbush, *Cassia brewsteri* and Nipan reaching a height of 4 m and crown cover of 24%.

A very sparse ground layer is present, consisting of species such as *Aristida calycina* and *Abutilon oxycarpum*. On average, bare ground comprises 19% of the total area, whilst organic litter comprises 63%.

VC7 is moderately disturbed from cattle grazing with minor impacts of introduced pasture grasses in the ground layer. RE 11.9.7 has been extensively cleared for cropping and pasture within Queensland (DES 2023). An area of this community located close to the Isaac River in the north of the survey area is highly impacted by erosion, forming deep gullies.

There are some patches of non-remnant sparse regrowth shrubland or sometimes thinned Poplar Box woodland. Despite presenting some mature and tall trees, it is a very highly disturbed area containing abundant dieback and mostly regrowth vegetation. The community is in a poor condition, likely attributed to edge effects and thinning practices associated with clearing for grazing purposes. In one of the patches, there are remnants of old construction and infrastructure (old pipes, beer bottles, concrete foundations). Although there is overlap in the vegetation composition with other Poplar Box vegetation communities, these areas correspond with RE 11.9.7a based on the soil and dense shrub layer.



Plate 7: *Shrubby Poplar Box open woodland on fine-grained sedimentary soils*

4.2.1.8 Lancewood low forest on sandstone escarpment (VC8)

VC8 is characterised by closed forest dominated by Lancewood (*Acacia shirleyi*), a sparse shrub layer and mid-dense grass cover occurring on sandstone escarpments on stony-sandy soils. The community is most consistent with RE 11.10.3 (Plate 8).



Plate 8: *Lancewood closed forest on sandstone escarpment*

The EDL consists of a closed canopy layer dominated by Lancewood and occasional emergent species such as Narrow-leaved Ironbark and *Corymbia clarksoniana*. The EDL is 12 m high, with up to a 17 m emergent layer and 67% crown cover. The shrub layer is sparse, and the ground layer characterised and co-dominated by either *Aristida latifolia* and *Eriochloa procera*, or *Digitaria* sp. and *Ottochloa gracillima*. On average, bare ground comprises 4.5% of the total area, whilst organic litter comprises 38%.

VC8 presents evidence of storm damage, but only minor cattle grazing pressure. Whilst some common introduced species are present, only one major weed species was recorded, the Velvety Tree Pear.

4.2.1.9 *Eucalyptus* and *Corymbia* spp. woodland with *Acacia* spp. on coarse-grained sedimentary rocks (VC9)

VC9 is characterised by *Eucalyptus* and *Corymbia* spp. dominated woodlands with high presence of *Acacia* spp. in the understory, occurring on colluvial foot-slopes, either on skeletal stony and sandy soils or sandstone outcrops. The community is most consistent with RE 11.10.4a (Plate 9).

Dominance in the EDL varied slightly in composition across the community, ranging from Narrow-leaved ironbark and *Corymbia clarksoniana* dominant, to *Eucalyptus cloeziana*, *Corymbia trachyphloia* and Lancewood dominant. The EDL averages between 15 m and 17 m high, with an emergent tree layer reaching up to 20 m. Crown cover is approximately 50%.

A shrub layer characterised by primarily *Acacia* spp., Quinine Tree, *Bossiaea carinalis*, *Senna artemisoides* and Cocaine Bush reaches a height of up to 2 m and 12% crown cover.

The ground layer has a high species diversity, irrespective of the sparse cover observed. Dominant species recorded are *Aristida latifolia*, *Aristida calycina* and *Ottochloa gracillima*. On average, bare ground cover varies considerably between 15% to 50%, whilst organic litter typically comprises 42% to 53% and rock cover is approximately 30%.

VC9 presents dieback in some areas and evidence of fire and storm damage. *Acacia* spp. dominates the subcanopy, with numerous patches of regrowth *Acacia* spp. throughout the vegetation community, likely as pioneer species after fire and storm damage. Cattle grazing pressure is limited to the areas of this community located at the bottom of the sandstone escarpment. Pressure from introduced pasture grasses such as Red Natal and Buffel Grass. These species were dominant in some areas of the community, typically at the bottom of the escarpment. One major weed species, Velvety Tree Pear was recorded within VC9.



Plate 9: *Eucalyptus* and *Corymbia* spp. with *Acacia* spp. woodland on coarse-grained sedimentary rocks

4.2.1.10 Cleared agricultural land

Cleared agricultural land occupies approximately half of the survey area and consists primarily of cleared pasture with some regrowth of various vegetation communities or non-native pasture dominated grassland along the Ti-Tree Creek (Plate 10). These areas are regularly cleared and characterised by sparse low regrowth (with a shrub layer reaching at most 1.5 m if present). The regrowth vegetation mostly corresponds with RE 11.9.7a and RE 11.9.5 on tertiary clay soils with some patches of cleared RE 11.3.2.

Some areas, to the northwest of the survey area are mapped by the government as RE 11.8.11, which corresponds to a native grassland TEC. However, pasture grasses, primarily Indian bluegrass are dominant in the ground layer. These areas are also subject to heavy invasion from Parthenium. One of these areas, limited to the sides of the Ti-Tree Creek, is characterised by basaltic black soil dominated by Indian Bluegrass and Parthenium.

The main land pressures recorded throughout this community was cattle grazing, exotic invasive species and erosion. Weed species such as Parthenium and Velvety tree pear were recorded, with Parthenium in particular, forming large infestations in some areas.



Plate 10: Cleared agricultural land

4.2.2 Native flora species

A total of 336 flora native species have been recorded during the field surveys; this represents 64 families. The dominant family group is Poaceae (83 species), followed by Fabaceae (49 species), Myrtaceae (21 species) and Malvaceae (18 species). The dominant family groups demonstrate the overall composition and condition of the vegetation communities surveyed, with the ground layer being the most diverse.

Despite extensive surveys over several years and seasons, no Endangered, Vulnerable, or Near Threatened Flora species under the EPBC Act have been identified within the survey area (Section 4.2.4).

A complete list of flora species recorded is provided in Appendix E, together with their conservation status under the EPBC Act and NC Act.

4.2.3 Introduced flora species

A total of 56 introduced flora species were identified during the field surveys. A list of introduced and invasive weed species recorded are listed in Appendix E alongside their respective State and Commonwealth status.

Historically, the survey area has been used for cattle grazing, and as such, areas of high disturbance are present. A large percentage of the proposed disturbance area has undergone clearing to develop improved pastureland, with areas of high disturbance being adjacent to dams, and old watering troughs. As a result, favourable conditions for weeds have led to local dominance of exotic grasses and other weeds.

Six flora species were identified on site that are classified as restricted under the Biosecurity Act (Queensland) and by the Australian Government as a Weed of National Security (WoNS) based on their invasiveness, potential for spread and environmental, social, and economic impacts. These species are Parthenium, Lantana, Rubber Vine, Prickly Acacia, Prickly Pear, and Velvety Tree Pear. Additionally, the *Harrisia Cactus (Harrisia martinii)*, also found within the survey area, is listed as restricted under the Biosecurity Act (Queensland).

Landowners and land managers at all levels are responsible for managing WoNS. Introduced plant species may also be classified by the Federal Government as WoNS if they present a serious threat to industry, water supply, human health/safety, plant communities and/or cultural values.

These species, however, are known to occur commonly throughout the broader region. Exotic pasture grasses such as Buffel Grass and Indian Bluegrass, dominated the ground layer, both within remnant and non-remnant vegetation. A range of other introduced grasses and forbs are also present across the survey area in low to moderate abundance.

4.2.4 EPBC Act Threatened Ecological Communities

Within the proposed disturbance area, only one vegetation community has been found to contain areas consistent with the key diagnostic characteristics (DoEE 2019) of the Poplar Box Grassy Woodland on Alluvial Plains TEC, namely the remnant Poplar Box woodland on alluvial plains vegetation community (VC1). Most of this vegetation community met the structure requirements for this TEC, either as Class A2 (best quality), Class B (good quality) or as Class C (moderate quality). Details of the Poplar Box within the survey area, including a detailed map, is found in Section 5.1 and Figure 12.

Some patches do not meet the relevant criteria due to the one or more of the following:

- low native species cover and/or low species diversity in the ground layer;
- shrub layer and subcanopy layer (<10m) cover over 30%; or
- patches that don't meet the thresholds and are separated from another patch of Poplar Box by a gap greater than 30 m wide.

The following TECs were not identified within the proposed disturbance area:

- Brigalow TEC;
- Natural Grassland TEC; and
- SEVT TEC.

No vegetation associated with the above mentioned TECs was identified within the proposed disturbance area during the surveys.

4.2.5 Flora species listed as threatened under the EPBC Act

Of the 10 flora species of conservation significance identified within 50 km of the Project, four were assessed to have potential to occur within the survey area prior to the field assessments.

No threatened flora species have been identified within the survey area during the numerous surveys, despite targeted seasonal surveys across the survey area by experienced botanists (Section 3.2.3.2 and Figure 5) including traverses (meanders) (Cropper 1993; DES 2020a) of potentially suitable habitat undertaken within the survey area.

The following four species listed in Section 4.1.1 are considered unlikely to occur within the proposed disturbance area:

- King Bluegrass (*Dichanthium queenslandicum*);
- Bluegrass (*Dichanthium setosum*);
- *Bertya opposens*; and
- *Polianthion minutiflorum*.

Of these species, the Endangered grass species King Bluegrass and the Vulnerable grass species Bluegrass were specifically listed in the PER guideline.

There are several confirmed records of the King Bluegrass between 25 and 10 km of the survey area, exclusively within RE 11.8.11, supporting the habitat description of the species detailed in Appendix C. Other communities where King Bluegrass can be found include Sally Wattle thickets in grassland and Eucalypt woodlands in association with *Corymbia dallachiana*, *C. erythrophloia*, Mountain Coolibah (Queensland government 2023). Although no RE 11.8.11 has been identified within the survey area, regrowth communities in landzone 8 (associated with Mountain Coolibah), and non-remnant grassland vegetation with occasional Sally Wattle along the Ti-Tree were targeted for surveys for the King Bluegrass. No individuals of the species were recorded during the surveys.

There are two records of Bluegrass identified within the 50 km, one from around 15 km to the west of the survey area, in Red Hill Mine, and the other one from over 30 km to the East of the survey area. As detailed in Appendix C, this species is associated with heavy basaltic black soils and stony red-brown hard-setting loam with clay subsoil. It has been described to occur in heavy soils (predominantly cracking clays or alluvium, often in gilgai) in woodland or open woodland usually dominated by Acacia (Brigalow) and/or Eucalyptus species (DCCEEW 2023b, Queensland government 2023). The species is found in moderately disturbed areas, such as cleared woodland, grassy roadside remnants, grazed land, and highly disturbed pasture (DCCEEW 2023b, Queensland government 2023), and therefore was targeted at all habitat types, but no individuals of the species were recorded during the surveys.

The habitat for the remaining two species, *Bertya opposens* and *Polianthion minutiflorum*, recorded within 10 km and 35 km of the survey area respectively, has been described as forest and woodland on sandstone slopes (Appendix C). Suitable habitat for these species is present within the survey area but limited to VC8 (Lancewood low forest on sandstone escarpment) and VC9 (*Eucalyptus* and *Corymbia* spp. woodland with *Acacia* spp. on coarse-grained sedimentary rocks). These habitats were targeted for surveys for both distinctive shrubs species, but no individuals of *Bertya opposens* or *Polianthion minutiflorum* were observed during the surveys.

4.3 Combined fauna results

4.3.1 Major habitat types

Field surveys identified five major habitat types for fauna within the survey area. These major habitat types are described in Sections 4.3.1.1 to 4.3.1.5.

Suitable habitat for MNES species is not also determined by the microhabitats present within each of the major habitat types. Detailed habitat mapping identified within the survey area for the each of the relevant MNES species is provided in Section 5.

4.3.1.1 Eucalypt open forest along main creeks

This habitat type is associated with VC 4 and contains open forests to woodlands of Blue Gum, with occasional *Casuarina cunninghamiana*. It primarily occurs along the Isaac River and Hill Creek (Figure 10).

Key habitat characteristics include shelter and breeding habitat in the form of large hollow-bearing trees containing small and large hollows, leaf litter and logs, creek banks, dense grass, and shrub cover (Plate 11). The hollows provide roosting and breeding habitat for a diverse range of bird and arboreal mammals as well as micro-bat species. In particular, this habitat type provides important refuge habitat and riparian corridors that provide connectivity with riparian vegetation along the Isaac River and Hill Creek for the Koala and Greater Glider (Section 5). Logs, leaf litter and shrub/grass cover provide refuge and foraging habitat for amphibians, reptiles, and ground-dwelling mammals.

The vegetation within this habitat type was lightly grazed at the time of the surveys. Moderate to high levels of erosion were observed in sections along the streams. Several invasive species were observed within this habitat type, including Parthenium, Lantana and Castor Oil Plant Tree (*Ricinus communis*).



Plate 11: Eucalypt open forest along the Isaac River (VC1)

4.3.1.2 Eucalypt dry woodlands on low land

Eucalypt dry woodlands major habitat type includes:

- Eucalypt grassy woodland with an absent or minimal shrub layer and dense groundcover (VC 1, VC 2, and VC 5); and
- Eucalypt woodlands with a dense understorey (VC 3, VC 6, VC 7 and VC 12).

This habitat type is widespread across the survey area (Figure 10) and provides connectivity between and to other habitat types.

Key habitat characteristics include a variety of shelter, including tree hollows, logs, leaf litter and dense grass cover (Plate 12). Some of this habitat type provides different degrees of habitat for the Koala and/or the Greater Glider, containing a wide variety of food and shelter tree species. This habitat also provides suitable shelter and foraging habitat for a range of amphibians, reptiles, woodland bird species, ground-dwelling mammals, and arboreal mammals.

This habitat has been subject to light to moderate grazing related disturbance, edge effects from historic clearing and storm related damage (fallen branches and trees). Invasive species such as Parthenium and Velvety Tree Pear are common within this habitat type.



Plate 12: *Eucalypt dry woodlands (VC4)*

4.3.1.3 Eucalypt dry woodlands on escarpments

This habitat type is limited to the sandstone escarpment located to the west the survey area (Figure 10) and it is associated with VC 9. This habitat type is characterised by a high presence of *Acacia* spp. in the understory and provides connectivity between and to other habitat types.

Key habitat characteristics include rock shelter, logs, and dense organic litter cover (Plate 13). This habitat type doesn't provide suitable habitat for the Koala and Greater Glider, due to the absence of food and shelter tree species, however, it can provide dispersal habitat for the Koala in the absence of better habitat. This habitat provides suitable shelter and foraging habitat for a range of reptiles, woodland bird species and ground-dwelling mammals.

Due to its location, this habitat type is not subject to grazing, however, presents fire and storm related damage (burnt or fallen branches and trees and abundant dieback). As a result, numerous patches of *Acacia* spp. regrowth were observed throughout the escarpment (additionally to the mature Lancewood present within this habitat type. Only one listed weed species was recorded within this habitat type, Velvety Tree Pear, but no introduced pasture species were recorded on top of the escarpment.



Plate 13: *Eucalypt dry woodlands (VC4)*

4.3.1.4 *Acacia* woodlands

The *Acacia* woodlands major habitat type includes the patches of Brigalow woodland to the north of the survey area (VC 10) (outside of the proposed disturbance area), Lancewood woodland on the sandstone escarpment slopes (VC 8) and some sections on the top of the escarpment (VC 9) (Figure 10). Most of this major habitat type provides connectivity to other habitat types.

This habitat type contains large amounts of coarse woody debris from fallen trees (Plate 14). The areas dominated by *Acacia* spp. provide shelter for amphibians, small reptiles and ground-dwelling mammals. These woodlands provide suitable foraging habitat for a range of woodland birds; however, nesting habitat is limited due to the lack of hollow-bearing trees. This habitat is primarily void of Koala and Greater Glider food trees; however, *Acacia* woodlands can provide dispersal habitat for the Koala in the absence of better habitat.



Plate 14: *Lancewood woodlands (VC 9)*

Only one patch of *Acacia* woodlands, located outside of the proposed disturbance area and associated with VC 10, presents undulating plains, with some potential to retain water following a rain event. However, the habitat patch available is small and isolated, presenting negligible fauna habitat value to frogs and, subsequently the Ornamental Snake.

The majority of this habitat type is lightly grazed. Except for the sandstone escarpment, cattle tracks and the presence of invasive species, are common throughout this habitat type.

4.3.1.5 Cleared agricultural areas

A large portion of the survey area has been historically cleared for agricultural purposes and covers approximately 739.56 ha of the survey area, 490 ha within the proposed disturbance area (Figure 10).

Remnant woodland areas also show evidence of ongoing grazing activity. This habitat type contains areas identified as non-remnant and regrowth vegetation and is characterised by pastureland, either cleared or containing regrowth vegetation bordering patches of remnant vegetation. One of these areas, dominated by Indian Bluegrass and *Parthenium*, occurs on basaltic black soil and it is only present along the Ti-Tree Creek. The ground layer is dominated by Buffel Grass and other pasture species, while the shrub layer is sparse and comprised mainly of *Flindersia dissorperma*, Brigalow, Poplar Box and Currantbush (Plate 15).

Trees were typically absent within this habitat type, with only isolated *Acacia* spp. or *Eucalypt* spp. saplings occurring throughout the cleared areas. The habitat value of the cleared agricultural areas is limited by the lack of shelter/cover and the disturbance from agricultural activities (clearing of Brigalow regrowth). However, these open areas provide hunting habitat for birds of prey and provide some foraging habitat for ground-dwelling mammals.

None of the cleared agricultural areas contain gilgais or any depression capable of accumulate water following a rain event and therefore don't provide habitat for amphibian species and subsequently the Ornamental Snake, which diet is formed nearly exclusively by frogs.



Plate 15: Cleared Agricultural Areas

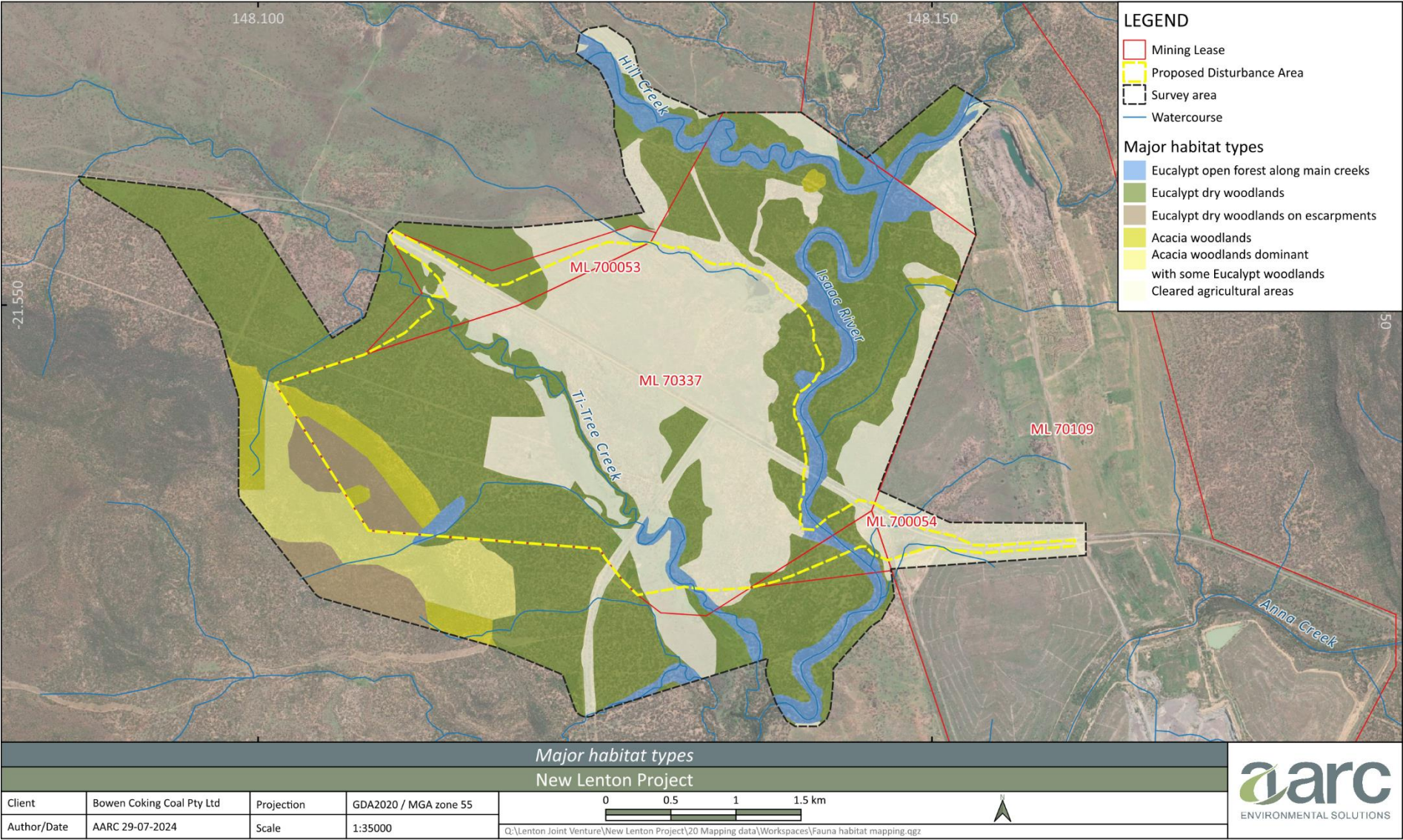


Figure 10: Major fauna habitat types

4.3.2 Native fauna species

A total of 170 native vertebrate species were identified during the field surveys, comprising seven amphibians, 35 reptiles, 92 birds and 36 mammals (of which, 21 confirmed micro-bat species).

A description of the amphibian, reptile, bird, and mammal assemblages within the survey area is provided in Sections 4.3.2.1 to 4.3.2.4. A complete list of fauna species recorded is provided in Appendix G, together with their conservation status under the EPBC Act and NC Act.

4.3.2.1 Amphibians

Seven common amphibian species were recorded across the cumulative survey effort. This included three species each from the *Limnodynastes* and *Litoria* genus' as well as Ornate Burrowing Frog (*Platyplectrum ornatum*).

Amphibian habitat in the survey area varies seasonally due to the ephemeral nature of the water features and tropical climate. Water features occur across the Project and are likely to provide temporary habitat values during heavy rainfall periods. Several of these have been dammed for cattle watering but now also support amphibian habituation and breeding during wet season periods. These habitat types have little other conservation value and heavy weed presence.

4.3.2.2 Reptiles

Thirty-five native reptile species have been recorded during field surveys within the survey area. The reptile species assemblage includes 17 skinks, six geckos, eight snakes, two dragon species and one monitor-lizard. All reptile species are found commonly throughout the region.

The survey area provided a variety of habitat types such as vegetated drainage features, woodlands to open forests and rocky escarpments to promote reptile diversity. This included several microhabitats such as tree hollows, fallen timber, dense leaf litter, and rock crevices.

However, no gilgais or deep cracking soil (suitable habitat for the Ornamental Snake) was identified within the survey area, despite numerous surveys. Further, the drainage lines within the survey area, Isaac River, Hill Creek and Ti-Tree Creek are ephemeral, with a sandy creek bed unlikely to hold water for long enough periods for frog species to breed. Surveys undertaken by Burton Mine personnel in July 2023, following a period of rains, confirmed no pooling areas along the Isaac River. It is concluded therefore, that no suitable habitat for the Ornamental Snake has been identified within the survey area.

4.3.2.3 Birds

A total of 92 bird species have been recorded during the field surveys. A variety of avian feeding guilds have been observed within the survey area, with the avian assemblage including carnivores, insectivores, granivores, omnivores, nectarivores, herbivores, and frugivores. One species of conservation significance has been recorded within the survey area, the Squatter Pigeon (Southern).

Most species observed during the field studies are common species and representative of the woodland habitats dominating the survey area.

Avian assemblages are generally determined by factors such as food sources (e.g. fruit, nectar, seeds and insects) as well as a mosaic of habitat structures such as grasslands and open woodlands to closed forests, with variation in vertical habitat complexity. Generally, the more heterogenous the habitat and the more food sources available, the more diverse the avifauna will be. Food sources across the survey area comprise seeds, fruit, nectar, insects, and vertebrate prey matter (or carrion). A larger diversity of avian species was observed in association to the riparian habitat of the Isaac River, as this habitat hosts suitable conditions for many bird species, including the largest availability of small to large hollows for nesting.

4.3.2.4 Mammals

Twenty-seven native mammal species have been recorded during the surveys comprising six macropods, three arboreal mammals, six ground-dwelling mammals, and 21 confirmed micro-bat species. Two species of conservation significance have been recorded within the survey area, namely the Greater Glider (listed under the NC Act and the EPBC Act), and the Short-beaked Echidna (listed as Special Least Concern under the NC Act but not listed under the EPBC Act).

The survey area offers a range of habitat types for small mammals, primarily associated with a plentiful food source (i.e. seeds, grains and insects) and ground layer shelter from climatic pressures and predators. Small mammal populations are typically influenced strongly by rainfall, which causes fluctuations in food sources and shelter. Consequently, the short life cycles of most small mammals can frequently result in dramatic population fluctuations depending on local climate.

Most arboreal mammals identified during the field studies have been recorded in habitats with a higher number of hollow-bearing trees, in Eucalypt open forest. Hollow bearing trees occur in abundance along Hill Creek and the Isaac River, where woodlands have a low shrub layer and are dominated by a canopy of Blue Gum. Alternatively, lesser quality habitat occurs away from the major waterway corridors, where hollow-bearing trees are sparsely distributed, exposing arboreal mammals to the dangers of predation.

Micro-bats are reliant on roosting sites such as thick foliage, loose decorticating bark, rock caves or cavities and tree hollows (Churchill 2008). Potential roosting sites in the survey area include tree hollows and decorticating bark, which are present across all vegetation communities.

4.3.3 Introduced fauna species

Six introduced fauna species have been recorded during the surveys through the detection of scats, tracks, or other traces (e.g. skulls), sensor camera detection and/or direct observation. These species are:

- Cane Toad (*Rhinella marina*);
- Wild Dog (*Canis famuiliaris*);
- Feral Cat (*Felis catus*);
- House Mouse (*Mus musculus*);
- Rabbit (*Oryctolagus cuniculus*); and
- Feral Pig (*Sus scrofa*).

4.3.4 Fauna species listed as threatened under the EPBC Act

As described in Section 4.1, of the 24 fauna species of conservation significance identified originally identified during the desktop searches, seven were assessed as potentially occurring within the survey area. Following targeted and habitat surveys, a likelihood of occurrence within the proposed disturbance area for these species has been undertaken again to identify the species assessed as known, likely or potentially occurring within the proposed disturbance area (Table 8).

Only two fauna species listed as threatened under the EPBC Act have been identified inhabiting the proposed disturbance area, namely the Greater Glider and the Squatter Pigeon. Desktop records indicated the White-throated Needletail, has been found within the survey area and the Koala has been recorded adjacent to the survey area. Although not identified during the field surveys, there is a reasonable likelihood that the survey area also provides suitable habitat for these two threatened species.

The Koala and the Greater Glider were listed as Vulnerable under the EPBC Act at the time of the referral decision for the Project. Since the referral decision, both species have been uplisted from Vulnerable to Endangered (2022). With this change occurring after the referral decision for the proposed Project, this assessment considers the impacts to these species in accordance with their listing status at the time of the

controlled action decision for the Project, as specified in the PER guideline, inclusive of consideration of information in the new conservation advice and recovery plans for the Koala for the Greater Glider.

A detailed description of the distribution, ecology, survey outcomes and habitat assessment and a habitat map for each species identified as known or likely to occur within the proposed disturbance area is provided in Section 5 and an impact assessment for the species is provided in Section 7. The location at which the conservation significant fauna has been recorded in the survey area is shown in Figure 11.

The remaining three species (Ornamental Snake, Northern Quoll and Ghost Bat) assessed as potentially occurring within the survey area following desktop assessment were assessed as unlikely to occur based on field survey findings.

Table 8: Conservation significant fauna species likelihood of occurrence – post survey

Family	Scientific Name/Common Name	EPBC Act Status ¹	Likelihood of occurrence within the proposed disturbance area
Elapidae	<i>Denisonia maculata</i> Ornamental Snake	V	Unlikely No Ornamental Snake records or observation of suitable habitat was recorded within the survey area, despite targeted surveys across seasons (Appendix E). This species is therefore considered unlikely to occur within the proposed disturbance area.
Apodidae	<i>Hirundapus caudacutus</i> White-throated Needletail	V, Mi	Known Desktop searches identify one record of the species within the proposed disturbance area (Section 5.5).
Columbidae	<i>Geophaps scripta scripta</i> Squatter Pigeon (Southern)	V	Known The species was recorded during the Autumn 2023 field assessment (Section 5.4)
Dasyuridae	<i>Dasyurus hallucatus</i> Northern Quoll	E	Unlikely Despite extensive fauna surveys over several years and seasons, including targeted survey effort (Appendix E), the Northern Quoll has not been identified within the survey area and is considered unlikely to occur within the proposed disturbance area.
Phascolarctidae	<i>Phascolarctos cinereus</i> Koala	V	Likely The species was not recorded during the field assessments (Appendix E). However, desktop searches identified one record adjacent to the survey area (Section 5.3), and habitat for the species has been identified within the proposed disturbance area. It is therefore considered likely the species uses habitat within the proposed disturbance area.
Pseudocheiridae	<i>Petauroides volans</i> Greater Glider	V	Known The species was recorded during several field assessment (Section 5.2)
Megadermatidae	<i>Macroderma gigas</i> Ghost Bat	V	Unlikely Despite extensive fauna surveys over several years and seasons, including targeted survey effort (Appendix E), the Ghost Bat has not been identified within the survey area and is considered unlikely to occur within the proposed disturbance area.

¹ EPBC Act conservation status at the time of the referral (2019): V = Vulnerable; Mi = migratory

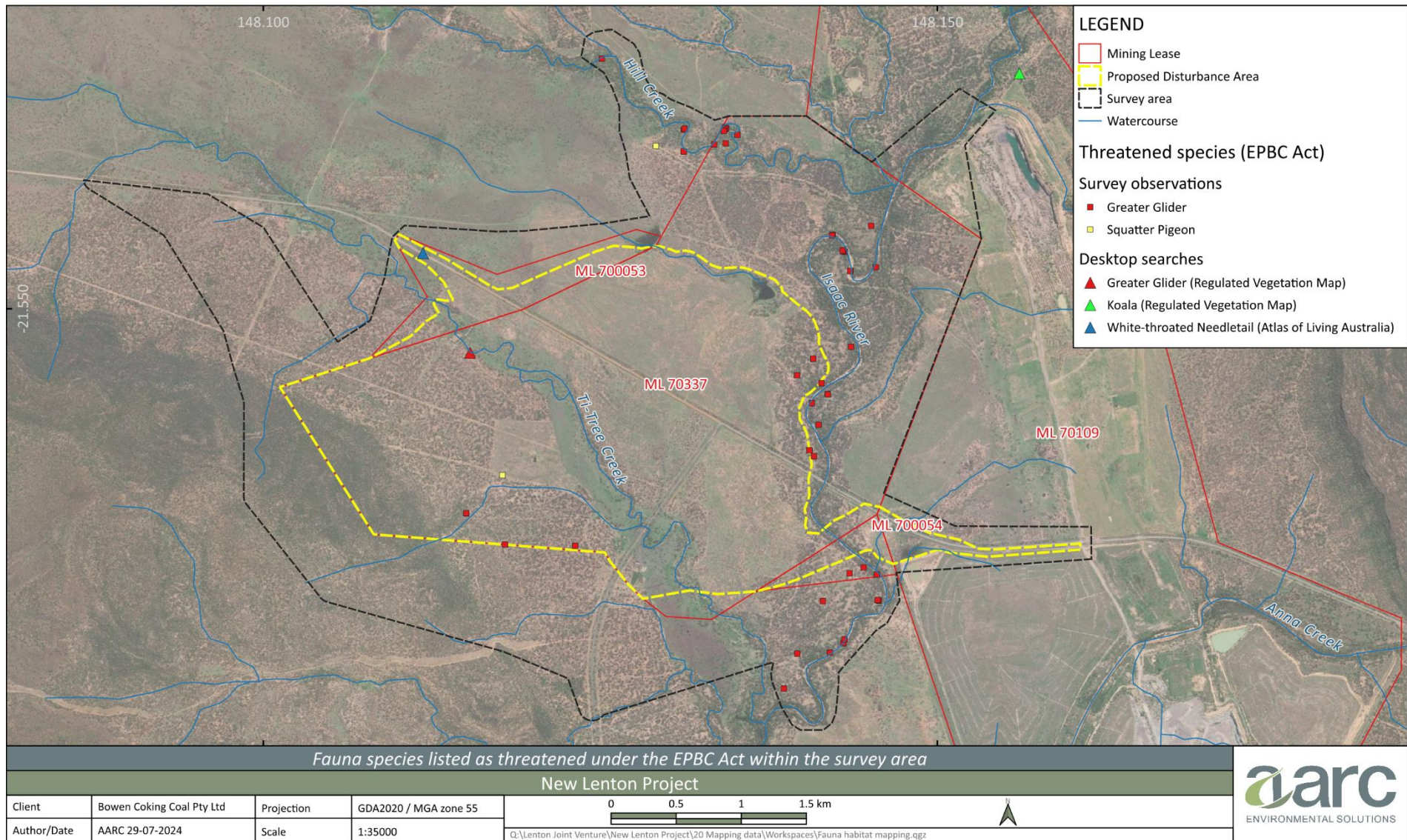


Figure 11: Fauna species listed as threatened under the EPBC within the survey area

5 MNES ecological values of the Project

Sections 5.1 to 5.5 provide an overview of the EPBC Act listed TECs and threatened species that have been identified as present or likely to utilise the proposed disturbance area (Section 4.2.4, Section 4.2.5 and Section 4.3.4). These MNES relevant to the Project are:

- Poplar Box Grassy Woodland on Alluvial Plains (Poplar Box Grassy Woodland on Alluvial Plains TEC)- Endangered
- Greater Gilder (*Petauroides volans*)- Vulnerable
- Koala (*Phascolarctos cinereus*) - Vulnerable
- Squatter Pigeon (Southern) (*Geophaps scripta scripta*) – Vulnerable
- White-throated Needletail (*Hirundapus caudacutus*) - Vulnerable

5.1 Poplar Box Grassy Woodland on Alluvial Plains TEC

5.1.1 TEC description

This ecological community, listed as Endangered under the EPBC Act, occurs west of the Great Dividing Range, typically at less than 300 m above sea level (ASL) and between latitudes 20°S to 34°S within the Brigalow Belt North, Brigalow Belt South, South East Queensland, Cobar Peneplain, Darling Riverine Plains, NSW South-western Slopes and Riverina IBRA bioregions (DCCEEW 2023b).

The Poplar Box Grassy Woodland on Alluvial Plains TEC typically comprises a grassy woodland with a canopy dominated by Poplar Box 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 (DoEE 2019). Within Queensland, five REs have the potential to represent the Poplar Box Grassy Woodland on Alluvial Plains TEC, namely RE 11.3.2, RE 11.3.17, RE 11.4.7, RE 11.4.12 and RE 12.3.10.

The Poplar Box Grassy Woodland on Alluvial Plains TEC has the following structure:

- a grassy woodland to grassy open woodland with a tree crown cover of 10% or more at patch scale;
- a tree canopy present that shows the following features:
 - canopy tree species that are capable of reaching 10 m or more in height; and
 - *Eucalyptus populnea* (Poplar Box) present in the canopy and the dominant tree species;
- low mid layer (1–10 m) crown cover of shrubs to small trees—about 30% or less; and
- ground layer (<1 m) mostly dominated across a patch by native grasses, other native herbs and sometimes chenopods.

Where hybrids of Poplar Box are present with other *Eucalyptus* spp., they have been counted as part of the *Eucalyptus populnea* component of the tree canopy when assessing the previous criterion.

A list of native plants associated with this TEC is provided in Appendix A of the Conservation Advice (DoEE 2019c).

Key threats to the Poplar Box TEC include (DoEE 2019c):

- clearance and fragmentation;
- invasive weeds and pests;
- inappropriate fire and grazing regimes;

- dieback;
- chemical impact and spray drift;
- invasive fauna;
- hydrological changes and salinization;
- nutrient enrichment; and
- climate change.

5.1.2 TEC desktop analysis

The Project is located within the Brigalow Belt North Bioregion, which is known to contain the Poplar Box Grassy Woodland on Alluvial Plains TEC. One Regional Ecosystem mapped by the Queensland Government within the survey area has the potential to represent the Poplar Box Grassy Woodland on Alluvial Plains TEC, specifically the RE 11.3.2 *Eucalyptus populnea woodland on alluvial plains*.

5.1.3 TEC survey effort

As detailed in Section 3.2.3, Vegetation communities within the survey area were mapped and described in accordance with the 'Methodology for surveying and mapping regional ecosystems and vegetation communities in Queensland (V6.0)' (Neldner *et al.* 2022).

The Autumn 2023 survey included a specific habitat and TEC assessment across the survey area. This survey improved on the scale and accuracy of vegetation / TEC mapping presented in previous assessments. In addition, Poplar Box vegetation was assessed against the key diagnostic characteristics and condition thresholds described in the Commonwealth approved conservation advice (DoEE 2019) to determine whether the vegetation community meets the Poplar Box Grassy Woodland on Alluvial Plains TEC status. This assessment was undertaken using BioCondition plots (100 x 50 m) (Eyre *et al.* 2015), as they adequately address the key diagnostic characteristics and condition thresholds for the Poplar TEC.

5.1.4 TEC survey outcomes

Portions of VC1 within the survey areas were found to meet the key diagnostic characteristics (DoEE 2019) of the Poplar Box Grassy Woodland on Alluvial Plains TEC, namely the remnant Poplar Box woodland on alluvial plains (Section 4.2.1.1).

5.1.5 TEC condition assessment

A total of 14 plots were assessed within the confirmed patches of VC 1. The condition assessment identified the following classes of TEC condition within the survey area:

- **Category A2 (highest quality)**, in patches where the crown cover was recorded as over 10%, circa 80% of perennial vegetation cover in the ground was native and more than 30 native species were recorded within the patch;
- **Category B (good quality)**, in patches where the crown cover was recorded as over 10%, over 50% of perennial vegetation cover in the ground was native and more than 20 native species were recorded within the patch; and
- **Category C (moderate quality)**, in patches where the ground cover was dominated by non-native perennial species (>50%), but presented more than 20 native species in the ground layer, more than 10 mature trees per hectare over 30 cm diameter breast height (dbh), and evidence of Poplar Box (or hybrids of Poplar Box with other *Eucalyptus* species) periodic recruitment.

A total of 184.2 ha of the Poplar Box Grassy Woodland on Alluvial Plains TEC was identified within the survey area, comprised of 106.9 ha of Category A2 highest quality, 36.8 of Category B good quality and 40.53 ha of

Category C, moderate quality, has been mapped within the survey area. The distribution of the Poplar Box Grassy Woodland on Alluvial Plains TEC patches is summarised Table 9 and shown on Figure 12.

Table 9: *Poplar Box Grassy Woodland on Alluvial Plains TEC within the survey area*

Patch	Description	Category	Current extent (ha)
P1	Large patch on the southwest of the survey area, west of the Ti-Tree Creek	Category A2	106.9
P2	Patch north of the Suttor Developmental Road, parallel to the Isaac River	Category C	12.4
P3	Patch north of the Suttor Developmental Road, parallel to the Isaac River, continuation of P2	Category C	5.1
P4	Patch between the Isaac River and Burton Mine, south of the Suttor Developmental Road	Category C	11.7
P5	Patch south of the Suttor Developmental Road, across from P3	Category C	5
P6	Patch north east of the proposed impact area	Category C	6.3
P7	Large patch to the north east of the survey area, between the Isaac River and Burton Mine pit	Category B	36.8

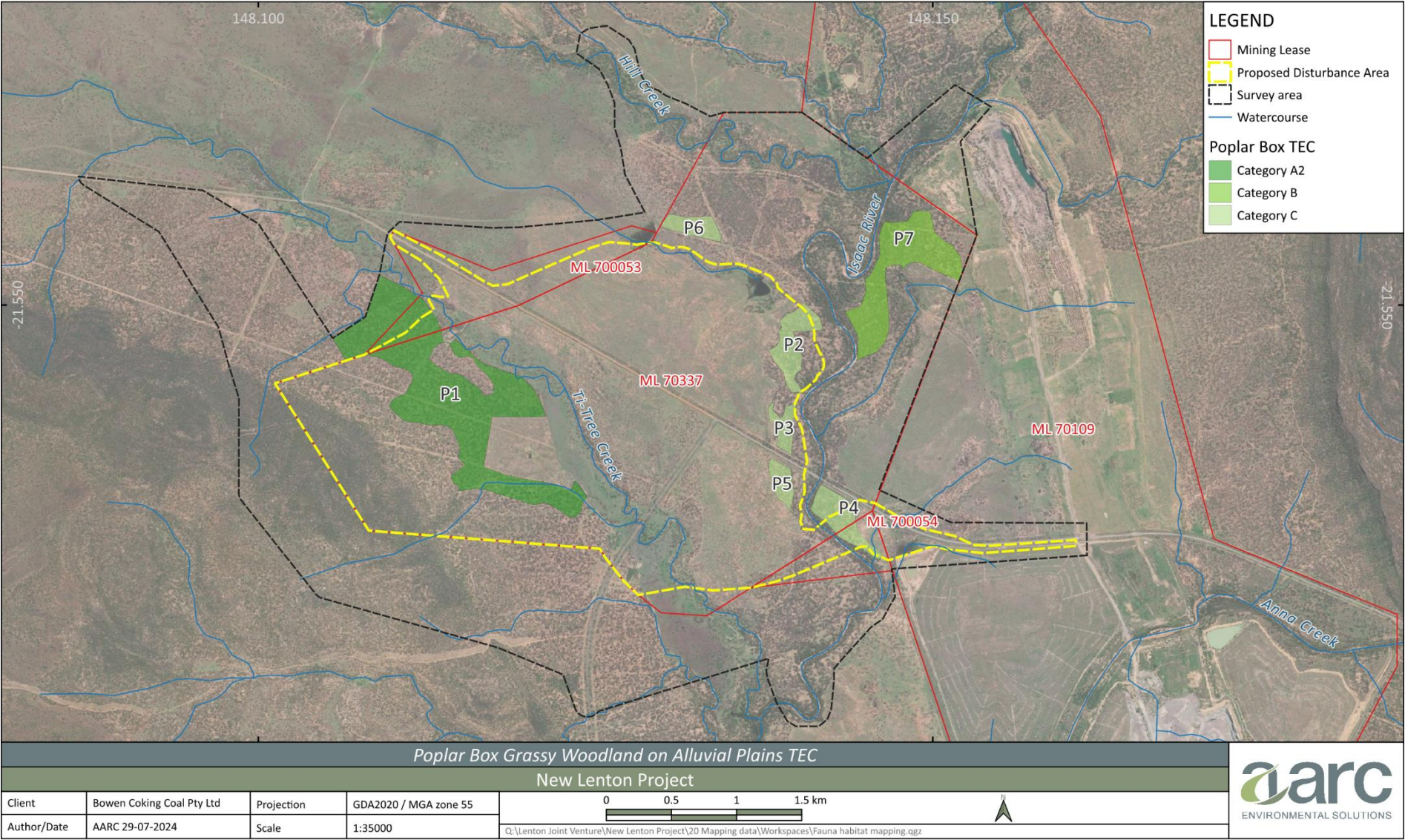


Figure 12: Poplar Box Grassy Woodland on Alluvial Plains TEC within the survey area

5.2 Greater Glider

5.2.1 Species description

The Greater Glider was listed as Vulnerable under the EPBC Act at the time of the referral decision. Since this time, the listing status for the Greater Glider has been upgraded to Endangered under the EPBC Act. The updated conservation advice for the Greater Glider has been considered for the habitat assessment for the species.

