

LEADING THE WAY
IN ENVIRONMENTAL
MANAGEMENT

**MATTERS OF NATIONAL
ENVIRONMENTAL SIGNIFICANCE
IMPACT ASSESSMENT**

**RW Corkery / Copi Mineral Sands,
Wentworth NSW - June 2025**

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Executive Summary

The Copi Mineral Sands Project (The Project) is a proposed open cut mineral sands mine. The Project will require the preparation, extraction and processing of heavy mineral ore to produce a heavy mineral concentrate. The Action includes construction, mining, primary processing, and rehabilitation of a single deposit located approximately 75 km northwest of Wentworth in NSW. The Project will extract a range of minerals containing titanium, zirconium, and rare earth elements (The Action), all of which are listed by the NSW and Commonwealth governments as Critical Minerals.

Biodiversity Australia (Bio Aus) has been engaged to review Matters of National Environmental Significance (MNES) listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) for the afore defined proposed Action. Biodiversity Australia has undertaken substantial survey and assessment to enable a determination as to whether The Project has *a real chance* (Save Our Strathbogies Forest Inc v Secretary to the Department of Energy, Environment and Climate Action [2024] FCA 317) of having a significant impact on any MNES entities.

This report is for R.W Corkery & Co Pty. Ltd (RWC) on behalf of RZ Resources Limited (the “Applicant”). The proposed mine and its associated infrastructure would be located within an area referred to as the Impact Site. The Impact Site contains the mineral extraction area referred to as the “Mine Site” and a haulage route referred to as the “Linear Corridor”.

The Impact area – Mine Site would result in direct impacts to 3,692.92 hectares (ha), which comprises Native Vegetation that is consistent with all identified Plant Community Types (PCTs). The Impact Area – Linear Corridor, would result in direct impacts to 190.16 ha of Native Vegetation.

The design of The Project has evolved in an iterative manner over a six-year period from 2018 to 2025 with great importance being placed on avoidance where possible. This has involved consideration of the findings of the technical and environmental studies undertaken, feedback from the local and wider community, and responses from the Biodiversity, Conservation and Science Directorate and other New South Wales agencies.

Thirteen vegetation communities were identified within the Impact Site. Each of the communities was assessed for associations with TECs. Only one, the Mallee Bird Community of the Murray Darling Depression Bioregion which is associated with PCT 170 Chenopod sandplain mallee woodland/shrubland, was assessed as having potential to occur within the Impact Site. All MNES entities recorded in the Impact Site, and those with suitable habitat and considered likely to occur in the Impact Site were subject to detailed assessment to determine the significance, or otherwise, of the impact/s. These entities, which have more than remote chance of being at risk of sustaining a significant impact, have been the subject of a detailed impact assessment in line with the MNES Significant impact guidelines 1.1. These species are:

1. Mallee Bird Community TEC.
2. South-eastern Hooded Robin (*Melanodryas cucullata cucullata*).
3. Southern Whiteface (*Aphelocephala leucopsis*).
4. Pink Cockatoo (*Lophochroa leadbeateri leadbeateri*).
5. Corben’s Long-eared Bat (*Nyctophilus corbeni*).

Flora species with potential to occur on the Impact Site and, having lower risk of having a non-remote chance of a significance impact, subject to a streamline MNES significance assessment are:



- A Saltbush (*Atriplex infrequens*).
- Winged Peppercress (*Lepidium monolocoides*).
- Desert greenhood (*Pterostylis xerophila*).
- Menindee Nightshade (*Solanum karsense*).
- Slender Darling-pea (*Swainsona murrayana*).
- Yellow Swainson-pea (*Swainsona pyrophila*).

Fauna species with potential to occur within the Impact Site and, having lower risk of having a non-remote chance of significance impact, have been subject to a streamline MNES significance assessment are:

- Murray Mallee Striated Grasswren (*Amytornis striatus howei*).
- Malleefowl (*Leipoa ocellata*).
- Grey Falcon (*Falco hypoleucos*).

All other species returned from the Protected Matters Search Tool were considered as having essential habitat elements absent from the Impact Site, such that all requirements for the lifecycle of the species could not be met. They were not considered further.

Field surveys conducted by EnviroKey since June 2020 and by Bio Aus since November 2024 have recorded the following EPBC Act listed species within the Impact Site:

- Southern Whiteface (*Aphelocephala leucopsis*).
- Pink Cockatoo* (*Lophochroa leadbeateri*) (foraging only).
- South-Eastern-Hooded Robin (*Melanodryas cucullata*).

The Project design includes a range of measures intended to mitigate and manage impacts on Biodiversity Values commensurate to the level of impact proposed by The Action. These include staging of vegetation clearing, avoidance of retained areas of vegetation, and pre-clearing surveys of spinifex grass and Hollow Bearing Trees.

All of the aforementioned species were assessed for the likelihood that the Action would have a non-remote chance of a significant impact via the Severity Assessment Matrix framework included within the Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) – 2013 Significant Impact Guideline 1.2. whilst it is acknowledged that the guideline 1.2 applies to actions on, or impacting upon, Commonwealth land, and actions by commonwealth agencies, it remains acutely appropriate in educating the balance of probabilities and ultimately the likelihood of a significant impact in relation to The Action. The Severity Assessment Matrix was used in conjunction with considerations of each species biology, distribution and sensitivity to the potential impacts of the Action, in the application of the Significant Impact Guidelines 1.1 (DEWHA 2013). From this assessment it has been confidently determined that no Matter of National Environmental Significance has more than a remote chance of incurring a Significant Impact and thus, referral to the Commonwealth Department of Climate Change, Energy, the Environment and Water is not considered necessary.



Abbreviations

Table 1: List of abbreviations used within the report

ALA	Atlas of Living Australia
AOO	Area of Occupancy
BAM	NSW Biodiversity Assessment Method 2020
BC Act	NSW Biodiversity Conservation Act 2016
Bio Aus	Biodiversity Australia
CE	Critically Endangered
CM	Centre meter
DAWE	Department of Agriculture, Water and the Environment
DBH	Diameter at Breast Height
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DotE	Department of the Environment
DSEWPC	Department of Sustainability, Environment, Water, Population and Communities
E	Endangered
EOO	Extent of Occurrence
EPBC Act	Environment Protection and Biodiversity Conservation Act
HA	Hectare
HBT	Hollow Bearing Tree
IBRA	Interim Biographic Regionalisation for Australia
KM	Kilometre
KTP	Key Threatening Process
LGA	Local Government Area
M	Million
MBC	Mallee Bird Community of the Murray Darling Depression Bioregion
MNES	Matters of National Environmental Significance
NSW	New South Wales
OEH	Office of Environment and Heritage
PCT	NSW Plant Community Type
PMST	Protected Matters Search Tool
SA	South Australia
TBDC	Threatened Species Database Collection
TSSC	Threatened Species Scientific Committee
TEC	Threatened Ecological Community
TPA	Tonnes per Annum
V	Vulnerable
WA	Western Australia



1. Introduction

The Copi Mineral Sands project (the Project) consists of the proposed development of an open-cut mineral sands mine (The Action) located approximately 75 km northwest of Wentworth, NSW (Figure 1). Biodiversity Australia (Bio Aus) has been engaged to assess the potential impacts associated with the Action on Matters of National Environmental Significance (MNES) listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and assess if the proposed Action will have a Significant Impact, representing a controlled Action, in accordance with the *Matters of National Environmental Significance Significant Impact Guidelines 1.1* (DoE 2013) (The Guidelines). Biodiversity Australia has undertaken significant survey effort and assessment to determine if a Significant Impact on MNES will occur as a result of the proposed Action.

Steps undertaken to complete the assessment were:

- Defining The Action extent and likely impacts,
- Search of MNES potentially occurring within Action are using the Protected Matters Search Tool (PMST) (**Appendix A-1**),
- Review of results from previous survey conducted by EnviroKey and Bio Aust between 2018 and 2025, and additional surveys targeting MNES entities assessed under the *New South Wales Biodiversity Conservation Act 2016* (BC Act) to have a 'moderate or 'high' likelihood of occurrence, between August 2024 and February 2025,
- Undertaking substantial levels of in-field investigation, in line with commonwealth and NSW Threatened species survey guidelines, as well as the BAM 2020 guidelines) to comprehensively capture and fully understand the biodiversity values of the Impact Site,
- A likelihood of occurrence assessment based on location and habitat constraints for all entities, and refinement of that assessment considering definitions of 'important populations' and 'habitat critical to the survival of the species, as well as local records of the entity (**Appendix A-2**), and
- An assessment of the significance of impacts from The Action upon all MNES entities which are known or likely to occur within the Impact Site based on survey records and/or the Potential Occurrence Assessment (POA).

After conducting thorough field surveys in line with EPBC Act threatened species survey methodologies, detailed significance assessments were undertaken for five (5) MNES entities (one (1) Threatened Ecological Community (TEC) and four (4) threatened species) considered to have a higher risk of having a non-remote chance of suffering a Significant Impact. Streamlined significance assessments were undertaken for five threatened flora species and four threatened fauna species considered to have a lower risk of there being a non-remote chance of a Significant Impact.

1.1 Definitions Used in the Report

This report uses key definitions and terms as per the MNES - Significant impact guidelines 1.1:

- **The Action:** A project, a development, an undertaking, an activity or a series of activities, or an alteration of any of these things, including but not limited to; construction, expansion, alteration or demolition of buildings, structures, infrastructure or facilities; industrial processes; mineral and petroleum resource exploration and extraction; storage or transport of hazardous materials;



waste disposal; earthworks; impoundment, extraction and diversion of water; agricultural activities; aquaculture; research activities; vegetation clearance; culling of animals; and dealings with land. The Action proposed specifically within the Copi Mineral Sands Project Impact Site is; the preparation of surface land for operations, vegetation clearance, construction of infrastructure and facilities, the extraction, storage and transport of mineral resources, extraction of water, altering of groundwater, rehabilitation and revegetation (MNES Significant Impact Guidelines 1.1. Introduction - Determining whether an action is likely to have a significant impact on a MNES).

- **Impact Site:** The site or area on which the proposed Action will have an impact. Sometimes also called a 'development envelope', or a project or development 'footprint'.
- **Less than a remote chance:** An extremely small possibility or likelihood
- **A remote chance:** A small possibility or likelihood
- **A real chance:** A genuine possibility or likelihood (Save Our Strathbogie Forest Inc v Secretary to the Department of Energy, Environment and Climate Action [2024] FCA 317)
- **Significant Impact:** Broadly, an impact that is important, notable or of consequence. The proponent must not take any action that has, will have or is likely to have a significant impact on a protected matter without first referring it for assessment (DCCEEW MNES - Glossary of terms)
- **Subject Land:** Land comprised of Lots 1907//DP763791, 1//DP1255308, 1940//DP763792 and 4068//DP766543 within the Impact Site – Mine Site area, and also Lots 4068//DP766543, 4117//DP766622, 3421//DP765710, 3422//DP765711, 3423//DP765712, 1908//DP763764, 1910//DP763766 and 3248//DP765453 within the Impact Site – Linear Corridor.