This assessment is applicable to the Greater Glider (southern and central) (*Petauroides volans*) as referred to on the DCCEEW Species Profiles and Threats database (DCCEEW 2023b). The species 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 1,200 m above sea level (DCCEEW 2022).

The Greater Glider is an arboreal, nocturnal marsupial known to occur in Eucalypt dominated habitats in eastern Australia (DCCEEW 2022). It is primarily folivorous, with a diet mostly comprising Eucalypt leaves and occasionally flowers. Preferred habitat consists of taller, montane, moist Eucalypt forests with relatively old trees and abundant hollows. It also favours forests with a diversity of Eucalypt species due to seasonal variation in its preferred tree species (DCCEEW 2022). During the day, this species shelters in tree hollows, with a particular selection for large hollows in large old trees (DCCEEW 2022) and requires at least two hollow bearing trees for every 2 ha of suitable forest habitat (DCCEEW 2022, Kerswell *et al.* 2020).

The species is absent from cleared areas and has little dispersal ability to move between fragments through cleared areas. Greater Gliders have been recorded in habitat patches <10 ha. However, population viability in small remnants is low due to the species' low reproductive output, susceptibility to disturbance and edge effects (DCCEEW 2022).

Threats to the Greater Glider include (DCCEEW 2022):

- inappropriate fire regimes;
- habitat clearing and fragmentation;
- timber harvesting;
- barbed wire fencing (entanglement);
- increased temperatures and changes to rainfall patterns;
- hyper-predation by owls;
- competition from Sulphur-crested Cockatoos;
- predation by Feral Cats; and
- predation by European Red Foxes.

No recovery plans or threat abatement plans have been developed, adopted, or identified as relevant for the Greater Glider (DCCEEW 2023c). Nevertheless, the latest conservation advice for the Greater Glider incorporates a section on conservation and recovery actions, including the implementation of the relevant abatement plans in areas where threats from introduced predators (e.g. Feral Cat) are locally significant (DCCEEW 2022).

5.2.2 Species desktop analysis

Desktop analyses were conducted of relevant databases to identify records of the Greater Glider within the vicinity of the Project (Wildlife Online, Wildnet, Regulated Vegetation Management Map and Atlas of Living Australia occurrence records). The desktop assessment also includes reviews of previous findings within the survey area.

Several records were identified within 10 km of the survey area during the database searches. Additionally, the Vegetation Management Supporting Map shows records of the species within the survey area, mostly records from AARC surveys listed in this report (DoR 2017-2023). Details of the desktop analysis are provided in Section 4.1.2 and Appendix D.

5.2.3 Species survey effort

Fauna surveys for the Project have been conducted in spring 2004 (30th August to 7th September), autumn 2017 (14th to 22nd March), summer 2018 (22nd to 27th February), autumn 2018 (30th April to 4th May) a targeted Greater Glider survey in spring 2018 (29th October to 1st November), autumn 2019 (2nd to 8th April), and autumn 2023 targeted habitat assessment (28th February to 9th March). The surveys total over 49 days with consideration of relevant Commonwealth and Queensland survey guidelines. Most surveys fell within the Brigalow Belt Bioregion recommended survey timing (Eyre *et al.* 2018).

Several fauna survey sites including spotlight, habitat searches and camera traps, were established during the surveys across all habitat types. Additionally, as mentioned above, one targeted Greater Glider survey was undertaken in spring 2018. This survey consisted of extensive diurnal habitat survey (recording obvious tree trunk scratches and scats) and spotlight searches in targeted suitable habitat for the Greater Glider. Targeted habitat was delineated into two habitat types:

- Type A. Preferred habitat of *Eucalyptus* spp. and/or *Corymbia* spp. woodland fringing drainage lines and likely to contain key habitat features such as large tree hollows; and
- Type B. Potentially suitable habitat of *Eucalyptus* spp. and/or *Corymbia* spp. woodland with a continuous canopy and potentially containing key habitat features such as large tree hollows, but in less density than Type A habitat.

Survey effort for the Greater Glider at standard and targeted sites accounts for an estimated:

- active searches for Greater Gliders and scats: 35 person hours;
- spotlighting: 52 person hours; and
- camera trapping: 56 trap nights.

The survey timing, methodology and effort are consistent with the Commonwealth Guidelines. Stag watch surveys were not applied, as spotlighting and call playback at potential den tree areas sufficiently surveyed these areas.

Further details of the survey timing, effort and methodology are provided in Section 3.2.4 and Appendix E.

In Autumn 2023, a habitat assessment for the Greater Glider was undertaken. This assessment comprised 53 plot areas of 100 m x 50 m within areas of potentially suitable vegetation. Important species attributes (Section 3.2.5) were recorded, such as the canopy cover of Myrtaceae eucalypt species (*Eucalyptus* and *Corymbia*), measured using the intercept method (Neldner *et al.* 2022), and the number of trees with suitable hollows (diameter >20 cm, alive or dead) (DCCEEW 2022).

5.2.4 Species survey outcomes

The Greater Glider has been recorded within the survey area during several surveys, with distribution almost exclusively confined to the Blue Gum riparian woodlands along the Isaac River and Hill Creek. As indicated in Appendix G, there were 57 records of Greater Gliders within the survey area, which include 15 observations during the autumn 2017 survey, 4 observations during the autumn 2018 survey and 38 observations during the spring 2018 survey. The locations of Greater Glider records are shown on Figure 13.

5.2.5 Species habitat assessment

Habitat mapping for the Greater Glider within the survey area is informed by the habitat assessment undertaken during the surveys, the new species conservation advice (DCCEEW 2022), aerial imagery obtained from the area at 1 m resolution collected in June 2022, state vegetation mapping, and information contained in the SPRAT database, including the relevant statutory documents and published research.

The latest conservation advice for the species identifies factors to consider when identifying habitat that is critical to the survival of the species (DCCEEW 2022):

- 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; and
- smaller or fragmented habitat patches connected to larger patches of habitat, that can facilitate dispersal of the species and/or that enable recolonization; and
- cool microclimate forest/woodland areas (e.g. protected gullies, sheltered high elevation areas, coastal lowland areas, southern slopes); and
- 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.

The species conservation advice indicates that a dbh >30 cm can be used as a proxy where hollows cannot be detected, citing a publication by Eyre et al. 2021. However, the Guide to Greater Glider Habitat in Queensland (Eyre et al. 2022) specifies that the denning trees are characterised by a dbh >50 cm, and that the average of large tree dbh thresholds available for almost half of the regional ecosystems identified as greater glider habitat is dbh >46 cm. This assessment has considered the more recent publication by Eyre et al. 2022 when applying dbh for the species habitat.

The habitat requirements of the Greater Glider are described in Section 5.2.1. The key habitat features are:

- sufficient continuous canopy cover of *Eucalyptus* species for the species dispersal;
- presence of mature hollow-bearing trees with suitably sized and aged hollows; and
- presence of a range of the species preferred food species.

The habitat description provided in Table 10 has been prepared in view of the key habitat features and the positive correlation between tree hollows, *Eucalyptus* spp. canopy cover and Greater Glider abundance (DCCEEW 2022 and survey results).

While not all the habitat assessed as potential habitat for the Greater Glider meets the conditions for habitat critical to the species' survival, the high presence of Greater Glider within the survey area means that the areas mapped as suitable habitat for the species can also be considered critical to the survival of the species. Habitat critical to the survival of the Greater Glider therefore includes preferred habitat and suitable habitat as defined in Table 10.

Table 10: Greater Glider habitat critical to the survival of the species

Habitat Description	Relevant features present within the survey area
Habitat critical to the survival of the species	
Preferred habitat Greater Glider preferred habitat that may provide: - Eucalyptus woodland continuous canopy to facilitate the species dispersion (above 20% of canopy cover); - More than 2 large hollows (or large tree (>46dbh)) per hectare, required for denning; and - Presence of a range of preferred food tree species.	Within the survey area, the preferred habitat for the species (critical habitat) corresponds to areas mapped as remnant Eucalypt open forest or woodlands, with continuous canopy, large hollows or hollow bearing trees and the presence of a range of food species. These communities tend to be along creeks and floodplains, with more fertile soils and are: - Riparian open forest along the Isaac River and the Hill Creek (RE 11.3.25); - Eucalypt grassy woodlands on alluvial plains (most of RE 11.3.2, RE 11.3.4, RE 11.3.36, one section of RE 11.3.7 near a drainage line to the southwest of the survey area, surrounded by preferred habitat); and - The area limited to the denser canopy along the Ti-Tree Creek that connects to the Isaac River, located south of Ellensfield Road.
Suitable habitat Greater Glider preferred habitat that may provide: - Eucalyptus woodland continuous canopy to facilitate the species dispersion (above 20% of canopy cover); and - More than 2 large hollows (or large tree (>46dbh)) per hectare, required for denning. But lack the presence of a range of preferred food tree species.	Areas that meet the Eucalypt canopy cover and hollow-bearing tree density criteria, but don't have enough preferred food species, are considered suitable habitat for the Greater Glider. This area corresponds to the Eucalypt dry woodlands on lowland and are: - Eucalypt woodland with sparse canopy and dense understorey (corresponding with RE 11.3.7, RE 11.9.10 and most of RE 11.9.7a); and - The area limited to the denser canopy along the Ti-Tree Creek, north of Ellensfield Road.

* For the assessed preferred food tree species included *Eucalyptus tereticornis*, *E. crebra* and *E. tessellaris*

The remaining areas within the survey area were assessed as unsuitable (i.e. not critical to the survival) habitat for the Greater Glider, as detailed in Table 11.

Table 11: Other habitat not critical to the survival of the species

Habitat Description	Relevant features present within the survey area
Unsuitable habitat	
Habitat is considered unsuitable (not critical) for the Greater Glider if: - the canopy is not continuous <i>Eucalyptus spp.</i>, or it is not dense enough for the species to disperse; and - does not present hollow bearing trees nor trees with dbh > 46 cm; or - does not contain Eucalypt food species for the Greater Glider.	Some areas have been assessed as unsuitable for the Greater Glider within the survey. These communities, shown in Figure 9, are: - Non-remnant vegetation, unless specified above, due to the absence of mature hollow bearing trees and/or sufficient canopy density and height to facilitate the species dispersal (including HVR); - One small patch of Poplar Box open woodland (RE 11.3.2) between a farm dam and the Ellensfield Road, to the southwest of the survey area with no hollow bearing trees and a very sparse canopy; - Acacia dominated vegetation communities, such as RE 11.10.3 and RE 11.9.1; and - Eucalypt woodland in sandstone escarpments with scattered patches of Acacia-dominated vegetation (RE 11.10.4a) on top of the sandstone escarpment. No food tree species for the Greater Glider were recorded in this woodland, which is also disconnected from the rest of the continuous Eucalypt open forest and woodland by Acacia spp. woodland (RE 11.10.3) on the slopes.

* For the assessed preferred food tree species included *Eucalyptus tereticornis*, *E. crebra* and *E. tessellaris*

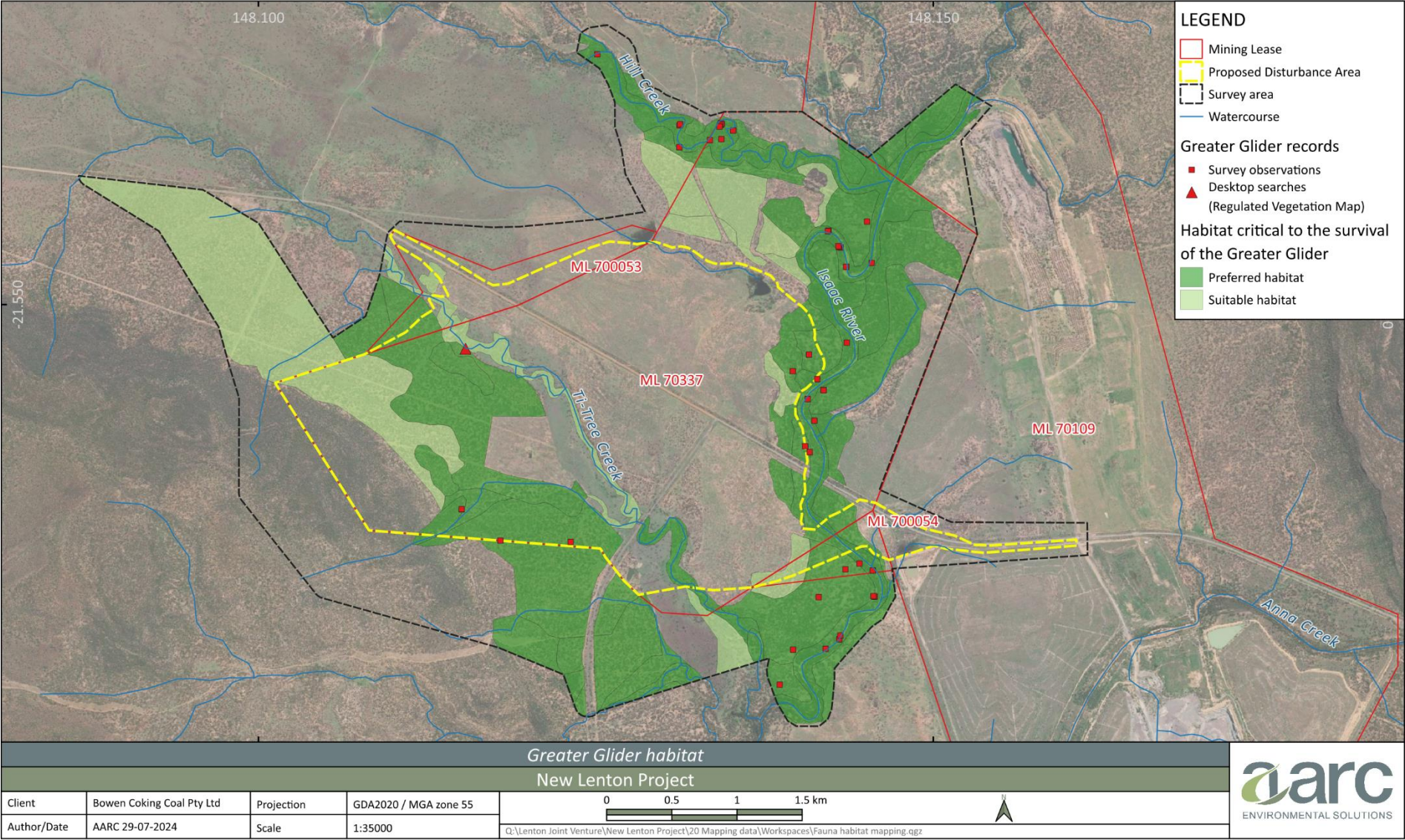


Figure 13: Greater Glider habitat mapping

5.3 Koala

5.3.1 Species description

The Koala was listed as Vulnerable under the EPBC Act at the time when the referral decision was made for the Project. Since this time, the listing status for the Koala has been upgraded to Endangered under the EPBC Act. The updated conservation advice for the Koala has been considered for the habitat assessment for the species

Koalas are a semi-arboreal marsupial that is endemic to Australia (DAWE 2022a; ANU 2021). They live along the eastern coast of Australia. The species distribution spans from coastal to semi-arid climate to the west (DAWE 2022a and DAWE 2022b).

Due to their wide distribution, koala habitat preferences can differ between local populations and are unable to be generalised. The Koala is a specialist folivore and preferred habitats are primarily dominated or associated with *Eucalyptus* spp., which are their primary food source (ANU 2021). They can, however, feed on other foliage including *Corymbia* spp. and *Angophora* spp. and can be found outside of the geographic range of *Eucalyptus* spp. (ANU 2021). The koala is primarily nocturnal and can be found sleeping on tree branches with no distinction made between foraging and sheltering trees (ANU 2021). The 'National Recovery Plan for the Koala *Phascolarctos cinereus* (combined populations of Queensland, New South Wales and the Australian Capital Territory)' (DAWE 2022b) defines a patch of habitat as 'all the necessary resources for the persistence of a population and that is separated from other patches by inhospitable habitat'.

Females commonly live until 13-14 years and have been documented to live till 18 years in the wild, while males generally live until 12 years old (DAWE 2022a and DAWE 2022b). Koalas reach sexual maturity between 2-3 years for females and 4 years for males with most births occurring between October and May (DAWE 2022a). Females will usually produce one offspring per year with variability in reproduction occurring from differences in seasonality between northern and southern populations (DAWE 2022a and DAWE 2022b). Joeys will travel with their mum until they reach approximately 12 months old and are weaned during periods of favourable climatic conditions and high resource availability (DAWE 2022b).

The main threats to Koalas are urban expansion, disease, habitat loss, fragmentation and degradation, vehicle strike, predation by feral dogs, drought, and climate change (DAWE 2022a; DAWE 2022b and ANU 2021).

No threat abatement plans have been developed, adopted, or identified as relevant for the Koala (DCCEEW 2023b).

5.3.2 Species desktop analysis

Desktop analyses were conducted of relevant databases to identify records of the Koala within the vicinity of the Project (Wildlife Online, Wildnet, Regulated Vegetation Management Map and Atlas of Living Australia occurrence records). The desktop assessment also includes reviews of previous findings within the survey area.

The Vegetation Management Supporting Map shows one record of the species within 5 km to the proposed disturbance area and additional records downstream of the survey area along the Isaac River (DoR 2017-2023). Details of the desktop analysis are provided in Section 4.1.2 and Appendix D.

5.3.3 Species survey effort

Fauna surveys for the Project have been conducted in spring 2004 (30th August to 7th September), autumn 2017 (14th to 22nd March), summer 2018 (22nd to 27th February), autumn 2018 (30th April to 4th May), spring 2018 (29th October to 1st November), autumn 2019 (2nd to 8th April), and autumn 2023 targeted habitat assessment (28th February to 9th March). The surveys total over 49 days in consideration of relevant Commonwealth and Queensland survey guidelines. Most surveys fell within the Brigalow Belt Bioregion recommended survey timing (Eyre *et al.* 2018).

As detailed in Section 5.2.3, the survey undertaken in spring 2018 was a targeted Greater Glider survey, focusing on suitable habitat for the Greater Glider, which is also considered suitable for the Koala. This survey consisted of extensive diurnal habitat survey and spotlight searches. Targeted habitat was delineated into two habitat types for the Greater Glider, which largely coincides with the Koala preferences:

- Type A. Preferred habitat of *Eucalyptus* spp. and/or *Corymbia* spp. woodland fringing drainage lines and likely to contain key habitat features such as large shelter trees and food tree species for the Koala; and
- Type B. Potentially suitable habitat of *Eucalyptus* spp. and/or *Corymbia* spp. woodland with a continuous canopy and potentially containing key habitat features such as food species trees, but no large shelter trees as the ones found in riparian vegetation.

Survey effort for the Koala at standard and targeted sites accounts for an estimated:

- diurnal searches for Koalas and scats: 35 person hours;
- call playback: 3.5 person hours;
- spotlighting: 52 person hours; and
- camera trapping: 56 trap nights.

Further details of the survey timing, effort and methodology are provided in Section 3.2.4 and Appendix E.

The habitat assessment survey undertaken in Autumn 2023 comprised 53 plots of 100 m x 50 m within areas of potentially suitable vegetation for the Koala. During this assessment, the important species attributes, described in Section 3.2.5, were recorded. These included availability of suitable Myrtaceae 'eucalypt' trees (species of *Eucalyptus*, and *Corymbia*) within remnant vegetation and high-value regrowth vegetation. Myrtaceae eucalypts with a diameter at breast height (dbh) of >10 cm were counted within each transect to calculate the density of food species per hectare.

5.3.4 Species survey outcomes

No Koala individuals or traces (scratches or scats) were recorded during the surveys. However, given the presence of species records in close proximity and the presence of suitable habitat for the species within the survey area, the species has been assumed to utilise suitable habitat within the proposed disturbance area.

The Koala populations within the Brigalow Belt are considered to be widespread and low-density populations (DAWE 2022a; DAWE 2022b).

5.3.5 Species habitat assessment

Habitat mapping for the Koala within the survey area is informed by the habitat assessment undertaken during the surveys, aerial imagery obtained from the area at 1 m resolution collected in June 2022, and information contained in the SPRAT database, including the relevant statutory documents and published research. The results of the field surveys, in Table 12, describe: the different vegetation types in the survey area; estimate the density of *Eucalyptus* and *Corymbia* tree species per hectare; estimate the density of important food trees per hectare; and estimate the ancillary habitat tree species per hectare in each area. This information was used to identify the habitat critical to the survival of the Koala, and the habitat not critical to the survival of the species. It is based on the criteria described in the species conservation advice for the species (DAWE 2022a).

Table 12: Estimated tree density per hectare for dominant habitat type within the survey area

Habitat type	Number of sites	Important food spp. density/ha [#]	Ancillary habitat spp. density/ha [#]
RE 11.3.25	3	71.3	38
RE 11.3.36	2	85	27
RE 11.3.2	10	71.8	3.8
RE 11.3.4	4	1.5	66
RE 11.3.7	3	6.7	36.7
non-remnant thin vegetated drainage line along Ti-Tree Creek south of the road (HVR RE 11.3.25)	1	16	28
RE 11.8.5	1	28	14
RE 11.9.7a	2	77	1
Non-remnant RE 11.9.7a near junction	1	36	0
Non-remnant RE 11.8.5 patch adjacent to Ti-Tree Creek	1	26	0
Non-remnant thin vegetated drainage line along Ti-Tree Creek north of the road (HVR 11.3.7)	1	6	6
RE 11.10.3	2	6	0
RE 11.10.4a	2	0	0
Patch of non-remnant RE 11.8.5 north of survey area	2	2	1

* including all *Eucalypt* and *Corymbia* species

for the assessed important food tree species included *Eucalyptus tereticornis*, *E. crebra*, *E. orgadophila* and *E. populnea* and ancillary tree species included *Corymbia tessellaris*, *Corymbia dallachiana* and *Corymbia erythrophloia*

Survey data indicates remnant vegetation within the survey area is dominated by Myrtaceae (Table 13), including trees preferentially used by the Koala for foraging (*E. tereticornis*, *E. crebra*, *E. orgadophila* and *E. populnea* (Kerswell *et al.* 2020)) or ancillary habitat trees (*Corymbia tessellaris*, *C. dallachiana* and *C. erythrophloia* (ANU 2021)). Within the survey area, most of the habitat types indicate a high density of foraging and shelter tree species (Table 12). Therefore, most of the vegetated area, with the exception of three habitat types characterised by minimal or no foraging or shelter tree species, has been assessed as potentially suitable habitat for the Koala, as described in Table 13 and shown in Figure 14.

The species conservation advice for the species identifies factors to consider when identifying Koala habitat that is critical for the survival of the species (DAWE 2022a):

- 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;

- e) 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;
- f) whether the habitat is necessary to ensure the long-term future of the species or ecological community through reintroduction or re-colonisation; and
- g) any other way in which habitat may be critical to the survival of a listed threatened species or a listed threatened ecological community.

In most habitats within the survey area, this includes a high density preferentially used for foraging (*E. tereticornis*, *E. crebra*, *E. orgadophilla* and *E. populnea* (Kerswell *et al.* 2020, ANU 2021)) or ancillary habitat trees (*Corymbia tessellaris*, *C. dallachiana* and *C. erythrophloia* (ANU 2021)).

While all areas of vegetation with dense preferred feed trees have the potential to support comparatively high Koala numbers, given the vegetation structure and occurrence within the landscape, RE 11.3.25 may play a more important ecological role for the local population. Koalas show a preference for tree species on more fertile soils with higher leaf nutrient status and possibly high leaf moisture, especially during times of drought or heat stress (DAWE 2022a). Koalas are also susceptible to extreme temperatures (DAWE 2022a) and will select trees which provide better thermal regulation (Davies *et al.* 2014; Briscoe *et al.* 2015). Such trees are often located in gullies and/or have thicker canopies (Crowther *et al.* 2013). It is likely vegetation in RE 11.3.25 meets these criteria, as it is within close proximity to creek lines (increasing the likelihood of high leaf moisture) and has a comparatively tall, dense canopy. Furthermore, this vegetation is linear, following major creek lines (Isaac River and Hill Creek) and may, therefore, also play a dispersal/movement role. This habitat is consistent with several factors of the criteria to be considered habitat critical to the survival of the species defined in the species conservation advice (DAWE 2022a).

The remaining habitat mapped as suitable for the Koala (Table 13 and Figure 14) could also meet the criteria to constitute habitat critical to the survival of the species as described in the species conservation advice (DAWE 2022a) as it is likely to:

- be used to meet essential life cycle requirements; and
- be necessary for use as corridors to allow the species to move freely between sites used to meet essential life cycle requirements.

Furthermore, the thin vegetated area along Ti-Tree Creek, in the section north of Ellensfield Road, has fewer food or ancillary tree species, but due to its location along the creek, it is likely to provide a necessary corridor for the species. Therefore, it is considered critical to its survival.

Habitat for Koala has been mapped for the survey area based on the relevant features for Koala habitat critical to the survival of the species as discussed, and as described in Table 13, and in Figure 14. Habitat critical to the survival of the species comprises 'important ecological function habitat' and 'suitable habitat' in Table 13.

Table 13: Koala habitat critical to the survival of the species

Habitat Description	Relevant features present within the survey area
Critical to the survival of the species	
Important ecological function habitat Koala habitat that may provide: • refugial habitat features, such as food trees on more fertile soils with higher leaf nutrient status, higher leaf moisture or with thicker canopies; these characteristics are especially important during periods of drought or heat stress; and • connective function between otherwise discontinuous areas of suitable habitat.	Within the survey area, areas mapped as Eucalypt open forest, with continuous canopy dominated by refuge trees (<i>Eucalyptus tereticornis</i>) have been identified as potential important ecological function habitat. These areas have been identified in riparian habitat along the Isaac River and Hill Creek.

Habitat Description	Relevant features present within the survey area
Suitable habitat Koala habitat is any forest or woodland that contains known koala food tree species, or shrubland with emergent food trees (TSSC 2012). A Koala food tree includes species from the <i>Eucalyptus</i>, <i>Corymbia</i>, <i>Angophora</i>, <i>Lophostemon</i> and <i>Melaleuca</i> genera (DAWE 2022a). Additionally, woodlands with a high density of ancillary koala trees within the vicinity of habitats deemed important or suitable, are also considered suitable for the species. Non-food trees such as Brigalow and Sally Wattle have been utilised by this species for daytime roosting (Ellis et al. 2002). A potential Koala habitat tree is considered to be a tree with a trunk diameter greater than 10 cm at 1.3m above ground (ANU 2021).	Within the survey area, areas mapped as remnant vegetation communities with high food or ancillary habitat trees density, are considered to provide potential suitable habitat for the Koala. These communities include: • Eucalypt grassy woodlands on alluvial plains; and • Eucalypt woodland with sparse canopy and dense understorey; • The area limited to the denser canopy along the Ti- Tree Creek, south of Ellensfield Road; and • The area limited to the denser canopy along the Ti- Tree Creek, north of Ellensfield Road.

In addition, based on the survey results detailed in Table 12, and in the context of the local landscape, this assessment identifies other vegetated areas that do not meet the requirements to be considered habitat critical to the survival of the species. Using the species conservation advice (DAWE 2022a) as the basis for not meeting the requirements to be considered habitat critical to the survival of the species, these vegetated areas (referred to as 'other habitat' and 'unsuitable habitat') are further described and assessed against the criteria below and summarised in Table 14. 'Other habitat' that is not critical to the survival of the species is shown on Figure 14.

- Eucalypt and Acacia woodland (mostly Lancewood) on the sandstone escarpment located to the west the survey area (in Table 12, referred to as RE 11.10.4a) with no food or ancillary tree species. Within the local landscape, this habitat is unlikely to:
 - a) be used during periods of stress (examples: flood, drought or fire), as it lacks food and ancillary trees; and there is abundant and continuous habitat for the species in the surrounding areas below the escarpment;
 - b) be used to meet essential life cycle requirements (examples: foraging, breeding, nesting, roosting, social behaviour patterns or seed dispersal processes) as it lacks food and ancillary trees; and there is abundant and continuous habitat for the species in the surrounding areas below the escarpment;
 - c) be used by important populations, as it lacks food and ancillary trees; and there is abundant and continuous habitat for the species in the surrounding areas below the escarpment;
 - d) be necessary to maintain genetic diversity and long-term evolutionary development as it lacks food and ancillary trees; and there is abundant and continuous habitat for the species in the surrounding areas below the escarpment;
 - e) be necessary for use as corridors to allow the species to move freely between sites used to meet essential life cycle requirements as it lacks food and ancillary trees; and there is abundant and continuous habitat for the species in the surrounding areas below the escarpment;
 - f) be necessary to ensure the long-term future of the species or ecological community through reintroduction or re-colonisation as it lacks food and ancillary trees; and there is abundant and continuous habitat for the species in the surrounding areas below the escarpment; and
 - g) be critical to the survival of a listed threatened species or a listed threatened ecological community as it lacks food and ancillary trees; and there is abundant and continuous habitat for the species in the surrounding areas below the escarpment.

- Lancewood woodland on the sandstone escarpment located to the west the survey area (in Table 12, referred to as RE 11.10.3). Within the local landscape, this habitat is unlikely to:
 - a) be used during periods of stress (examples: flood, drought or fire) due to the minimal and very patchy presence of food or ancillary trees in the area, whilst there is abundant and continuous habitat for the species in the surrounding areas below the escarpment;
 - b) be used to meet essential life cycle requirements (examples: foraging, breeding, nesting, roosting, social behaviour patterns or seed dispersal processes) due to the minimal and very patchy presence of food or ancillary trees in the area, whilst there is abundant and continuous habitat for the species in the surrounding areas below the escarpment;
 - c) be used by important populations due to the minimal and very patchy presence of food or ancillary trees in the area, whilst there is abundant and continuous habitat for the species in the surrounding areas below the escarpment;
 - d) be necessary to maintain genetic diversity and long-term evolutionary development due to the minimal and very patchy presence of food or ancillary trees in the area, whilst there is abundant and continuous habitat for the species in the surrounding areas below the escarpment;
 - e) be necessary for use as corridors to allow the species to move freely between sites used to meet essential life cycle requirements due to the minimal and very patchy presence of food or ancillary trees in the area, whilst there is abundant and continuous habitat for the species in the surrounding areas below the escarpment;
 - f) be necessary to ensure the long-term future of the species or ecological community through reintroduction or re-colonisation due to the minimal and very patchy presence of food or ancillary trees in the area, whilst there is abundant and continuous habitat for the species in the surrounding areas below the escarpment; and
 - g) be critical to the survival of a listed threatened species or a listed threatened ecological community due to the minimal and very patchy presence of food or ancillary trees in the area, whilst there is abundant and continuous habitat for the species in the surrounding areas below the escarpment.
- One patch of very sparse regrowth vegetation of RE 11.8.5 north of the Suttor Developmental Road (in Table 12). This patch is heavily disturbed, with very few food or ancillary tree species, dieback is present, and does not provide a connection with another patch of vegetation. Within the local landscape, this habitat is unlikely to:
 - a) be used during periods of stress (examples: flood, drought or fire), due to the minimal presence of food or ancillary trees, as well as minimal protection against predators. This patch is isolated, surrounded by a vast area of cleared agricultural land. In the context of the local landscape, it is not necessary for movement of the species;
 - b) be used to meet essential life cycle requirements (examples: foraging, breeding, nesting, roosting, social behaviour patterns or seed dispersal processes) due to the minimal presence of food or ancillary trees, as well as minimal protection against predators. This patch is isolated, surrounded by a vast area of cleared agricultural land. In the context of the local landscape, it is not necessary for movement of the species;
 - c) be used by important populations, due to the minimal presence of food or ancillary trees, as well as minimal protection against predators. This patch is isolated, surrounded by a vast area of cleared agricultural land. In the context of the local landscape, it is not necessary for movement of the species;
 - d) be necessary to maintain genetic diversity and long-term evolutionary development due to the minimal presence of food or ancillary trees, as well as minimal protection against predators. This patch is isolated, surrounded by a vast area of cleared agricultural land. In the context of the local landscape, it is not necessary for movement of the species;

- e) be necessary for use as corridors to allow the species to move freely between sites used to meet essential life cycle requirements due to the minimal presence of food or ancillary trees, as well as minimal protection against predators. This patch is isolated, surrounded by a vast area of cleared agricultural land. In the context of the local landscape, it is not necessary for movement of the species;
- f) be necessary to ensure the long-term future of the species or ecological community through reintroduction or re-colonisation due to the minimal presence of food or ancillary trees, as well as minimal protection against predators. This patch is isolated, surrounded by a vast area of cleared agricultural land. In the context of the local landscape, it is not necessary for movement of the species; and
- g) be critical to the survival of a listed threatened species or a listed threatened ecological community due to the minimal presence of food or ancillary trees, as well as minimal protection against predators. This patch is isolated, surrounded by a vast area of cleared agricultural land. In the context of the local landscape, it is not necessary for movement of the species.

Table 14: Other habitat not critical to the survival of the species

Habitat Description	Relevant features present within the survey area
Other habitat Koala habitat with sub-suitable food or ancillary tree species density or lack of protection against predators.	Within the survey area, areas mapped as remnant or non-remnant vegetation communities with food and ancillary tree species density less or equal than 6 trees per ha are not considered to provide habitat critical to the survival of the species. These communities include: • Eucalypt and Acacia woodland (mostly Lancewood) on sandstone escarpment with no food or ancillary tree species; • Lancewood woodland on sandstone escarpment; and • One patch of very sparse regrowth vegetation of RE 11.8.5 to the north of the Suttor Developmental Road with dieback and very few food or ancillary tree species. As detailed above, the thin vegetated area along Ti-Tree Creek, in the section north of Ellensfield Road has a low density of food or ancillary tree species, but due to its location along the creek, it is likely to provide a necessary corridor for the species. Therefore, it is considered critical to its survival.
Unsuitable habitat Unsuitable habitats are cleared agricultural areas and some regrowth areas. While Eucalypt regrowth can be suitable for the Koala, the cleared agricultural areas within the survey area contain low Brigalow regrowth, or Poplar Box regrowth below 1.5 m tall, which is unsuitable for the Koala.	

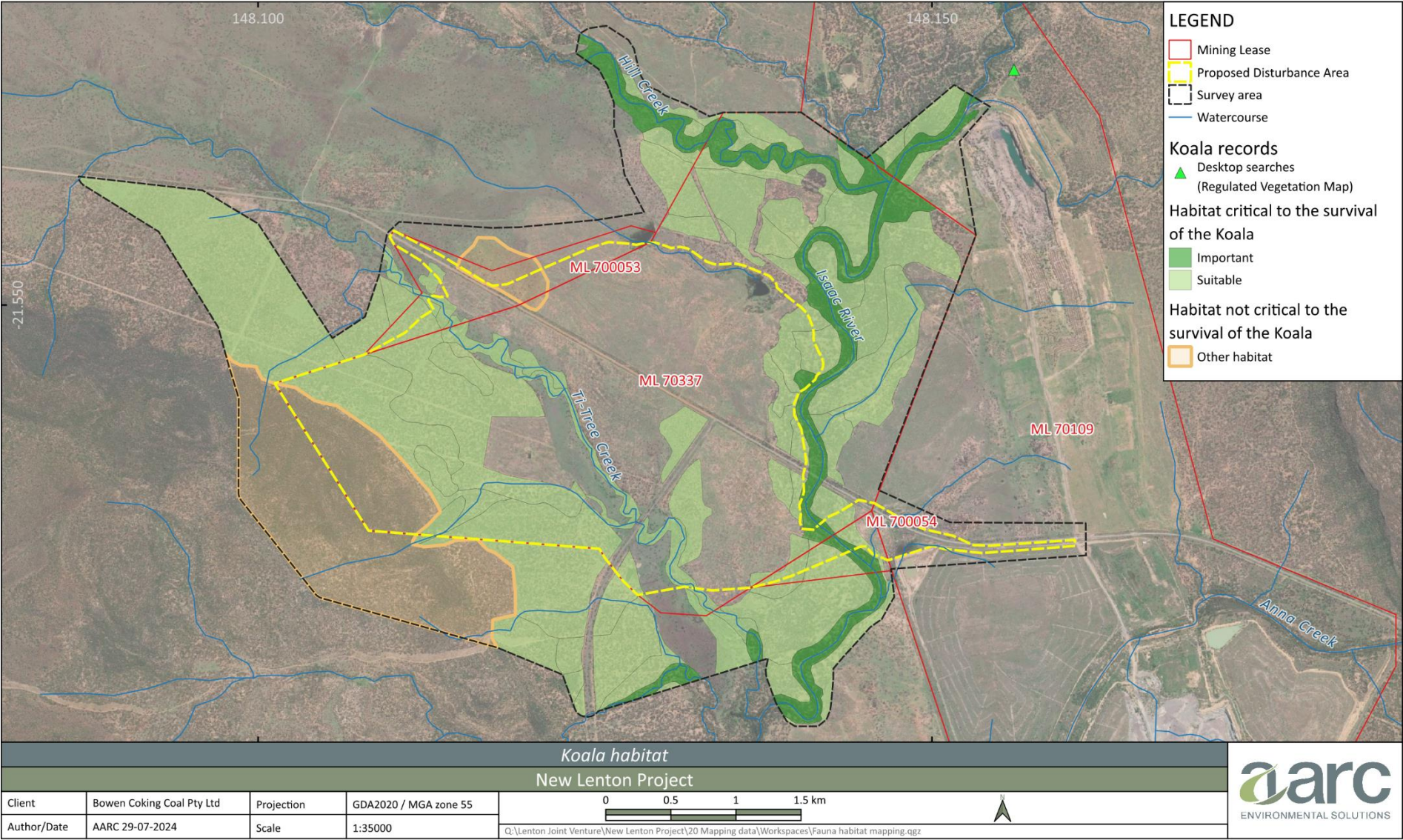


Figure 14: Koala habitat mapping

5.4 Squatter Pigeon

5.4.1 Species description

Squatter Pigeons are a ground dwelling species of bird measuring approximately 30 cm in length and weighing up to 250 g at maturity. The Squatter Pigeon has two subspecies: northern and southern. The southern subspecies tend to have larger bodies and more blue-grey colouring around their eyes than the northern subspecies, which are more yellowy-orange.

The southern subspecies of Squatter Pigeon (*Geophaps scripta scripta*), herein Squatter Pigeon, is listed as Vulnerable under the EPBC Act.

The geographic distribution of the Squatter Pigeon extends from the Burdekin-Lynd divide in the southern region of Cape York in the north down to the Border Rivers region of New South Wales (NSW) (DCCEEW 2023b). This species habitat is typically found within 3 km of a waterbody in remnant, regrowth, or partially modified vegetation communities. These include open forests, sparse open woods, and scrub that are dominated by *Eucalyptus*, *Corymbia*, *Acacia*, or *Callitris* species.

Squatter Pigeons breed in solitary pairs, producing up to two broods per year (DCCEEW 2023b). Peak breeding season is early to mid- dry season (May-June) (DCCEEW 2023b). They can breed throughout the year if conditions are good, however optimal conditions are likely in the dry season when food sources are abundant (DCCEEW 2023b).

Suitable breeding habitats occur on stony rises of sandy or gravelly soils located with 1 km of a suitable waterbody (DCCEEW 2023b). Typically, the ground-cover vegetation for both foraging and breeding habitats consists of native perennial tussock grasses or mixtures of perennial tussock grasses and shrubs or forbs. The Squatter Pigeons consumes seeds from several *Acacia* species, grasses, herbs, and shrubs. The subspecies also prefers to forage and dust-bathe on bare ground under an open canopy of trees (DCCEEW 2023b). The subspecies is considered unlikely to move far from woodland trees, which 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 (DCCEEW 2023b).

The Squatter Pigeon is likely to be sedentary or locally nomadic (DCCEEW 2023b), residing near permanent water bodies and reliable food sources. When dispersed between breeding and foraging habitat, forests of woodland within range of a water source represent preferred habitat.

The Squatter Pigeon is listed under the EPBC Act as a vulnerable species. Threats to the Squatter Pigeon include (DCCEEW 2023b):

- vegetation clearing and fragmentation;
- habitat degradation by overgrazing by stock (especially cattle) and feral herbivores such as rabbits;
- habitat degradation by the establishment of weeds and introduced pasture species including Buffel Grass; and
- predation by species including the Fox, Dingo (*Canis familiaris dingo*), and Feral Cat.

Threat abatement plans relevant to the Squatter Pigeon have been developed for the Feral Cat (DoE 2015a), Fox (DoEE 2016) and Rabbit (DEWHA 2008).

5.4.2 Species desktop analysis

Desktop analyses were conducted of relevant databases to identify records of the Squatter Pigeon within the vicinity of the Project (Wildlife Online, Wildnet, Regulated Vegetation Management Map and Atlas of Living Australia occurrence records). The desktop assessment also includes reviews of previous findings within the survey area.

Several records were identified within 10 km of the survey area during the database searches. Details of the desktop analysis are provided in Section 4.1.2 and Appendix D.

5.4.3 Species survey effort

Fauna surveys for the Project have been conducted in spring 2004 (30th August to 7th September), autumn 2017 (14th to 22nd March), summer 2018 (22nd to 27th February), autumn 2018 (30th April to 4th May), spring 2018 (29th October to 1st November), autumn 2019 (2nd to 8th April), and autumn 2023 targeted habitat assessment (28th February to 9th March). The surveys total over 49 days in consideration of relevant Commonwealth and Queensland survey guidelines. Most surveys fell within the Brigalow Belt Bioregion recommended survey timing (Eyre *et al.* 2018).

Survey effort for the Squatter Pigeon at standard and targeted sites accounts for an estimated:

- diurnal searches: 53 person hours;
- diurnal bird surveys: 39 person hours;
- camera trapping: 56 trap nights.
- incidental recordings obtained from opportunistic observations while travelling within the general study.

Survey timing, effort and methodology are consistent with the Commonwealth guidelines. The survey area is greater than 50 ha, ruling out the need for flushing surveys, which are required under Commonwealth guidelines for small survey areas (<50 ha).

Further details of the survey timing, effort and methodology are provided in Section 3.2.4 and Appendix E.

The habitat assessment survey undertaken in Autumn 2023 comprises 53 plots 100 m x 50 m within remnant vegetation and high-value regrowth vegetation of potential suitable habitat for the species. These transects were used to assess the characteristics that determine the presence, extent and condition of potential habitat for the Squatter Pigeon, such as ground cover and overstorey.

5.4.4 Species survey outcomes

Squatter Pigeon has been recorded within the survey area during the surveys (Figure 15) confirming the species utilises suitable habitat on the site. A flock of around 13 individuals was recorded as incidentals in a farm track near Hill Creek during the spring 2018 survey, which targeted the Greater Glider while one individual was recorded south of Ti-Tree Creek during the autumn 2023 survey.

5.4.5 Species habitat assessment

Habitat mapping for the Squatter Pigeon within the survey area is informed by the habitat assessment undertaken during the surveys, aerial imagery obtained from the area at 1 m resolution collected in June 2022, and information contained in the SPRAT database, including the relevant statutory documents and published research.

Habitat mapping for the Squatter Pigeon within the survey area is shown on Figure 15 and is based on the habitat descriptions outlined in Table 15.

Potential permanent, semi-permanent and seasonal water sources (watercourses and farm) within the survey area were assessed to determine their suitability as a water source for the Squatter Pigeon breeding and foraging. The habitat assessment involved observations of the characteristics of the potential water source, the ground cover and other microhabitat features in areas surrounding the water source.

Table 15: Squatter Pigeon habitat description and occurrence

Habitat description	Relevant features present within the survey area
Potential for breeding	
Remnant or regrowth open forest, woodland, open woodland or scrub, with relatively sparse (<33%) groundcover vegetation, typically an overstorey dominated by <i>Eucalyptus</i> , <i>Corymbia</i> , <i>Acacia</i> or <i>Callitris</i> species within 1 km of suitable permanent or semi-permanent water bodies (DCCEEW 2023b).	Available literature suggests Squatter Pigeons have the potential to nest in areas of suitable habitat within 1 km of a permanent or semi-permanent water source. Areas mapped as remnant vegetation and high-value regrowth vegetation within the survey area provide suitable overstorey and groundcover for the Squatter Pigeon (subject to weather and grazing pressure). However, most areas of remnant and high-value regrowth within the site have been identified as having a dense ground cover vegetation (>33%) (subject to weather and grazing conditions). Permanent or semi-permanent water bodies identified within the survey area include all farm dams. Applying the 1 km buffer around these sources suggests breeding opportunity is possible within areas with the right substrate and <33% groundcover (shown in Figure 15). The ephemeral watercourses, Isaac River, Hill Creek, and Ti-Tree Creek are characterised by sandy substrates. While water can be present in these streams following large rainfall events/flooding, the water quickly disappears within days. Surveys undertaken by Burton Coal Mine personnel in July 2023, following a period of rains, confirmed no pooling areas along the Isaac River. These streams do not provide a semi-permanent or permanent water source for the Squatter Pigeon.
Suitable foraging habitat	
Remnant or regrowth open forest, woodland, open woodland or scrub with relatively sparse (<33%) groundcover vegetation, typically an overstorey dominated by <i>Eucalyptus</i> , <i>Corymbia</i> , <i>Acacia</i> or <i>Callitris</i> species within 3 km of suitable permanent, semi-permanent, or seasonal water bodies.	Areas mapped as remnant vegetation and high-value regrowth vegetation within the survey, that present <33% groundcover (shown in Figure 15), have been mapped as suitable habitat where the vegetation occurs within 3 km of suitable permanent, semi-permanent, or seasonal water sources. The suitable water sources include those described above in 'potential for breeding'. The ephemeral streams, Isaac River, Hill Creek, and Ti-Tree Creek are considered not to provide a suitable seasonal source of water. Grass cover in the cleared agricultural areas is typically much greater than 33% and unsuitable foraging habitat for the Squatter Pigeon. There is some opportunity for Squatter Pigeon to forage in the immediate vicinity of farm dams, where cattle grazing prohibits grass growth, and along property access tracks. However, these areas are considered unlikely to provide extensive foraging opportunities for the species.
Dispersal habitat	
Any forest or woodland occurring between patches of foraging or breeding habitat and suitable waterbodies—includes areas of cleared land less than 100 m wide linking areas of suitable breeding or foraging habitat.	Dispersal habitat has been defined to include any remnant and regrowth open forest or woodland occurring between patches of foraging and breeding habitat and areas of cleared land (less than 100 m wide) that link areas of suitable habitat while providing protection to the species (DCCEEW 2023b).

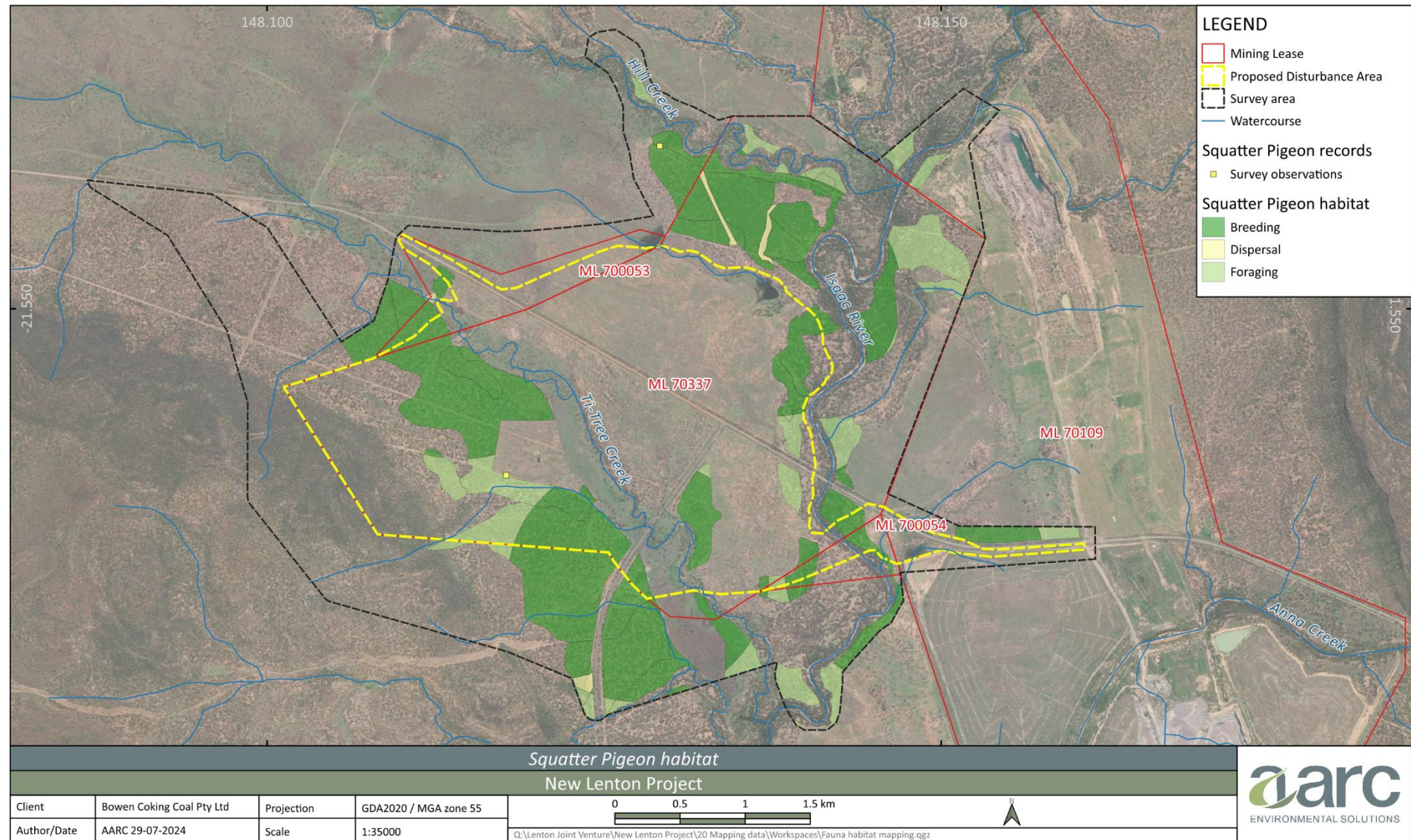


Figure 15: Squatter Pigeon habitat mapping

5.5 White-throated Needletail

5.5.1 Species description

The White-throated Needletail is listed as Vulnerable and migratory under the EPBC Act.

The White-throated Needletail is a large migratory swift, widespread across eastern and south-eastern Australia during its non-breeding season in September/October (DCCEEW 2023b, TSSC 2019). In eastern Australia, it has been recorded in all coastal regions of Queensland, extending inland to the western slopes of the Great Divide and occasionally onto adjacent inland plains (DCCEEW 2023b). The species is considered to be widespread in eastern and south-eastern Australia, from the islands in Torres Strait south to Tasmania. One of two subspecies of White-throated Needletail occurs in Australia although both occur in the northern hemisphere. (DCCEEW 2023b).

Primarily an aerial species, this species is known to occur across a variety of habitats including wooded areas, open forests, and rainforests (DCCEEW 2023b). Large tracts of native vegetation, particularly forest, is considered likely to be a key habitat requirement for this species (DoE 2015b). It has been observed flying over farmland, typically over partially cleared pasture or within remnant vegetation at the edge of paddocks where it predominantly forages at cloud level along the edges of low-pressure systems (DCCEEW 2023b). This species also forages in open habitats or recently disturbed areas (TSSC 2019) feeding on a wide variety of insects (DCCEEW 2023b), occasionally near ground level. White-throated Needletails seldom alight on the ground or other substrates to catch insects and have very occasionally been seen foraging by launching into the air from trees in pursuit of flying insects or clinging to flowers on eucalypts, searching for insects (DCCEEW 2023b).

The species prefers to roost in forests and woodlands, both among dense foliage in the canopy or in tree hollows, as well as on bark or rock faces, and occasionally roost aerially (DCCEEW 2023b, DoE 2015b).

Potential threats to the White-throated Needletail include (DAWE 2021a):

- collision with wind turbines and overhead wires;
- use of insecticides; and
- habitat loss and fragmentation (breeding habitat or non-breeding habitat).

5.5.2 Species desktop analysis

Desktop analysis of relevant databases was conducted to identify records of the White-throated Needletail within the vicinity of the Project (Wildlife Online, Wildnet, Regulated Vegetation Management Map and Atlas of Living Australia). The desktop assessment also included review of ecological survey and assessments for nearby developments for information/records relating to the White-throated Needletail. The desktop assessment also includes reviews of previous findings within the survey area.

Details of the desktop analysis are provided in Section 4.1.2 and Appendix D.

5.5.3 Species survey effort

Fauna surveys for the Project have been conducted in spring 2004 (30th August to 7th September), autumn 2017 (14th to 22nd March), summer 2018 (22nd to 27th February), autumn 2018 (30th April to 4th May), spring 2018 (29th October to 1st November), and autumn 2019 (2nd to 8th April), and autumn 2023 targeted habitat assessment (28th February to 9th March). The surveys total over 49 days in consideration of relevant Commonwealth and Queensland survey guidelines. Most surveys fell within the Brigalow Belt Bioregion recommended survey timing (Eyre et al. 2018).

Survey effort for the White-throated Needletail at standard and targeted sites accounts for an estimated:

- diurnal searches: 53 person hours;

- diurnal bird surveys: 39 person hours;
- camera trapping: 56 trap nights.
- incidental recordings obtained from opportunistic observations while travelling within the general study.

The survey effort and timing meet the Commonwealth Guideline (DCCEEW 2023b) and the Queensland Guideline (Eyre 2018).

Further details of the survey timing, effort and methodology are provided in Section 3.2.4 and Appendix E.

The habitat assessment survey undertaken in Autumn 2023 comprises 53 plots 100 m x 50 m within remnant vegetation and high-value regrowth vegetation within potential habitat for the species. These transects were used to assess the characteristics that determine the presence, extent and condition of potential habitat for the White-throated Needletail.

5.5.4 Species survey outcomes

No White-throated Needletail individuals were recorded during the surveys. However, given the presence of one record from the proposed disturbance area and the presence of suitable habitat for the species within the survey area (Figure 11), the species has been assumed to utilise suitable habitat within the proposed disturbance area.

5.5.5 Species habitat assessment

The White-throated Needletail does not breed in Australia (Higgins 1996). During the non-breeding season in Australia, the White-throated Needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1,000 m above the ground (DCCEEW 2023b). While the species forages above most habitat types, the White-throated Needletail is predominantly recorded above wooded areas (TSSC 2019). Habitat for the species corresponds with all the major habitat types within the Project except for cleared agricultural areas (Figure 16).

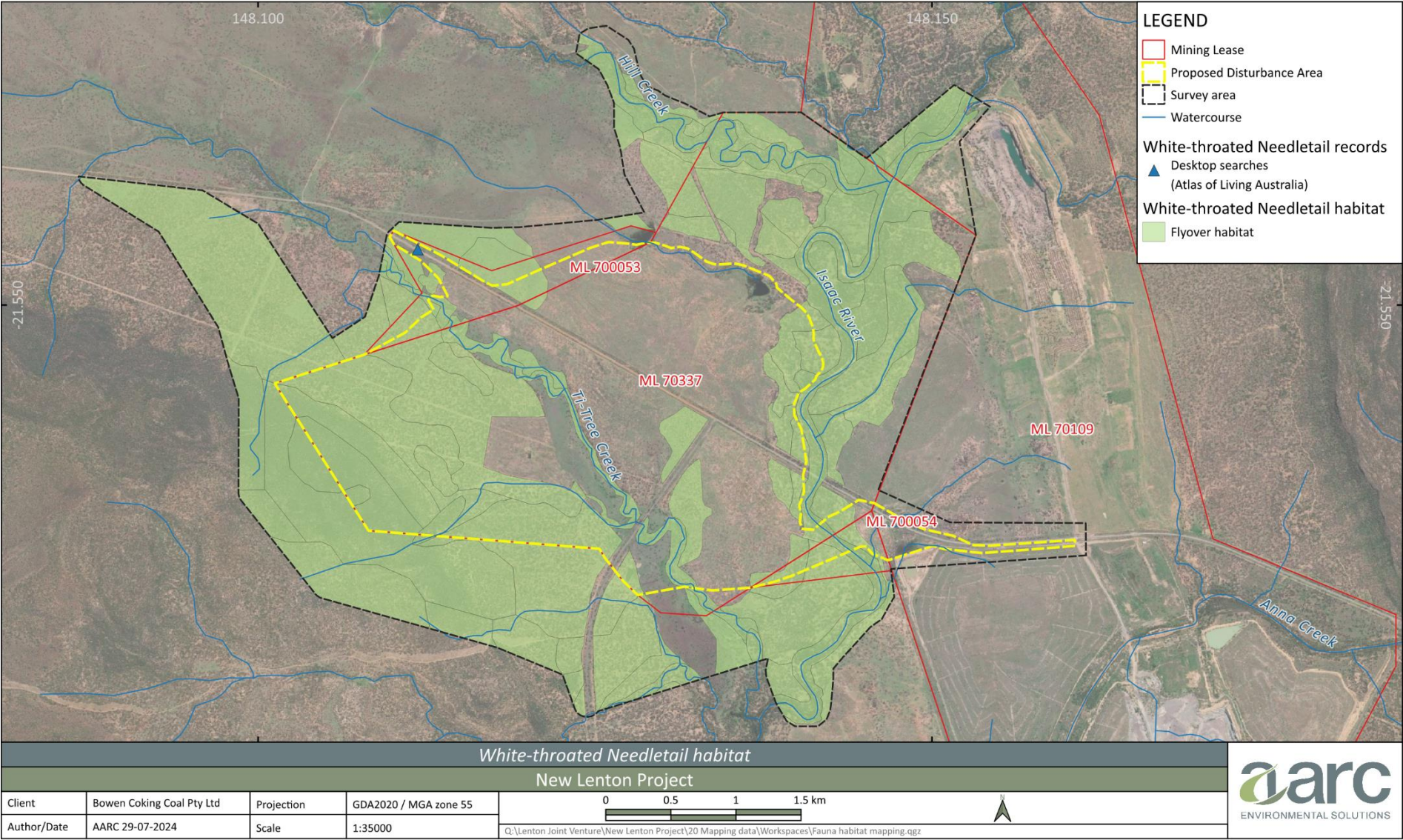


Figure 16: White-throated Needletail habitat mapping

6 General potential impacts, avoidance, mitigation and management measures

The potential impacts of the Project on terrestrial flora and fauna, including identified MNES, and their habitats are:

- direct impacts through vegetation clearance and habitat disturbance;
- indirect impacts including;
 - fragmentation and edge effects;
 - weeds and pests;
 - noise and vibration;
 - dust;
 - artificial lighting;
 - vehicle strike
 - hydrological changes (i.e. surface water, flooding, groundwater drawdown);
 - erosion and sedimentation; and
 - bushfires.
- cumulative impacts; and
- facilitated impacts.

6.1 Direct impacts

The Project infrastructure has been sited to avoid or minimise disturbance to remnant vegetation when possible. Details of the direct disturbance and vegetation removal for the Project stages are outlined below.

6.1.1 Vegetation clearing

A total of 342.6 ha of remnant and 54.4 ha of HVR vegetation will be cleared as a result of the Project, while 489.2 ha (55.2 %) of the disturbance footprint will be located in cleared pastureland. This represents some 27.4 % of remnant and 59.4 % HVR vegetation within the survey area.

The vegetation mapped during the field studies, remnant and non-remnant (with the exception of cleared agricultural land), provides terrestrial fauna with opportunities for foraging, breeding, nesting, predator avoidance and movement between areas, facilitates dispersal/migration and promotes genetic diversity. These opportunities could potentially be reduced for fauna by clearing associated with the proposed mining activities. Where practicable, Project infrastructure has been sited within cleared agricultural areas, as shown in Figure 9. Table 16 details the proposed clearance of each vegetation community and major habitat type identified within the proposed disturbance area.

Table 16: Proposed disturbance of vegetation communities

Map unit	Vegetation community	Associated RE	Extent within survey area (ha)*	Area of disturbance (ha)
Eucalypt open forest to woodlands along main creeks				
VC4	Blue gum (<i>Eucalyptus tereticornis</i>) open woodland fringing drainage lines on sandy-loam soils	11.3.25	162.5	11.5
			15.2 (HVR)	9.8 (HVR)

Map unit	Vegetation community	Associated RE	Extent within survey area (ha)*	Area of disturbance (ha)
Eucalypt dry woodlands on floodplains and fine sedimentary rocks				
VC1	Poplar box (<i>Eucalyptus populnea</i>) woodland on alluvial plains	11.3.2	348.5	113.7
VC2	Moreton Bay ash (<i>Corymbia tessellaris</i>) woodland on alluvial plains	11.3.4	148.3	14.6
VC3	<i>Corymbia</i> spp. woodland with sparse shrub layer on sandy duplex soils	11.3.7	205.9	61.9
			25.9 (HVR)	22 (HVR)
VC5	Narrow-leaved ironbark (<i>Eucalyptus crebra</i>) woodland on alluvial plains	11.3.36	52.2	50.4
VC6	Mountain coolibah (<i>Eucalyptus orgadophila</i>) open woodland on basaltic clays	11.8.5	2.9	1.1
			27.59 (HVR)	12.29 (HVR)
VC7	Shrubby Poplar box open woodland on fine-grained sedimentary soils	11.9.7a	78.6	27.2
			23 (HVR)	10.3 (HVR)
Eucalypt dry woodland on sandstone escarpments				
VC9	<i>Eucalyptus</i> and <i>Corymbia</i> spp. with <i>Acacia</i> spp. woodland on coarse-grained sedimentary rocks	11.10.4a	101.9	29.4
Acacia woodlands				
VC8	Lancewood (<i>Acacia shirleyi</i>) low forest on sandstone escarpment	11.10.3	151	33
Cleared agricultural land				
NA	Cleared agricultural land	NA	739.6	489.2
Total				886.4

*Mixed vegetation in the survey area (outside of the proposed disturbance) is calculated based on percentages of vegetation (e.g. polygons of 95% RE 11.3.2 and 5% 11.3.25)

The proposed disturbance area which has informed the vegetation clearing calculations includes areas for construction working room for infrastructure and between different mining areas (Figure 3). It therefore is likely to overestimate the direct impact. Opportunities will be sought to avoid clearing in sensitive areas located within the proposed disturbance area, such as the riparian vegetation at the Isaac River crossing locations. Never-the-less, the assessment of impacts has adopted a conservative approach through estimation of a maximum proposed disturbance area.

To minimise impacts on the Isaac River, the proposed disturbance area is generally greater than 50 m from the Isaac River high bank, with some localised areas approximately 30 m distant.

Indirect impacts and mitigation measures associated with these crossings will be discussed in Section 6.2.1

6.1.2 Vegetation clearance protocols

The following management measures are proposed to be implemented where vegetation clearance is necessary:

- Clearing activities will be undertaken progressively in accordance with the mine schedule and Project requirements and not before.
- Vegetation/habitat adjoining proposed clearance areas will be delineated and clearly marked to prevent accidental damage through a 'Permit to Disturb' process.

- Areas to be cleared will be inspected to identify fauna at direct risk from clearing activities, and an appropriately qualified fauna spotter/catcher will be present during clearing.
- Broadscale vegetation clearing is to be undertaken towards retained vegetation to prevent isolation and allow movements of fauna.
- Trees bordering vegetation will be felled in the direction of the clearance zone to avoid impacts to adjoining retained vegetation and habitat.
- Clearing operations will be managed to maximise the reuse of cleared vegetative material. This will include the salvage and reuse of select habitat resources from the cleared vegetation (e.g. logs) for habitat enhancement either in the rehabilitation program or elsewhere on site.

6.1.3 Rehabilitation

Land disturbed by mining activities will be rehabilitated progressively as it becomes available. Details of the proposed rehabilitation program are provided in the Progressive Rehabilitation and Closure Plan (PRCP) prepared for the Project, which requires approval by the State DES. In accordance with the Queensland government's policy objectives defined in the 'Mined land rehabilitation policy' (Queensland Government 2018), the general rehabilitation goals for the Project are to leave an area that is safe and stable, does not cause environmental harm and is able to sustain the post-mining land use approved in the PRCP.

6.2 Indirect impacts

6.2.1 Habitat fragmentation

Vegetation clearing can result in a variety of environmental consequences, including habitat fragmentation reducing connectivity and reduced habitat value (through the impact of edge effects). Habitat fragmentation can impact both flora and fauna species. Often clearing activities form barriers that restrict and impair the movement of fauna species, resulting in lowered habitat connectivity.

Edge effects are impacts that occur along the boundary of natural or remnant vegetation and cleared or developed land. This boundary is exposed to increased light, wind shear and weed invasions augmenting the local environment (e.g. altered species and structural composition).

The west portion of the survey area contains a large contiguous area of remnant vegetation that provides fauna with significant dispersal opportunities. The areas of disturbance associated with Project activities are unlikely to increase the fragmentation and limit the opportunities for faunal dispersal through the woodland habitats.

Riparian corridors associated with Isaac River and Hill Creek, provide north–south fauna movement opportunities through the landscape for movement and dispersal, in particular the Koala and Greater Glider. The riparian vegetation along the Isaac River is mapped as state significant corridor. As detailed in Section 6.1.1, the infrastructure associated with the Project includes two crossings on the Isaac River that can potentially compromise the species' ability to disperse along the riparian corridor:

- Bed level crossing of the Isaac River; and
- Suttor Developmental Road (a public road) realignment, with a new bridge over the Isaac River.

The current Suttor Developmental Road crossing of the Isaac River is shown in the image below (Plate 16), with riparian vegetation flanking the crossing that is similar to upstream and downstream reaches. The realigned Suttor Developmental Road is expected to be similar following rehabilitation of the construction corridor.



Plate 16: Current Suttor Developmental Road crossing of the Isaac River (source: Queensland Globe)

The avoidance, mitigation and management measures that have been described for direct vegetation clearance/habitat disturbance, are also relevant to minimising habitat fragmentation and impacts on connectivity. Nonetheless, additional mitigation measures, such as the ones recommended in Koala-sensitive Design Guideline (DES 2022b), will be adopted to minimise the impact to habitat connectivity:

- The width of the crossings and disturbance buffer will be reduced where possible.
- Rehabilitation of the construction corridor will occur when disturbance occurs beyond the infrastructure area
- A species management plan for species of conservation significance (i.e. Koala and Greater Glider) will be developed to:
 - assist on the planning for the construction; and
 - monitor the species during and after the construction process.
- The bed level haul road crossing does not constitute a barrier for small dwelling fauna.

With the proposed management measures it is considered unlikely that the Project will result in habitat fragmentation beyond the assessed direct impacts.

6.2.2 Weeds and pests

Introduced flora species are effective competitors for resources and have the potential to reduce the floristic structure and diversity of native plant communities.

As detailed in Section 4.2.3, 47 introduced flora species have been recorded within the survey area. Of them, seven flora species recorded are listed as restricted matters under the Biosecurity Act (Queensland) and/or as WoNS:

- | | |
|--------------------|-----------------------|
| 1) Parthenium; | 5) Velvety Tree Pear; |
| 2) Lantana; | 6) Prickly Pear; and |
| 3) Rubber Vine; | 7) Harrisia Cactus. |
| 4) Prickly Acacia; | |

Activities that could introduce or spread weeds include soil disturbance and vehicle movements. Vegetation clearing can also result in 'edge effects', when the clearing activities cause modifications to the interface with natural habitats. A large percentage of areas to be directly disturbed by the Project are predominantly associated with cleared agricultural areas where introduced plants (such as Buffel grass) dominate the ground layer. Parthenium is the most common Biosecurity Act (Queensland)/WoNS weed species recorded throughout the survey area and occurs in higher densities within cleared agricultural areas and adjacent vegetation.

Six introduced fauna species that present risk to native fauna and their habitat have been recorded in the survey area:

- | | |
|---------------|-----------------|
| 1) Cane Toad; | 4) House Mouse; |
| 2) Wild Dog; | 5) Rabbit; and |
| 3) Feral Cat; | 6) Feral Pig. |

Of relevance to these introduced species, the following are listed as key threatening processes under the EPBC Act²:

- biological effects, including lethal toxic ingestion, caused by Cane Toads;
- predation by Feral Cats;
- predation, habitat degradation, competition and disease transmission by Feral Pigs; and
- competition and land degradation by rabbits.

The provision of scavenging areas (e.g. discarded food scraps and other rubbish) has the potential to increase populations of introduced fauna species in and around the proposed disturbance area.

A Weed and Pest Management Plan has been prepared to incorporate pest and weed management measures for the Project (AARC 2024a). The Weed and Pest Management Plan includes:

- inspections within the MLs to identify areas requiring weed management to be implemented;
- weed management measures (e.g. mechanical removal and application of approved herbicides) based on weed control strategies outlined by the Department of Agriculture and Fisheries and the 'Isaac Regional Biosecurity Plan 2024–2027' (Isaac Regional Council 2024);
- requirements for maintenance of a clean, rubbish-free environment to discourage scavenging and reduce the potential for colonisation of these areas by introduced fauna;
- requirements for storage of domestic waste in appropriate receptacles and locations;
- feral animal control strategies based on pest control strategies outlined by the Department of Agriculture and Fisheries, 'Isaac Regional Biosecurity Plan 2024–2027' (Isaac Regional Council 2024) and Threat Abatement Plans applicable to the EPBC Act listed key threatening processes.

² A threatening process is defined as a key threatening process under the EPBC Act if it threatens or may threaten the survival, abundance or evolutionary development of a native species or ecological community.

It is considered unlikely that the Project will significantly increase the occurrence or diversity of weeds or feral pests with the proposed management measures.

6.2.3 Noise and vibration

Noise and vibration associated with construction and operation of the Project has the potential to disrupt the routine activities of fauna species in close proximity to the operations.

Potential sources of noise or vibration in the proposed mining area include the vehicle movements and the operation of equipment (e.g. haulage trucks, loaders, dozers, drill rigs, compressors and other drilling-related equipment).

The noise impacts on the different habitats from the mining activities proposed to be undertaken will be minor given fauna often readily habituate in close proximity to continuous noise. While sudden noise (e.g. blasting activities) has the potential to startle native fauna, animals are likely to adapt to the disturbance and/or move to similar habitats in the surrounding landscape.

6.2.4 Dust

Open cut mining operations and exposed surface areas (e.g. windblown emissions from ROM stockpiles) have potential to result in the generation and dispersion of atmospheric dust.

Studies have shown that excessive dust generation can impact the health and viability of surrounding vegetation. However, studies on the impacts of dust from unsealed roads on vegetation and fauna (Cumberland Ecology 2015; Jones et al. 2016) found no evidence that dust has any detrimental impacts on vegetation or fauna abundance.

An air quality impact assessment was undertaken for the Project as part of the Queensland approval process, and predictions of dust deposition rates comply with the condition limits at all sensitive receptors (SLR 2019). Notwithstanding, dust control measures will be employed, including personnel and contractors will be required to observe speed limits when driving on access roads within mining area and surrounds to minimise the generation of dust, watering of potential dust generating surfaces, and progressive rehabilitation of disturbance areas (such as mine waste rock emplacements) to minimise dust emissions.

Given the predicted dust deposition associated with the Project and the suggested control measures, the health and viability of surrounding vegetation and local fauna will not be deleteriously affected.

6.2.5 Artificial lighting

Artificial lighting will be established for the Project including within the MIA and infrastructure corridor. Project lighting has the potential to affect behavioural patterns of some species. Some bird and bat species, for example, are attracted to insects around lights and could become prey for larger predators (e.g. owls). Artificial lighting can also attract predators and invasive pests, both of which may pose a threat to native fauna (DoEE 2020).

The exterior lighting will be designed to provide a safe working environment. Australian Standard AS/NZS 4282:2019 'Control of the obtrusive effects of outdoor lighting' recognises the impact of artificial light on biota (DoEE 2020). To minimise potential impacts of artificial lighting, the placement, configuration and direction of lighting for the Project will be implemented in consideration of AS 4282:2019 'Control of the obtrusive effects of outdoor lighting' (Standards Australia 2019).

6.2.6 Vehicle strike

The movement of vehicles has the potential to increase the incidence of fauna mortality via vehicular strike. Ground-dwelling fauna are most susceptible to this potential impact. The risk of injury or mortality from vehicle strike is greatest where roads cross fauna movement corridors, such as the Isaac River.

Contributing risk factors for vehicle strike are the speed of vehicles on roads and tracks, and limiting speed can reduce the threat of vehicle strike to fauna species such as Koala. Speed limits will be imposed on Project roads and tracks to reduce the risk of vehicle strike on native fauna. The public road realignment will not change the frequency of public traffic compared to the existing crossing, with speed limits expected to be the same as the current public road. The bed level crossing for mine haul trucks will be subject to speed controls (e.g. maximum speed limit of 40 km/h), which will reduce the potential for vehicle strike. Safe driving procedures will also be incorporated into site inductions to increase awareness of the risk of vehicle strike.

6.2.7 Hydrological changes

Due to the location of the deposit, it is proposed to divert Ti-Tree Creek around the open cut mine pit workings. The diverted Ti-Tree Creek will flow into the Isaac River approximately 4.7 km upstream of the current Ti-Tree Creek and Isaac River confluence, maintaining a similar bed grade of the existing Ti-Tree Creek. This design aims to control the flood velocities to mimic the existing channel and thereby minimise subsequent impacts on Ti-Tree Creek and the Isaac River. The diversion releases through an engineered structure to control water flows and velocity, into a natural drainage channel approximately 400 m before the Isaac River.

A levee is also required on the Isaac River floodplain to protect the eastern and southern extent of East Pit from flood ingress from the Isaac River. The Isaac River levee will merge with the Ti-Tree Creek levee. The levees will be a fully engineered structure and covered to minimise the potential for erosion.

The predicted changes in key hydraulic parameters for watercourses as a result of the Project are identified in the Project 'Surface Water and Flood Impact Assessment' (WRM 2023). The results of detailed flood modelling show that the impacts of the Project on the hydraulic characteristics (such as velocity, bed shear stress and stream power) of the Isaac River are minimal. For other key drainage features potentially impacted by the Project, hydraulic parameters are generally within the range of existing values along these drainage features for operational and postmining conditions. Ongoing monitoring of the performance of the diversion will be undertaken and, if necessary, mitigation measures will be implemented to prevent excessive erosion or sediment deposition. Potential mitigation measures would include minor earthworks, such as filling scour areas, reprofiling banks or removing accumulated sediment, and revegetation of areas subject to erosion.

The predicted changes to the flooding regime as a result of the Project are identified in the Project 'Surface Water and Flood Impact Assessment' (WRM 2023). This study modelled changes to flood depth and velocities for the 50%, 10%, 2% and 1% Annual Exceedance Probability (AEP) flood events. A summary of the predicted changes within the floodplain within and adjacent the Project disturbance area with reference to terrestrial ecology values is presented below:

- Hill Creek shares a floodplain area with the Isaac River. The Project is not expected to have any impact on the catchment or stream channel of Hill Creek.
- For the Isaac River flood levels:
 - For the 10% AEP flood event, level changes are insignificant (< 0.25m), have minimal interaction with the levee and new bridge, and result in an insignificant change in the areas that are subject to flooding.
 - For the 1% AEP and 1 in 1,000 AEP events level changes are minor (< 0.5 m to < 1 m) adjacent the levee and upstream of the new bridge, dissipating to insignificant (<0.25 m) upstream and downstream of the levee. There are minor changes in the areas that are subject to flooding.
- For Ti-Tree Creek and Ti-Tree Creek diversion flood levels:
 - Upstream of the Ti-Tree Creek diversion and levee, there are increases in flood levels by 2.2 m (10% AEP) to about 3 m (1 in 1,000 AEP), with these impacts dissipating within about 600 m upstream. The

- diversion and levee are operating in accordance with their conceptual design to channel water around active mining areas and prevent ingress of flood water up to the 1 in 1,000 AEP event.
- Water levels along the unnamed tributary downstream of the Ti-Tree Creek diversion channel increase by up to about 2.3 m for the range of modelled flood events. These changes dissipate once the unnamed tributary joins the Isaac River. There are minor changes in the areas that are subject to flooding around the downstream portion of the unnamed tributary.
 - Water levels are reduced along Ti-Tree Creek downstream of the Project disturbance area by 2.8 m to 3.5 m over the range of modelled events due to the diversion of flow to the unnamed tributary. These changes dissipate once the remaining portion of Ti-Tree Creek enters the Isaac River.
 - For the Isaac River flood velocities:
 - For the 10% and 2% AEP flood event there are nil to insignificant velocity changes, with changes confined to very small areas.
 - For the 1% AEP and 1 in 1,000 AEP velocity changes range from nil to minor ($< 0.3\text{ m/s}$) with some very localised areas of around 0.5 m/s to 1 m/s near the levee and River crossings. Detailed design of the levees and road embankments will consider appropriate erosion protection measures for locations of potentially higher velocity. Velocity changes dissipate to insignificant ($< 0.3\text{ m/s}$) upstream of the levee and downstream of confluence with the residual Ti-Tree Creek channel.
 - For Ti-Tree Creek and Ti-Tree Creek diversion flood velocities:
 - Upstream of the Ti-Tree Creek diversion and levee, there are reductions in velocity as the diversion and levee slow the flow of water from Ti-Tree Creek.
 - Velocities along the unnamed tributary downstream of the Ti-Tree Creek diversion channel increase by up to 2.3 m/s for the range of modelled flood events. These changes dissipate once unnamed tributary joins the Isaac River.
 - Velocities are reduced along Ti-Tree Creek downstream of the Project disturbance area. These changes dissipate once the remaining portion of Ti-Tree Creek enters the Isaac River.

This variation in the flood velocities is predicted to have insignificant to minor impact on the Isaac River geomorphology (WRM 2023) and therefore riparian vegetation and fauna habitat.

Variation in the flood depths is expected to be temporary, localised and dissipate quickly, therefore not significant to the environmental values present in the area. The model shows that the event duration that produces peak flows in Ti-Tree Creek and the Isaac River is less than 24 hours under existing conditions. An assessment of potential changes in flood hydrographs (i.e. duration and flow volumes) due to Project activities was undertaken for a section of the Isaac River adjacent the Project. It was determined that any change in duration in developed conditions is negligible. Therefore, the duration of flooding for developed conditions is similar to existing conditions, which in both cases demonstrates that flood events in the region round the Project have a very short duration for minor to extreme rainfall events.

Any changes to flood hydrology are not predicted to result in any significant impacts on terrestrial ecology values due to the insignificant to minor changes in flood levels, velocities, duration and extent of inundation. The function of flood regimes is expected to be retained for vegetation and habitat features, including areas of floodplains adjacent to the Isaac River that undergo inundation in periodic flood conditions.

6.2.7.1 Groundwater Dependent Ecosystem

The GDE field study for the Project by 3D Environmental (2023) used multiple lines of evidence to assess the groundwater dependence of vegetation. Based on the results of the field survey, it was concluded that riparian vegetation associated with the Isaac River floodplain and alluvium (Terrestrial GDEs (TGDEs)) present the only GDEs identified within the survey area.

The GDE Assessment (3D Environmental (2023)) concluded that with implementation of a GDE monitoring and management plan (GDEMMP) (3D Environmental 2024), it is considered that the risk to GDEs posed by Project

development, other than the small area of direct clearing, ranges from low to insignificant. Any direct clearing of vegetation is assessed within this report.

6.2.8 Erosion and sedimentation

Vegetation clearing and land disturbance may result in topsoil exposure and erosion. In addition, disturbance within proximity to the Isaac River, such as the crossings, may also reduce bank stability and increase soil erosion and elevated sediment levels in downstream receiving waters.

The Project has the potential to result in erosion of disturbed areas and sedimentation of waterways through the clearing of vegetation for the development of open-cut pits and the construction of haul roads and other infrastructure.

Vegetation clearance protocols, as described in Section 6.1.2, and erosion and sediment control measures will be implemented to minimise potential impacts (WRM 2023). These sediment control measures, primarily sediment drains and sediment dams, designed in accordance with International Erosion Control Association (IECA) guidelines, will minimise impacts from runoff from dumps (WRM 2023).

6.2.9 Bushfire

While plants and animals have a range of mechanisms to survive individual fires, accidental bushfires could potentially occur if mine activities are not appropriately managed.

Bushfire prevention and management measures will be implemented for the Project, and fire awareness will be included in the induction of personnel and contractors to minimise the risk of bushfire, this also be a critical health and safety requirement for mining activities. Given the implementation of management measures, the Project is unlikely to increase the bushfire potential within the surrounding landscape.

6.2.10 Cumulative impacts

Cumulative impacts can be defined as the total impact on the environment that results from the incremental impacts of the action (the Project) added to other past, present and reasonably foreseeable future actions from activities in the region. Cumulative impacts include direct and indirect impacts on the environment.

For ecosystems to be resilient to threats, they need a healthy diversity of individuals, species and populations. The cumulative impact assessment has considered the species present (species diversity, abundance and dynamics), patterns of species distribution (the communities and ecosystem present that encompass all species), broad habitat types (the ecological niches for the range of species present) and ecosystem processes.

The Project is located within the Brigalow Belt Bioregion and within the Northern Bowen Basin subregion. The Brigalow Belt Bioregion has experienced considerable modification, particularly over the last 70 years due to agriculture and mining (DES 2018). Remnant vegetation cover has been reduced, with communities on the more fertile soils being the most affected (DES 2018). Habitat loss, fragmentation, inappropriate fire regimes, invasive plants and feral animals are relevant threats to the biodiversity values of the bioregion.

Burton Mine and other regional mining projects shown in Figure 2, have been considered in the assessment of potential cumulative impacts by the Project relevant to the ecological values. Mining activities at Burton Mine located immediately to the east and south have the most potential for cumulative impacts with the Project. Other smaller mines are located between 5 km and 30 km south of Burton Mine. The nearest mining activities to the west are North Goonyella and Red Hill mines, which are approximately 15 km west and separated from the Project by the Burton Range. The nearest mining activity to the east is Hail Creek Mine which is approximately 25 km west and separated from the Project by the Carborough Range.

The Project will result in direct disturbance of 397 ha of vegetation, of which, 342.6 ha is remnant vegetation, and the remaining 54.4 ha is high-value regrowth, adding to the vegetation clearance from other Projects in the region. The remnant and high-value regrowth vegetation to be cleared for the Project provide suitable habitat and connectivity for the threatened species under the EPBC Act identified as potentially impacted by the

Project, namely the Koala, the Greater Glider, White-throated Needletail and the Squatter Pigeon. The impacted vegetation represents < 0.4% of the current extent (Accad et al. 2023) of remnant vegetation in the Northern Bowen Basin subregion, including 1.2% of the remaining RE 11.3.2 within the subregion, associated with the Poplar Box Grassy Woodland on Alluvial Plains TEC.

The cleared agricultural land does not provide habitat for any of the threatened species under the EPBC Act identified as potentially impacted by the Project (Section 5). All these species rely on wooded vegetation, including the White-throated Needletail, predominantly recorded above wooded areas (Section 5.5.5), and the Squatter Pigeon, which is unlikely to move far from woodland trees which provide protection from predatory birds (Section 5.4.5). Therefore, the impact to cleared agricultural land will not contribute to the cumulative impact in the region.

The Project may impact on biodiversity corridors that provide mobility for fauna species, such as the Koala and the Greater Glider (e.g. the Isaac River). As discussed, the Project has been designed to avoid and/or minimise impacts to remnant vegetation within the corridors. Impacts within the Isaac River corridor have been limited to two road crossings described above, which are not expected to inhibit species passage. Other regional impacts within biodiversity corridors are limited to three Isaac River crossings at the Red Hill Mine, and the location of North Goonyella Mine at the eastern edge of the Burton Range.

The Project is predicted to have a negligible cumulative impact on surface water and groundwater quality and quantity with a range of management and mitigation measures proposed to be implemented to minimise impacts on surface waters and groundwater. The key ecosystem cycles (e.g. water, nutrients) will remain intact and are not expected to be compromised as a result of cumulative impacts.

‘Loss of Climatic Habitat Caused by Anthropogenic Emissions of Greenhouse Gases’ is listed as a key threatening process under the EPBC Act and consists of reductions in the bioclimatic range within which a given species or ecological community exists due to emissions induced by human activities of greenhouse gases. The likely impacts of climate change on terrestrial flora and fauna are difficult to predict but highlighted as one of the threats to species (e.g. Koala). However, considering the proportional contributions of the Project to direct emissions, the Project is unlikely to significantly alter anthropogenic emissions of greenhouse gases.

The provision of biodiversity offsets in line with Commonwealth policies provide an opportunity to mitigate cumulative impacts on the above mentioned MNES. Offsets for these particular MNES have been required for many of the Projects within the region and increase the area of protected habitat that will be managed for conservation. Offsets will also be provided for the Project to provide adequate compensation for significant residual impacts on matters of environmental significance and to yield no net conservation loss. The Project’s offset requirements are summarised in Section 8.

6.2.11 Facilitated impacts

Facilitated impacts relate to impacts from other Projects (including by third parties) which are made possible (facilitated) by the Project. Facilitated impacts may be expected to occur through the development of an infrastructure project (e.g. a dam, road or rail line), when that development would enable the development of other projects which otherwise may not have been viable (e.g. the development of a road leads to urban development in an undeveloped area).

The Project will not develop any additional infrastructure that will facilitate the development of any other projects. Rather, the Project will utilise infrastructure already located in the region to minimise its own impacts, such as the Burton Mine CHPP and rain load, and the Goonyella rail line and Port for coal export. Mining operations will not facilitate the development of any other projects that could not already be developed. Proposed electrical, rail line, water supply and telecommunications infrastructure will link to existing infrastructure at the Burton Mine and does not facilitate the development of other future projects.

As such, there are not expected to be any facilitated impacts from the Project on any flora or fauna values.

7 Significant Impact Assessments of MNES

Sections 7.1 to 7.5 provide an impact assessment of the listed TECs and threatened species known, likely or potentially occurring within the proposed disturbance area and therefore have the potential to be impacted by the Project, namely:

- Poplar Box Grassy Woodland on Alluvial Plains (Poplar Box Grassy Woodland on Alluvial Plains TEC) - Endangered
- Greater Gilder (*Petauroides volans*)- Vulnerable³
- Koala (*Phascolarctos cinereus*) - Vulnerable⁴
- Squatter Pigeon (Southern) (*Geophaps scripta scripta*) – Vulnerable
- White-throated Needletail (*Hirundapus caudacutus*) – Vulnerable

Threatened species and communities considered unlikely to occur within the proposed disturbance area (refer to Section 4.2.4, Section 4.2.5 and Section 4.3.4), are not likely to be impacted by the Project and therefore will be unlikely to be significantly impacted and do require assessment against the 'Significant Impact Guidelines 1.1: Matters of National Environmental Significance' (DoE 2013).