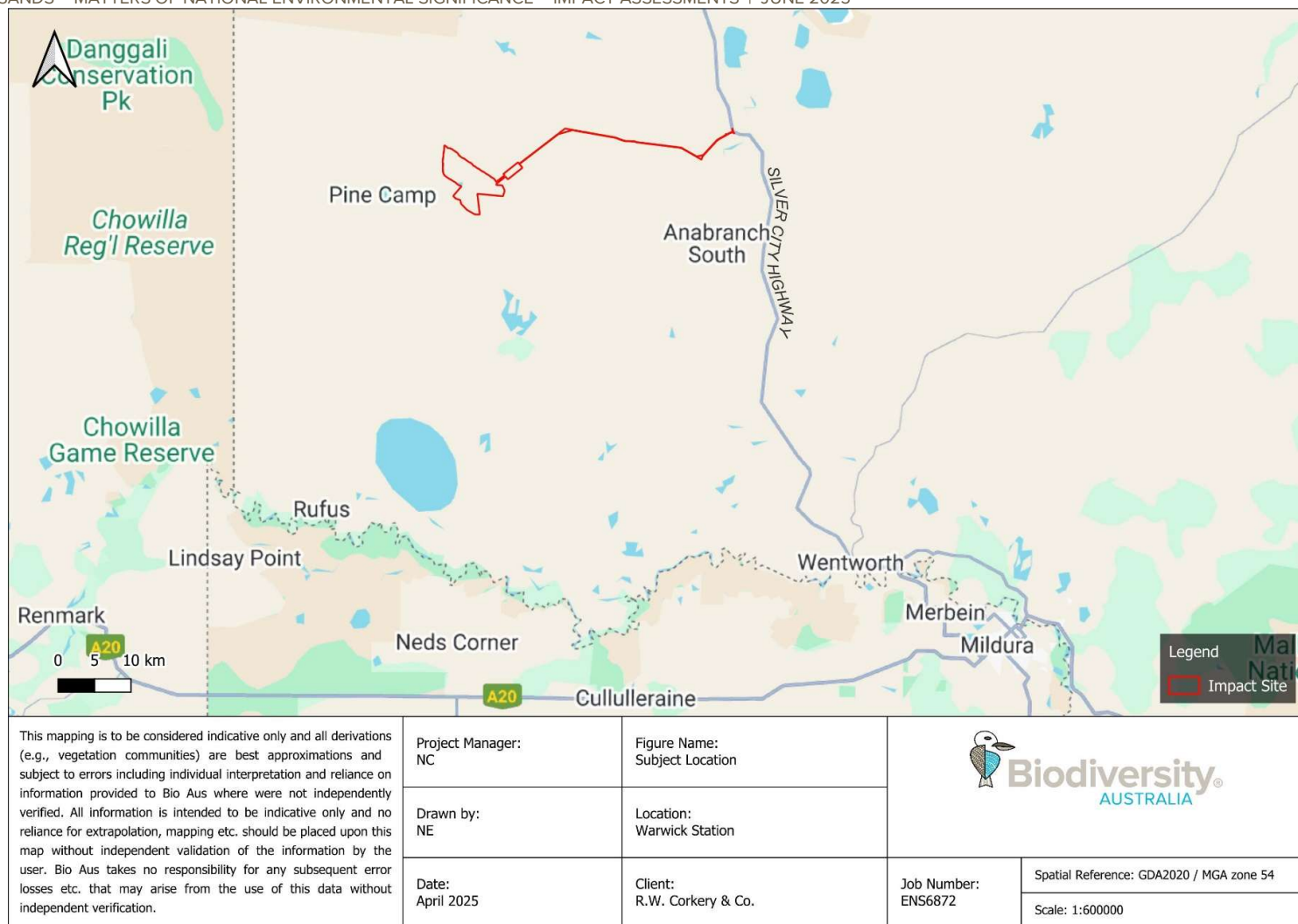


Figure 1: Location of the Impact Site in the locality and region



2. Environmental Statutory Considerations

The following section provides an outline of environmental planning acts and legislations relevant to the proposed development of the Impact Site. Compliance with legislation and guidelines below is necessary for approval of the proposed development.

2.1 Environmental Protection and Biodiversity Conservation Act 1999

The EPBC Act is the Federal Government's key environmental legislative instrument, established in 1999 to safeguard Australia's unique natural environment and cultural heritage history. It is designed to control and regulate any actions that may result in a significant environmental impact by mandating a national assessment process. At its core, the EPBC Act encapsulates Australia's commitment to conserving biodiversity and ensuring ecologically sustainable development by striking a balance between economic growth and environmental protection. The EPBC Act protects flora and fauna and extends to heritage sites, internationally recognised wetlands, and areas of profound cultural significance. This framework ensures that environmental risks are managed from both a regulatory and a practical perspective, influencing the decisions of government agencies, developers, and other stakeholders who undertake actions with the potential to influence these protected matters.

2.1.1 Matters of National Environmental Significance

Under the EPBC Act, certain environmental elements are classified as MNES. These form the basis of federal review and protection mechanisms. The Act lists seven (7) key types of protected matters, including:

- World Heritage Properties:
 - Sites of outstanding universal value that merit preservation for future generations.
- National Heritage Places:
 - Areas recognised by the nation due to their significant historical, cultural, or environmental attributes.
- Ramsar Wetlands:
 - Wetlands of international importance designated under the Ramsar Convention.
- Threatened Species and Ecological Communities:
 - Species and ecosystems in jeopardy of extinction or significant degradation.
- Migratory Species:
 - Species that rely on transboundary habitats and require international conservation efforts.
- Nuclear Actions:
 - Actions related to uranium mining, reflecting the high risks associated with nuclear materials and activities.
- The Commonwealth Marine Environment:
 - Marine areas are protected due to their biodiversity and ecological roles.

The above ensures that any action potentially affecting the seven (7) diverse elements automatically triggers a careful federal scrutiny process. By defining these categories, the Act provides clear benchmarks and triggers for environmental assessments. It not only protects the “what” in terms of specific sites and species but also the “why” by maintaining the integrity of Australia's environmental assets for both national and global benefit.



2.1.2 Defining “Significant Impact”

According to the guidelines outlined in DOE 2013 *“a significant impact is described as an effect that is important, notable, or of consequence”*. This definition is inherently multidimensional. It requires considering the sensitivity, value, and quality of the environmental component being affected, along with detailed attributes of the impact itself. Key factors that determine whether an impact is significant include:

- Intensity of the Impact:
 - Actions that cause substantial changes to the physical or biological components of the environment.
- Duration and Persistence:
 - Whether the change is temporary or long-lasting, including irreversible damage.
- Geographic Extent:
 - The spatial scale of the impact, which can range from a localised event to widespread ecological disturbances.
- Frequency and Cumulative Effects:
 - The likelihood of repeated or cumulative impacts from multiple actions.

The guidelines note that a significant impact is where there is a “real or not remote chance or possibility” (Strathbogie) that adverse environmental consequences may occur. This concept is inherently risk-based and involves environmental risk assessments. Environmental factors are to be evaluated guided by questions from the guidelines to systematically consider each variable, ensuring that the potential harm is neither underestimated nor ignored within the broader economic or development pressures.

2.1.3 Assessment Process and Decision-Making Framework

When a proposed action is anticipated to have any potential effect on MNES, it is referred to the EPBC Act’s assessment process. This process is a comprehensive review where the relevant documents and evidence provided by the project proponents are scrutinised. The assessment involves multiple stages:

- Referral:
 - Any entity proposing a development or action that might impact a protected matter must formally refer the proposal to the relevant authorities.
- Screening and Assessment:
 - Experts evaluate the proposal using the guidelines set out by the DOE, which lays out detailed questions regarding the scope, intensity, duration, and environmental context.
- Ministerial Decision:
 - Ultimately, the Environment Minister reviews the evidence and decides whether the action qualifies as a “controlled action” under the Act. Should the action be flagged as having a significant impact, further assessments, mitigation strategies, or even project modifications may be required.
- Approval and Monitoring:
 - Once approved, ongoing monitoring ensures that the projected impacts do not manifest in unexpected ways, and if they do, contingency plans are in place to address any environmental issues promptly.



This entire process reflects a commitment to transparency and precaution. It ensures that decisions are not made lightly and that environmental considerations are integrated into the planning and execution stages of potentially disruptive projects. The systematic approach encouraged by the guidelines helps guard against overt and subtle risks that might compromise critical environmental assets.

In a related context under section 139(2)(b) of the EPBC Act, the term “significant” has been taken to operate as a limitation to “*exclude impacts which are minor or negligible on a listed threatened species*” (*Northern Inland Council for the Environment Inc v Minister for the Environment (2013) 218 FCR 491 at [92] (Cowdroy J)*).

As Dowsett J observed in *Krajniw v Brisbane City Council (No 2) [2011] FCA 563 at [10]*, the purpose of the EPBC Act “would not be achieved if any possibly adverse effect upon a species, however minor and however unlikely, was sufficient to engage either of ss 18 and 18A”. Whether a proposed action is likely to have a significant impact under s 18 of the EPBC Act is a question of fact: (*Greentree at [192] (Sackville J)*; *Australian Brumby Alliance at [230] (O’Byrne J)*). Accordingly, this assessment has relied on data-driven decision making to demonstrate and draw its conclusions.

The assessment of significance was achieved by staging the methodology activities into four (4) stages, shown in Figure 2.