For those species and TECs for which it has been determined that an assessment in accordance with the significant impact guidelines is required, the assessment includes:

- a description of the potential impacts to each threatened community and species;
- a description of the statutory requirements considered in the assessment;
- specific measures that are proposed to avoid, mitigate and manage the potential impacts; and
- an assessment of the likelihood of significant impacts.

Key terms relevant to the assessment of the likelihood of significant impacts are defined below in accordance with the 'Significant Impact Guidelines 1.1: Matters of National Environmental Significance' (DoE 2013).

'Habitat critical to the survival of a species or ecological community' refers to areas that are necessary:

- *for activities such as foraging, breeding, roosting, or dispersal;*
- *for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);*
- *to maintain genetic diversity and long term evolutionary development; or*
- *for the reintroduction of populations or recovery of the species or ecological community.*

A 'population of a species' is defined under the EPBC Act as an occurrence of the species in a particular area:

In relation to Critically Endangered, Endangered or Vulnerable threatened species, occurrences include but are not limited to:

- *a geographically distinct regional population, or collection of local populations; or*
- *a population, or collection of local populations, that occurs within a particular bioregion.*

For Vulnerable species under the EPBC Act, an:

³ At the time of the referral

⁴ At the time of the referral

‘Important population’ 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.*

7.1 Poplar Box Grassy Woodland on Alluvial Plains TEC

7.1.1 TEC impact assessment

The Poplar Box Grassy Woodland on Alluvial Plains TEC has been identified in seven patches within the survey area, a large patch to the west of Ti-Tree Creek, one patch north of the proposed disturbance, and several patches along the Isaac River (Table 17 and Figure 12).

The Project will directly disturb five of these patches of Poplar Box Grassy Woodland on Alluvial Plains TEC. To ensure all Poplar Box Grassy Woodland on Alluvial Plains TEC remain viable post Project impact, residual patches whose extent is reduced to below 5 ha as result of the Project, have been considered impacted. With this taken into account, three patches will be wholly cleared (P2, P3 and P5) and two will be partially cleared (P1 and P4) as a result of the Project. The remaining patches will be viable (>5 ha) and will retain existing connectivity. Vegetation management controls and clearing protocols will be implemented to prevent accidental damage to the remaining vegetation (e.g. a ‘Permit to Disturb’ process), as indicated in Section 6.1.

The vegetation clearing may increase the edge effects on affected Poplar Box Grassy Woodland on Alluvial Plains TEC patches. It is not expected to generate conditions likely to cause additional weed incursion in the remaining Poplar Box Grassy Woodland on Alluvial Plains TEC, and the monitoring and maintenance of weeds in accordance with the site Weed and Pest Management Plan (AARC 2024a) will be implemented (Section 6.2.2).

Potential hydrological changes that might affect the Poplar Box Grassy Woodland on Alluvial Plains TEC are groundwater drawdown (impacting GDEs) and potential flooding. Based on the GDE Assessment (3D Environmental 2023) riparian vegetation associated with the Isaac River floodplain and alluvium (Terrestrial GDEs (TGDEs)) presents the only GDEs identified within the study area, corresponding to VC1 (RE 11.3.25) within the Isaac River. Groundwater drawdown is unlikely to affect the Poplar Box Grassy Woodland on Alluvial Plains TEC, and with implementation of the site GDEMMP (3D Environmental 2024), it is considered that the risk to GDEs posed by drawdown from Project development, ranges from low to insignificant. Likewise, based on the flooding models prepared for the Project, (Section 6.2.7) it is not predicted that changes in flood behaviour will impact the vegetation within and adjacent the Project disturbance area.

Indirect impacts associated with dust and bushfire risk are considered unlikely given the management measures to be implemented (e.g. including fire awareness in inductions for personnel and contractors) (Section 6.2).

Table 17: Poplar Box Grassy Woodland on Alluvial Plains TEC extent of disturbance to each patch

Patch	Description	Category	Current extent (ha)	Extent of impact (ha)
P1	Large patch on the south west of the survey area, west of the Ti-Tree Creek	Category A2	106.9	83.1
P2	Patch north of the Suttor Developmental Road, parallel to the Isaac River	Category C	12.4	12.4
P3	Patch north of the Suttor Developmental Road, parallel to the Isaac River, continuation of P2	Category C	5.1	5.1

Patch	Description	Category	Current extent (ha)	Extent of impact (ha)
P4	Patch between the Isaac River and Burton Mine, south of the Suttor Developmental Road	Category C	11.7	6.6
P5	Patch south of the Suttor Developmental Road, across from P3	Category C	5	5
			Total impact	112.2

7.1.2 TEC mitigation measures

The Project has been designed to avoid and mitigate impacts to the Poplar Box Grassy Woodland on Alluvial Plains TEC where practicable. The proposed avoidance and mitigation measures for the Poplar Box Grassy Woodland on Alluvial Plains TEC, including timing, predicted effectiveness, monitoring, adaptive management and the relevant statutory or policy basis, is provided in Table 18.

Conservation, recovery and threat abatement plans relevant to the Poplar Box Grassy Woodland on Alluvial Plains TEC have been considered in the assessment of the TEC, the development of avoidance, mitigation and management measures and/or assessment of significant impact for the Poplar Box Grassy Woodland on Alluvial Plains TEC (Section 7.1.3):

- The 'Approved Conservation Advice for Poplar Box Grassy Woodland on Alluvial Plains' (DoEE 2019), developed at the time of EPBC Act listing outlines the key diagnostic criteria and condition thresholds for the TEC and the priority conservation actions for the community. The conservation advice also describes areas considered critical to the survival of the community.
- The 'Poplar Box Grassy Woodland on Alluvial Plains' ecological community' SPRAT profile provides information about the indicative distribution of the Poplar Box Grassy Woodland on Alluvial Plains TEC.
- The SPRAT profile for this species indicates there is no adopted or made Recovery Plan for this ecological community, as the listing and the implementation of actions in the Approved Conservation Advice (DoEE 2019) provides sufficient protection and guidance on the recovery of the ecological community.
- No Threat Abatement Plan has been identified as being relevant the Poplar Box Grassy Woodland on Alluvial Plains TEC.
- 'Australia's Strategy for Nature 2019–2030' (Commonwealth of Australia 2019) and Australia's actions for nature including the 'Threatened Species Strategy 2021–2031' (Commonwealth of Australia 2021), 'Australian Weeds Strategy 2017–2027' (Commonwealth of Australia 2017a) and 'Australian Pest Animal Strategy 2017–2027' (Commonwealth of Australia 2017b) outline relevant actions to recover Australia's threatened plants, animals and ecological communities.

Table 18: *Poplar Box Grassy Woodland on Alluvial Plains TEC impact avoidance and mitigation measures*

Avoidance/mitigation measures	Timing	Predicted effectiveness	Monitoring and adaptive management	Statutory or policy basis
Implement vegetation clearance protocols, including the delineation of vegetation adjoining proposed clearance areas to prevent accidental damage.	Construction/operations	Highly effective management technique to manage vegetation clearance activities.	Monitor disturbance/vegetation clearance areas against approved disturbance limits, in accordance with the MNES Species Impact Management Plan (AARC 2024b). Should clearing exceed approved limits, incident reporting would be initiated, with a corrective action plan to be proposed (including proposed timing) and implemented, in accordance with the site MNES Species Impact Management Plan (AARC 2024b). The corrective actions will be informed by the nature and extent of the exceedance.	DoEE (2019)
Limit activities that cause disturbance to minimise occurrence and spread of weeds.	Construction/operations	Highly effective management technique to manage the spread and occurrence of weeds.	Monitor disturbance/vegetation clearance areas against approved disturbance limits (AARC 2024a, 2024b).	DoEE (2019)
Regularly inspect mine-related surface disturbance areas to identify areas requiring weed management measures to be implemented, in accordance with the site Weed and Pest Management Plan (AARC 2024a). Implement weed management measures in accordance with the site Weed and Pest Management Plan (AARC 2024a) (e.g. mechanical removal and application of approved herbicides).	Construction/operations/rehabilitation and decommissioning	Effective management measure to manage the spread and occurrence of weeds.	Monitor and manage weeds in accordance with the site Weed and Pest Management Plan (AARC 2024a). Corrective actions (such as increasing the frequency or extent of control efforts, or alternative control strategies) will be implemented as necessary in accordance with the site Weed and Pest Management Plan (AARC 2024a).	DoEE (2019), Commonwealth of Australia (2017a), DAF (2023), Isaac Regional Council (2024)
Maintain a clean, rubbish-free environment to discourage scavenging and reduce the potential for colonisation of these areas by introduced fauna.	Construction/operations/rehabilitation and decommissioning	Effective management measure to manage the occurrence and abundance of feral pests.	Regular monitoring of the site will be carried out by environmental personnel. Raise awareness through personnel inductions. Additional measures (such as tool box talks or staff newsletters) will be implemented if inspections indicate a clean, rubbish-free environment is not being maintained.	DoEE (2019), Commonwealth of Australia (2017b), DoEE (2017)

Avoidance/mitigation measures	Timing	Predicted effectiveness	Monitoring and adaptive management	Statutory or policy basis
Store domestic waste in appropriate receptacles and locations.	Construction/ operations/ rehabilitation and decommissioning	Effective management measure to manage the occurrence and abundance of feral pests.	Regular monitoring of site will be carried out by environmental personnel. Waste generation monitoring and audit will be in accordance with the site Waste Management Plan. Additional measures (such as provision of additional receptacles or change in location of receptacles) will be implemented if current storage practices encourage feral animals.	DoEE (2019), Commonwealth of Australia (2017b)
Implement pest control measures in accordance with the site Weed and Pest Management (AARC 2024a) where infestations develop.	Construction/ operations/ rehabilitation and decommissioning	Effective management measure to manage the occurrence and abundance of feral pests.	Monitor and manage pests in accordance with the site Weed and Pest Management Plan (AARC 2024a) (Section 6.2.2). Corrective actions (such as increasing the frequency or extent of control efforts, or alternative control strategies) will be implemented, as necessary in accordance with the site Weed and Pest Management Plan (AARC 2024a)	DoEE (2019), Commonwealth of Australia (2017b), DAF (2023), Isaac Regional Council (2024), DoEE (2016), DoEE (2017)
Coordinate pest management program in consideration of surrounding stakeholders.	Construction/ operations/ rehabilitation and decommissioning	Coordinated activities are predicted to achieve better regional outcomes for weed and pest species.	Incorporate consultation outcomes into management measures, with the management measures will be implemented on -site in accordance with the site Weed and Pest Management Plan (AARC 2024a) (Section 6.2.2).	DoEE (2019), Commonwealth of Australia (2017a), Commonwealth of Australia (2017b), Isaac Regional Council (2024)
Bushfire prevention and management measures will be outlined in the Emergency Response Plan to be prepared for the Project. Inductions of mine site personnel will include fire awareness.	Construction/ operations/ rehabilitation and decommissioning	Effective management procedure to reduce the risk of bushfire.	Any incidence of bushfire will be investigated to determine the requirement for additional controls. Potential adaptive management measures include revision of the Emergency Response Plan and/or a program to increase personnel awareness of bushfire risk (e.g. through tool box talks)	DoEE (2019)

7.1.3 Residual significant impact assessment

Table 19 provides an assessment of the likelihood of significant impacts on the Poplar Box Grassy Woodland on Alluvial Plains TEC in accordance with the Commonwealth 'Significant Impact Guidelines 1.1: Matters of National Environmental Significance' (DoE 2013).

Table 19: *Poplar Box Grassy Woodland on Alluvial Plains TEC significant impact assessment*

Significance criteria	Assessment of significance
An action is likely to have a significant impact on a Critically Endangered or Endangered ecological community if there is a real chance or possibility that it will:	
Reduce the extent of an ecological community	The Project will result in direct clearing of 112.2 ha of Poplar Box Grassy Woodland on Alluvial Plains TEC.
Fragment or increase fragmentation of an ecological community	The Poplar Box Grassy Woodland on Alluvial Plains TEC vegetation in the survey area has been subject to past disturbance related to grazing land use. Two patches of Poplar Box Grassy Woodland on Alluvial Plains TEC will be only partially impacted, and three patches will be wholly impacted. However, the remaining patches are expected to remain viable post the mining impact (patch size above 5 ha) and will retain connectivity with the remnant vegetation within the survey area.
Adversely affect habitat critical to the survival of an ecological community	Habitat critical to the survival of the Poplar Box Grassy Woodland on Alluvial Plains TEC is 'Class A, High quality' (DoEE 2019). One patch of Poplar Box Grassy Woodland on Alluvial Plains TEC within the proposed disturbance area has been identified as Category A2 (within 'Class A Good quality') and, therefore, may be considered habitat critical to the survival of the TEC. This patch will be partially cleared, resulting in the disturbance of 83.1 ha.
Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels or substantial alteration of surface water drainage patterns	Management measures will be applied to prevent erosion and sedimentation resulting from Project activities within the Poplar Box Grassy Woodland on Alluvial Plains TEC habitat. Given these controls, the Project is not predicted to cause erosion-related impacts that will modify or destroy factors necessary for the survival of the Poplar Box Grassy Woodland on Alluvial Plains TEC. The Poplar Box Grassy Woodland on Alluvial Plains TEC in the survey area has not been identified as a GDE (3D Environmental 2023), and therefore modifications to groundwater levels are unlikely to affect the TECs survival. Further monitoring of GDE presence and health, including groundwater usage by the TECs will be completed as part of the GDEMMP (3D Environmental 2024) and GDE habitat quality monitoring program (AARC 2024c). As detailed in Section 6.2.7, modifications to flood behaviour change will result in negligible impacts to the Poplar Box Grassy Woodland on Alluvial Plains TEC.

Significance criteria	Assessment of significance
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species	Two Poplar Box Grassy Woodland on Alluvial Plains TEC patches will be partially impacted by the Project. The partial impact on these patches may create potential for edge effects on these patches. Edge effects to remaining areas of this TEC are unlikely to be significant, as the TEC is already subject to established introduced ground cover species and weed species listed as restricted matters under the Biosecurity Act (Queensland) and/or as WoNS. Weed control measures will be implemented throughout the survey area, in accordance with the site Weed and Pest Management Plan (AARC 2024a), to minimise the risk of degradation of Poplar Box Grassy Woodland on Alluvial Plains TEC through change in species composition. The result of the implementation of the mitigation measures proposed in this assessment will be that it is unlikely the retained TEC in the survey area will experience a decline or loss of the functionally important species. Bushfire prevention and management measures will be implemented in accordance with the site Emergency Response Plan, which will protect the functionally important species of the Poplar Box Grassy Woodland on Alluvial Plains TEC.
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: • assisting invasive species that are harmful to the listed ecological community to become established, or • causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community, which kill or inhibit the growth of species in the ecological community	Two Poplar Box Grassy Woodland on Alluvial Plains TEC patches will be partially impacted by the Project. The remaining areas of the impacted patches may be subject to edge effects; however, the Project disturbance area is within a modified rural landscape where introduced species have been recorded throughout the TEC. The proposed Project is unlikely to increase the threat of invasive species in the landscape. The Project is unlikely to result in the mobilisation of pollutants of any kind into this TEC either within or adjacent to the Project disturbance area. The Project is not likely to use fertilisers on-site or cause regular mobilisation of herbicides that may impact the Poplar Box Grassy Woodland on Alluvial Plains TEC. Control measures such as sediment dams will be in place to minimise the potential for pollutants to affect the Poplar Box Grassy Woodland on Alluvial Plains TEC in the survey area.
Interfere with the recovery of an ecological community	There is no national recovery plan for the Poplar Box Grassy Woodland on Alluvial Plains TEC. The Project will result in the reduction of extent of the Poplar Box Grassy Woodland on Alluvial Plains TEC by approximately 112.2 ha.
Conclusion	The Project is considered to have a significant impact on 112.2 ha of the Poplar Box Grassy Woodland on Alluvial Plains TEC. The extent of these impacts is shown in Figure 17.

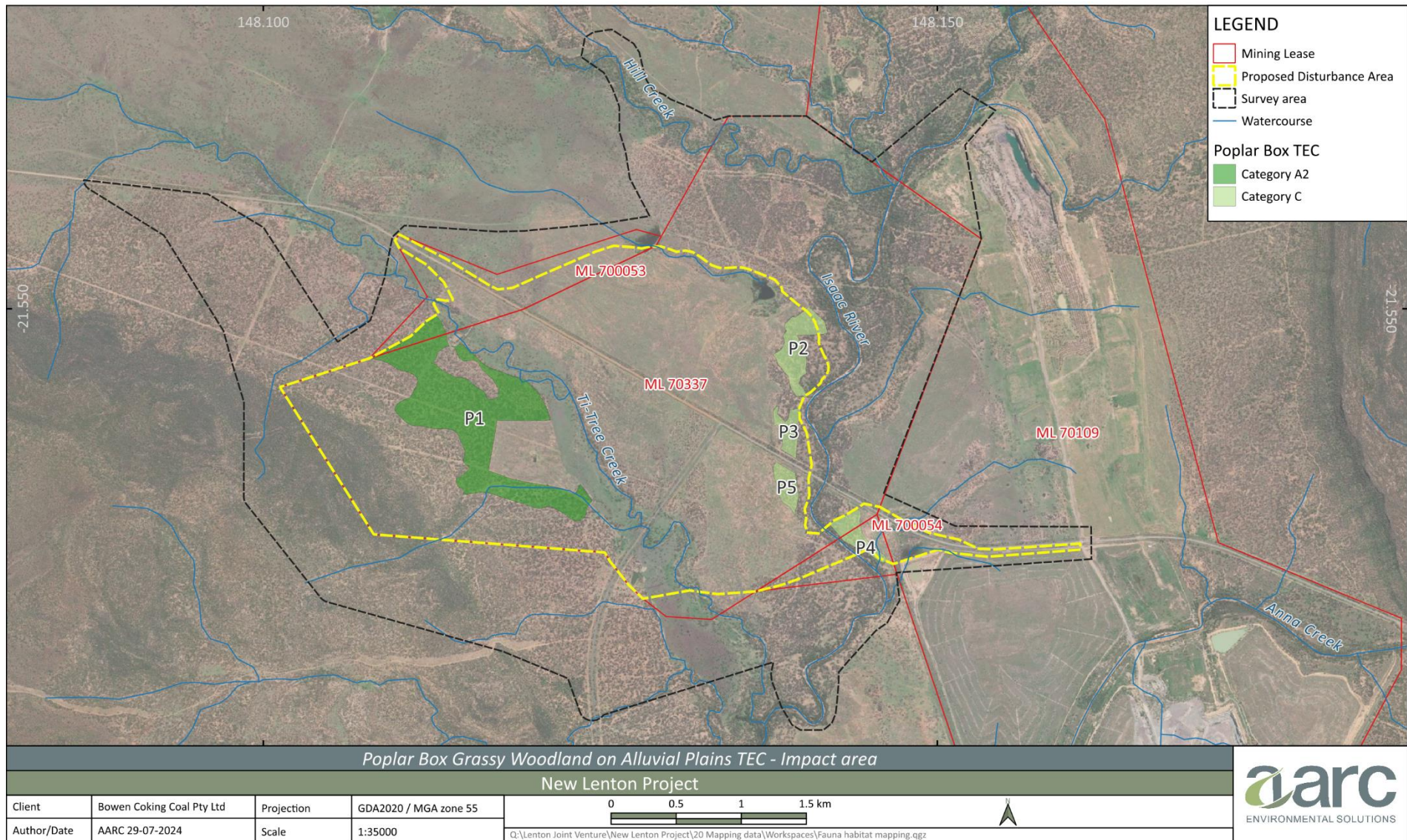


Figure 17: Poplar Box Grassy Woodland on Alluvial Plains TEC significant impact areas

7.2 Greater Glider

7.2.1 Species impact assessment

Approximately 1,036.6 ha of Greater Glider habitat have been identified within the survey area, including 733.7 ha of preferred habitat, and 302.9 ha of suitable habitat (5.2.5). A total of 293 ha of Greater Glider habitat is proposed to be directly disturbed through clearing for the Project, 203.3 ha of preferred habitat and 89.7 ha of suitable habitat (Table 20 and Figure 13).

Greater Glider habitat mostly occurs within riparian vegetation adjacent to Isaac River, Hill Creek and on the floodplain to the west of Ti-Tree Creek. The riparian vegetation along the Isaac River and Hill Creek will be mostly retained, and it will be only impacted by the Isaac River crossings discussed in Section 6.1 and shown in Figure 3. Potential fragmentation of the Isaac River fauna corridor will be minimised by the implementation of the measures listed in Section 6.2.1.

The risk of changes in flood behaviour impacting vegetation is negligible (Section 6.2.7). One the vegetation communities along the Isaac River, V4 (RE 11.3.25), has been identified as GDE. Based on the GDE report (3D Environmental 2023), with implementation of the Project GDEMMP (3D Environmental 2024), it is considered that the risk to GDEs posed by drawdown from Project development, ranges from low to insignificant. Therefore, changes in hydrology and groundwater are considered unlikely to impact the species habitat.

The potential for other indirect impacts to the species from noise and vibration, dust, erosion and sedimentation, lighting and vehicle strike is considered to be minimal, given the measures that will be implemented to manage these impacts (Section 6.2). Weed and pest management measures will be implemented for the Project in accordance with the site Weed and Pest Management Plan (AARC 2024a), reducing the risk of an increase in weed and animal pest populations.

An assessment of the significance of the impacts on the Greater Glider is provided in Section 7.2.3

Table 20: Proposed disturbance of Greater Glider habitat

Habitat type	Extent within survey area (ha)	Extent of direct disturbance (ha)
Preferred (Critical)	733.7	203.3
Suitable (Not Critical)	302.9	89.7

7.2.2 Species mitigation measures

The Project has been designed to avoid and mitigate impacts to the Greater Glider where practicable. The proposed avoidance and mitigation measures for the Greater Glider, including timing, predicted effectiveness, monitoring, adaptive management and the relevant statutory or policy basis is provided in Table 21.

Conservation information relevant to the Greater Glider has been considered in this assessment as follows:

- The 'Conservation Advice for *Petauroides volans* (greater glider (southern and central))' (DCCEEW 2022) outlines the reasons for the conservation assessment of the species with regard to the 2022 uplisting of the species and provides information about the Greater Glider, including information in relation to its distribution, biology/ecology, threats and conservation and management actions.
- The '*Petauroides volans*–Greater Glider' SPRAT profile provides information about the relevant regulatory considerations and links to information available in relation to its listing under the EPBC Act. The SPRAT profile indicates there is no adopted or made Recovery Plan for this species; however, a Recovery Plan is required.
- 'Australia's Strategy for Nature 2019–2030' (Commonwealth of Australia 2019), Australia's actions for nature including the 'Threatened Species Strategy 2021–2031' (Commonwealth of Australia 2021) and

'Australian Pest Animal Strategy 2017–2027' (Commonwealth of Australia 2017b) outline relevant actions to recover Australia's threatened plants, animals and ecological communities.

Table 21: Greater Glider impact avoidance and mitigation measures

Avoidance/mitigation measures	Timing	Predicted effectiveness	Monitoring and adaptive management	Statutory or policy basis
Project infrastructure has been located to minimise direct disturbance to Greater Glider habitat.	Mine planning/ construction/ operations	Highly effective—minimises the extent of impacts to Greater Glider habitat.	Monitor disturbance/vegetation clearance areas against approved disturbance limits, in accordance with the site MNES Species Impact Management Plan (AARC 2024b).	DCCEEW (2022)
Implement vegetation clearance protocols, including the delineation of vegetation adjoining proposed clearance areas to prevent accidental damage.	Construction/ operations	Highly effective management technique to manage vegetation clearance activities.	Should clearing exceed approved limits, incident reporting would be initiated with a corrective action plan proposed (including proposed timing) and implemented, in accordance with the site MNES Species Impact Management Plan (AARC 2024b). The corrective actions will be informed by the nature and extent of the exceedance.	
Coordinate pest management program in consideration of surrounding stakeholders.	Construction/ operations/ rehabilitation and decommissioning	Effective management measure to manage the occurrence and abundance of feral pests.	Monitor and manage pests in accordance with the site Weed and Pest Management Plan (AARC 2024a) (Section 6.2.2).	DCCEEW (2022), Commonwealth of Australia (2017b), DAF (2023), Isaac Regional Council (2020)
Fauna spotter/ catcher will be on -site when clearing activities occur within Greater Glider habitat. Fauna spotter/catcher will monitor clearance activities for the Greater Glider, and any incidence of fauna mortality or injury will be recorded. Injured fauna will be taken to a wildlife carer or veterinarian.	Construction/ operations	Potentially effective.	Adaptive measures will be implemented, in accordance with the MNES Species Impact Management Plan (AARC 2024b), as necessary. Potential adaptive measures will include pre-clearance surveys and progressive clearing around known habitat trees.	DCCEEW (2022)
Minimise effects of artificial lighting.	Mine planning/ construction	Effective management measure to minimise effects of artificial lighting.	Mine planning for MIA will include lighting designs (placement, configuration and direction) to minimise light spill.	DAWE (2020), AS/NZS 4282:2019 Control of the obtrusive effects of outdoor lighting' (Standards Australia 2019)

Avoidance/mitigation measures	Timing	Predicted effectiveness	Monitoring and adaptive management	Statutory or policy basis
Bushfire prevention and management measures will be outlined in the Emergency Response Plan. Inductions of mine site personnel will include fire awareness.	Construction/ operations/ rehabilitation and decommissioning	Effective management procedure to reduce the risk of bushfire.	Any incidence of bushfire will be investigated to determine the requirement for additional controls. Potential adaptive management measures include revision of the Emergency Response Plan and/or a program to increase personnel awareness of bushfire risk (e.g. through tool box talks).	DCCEEW (2022)

7.2.3 Residual significant impact assessment

Table 22 provides an assessment of the likelihood of significant impacts on the Greater Glider in accordance with the Commonwealth 'Significant Impact Guidelines 1.1: Matters of National Environmental Significance' (DoE 2013).

The Greater Glider population occurring at the survey area has been assessed against the definition of 'important population' of a Vulnerable species (DoE 2013). The population is determined to be part of a large population, which is distributed throughout the broader region and maintains connectivity for breeding and dispersal throughout this area. Breeding is considered to occur amongst the population of the broader region and, therefore, the population occurring in the survey area is not likely to be necessary for maintaining species genetic diversity. The Greater Glider range extends throughout the coast and inland areas of eastern Australia, and the survey area is not near the limits of the species range (DCCEEW 2023b).

The survey area is close to the eastern limits of the known species range (ALA 2019-2023). Additionally, considering the species' most recent conservation advice (DCCEEW 2022), which states that all populations are important populations given its Endangered status, the greater glider has been assessed as important population for the purpose of the significant impact assessment.

Table 22: Greater Glider significant impact assessment

Significance criteria	Assessment of significance
An action is likely to have a significant impact on a Vulnerable species if there is a real chance or possibility that it will:	
Lead to a long-term decrease in the size of an important population of a species	The impacts to all Greater Glider habitat include the removal of 293 ha of habitat. However, it is unlikely that this disturbance will lead to a long-term decrease in size of an important population as the connectivity within the Isaac River and Hill Creek riparian corridors, where the species has been mostly recorded (Figure 13) will be retained.
Reduce the area of occupancy of an important population	The Greater Glider has been observed to favour the riparian vegetation along the Isaac River and Hill Creek (5.2.4 and Figure 13), with occasional observations within the surrounding dry Eucalypt woodlands in the surrounding area, particularly in floodplains. Given the abundance of species records within the survey area, the clearing on 293 ha of dry Eucalypt woodland, which form preferred and suitable habitat for the species, will likely reduce the area of occupancy of the local important population.
Fragment an existing important population into two or more populations	The riparian vegetation will be mostly retained, only impacted by the construction of the Isaac River crossings (Figure 3). Considering the mitigation measures proposed for the river crossings (Section 6.2.1), it is unlikely the new infrastructure will prevent the movement of the species, and therefore the Project is unlikely to fragment a population into two or more populations.
Adversely affect habitat critical to the survival of a species	There is currently no habitat for the Greater Glider listed on the Register of Critical Habitat (DCCEEW 2023c). However, according to the latest approved conservation advice (DCCEEW 2022), all preferred habitat identified within the survey area is considered habitat critical to the survival of the species due to being a large contiguous area of eucalypt forest with mature hollow-bearing trees and a variety of forage species in the canopy. As such, impacts on 203.3 ha of preferred habitat for the Greater Glider within the survey area is considered likely to adversely affect habitat critical to the survival of the species.

Significance criteria	Assessment of significance
Disrupt the breeding cycle of an important population	The Greater Glider has been observed to favour the riparian vegetation along the Isaac River and Hill Creek (5.2.4 and Figure 13), with only occasional records within the surrounding dry Eucalypt woodlands. This observation coincides with the presence of hollow-bearing trees, required by the species for nesting. The riparian corridors will be mostly retained, and only will be impacted by the construction of Isaac River crossings (Figure 3). This disturbance, undertaken as proposed in Section 6.2.1, is unlikely to 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	The impacts to all Greater Glider habitat include the removal of 293 ha of preferred and suitable habitat. The removal of this extent of habitat is unlikely to lead to a long-term decline in the species population given the wide extent of habitat for this species. The survey area is connected to areas of remnant vegetation habitat to the north-east and north-west boundaries and along the riparian vegetation at the Isaac River and Hill Creek, which represents areas of habitat to support mobility for the species throughout the broader region. The retained habitat throughout the survey area is unlikely to be indirectly impacted by the Project. Indirect impacts, such as weeds and pests, noise and vibration, dust, artificial lighting, vehicle strike and bushfire, will be managed as outlined in Section 7.2.2 and are considered not to have potential to impact the availability or quality of habitat to the extent that the Greater Glider is likely to decline. Similarly, as indicated in Section 6.2.7, flood behaviour change will result in negligible impacts to the availability or quality of the species habitat. Based on the GDE assessment (3D Environmental 2023), the risk to the GDE identified within the survey area (which form a portion of Greater Glider habitat in the survey area) will be low to insignificant and therefore groundwater drawdown is unlikely to impact on the availability or quality of habitat to the extent that the Greater Glider is likely to decline.
Result in invasive species that are harmful to a Vulnerable species becoming established in the Vulnerable species habitat	The survey area is in a modified rural landscape, and invasive species exist in the broader region. Invasive species (Feral Cats and European Red Foxes) and native species (owls and Sulphur Crested Cockatoos) are recognised as a threat to the Greater Glider (DCCEE 2022). Feral Cat was recorded in surveys. Given the proposed monitoring and management of pests including corrective actions in accordance with the site Weed and Pest Management Plan (AARC 2024a) (Section 7.2.2), the Project is unlikely to result in the increase of invasive species likely to be harmful to the Greater Glider. The confidence in the threat posed by native species threats is considered low and these threats are considered applicable for small parts of the Greater Glider range (DCCEE 2022). The numbers of native owls or Sulphur-crested Cockatoos are considered unlikely to be a threat to the Greater Glider in the survey area and the Project is unlikely to alter these threats.
Introduce disease that may cause the species to decline	There are no diseases of the Greater Glider listed as a threat to the species (DCCEE 2022). The Project is unlikely to introduce a disease that may cause the species to decline.

Significance criteria	Assessment of significance
Interfere substantially with the recovery of the species	There is no adopted or made Recovery Plan for this species; however, a Recovery plan is considered to be required (DCCEEW 2022). Priority conservation actions identified by Conservation Advice (DCCEEW 2022) include: • management of habitat loss, disturbance and modification (including fire) including protection of unburnt habitat, revision of prescribed burning prescriptions, protection of habitat trees, avoidance of habitat fragmentation and avoidance of the use of barbed wire; • protection of climate change refuge habitat and improve micro-climate conditions in at risk areas; • manage invasive species threats; and • investigate the feasibility of reintroductions to areas the species was extirpated. The Project is unlikely to substantially interfere with the recovery of the species.
Conclusion	The proposed clearing of 293 ha of Greater Glider habitat, including 203.3 ha of preferred habitat, and 89.7 ha of suitable habitat, will result in a significant residual impact on the Greater Glider. The extent of these impact areas is shown in Figure 18.

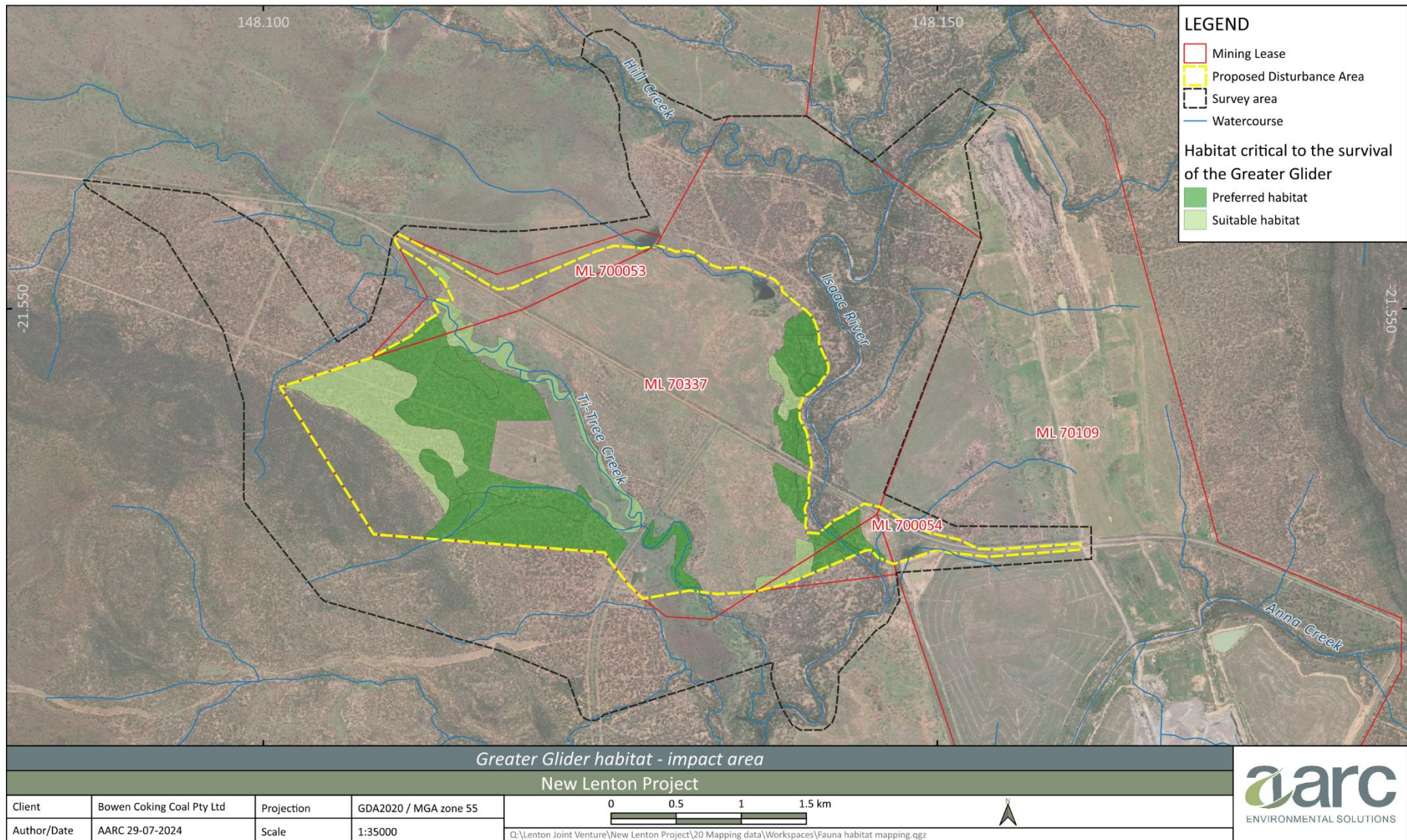


Figure 18: Greater Glider significant impact areas

7.3 Koala

7.3.1 Species impact assessment

Approximately 1,369.8 ha of Koala habitat has been identified within the survey area (Table 23 and Figure 14) of which 327 ha of habitat critical to the survival of the species is proposed to be cleared for the Project.

The impacts on the Koala and its habitat are predominantly due to direct clearing and some habitat fragmentation. Koala habitat mostly occurs within riparian vegetation along the Isaac River, Hill Creek, the Ti-Tree Creek, and on the associated floodplains, including the west of Ti-Tree Creek. The fauna corridor formed by the Isaac River, and Hill Creek riparian vegetation will be mostly retained, only impacted by the construction of the haul road crossing and the new (diverted) Suttor Developmental Road crossing over the Isaac River (Figure 3). Mitigation measures for the Isaac River crossings, detailed in Section 6.2.1, will minimise the impact to the fauna corridor and therefore the species mobility. Additionally, in the context of the local landscape, and given the retained vegetation west of the escarpment, connectivity for the species west of the Ti-Tree Creek will not be compromised.

The risk of changes in flood behaviour impacting vegetation is negligible (Section 6.2.7). One the vegetation community along the Isaac River, V4 (RE 11.3.25), has been identified as GDE. Based on the GDE report (3D Environmental, 2023), with implementation of the site GDEMMP (3D Environmental), it is considered that the risk to GDEs posed by drawdown from Project development ranges from low to insignificant. Therefore, changes in hydrology and groundwater are considered unlikely to impact the species habitat.

The potential for other indirect impacts to the Koala from noise and vibration, dust, erosion and sedimentation, lighting and vehicle strike is considered to be minimal given the measures that will be implemented to manage these impacts (Section 6.2). The Project also has the potential to increase animal pest populations if they are not appropriately managed. However, as described in Section 7.3.2, pest management measures will be implemented for the Project in accordance with the site Weed and Pest Management Plan (AARC 2024a).

An assessment of the significance of the impacts on the Koala is provided in Section 7.3.3.

Table 23: Proposed disturbance of habitat critical to the survival of the Koala

Critical habitat to the survival of the species	Extent within survey area (ha)	Extent of disturbance (ha)
Important ecological function habitat	152.4	6.5
Suitable habitat	941.5	320.5

7.3.2 Species mitigation measures

The Project has been designed to avoid and mitigate impacts to the Koala where practicable. The proposed avoidance and mitigation measures for the Koala, including timing, predicted effectiveness, monitoring, adaptive management and the relevant statutory or policy basis, are provided in Table 24.

Conservation and recovery plans relevant to the Koala have been considered in this assessment as follows:

- The 'Conservation Advice for *Phascolarctos cinereus* (Koala) combined populations in Queensland, New South Wales and the Australian Capital Territory' (DAWE 2022a), outlines the reasons for the conservation assessment of the species with regard to the 2022 uplisting of the species and provides information about the species, including its distribution and habitat, threats and priority management actions.
- The '*Phascolarctos cinereus* combined populations of Qld, NSW and the ACT–Koala' SPRAT profile provides information about the Koala, including relevant regulatory considerations and information in relation to its

population and distribution, habitat, life cycle, feeding, movement patterns, threats, abatement and recovery.

- The 'National Recovery Plan for the Koala' (DAWE 2022b) considers habitat critical to the survival of a species to be the area that the species relies on to halt decline and promote the recovery of the species that can be unambiguously identified. Under the EPBC Act, the following factors and any other relevant factors may be considered when identifying habitat that is critical to the survival of a species:
 - a) *whether the habitat is used during periods of stress (examples flood, drought or fire);*
 - b) *whether the habitat is used to meet essential life cycle requirements (examples: foraging, breeding, nesting, roosting, social behaviour patterns or seed dispersal processes);*
 - c) *the extent to which the habitat is used by important populations;*
 - d) *whether the habitat is necessary to maintain genetic diversity and long-term evolutionary development;*
 - e) *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;*
 - f) *whether the habitat is necessary to ensure the long-term future of the species or ecological community through reintroduction or re-colonisation;*
 - g) *any other way in which habitat may be critical to the survival of a listed threatened species or a listed threatened ecological community.*
- 'Australia's Strategy for Nature 2019–2030' (Commonwealth of Australia 2019), Australia's actions for nature including the 'Threatened Species Strategy 2021–2031' (Commonwealth of Australia 2021) and 'Australian Pest Animal Strategy 2017–2027' (Commonwealth of Australia 2017b) outline relevant actions to recover Australia's threatened plants, animals and ecological communities.

Table 24: Koala impact avoidance and mitigation measures

Avoidance/mitigation measures	Timing	Predicted effectiveness	Monitoring and adaptive management	Statutory or policy basis
Project infrastructure has been located to minimise direct disturbance to Koala habitat.	Mine planning/ construction/ operations	Highly effective—minimises the extent of impacts to Koala habitat.	Monitor disturbance/vegetation clearance areas against approved disturbance limits, in accordance with the site MNES Species Impact Management Plan (AARC 2024b). Should clearing exceed approved limits, incident reporting would be initiated with a corrective action plan proposed (including proposed timing) and implemented, in accordance with the site MNES Species Impact Management Plan (AARC 2024b). The corrective actions will be informed by the nature and extent of the exceedance.	DAWE (2022a), DCCEEW (2023), DES (2022b)
Implement vegetation clearance protocols, including the delineation of vegetation adjoining proposed clearance areas to prevent accidental damage.	Construction/ operations	Highly effective management technique to manage vegetation clearance activities.		
Fauna spotter/catcher will be on-site when clearing activities occur within Koala habitat. Fauna spotter/catcher will monitor clearance activities for the Koala and any incidence of fauna mortality or injury will be recorded. Injured fauna will be taken to a wildlife carer or veterinarian.	Construction/ operations	Highly effective management technique—vegetation clearance activities can be timed to avoid the clearance of trees until vacated by Koalas (should they be present).	Adaptive measures will be implemented, in accordance with the site MNES Species Impact Management Plan (AARC 2024b), as necessary. Potential adaptive measures will include pre-clearance surveys and progressive clearing around known habitat trees.	DAWE (2022a)
Speed limits on Project roads will be imposed to reduce the risk of vehicle strike.	Construction/ operations/ rehabilitation and decommissioning	Highly effective management technique to minimise the potential for vehicle strike.	Monitor incidence of vehicle strike, in accordance with the site MNES Species Impact Management Plan (AARC 2024b). Adaptive management measures will include signage and/or reduction in speed limits at selected locations identified as having a higher risk of vehicle strike (AARC 2024b).	DAWE (2022a), DCCEEW (2023), DES (2022b)

Avoidance/mitigation measures	Timing	Predicted effectiveness	Monitoring and adaptive management	Statutory or policy basis
Safe driving procedures will be incorporated into site inductions to increase awareness of the risk of vehicle strike.	Construction/ operations/ rehabilitation and decommissioning	Highly effective management technique to minimise the potential for vehicle strike.	Monitor incidence of vehicle strike, in accordance with the site MNES Species Impact Management Plan (AARC 2024b). Adaptive management measures will include an increase in measures (frequency or methods) or signage to increase awareness (AARC 2024b).	DAWE (2022a), DCCEEW (2023), DES (2022b)
Maintain a clean, rubbish-free environment to discourage scavenging and reduce the potential for colonisation of these areas by introduced fauna (e.g. feral dogs).	Construction/ operations/ rehabilitation and decommissioning	Effective management measure to manage the occurrence and abundance of feral pests such as feral dogs.	Regular monitoring of site will be carried out by environmental personnel. Raise awareness through personnel inductions. Additional measures (such as tool box talks or staff newsletters) will be implemented if inspections indicate a clean, rubbish-free environment is not being maintained.	DAWE (2022a), DCCEEW (2023), Commonwealth of Australia (2017b)
Store domestic waste in appropriate receptacles and locations.	Construction/ operations/ rehabilitation and decommissioning	Effective management measure to manage the occurrence and abundance of feral pests, including feral dogs if site protocols are followed by personnel.	Regular monitoring of the site will be carried out by environmental personnel. Implement the site Waste Management Plan. Additional measures (such as the provision of additional receptacles or change in location of receptacles) will be implemented if current storage practices encourage feral animals.	DAWE (2022a), Commonwealth of Australia (2017b)

Avoidance/mitigation measures	Timing	Predicted effectiveness	Monitoring and adaptive management	Statutory or policy basis
Monitor and manage pest animal populations and implementation of pest control measures in accordance with the site Weed and Pest Management Plan (AARC 2024a) (Section 6.2.2).	Construction/ operations/ rehabilitation and decommissioning	Effective management measure to manage the occurrence and abundance of feral pests.	Corrective actions (such as increasing the frequency or extent of control efforts or alternative control strategies) will be implemented, in accordance with the site Weed and Pest Management Plan (AARC 2024a).	DAWE (2022a), Commonwealth of Australia (2017b), DAF (2023), Isaac Regional Council (2024)
Coordinate pest management program in consideration of surrounding stakeholders.	Construction/ operations/ rehabilitation and decommissioning	Effective management measure to manage the occurrence and abundance of feral pests.	Monitor and manage pests in accordance with the site Weed and Pest Management Plan (AARC 2024a) (Section 6.2.2). Incorporate consultation outcomes into management measures, with the management measures implemented on-site.	DAWE (2022a), Commonwealth of Australia (2017b), Isaac Regional Council (2024)
Minimise effects of artificial lighting.	Mine planning/ construction	Effective management measure to minimise effects of artificial lighting.	Mine planning for MIA will include lighting designs (placement, configuration and direction) to minimise light spill.	DAWE (2020), AS/NZS 4282:2019 Control of the obtrusive effects of outdoor lighting' (Standards Australia 2019), DES (2019)
Bushfire prevention and management measures will be outlined in the Emergency Response Plan. Inductions of mine site personnel will include fire awareness.	Construction/ operations/ rehabilitation and decommissioning	Effective management procedure to reduce the risk of bushfire.	Any incidence of bushfire will be investigated to determine the requirement for additional controls. Potential adaptive management measures include revision of the Emergency Response Plan and/or a program to increase personnel awareness of bushfire risk (e.g. through tool box talks).	DAWE (2022a), DCCEEW (2023)

7.3.3 Residual significant impact assessment

Table 25 provides an assessment of the likelihood of significant impacts on the Koala in accordance with the Commonwealth 'Significant Impact Guidelines 1.1: Matters of National Environmental Significance' (DoE 2013).