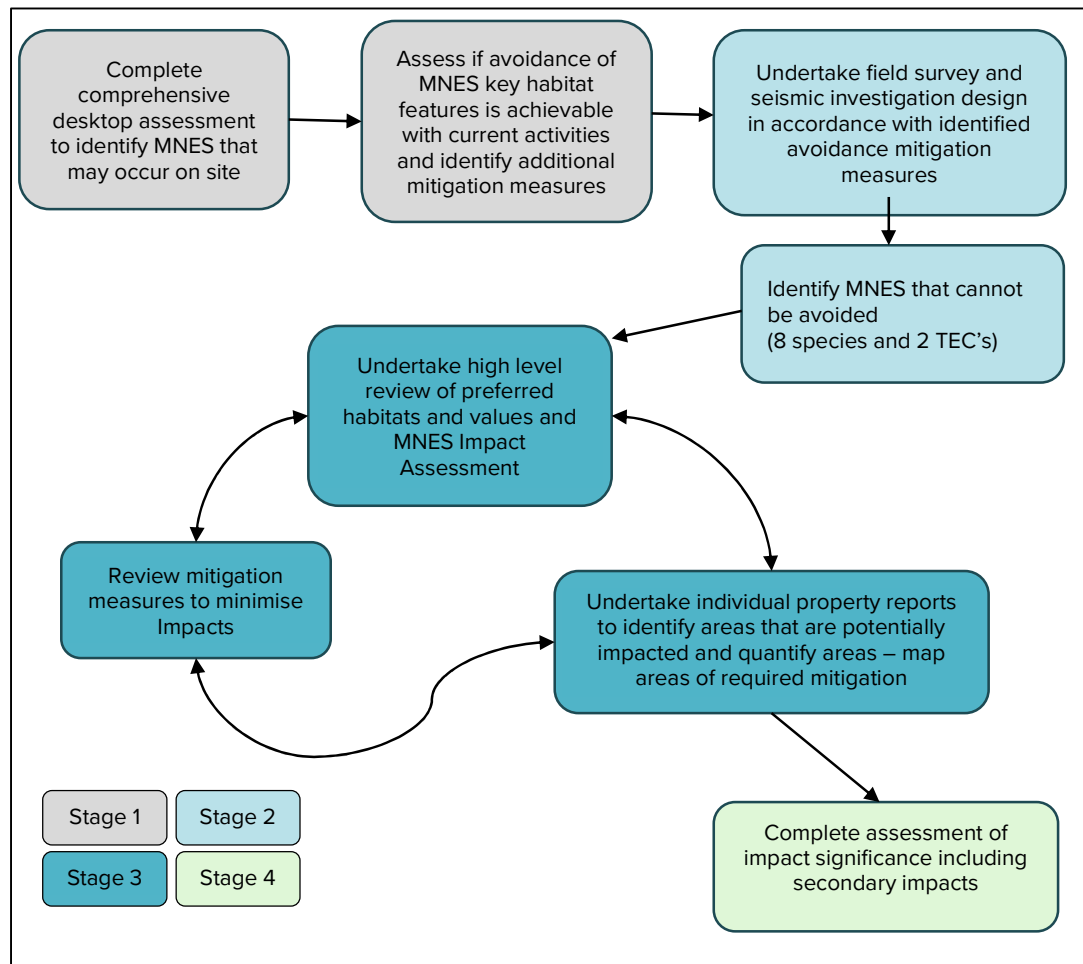


Figure 2: Impact Assessment Process



3. The Action

The Copi Mineral Sands Project is an open cut mineral sands mine. The Action is the extraction and processing of heavy mineral ore to produce a heavy mineral concentrate. The Action includes construction, mining, primary processing, and rehabilitation of a single deposit located approximately 75 km northwest of Wentworth in NSW. The Action will extract a range of minerals containing titanium, zirconium, and rare earth elements, all of which are listed by the NSW and Commonwealth governments as Critical Minerals. These minerals are vital for producing advanced electronics, telecommunications, defence infrastructure and medical devices and are necessary to help drive the transition towards renewable energy.

The Action includes the following components:

- Mining using a combination of traditional dry (excavate, load and haul) and wet (dredging) mining techniques to extract up to approximately 46.8 million (M) tonnes per annum (tpa) of overburden, 44.1 M tpa of interburden and 27.1 M tpa of ore.
- On-site processing to produce up to 475,000 tpa of mine products.
- Transportation of mine products in sealed containers from the Impact Site (Figure 3) to an existing rail facility in Broken Hill.
- Progressive re-establishment and rehabilitation of a final landform with ecosystem function.

The Project lifespan will be 26 years, comprising an initial 3-year construction period, followed by 18 years of mining operations and a further period of 5 years of rehabilitation.

The Action will result in the removal of 3,883.08 hectares (ha) of Native Vegetation from the Impact Site; 3,692.92 ha from the Mine Site area and 190.16 ha from the Linear Corridor. An additional 28.11 ha of roads, tracks and other cleared land within the Linear Corridor, and 108.30 ha from the Mine Site, will be cleared due to the proposed Action, resulting in a total of 4019.49 ha of land cleared. No further vegetation loss will be required through the operational phase of the development.

The explanation above provides a detailed definition of “The Action”.



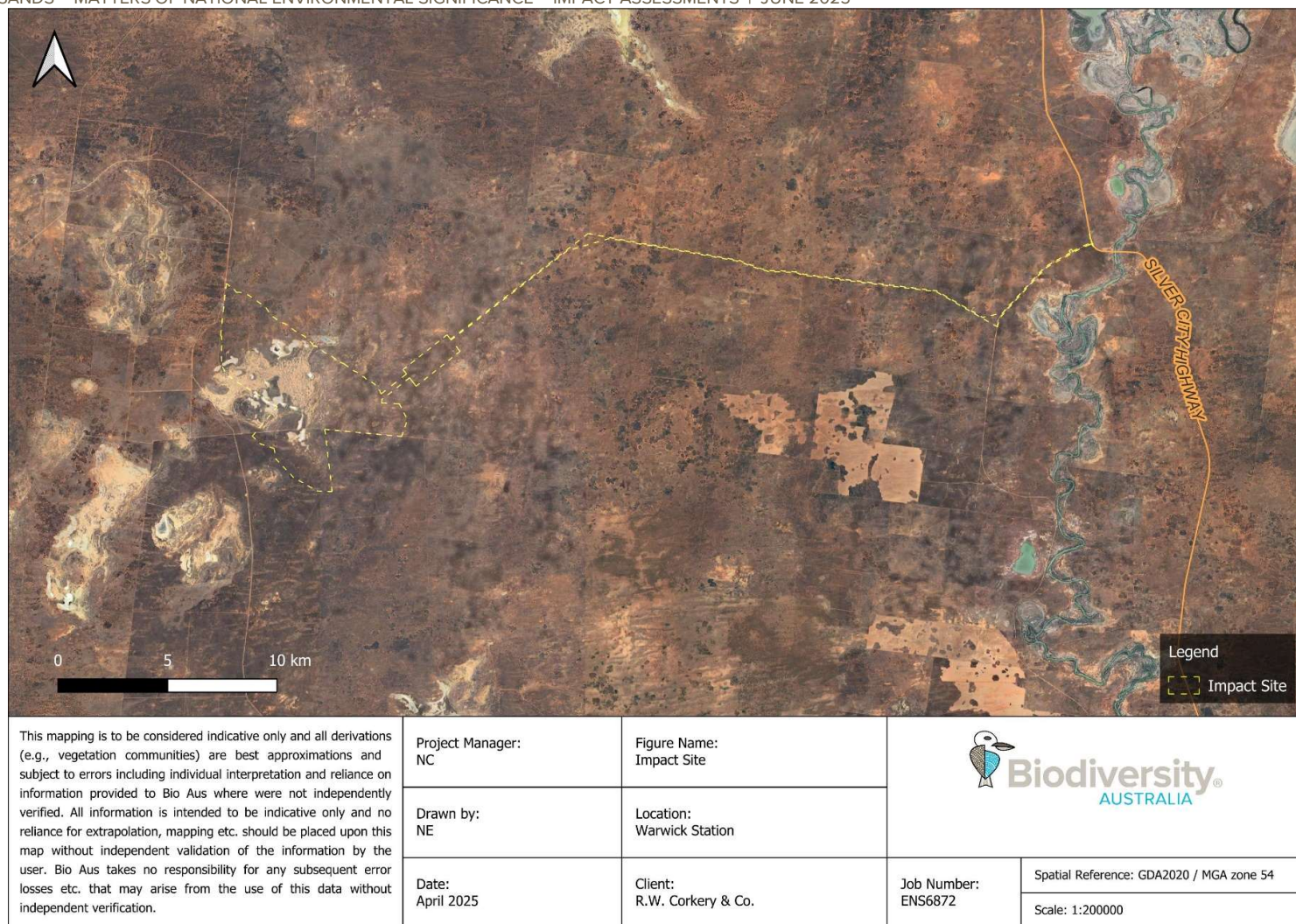


Figure 3: Location and extent of the Impact Site



4. Severity of Action

An important step in determining the significance of an Action on an MNES entity and understanding the Severity of The Action in regard to the context of the population, is the balance of probabilities. This Assessment of Significance report has adopted the Severity Assessment Matrix framework included within the Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) – 2013 Significant Impact Guideline 1.2. whilst it is acknowledged that the guideline 1.2 applies to actions on, or impacting upon, Commonwealth land, and actions by commonwealth agencies, it remains acutely appropriate in educating the balance of probabilities and ultimately the likelihood of a significant impact in relation to The Action. As per the guidelines, to judge the severity of potential impacts it is necessary to consider four key factors collectively, namely:

- Intensity
- Scale
- Duration
- Timing/frequency

The Significant Impact Guidelines 1.2 (DSEWPC, 2013) provides categories to assist in drawing conceptual distinctions between different levels of severity:

- **Severe:** Severe impacts generally have two or more of the following characteristics: permanent/irreversible; medium-large scale; moderate-high intensity.
- **Moderate:** Moderate impacts generally have two or more of the following characteristics: medium-long term; small-medium scale; moderate intensity.
- **Minor:** Minor impacts generally have two or more of the following characteristics: short term/reversible; small-scale/localised; low intensity.

The Action Severity Assessment Matrix shown in Table 2 below is based on the four key factors, and three severity categories established in The Significant Impact Guidelines 1.2 (DSEWPC, 2013). This matrix has been used to assist in defining the severity of The Action. As per the definitions established in the guidelines, the following four key factors are best described as:

Table 2: Severity Assessment Matrix

Severity Assessment Matrix		Severity		
		Minor	Moderate	Severe
Key Factors	Scale	small-scale	small-medium scale	medium-large scale
	Intensity	low intensity	moderate intensity	moderate-high intensity
	Duration	short term/reversible	medium-long term	permanent/irreversible
	Timing/frequency	single event	recurring moderate frequency	recurring high frequency

A definition of key factors as per The Significant Impact Guidelines 1.2 and an assessment of the proposed Actions against these definitions is provided in Table 3 below.



Table 3: Severity of Action - key factors assessment

Criteria	Assessment
Scale: refers to the extent or magnitude of an Action relevant to the environment, species or Impact Site being discussed, typically a large-scale action with widespread impacts is more likely to have a significant impact than a smaller-scale action with localised impacts.	Medium-large scale - The proposed Action will occur over an area of 3888 ha in which all vegetation will be progressively cleared resulting in the removal of all substantial habitat values.
Intensity: refers to the strength and concentration of the impacts stemming from an action. An example of an action with high intensity impacts is open cut mining which involves comprehensive modification of the entire environment. An example of an action with low intensity impacts is low density grazing of livestock on native pastures.	High Intensity –The Action will comprehensively modify the environment through vegetation clearing and landscape excavation/ dredging.
Duration: refers to the full period over which the impacts of an Action are felt. An example of permanent/irreversible impacts from an Action includes the pollution of radioactive material/forever chemicals into the environment. An example of a short term/reversible impact from an Action is the slashing of native pasture, as the pasture is able to recover to its condition before The Action within the short term.	Medium-long term - The impact will occur in sections over the life of the mine, expected to be 26 years, with progressive rehabilitation.
Timing and frequency: The timing of an Action refers to when The Action occurs relative to important seasonal factors. For example, is The Action impacting a sensitive species during the breeding season, or period of stress such as drought, flood, or post fire. The frequency of an action refers to the period between Action events, for example weekly weed control has a high frequency, yearly fire management has a low frequency and clearing of a patch of vegetation is a singular event.	Single event per area, progressing across The Site - Each area will be subject to clearing once. The Project has not factored in periods of drought, flood or fire.

An assessment of The Action, utilising the matrix developed from the Significant Impact Guidelines 1.2, is presented in Table 4: Matrix Assessment of action severity. Considering the intensity, duration, scale and timing of the proposed Actions, the Actions align most closely with the 'Moderate Severity' category across all four key factors. The proposed Actions are characterised by their moderate-high intensity, medium-large scale and medium-long term, but reversible nature through rehabilitation.

Table 4: Matrix Assessment of action severity

Severity Assessment Matrix		Severity		
		Minor	Moderate	Severe
Key Factors	Duration	short term/reversible	✓ medium-long term	permanent/irreversible
	Intensity	low intensity	moderate intensity	✓ moderate-high intensity
	Scale	small-scale	✓ small-medium scale	medium-large scale
	Timing/frequency	✓ single event	recurring moderate frequency	recurring high frequency



5. Potential Occurrence Assessment

Results of the EPBC PMST (DCCEEW, 2022a) search detail:

Matters of National Significance	Count
World Heritage Properties	0
National Heritage Places	0
Wetlands of International Importance (Ramsar Wetlands)	3
Great Barrier Reef Marine Park	0
Commonwealth Marine Areas	0
Listed Threatened Ecological Communities	3
Listed Threatened Species	38
Listed Migratory Species	9

- three (3) Ramsar Wetlands,
- three (3) TECs,
- 38 threatened species, and
- nine (9) migratory species

have the potential to occur within the Impact Site. The identification of suitable habitat for MNES entities indicates there is potential for the occurrence of MNES entities within both search feature and buffer areas. A Likelihood of occurrence assessment was undertaken for each of these species (apart from listed fish species since there is no fresh water in the Impact Site) and is contained in **Appendix A-2**.

All three Ramsar wetlands are located outside the Impact Site and are not directly or indirectly impacted by the Action. All three Ramsar wetlands are located within the PMST search buffer area only; with Banrock station wetland complex located 50-100 km downstream, Riverland situated 10-20 km downstream and The Coorong, and Lakes Alexandrina and Albert wetland situated 200-300 km downstream.