The population of Koala that potentially uses the habitat within the survey area has been assessed against the definition of 'important population' of a Vulnerable species (DoE 2013) and the definition in the latest conservation advice for the species (DAWE 2022). This population has been determined to be part of a large population that is distributed throughout the broader region and maintains connectivity for breeding and dispersal throughout this area. Breeding is considered to occur amongst the population in the broader region; therefore, the population occurring in the survey area is not likely to be necessary for maintaining species genetic diversity. The Koala range extends throughout the coast and inland areas of eastern Australia, and the survey area is not near the limits of the species range.

However, as indicated in the latest conservation advice for the species (DAWE 2022), the Isaac River could be considered a climatically suitable refugia during periods of environmental stress including droughts, heatwaves, and long-term climate change. Therefore, the population of Koala that potentially uses the habitat within the survey area can be considered an important population.

Table 25: Koala significant impact assessment

Significance criteria	Assessment of significance
An action is likely to have a significant impact on a Vulnerable species if there is a real chance or possibility that it will:	
Lead to a long-term decrease in the size of an important population of a species	The removal of 327 ha of habitat critical to the survival of the Koala, is considered unlikely to lead to a long-term decrease in the size of an important population of the species, as the connectivity within the Isaac River and Hill Creek riparian corridors, where the species has been mostly recorded (Figure 13) will be retained.
Reduce the area of occupancy of an important population	The population of Koala that potentially uses the proposed disturbance area likely uses the habitat assessed as critical to the survival of the species, not the other habitat, which has limited to no value as food, shelter or dispersal habitat for the Koala. The removal of 327 ha of habitat critical to the survival of the Koala may reduce the area of occupancy of an important population of the species.
Fragment an existing important population into two or more populations	The removal of 327 ha of habitat critical to the survival of the species is considered unlikely to fragment an existing population into two or more populations. The remaining vegetation will retain connectivity to the broader region of Koala habitat, in particular the riparian corridors along the Isaac River and Hill Creek, which will be retained. The riparian vegetation will be mostly retained, only impacted by the construction of the Isaac River crossings (Figure 3). Given the mitigation measures proposed for the river crossings (Section 6.2.1), it is unlikely the new infrastructure will prevent the movement of the species, and therefore the Project is unlikely to fragment a population into two or more populations.
Adversely affect habitat critical to the survival of a species	There is currently no habitat for the Koala listed on the Register of Critical Habitat (DCCEEW 2023c). However, the important and suitable Koala habitat, in the survey area are considered likely to meet the Koala conservation advice (DAWE 2022) definition of habitat critical to the Koala for being located adjacent to the Isaac River. Approximately 327 ha of habitat critical to the survival of the Koala will be disturbed by the Project through direct clearing. This action is considered likely to adversely affect habitat critical to the survival of the species. The other vegetated areas within the proposed disturbed area do not meet the criteria for habitat critical to the survival of the species, and therefore, their clearing is considered unlikely to adversely affect habitat critical to the survival of the species. Habitat for the species will be retained within the survey area, in particular along the riparian corridors, which is expected to continue to provide its current habitat function.

Significance criteria	Assessment of significance
Disrupt the breeding cycle of an important population	The removal of 327 ha of habitat critical to the survival of the species is considered unlikely to disrupt the breeding cycle of an important population. The Koala habitat retained, in particular the riparian corridors along the Hill Creek and the Isaac River is expected to remain suitable for breeding for the species. Indirect impacts will be managed such that the breeding cycle will not be disrupted of the population.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The Project requires the removal of 327 ha of habitat critical to the survival of the species. The removal of this extent of habitat is unlikely to lead to a long-term decline in the species population given the availability of habitat for the species in the broader region. The survey area is connected to areas of remnant vegetation habitat along the east and north-east boundaries, mainly through the riparian corridors formed by the Isaac River and the Hill Creek. These riparian corridors support mobility for the species throughout the broader region. The retained habitat throughout the survey area is unlikely to be indirectly impacted by the Project. Indirect impacts, such as weeds and pests, noise and vibration, dust, artificial lighting, vehicle strike and bushfire, will be managed as outlined in Section 7.3.2 and are considered not to have potential to impact the availability or quality of habitat to the extent that the Koala is likely to decline. Similarly, as indicated in Section 6.2.7, flood behaviour change will result in negligible impacts to the availability or quality of the species habitat. Based on the GDE Assessment (3D Environmental, 2023), the risk to the GDE identified within the survey area (which forms a portion of Koala habitat in the survey area) will be low to insignificant and therefore groundwater drawdown is unlikely to impact on the availability or quality of habitat to the extent that the Koala is likely to decline.
Result in invasive species that are harmful to a Vulnerable species becoming established in the Vulnerable species habitat	The survey area is located in a modified rural landscape, and invasive species that are harmful to the Koala exist in the broader region. While predatory species, including wild dogs, are recorded to be established in the survey area, the Project is unlikely to result in the introduction and establishment of any invasive species that are harmful to the Koala within the survey area. Monitoring and management of pests, including corrective actions, will be implemented in accordance with the site Weed and Pest Management Plan (AARC 2024a) (Section 7.3.2).
Introduce disease that may cause the species to decline, or	Koala populations are affected by three known viral diseases which are widespread throughout the wild population. These diseases are likely to be present in the population in the survey area; however, the proposed Project is unlikely to cause the introduction of these diseases or other diseases to the survey area. The Koala population in the survey area will retain connectivity to the surrounding Koala habitat and will, therefore, remain exposed to infections from the broader region.
Interfere substantially with the recovery of the species	The Recovery Plan for the Koala (DAWE 2022b) identifies that direct threats to the Koala include climate change, land-use changes and natural system modifications, while ecological threatening processes include habitat loss and fragmentation, habitat degradation and genetic effects. There is currently no habitat for the Koala listed on the Register of Critical Habitat (DCCEEW 2023c). However, 327 ha of habitat is considered likely to meet the Koala conservation advice (DAWE 2022a) definition of habitat critical to the survival of the Koala. Therefore, the impact of the Project on the Koala habitat in the proposed impact area may interfere with the recovery of the species.
Conclusion	The Project will result in the clearing or disturbance of 327 ha of habitat critical to the survival of the Koala and, therefore, the Project is likely to have a significant impact to the Koala. The extent of these impact areas is shown in Figure 19.

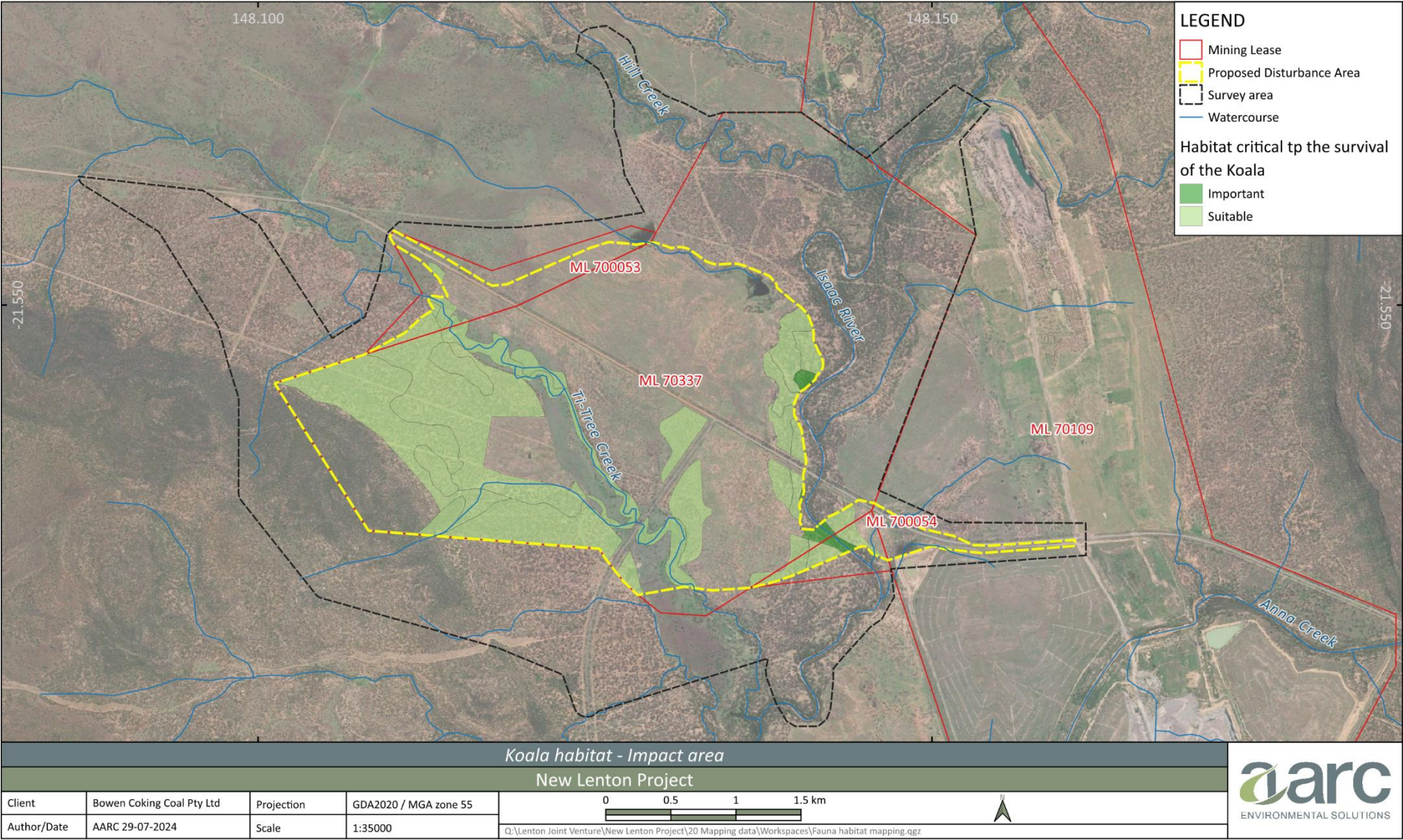


Figure 19: Koala significant impact areas

7.4 Squatter Pigeon

7.4.1 Species impact assessment

A total of 526.87 ha of suitable Squatter Pigeon habitat has been identified within the survey area, including breeding habitat, foraging habitat (i.e. additional to the foraging habitat provided by the potential breeding areas) and dispersal habitat (Table 26 and Figure 15). A total of 192.3 ha of Squatter Pigeon habitat is proposed to be cleared for the direct surface disturbance of the Project, including 150.3 ha of potential breeding habitat, and 42 ha of additional foraging habitat.

The land disturbance associated with the Project will result in some fragmentation of Squatter Pigeon habitat; however, this is unlikely to be significant given the mobility of this species.

The risk of changes in flood behaviour impacting vegetation is negligible (Section 6.2.7). One the vegetation community along the Isaac River, the V4 (RE 11.3.25), has been identified as GDE. Based on the GDE report (3D Environmental, 2023), with implementation of the Project GDEMMP (3D Environmental 2024), it is considered that the risk to GDEs posed by drawdown from Project development ranges from low to insignificant. Therefore, changes in hydrology and groundwater are considered unlikely to impact the species habitat.

The potential for indirect impacts on the Squatter Pigeon from noise and vibration, dust, lighting and vehicle strike are considered to be minimal given the measures that will be implemented to manage these impacts (Section 6.2). The Project also has the potential to increase weed and animal pest populations if they are not appropriately managed. However, weed and pest management measures will be implemented for the Project in accordance with the site Weed and Pest Management Plan (AARC 2024a) (Section 6.2).

An assessment of the significance of the impacts on the Squatter Pigeon is provided in Section 7.4.3.

Table 26: Proposed Project footprint within Squatter Pigeon habitat

Habitat type	Extent within survey area (ha)	Extent of direct disturbance (ha)
Breeding	402.9	150.3
Foraging	117.6	42
Dispersal	6.4	0

7.4.2 Species mitigation measures

The Project has been designed to avoid and mitigate impacts to the Squatter Pigeon where practicable. The proposed avoidance and mitigation measures for the Squatter Pigeon include timing, predicted effectiveness, monitoring, and adaptive management, and the relevant statutory or policy basis is provided in Table 27.

A number of conservation, recovery and threat abatement plans are relevant to the Squatter Pigeon and have been considered in assessment of the Squatter Pigeon:

- The 'Conservation Advice for *Geophaps scripta scripta* (Squatter Pigeon [southern])' (TSSC 2015a), developed at the time of EPBC Act listing and 'Geophaps scripta scripta—Squatter Pigeon (southern)' SPRAT profile provides information about the species, including its distribution, biology/ecology, threats and conservation actions and priorities.
- The SPRAT profile for this species indicates that there is no adopted or made Recovery Plan for this species, as the approved conservation advice (TSSC 2015a) provides sufficient direction to implement priority actions and mitigate against key threats.
- The 'Survey guidelines for Australia's threatened birds' (DEWHA 2010) includes information on Squatter Pigeon and recommended methods for survey.

- Three threat abatement plans are listed in the SPRAT profile (DCCEEW 2023b) as being relevant to the Squatter Pigeon, namely:
 - 1) Department of the Environment (DoE 2015a) Threat abatement plan for predation by feral cats;
 - 2) Department of the Environment and Energy (DoEE 2016) Threat abatement plan for competition and land degradation by rabbits;
 - 3) Department of the Environment, Water, Heritage and the Arts (DEWHA 2008a) Threat abatement plan for predation by the European red fox.

A threat abatement plan is a plan made or adopted under section 270B of the EPBC Act which establishes a national framework to guide and coordinate Australia's response to the impacts of a key threatening process.

- 'Australia's Strategy for Nature 2019–2030' (Commonwealth of Australia 2019), Australia's actions for nature including the 'Threatened Species Strategy 2021–2031' (Commonwealth of Australia 2021), 'Australian Weeds Strategy 2017–2027' (Commonwealth of Australia 2017a) and 'Australian Pest Animal Strategy 2017–2027' (Commonwealth of Australia 2017b) outline relevant actions to recover Australia's threatened plants, animals and ecological communities.

Table 27: Squatter Pigeon impact avoidance and mitigation measures

Avoidance/mitigation measures	Timing	Predicted effectiveness	Monitoring and adaptive management	Statutory or policy basis
Project infrastructure will be located to minimise direct disturbance to Squatter Pigeon habitat.	Mine planning/ construction/ operations	Highly effective—minimises the extent of impacts to Squatter Pigeon habitat.	Monitor disturbance/vegetation clearance areas against approved disturbance limits, in accordance with the site MNES Species Impact Management Plan (AARC 2024b).	TSSC (2015b)
Disturbance areas will be delineated to prevent accidental damage to adjacent Squatter Pigeon habitat.	Construction/ operations	Highly effective management technique to manage Project disturbance activities.	Should clearing exceed approved limits, incident reporting would be initiated with a corrective action plan proposed (including proposed timing) and implemented, in accordance with the site MNES Species Impact Management Plan (AARC 2024b). The corrective actions will be informed by the nature and extent of the exceedance.	
Regularly inspect mine-related surface disturbance areas to identify areas requiring weed management measures to be implemented in accordance with the site Weed and Pest Management Plan (AARC 2024a). Implement weed management measures in accordance with the site Weed and Pest Management Plan (AARC 2024a) (e.g. mechanical removal and application of approved herbicides).	Construction/ operations/ rehabilitation and decommissioning	Effective management measure to manage the spread and occurrence of weeds.	Monitoring and management of weeds in accordance with the site Weed and Pest Management Plan (AARC 2024a) (Section 6.2.2) to be prepared for the Project. Corrective actions (such as increasing the frequency or extent of control efforts, or alternative control strategies) will be implemented, in accordance with the site Weed and Pest Management Plan (AARC 2024a).	TSSC (2015b), Commonwealth of Australia (2017a), DAF (2023), Isaac Regional Council (2024)
Maintain a clean, rubbish-free environment to discourage scavenging and reduce the potential for colonisation of these areas by introduced fauna.	Construction/ operations/ rehabilitation and decommissioning	Effective management measure to manage the occurrence and abundance of feral pests.	Regular monitoring of the site will be carried out by environmental personnel. Raise awareness through personnel inductions. Additional measures (such as tool box talks or staff newsletters) will be implemented if inspections indicate a clean, rubbish-free environment is not being maintained.	TSSC (2015b), Commonwealth of Australia (2017b)

Avoidance/mitigation measures	Timing	Predicted effectiveness	Monitoring and adaptive management	Statutory or policy basis
Store domestic waste in appropriate receptacles and locations.	Construction/ operations/ rehabilitation and decommissioning	Effective management measure to manage the occurrence and abundance of feral pests if site protocols are followed by personnel.	Regular monitoring of site will be carried out by environmental personnel. Implement the site Waste Management Plan. Additional measures (such as provision of additional receptacles or change in location of receptacles) will be implemented if current storage practices encourage feral animals	TSSC (2015b), Commonwealth of Australia (2017b)
Monitor pest animal populations and implementation of pest control measures in accordance with the site Weed and Pest Management Plan (AARC 2024a) .	Construction/ operations/ rehabilitation and decommissioning	Effective management measure to manage the occurrence and abundance of feral pests	Corrective actions (such as increasing the frequency or extent of control efforts or alternative control strategies) will be implemented in accordance with the site Weed and Pest Management Plan (AARC 2024a).	TSSC (2015b), Commonwealth of Australia (2017b), DAF (2023), Isaac Regional Council (2024), DoEE (2016)
Coordinate pest management program in consideration of surrounding stakeholders.	Construction/ operations/ rehabilitation and decommissioning	Effective management measure to manage the occurrence and abundance of feral pests.	Monitor and manage pests in accordance with the site Weed and Pest Management Plan (AARC 2024a). Incorporate consultation outcomes into management measures, with the management measures implemented on site.	TSSC (2015b), Commonwealth of Australia (2017a), Commonwealth of Australia (2017b), Isaac Regional Council (2024)
Bushfire prevention and management measures will be outlined in the Emergency Response Plan. Inductions of mine site personnel will include fire awareness.	Construction/ operations/ rehabilitation and decommissioning	Effective management procedure to reduce the risk of bushfire.	Any incidence of bushfire will be investigated to determine the requirement for additional controls. Potential adaptive management measures include revision of the Emergency Response Plan and/or a program to increase personnel awareness of bushfire risk (e.g. through tool box talks).	TSSC (2015b)

7.4.3 Residual significant impact assessment

Table 28 provides an assessment of the likelihood of significant impacts on the Squatter Pigeon in accordance with the Commonwealth 'Significant Impact Guidelines 1.1: Matters of National Environmental Significance' (DoE 2013).

The Squatter Pigeon population occurring at the survey area is not part of the sub-population occurring south of the Carnarvon Ranges, which is an important sub-population (DCCEEW 2023b). The species occurs regularly north of the Carnarvon Ranges and is considered one population occurring commonly throughout the northern range. The population occurring at the survey area is part of this northern population that has connectivity across a large area for dispersal and breeding.

The Squatter Pigeon range extends south to northern NSW, north to Mackay and west to near Longreach. Therefore, the population occurring at the survey area is not located near the limit of the species range.

Therefore, the Squatter Pigeon occurring at the survey area is neither:

- a key source population for breeding or dispersal;
- a population that is necessary for maintaining genetic diversity; nor
- a population that is near the limit of the species range

The population of Squatter Pigeon that uses the survey area is considered unlikely to be an important population according to the criteria of the Significant Impact Guidelines (DoE 2013).

Table 28: Squatter Pigeon significant impact assessment

Significance criteria	Assessment of significance
An action is likely to have a significant impact on a Vulnerable species if there is a real chance or possibility that it will:	
Lead to a long-term decrease in the size of an important population of a species	The population of Squatter Pigeon that uses habitat within the survey area is considered not to be an important population. The removal of 192.3 ha of Squatter Pigeon habitat will not lead to a long-term decrease in the size of an important population.
Reduce the area of occupancy of an important population	The population of Squatter Pigeon that uses habitat within the survey area is considered not to be an important population. The removal of 192.3 ha of Squatter Pigeon habitat is considered unlikely to reduce the area of occupancy of an important population.
Fragment an existing important population into two or more populations	The population of Squatter Pigeon that uses the habitat within the survey area is considered not to be an important population. The removal of 192.3 ha of Squatter Pigeon habitat is considered unlikely to fragment an existing important population into two or more populations.
Adversely affect habitat critical to the survival of a species	There is currently no habitat for the Squatter Pigeon listed on the Register of Critical Habitat (DCCEEW 2023b). The Squatter Pigeon habitat to be impacted by the Project is considered not critical to the survival of the species as, while the habitat is used by a local population of the species, the areas are unlikely to be necessary for the species as a whole for activities such as foraging, breeding, roosting, dispersal, the long-term maintenance of the species, maintaining genetic diversity; and for the reintroduction or recovery of the species.
Disrupt the breeding cycle of an important population	The population of Squatter Pigeon that uses habitat within the survey area is considered not to be an important population. The removal of 192.3 ha of Squatter Pigeon habitat is considered unlikely to disrupt the breeding cycle of an important population.

Significance criteria	Assessment of significance
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The Project requires the removal of 192.3 ha of Squatter Pigeon habitat, including 150.34 ha of potential breeding habitat, and 41.96 ha of foraging habitat. The removal of this extent of habitat is unlikely to lead to a long-term decline in the species population given the wider extent of habitat for this species.
Result in invasive species that are harmful to a Vulnerable species becoming established in the Vulnerable species habitat	The survey area is located in a modified rural landscape, and invasive species that are harmful to the Squatter Pigeon exist in the broader region. Predatory species, including feral cat and feral fox, have been recorded and are established in the survey area and are recognised threats to the Squatter Pigeon. Buffel grass, which can change understory cover, is already established throughout the survey area. The Project is unlikely to result in the introduction and establishment of any invasive species that are harmful to the Squatter Pigeon in the habitat present in the survey area. Monitoring and management of pests including corrective actions will be implemented in accordance with the site Weed and Pest Management Plan (AARC 2024a) (Section 7.4.2).
Introduce disease that may cause the species to decline, or	No diseases are listed as a threat to the Squatter Pigeon. The Project is unlikely to introduce a disease that may cause the species to decline.
Interfere substantially with the recovery of the species	There is no adopted or made Recovery Plan for this species. The approved conservation advice provides direction to implement priority actions for this species and mitigate against key threats (TSSC 2015a). Priority conservation and management actions include the identification of sub-populations of high conservation priority, development of conservation agreements and control of feral herbivores. The Project is unlikely to substantially interfere with the recovery of the species.
Conclusion	The Project is considered unlikely to result in a significant impact to the Squatter Pigeon. The impacted habitat is not considered to be utilised by an important population. Similar habitat for the species is abundant within wider region and the proposed disturbance won't affect the landscape connectivity identified within the survey area and the broader region. Nevertheless, the species and species habitat have been identified within the proposed disturbance, and the Commonwealth PER guideline has identified that this species may be subject significant residual impacts. Based on this assumption in the PER guideline, clearing 192.3 ha of suitable habitat for the Squatter Pigeon may result in significant residual impacts to the species. The extent of these impact areas is shown in Figure 20.

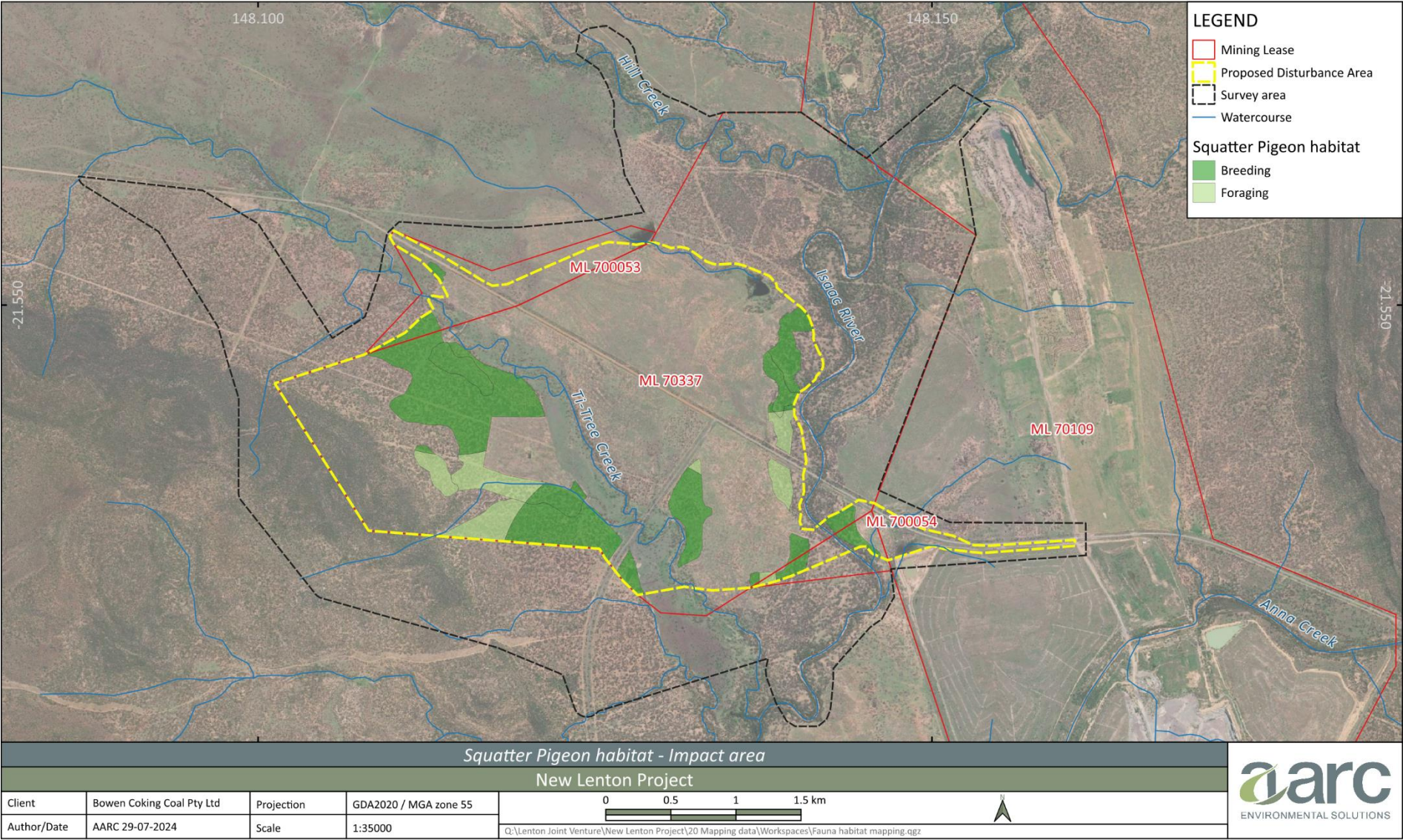


Figure 20: Squatter Pigeon significant impact areas

7.5 White-throated Needle-tail

7.5.1 Species impact assessment

A total of 309.6 ha of remnant vegetation is proposed to be cleared for the Project. The impacts on White-throated Needle-tail habitat will add to habitat disturbance that is proposed to occur for other Projects in the region. The clearance of remnant vegetation/habitat for the Project will not fragment habitat for this highly mobile species.

7.5.2 Species mitigation measures

The Project has been designed to avoid and mitigate impacts to the White-throated Needle-tail where practicable. The proposed avoidance and mitigation measures for the species, including timing, predicted effectiveness, monitoring and adaptive management, and the relevant statutory or policy basis, is provided in Table 29.

The following conservation, recovery and threat abatement information has been considered for assessment of the White-throated Needle-tail:

- The 'Approved Conservation Advice for *Hirundapus caudacutus* (White-throated Needle-tail)' (TSSC 2019), developed at the time of EPBC Act listing and the '*Hirundapus caudacutus*–White-throated Needle-tail' SPRAT profile provides information about the White-throated Needle-tail, including its distribution, biology/ecology, threats and conservation actions and priorities.
- The SPRAT profile for this species indicates there is no adopted or made Recovery Plan for this species, as the approved conservation advice (TSSC 2019) provides sufficient direction to implement priority actions and mitigate against key threats and enable recovery.
- The 'Draft Referral guideline for 14 birds listed as migratory species under the EPBC Act' (DoE 2015c) provides information on 14 migratory species, including the White-throated Needle-tail. The referral guideline describes important non-breeding habitat for the White-throated Needle-tail.
- 'Australia's Strategy for Nature 2019–2030' (Commonwealth of Australia 2019), Australia's actions for nature including the 'Threatened Species Strategy 2021–2031' (Commonwealth of Australia 2021), 'Australian Weeds Strategy 2017–2027' (Commonwealth of Australia 2017a) and 'Australian Pest Animal Strategy 2017–2027' (Commonwealth of Australia 2017b) outline relevant actions to recover Australia's threatened plants, animals and ecological communities.

Table 29: *White-throated Needletail impact avoidance and mitigation measures*

Avoidance/mitigation measures	Timing	Predicted effectiveness	Monitoring and adaptive management	Statutory or policy basis
Project infrastructure has been located to avoid or minimise direct disturbance to remnant vegetation.	Mine planning/ construction/ operations	Highly effective—minimises the extent of impacts to woodland habitats.	Monitor disturbance/vegetation clearance areas against approved disturbance limits, in accordance with the site MNES Species Impact Management Plan (AARC 2024b).	TSSC (2019), DoE (2015)
Implement vegetation clearance protocols, including the delineation of vegetation adjoining proposed clearance areas to prevent accidental damage (Section 4.3.4).	Construction/ operations	Highly effective management technique to manage vegetation clearance activities.	Should clearing exceed approved limits, incident reporting would be initiated with a corrective action plan proposed (including proposed timing) and implemented. The corrective actions will be informed by the nature and extent of the exceedance.	

7.5.3 Residual significant impact assessment

Table 30 provides an assessment of the likelihood of significant impacts on the White-throated Needletail in accordance with the Commonwealth 'Significant Impact Guidelines 1.1: Matters of National Environmental Significance' (DoE 2013).

The White-throated Needletail population occurring at the survey area has been assessed against the definition of 'important population' of a Vulnerable species (DoE 2013a). The survey area is located near the centre of the White-throated Needletail range within Australia. Dispersal and genetic exchange are likely to occur between the population occupying the survey area and the population occupying the broader region. It is considered that the population occupying the survey area is not likely to be:

- a key source population for breeding or dispersal;
- a population necessary for maintaining genetic diversity; or
- a population near the limit of the species range.

Therefore, the population occupying the survey area is not considered an important population.

Table 30: White-throated Needletail significant impact assessment

Significance criteria	Assessment of significance
An action is likely to have a significant impact on a Vulnerable species if there is a real chance or possibility that it will:	
Lead to a long-term decrease in the size of an important population of a species	Although two subspecies of White-throated Needletails breed in separate populations in the Northern Hemisphere, only one occurs in Australia where they do not occur as smaller populations (DCCEEW 2023b). The clearing of 309.6 ha of remnant vegetation for the Project is unlikely to decrease the size of the population given the extent of habitat available to this species across eastern and south-eastern Australia.
Reduce the area of occupancy of an important population	The population of the White-throated Needletail that may use habitat within the survey area is considered not to be an important population. The extent of vegetation clearing required for the Project is unlikely to reduce the area of occupancy of this species. Tracts of native vegetation which can provide roosting habitat will remain within the New Lenton MLs and is widespread in the region. The survey area habitat will continue to provide aerial foraging habitat.
Fragment an existing important population into two or more populations	The White-throated Needletail migrates to Australia during the non-breeding season and is widespread across eastern and south-eastern Australia. The Project will not fragment the population into two or more populations.
Adversely affect habitat critical to the survival of a species	There is currently no habitat for the White-throated Needletail listed on the Register of Critical Habitat (DCCEEW 2023c). Habitat within the Project disturbance area does not represent habitat critical to the survival of the species.
Disrupt the breeding cycle of an important population	The White-throated Needletail does not breed in Australia. The Project will not disrupt the breeding cycle.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Primarily an aerial species, the White-throated Needletail predominantly forages aerially, feeding on a wide variety of insects. They roost in forest and woodlands. While the Project will include some vegetation clearance, it will not reduce the quality or availability of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a Vulnerable species becoming established in the Vulnerable species habitat	Invasive species are not a serious threat to the White-throated Needletail. The Project is unlikely to result in invasive species that are harmful to the White-throated Needletail.

Significance criteria	Assessment of significance
Introduce disease that may cause the species to decline	Disease is not a known threat to the White-throated Needle-tail. The Project is unlikely to introduce a disease that may cause the species to decline.
Interfere substantially with the recovery of the species	There is no recovery plan for this species. Priority conservation actions identified for this species include working with governments in East Asia to minimise disturbance to breeding habitats and the identification and protection of important habitats in Australia (TSSC 2019). The Project is unlikely to substantially interfere with the recovery of the species.
Conclusion	The area of habitat proposed to be cleared and the limited importance of the habitat present, indicate the Project is unlikely to have a significant impact on the White-throated Needle-tail.

8 Environmental MNES offset requirements

The assessments of significant impact for MNES are provided in Section 7. They indicate that the Project is unlikely to result in a significant impact on the White-throated Needletail, Ornamental Snake, Bluegrass and King Bluegrass.

The Project is likely to have a significant impact on the following MNES listed in Table 31, and offsets will be required in accordance with the 'Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy' (DSEWPaC 2012b).

A Biodiversity Offset Strategy will be prepared for the Project under the EPBC Act. The strategy will include habitat quality information for the proposed disturbance areas and outline the proposed provision of offsets for impacted matters.

Table 31: Summary of assessment of prescribed matters

Prescribed matter	Total Impact Area (ha)	Impact Assessment	Offset Requirement
EPBC Endangered listed TEC	112.2	Poplar Box Grassy Woodland on Alluvial Plains TEC: Significant impact assessment for the species was completed under the MNES 'Significant Impact Guidelines 1.1: Matters of National Environmental Significance' (DoE, 2013). It was found the clearing of 112.2 ha of Poplar Box Grassy Woodland on Alluvial Plains TEC is likely to result in significant impact to the TEC (Section 7.1.3).	Required
EPBC Vulnerable listed species	293	Greater Glider: Significant impact assessment for the species was completed under the MNES 'Significant Impact Guidelines 1.1: Matters of National Environmental Significance' (DoE, 2013). It was found the clearing of 293 ha suitable habitat for the species, is likely to result in significant impact to the species and its habitat (Section 7.2.3).	Required
	327	Koala: Significant impact assessment for the species was completed under the MNES 'Significant Impact Guidelines 1.1: Matters of National Environmental Significance' (DoE, 2013). It was found the clearing of 305 ha of important and suitable habitat for the species, is likely to result in significant impact to the species and its habitat (Section 7.3.3).	Required
	192.3	Squatter Pigeon: Significant impact assessment for the species was completed under the MNES 'Significant Impact Guidelines 1.1: Matters of National Environmental Significance' (DoE, 2013). It was found the clearing of 192.3 ha suitable habitat for the species may result in significant impacts to the species and its habitat (Section 7.4.3).	Required

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Appendix A. Relevant PER guideline reconciliation table

Item No.	PER Guideline	Document reference (location in document this is addressed)
5. Matters of National Environmental Significance		
5a	Inventory of surveys, both office-based and field-based, in relation to the MNES as controlling provision for the proposal must be provided	Section 1.3
5b	Output from the protected matters search tool must also be included as an appendix	Appendix B
5c	The results, indicating the presence of MNES, must also be provided. Any species or values considered likely or known to occur in areas impacted by the controlled action must be addressed. The description of MNES should focus on the following controlling provisions: Listed threatened species and ecological communities (sections 18 & 18A)	Section 4.2.4 Section 4.3.4 Section 5
5.1. Listed threatened species and ecological communities Must address, at a minimum, the following listed threatened species and ecological communities: - Poplar Box Grassy Woodland on Alluvial Plains (Poplar Box TEC)- Endangered - Greater Gilder (<i>Petauroides volans</i>)- Vulnerable - Koala (<i>Phascolarctos cinereus</i>) (combined populations of Queensland, New South Wales and the Australian Capital Territory) - Vulnerable - Squatter Pigeon (Southern) (<i>Geophaps scripta scripta</i>) – Vulnerable - Ornamental Snake (<i>Denisonia maculata</i>) – Vulnerable - Bluegrass (<i>Dichanthium setosum</i>) – Vulnerable - King Bluegrass (<i>Dichanthium queenslandicum</i>) – Endangered		
5.1.1	Description (including EPBC Act listing status, distribution, life history, etc.).	Appendix C Appendix D Section 5
5.1.2	Desktop analysis – describing the assessment methodology used to inform the field surveys within and/or adjacent to the project site. Provide context to the proposed action area by discussing known historical records of listed species and ecological communities in the broader region.	Section 3 Appendix C Appendix D
5.1.3	Survey effort – details of the scope, methodology, timing and effort of field surveys (undertaken by qualified experts with demonstrated experience in detecting the listed species) with and/or adjacent to the project site. Provide details of how surveys were undertaken in accordance with relevant Commonwealth, State guidelines or best practice guidelines at the time of the surveys; and if relevant, the justification for divergence from the mentioned guidelines.	Section 1.3 Section 3.2 Appendix E
5.1.4	Survey outcomes – State the total number of records (individuals and evidence of presence) of listed species and ecological communities within and/or adjacent to the project site identified during the survey. Note: Data from field surveys will be required for the Poplar Box TEC.	Section 4 Section 5 0 Appendix G Appendix H

Item No.	PER Guideline	Document reference (location in document this is addressed)
5.1.5	Habitat assessment - Provide a robust assessment of the potential habitat available within, adjacent to and downstream of the project site for listed threatened species and ecological communities. At a minimum the habitat assessment for each listed threatened species and ecological community above must: - identify any specific habitat requirement/s (e.g. breeding, foraging, dispersal, known important habitat, suitable habitats, roosting, etc.); - discuss existing threats (e.g. feral predators, traffic, etc.); - consider the regional context, describing the connectivity of habitat in the broader landscape; and - provide the total amount of each type of habitat (in hectares) in the project site. The total amount of each type of habitat must also be presented on a map for each listed threatened species and ecological community. Each map must: - include an appropriate basemap that provides the geographical context of the project area in the surrounding environment (i.e. aerial imagery); - be specific to the habitat assessment undertaken for each listed threatened species and ecological community (i.e. not illustrate relevant Queensland REs only); - include an overlay of the proposed project disturbance footprint; and - include known records of individuals (or evidence of individuals) derived from desktop analysis and/or field surveys.	Section 5
5.1.6	Impact assessment - Describe and assess the impacts (direct and indirect) to listed threatened species and communities giving consideration to the SPRAT Database and relevant departmental policies and guidelines, including the Significant Impact Guidelines 1.1: Environment Protection and Biodiversity Conservation Act 1999 (2013).	Section 6 Section 7
5.1.7	Mitigation measures - The PER must include detailed descriptions of measures proposed to be undertaken by the proponent to avoid, mitigate and manage relevant impacts of all stages of the action on listed threatened species and communities. Please note the SPRAT Database may provide some relevant mitigation measures for listed threatened species and ecological communities.	Section 6 Section 7
5.1.8	Residual significant impact assessment - After consideration of all proposed avoidance, mitigation and management measures, provide an assessment of the likelihood of residual significant impacts on relevant listed threatened species and ecological communities. The PER must provide a clear and definitive conclusion of residual significant impacts on relevant listed threatened species and ecological communities to align with the EPBC Act Environmental Offsets Policy (2012).	Section 7
6. Proposed safeguards and mitigation measures		
6a	Proposed safeguards and mitigation measures in relation to MNES.	Section 6 Section 7
7. Environmental offsets		
7a	The PER must include an assessment of the likelihood of residual significant impacts occurring on MNES after avoidance, mitigation and management measures relating to the proposed action have been applied.	Section 7

Appendix B. Desktop Searches Results

Appendix C. EPBC listed flora species – Likelihood of occurrence

Species	Status EPBC Act ¹	Description	Desktop likelihood of occurrence in the survey area
<i>Bertya opposens</i>	V	Distribution <i>Bertya opposens</i> occurs in Queensland and New South Wales. In Queensland it is widely distributed within an area bounded by Emerald in the north and Charleville in the west, with an outlier near Charters Tower (DCCEEW 2023b; Queensland government 2023). Habitat This species has been recorded growing in a variety of community types including mixed shrubland, lancewood woodland, Mallee woodland, <i>Eucalyptus</i> / <i>Acacia</i> open forest with shrubby understorey, <i>Eucalyptus</i> / <i>Callitris</i> open woodland and semi-evergreen vine-thicket. Soils are recorded as generally shallow sandy loams or red earths associated mostly with sandstone, but also with rhyolite, shale and metasediments (DCCEEW 2023b; Queensland government 2023). Ecology Flowering occurs from June to November (Queensland government 2023).	<u>Potential</u> Suitable habitat has been recorded within the survey area and the species has been recorded on surrounding EPCs, including one record within 10 km of the proposed disturbance area.
<i>Cycas ophiolitica</i> Marlborough Blue	E	Distribution <i>Cycas ophiolitica</i> is endemic to Queensland, occurring from Marlborough to Rockhampton in central-eastern Queensland (DCCEEW 2023b). Habitat Inhabits eucalypt open forest and woodland communities with a grassy understorey on hill tops or steep slopes, at altitudes of 80m to 620 m above sea level. It grows on shallow, stony, red clay loams or sandy soils (Queensland government 2023). Although this species reaches its best development on red clay soils near Marlborough, it is more frequently found on shallow, stony, infertile soils, which are developed on sandstone and serpentinite, and is associated with species such as <i>Corymbia dallachiana</i>, <i>C. erythrophloia</i>, <i>C. xanthope</i> and <i>Eucalyptus fibrosa</i>. <i>Cycas ophiolitica</i> has also been found on mudstone in association with <i>Corymbia dallachiana</i>, <i>C. erythrophloia</i> and <i>Eucalyptus crebra</i>, and on alluvial loams with <i>Corymbia intermedia</i>, <i>Eucalyptus drepanophylla</i> and <i>E. tereticornis</i> (Queensland government 2023).	<u>Unlikely</u> Preferred habitat for this species has not been found to occur in the survey area and lies outside of the distribution. No records occur within 50 km of the proposed disturbance area.