All MNES entities recorded or predicted to occur within the Study Area (20 km buffer around the Impact Site) were evaluated for their potential to occur within Impact Site. This was based on suitable habitat features occurring within the search feature area. An indicative, categorical scale was applied to indicate the likelihood of each MNES entity to potentially occur in the habitat within the Impact Site as follows:

- **Unlikely** (<1% probability) - no potentially suitable habitat; too disturbed; or habitat is very poor. No or few records in region or records/Site very isolated, e.g., by pastoral land, urbanisation, etc.
- **Low** (1-25%) - few minor areas of potential habitat; highly modified Site/habitat; or few habitat parameters present, but others absent or relatively insignificant (sub-optimum habitat). Usually very few records in locality.
- **Fair** (25-50%) - some significant areas of potential habitat, but some habitat parameters limited. Potential for occasional foraging e.g., from nearby more optimal areas or known habitat. Records at least within 10-15 km radius of Site.



- **Moderate** (50-75%) - quite good potentially suitable habitat on and adjacent to the Site, and/or good quality and abundance of some vital habitat parameters. Records within <10 km, or adjacent to the Site, or adjacent to high quality habitat where species are likely to occur.
- **High** (>75%) - very good to optimum habitat occurring on or adjacent to the Site (support breeding pair or population). Recorded within 5-10 km of Site in same or similar habitat.

Species with a 'moderate' or 'high' potential to occur were targeted during field assessments. A summary of those species with a likelihood of occurrence result in the 'moderate' or 'high' categories were subject to detailed assessment against the Significant Impact criteria.



6. Targeted threatened Species Surveys

6.1 Additional Survey Effort

As a result of an onsite meeting, document reviews and discussions with referral assessment staff at the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW), the project decision maker requested Bio Aus undertake additional survey between August 2024 and March 2025. These additional surveys were designed to collect data for areas and species within the Impact Site which had not previously been covered or where data was older than the 5 years.

The additional survey details are as follows

- Completed over 5,500 x 40 m diameter targeted threatened flora transect plots as part of a two-phase 100 m grid-based systematic threatened flora survey effort for large-areas across the Impact Site in line with BAM 2020.
- Added an additional 80 BAM 2020 compliant Vegetation Integrity plots and recorded detailed Rapid Data Points for Hollow Bearing Trees within plots.
- Undertook a gap analysis to determine the accuracy and structural condition of the existing vegetation communities and applied the NSW BAM 2020 methods for identifying Plant Community Types (PCT), mapping vegetation and sourced soil, contour and topography maps to further refine boundaries to meet BAM 2020 standards.
- Refined habitat constraints and associated PCTs for threatened species returned in updated PMST and gained DCCEEW's agreement with our habitat definitions
- Undertook EPBC and BC Act compliant targeted threatened species survey transects using species specific methodologies, for raptors (White-bellied Sea Eagle, Black-breasted Buzzard, Square-tailed Kite, Little Eagle, Masked Owl) and Pink Cockatoo, including large area targeted call playback methodology within suitable habitat.
- Undertook EPBC Act compliant targeted 'mallee-specialist' and 'mallee-dependant' bird surveys within mallee communities meeting the patch size definition for the TEC *Mallee Bird Community of the Murray Darling Basin Bioregion* (MBC or Mallee Bird Community).
- Completed EPBC and BC Act compliant habitat assessments across the entire Impact Site, including vegetation structure, condition and floristics, Hydrology, landscape feature assessments, and targeted Hollow Bearing Tree searches (Recorded hollow dimensions and mapped Hollow Bearing Trees on site).
- Conducted EPBC and BC Act compliant active herpetological surveys, using species specific methodologies, targeting Crowned Geckos (*Lucasium stenodactylum*) including nocturnal spotlight, physical habitat searches, and Elliot and pitfall trapping.
- Conducted concurrent Elliot and pitfall trapping surveys for both Desert Mouse (*Pseudomys deserti*) and Crowned Gecko utilising specific threatened species survey methodologies in suitable habitat.
- Completed EPBC Act compliant bird census surveys targeting the Eastern Mallee Bird TEC and other threatened bird species in suitable habitat, consisting of 30-minute area searches of areas covering 2 ha.



- Deployed Song Meter acoustic recording devices as part of the targeted threatened frog surveys, within potential habitat for the Painted Burrowing Frog (*Neobatrachus pictus*).
- Completed targeted BC Act compliant nocturnal spotlight surveys for Southern Hairy-nosed Wombat (*Lasiorchinus latifrons*) burrows/warrens, scats, and individuals, using high-power hand-held torches and thermal binoculars.
- Completed additional EPBC Act compliant targeted threatened microbat surveys utilising arrays of ultrasonic recorders.
- Refined the PCT boundaries, boundaries (Table 5), mapping and added a secondary condition states to three mapped PCTs.

Table 5: Plant Community Types associated with Copi Sands

PCT ID	Area (ha)	PCT name
28	0.77	White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone
58	238.42	Black Oak – Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
64	641.13	Samphire - Water Weed - Sea-Heath shrubland saline wetland of depressions of the arid and semi-arid
143	17.52	Narrow-leafed Hopbush – Scrub Turpentine – Senna shrubland on semi-arid and arid sandplains and dunes
152	250.43	Lunette chenopod shrubland mainly of the Murray Darling Depression Bioregion
154	1669.80	Pearl Bluebush low open shrubland of the arid and semi-arid plains
157	495.38	Bladder Saltbush shrubland on alluvial plains in the semi-arid (warm) zone including Riverina Bioregion
170	15.59	Chenopod sandplain mallee woodland/shrubland
171	12.11	Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
215	5.91	Woollybutt Grass open grassland on red earths of the inland plains
221	395.14	Black Oak – Pearl Bluebush open woodland of the sandplains of the semi-arid warm and arid climate zones
253	139.72	Gypseous shrubland on rises in the semi-arid and arid plains
254	1.16	Black Oak - Bladder Saltbush on light clays in the arid zone
Total	3883.08	



6.2 Summary of Total Survey effort

6.2.1 Flora Species Surveys

A targeted survey for threatened flora species was undertaken over the Impact Site between 11th November and 30th November 2024.

The survey method for the target species followed the *Surveying Threatened Plants and Their Habitats* and the *NSW Survey guide for the Biodiversity Assessment Method 2020* consisting of botanists walking over large areas of suitable habitat using a two-phase grid-based systematic survey approach. Survey locations were positioned on a 100 m grid intersect, facilitating planning and enabling rapid assessment across larger areas.

6.2.2 Fauna Species Surveys

All threatened fauna species were surveyed in accordance with recommended survey guidelines and during recommended survey periods as detailed in the BioNet TBDC, specific threatened species survey guidelines, and other resources such as conservation advice and species action plan and recovery plan.

6.2.3 Complimentary Opportunistic fauna Surveys

Opportunistic fauna surveys, complementary to the method-specific targeted surveys were conducted on foot across the Impact Site – Mine Site by qualified fauna ecologists experienced in bird identification and equipped with binoculars and fauna identification resources. Staff traversed the areas between Threatened Flora plots whilst searching for individuals and signs of wildlife. Additional surveys were conducted along tracks outside the Impact Site where surveyors paid particular attention to soaring birds, stick nests and burrows. All other species encountered incidentally were also recorded. The complementary opportunistic fauna surveys covered approximately 1958.70 km.

6.2.4 Habitat Constraints, Evaluations and surveys

Desktop assessments and field surveys within the Impact Site included assessment of habitat constraints and microhabitats for fauna Species Credit Species. This included desktop assessment of the proximity of the Impact Site to features such as caves, wetlands and waterways and field inspection of microhabitats including leaf litter, stick nests and Hollow Bearing Trees etc. Habitat evaluation was the main survey method employed to assess the suitability habitats for threatened species observed in the Assessment Area, or in broadly similar habitats in the region. Habitats on and adjacent to the Impact Site were defined and assessed.

6.2.5 Active Herpetological Surveys

Targeted surveys involved nocturnal spotlight, physical habitat searches, and Elliot and pitfall trapping. The nocturnal spotlight surveys were conducted in suitable habitats within the Impact Site – Mine Site. The surveys were conducted by scanning for eye-shine with hand-held torches either on foot as a random



meander or in a slow-moving vehicle. All observations of eye shine were investigated, and the species responsible was identified.

6.2.6 Diurnal Bird Surveys

Diurnal bird census surveys targeting the Eastern Mallee Bird TEC and other threatened bird species were conducted in suitable habitat within and adjacent to the Impact Site. The surveys consisted of a 30-minute area search of an area covering 2 ha. During each survey, observers identified and recorded all bird species seen and heard. Surveys were conducted in the early morning (dawn) or late afternoon (dusk) when bird activity was highest. EnviroKey ecologists conducted surveys to determine the presence and usage of the Impact Site by diurnal birds in either the early morning or late afternoon to coincide with peak bird activity. These surveys were completed at 243 locations.

Combined foot and vehicle surveys were conducted for birds of prey within the Impact Site. The surveys commenced during the heat of the day when it was expected that conditions for thermal soaring would be optimal. Observers surveyed the sky for soaring individuals and scanned their surroundings for individuals perched on trees. Additionally, observers searched for large stick nests in areas with suitable habitat for nest construction.

EnviroKey ecologists used song meter SM4 acoustic recorders during 2022 field surveys to record bird calls. A song meter was activated at four locations (1 within the Impact Site and 3 within the broader Subject Land) for a total of 3 full days, giving a total of 12 recording days.

6.2.7 Hollow bearing Tree Search

Data on Hollow Bearing Trees and tree hollows were recorded opportunistically while conducting diurnal bird survey and nocturnal spotlighting surveys within and adjacent to the Impact Site. Where tree hollows were located, the number, size, and height above ground of hollows, as well as the Diameter at Breast Height (DBH) and species of the trees in which hollows were located were recorded.

6.2.8 Nocturnal Spotlight Surveys

Targeted nocturnal spotlight surveys were conducted within the Impact Site. In areas of suitable habitat observers searched for burrows/warrens, scats, and individuals, using high-power hand-held torches and thermal binoculars. Each search spanned a minimum of 60 person minutes and was replicated in the same area on the following night.

6.2.9 Nocturnal Call playback

Nocturnal call playbacks were undertaken within the Impact Site, where observers surveyed for the Masked Owl in suitable habitat by spotlighting with hand-held torches and listening for the species' calls for a period of 10 minutes. If no sightings or calls were registered during this time, the observers broadcast a recording of the Masked Owl's call over a speaker for 15 seconds, followed by a wait period of 30



seconds, during which time the observers again searched for the masked owl and listened for its calls. This process was repeated 6 times.

6.2.10 Elliot and Pitfall Trapping

Concurrent Elliot and pitfall trapping surveys were undertaken within the Impact Site. Three Elliot and pitfall trap arrays were established in suitable habitat, two within the Mine Site area and one along the Linear Corridor area. The pitfall arrays consisted of a 30 m drift fence with 7 buckets distributed along its length. Ten 'A' sized Elliot traps were set in the area surrounding each pitfall array, each trap baited with a mix of peanut butter, honey, and oats.

6.2.11 Microbat Call Recording and Analysis

6.2.12 Acoustic Recording Surveys

The details of all targeted threatened species surveys conducted within the Impact Site is provided in **Appendix A-3**.



7. Refinement of Potential Impact entities

All MNES entities recorded in the Impact Site, and those with suitable habitat and considered likely to occur (**Appendix A-2**) in the Impact Site were subject to detailed assessment to determine the significance of the impact. These entities are:

- Mallee Bird Community TEC.
- South-eastern Hooded Robin (*Melanodryas cucullata cucullata*).
- Southern Whiteface (*Aphelocephala leucopsis*).
- Pink Cockatoo (*Lophochroa leadbeateri leadbeateri*).
- Corben's Long-eared Bat (*Nyctophilus corbeni*).

Flora species with potential to occur on site and subject to a streamline significance assessment are:

- A Saltbush (*Atriplex frequens*).
- Winged Peppergrass (*Lepidium monophloides*).
- Desert Greenhood (*Pterostylis xerophila*).
- Menindee Nightshade (*Solanum karsense*).
- Slender Darling-pea (*Swainsona murrayana*).
- Yellow Swainson-pea (*Swainsona pyrophila*).

Fauna species with potential to occur on site and subject to a streamline significance assessment are:

- Murray Mallee Striated Grasswren (*Amytornis striatus howe*).
- Malleefowl (*Leipoa ocellata*).
- Grey Falcon (*Falco hypoleucos*).

All other MNES entities returned from the PMST (**A-1**) were considered to have essential habitat elements missing from the Impact Site (**Appendix A-2**), such that all requirements for the lifecycle of the species could not be met. They were not considered further.



8. Entities With a Higher Risk of a Real Chance of Significant Impact

8.1 Mallee Bird Community TEC

8.1.1 Conservation status

The Mallee Bird Community is listed as an Endangered TEC under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). This TEC is a type of fauna community found in the Murray Darling Depression bioregion. It is an assemblage of bird species that are dependent on the mallee vegetation that characterises this bioregion (DAWC 2021).

The main factors that make the TEC eligible for listing in the Endangered category are:

- Severe loss of a functionally important species over much of the landscape.
- Severe loss of ecological integrity from the combined actions of several threats.
- A severe rate of continuing detrimental change shown by many members of the ecological community.

8.1.2 TEC Range and Distribution

Mallee ecosystems occur in the drier parts of Australia, south of the arid zone in Western Australia (WA), South Australia (SA), New South Wales (NSW) and Victoria (Yates et al. 2017; Keith et al. 2020). Within south-eastern Australia, mallee is generally associated with unconsolidated aeolian sands in low rainfall zones, typically within the 200-350 mm annual rainfall isohyets (DAWE, 2021).

The Mallee Bird Community TEC is an assemblage of 20 bird species that rely on mallee habitats and is defined as a TEC by bird species richness within these habitats.