		Ecology <i>Cycas ophiolitica</i> is pollinated by small beetles. Seed becomes ripe from March onwards, when it drops from the plant. The seeds are not ready to germinate for at least nine months due to the delayed fertilisation unique to cycads. The species occurs in habitats that are subjected to periodic fires of varying intensities. As with other cycads, adult plants are resistant to most fires, although the foliage may be destroyed and the stems may be scarred. Fires may kill small seedlings or seed that is either on the plant or locally dispersed (Queensland government 2023).	
<i>Dichanthium queenslandicum</i> King Bluegrass	E	Distribution King Bluegrass is endemic to Queensland, occurring from Dalby north to approximately 90 km north of Hughenden and to Clermont in the west, in three disjunct populations (Queensland government 2023; TSSC 2013). Habitat This species occurs on black cracking clay soils in tussock grasslands mainly in association with other species of Bluegrasses (TSSC 2013, Queensland Government 2019). It is mostly confined to natural bluegrass grasslands of central and southern Queensland (TSSC 2013). Other communities where King Bluegrass can be found include <i>Acacia salicina</i> thickets in grassland and eucalypt woodlands in association with <i>Corymbia dallachiana</i> , <i>C. erythrophloia</i> , <i>E. orgadophila</i> (Queensland government 2023). Ecology Flowering occurs throughout the year, particularly in March (Queensland government 2023).	Potential There 30 records occur within 50 km of the proposed disturbance area, associated with RE 11.8.11, which is not present within the survey area, but it is present in adjacent to the survey area.
<i>Dichanthium setosum</i> Bluegrass	V	Distribution Bluegrass has been reported from inland New South Wales and Queensland (DCCEEW 2023b). In Queensland, it has been recorded from the Leichhardt, Morton, North Kennedy and Port Curtis regions (DCCEEW 2023b, DEWHA 2008b). Habitat Occurs in grassy woodland and open forests usually dominated by <i>Acacia</i> or Eucalypt species. Bluegrass is associated with heavy basaltic black soils and stony red-brown hard-setting loam with clay subsoil. It is found in moderately disturbed areas such as cleared woodland, grassy roadside remnants, grazed land and highly disturbed pasture (DCCEEW 2023b, DEWHA 2008b, Queensland government 2023).	Potential Potentially suitable habitat in the form of grazing pastureland has been recorded within the survey area. Two records exist within 50 km of the proposed disturbance area.

		Ecology This plant commences growing in spring, flowers in summers and becomes dormant in late autumn (DCCEEW 2023b).	
<i>Eucalyptus raveretiana</i> Black Ironbox	V	Distribution This species occurs in scattered and disjunct populations in central coastal and sub-coastal Queensland. It has been recorded from Charters Towers and Ayr, and south to Rockhampton (Queensland government 2023). Habitat Occurs on alluvial soils, loams, light clays or cracking clays in open forests and woodlands along watercourses and occasionally on river flats. Associated alluvial soils include sands, loams, light clays, and cracking clays. This species prefers areas with moderately fertile soil and suitable sub-soil moisture levels (Queensland government 2023). Ecology This species has been recorded flowering from December to March. Black Ironbox is considered a fast-growing species (Queensland government 2023).	<u>Unlikely</u> There are numerous records within 50 km of the proposed disturbance area and suitable habitat for this species occurs within the survey area in association with the Isaac River, however the Project lies approximately 30 km outside of the western boundary of this species natural coastal distribution.
<i>Omphalea celata</i>	V	Distribution <i>Omphalea celata</i> has a very restricted distribution in central Queensland. It is known from two localities; Hazlewood Gorge west of Mackay and on Gloucester Island north of Proserpine (Queensland government 2023). Habitat Occurs in fragmented semi evergreen vine thicket or araucarian microphyll vine forest. Recorded along watercourses in steep sided gorges and gullies on weathered metamorphic or granitic soils. Associated species include <i>Eucalyptus raveretiana</i> , <i>E. tereticornis</i> , <i>Bauhinia hookeri</i> and <i>Ficus opposita</i> (Queensland government 2023). Ecology This species has been recorded flowering from June to December and fruiting from December to February (Queensland government 2023).	<u>Unlikely</u> The survey area does not contain suitable habitat or landforms. Thirteen records exist within 50 km of the proposed disturbance area.
<i>Ozothamnus eriocephalus</i> Eungella Hairy Daisy	V	Distribution <i>Ozothamnus eriocephalus</i> is an endemic to Queensland and is known from the Bowen and Mackay area of central Queensland. The species occurs at Pease Lookout and Dick's Tableland in the Eungella	<u>Unlikely</u> The survey area does not contain the suitable vegetation at suitable altitude to present

		National Park, Sydney Heads in Homevale NP, Finch Hatton Gorge, Lake Elphinstone, Mt Abbott (two small populations), Gloucester Island and Redcliffe vale (Queensland government 2023). Habitat Known from a range of habitat types, including the margins of notophyll vine forest, margins of gallery forest, microphyll vine forest, tall open eucalypt forest and on rocky ridges within <i>Eucalyptus</i> spp. / <i>Acacia</i> spp. scrub. It is also known from the edge of creek banks, crevices on steep granite slopes, often in sunny situations. Grows from moderate to high elevations ranging from 380 to 950 m. It occurs on skeletal sandy or gravelly soils or occasionally deeper red-brown clay loams derived from granites and sandstones (Queensland government 2023). Ecology <i>Ozothamnus eriocephalus</i> is known to flower in March, May and from July to September. Fruits have been recorded in March and July (Queensland government 2023).	suitable habitat. Ten records exist within 50 km of the proposed disturbance area.
<i>Phlegmariurus tetrastichoides</i> Square Tassel Fern	V	Distribution The Square Tassel-fern is endemic to north-east Queensland and occurs from Mount Finnigan south to the Clarke Range, west of Mackay. It is most prevalent on the Evelyn, Atherton and Mount Carbine Tablelands but extends to lower altitudes along the North Johnstone River and Mossman Gorge (DCCEEW 2023b). Habitat The species occurs in upland notophyll vine forest. It is an epiphyte on rainforest trees, occurring in north-eastern Qld, from the Daintree, south to Hinchinbrook Island, and west of Mackay, from sea level to 1100 m altitude (DCCEEW 2023b).	<u>Unlikely</u> The survey area does not contain the suitable mix of vegetation and soils to present suitable habitat. Two records exist within 50 km of the proposed disturbance area.
<i>Polianthion minutiflorum</i>	V	Distribution <i>Polianthion minutiflorum</i> is known from Redcliffe Vale, about 110 km west of Mackay, south to Kingaroy, covering a distance of approximately 800 km. (Queensland government 2023). Habitat 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 include open woodland of <i>Acacia shirleyi</i>, <i>Lysicarpus angustifolius</i>, <i>Corymbia aureola</i>; woodland of <i>Eucalyptus corynodes</i>, <i>Corymbia trachyphloia</i>, <i>E. cloeziana</i> on sandy soil over sandstone; and sandstone plateau with <i>Eucalyptus dura</i>, <i>E. fibrosa</i>, <i>Angophora leiocarpa</i>, <i>E. major</i> (Queensland government 2023).	<u>Potential</u> Suitable habitat has been recorded within the survey area in the form of <i>Acacia shirleyi</i> and <i>Corymbia</i> spp. woodland on sandstone slopes in the far western portion of the MLs. One record exists within 50 km of the proposed disturbance area.

		Ecology The species flowers throughout the year. Fruits have been recorded in August and November (Queensland government 2023).	
<i>Samadera bidwillii</i> Quassia	V	Distribution Quassia is endemic to Queensland occurring in several localities between Scawfell Island, near Mackay, and Goomboorian, north of Gympie (DCCEEW 2023b, DEWHA 2008c). This species occurs within the Burnett Mary, Fitzroy, Mackay Whitsunday, and Burdekin Natural Resource Management Regions (DCCEEW 2023b). Habitat This species occurs in lowland rainforest often in association with <i>Araucaria cunninghamii</i> or on rainforest margins, also commonly found in areas adjacent to both temporary and permanent watercourses (Queensland Government 2019, DCCEEW 2023b). It can also be found in open forest and woodland, in locations up to 510m in altitude (DCCEEW 2023b). Spotted Gum (<i>Corymbia citriodora</i>), Grey Gum (<i>Eucalyptus propinqua</i>), White Mahogany (<i>E. acmenoides</i>), Forest Red Gum (<i>E. tereticornis</i>), Pink Bloodwood (<i>C. intermedia</i>), Ironbark (<i>E. siderophloia</i>), Gum Topped Box (<i>E. moluccana</i>), Gympie Messmate (<i>E. cloeziana</i>) and Broad-leaved Ironbark (<i>E. fibrosa</i>) are commonly associated tree species that occur in association with Quassia in open forest/woodland habitat types (Queensland Government 2019, DEWHA 2008c). Ecology Flowering occurs from November – March (DCCEEW 2023b).	<u>Unlikely</u> The survey area does not contain suitable habitat and lies outside of the species distribution. No records exist within 50 km of the proposed disturbance area.

Appendix D. EPBC listed fauna species – Likelihood of occurrence

Species	Status EPBC Act ¹	Description	Desktop likelihood of occurrence in the survey area
Amphibians			
<i>Rheobatrachus vitellinus</i> Northern Gastric Brooding Frog	Ext	Distribution It was found exclusively in undisturbed rainforest in the Clarke Range. This species has not been recorded since 1986 (DCCEEW 2023b). Habitat The Northern Gastric-brooding Frog was recorded in pristine rainforest where the only form of human disturbance was a poorly defined walking trail. The species occurred in shallow, rocky, broken-water areas where water flowed quickly in cascades, riffles and trickles. The water in these streams was cool and clear, and individuals hid away beneath or between boulders in the current or in backwaters (DCCEEW 2023b).	<u>Unlikely</u> This species is classed as extinct in Australia. 1 pre-1986 record exists within 50 km of the proposed disturbance area, to the west of Mackay. However, the Project does not contain suitable habitat for the species.
<i>Taudactylus eungellensis</i> Eungella Frog	V	Distribution The Eungella Day Frog is restricted to the ranges west of Mackay, mid-eastern Queensland, from Clarke Range in the north to Finch Hatton Gorge and Credition in the south at altitudes between 200 and 1000 m (DCCEEW 2023b). Habitat The species inhabits exposed rocky outcrops in association with waterbodies. Prefers natural waterholes, waterfalls and rainforest streams. Bottom dwelling tadpoles inhabit mid-stream pools or partially connected stream-side pools (TSSC 2017). Ecology The Eungella Day Frog is active during day and night, it is a true stream-dwelling frog, and spends its entire life at the stream. (DCCEEW 2023b). The species is a late summer/autumn breeder with calling occurring all year except June (TSSC 2017).	<u>Unlikely</u> Confirmed records exist within 50 km of the proposed disturbance area, to the west of Mackay. However, there is no suitable habitat for the species within the survey area.

Reptiles			
Ornamental Snake <i>Denisonia maculata</i>	V	Distribution This species is sparsely distributed throughout its range and is known only from the Brigalow Belt North and parts of the Brigalow Belt South biogeographical regions (DoE 2014a, DCCEEW 2023b). The drainage system of the Fitzroy and Dawson Rivers are core areas associated with this species distribution (DCCEEW 2023b). Habitat The Ornamental Snake's preferred habitat is within, or close to, habitat that is preferred by its prey (frogs) (DCCEEW 2023b). This species is known to prefer woodlands and open forests associated with moist areas, particularly gilgai (melon-hole) mounds and depressions in Queensland Regional Ecosystem Land Zone 4, as well as lake margins and wetlands (DCCEEW 2023b). The vegetation communities associated with this species habitat include Brigalow (<i>Acacia harpophylla</i>), Gidgee (<i>Acacia cambagei</i>), Blackwood (<i>Acacia argyrodendron</i>) or Coolibah (<i>Eucalyptus coolabah</i>), or grassland associated with gilgais (DCCEEW 2023b). In Queensland, it has been recorded in Queensland Regional Ecosystems 11.4.3, 11.4.6, 11.4.8 and 11.4.9, 11.3.3 and 11.5.16 (DCCEEW 2023b). This species has been recorded in abundance at sites that contain the following microhabitat features; in shallow water where some aquatic vegetation is present or in flooded gilgais where the fringing groundcover has been inundated, where there is a diverse range of gilgai size and depth, in soils of high clay content and deep cracking, ground debris, and in habitat patches greater than 10 ha in area connected to or within large areas of remnant vegetation (DCCEEW 2023b). Ecology The Ornamental Snake seeks refuge within soil cracks within gilgai mounds during dry periods. This species is nocturnally active predominantly in early summer throughout the wet season (DCCEEW 2023b), foraging in areas where burrowing frogs are abundant, with frogs being the main food source (DCCEEW 2023b). It is not known to have specific breeding or dispersal habitat requirements (DCCEEW 2023b).	despite being unlikely to occur, they have been assessed in Section 5 to comply with the PER guideline. The Project does not contain habitat for the species. No records exist within 10 km of the proposed disturbance area, however confirmed records occur within 50 km.
Dunmall's Snake <i>Furina dunmalli</i>	V	Distribution This species occurs from near the Queensland border throughout the Brigalow Belt South and Nandewar bioregions, and as far south as Ashford in New South Wales (DCCEEW 2023b). In Queensland, the Dunmall's Snake is primarily found in the Brigalow Belt region approximately 200-500m asl (DCCEEW 2023b, DoE 2014b).	<u>Unlikely</u> Limited suitable habitat for this species exists within the survey area. Project lies outside of southern Brigalow Belt distribution. No records within 50 km of the proposed disturbance area, no known records from north of Clermont. The Project does not contain important habitat for the species.

		Habitat The Dunmall's Snake can occur in a broad range of habitat types including forests to woodlands on black alluvial cracking clay/clay loams (DCCEEW 2023b). Dominant vegetation associated with these habitat types include Brigalow (<i>Acacia harpophylla</i>), Wattles (<i>A. burowii</i>, <i>A. deanii</i>, <i>A. leioclyx</i>), native Cypress (<i>Callitris spp.</i>) or Bull-oak (<i>Allocasuarina luehmannii</i>), <i>Corymbia citriodora</i>, <i>Eucalyptus crebra</i>, <i>E. melanophloia</i> and <i>Callitris glaucophylla</i> (DCCEEW 2023b). This species has been found sheltering beneath litter and fallen timber, and may use cracks in the alluvial clay soils (DCCEEW 2023b, DSEWPC 2011a). Ecology The Dunmall's Snake is an inconspicuous, terrestrial snake that is difficult to detect (DCCEEW 2023b). It is nocturnally active between sheltering sites at night, with peak activity likely to occur in early summer through to the wet season (DSEWPC 2011a). This species eats small skinks and geckos.	
Yakka Skink <i>Egernia rugosa</i>	V	Distribution The Yakka Skink has a highly fragmented distribution, limited to Queensland (DoE 2014c, DCCEEW 2023b). The known distribution of this species extends from the coast to the hinterland of sub-humid to semi-arid eastern Queensland (DCCEEW 2023b, DSEWPC 2011a), including portions of the Brigalow Belt (North and South), South-east Queensland, Mulga Lands, Einasleigh Uplands, Cape York Peninsula and Wet Tropics Biogeographical Regions (DCCEEW 2023b). Habitat The core habitat for this species is within the Brigalow Belt South and Mulga Lands Bioregions (DCCEEW 2023b). It occurs in a wide variety of vegetation types including open dry sclerophyll forest, woodland, and scrub (DCCEEW 2023b). It is known to prefer areas which contain partly buried rocks, logs or tree stumps, root cavities or abandoned animal burrows within these vegetation types, where it occupies burrows and cavities beneath these features (DCCEEW 2023b, DoE 2014c, DSEWPC 2011a, Queensland government 2023, Ferguson and Mathieson 2014). It is not generally found in trees or rocky habitats (DCCEEW 2023b) and is known to occur in Queensland Regional Ecosystem 11.3.2 (DCCEEW 2023b). This species is known to take refuge around deep gullies, tunnel erosion/sinkholes, rabbit warrens, raked log piles, sheds and loading ramps in areas where its habitat has been cleared (DCCEEW 2023b, DoE 2014c, DSEWPC 2011a). Ecology The Yakka Skink is a secretive, terrestrial skink that quickly retreats into its burrow shelter sites if it detects movement or disturbance (Queensland Government 2019, DSEWPC 2011a). This species is limited in its capacity to disperse from a colony site, and active burrows can be identified by scat piles near the entrance	<u>Unlikely</u> Limited habitat and microhabitat feature available within the survey area. The Project does not contain important habitat for the species. No records within 50 km of the proposed disturbance area.

		(DCCEEW 2023b, Queensland government 2023). It is active during the morning and dusk, through to the early evening (DCCEEW 2023b), feeding on soft plant materials, fruits and a wide variety of invertebrates that venture into, or near the burrow entrance (DCCEEW 2023b). It is not known to have specific breeding or dispersal habitat requirements.	
Allan's Lerista <i>Lerista allanae</i>	E	Distribution This species is found in three localities in central Queensland comprising of Retro, Logan Downs, and Clermont, based on 13 museum specimens (DEWHA 2008d). Habitat Only known to occur in the Brigalow Belt North Biogeographic Region on black soil downs (undulating plains formed on basalt, shale, sandstone and unconsolidated sediments) (DCCEEW 2023b). Earlier records suggest that this species was found under the surface of black-red soil, under tussocks of grass on farmland (DCCEEW 2023b) in association with Mountain Coolibah (<i>Eucalyptus orgadophila</i>)/Red Bloodwood (<i>E. erythrophloia</i>) open woodlands and Black Tea-tree (<i>Melaleuca bracteata</i>) closed scrub to low closed-forest gravelly hills, ridges and gullies (DCCEEW 2023b). Recent records are from leaf litter and friable soils beneath trees and shrubs (DSEWPC 2011a), associated with Queensland Regional Ecosystems 11.8.5 and 11.8.11 (DCCEEW 2023b). Ecology No information is available about the life cycle, reproductive behaviour, movement, diet or feeding habits of the Allan's Lerista (DCCEEW 2023b). This species is thought to be nocturnally active, feeding on termites as its primary food source (DCCEEW 2023b).	<u>Unlikely</u> Survey area occurs outside of this species distribution. No known records within 50 km of the proposed disturbance area. The Project does not contain important habitat for the species.
<i>Lerista vittata</i> Mount Cooper Striped Lerista	V	Distribution <i>Lerista vittata</i> was first described at Mount Cooper Station, approximately 80 km south-east of Charters Towers, Queensland. A second population has been tentatively identified approximately 100–200 km NNW of Hughenden on the Chudleigh Plateau. (DCCEEW 2023b). Habitat Found in the area of Mount Cooper, this species resides in woodland habitat dominated by vine thicket (RE 11.5.15), or woodland dominated by ironbark and bloodwood (RE 11.5.9). They are often found burrowing under leaf litter and loose sandy soil under logs (DCCEEW 2023b). Ecology Based on the habits of similar congeners, the Mount Cooper Striped Lerista is probably nocturnally active (DCCEEW 2023b).	<u>Unlikely</u> There is no suitable habitat within the survey area and no known records within 50 km of the proposed disturbance area. The Project is located outside of the known distribution of the species.

Birds			
Curlew Sandpiper <i>Calidris ferruginea</i>	CE	Distribution Widespread in small numbers, this species is known to occur around coasts in Australia and in many areas inland during the non-breeding season (DCCEEW 2023b). In Queensland, this species has been recorded in the Gulf of Carpentaria, with widespread records along the coast, south of Cairns (DCCEEW 2023b). Habitat Inhabiting wetland environments, the Curlew Sandpiper mainly occurs on intertidal mudflats in sheltered coastal areas, (estuaries, bays, inlets and lagoons), as well as around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms (DoE 2015c). Small numbers have been recorded living inland around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand (DoE 2015c). Ecology Curlew Sandpipers forage on mudflats and nearby shallow water at the edge of shallow pools, wading through water 15-60 mm deep (DCCEEW 2023b). At high tide, they forage among low sparse emergent vegetation, such as saltmarsh, and sometimes forage in flooded paddocks or inundated salt flats (DCCEEW 2023b). Roosting occurs on bare dry shingle, shell, or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands (DCCEEW 2023b). Occasionally roosting occurs in dunes during very high tides and sometimes in saltmarsh (DCCEEW 2023b). Substantial numbers of Curlew Sandpipers remain in northern Australia throughout the nonbreeding season, arriving around September (DoE 2015c).	<u>Unlikely</u> Although this species has been recorded in association with inland waterbodies, it is very rare. Available habitat is not suited for this species within the survey area as is not coastal and does not provide adequate resources required to sustain this species. The Project does not contain suitable habitat for the species. There are no confirmed records within 50 km of the proposed disturbance area.
Red Goshawk^ <i>Erythrorhynchus radiatus</i>	V	Distribution Endemic to Australia, the Red Goshawk is sparsely dispersed across coastal and sub-coastal Australia, from western Kimberley Division to north eastern New South Wales, and occasionally on continental islands (DCCEEW 2023b, DCCEEW 2023d). Three recently confirmed sightings of dispersive individuals suggest that this species also occurs in central Australia, across South-east Queensland to the western slopes of the Great Dividing Range (DCCEEW 2023b). Habitat The Red Goshawk prefers forest and woodland with a mix of vegetation types, including eucalypt woodland, tall open forest, gallery rainforest, swamp sclerophyll forest, and at the edge of rainforest (DCCEEW 2023b). In partly cleared areas of eastern Queensland, it is associated with gorge and escarpment country (DCCEEW	<u>Unlikely</u> The survey area lacks the mosaic of habitat types preferred by this species and the Isaac River and other local waterways are highly ephemeral only holding water for a few weeks of the year. The Project does not contain suitable habitat for the species. No records exist within 10 km of the proposed disturbance area, however records occur within 50 km.

		2023d). <i>E. radiatus</i> avoids very dense or very open habitats and prefer areas where large prey populations (birds) and permanent water exist (DCCEEW 2023b). Ecology Forests of intermediate density or ecotones between habitats of differing densities (e.g. between rainforest and eucalypt forest, between gallery forest and woodland) are preferred for foraging (DCCEEW 2023b). This species ambushes its prey when hunting, feeding on medium to large birds (DCCEEW 2023d). Nests are located within large trees, within 1 km of permanent water (DCCEEW 2023d). Nest trees have been noted to be significantly taller (>20m) than surrounding trees, with larger crown diameters and greater girth at breast height (approx. 2.9m) (DCCEEW 2023b, DCCEEW 2023d, DEWHA 2010). Movement patterns of the Red Goshawk are poorly known (DCCEEW 2023b). They have been observed individually, in pairs and in family groups (DEWHA 2010).	
Squatter Pigeon (Southern) <i>Geophaps scripta scripta</i>	V	Distribution The southern sub species for the Squatter Pigeon occurs on the inland slopes of the Great Dividing Range. Its range extends from the Burdekin-Lynd Divide in central Queensland in the southern region of Cape York Peninsula to the Border Rivers region of northern New South Wales, and from the east coast to Hughenden, Longreach and Charleville in Queensland (DCCEEW 2023b, TSSC 2015a). Habitat Defined as open-forests to sparse, open-woodlands and scrub, this species inhabits the grassy understory of open eucalypt woodland (TSSC 2015a, DEWHA 2010). Sandy areas separated by gravel ridges, which have open and short grass cover allowing easier movement, are preferred (TSSC 2015a). Important microhabitat features include vegetation that is within 3 km of water bodies or courses, within remnant, regrowth or partly modified vegetation communities and areas that are mostly dominated by <i>Eucalyptus</i>, <i>Corymbia</i>, <i>Acacia</i> or <i>Callitris</i> species within the overstorey (DCCEEW 2023b). Ecology Natural foraging habitat for this species occurs in any remnant or regrowth open-forest to sparse, open-woodland or scrub dominated by <i>Eucalyptus</i>, <i>Corymbia</i>, <i>Acacia</i> or <i>Callitris</i> species (DCCEEW 2023b). It prefers landscapes with well-draining, sandy or loamy soils on low, gently sloping, flat to undulating plains and foothills (DCCEEW 2023b). Access to water is important and foraging habitat is usually within 3 km of a suitable, permanent, or seasonal waterbody (DCCEEW 2023b). Typically the ground covering vegetation layer is patchy consisting of native, perennial tussock grasses or a mix of perennial tussock grasses and low shrubs or forbs (DCCEEW 2023b), rarely exceeding 33% of the ground area. The remaining ground cover is areas of bare soil and light leaf litter/coarse woody debris (DCCEEW 2023b).	<u>Likely</u> The survey area contains suitable habitat for the species. There are records of the species within 10 km of the proposed disturbance area.

		Breeding habitat occurs on stony rises occurring on sandy or gravelly soils, within 1 km of a suitable, permanent waterbody. The ground covering vegetation layer is consistent with foraging habitat (DCCEEW 2023b). Any forest or woodland occurring between patches of foraging or breeding habitat which facilitates movement between patches of foraging habitat, breeding habitat and/or waterbodies, as well as areas of cleared land less than 100 metres (m) wide linking areas of suitable breeding and/or foraging habitat are important for dispersal (DCCEEW 2023b). Dispersal habitat typically occurs on non-alluvial clays (Queensland RE Land zone 4) where the ground vegetation layer has been thinned through current land-use practices (cattle grazing) (DCCEEW 2023b).	
Painted Honeyeater <i>Grantiella picta</i>	V	Distribution The Painted Honeyeater is sparsely distributed from south-eastern Australia to north-western Queensland and eastern Northern Territory (DoE 2015d). Breeding records are west of the dividing range in Queensland, whereas non-breeding records also occur in coastal areas along the eastern seaboard (Rowland 2012). Habitat This species occurs in eucalyptus forests/ woodlands, which consist of <i>Eucalyptus</i>, <i>Melaleuca</i>, <i>Casuarina</i>, <i>Callitris</i> and <i>Acacia</i> species (Queensland Government 2019, DoE 2015d, Rowland 2012). It prefers woodlands, containing a higher number of mature trees, with flowering and fruiting mistletoe and flowering eucalypts (Queensland government 2023, Rowland 2012). Ecology The diet of the Painted Honeyeater primarily consists of the fruit of mistletoes (<i>Amyema sp</i>), and occasionally nectar and insects (Queensland government 2023, Rowland 2012). The nesting locations are within the vicinity of abundant fruiting mistletoes, or within the mistletoe itself (Rowland 2012). Breeding occurs from October to March when mistletoe fruits are most available. Dispersal habitat requirements for this species are not known, however its movements are in response to mistletoe flowering and fruiting (Queensland government 2023, Rowland 2012).	<u>Unlikely</u> No mistletoes were identified during the flora survey and the survey area occurs outside the breeding range. No records exist within 50 km of the proposed disturbance area. The Project does not contain important habitat for the species.
White-throated Needletail <i>Hirundapus caudacutus</i>	V	Distribution The White-throated Needletail migrates to Australia during the non-breeding season around September/October (DCCEEW 2023b, TSSC 2019). During this time, this species is widespread across eastern and south-eastern Australia (DCCEEW 2023b, TSSC 2019). In eastern Australia, it has been recorded in all coastal regions of Queensland, extending inland to the western slopes of the Great Divide and occasionally onto adjacent inland plains (DCCEEW 2023b).	<u>Known</u> Suitable wooded habitat occurs within the survey area and surrounding area. One desktop searches record within the Project.

		Habitat Primarily an aerial species, this species is known to occur across a variety of habitats including wooded areas, open forests, and rainforests (DCCEEW 2023b). Large tracts of native vegetation, particularly forest, is considered likely to be a key habitat requirement for this species (DoE 2015b). It has been observed flying over farmland, typically over partially cleared pasture or within remnant vegetation at the edge of paddocks (DCCEEW 2023b). Ecology This species predominantly forages aerially at heights up to 'cloud level', along the edges of low-pressure systems (DCCEEW 2023b). This species is also known to forage much closer to the ground (still aerial) in open habitats or recently disturbed areas feeding on a wide variety of insects (DCCEEW 2023b). It prefers to roost in forest and woodlands, both among dense foliage in the canopy or in tree hollows, as well as on bark or rock faces, and maybe aerially on occasion (DCCEEW 2023b, DoE 2015b).	
Star Finch <i>Neochmia ruficauda ruficauda</i>	E	Distribution The eastern sub species for the Star Finch is known to occur in Central Queensland only (DCCEEW 2023b). Its distribution extends north to Bowen, west to beyond Winton and, south to near Wowa (DCCEEW 2023b, DEWHA 2008c), within the Desert Channels, Burdekin and Fitzroy Natural Resource Management Regions (DCCEEW 2023b). Habitat The Star Finch occurs in damp grasslands, sedgelands and grassy woodlands, near permanent water, and often in or near suburban areas (DCCEEW 2023b, DEWHA 2008c). Common species associated with these areas include <i>Eucalyptus coolabah</i>, <i>E. tereticornis</i>, <i>E. tessellaris</i>, <i>Melaleuca leucadendra</i>, <i>E. camaldulensis</i> and <i>Casuarina cunninghamii</i> (DCCEEW 2023b). Ecology Little is known about the foraging ecology of this species (DCCEEW 2023b). It has been seen eating insects in fig trees and is said to forage in the shade of <i>Eucalyptus</i> trees (DCCEEW 2023b). This species predominantly eats seeds taken from a range of grasses including <i>Arundinella</i>, <i>Brachyachne</i>, <i>Chloris</i>, <i>Chrysopogon</i>, <i>Digitaria</i>, <i>Echinochloa</i>, <i>Heterachne</i>, <i>Iseilema</i>, <i>Oryza</i>, <i>Panicum</i>, <i>Setaria</i>, <i>Sorghum</i>, <i>Themeda</i> and <i>Urochloa</i> (DCCEEW 2023b). Nests are bottle-shaped made from grass, often placed in trees 3-9m above the ground, in a shrub or tree or amongst grass, sedges or reeds (DCCEEW 2023b). The Star Finch is sedentary or resident species that may undertake some local dispersal at the completion of the breeding season. This species is not known to have specific dispersal requirements (DCCEEW 2023b).	<u>Unlikely</u> Potentially suitable habitat occurs in association with waterbodies within the survey area, however distribution is extremely restricted, and no confirmed records exist within 50 km of the proposed disturbance area.

Eastern Curlew <i>Numenius madagascariensis</i>	CE	Distribution Within Australia, the Eastern Curlew has a primarily coastal distribution (DoE 2015e). They are rarely recorded inland and have a continuous distribution throughout Queensland (DoE 2015e). Habitat During the non-breeding season the Eastern Curlew is mostly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, in areas that contain large intertidal mudflats or sandflats, often with beds of seagrass (DoE 2015e). Occasionally this species occurs on ocean beaches, coral reefs, rock platforms, or rocky islets among saltmarsh and on mudflats fringed by mangroves (DoE 2015e). Foraging Foraging occurs on soft sheltered intertidal sandflats or mudflats, open and without vegetation, often near mangroves, on saltflats and in saltmarsh, rockpools and among rubble on coral reefs. As well as on ocean beaches near the tideline, feeding on crustaceans, molluscs and insects (DoE 2015e). This species rarely occurs on grassy areas of near costal lakes (DoE 2015e). Roosting/ Breeding Roosting occurs during high tide on sandy spits, sandbars, and islets, on beach sand near the high-water mark among coastal vegetation (DoE 2015e). They have also been recorded occasionally roosting in trees (DoE 2015e). Dispersal These birds are both diurnal and nocturnal with feeding and roosting cycles determined by the tides (DoE 2015e). After breeding, the birds migrate by day and night at varying altitude, arriving in Australia November or between December-February, indicating little movement during this period (DoE 2015e).	<u>Unlikely</u> No suitable habitat occurs within the survey area, which is outside of the preferred coastal distribution. No confirmed records within 50 km of the proposed disturbance area. The Project does not contain important habitat for the species.
Black-throated Finch (southern) <i>Poephila cincta cincta</i>	E	Distribution The southern sub species occurs within the Townsville region and its surrounds, Ingham and sites nearby, and at scattered sites in central-eastern Queensland (DCCEEW 2023b). Habitat The Black-throated Finch (southern) occurs mainly in grassy, open woodlands and forests, dominated by <i>Eucalyptus</i>, <i>Corymbia</i> and <i>Melaleuca</i> species. It is also known to occur in tussock grasslands, often along or near watercourses, or in the vicinity of water (DCCEEW 2023b). Within these habitat types the Black-Throated Finch requires access to water sources, grass seeds and trees providing suitable nesting habitat (DEWHA 2009).	<u>Unlikely</u> Limited suitable habitat for this species occurs within the survey area. No confirmed records within 50 km of the proposed disturbance area. The Project does not contain important habitat for the species.

		Almost all recent records have been in riparian habitat south of the tropics (DCCEEW 2023b). It is likely that permanent sources of water (and the habitat surrounding these) provide refuge for this species during the dry season, especially during drought years (DCCEEW 2023b). There have been occasional records in freshwater wetlands, in cultivation surrounded by woodland, and in a heavily grazed paddock (DCCEEW 2023b). Foraging Requires habitat where there is access to seeding grasses and water, utilising a variety of different habitats for foraging, especially when finding seed during the wet season DCCEEW 2023b). It has been seen foraging around roads, in other cleared and open areas, in tall open woodland dominated by species of <i>Erythrophloia</i> or <i>Platyphylloa</i>, in riparian habitats, and on flat, raised areas (DCCEEW 2023b). Roosting/ Breeding Nest sites tend to be near water, approximately 400m away (DCCEEW 2023b). They are often built in a hollow branch or fork of a tree, shrub or sapling. Nests can also be placed in other sites, such as in tall grass, amongst mistletoe, beneath active raptor nests, or in an old nest of a Babbler (<i>Pomatostomus spp.</i>) or Diamond Firetail (<i>Stagonopleura guttata</i>) (DCCEEW 2023b). Dispersal This species is sedentary, although localised movement can occur. Birds may move in response to drought or rainfall, and to access sufficient seed supply between different habitat types (DCCEEW 2023b).	
Australian Painted Snipe <i>Rostratula australis</i>	E	Distribution Known to occur within wetlands within all states of Australia (DCCEEW 2023b). This species is most common in eastern Australia, where it has been recorded throughout much of Queensland, New South Wales, Victoria, and south-eastern South Australia at scattered locations (DCCEEW 2023b). Habitat The Australian Painted Snipe generally inhabits shallow freshwater (sometimes brackish) wetlands, including temporary and permanent lakes, swamps and claypans (DCCEEW 2023b). It has also been known to occupy inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains (DCCEEW 2023b). These areas usually include emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of lignum <i>Muehlenbeckia</i>, Canegrass or Tea-tree (<i>Melaleuca</i>) (DCCEEW 2023b). Areas lined with trees, or that have some scattered fallen or washed-up timber are sometimes also used (DCCEEW 2023b).	<u>Unlikely</u> Limited suitable habitat for this species occurs within the survey area (artificial dam). No confirmed records within 50 km of the proposed disturbance area. The Project does not contain important habitat for the species.

		Ecology This species generally remains in dense cover when feeding, although may forage over nearby mudflats and other open areas such as ploughed land or grassland (DCCEEW 2023b). This species requires suitable wetland areas even in drought conditions (DCCEEW 2023b). Breeding habitat requirements are specific: shallow wetlands with areas of bare wet mud and both upper and canopy cover (low and sometimes tall and dense) nearby (DCCEEW 2023b). This species may breed in response to wetland conditions rather than during a season (DCCEEW 2023b). Most nest records are from or near small islands in freshwater wetlands, which contain a combination of very shallow water, exposed mud, dense low cover and sometimes some tall dense cover (DCCEEW 2023b). The Australian Painted Snipe is possibly dispersive or migratory (DCCEEW 2023b). Dispersive movements have been attributed to local conditions: moving to flooded areas; moving from drying to permanent wetlands; moving away from areas affected by drought (DCCEEW 2023b). This species is mainly crepuscular (active at dawn and dusk) and highly cryptic (DCCEEW 2023b).	
Masked Owl (northern) <i>Tyto novaehollandiae kimberli</i>	V	Distribution The northern sub species is poorly known, and three subpopulations have been suggested in the Kimberley, Northern Territory and Cape York (DCCEEW 2023b). In Queensland, it occurs along the southern rim of the Gulf of Carpentaria, Cape York Peninsula and south to Atherton Tablelands and the Einasleigh-Burdekin divide (DCCEEW 2023b). Habitat Known to occur within riparian forest, rainforest, open forest, Melaleuca swamps and the edges of mangroves, as well as along the margins of sugar cane fields (DCCEEW 2023b, DEWHA 2010). Ecology The Masked Owl (northern) eats small to medium sized terrestrial mammals in open woodland (DCCEEW 2023b). It nests in tree hollows, within patches of closed forest (DCCEEW 2023b), breeding in March-October. During the non-breeding season, the Masked Owl can have a home range of 1017-1178 ha with a core area of approximately 155 ha. It is sedentary, territorial, and usually seen singly but occasionally in pairs or family groups (DCCEEW 2023b, DEWHA 2010). It is not known to have specific dispersal habitat requirements.	<u>Unlikely</u> Possible habitat within the survey area, however it lies on the far southern limit of distribution. No confirmed records within 50 km of the proposed disturbance area. The Project does not contain important habitat for the species.

Mammals			
Northern Quoll <i>Dasyurus hallucatus</i>	E	Distribution The Northern Quoll occurs in five regional populations across Queensland, the Northern Territory and Western Australia both on mainland and on offshore islands (DCCEEW 2023b). In Queensland, it is known to occur as far south as Gracemere and Mt Morgan, south of Rockhampton, as far north as Weipa in Queensland and as far west into central Queensland to the vicinity of Carnarvon Range National Park (DCCEEW 2023b). Habitat This species does not have highly specific habitat requirements, living in a range of open woodland and open forest types preferring rocky areas (DCCEEW 2023b). They have also been recorded in vine forest, vegetation along creek lines, adjacent to mangroves, around urban areas and on beaches (DSEWPC 2011b). In central Queensland the Northern Quoll is also known to occupy non-rocky lowland habitats such as beach scrub communities. Northern Quoll habitat generally encompasses some form of rocky area for denning purposes with surrounding vegetated habitats used for foraging and dispersal (DCCEEW 2023b). Important factors in the landscape include shallow soils, large cover of rocks including outcropping rock, distance to permanent water and time since last fire (DSEWPC 2011b). Ecology Day time den sites occur in a wide range of areas including rock overhangs, tree hollows, hollow logs, termite mounds, goanna burrows and human structures (DSEWPC 2011b), generally including some form of rocky area for denning purposes (DCCEEW 2023b). Their greatest breeding success is known to occur at sites near water (DCCEEW 2023b), and they are active at night and twilight (DSEWPC 2011b). Little is understood about the characteristics of foraging or dispersal habitat for the Northern Quoll. Current knowledge is that foraging/dispersal habitat is recognised to be any land comprising predominantly of native vegetation in the immediate area (i.e. within 1 km) of shelter habitat (DoE 2016).	<u>Potential</u> Limited potential habitat occurs within the rocky Eucalypt woodland escarpment in the west of the ML. No confirmed records within 10 km of the proposed disturbance area, but records exist within 50 km, to the east, in association with the Great Dividing Range.
Ghost Bat <i>Macroderma gigas</i>	V	Distribution The Ghost Bat is endemic to Australia, occurring in Queensland, northern Pilbara and Kimberley in Western Australia, and the top end of the Northern Territory (TSSC 2016, Hourigan 2011). In Queensland, this species is currently distributed in 4-5 highly disjunct populations along the coast and inland from the McIlwraith Range in Cape York to Rockhampton, with the biggest colony occurring at Mount Etna (Hourigan 2011a). Habitat modelling studies suggest that the Ghost Bat is a geographically relictual species in southern, arid landscapes, present only because caves provide suitable roost microclimates (TSSC 2016).	<u>Potential</u> Preferred habitat is broad, and it is possible the species could utilise habitat within the survey area. No confirmed records within 10 km of the proposed disturbance area, but 3 records within 50 km.

		Habitat This species occupies a variety of habitats ranging from arid Pilbara to tropical savanna woodlands and rainforests. During the daytime they roost in caves, rock crevices and old mines. (TSSC 2016). Foraging Foraging areas are approximately 60 ha in size (TSSC 2016). Their diet consists of large insects, small mammals, reptiles, birds and bats, and prey availability is thought to influence foraging habitat for this species (Hourigan 2011). Roosting/ Breeding Roost sites consist of caves, rock crevices and disused mine adits (TSSC 2016). Permanently used roost sites are generally deep natural caves or disused mines with a relatively stable temperature of 23°–28°C, with a moderate to high relative humidity of 50–100% and the ceiling at least 2 m above the floor (TSSC 2016, Hourigan 2011). Individuals aggregate in these maternity roosts during spring and summer (Hourigan 2011). Dispersal Ghost Bats usually require several caves to move between seasonally or as dictated by weather conditions (TSSC 2016). It is known to forage up to 2 km from its daytime roost area and will use the same foraging area each night (TSSC 2016, Hourigan 2011).	
Koala[^] <i>Phascolarctos cinereus</i>	V	Distribution The Koala is endemic to Australia, ranging from north-eastern Queensland to the south-east corner of South Australia, across coastal and inland areas (DCCEEW 2023b). Biogeographic regions of Queensland where Koalas have been recorded include; the Einasleigh Uplands, Wet Tropics, Desert Uplands, Central Mackay Coast, Mitchell Grass Downs, Mulga Lands, Brigalow Belt, South Eastern Queensland and Channel Country. South Eastern Queensland and Central Mackay Coast contain the highest density of Koalas (DCCEEW 2023b, DAWE 2022a). Habitat Koalas occupy a range of temperate, sub-tropical and tropical forest, woodland and semi-arid communities dominated by species from the <i>Eucalyptus</i> genus or related genera (including <i>Corymbia</i> and <i>Angophora</i> species) (DAWE 2022a), as well as <i>Lophostemon</i> and <i>Melaleuca</i> species (DAWE 2022b). These habitat types are largely influenced by land elevation, annual temperature and rainfall patterns, soil types and the available soil fertility (DAWE 2022b, ANU 2021). Preferred food and shelter trees are naturally abundant on fertile clay soils, and there is a tendency to find the highest densities of Koalas along creek lines (DAWE 2022a).	<u>Likely</u> Potential habitat for this species occurs within the survey area. There is one record within 10 km, and numerous records within 50 km of the proposed disturbance area.

		Ecology Koalas are leaf-eating specialists, occupying a range of vegetation communities; dominated by <i>Eucalyptus</i> species, or related genera (including <i>Corymbia</i> and <i>Angophora</i> species), as well as <i>Lophostemon</i> and <i>Melaleuca</i> species usually along watercourses (ANU 2021). The species is known to have quite specific foraging habitat requirements, as Koalas have been known to show a strong preference between individual trees within species (DAWE 2022a, DAWE 2022b, ANU 2021), and individual Koalas usually obtain most of their nutrition from one or a few species present at a site (DAWE 2022a, DAWE 2022b, ANU 2021). Dispersing individuals, mostly young males, may occasionally cover distances of several kilometres over land with little vegetation (DAWE 2022a, DAWE 2022b, ANU 2021). Koala's often change trees at night, as preferred food trees may be several hundred metres apart, they spend a considerable amount of time on the ground (Van Dyck & Strahan 2008).	
Grey-headed Flying-fox <i>Pteropus poliocephalus</i>	V	Distribution Australia's only endemic flying-fox, The Grey-headed Flying-fox occurs in the coastal belt from Rockhampton in central Queensland to Melbourne in Victoria (DCCEEW 2023b, DEWHA 2010b). Only a small proportion of this range is used at any one time, as the species selectively forages where food is available (DCCEEW 2023b). Habitat This species requires foraging and roosting sites (DCCEEW 2023b). It utilises a range of habitat types including rainforests, open forests, closed and open woodlands, <i>Melaleuca</i> swamps and Banksia woodlands, in search of its flowering and fruiting trees (DCCEEW 2023b, Queensland government 2023). Foraging They primarily eat nectar and pollen from <i>Eucalyptus</i> and related genera (<i>Corymbia</i> and <i>Angophora</i>), as well as from <i>Melaleucas</i> and <i>Banksias</i> (DCCEEW 2023b). In some areas they have also been known to eat a wide range of rainforest fruits (DCCEEW 2023b). They will also feed on cultivated fruit trees in gardens and orchards (DEWHA 2010b). Flying-fox camps form in response to the location and timing of local flowering and fruiting events. An area will be occupied for a few weeks to several months until the food resource is exhausted (DEWHA 2010b). Roosting/ Breeding The Grey-headed Flying-fox roosts in groups of various sizes (few individuals to over 70,000) on exposed branches during the day (DCCEEW 2023b, DEWHA 2010b). These roost sites are generally in proximity to water (rivers, lakes on the coast), and can include stands of <i>Melaleuca</i>, mangroves, riparian vegetation, and rainforest patches of vegetation (DCCEEW 2023b). Flying-fox colonies can also use highly modified vegetation in urban and suburban areas for roost sites (DCCEEW 2023b).	<u>Unlikely</u> Potential habitat for this species exists within the survey area. No known camps occur in the region, with a few sparse records located approximately 60 km away. The Project does not contain important habitat for the species.

		Dispersal Flying-foxes typically commute within 15 km of their day roost site to daily foraging areas (DCCEEW 2023b). They are capable of nightly flights of up to 50km from their roost to different feeding areas, as different plant species flower and fruit (DCCEEW 2023b, Queensland Government 2019, DEWHA 2010b). The national population is fluid and highly mobile, moving up and down the east coast in search of food (DCCEEW 2023b).	
Greater Glider^ <i>Petauroides volans</i>	V	Distribution The Greater Glider (<i>Petauroides volans</i>) 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 (DCCEEW 2022). Habitat Largely restricted to eucalypt forests and woodlands, the Greater Glider's preferred habitat consists of taller, montane, moist eucalypt forests with relatively old trees and abundant hollows. It also favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species (DCCEEW 2022). Ecology This species is primarily folivorous, with a diet mostly comprising of eucalypt leaves, and occasionally flowers (DCCEEW 2022). It is an arboreal nocturnal marsupial, sheltering in den trees (large hollows in large, old trees) during the day (DCCEEW 2022). Home ranges of the Greater Glider are typically relatively small (1 to 4 ha) but are larger in lower productivity forests and more open woodlands (up to 19 ha) (DCCEEW 2022). Due in part to the Greater Gliders relatively small home range, and due to its low dispersal ability, this species disperses poorly across vegetation that is not native forest (DCCEEW 2022).	<u>Known</u> The species has been recorded within the survey area during the field surveys.
Corben's Long-eared Bat <i>Nyctophilus corbeni</i>	V	Distribution This species is found across semi-arid southern Australia, where it is patchily distributed in southern central Queensland, central western New South Wales, north-western Victoria, and eastern South Australia (TSSC 2015b). In Queensland, approximately 30% of its distribution is within the Brigalow Belt South Bioregion (TSSC 2015b). Habitat Known to occur in a range of inland woodland vegetation types, including Bulloke woodlands, Brigalow woodland, Belah woodland, Smooth-barked Apple woodland, River Red Gum forest, Black Box woodland (TSSC 2015b). Corben's Long-eared Bat is more common in box / ironbark / cypress-pine vegetation, with a distinct tree canopy and a dense, cluttered understorey layer (TSSC 2015b).	<u>Unlikely</u> Potential habitat for this species exists within the survey area, however the Project lies outside of its known distribution. No confirmed records within 50 km of the proposed disturbance area. The Project does not contain important habitat for the species.

		Foraging Foraging appears concentrated around patches of trees, with many individuals from different species of bat sharing the same foraging area (TSSC 2015b). This bat feeds on insects in flight, by gleaning vegetation and during ground foraging (TSSC 2015b). Roosting/ Breeding Corben's Long-eared Bat roosts solitarily in tree hollows, crevices, under loose bark and possibly under dense foliage (DCCEEW 2023b, TSSC 2015b). Dispersal Most roost sites are used just for a single day and large distances are travelled at night, with consecutive roost sites generally within 4 km (TSSC 2015b).	
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¹ EPBC Act Conservation status: CE – Critically Endangered; E - Endangered; V - Vulnerable; Mi – Migratory

^ Koala, Greater Glider and Red Goshawk have EPBC status at the time of the Controlled Action decision for the Project

The Grey Falcon was listed as threatened under the EPBC Act after the Controlled Action decision for the Project and therefore has not been included.

Appendix E. Relevant survey guidelines and survey effort implemented for threatened species

Species	EPBC Act Status	Species Likelihood Determination	Commonwealth		Queensland survey guidelines	Survey Timing, Effort and Methodology
			Survey guidelines	EPBC Act referral guidelines		
Reptiles						
<i>Denisonia maculata</i> Ornamental Snake	V	Unlikely based on desktop and field assessments	Guideline: Habitat search around suitable gilgai habitat while frogs are active. Spotlight driving roads at night, after wet weather when frogs are active. Survey in warm evenings.	Guideline:	- No species-specific guidelines, survey guidelines for reptiles⁴: - Brigalow Belt Bioregion survey timing Spring to Early Summer (September - mid November), Autumn (March - mid May).	- Surveys in spring 2004, autumn 2017 and autumn 2019. - Autumn surveys (2017, 2019) occurred during suitable weather conditions and frog activity. - Twelve standard trap sites were established during the surveys with at least two survey sites in each habitat type. - Three standard trap sites, including pitfalls, funnels and spotlight were

Species	EPBC Act Status	Species Likelihood Determination	Commonwealth		Queensland survey guidelines	Survey Timing, Effort and Methodology
			Survey guidelines	EPBC Act referral guidelines		
			Diurnal searches under sheltering sites (rocks, logs etc).	Spotlighting is more effective on warm/humid nights. Target areas of water-inundated gilgais, wetlands, riparian habitat and large logs between early morning hours and dusk. 1.5 person-hours per ha for habitats of average complexity. Survey three nights minimum. - One off diurnal searches of target areas of water-inundated gilgais, wetlands, riparian habitat, and large logs. 1.5 person-hours per ha for habitats of average complexity. Survey three nights minimum. - Opportunistic active searches whilst driving along roads/tracks in survey area. Trapping (pitfall & funnel) with three replicates sites per habitat type. Traps to be checked over four days morning and early evening (after optimal foraging). Trap lines to consist of: - six 20L buckets, buried 500mm deep. Buckets to be evenly distributed under a 30 m drift fence. - Funnels to be placed each end of pitfall line.	- Three replicate generic survey sites established per assessment unit. Pitfall trapping consisting of four buckets 7.5 m apart in a 'T' shape design along 45 m drift fence. Traps set for four nights in total. Funnel trapping consisting of six funnels placed 3 m from the distal ends of the 'T' shape drift fence. Traps set for four nights in total. design. Diurnal searches consisting of two 30 person-minute searches within two different 50 m by 50 m plots within a survey site. Nocturnal searches consisting of two 30 person-minute searches within the 100 m by 100 m survey site. Scat and sign searches to coincide with the diurnal searches.	established near the creeks within the survey area. - Thirteen habitat assessment survey sites were established in Autumn 2023 targeting Ornamental Snake habitat in cleared agricultural areas and four in the black soil area adjacent to Ti-tree Creek. - Survey effort for each survey method utilised for Ornamental Snake detection is as follows: - Pitfall traps: 208 trap nights - Funnel traps: 237 trap nights - Diurnal searches: 53 person hours - Camera trapping: 56 trap nights - Spotlighting: 52 person hour Survey timing, methodology and effort were consistent with the Queensland guideline⁴ and Commonwealth guideline¹, and three standard trap site sites were established near the creeks within the survey area, however, it should be noted that no gilgais were identified within the survey area. Survey effort for active searching and spotlighting did not meet duration requirements as per Commonwealth Guideline³. This guideline³ requires 1.5 person-hours of spotlighting and diurnal searches per ha for habitats of average complexity. It was determined that targeted surveys are the most appropriate means of survey in these

Species	EPBC Act Status	Species Likelihood Determination	Commonwealth		Queensland survey guidelines	Survey Timing, Effort and Methodology
			Survey guidelines	EPBC Act referral guidelines		
					Otherwise, incidental observations. • Incidental detection of species unintentionally. • Camera trapping consisting of camera per site, for a minimum of four nights.	habitats given the size of the survey area. This species or species habitat was not recorded during surveys.
Birds						
<i>Hirundapus caudacutus</i> White-throated Needletail	V, Mi	Known based on desktop searches records	Guideline: • Survey between October and April in northern and eastern Australia, and between December and March in south-eastern Australia. • Diurnal incidental detection of species.	Guideline: • Observations made in the evening when birds come in to roost (tall trees along ridge tops).	No species-specific guidelines, survey guidelines for birds: • Brigalow Belt Bioregion survey timing Spring to Early Summer (September - mid November), Autumn (March - mid May). • Three replicate generic survey sites established per assessment unit. • Diurnal bird survey consisting of six 5-10-minute area searches within a 100 m by 100 m plot area. • Incidental detection of species unintentionally.	• Surveys in spring 2004, autumn 2017, summer 2018, autumn 2018, autumn 2019 occurred within the survey window for northern and eastern Australia. • Twelve standard trap sites were established during the surveys, with at least two survey sites in each habitat type. • Diurnal searches: 53 person hours • Bird surveys: 39 person hours • Spotlighting: 52 person hour Survey timing, methodology and effort were consistent with the Commonwealth guidelines and the Queensland guideline. This species was not recorded during surveys.

Species	EPBC Act Status	Species Likelihood Determination	Commonwealth		Queensland survey guidelines	Survey Timing, Effort and Methodology
			Survey guidelines	EPBC Act referral guidelines		
<i>Geophaps scripta scripta</i> Squatter Pigeon (Southern)	V	Known based on desktop and field assessments	Guideline⁷: • Area searches or transect surveys with a survey effort of 15 hours over three days. Based on areas smaller than 50 ha in size. • Flushing surveys with a survey effort of ten hours over three days. Based on areas smaller than 50 ha in size. Guideline¹¹: • Slow driving surveys at a constant speed, with a minimum of two along the same roads/ tracks/dusty areas. Timing recommended is sunrise to 9:00 am and from 3:30 pm to sunset.	There is no specific guideline for this species.	No species-specific guidelines, survey guidelines for birds⁴: • Brigalow Belt Bioregion survey timing Spring to Early Summer (September - mid November), Autumn (March - mid May). • Three replicate generic survey sites established per assessment unit. • Diurnal bird survey consisting of six 5–10-minute area searches within a 100 m by 100 m plot area. • Incidental detection of species unintentionally.	• Surveys in spring 2004, autumn 2017, summer 2018, autumn 2018, autumn 2019. • Twelve standard trap sites were established during the surveys, with at least two survey sites in each habitat type. • Diurnal searches: 53 person hours • Bird surveys: 39 person hours • Tracks and dusty areas were surveyed during travel between sites. Survey timing, methodology and effort were consistent with the Queensland guideline and the Commonwealth guideline. Survey techniques and effort utilised were partially compliant with Commonwealth guideline requirements. No flushing surveys were undertaken, while area searches were conducted in accordance with Commonwealth guideline requirements. It is noted that Commonwealth guideline identifies that these methods are based on areas smaller than 50 ha in size. Flushing surveys were deemed unnecessary given the size of the survey area and was sufficiently covered using other methods. This species was recorded during surveys.
Mammals						

Species	EPBC Act Status	Species Likelihood Determination	Commonwealth		Queensland survey guidelines	Survey Timing, Effort and Methodology
			Survey guidelines	EPBC Act referral guidelines		
<i>Dasyurus hallucatus</i> Northern Quoll	E	Unlikely based on desktop and field assessments	Guideline: • Cage trapping and Elliott trapping surveys ideally undertaken between May and August. Trapping focused on suitable habitats. Traps to be set four a minimum of three nights. Minimum of four cage traps per trap configuration. • Daytime searches of potentially suitable habitat for signs including scats and tracks (can also utilise sand traps). • Remote cameras, in potentially suitable habitat. • Spotlight surveys, of at least two 200 m transects per 5 ha site. Ideally undertaken over two separate nights. • Hair tube surveys.	Guideline: • Reconnaissance surveys consisting of motion sensing cameras with lures/baits, and active scat searches. Can be combined with other methods such as hair tubes, detection dogs or spotlighting. Survey should assess if suitable habitat is present; if present targeted surveys may be required: • Targeted surveys consist of Elliot or cage trapping (to be undertaken between April and September) and additional supplementary techniques such as motion sensing cameras (able to be undertaken year-round).	No species-specific guidelines, survey guidelines for medium to large terrestrial mammals⁴: • Brigalow Belt Bioregion timing Spring to Early Summer (September - mid November), Autumn (March - mid May). • Three replicate generic survey sites established per assessment unit. • Incidental detection of species unintentionally. • Spotlighting consisting of two 30-minute searches within a 100 m by 100 m plot area. • Scat and sign searches within two different 50 m by 50 m plots for two 30 person-minute searches. • Camera trapping consisting of camera per site, for a minimum of four nights. • Hair tubes to be deployed alongside	• Surveys in spring 2004, autumn 2017, summer 2018, autumn 2018, spring 2018, autumn 2019. • Surveys in Spring 2004 and Autumn 2017 included cage and/or Elliot B traps in the rocky escarpments as potential denning habitat for the species. • Twelve standard trap sites were established during the surveys, with at least two survey sites in each habitat type. • Diurnal searches: 53 person hours • Camera trapping: 56 trap nights • A total of 58.6 person hours of spotlighting. Survey timing, methodology and effort were consistent with the Commonwealth guidelines and the Queensland guideline⁴. This species was not recorded during surveys.

Species	EPBC Act Status	Species Likelihood Determination	Commonwealth		Queensland survey guidelines	Survey Timing, Effort and Methodology
			Survey guidelines	EPBC Act referral guidelines		
					other trapping sites and within suitable habitat for species, set for a minimum of four nights.	
<i>Macroderma gigas</i> Ghost Bat [#]	V	Unlikely based on desktop and field assessments	No species-specific guidelines, survey guidelines for EPBC Act threatened bats: General survey methods for microbats include harp traps, mist nets, echolocation call detection, roost surveys.	There is no specific guideline for this species.	Guideline: Acoustic detection, through the use of Anabat detectors or walking transects with handheld call detectors. Minimum effort of eight detector hours across four nights. Harp traps to be deployed for a minimum of effort of eight trap nights across four nights. Mist nets to be set for a minimum of effort of eight hours across four nights. Roost searches, comprising of approximately two hours per survey day.	- Surveys in spring 2004, autumn 2017, summer 2018, autumn 2018, autumn 2019. - Twelve standard trap site sites and three supplementary sites utilising Anabat recorders, nine survey sites employing harp traps and three survey sites utilising mist nets were established during the surveys. - In total, 51 echolocation call detection nights across the surveys. - In total, 6 hours of mist netting. - In total, 50 trap nights of harp trapping. Survey timing, methodology and effort were consistent with the Commonwealth guideline and the Queensland guideline. This species was not detected.
<i>Phascolarctos cinereus</i> Koala	V	Likely based on desktop searches records	No species-specific guidelines, survey guidelines for EPBC Act threatened mammals: Diurnal searches on foot with transects spaced 50 m	Guideline: This guideline does not prescribe survey effort standards for koala surveys¹⁹. The following methods are recommended:	No species-specific guidelines, survey guidelines for arboreal and volant mammals:	- Surveys in spring 2004, autumn 2017, summer 2018, autumn 2018, autumn 2019. - Survey in spring 2018 targeted the Greater Glider and therefore it targeted traces of arboreal

Species	EPBC Act Status	Species Likelihood Determination	Commonwealth		Queensland survey guidelines	Survey Timing, Effort and Methodology
			Survey guidelines	EPBC Act referral guidelines		
			to 100 m intervals in key habitat areas. These searches are to target the presence of shelter, fodder trees and scats; these values are to be identified, and their position recorded. - Spotlighting surveys utilising handheld lights. Surveys to comprise of two 200 m transects 100 m apart per 5 ha site (or longer transects for larger sites). Walking speed to be 10 m/minute. Surveys ideally repeated over two nights at each location, avoiding inclement weather. - Call playback consisting of two sessions of call playback of relevant species in each site (or stratification unit up to 200 ha). Call playback surveys can coincide with spotlight surveys.	Direct observation methods should be undertaken between August and January. Suggested methods include: - Strip transects. - Spotlighting. - Call playback. - Remote sensor activated cameras. - Mark resight or mark recapture. - Detection dogs. Suggested indirect observation methods include: - Scratching searches. - Scat searches. - Spot Assessment Technique. - Regularised Grid Based Spot Assessment Technique, - Koala optimised Rapid Assessment Methodology, and - Faecal standing crop assessment.	- Brigalow Belt Bioregion timing Spring to Early Summer (September - mid November), Autumn (March - mid May). - Three replicate generic survey sites established per assessment unit. - Incidental detection of species unintentionally. - Spotlighting consisting of two 30-minute searches within a 100 m by 100 m plot area. - Call playback consisting of two sessions of call playback of relevant species at the midpoint of survey site. - Scat and sign searches within two different 50 m by 50 m plots for two 30 person-minute searches. - Diurnal survey consisting of six 5-10-minute area searches within a 100 m by 100 m plot area.	mammals by transects along riparian vegetation on the banks of the Isaac River and Hill Creek. - Twelve standard trap sites were established during the surveys, with at least two survey sites in each habitat type. - Diurnal searches: 53 person hours - Camera trapping: 56 trap nights - A total of 58.6 person hours of spotlighting. - A total of 3.5 person hours of call playback. Survey timing, methodology and effort were consistent with the Commonwealth guideline and the Queensland guideline. Survey methods utilised included a range of methods identified within the EPBC Act referral guideline. This species was not detected.

Species	EPBC Act Status	Species Likelihood Determination	Commonwealth		Queensland survey guidelines	Survey Timing, Effort and Methodology
			Survey guidelines	EPBC Act referral guidelines		
Greater Glider <i>Petauroides volans</i>	V	Known based on desktop and field assessments	No species-specific guidelines, survey guidelines for EPBC Act threatened mammals: • Diurnal searches on foot with transects spaced 50 m to 100 m intervals in key habitat areas. These searches are to target the presence of shelter, fodder trees and scats; these values are to be identified, and their position recorded. • Spotlighting surveys utilising handheld lights. Surveys to comprise of two 200 m transects 100 m apart per 5 ha site (or longer transects for larger sites). Walking speed to be 10m/minute. Surveys ideally repeated over two nights at each location, avoiding inclement weather. • Call playback consisting of two sessions of call playback of relevant species in each site (or stratification unit up to 200 ha). Call playback surveys can coincide with spotlight and stag watch surveys.	There is no specific guideline for this species.	No species-specific guidelines, survey guidelines for arboreal and volant mammals: • Brigalow Belt Bioregion survey timing Spring to Early Summer (September - mid November), Autumn (March - mid May). • Three replicate generic survey sites established per assessment unit. • Incidental detection of species unintentionally. • Spotlighting consisting of two 30-minute searches within a 100 m by 100 m plot area. • Call playback consisting of two sessions of call playback of relevant species at the midpoint of survey site. • Scat and sign searches within two different 50 m by 50 m plots for two 30 person-minute searches.	• Surveys in spring 2004, autumn 2017, summer 2018, autumn 2018, autumn 2019. • Survey in spring 2018 targeted the Greater Glider and therefore it targeted traces of arboreal mammals by transects along riparian vegetation on the banks of the Isaac River and Hill Creek. • Twelve standard trap sites were established during the surveys, with at least two survey sites in each habitat type. • Diurnal searches: 53 person hours • Camera trapping: 56 trap nights • A total of 58.6 person hours of spotlighting. • A total of 3.5 person hours of call playback. Survey timing, methodology and effort were consistent with the Commonwealth guideline and the Queensland guideline⁴. This species was recorded during surveys.

Species	EPBC Act Status	Species Likelihood Determination	Commonwealth		Queensland survey guidelines	Survey Timing, Effort and Methodology
			Survey guidelines	EPBC Act referral guidelines		
			Stag watch surveys to occur at locations of potential den trees. Surveys to occur 30 minutes before dusk for a total of 60 minutes.			

Appendix F. Flora species list

Family	Scientific Name	Common Name	Status		Spring 2004	Autumn 2018	Autumn 2019	Autumn 2023
			NC Act/ BS Act	EPBC Act				
Acanthaceae	<i>Brunoniella acaulis</i>		LC	NL			x	x
Acanthaceae	<i>Pseuderanthemum variabile</i>	Love flower	LC	NL			x	x
Acanthaceae	<i>Rostellularia adscendens</i>		LC	NL		x	x	x
Aizoaceae	<i>Tetragonia tetragonioides</i>	New Zealand spinach	LC	NL		x		
Aizoaceae	<i>Trianthema portulacastrum</i>	Black pigweed	Int.	NL				x
Aizoaceae	<i>Trianthema triquetra</i>	Red spinach	LC	NL			x	
Amaranthaceae	<i>Achyranthes aspera</i>	Chaff flower	LC	NL	x	x		x
Amaranthaceae	<i>Alternanthera denticulata</i>	Lesser joyweed	LC	NL				x
Amaranthaceae	<i>Alternanthera nana</i>	Hairy joyweed	LC	NL			x	
Amaranthaceae	<i>Alternanthera pungens</i>	Khaki weed	Int.	NL				x
Amaranthaceae	<i>Alternanthera sp.</i>		LC	NL	x			
Amaranthaceae	<i>Gomphrena canescens</i>		LC	NL	x			x
Amaranthaceae	<i>Nyssanthus erecta</i>		LC	NL	x			x
Amaranthaceae	<i>Ptilotus sp.</i>		LC	NL	x			x
Amaryllidaceae	<i>Crinum sp.</i>		LC	NL				x
Anacardiaceae	<i>Pleiogynium timorense</i>	Burdekin plum	LC	NL	x			x

Family	Scientific Name	Common Name	Status		Spring 2004	Autumn 2018	Autumn 2019	Autumn 2023
			NC Act/ BS Act	EPBC Act				
Apocynaceae	<i>Alstonia constricta</i>		LC	NL				x
Apocynaceae	<i>Asclepias curassavica</i>	Redhead cottonbush	Int.	NL	x			
Apocynaceae	<i>Carissa ovata</i>	Currant bush	LC	NL	x	x	x	x
Apocynaceae	<i>Cryptostegia grandiflora</i>	Rubber vine	RIP	WoNS	x	x	x	x
Apocynaceae	<i>Cynanchum viminalis</i>		LC	NL				x
Apocynaceae	<i>Leichhardtia viridiflora</i>		LC	NL				x
Apocynaceae	<i>Marsdenia sp.</i>		LC	NL				x
Apocynaceae	<i>Parsonsia lanceolata</i>	Rough silkpod	LC	NL	x		x	
Apocynaceae	<i>Parsonsia paulfosteri</i>	Narrow-leaved silkpod	LC	NL				
Apocynaceae	<i>Parsonsia sp.</i>		LC	NL				x
Apocynaceae	<i>Parsonsia straminea</i>	Monkey vine	LC	NL			x	
Asparagaceae	<i>Eustrephus latifolius</i>	Wombat berry	LC	NL	x	x	x	x
Asparagaceae	<i>Laxmannia gracilis</i>	Slender wire lily	LC	NL		x	x	
Asparagaceae	<i>Lomandra confertifolia</i>	Clumped matrush	LC	NL				x
Asparagaceae	<i>Lomandra filiformis</i>	Matrush	LC	NL				x
Asparagaceae	<i>Lomandra longifolia</i>	Spiked mat rush	LC	NL		x		
Asparagaceae	<i>Lomandra multiflora</i>		LC	NL				x
Asteraceae	<i>Acanthospermum hispidum</i>	Star burr	Int.	NL	x			x

Family	Scientific Name	Common Name	Status		Spring 2004	Autumn 2018	Autumn 2019	Autumn 2023
			NC Act/ BS Act	EPBC Act				
Asteraceae	<i>Apowollastonia spilanthis</i>		LC	NL				x
Asteraceae	<i>Asteraceae sp.</i>		LC	NL				x
Asteraceae	<i>Bidens bipinnata</i>		Int.	NL				x
Asteraceae	<i>Bidens pilosa</i>	Cobbler's peg	Int.	NL				x
Asteraceae	<i>Calotis cuneata</i>		LC	NL				x
Asteraceae	<i>Calotis cuneifolia</i>		LC	NL				x
Asteraceae	<i>Calotis sp.</i>		LC	NL				x
Asteraceae	<i>Centipeda minima</i>		LC	NL				x
Asteraceae	<i>Chrysocephalum apiculatum</i>	Yellow buttons	LC	NL				x
Asteraceae	<i>Cirsium vulgare</i>	Scotch thistle	Int.	NL	x			
Asteraceae	<i>Cyanthillium cinereum</i>		LC	NL	x			x
Asteraceae	<i>Emilia sonchifolia</i>		Int.	NL	x			x
Asteraceae	<i>Erigeron bonariensis</i>		Int.	NL	x			x
Asteraceae	<i>Helichrysum apiculatum</i>		Int.	NL	x			
Asteraceae	<i>Olearia xerophila</i>		LC	NL		x		
Asteraceae	<i>Parthenium hysterophorus</i>	Parthenium	RIP	WoNS	x	x	x	x
Asteraceae	<i>Peripleura hispidula</i>		LC	NL				x
Asteraceae	<i>Praxelis sp.</i>		Int.	NL	x			x

Family	Scientific Name	Common Name	Status		Spring 2004	Autumn 2018	Autumn 2019	Autumn 2023
			NC Act/ BS Act	EPBC Act				
Asteraceae	<i>Pterocaulon redolens</i>		LC	NL		x		
Asteraceae	<i>Pterocaulon sphacelatum</i>		LC	NL				x
Asteraceae	<i>Sphaeromorphaea australis</i>		LC	NL				x
Asteraceae	<i>Vittadinia dissecta</i>		LC	NL				x
Asteraceae	<i>Vittadinia sp.</i>		LC	NL				x
Asteraceae	<i>Xanthium occidentale</i>	Noogoora Burr	OIP	NL				x
Asteraceae	<i>Xanthium spinosum</i>	Bathurst burr	OIP	NL	x			
Boraginaceae	<i>Ehretia membranifolia</i>	Peach Bush	LC	NL	x		x	x
Boraginaceae	<i>Trichodesma zeylanicum</i>	Camel bush	LC	NL				x
Byttneriaceae	<i>Commersonia hermanniifolia</i>		Int.	NL	x			x
Byttneriaceae	<i>Melochia pyramidata</i>	Pyramid flower	Int.	NL	x			x
Byttneriaceae	<i>Waltheria indica</i>		LC	NL				x
Cactaceae	<i>Harrisia martinii</i>	Harissia cactus	RIP	NL	x		x	x
Cactaceae	<i>Opuntia stricta</i>	Prickly pear	RIP	WoNS	x	x		x
Cactaceae	<i>Opuntia tomentosa</i>	Velvety tree pear	RIP	WoNS		x	x	x
Campanulaceae	<i>Wahlenbergia gracilis</i>	Sprawling bluebell	LC	NL	x	x	x	x
Capparaceae	<i>Capparis canescens</i>	Wild orange	LC	NL	x			
Capparaceae	<i>Capparis lasiantha</i>	Nipan	LC	NL	x	x	x	x

Family	Scientific Name	Common Name	Status		Spring 2004	Autumn 2018	Autumn 2019	Autumn 2023
			NC Act/ BS Act	EPBC Act				
Capparaceae	<i>Capparis sp.</i>		LC	NL	x			
Capparaceae	<i>Capparis spinosa</i>		Int.	NL				x
Caryophyllaceae	<i>Polycarpaea corymbosa</i>		LC	NL	x	x	x	x
Casuarinaceae	<i>Casuarina cunninghamiana</i>	River she-oak	LC	NL	x		x	x
Celastraceae	<i>Denhamia disperma</i>		LC	NL				x
Celastraceae	<i>Elaeodendron australe var. integrifolia</i>	Narrow-leaved red olive palm	LC	NL	x			
Celastraceae	<i>Maytenus disperma</i>	Orange bark	Int.	NL	x			
Chenopodiaceae	<i>Chenopodiaceae sp.</i>		LC	NL				x
Chenopodiaceae	<i>Dysphania carinata</i>		LC	NL				x
Chenopodiaceae	<i>Einadia nutans</i>	Climbing saltbush	LC	NL			x	x
Chenopodiaceae	<i>Enchylaena tomentosa</i>	Ruby salt bush	LC	NL	x		x	x
Chenopodiaceae	<i>Maireana microphylla</i>	Small-leaved bluebush	LC	NL				x
Chenopodiaceae	<i>Salsola australis</i>	Bushbush	LC	NL	x			x
Chenopodiaceae	<i>Sclerolaena sp.</i>		LC	NL				x
Cleomaceae	<i>Arivela viscosa</i>		LC	NL	x			x
Combretaceae	<i>Terminalia oblongata</i>	Yellow wood	LC	NL		x	x	x
Commelinaceae	<i>Commelina diffusa</i>	Wandering jew	LC	NL			x	x

Family	Scientific Name	Common Name	Status		Spring 2004	Autumn 2018	Autumn 2019	Autumn 2023
			NC Act/ BS Act	EPBC Act				
Commelinaceae	<i>Commelina ensifolia</i>	Scurvy grass	LC	NL				x
Commelinaceae	<i>Commelina sp.</i>		LC	NL				x
Commelinaceae	<i>Murdannia graminea</i>	Murdannia	LC	NL				x
Convolvulaceae	<i>Bonamia media</i>		LC	NL				x
Convolvulaceae	<i>Evolvulus alsinoides</i>	Slender dwarf morning-glory	LC	NL		x	x	x
Convolvulaceae	<i>Ipomea plebeia</i>		LC	NL				x
Convolvulaceae	<i>Ipomea polymorpha</i>		LC	NL				x
Convolvulaceae	<i>Ipomea sp.</i>		LC	NL		x		x
Convolvulaceae	<i>Polymeria calycina</i>	Pink bindweed	LC	NL				x
Convolvulaceae	<i>Polymeria longifolia</i>		LC	NL				x
Cucurbitaceae	<i>Cucumis melo</i>	Wild cucumber	LC	NL			x	
Cyperaceae	<i>Bulbostylis barbata</i>		LC	NL			x	
Cyperaceae	<i>Cyperus exaltatus</i>	Nut grass	LC	NL	x	x		
Cyperaceae	<i>Cyperus gracilis</i>	Dainty sedge	LC	NL	x	x	x	x
Cyperaceae	<i>Cyperus javanicus</i>		LC	NL	x	x	x	x
Cyperaceae	<i>Cyperus sp.</i>		LC	NL	x	x	x	x
Cyperaceae	<i>Cyperus victoriensis</i>		LC	NL	x	x	x	x

Family	Scientific Name	Common Name	Status		Spring 2004	Autumn 2018	Autumn 2019	Autumn 2023
			NC Act/ BS Act	EPBC Act				
Cyperaceae	<i>Fimbristylis dichotoma</i>	Common fringe-rush	LC	NL	x	x	x	x
Cyperaceae	<i>Fimbristylis sp.</i>		LC	NL				x
Cyperaceae	<i>Scleria brownii</i>		LC	NL				x
Cyperaceae	<i>Scleria sp.</i>		LC	NL				x
Erythroxylaceae	<i>Erythroxylum australe</i>	Cocain bush	LC	NL	x	x	x	x
Euphorbiaceae	<i>Euphorbia bifida</i>		LC	NL				x
Euphorbiaceae	<i>Euphorbia drummondii</i>	Mat spurge	LC	NL			x	x
Euphorbiaceae	<i>Euphorbia tannensis</i>	Desert spurge	LC	NL				x
Euphorbiaceae	<i>Ricinus communis</i>	Castor oil plant tree	OIP	NL	x			
Fabaceae	<i>Acacia bancroftiorum</i>		LC	NL	x			
Fabaceae	<i>Acacia bidwillii</i>	Corkwood wattle	Int.	NL	x			
Fabaceae	<i>Acacia excelsa</i>	Ironwood wattle	LC	NL	x	x		x
Fabaceae	<i>Acacia flavescens</i>	Red wattle	LC	NL			x	x
Fabaceae	<i>Acacia fodinalis</i>		LC	NL	x			
Fabaceae	<i>Acacia harpophylla</i>	Brigalow	LC	NL	x		x	x
Fabaceae	<i>Acacia holosericea</i>	Silky wattle	LC	NL			x	
Fabaceae	<i>Acacia leiocalyx</i>		LC	NL				x
Fabaceae	<i>Acacia leptostachya</i>		LC	NL			x	

Family	Scientific Name	Common Name	Status		Spring 2004	Autumn 2018	Autumn 2019	Autumn 2023
			NC Act/ BS Act	EPBC Act				
Fabaceae	<i>Acacia multisiliqua</i>		LC	NL			x	x
Fabaceae	<i>Acacia oswaldii</i>	Nelia	LC	NL	x			
Fabaceae	<i>Acacia salicina</i>	Sally wattle	LC	NL	x	x	x	x
Fabaceae	<i>Acacia shirleyi</i>	Lancewood	LC	NL	x	x	x	x
Fabaceae	<i>Acacia sp.</i>		LC	NL	x			
Fabaceae	<i>Acacia tenuissima</i>	Narrow-leaved wattle	LC	NL			x	
Fabaceae	<i>Alysicarpus rugosus</i>		Int.	NL				
Fabaceae	<i>Archidendropsis basaltica</i>	Dead finnish	LC	NL			x	x
Fabaceae	<i>Bauhinia carronii</i>	Queensland ebony	LC	NL	x	x	x	x
Fabaceae	<i>Bauhinia hookeri</i>	White bauhinia	LC	NL	x	x		x
Fabaceae	<i>Bossiaea carinalis</i>		LC	NL	x	x		x
Fabaceae	<i>Cassia brewsteri</i>	Brewster's cassia	LC	NL	x	x	x	x
Fabaceae	<i>Clitoria ternatea</i>	Butterfly pea	LC	NL				x
Fabaceae	<i>Crotalaria medicaginea</i>	Trefoil rattlepod	LC	NL				x
Fabaceae	<i>Crotalaria montana</i>		LC	NL				x
Fabaceae	<i>Crotalaria novae-hollandiae</i>	New Holland rattlepod	LC	NL	x			x
Fabaceae	<i>Crotalaria sp.</i>	Rattle pod	LC	NL	x		x	
Fabaceae	<i>Cullen sp.</i>		LC	NL				x

Family	Scientific Name	Common Name	Status		Spring 2004	Autumn 2018	Autumn 2019	Autumn 2023
			NC Act/ BS Act	EPBC Act				
Fabaceae	<i>Desmodium intortum</i>		Int.	NL				x
Fabaceae	<i>Desmodium sp.</i>		LC	NL				x
Fabaceae	<i>Erythrina vespertilio</i>	Bat wing coral tree	LC	NL		x		
Fabaceae	<i>Flemingia parviflora</i>		LC	NL				x
Fabaceae	<i>Fabaceae sp.</i>		LC	NL				x
Fabaceae	<i>Galactia tenuiflora</i>		LC	NL				x
Fabaceae	<i>Glycine clandestina</i>		LC	NL				x
Fabaceae	<i>Glycine sp.</i>		LC	NL			x	
Fabaceae	<i>Glycine tabacina</i>		LC	NL				x
Fabaceae	<i>Glycine tomentella</i>	Woolly glycine	LC	NL				x
Fabaceae	<i>Hardenbergia perbrevidens</i>		LC	NL				x
Fabaceae	<i>Indigofera colutea</i>		LC	NL				x
Fabaceae	<i>Indigofera hirsuta</i>	Hairy Indigo	LC	NL			x	
Fabaceae	<i>Indigofera linifolia</i>	Flax-leaf indigo	LC	NL		x	x	x
Fabaceae	<i>Indigofera linnaei</i>	Nine-leaved indigo	LC	NL			x	x
Fabaceae	<i>Indigofera sp.</i>		LC	NL		x	x	x
Fabaceae	<i>Macroptilium atropurpureum</i>	Siratro	Int.	NL			x	
Fabaceae	<i>Macroptilium lathyroides</i>		Int.	NL				x

Family	Scientific Name	Common Name	Status		Spring 2004	Autumn 2018	Autumn 2019	Autumn 2023
			NC Act/ BS Act	EPBC Act				
Fabaceae	<i>Neptunia gracilis</i>	Native sensitive weed	LC	NL		x	x	x
Fabaceae	<i>Rhynchosia minima</i>	Rhyncho	LC	NL		x	x	x
Fabaceae	<i>Rhynchosia sp.</i>		LC	NL	x			
Fabaceae	<i>Senna artemisioides subsp. zygophylla</i>	Twin-leaf desert senna	LC	NL	x	x		x
Fabaceae	<i>Senna occidentalis</i>	Coffee senna	Int.	NL				x
Fabaceae	<i>Senna sp.</i>		LC	NL	x			x
Fabaceae	<i>Sesbania cannabina</i>		LC	NL				x
Fabaceae	<i>Stylosanthes hamata</i>		Int.	NL				x
Fabaceae	<i>Stylosanthes scabra</i>	Shrubby stylo	Int.	NL		x	x	x
Fabaceae	<i>Tephrosia leptoclada</i>		LC	NL			x	x
Fabaceae	<i>Vachellia farnesiana</i>	Mimosa bush	OIP	NL	x			x
Fabaceae	<i>Vachellia nilotica</i>	Prickly acacia	RIP	WoNS		x	x	
Fabaceae	<i>Vigna lanceolata</i>	Maloga bean	LC	NL		x		
Fabaceae	<i>Zornia sp.</i>		LC	NL				x
Goodeniaceae	<i>Brunonia australis</i>	Blue pincushion	SL	NL				x
Goodeniaceae	<i>Goodenia rotundifolia</i>		LC	NL				x
Goodeniaceae	<i>Goodenia sp.</i>		LC	NL				x
Haloragaceae	<i>Haloragis aspera</i>	Raspweed	LC	NL				x

Family	Scientific Name	Common Name	Status		Spring 2004	Autumn 2018	Autumn 2019	Autumn 2023
			NC Act/ BS Act	EPBC Act				
Hemerocallidaceae	<i>Dianella longifolia</i>		LC	NL				x
Hypoxidaceae	<i>Hypoxis sp.</i>		LC	NL				x
Lamiaceae	<i>Basilicum polystachyon</i>	Musk basil	LC	NL				x
Lamiaceae	<i>Clerodendrum floribundum</i>	Lolly bush	LC	NL				x
Loganiaceae	<i>Mitrasacme sp.</i>		LC	NL				x
Malvaceae	<i>Abutilon oxycarpum</i>	Flannel weed	LC	NL		x	x	x
Malvaceae	<i>Abutilon sp.</i>		LC	NL	x			
Malvaceae	<i>Brachychiton australis</i>	Broad leaved bottle tree	LC	NL	x			
Malvaceae	<i>Brachychiton rupestris</i>	Narrow-leaved bottle tree	LC	NL	x			
Malvaceae	<i>Grewia latifolia</i>	Dog's balls	LC	NL			x	x
Malvaceae	<i>Grewia retusifolia</i>	Dog's balls	LC	NL		x	x	x
Malvaceae	<i>Hibiscus heterophyllus</i>		LC	NL				x
Malvaceae	<i>Hibiscus sp.</i>		LC	NL				x
Malvaceae	<i>Hibiscus sturtii</i>	Sturt's desert rose	LC	NL		x		x
Malvaceae	<i>Hibiscus verdcourtii</i>		LC	NL				x
Malvaceae	<i>Malvastrum americanum</i>	Spiked malvastrum	Int.	NL	x	x		x
Malvaceae	<i>Malvastrum coromandelianum</i>	Prickly malvastrum	Int.	NL	x	x		x
Malvaceae	<i>Melhanian oblongifolia</i>	Velvet hibiscus	LC	NL			x	x

Family	Scientific Name	Common Name	Status		Spring 2004	Autumn 2018	Autumn 2019	Autumn 2023
			NC Act/ BS Act	EPBC Act				
Malvaceae	<i>Sida cordifolia</i>	Flannel sida	Int.	NL	x	x		x
Malvaceae	<i>Sida corrugata</i>	Corrugated sida	LC	NL		x		x
Malvaceae	<i>Sida fibulifera</i>		LC	NL				x
Malvaceae	<i>Sida hackettiana</i>	Spiked sida	LC	NL	x	x	x	x
Malvaceae	<i>Sida rhombifolia</i>	Arrow-leaf sida	Int.	NL	x	x	x	x
Malvaceae	<i>Sida rohlenae</i>	Shrub sida	LC	NL			x	x
Malvaceae	<i>Sida sp.</i>		LC	NL	x			x
Malvaceae	<i>Sida spinosa</i>	Paddy's lucerne	LC	NL			x	
Malvaceae	<i>Sida trichopoda</i>		LC	NL				x
Meliaceae	<i>Owenia acidula</i>	Emu apple	LC	NL	x	x	x	x
Menispermaceae	<i>Tinospora smilacina</i>	Snakevine	LC	NL	x			
Moraceae	<i>Ficus opposita</i>	Sandpaper fig	LC	NL	x			x
Moraceae	<i>Ficus platypoda</i>	Small-leaved Moreton Bay fig	LC	NL	x			
Myrtaceae	<i>Corymbia aureola</i>	Yellow bloodwood	LC	NL			x	
Myrtaceae	<i>Corymbia clarksoniana</i>	Clarkson's bloodwood	LC	NL	x	x	x	x
Myrtaceae	<i>Corymbia dallachiana</i>	Ghost gum	LC	NL	x		x	x
Myrtaceae	<i>Corymbia erythrophloia</i>	Gum-topped bloodwood	LC	NL	x			x

Family	Scientific Name	Common Name	Status		Spring 2004	Autumn 2018	Autumn 2019	Autumn 2023
			NC Act/ BS Act	EPBC Act				
Myrtaceae	<i>Corymbia intermedia</i>	Pink bloodwood	LC	NL	x			
Myrtaceae	<i>Corymbia tessellaris</i>	Moreton bay ash	LC	NL	x	x	x	x
Myrtaceae	<i>Corymbia trachyphloia</i>	Brown bloodwood	LC	NL	x			x
Myrtaceae	<i>Eucalyptus brownii</i>		LC	NL	x			
Myrtaceae	<i>Eucalyptus camaldulensis</i>	River gum	LC	NL	x			
Myrtaceae	<i>Eucalyptus cambageana</i>	Dawson gum	LC	NL	x		x	x
Myrtaceae	<i>Eucalyptus cloeziana</i>	Gympie messmate	LC	NL	x		x	x
Myrtaceae	<i>Eucalyptus crebra</i>	Narrow-leaved ironbark	LC	NL	x	x		x
Myrtaceae	<i>Eucalyptus decorticans</i>		LC	NL		x		
Myrtaceae	<i>Eucalyptus orgadophila</i>	Mountain coolibah	LC	NL	x	x		x
Myrtaceae	<i>Eucalyptus platyphylla</i>	Popular gum	LC	NL	x			
Myrtaceae	<i>Eucalyptus populnea</i>	Popular box	LC	NL	x		x	x
Myrtaceae	<i>Eucalyptus tereticornis</i>	Blue gum	LC	NL	x	x		x
Myrtaceae	<i>Melaleuca bracteata</i>	Black tea tree	LC	NL	x			x
Myrtaceae	<i>Melaleuca fluviatilis</i>		LC	NL	x			
Myrtaceae	<i>Melaleuca linariifolia</i>	flaxleaf paperbark	LC	NL	x			
Myrtaceae	<i>Melaleuca nervosa</i>		LC	NL	x			x
Nyctaginaceae	<i>Boerhavia dominii</i>	Tarvine	LC	NL			x	x

Family	Scientific Name	Common Name	Status		Spring 2004	Autumn 2018	Autumn 2019	Autumn 2023
			NC Act/ BS Act	EPBC Act				
Oleaceae	<i>Jasminum didymum</i>	Native jasmine	LC	NL	x			x
Orchidaceae	<i>Cymbidium canaliculatum</i>		LC	NL	x			
Oxalidaceae	<i>Oxalis corniculata</i>		Int.	NL				x
Papaveraceae	<i>Argemone ochroloca</i>	Yellow poppy	LC	NL	x			
Passifloraceae	<i>Passiflora aurantia</i>		LC	NL				x
Passifloraceae	<i>Passiflora foetida</i>	Stinking passionflower	OIP	NL		x		x
Passifloraceae	<i>Passiflora sp.</i>		LC	NL	x			
Phyllanthaceae	<i>Breynia oblongifolia</i>	Coffee bush	LC	NL		x	x	x
Phyllanthaceae	<i>Bridelia leichhardtii</i>		LC	NL	x	x	x	x
Phyllanthaceae	<i>Glochidion sp.</i>		LC	NL	x			
Phyllanthaceae	<i>Phyllanthus carpentariae</i>		LC	NL	x	x	x	x
Phyllanthaceae	<i>Phyllanthus maderaspatensis</i>	Spurge	LC	NL			x	
Phyllanthaceae	<i>Phyllanthus sp.</i>		LC	NL				x
Phyllanthaceae	<i>Phyllanthus virgatus</i>		LC	NL			x	x
Phyllanthaceae	<i>Poranthera microphylla</i>	Small poranthera	LC	NL				x
Picrodendraceae	<i>Petalostigma pubescens</i>	Quinine bush	LC	NL	x	x	x	x
Pittosporaceae	<i>Bursaria incana</i>	Prickly pine	LC	NL	x			x
Pittosporaceae	<i>Pittosporum angustifolium</i>	Butterbush	LC	NL	x			x

Family	Scientific Name	Common Name	Status		Spring 2004	Autumn 2018	Autumn 2019	Autumn 2023
			NC Act/ BS Act	EPBC Act				
Pittosporaceae	<i>Pittosporum phylliraeoides</i>	Weeping pittosporum	LC	NL	x			
Plantaginaceae	<i>Scoparia dulcis</i>	Bitter broom	Int.	NL			x	x
Plumbaginaceae	<i>Plumbago zeylanica</i>		LC	NL		x	x	x
Poaceae	<i>Alloteropsis cimicina</i>		LC	NL		x	x	x
Poaceae	<i>Aristida acuta</i>		LC	NL		x	x	x
Poaceae	<i>Aristida benthamii</i>		LC	NL				x
Poaceae	<i>Aristida calycina</i>	Dark wire grass	LC	NL		x	x	x
Poaceae	<i>Aristida gracilipes</i>		LC	NL		x	x	x
Poaceae	<i>Aristida holathera</i>		LC	NL				x
Poaceae	<i>Aristida ingrata</i>		LC	NL				x
Poaceae	<i>Aristida jerichoensis</i>	Jericho wiregrass	LC	NL				x
Poaceae	<i>Aristida latifolia</i>	Feathertop wiregrass	LC	NL	x	x	x	x
Poaceae	<i>Aristida leptopoda</i>	White wiregrass	LC	NL		x	x	x
Poaceae	<i>Aristida personata</i>		LC	NL				x
Poaceae	<i>Aristida sp.</i>		LC	NL	x			
Poaceae	<i>Astrela elymoides</i>	Hoop mitchell grass	LC	NL		x		
Poaceae	<i>Bothriochloa bladhii</i>		LC	NL		x	x	x
Poaceae	<i>Bothriochloa decipiens</i>		LC	NL		x	x	x

Family	Scientific Name	Common Name	Status		Spring 2004	Autumn 2018	Autumn 2019	Autumn 2023
			NC Act/ BS Act	EPBC Act				
Poaceae	<i>Bothriochloa erianthoides</i>	Satintop grass	LC	NL		x		
Poaceae	<i>Bothriochloa ewartiana</i>	Desert bluegrass	LC	NL			x	x
Poaceae	<i>Bothriochloa pertusa</i>	Indian bluegrass	Int.	NL		x	x	x
Poaceae	<i>Bothriochloa sp.</i>	Blue grass	LC	NL			x	
Poaceae	<i>Brachyachne ciliaris</i>	Hairy native couch	LC	NL				x
Poaceae	<i>Brachyachne convergent</i>		LC	NL				x
Poaceae	<i>Cenchrus ciliaris</i>	Buffel grass	Int.	NL	x	x	x	x
Poaceae	<i>Chloris divaricata</i>		LC	NL	x			
Poaceae	<i>Chloris gayana</i>	Rhodes grass	OIP	NL	x			
Poaceae	<i>Chloris inflata</i>		Int.	NL	x	x	x	x
Poaceae	<i>Chloris pectinata</i>	Comb Chloris	LC	NL				x
Poaceae	<i>Chloris ventricosa</i>	Tall Chloris	LC	NL				x
Poaceae	<i>Chloris virgata</i>	Feathertop rhodes grass	Int.	NL	x			
Poaceae	<i>Chrysopogon fallax</i>		LC	NL				x
Poaceae	<i>Cymbopogon bombycinus</i>	Citronella grass	LC	NL		x	x	
Poaceae	<i>Cymbopogon oblectus</i>		LC	NL				x
Poaceae	<i>Cymbopogon refractus</i>	Barbed-wire grass	LC	NL			x	x
Poaceae	<i>Cymbopogon sp.</i>		LC	NL	x			

Family	Scientific Name	Common Name	Status		Spring 2004	Autumn 2018	Autumn 2019	Autumn 2023
			NC Act/ BS Act	EPBC Act				
Poaceae	<i>Dactyloctenium radulans</i>	Button grass	LC	NL	x			x
Poaceae	<i>Dichanthium aristatum</i>	Angleton grass	Int.	NL		x		x
Poaceae	<i>Dichanthium fecundum</i>	Curly bluegrass	LC	NL		x		
Poaceae	<i>Dichanthium sericeum</i>	Queensland bluegrass	LC	NL			x	x
Poaceae	<i>Dichelachne sp.</i>		LC	NL	x			x
Poaceae	<i>Digitaria brownii</i>	Cotton panic	LC	NL				x
Poaceae	<i>Digitaria ciliaris</i>		Int.	NL		x		x
Poaceae	<i>Digitaria diminuta</i>		LC	NL				x
Poaceae	<i>Digitaria divaricatissima</i>	Umbrella grass	LC	NL			x	x
Poaceae	<i>Digitaria sp.</i>		LC	NL			x	
Poaceae	<i>Dinebra decipiens</i>		LC	NL			x	x
Poaceae	<i>Enneapogon gracilis</i>		LC	NL				x
Poaceae	<i>Enneapogon lindleyanus</i>	Nine-awn grass	LC	NL			x	x
Poaceae	<i>Enneapogon oblongus</i>		LC	NL	x			
Poaceae	<i>Enneapogon polyphyllus</i>	Leafy nineawn	LC	NL			x	x
Poaceae	<i>Enneapogon robustissimus</i>		LC	NL				x
Poaceae	<i>Enneapogon sp.</i>		LC	NL			x	
Poaceae	<i>Enneapogon truncatus</i>	Bottle washer	LC	NL		x		

Family	Scientific Name	Common Name	Status		Spring 2004	Autumn 2018	Autumn 2019	Autumn 2023
			NC Act/ BS Act	EPBC Act				
Poaceae	<i>Enteropogon acicularis</i>		LC	NL				x
Poaceae	<i>Enteropogon ramosus</i>	Curly windmil grass	LC	NL	x	x	x	x
Poaceae	<i>Entolasia stricta</i>	Wiry panic	LC	NL	x			x
Poaceae	<i>Eragrostis elongata</i>		LC	NL	x			x
Poaceae	<i>Eragrostis fallax</i>		LC	NL	x			
Poaceae	<i>Eragrostis lacunaria</i>	Purple love grass	LC	NL			x	
Poaceae	<i>Eragrostis sororia</i>		LC	NL		x		x
Poaceae	<i>Eragrostis sp.</i>		LC	NL	x		x	x
Poaceae	<i>Eragrostis speciosa</i>		LC	NL		x		
Poaceae	<i>Eriachne aristidea</i>		LC	NL	x		x	x
Poaceae	<i>Eriachne ciliata</i>		LC	NL				x
Poaceae	<i>Eriachne mucronata</i>	Wandarrie grass	LC	NL		x	x	
Poaceae	<i>Eriachne sp.</i>		LC	NL	x	x		
Poaceae	<i>Eriochloa procera</i>	Slender cup-grass	LC	NL		x		
Poaceae	<i>Eriochloa pseudoacrotricha</i>	Spring grass	LC	NL				x
Poaceae	<i>Eriochloa sp.</i>		LC	NL	x			
Poaceae	<i>Eulalia aurea</i>	Silky browntop	LC	NL				x
Poaceae	<i>Heteropogon contortus</i>	Black spear grass	LC	NL	x	x	x	x

Family	Scientific Name	Common Name	Status		Spring 2004	Autumn 2018	Autumn 2019	Autumn 2023
			NC Act/ BS Act	EPBC Act				
Poaceae	<i>Heteropogon triticeus</i>	Giant speargrass	LC	NL	x			
Poaceae	<i>Iseilema vaginiflorum</i>	Red flinders grass	LC	NL				x
Poaceae	<i>Megathursus maximus</i>	Green panic	Int.	NL	x		x	x
Poaceae	<i>Melinis repens</i>	Red natal	Int.	NL	x	x	x	x
Poaceae	<i>Mnesithea rottboellioides</i>		LC	NL		x		
Poaceae	<i>Panicum decompositum</i>	Australian Millet	LC	NL				x
Poaceae	<i>Panicum effusum</i>	Hairy panic	LC	NL		x	x	x
Poaceae	<i>Paspalidium sespitotum</i>	Brigalow grass	LC	NL			x	x
Poaceae	<i>Paspalidium sp.</i>		LC	NL	x			
Poaceae	<i>Perotis rara</i>	Comet grass	LC	NL		x	x	x
Poaceae	<i>Sarga plumosum</i>		LC	NL		x	x	x
Poaceae	<i>Schizachyrium fragile</i>	Firegrass	LC	NL				x
Poaceae	<i>Sehima nervosum</i>		LC	NL		x	x	x
Poaceae	<i>Setaria surgens</i>		LC	NL	x			x
Poaceae	<i>Sporobolus actinocladus</i>		LC	NL				x
Poaceae	<i>Sporobolus australasicus</i>		LC	NL	x			x
Poaceae	<i>Sporobolus caroli</i>	Fairy grass	LC	NL	x			x
Poaceae	<i>Sporobolus creber</i>		LC	NL				x

Family	Scientific Name	Common Name	Status		Spring 2004	Autumn 2018	Autumn 2019	Autumn 2023
			NC Act/ BS Act	EPBC Act				
Poaceae	<i>Sporobolus elongatus</i>	Slender rat's tail grass	LC	NL				x
Poaceae	<i>Thellungia advena</i>	Coolibah grass	LC	NL	x			x
Poaceae	<i>Themeda triandra</i>	Kangaroo grass	LC	NL	x		x	x
Poaceae	<i>Tragus australianus</i>		LC	NL	x		x	x
Poaceae	<i>Urochloa mosambicensis</i>	Sabi grass	Int.	NL			x	x
Poaceae	<i>Whiteochloa airoides</i>		LC	NL				x
Polygalaceae	<i>Polygala sp.</i>		LC	NL				x
Polygonaceae	<i>Persicaria attenuata</i>	Hairy knotweed	LC	NL	x			
Polygonaceae	<i>Persicaria orientalis</i>	Prince's feather	LC	NL	x			
Portulacaceae	<i>Portulaca bicolor</i>		LC	NL				x
Portulacaceae	<i>Portulaca oleracea</i>	Pigweed	Int.	NL		x	x	
Portulacaceae	<i>Portulaca pilosa</i>	Hairy pigweed	Int.	NL			x	
Portulacaceae	<i>Portulaca sp.</i>		LC	NL	x			x
Potamogetonaceae	<i>Potamogeton javanicus</i>		Int.	NL	x			
Proteaceae	<i>Grevillea longistyla</i>		LC	NL	x			
Proteaceae	<i>Grevillea parallela</i>		LC	NL				x
Proteaceae	<i>Grevillea striata</i>	Beefwood	LC	NL	x	x		x
Proteaceae	<i>Hakea lorea</i>	Bootlace oak	LC	NL	x			x

Family	Scientific Name	Common Name	Status		Spring 2004	Autumn 2018	Autumn 2019	Autumn 2023
			NC Act/ BS Act	EPBC Act				
Proteaceae	<i>Persoonia falcata</i>	Booral	LC	NL			x	x
Pteridaceae	<i>Cheilanthes sieberi</i>	Mulga fern	LC	NL	x			x
Rhamnaceae	<i>Alphitonia excelsa</i>	Soap tree	LC	NL	x	x	x	x
Rhamnaceae	<i>Ventilago sp.</i>		LC	NL	x			
Rhamnaceae	<i>Ventilago viminalis</i>	Supplejack	LC	NL	x	x	x	x
Rubiaceae	<i>Coelospermum reticulatum</i>		LC	NL	x			x
Rubiaceae	<i>Cyclophyllum coprosmoides var. coprosmoides</i>	Coast canthium	LC	NL	x			
Rubiaceae	<i>Larsenaikia ochreatea</i>		LC	NL	x			x
Rubiaceae	<i>Pssydrax oleifolia</i>		LC	NL				x
Rubiaceae	<i>Psychotria sp.</i>		LC	NL	x			
Rubiaceae	<i>Psydrax johnsoni</i>		LC	NL				x
Rubiaceae	<i>Psydrax sp.</i>		LC	NL	x		x	
Rubiaceae	<i>Psydrax saligna</i>		LC	NL	x			
Rubiaceae	<i>Richardia brasiliensis</i>		Int.	NL			x	x
Rubiaceae	<i>Spermacoce brevifolia</i>		Int.	NL				x
Rubiaceae	<i>Tarenna sp.</i>		LC	NL	x	x	x	x
Rutaceae	<i>Citrus glauca</i>	Desert lime	LC	NL	x	x	x	x
Rutaceae	<i>Flindersia dissosperma</i>		LC	NL	x		x	x

Family	Scientific Name	Common Name	Status		Spring 2004	Autumn 2018	Autumn 2019	Autumn 2023
			NC Act/ BS Act	EPBC Act				
Rutaceae	<i>Geijera parviflora</i>	Wilga	LC	NL	x	x	x	x
Santalaceae	<i>Exocarpos latifolius</i>	Broad leaved native cherry	LC	NL	x			
Santalaceae	<i>Santalum lanceolatum</i>	Sandalwood	LC	NL	x			x
Sapindaceae	<i>Alectryon connatus</i>	Alectryon	LC	NL	x			x
Sapindaceae	<i>Alectryon diversifolius</i>		LC	NL				x
Sapindaceae	<i>Alectryon oleifolius</i>		LC	NL	x		x	x
Sapindaceae	<i>Atalaya hemiglauca</i>	Whitewood	LC	NL	x	x	x	x
Sapindaceae	<i>Cupaniopsis anacardiodes</i>	Tuckeroo	LC	NL	x			
Sapotaceae	<i>Planchonella pohlmaniana</i>		LC	NL	x			
Scrophulariaceae	<i>Eremophila debilis</i>	Creeping boobialla	LC	NL			x	x
Scrophulariaceae	<i>Eremophila mitchellii</i>	False sandalwood	LC	NL		x	x	x
Scrophulariaceae	<i>Myoporum acuminatum</i>	Coastal boobialla	LC	NL				x
Solanaceae	<i>Solanum ellipticum</i>	Potato bush	LC	NL		x	x	
Solanaceae	<i>Solanum nigrum</i>	Black nightshade	Int.	NL				x
Solanaceae	<i>Solanum sp.</i>		LC	NL				x
Sparmanniaceae	<i>Corchorus trilocularis</i>	Wild jute	LC	NL				x
Thymelaeaceae	<i>Pimelea haematostachya</i>		LC	NL				x
Verbenaceae	<i>Lantana camara</i>	Lantana	RIP	WoNS		x		x

Family	Scientific Name	Common Name	Status		Spring 2004	Autumn 2018	Autumn 2019	Autumn 2023
			NC Act/ BS Act	EPBC Act				
Violaceae	<i>Pigea enneasperma</i>		LC	NL				x
Vitaceae	<i>Clematicissus opaca</i>	Slender grape	LC	NL			x	

LC Least Concern
 NL Not Listed
 Int. Introduced
 OIP Other Invasive Plant
 RIP Restricted Invasive Plant
 WoNS Weed of National Significance

Appendix G. Fauna species list

Family	Scientific Name	Common Name	Status		Spring		Autumn		Summer		Autumn		Spring		Autumn		Total
			NC Act	EPBC Act	-2004		-2017		-2018		-2018		-2018		-2019		
					OPPS	Sites	OPPS	Sites	OPPS	Sites	OPPS	Sites	OPPS	Sites	OPPS	Sites	
Amphibians																	
Bufonidae	Rhinella marina	Cane toad	OIP	F								1					1
Hylidae	Litoria caerulea	Green tree frog	LC	-								2				1	3
Hylidae	Litoria inermis	Bumpy rocket frog	LC	-		3											3
Hylidae	Litoria latopalmata	Broad-palmed frog	LC	-		50											50
Limnodynastidae	Limnodynastes peronii	Striped marsh frog	LC	-				9									9
Limnodynastidae	Limnodynastes tasmaniensis	Spotted grass frog	LC	-				1		116							117
Limnodynastidae	Limnodynastes terraereginae	Northern banjo frog	LC	-				1									1
Limnodynastidae	Platyplectrum ornatum	Ornate burrowing frog	LC	-		1		16									17
Reptiles																	
Agamidae	Diporiphora australis	Tommy roundhead	LC	-		3		2							2		7
Agamidae	Pogona barbata	Bearded dragon	LC	-			1	1				2			2		6
Carphodactylidae	Nephrurus asper	Rough knob-tailed gecko	LC	-		1		1									2
Diplodactylidae	Diplodactylus conspicillatus	Fat-tailed gecko	LC	-		1											1
Diplodactylidae	Oedura monilis	Ocellated velvet gecko	LC	-		5	1	1									7
Diplodactylidae	Strophurus williamsi	Eastern spiny-tailed gecko	LC	-		2											2
Gekkonidae	Gehyra dubia	Dubious dtella	LC	-		13		2				15				1	31
Gekkonidae	Heteronotia binoei	Bynoe's gecko	LC	-		14		6								3	23
Pygopodidae	Lialis burtonis	Burton's snake-lizard	LC	-											1		1

Family	Scientific Name	Common Name	Status		Spring		Autumn		Summer		Autumn		Spring		Autumn		Total
					-2004		-2017		-2018		-2018		-2018		-2019		
			NC Act	EPBC Act	OPPS	Sites	OPPS	Sites	OPPS	Sites	OPPS	Sites	OPPS	Sites	OPPS	Sites	
Scincidae	Anomalopus brevicollis	Short-necked worm-skink	LC	-		2											2
Scincidae	Carlia pectoralis	Open-litter rainbow-skink	LC	-		13		4				17					34
Scincidae	Carlia rubigo	Orange-flanked rainbow skink	LC	-				6				6					12
Scincidae	Carlia sp.	a rainbow skink	-	-											1		1
Scincidae	Carlia vivax	Tussock rainbow skink	LC	-				1									1
Scincidae	Cryptoblepharus plagiocephalus	Péron's snake-eyed skink	LC	-		9											9
Scincidae	Cryptoblepharus virgatus	Striped snake-eyed skink	LC	-				2									2
Scincidae	Ctenotus robustus	Robust ctenotus	LC	-	1												1
Scincidae	Ctenotus taeniolatus	Copper-tailed skink	LC	-		3											3
Scincidae	Lerista fragilis	Eastern Mulch Slider	LC	-		5											5
Scincidae	Lygisaurus foliorum	Iridescent litter-skink	LC	-				2									2
Scincidae	Menetia greyii	Common dwarf skink	LC	-		2											2
Scincidae	Morethia boulengeri	Boulenger's snake-eyed skink	LC	-											2		2
Scincidae	Morethia sp.		-	-													0
Scincidae	Morethia taeniopleura	Fire-tailed skink	LC	-		2		4									6
Scincidae	Scincidae sp.	a skink	-	-				1									1
Varanidae	Varanus tristis	Black-headed monitor	LC	-		1		1									2
Boidae	Antaresia maculosa	Spotted python	LC	-	1												1
Boidae	Morelia spilota	Carpet python	LC	-				1									1
Colubridae	Boiga irregularis	Brown tree snake	LC	-												1	1

Family	Scientific Name	Common Name	Status		Spring		Autumn		Summer		Autumn		Spring		Autumn		Total
					-2004		-2017		-2018		-2018		-2018		-2019		
			NC Act	EPBC Act	OPPS	Sites	OPPS	Sites	OPPS	Sites	OPPS	Sites	OPPS	Sites	OPPS	Sites	
Colubridae	<i>Tropidonophis mairii</i>	Keelback	LC	-				1									1
Elapidae	<i>Cryptophis nigrostriatus</i>	Black-striped snake	LC	-				1									1
Elapidae	<i>Demansia psammophis</i>	Yellow-faced whip snake	LC	-				1									1
Elapidae	<i>Elapidae sp.</i>	an elapid snake	-	-		1											1
Elapidae	<i>Furina ornata</i>	Orange-naped snake	LC	-		1											1
Elapidae	<i>Hoplocephalus bitorquatus</i>	Pale-headed snake	LC	-				1									1
Birds																	
Acanthizidae	<i>Acanthiza (Geobasileus) reguloides</i>	Buff-rumped thornbill	LC	-		6						1					7
Acanthizidae	<i>Gerygone olivacea</i>	White-throated gerygone	LC	-		10		1				1					12
Acanthizidae	<i>Smicrornis brevirostris</i>	Weebill	LC	-		28						6					34
Accipitridae	<i>Accipiter (Leucospiza) fasciatus</i>	Brown goshawk	LC	-		1											1
Accipitridae	<i>Aquila (Uroaetus) audax audax</i>	Wedge-tailed eagle	LC	-		4						2			1		7
Accipitridae	<i>Haliastur sphenurus</i>	Whistling kite	LC	Ma		1		1				1				2	5
Aegothelidae	<i>Aegotheles (Aegotheles) cristatus</i>	Australian owlet-nightjar	LC	-								2				1	3
Anatidae	<i>Anas (Anas) superciliosa</i>	Pacific black duck	LC	-				2									2
Anatidae	<i>Aythya (Nyroca) australis</i>	Hardhead	LC	-				1									1
Anatidae	<i>Oxyura australis</i>	Blue-billed duck	LC	-				1									1
Anhingidae	<i>Anhinga novaehollandiae</i>	Australasian darter	LC	-		1					1						2
Ardeidae	<i>Ardea alba</i>	Great egret	LC	Ma		1											1
Ardeidae	<i>Ardea pacifica</i>	White-necked heron	LC	-							1						1
Artamidae	<i>Cracticus nigrogularis</i>	Pied butcherbird	LC	-		5		55		9		9				9	87
Artamidae	<i>Cracticus tibicen</i>	Australian magpie	LC	-		10		37		2		6				4	59

Family	Scientific Name	Common Name	Status		Spring		Autumn		Summer		Autumn		Spring		Autumn		Total
					-2004		-2017		-2018		-2018		-2018		-2019		
			NC Act	EPBC Act	OPPS	Sites	OPPS	Sites	OPPS	Sites	OPPS	Sites	OPPS	Sites	OPPS	Sites	
Artamidae	<i>Cracticus torquatus</i>	Grey butcherbird	LC	-		4						4				1	9
Artamidae	<i>Strepera (Strepera) graculina</i>	Pied currawong	LC	-		3				3							6
Cacatuidae	<i>Cacatua (Cacatua) galerita</i>	Sulphur-crested cockatoo	LC	-		8		5		2		3				1	19
Cacatuidae	<i>Eolophus roseicapilla</i>	Galah	LC	-	10	19										2	31
Cacatuidae	<i>Nymphicus hollandicus</i>	Cockatiel	LC	-		6											6
Campephagidae	<i>Coracina (Coracina) novaehollandiae</i>	Black-faced cuckoo-shrike	LC	Ma		6		35				8				3	52
Campephagidae	<i>Coracina (Coracina) papuensis</i>	White-bellied cuckoo-shrike	LC	Ma		3											3
Campephagidae	<i>Coracina (Pteropodocys) maxima</i>	Ground cuckoo-shrike	LC	-	3	3											6
Caprimulgidae	<i>Caprimulgus macrurus</i>	Large-tailed nightjar	LC	-		1											1
Caprimulgidae	<i>Eurostopodus (Eurostopodus) mystacalis</i>	White-throated nightjar	LC	-												1	1
Casuariidae	<i>Dromaius novaehollandiae</i>	Emu	LC	-	3	5	4	8			1	1					22
Charadriidae	<i>Elseyornis melanops</i>	Black-fronted dotterel	LC	-		2											2
Charadriidae	<i>Vanellus (Lobipluvia) miles</i>	Masked lapwing	LC	-				4									4
Columbidae	<i>Geopelia humeralis</i>	Bar-shouldered dove	LC	-				4		2		3					9
Columbidae	<i>Geopelia striata placida</i>	Peaceful dove	LC	-		10		5								2	17
Columbidae	<i>Geophaps scripta scripta</i>	Squatter Pigeon	V										13				13
Columbidae	<i>Ocyphaps lophotes</i>	Crested pigeon	LC	-		6		8								1	15
Coraciidae	<i>Eurystomus orientalis</i>	Dollarbird	LC	Ma				10									10
Corcoracidae	<i>Struthidea cinerea</i>	Apostlebird	LC	-		26		20				1					47
Corvidae	<i>Corvus coronoides</i>	Australian raven	LC	-						9		2					11
Corvidae	<i>Corvus orru</i>	Torresian crow	LC	-		26		29				5				8	68
Cuculidae	<i>Scythrops novaehollandiae</i>	Channel-billed cuckoo	LC	-												1	1

Family	Scientific Name	Common Name	Status		Spring		Autumn		Summer		Autumn		Spring		Autumn		Total
					-2004		-2017		-2018		-2018		-2018		-2019		
			NC Act	EPBC Act	OPPS	Sites	OPPS	Sites	OPPS	Sites	OPPS	Sites	OPPS	Sites	OPPS	Sites	
Dicruridae	Dicrurus bracteatus	Spangled drongo	LC	Ma				1		2					2		5
Estrildidae	Stizoptera bichenovii	Double-barred finch	LC	-		12											12
Falconidae	Falco (Leracidea) berigora	Brown falcon	LC	-		1											1
Falconidae	Falco (Tinnunculus) cenchroides	Nankeen kestrel	LC	Ma		2											2
Gruidae	Grus (Mathewsia) rubicunda	Brolga	LC	-		4											4
Halcyonidae	Dacelo (Dacelo) leachii	Blue-winged kookaburra	LC	-		1											1
Halcyonidae	Dacelo (Dacelo) novaeguineae	Laughing kookaburra	LC	-		11		22		2	1	2					38
Halcyonidae	Todiramphus (Cyanalcyon) pyrrhopygius	Red-backed kingfisher	LC	-	1	1											2
Halcyonidae	Todiramphus (Lazulena) macleayii	Forest kingfisher	LC	Ma	1	1		1									3
Hirundinidae	Petrochelidon (Hylochelidon) nigricans	Tree martin	LC	Ma		4											4
Maluridae	Malurus (Leggeornis) lamberti	Variegated fairy-wren	LC	-		4											4
Maluridae	Malurus (Malurus) cyaneus	Superb fairy-wren	LC	-								3					3
Maluridae	Malurus (Musciparus) melanocephalus	Red-backed fairy-wren	LC	-		4											4
Meliphagidae	Entomyzon cyanotis	Blue-faced honeyeater	LC	-		4		14							1		19
Meliphagidae	Lichmera (Lichmera) indistincta	Brown honeyeater	LC	-		4											4
Meliphagidae	Manorina (Myzantha) flavigula	Yellow-throated miner	LC	-		6											6
Meliphagidae	Manorina (Myzantha) melanocephala	Noisy miner	LC	-	2	2		16		2		11				2	35
Meliphagidae	Meliphaga (Meliphaga) lewinii	Lewin's honeyeater	LC	-								1					1
Meliphagidae	Melithreptus (Melithreptus) albogularis	White-throated honeyeater	LC	-		15		18									33
Meliphagidae	Myzomela (Myzomela) sanguinolenta	Scarlet honeyeater	LC	-		3											3
Meliphagidae	Philemon (Microphilemon) citreoqularis	Little friarbird	LC	-		6		60									66

Family	Scientific Name	Common Name	Status		Spring		Autumn		Summer		Autumn		Spring		Autumn		Total
					-2004		-2017		-2018		-2018		-2018		-2019		
			NC Act	EPBC Act	OPPS	Sites	OPPS	Sites	OPPS	Sites	OPPS	Sites	OPPS	Sites	OPPS	Sites	
Meliphagidae	Philemon (Tropidorhynchus) corniculatus	Noisy friarbird	LC	-		48				1		3				1	53
Meropidae	Merops (Merops) ornatus	Rainbow bee-eater	LC	Ma		18											18
Monarchidae	Grallina cyanoleuca	Magpie-lark	LC	Ma		2		9				3				5	19
Monarchidae	Myiagra (Myiagra) cyanoleuca	Satin flycatcher	LC	-								2			2		4
Monarchidae	Myiagra (Myiagra) rubecula	Leaden flycatcher	LC	-		4											4
Motacillidae	Anthus (Anthus) novaeseelandiae	Australian pipit	LC	Ma		6											6
Nectariniidae	Dicaeum (Dicaeum) hirundinaceum	Mistletoebird	LC	-								2					2
Neosittidae	Daphoenositta (Neositta) chrysoptera	Varied sittella	LC	-	10	24											34
Oriolidae	Oriolus (Mimeta) sagittatus	Olive-backed oriole	LC	-													0
Otididae	Ardeotis australis	Australian bustard	LC	-	4	7										3	14
Pachycephalidae	Colluricincla (Colluricincla) harmonica	Grey shrike-thrush	LC	-	2	2				1		4					9
Pachycephalidae	Pachycephala (Alisterornis) rufiventris	Rufous whistler	LC	-		4						4			2		10
Pardalotidae	Pardalotus (Pardalotinus) striatus	Striated pardalote	LC	-		30		3				4			1	8	46
Pardalotidae	Pardalotus (Pardalotinus) striatus melanocephalus	Black-headed pardalote	LC	-				16									16
Pelecanidae	Pelecanus conspicillatus	Australian pelican	LC	Ma		1						3					4
Phalacrocoracidae	Phalacrocorax (Phalacrocorax) sulcirostris	Little black cormorant	LC	-		6											6
Phalacrocoracidae	Phalacrocorax melanoleucos	Little pied cormorant	LC	-		1											1
Phasianidae	Coturnix (Coturnix) pectoralis	Stubble quail	LC	Ma		2											2
Phasianidae	Coturnix (Synoicus) ypsilophora	Brown quail	LC	-	2	2									2		6
Podargidae	Podargus strigoides	Tawny frogmouth	LC	-		2	1	1				1					5
Pomatostomidae	Pomatostomus (Pomatostomus) temporalis	Grey-crowned babbler	LC	-		10		18				1				5	34
Psittacidae	Aprosmictus erythropterus	Red-winged parrot	LC	-		2		35		8		6				9	60

Family	Scientific Name	Common Name	Status		Spring		Autumn		Summer		Autumn		Spring		Autumn		Total
			NC Act	EPBC Act	-2004		-2017		-2018		-2018		-2018		-2019		
					OPPS	Sites	OPPS	Sites	OPPS	Sites	OPPS	Sites	OPPS	Sites	OPPS	Sites	
Psittacidae	<i>Platycercus (Violania) adscitus</i>	Pale-headed rosella	LC	-		23		10		7						6	46
Psittacidae	<i>Trichoglossus haematodus moluccanus</i>	Rainbow lorikeet	LC	-		12		99		17		15					143
Ptilonorhynchidae	<i>Ptilonorhynchus maculatus</i>	Spotted bowerbird	LC	-		2									1		3
Rallidae	<i>Fulica atra</i>	Eurasian coot	LC	-				1									1
Rhipiduridae	<i>Rhipidura (Howeavis) rufifrons</i>	Rufous fantail	LC	Mi				3				2					5
Rhipiduridae	<i>Rhipidura (Rhipidura) albiscapa</i>	Grey fantail	LC	-		4						1					5
Rhipiduridae	<i>Rhipidura (Sauloprocta) leucophrys</i>	Willie wagtail	LC	-		5		1				3					9
Strigidae	<i>Ninox (Ninox) novaeseelandiae</i>	Southern boobook	LC	Ma		7						2					9
Threskiornithidae	<i>Plegadis falcinellus</i>	Glossy ibis	SLC	Mi				5									5
Threskiornithidae	<i>Threskiornis spinicollis</i>	Straw-necked ibis	LC	Ma		2											2
Tytonidae	<i>Tyto (Megastrix) novaehollandiae novaehollandiae</i>	Masked owl	LC	-												1	1
Tytonidae	<i>Tyto alba</i>	Barn owl	LC	-	1	3											4
Mammals																	
Emballonuridae	<i>Saccolaimus flaviventris</i>	Yellow-bellied sheath-tail-bat	LC	-			1			U		U				U	U
Emballonuridae	<i>Taphozous georgianus</i>	Common sheath-tail-bat	LC	-		U		U		U							U
Emballonuridae	<i>Taphozous troughtoni</i>	Troughton's sheath-tail-bat	LC	-						U							U
Molossidae	<i>Austronomus australis</i>	White-striped freetail-bat	LC	-						U							U
Molossidae	<i>Chaerephon jobensis</i>	Greater northern freetail-bat	LC	-				U		U		U				U	U
Molossidae	<i>Mormopterus (Ozimops) lumsdenae</i>	Northern free-tailed bat	LC	-				U		U		U				U	U
Molossidae	<i>Mormopterus (Ozimops) ridei</i>	Ride's free-tailed bat	LC	-				U		U						U	U

Family	Scientific Name	Common Name	Status		Spring		Autumn		Summer		Autumn		Spring		Autumn		Total
					-2004		-2017		-2018		-2018		-2018		-2019		
			NC Act	EPBC Act	OPPS	Sites	OPPS	Sites	OPPS	Sites	OPPS	Sites	OPPS	Sites	OPPS	Sites	
Molossidae	Mormopterus (Setirostris) eleryi	Hairy-nosed freetail-bat	LC	-						A							A
Molossidae	Mormopterus sp.	a freetail-bat	LC	-		U						U					U
Pteropodidae	Pteropus scapulatus	Little red flying-fox	LC	-			1			U							U
Vespertilionidae	Chalinolobus gouldii	Gould's wattled bat	LC	-		U		U		U		U				U	U
Vespertilionidae	Chalinolobus morio	Chocolate wattled bat	LC	-			1	U		A							U
Vespertilionidae	Chalinolobus nigrogriseus	Hoary wattled bat	LC	-		U		U		U		A				U	U
Vespertilionidae	Chalinolobus picatus	Little pied bat	LC	-				U		U		U				U	U
Vespertilionidae	Miniopterus australis	Little bentwing-bat	LC	-				U		U		U				U	U
Vespertilionidae	Miniopterus schreibersii oceanensis	Eastern bentwing-bat	LC	-				U		A						A	U
Vespertilionidae	Nyctophilus geoffroyi	Lesser long-eared bat	LC	-		U		U		U							U
Vespertilionidae	Scoteanax rueppellii	Greater broad-nosed bat	LC	-						A							A
Vespertilionidae	Scotorepens balstoni	Inland broad-nosed bat	LC	-				1	U		U		A			U	U
Vespertilionidae	Scotorepens greyii	Little broad-nosed bat	LC	-				1	U		U		A			U	U
Vespertilionidae	Scotorepens orion	Eastern broad-nosed bat	LC	-						A							A
Vespertilionidae	Scotorepens sanborni	Northern broad-nosed bat	LC	-				1	U		U		A			A	U
Vespertilionidae	Vespadelus baverstocki	Inland forest bat	LC	-					U		U					A	U
Vespertilionidae	Vespadelus troughtoni	Eastern cave bat	LC	-				2	U		U		U			U	U
Dasyuridae	Planigale ingrami	Long-tailed planigale	LC	-					1								1
Dasyuridae	Planigale tenuirostris	Narrow-nosed planigale	LC	-			1										1
Dasyuridae	Sminthopsis macroura	Stripe-faced dunnart	LC	-			1										1
Macropodidae	Macropus sp.	a macropod	-	-					1								1

Family	Scientific Name	Common Name	Status		Spring		Autumn		Summer		Autumn		Spring		Autumn		Total
					-2004		-2017		-2018		-2018		-2018		-2019		
			NC Act	EPBC Act	OPPS	Sites	OPPS	Sites	OPPS	Sites	OPPS	Sites	OPPS	Sites	OPPS	Sites	
Macropodidae	Macropus giganteus	Eastern grey kangaroo	LC	-		4		3			5	8			3		23
Macropodidae	Osphranter robustus	Common wallaroo	LC	-		2		1									3
Macropodidae	Petrogale inornata	Unadorned rock-wallaby	LC	-				2			1	4			2		9
Macropodidae	Petrogale sp.	a rock-wallaby	LC	-		2											2
Macropodidae	Wallabia bicolor	Swamp wallaby	LC	-								2			1		3
Peramelidae	Isoodon macrourus	Northern brown bandicoot	LC	-		1											1
Petauridae	Petaurus norfolcensis	Squirrel glider	LC	-				1									1
Phalangeridae	Trichosurus vulpecula	Common brushtail possum	LC	-		1		2				1					4
Potoroidae	Aepyprymnus rufescens	Rufous bettong	LC	-		1		9				2					12
Pseudocheiridae	Petauroides volans	Greater glider	V	V				15				4		38			57
Tachyglossidae	Tachyglossus aculeatus	Short-beaked echidna	SLC	-		2		1									3
Canidae	Canis familiaris	Dingo / Dog	RIP	-		1						2				1	4
Felidae	Felis catus	Cat	RIP	F		2		2								1	5
Leporidae	Oryctolagus cuniculus	Rabbit	RIP	F		4		11				1					16
Muridae	Mus musculus	House mouse	OIP	-		3											3
Suidae	Sus scrofa	Pig	RIP	F		2									3		5

OPPS denotes an opportunistic record, observed incidentally during survey

LC Least Concern

SLC Special Least Concern

V Vulnerable

Mi Migratory

Ma Marine

OIP 'Other' Invasive Pest

RIP 'Restricted' Invasive Pest

U denotes an unambiguous identification of the species via bat call analysis

A denotes an ambiguous (unconfirmed) identification of the species via bat call analysis

Appendix H. Poplar Box Grassy Woodland on Alluvial Plains TEC threshold assessment data

Poplar patch 1

Attribute	VT42	VT43	VT44	VT45	VT46	VT47	Mean
Tree canopy cover (%)	31	43.5	41.5	62	8.5	15.5	33.67
Tree subcanopy (<10m)/shrub cover (%)	11.5	13	24.5	8	9	77.8	23.97
Native vegetation cover in ground layer (%) of perennial vegetation	83.6	98.1	100	7.9	96.9	100	81.1
Native plant species ground layer per patch	39	31	31	33	31	29	>30
Number of mature trees per ha (>30dbh)	8	26	26	30	14	16	20
Recruitment	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Size of patch (ha)	>80						
Poplar TEC Category	Category A2						

Poplar patch 2, 3 and 5

Attribute	VT52
Tree canopy cover (%)	53.5
Tree subcanopy (<10m)/shrub cover (%)	12.5
Native vegetation cover in ground layer (%) of perennial vegetation	17.6
Native plant species ground layer per patch	34
Number of mature trees per ha (>30dbh)	34
Recruitment	Yes
Size of patch (ha)	>5
Poplar TEC Category	Category C

Poplar patch 4

Attribute	VT17	VT18	Mean
Tree canopy cover (%)	46	27.4	36.7
Tree subcanopy (<10m)/shrub cover (%)	22	2.3	12.15
Native vegetation cover in ground layer (%) of perennial vegetation	66.7	5.2	35.9
Native plant species ground layer per patch	25	33	>20
Number of mature trees per ha (>30dbh)	50	22	36
Recruitment	Yes	Yes	Yes
Size of patch (ha)	>5		
Poplar TEC Category	Category C		

Poplar patch 6

Attribute	VT32
Tree canopy cover (%)	17.5
Tree subcanopy (<10m)/shrub cover (%)	0.6
Native vegetation cover in ground layer (%) of perennial vegetation	23.5
Native plant species ground layer per patch	32
Number of mature trees per ha (>30dbh)	12
Recruitment	Yes
Size of patch (ha)	>5
Poplar TEC Category	Category C

Poplar patch 7

Attribute	VT48	VT49	LSG08	Mean
Tree canopy cover (%)	40.5	61	28	43.17
Tree subcanopy (<10m)/shrub cover (%)	11.5	30.5	18	20
Native vegetation cover in ground layer (%) of perennial vegetation	66.7	17.5	92.8	59
Native plant species ground layer per patch	23	21	20	>20
Number of mature trees per ha (>30dbh)	20	56	10	28.67
Recruitment	Yes	Yes	Yes	Yes
Size of patch (ha)	>5			
Poplar TEC Category	Category B			

Poplar patch 8

Attribute	VT14
Tree canopy cover (%)	3.6
Tree subcanopy (<10m)/shrub cover (%)	25.5
Native vegetation cover in ground layer (%) of perennial vegetation	85.2
Native plant species ground layer (to add up, per patch)	20
Number of mature trees per ha (>30dbh)	14
Recruitment	Yes
Size of patch (ha)	>5
Poplar TEC Category	None

Poplar patch 9

Attribute	VT51
Tree canopy cover (%)	33.5
Tree subcanopy (<10m)/shrub cover (%)	33.5
Native vegetation cover in ground layer (%) of perennial vegetation	50.9
Native plant species ground layer per patch	20
Number of mature trees per ha (>30dbh)	32
Recruitment	Yes
Size of patch (ha)	>5
Poplar TEC Category	None