The indicative extent of the community and its likely current occurrence is illustrated in Figure 4.



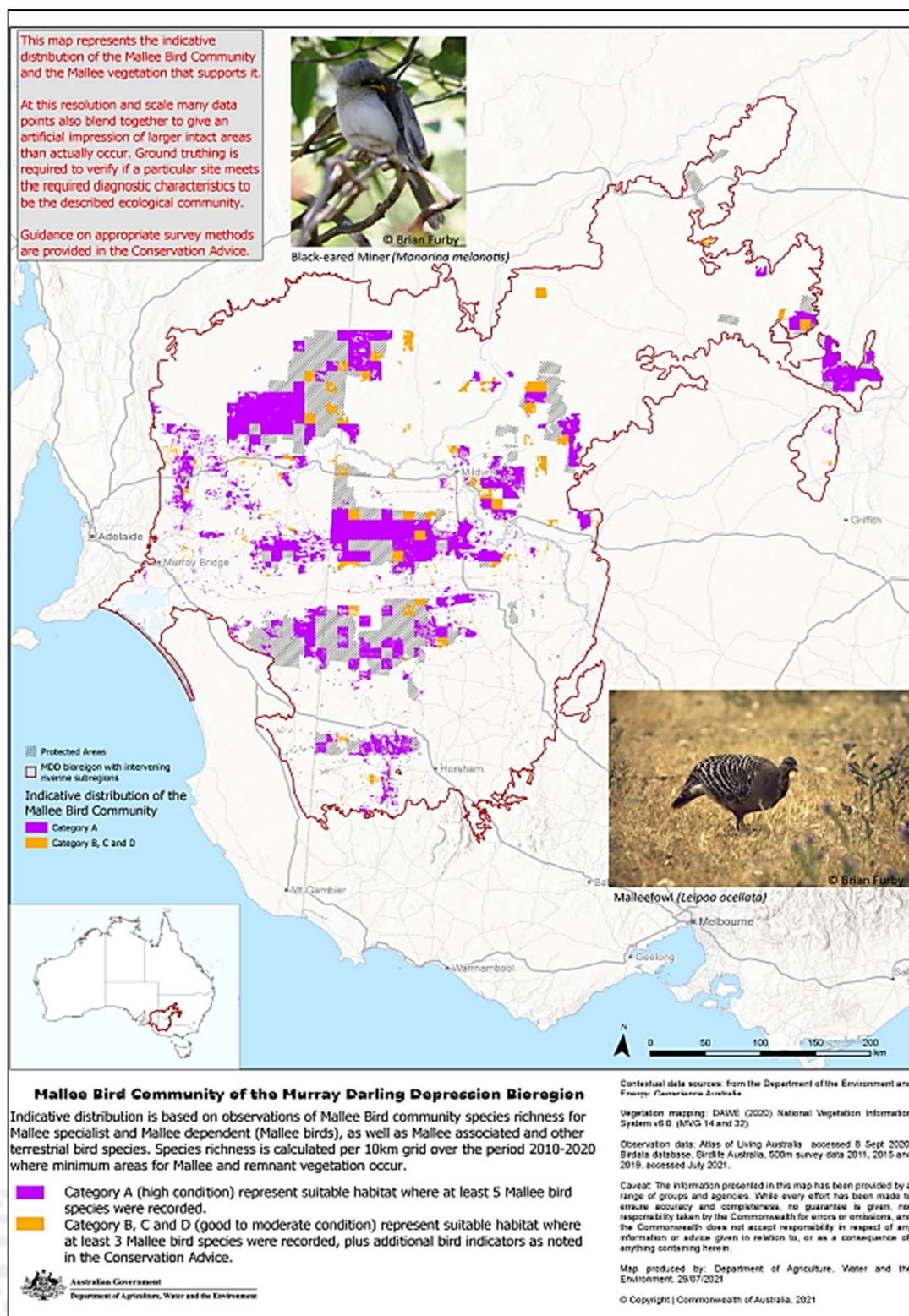


Figure 4: Geographic distribution of the Mallee Bird Community



8.1.3 Key Diagnostic Characteristics

The key diagnostic attributes for the Mallee Bird Community (DAWE 2021) are as follows:

- Site location – found in the Murray Darling Depression Interim Biogeographic Regionalisation for Australia (IBRA) bioregion, and parts of the Riverina and the Darling Riverine Plains bioregions. The Impact Site is within the Murray Darling Depression and South Olary Plain subregion.
- Mallee habitats must be present on site.
- Vegetation patches must consist of at least 10 ha of native vegetation with at least 5 ha dominated by mallee.
- At least three (3) terrestrial bird species from the list of MBC diagnostic birds must be present (any mix of mallee specialists or mallee dependents) (Table 6).

Table 6: MBC diagnostic bird species

Common name	Species name	Family	EPBC status	NSW Status
Mallee specialists				
Black-eared Miner	<i>Manorina melanotis</i>	Meliphagidae	E	CE
Chestnut Quail-thrush	<i>Cinclosoma castanotum</i>	Cinclosomatidae		V
Mallee Emu-wren	<i>Stipiturus mallee</i>	Maluridae	E	
Malleefowl	<i>Leipoa ocellata</i>	Megapodiidae	V	E
Red-lored Whistler	<i>Pachycephala rufogularis</i>	Pachycephalidae	V	CE
Scarlet-chested Parrot	<i>Neophema splendida</i>	Psittacidae		V
Striated Grasswren	<i>Amytornis striatus</i>	Maluridae		V
Mallee Western Whipbird	<i>Psophodes nigrogularis</i>	Psophodidae	V	
Mallee dependents				
Crested Bellbird	<i>Oreoica gutturalis</i>	Oreocidae		
Grey-fronted Honeyeater	<i>Ptilotula plumula</i>	Meliphagidae		
Jacky Winter	<i>Microeca fascinans</i>	Petroicidae		
Purple-gaped Honeyeater	<i>Lichenostomus cratitius</i>	Meliphagidae		V
Regent Parrot	<i>Polytelis anthopeplus</i>	Psittacidae	V	E
Shy Heathwren	<i>Calamanthus cautus</i>	Acanthizidae		V
Southern Scrub-robin	<i>Drymodes brunneopygia</i>	Petroicidae		V
Splendid Fairy-wren	<i>Malurus splendens</i>	Maluridae		
Spotted Pardalote	<i>Pardalotus punctatus</i>	Pardalotidae		
White-eared Honeyeater	<i>Nesoptilotis leucotis</i>	Meliphagidae		



Common name	Species name	Family	EPBC status	NSW Status
White-fronted Honeyeater	<i>Purnella albifrons</i>	Meliphagidae		
Yellow-plumed Honeyeater	<i>Ptilotula ornata</i>	Meliphagidae		

Table sourced from the Approved Conservation Advice for the Mallee Bird Community of the Murray Darling Depression Bioregion (DCCEEW 2021)

- If the above criteria are satisfied, then four conditions are categorised as follows:
 - Category A - At least 5 MBC species, any mix of mallee specialist and dependent species.
 - Category B – 3 to 4 MBC species including at least one mallee specialist species.
 - Category C - 3 to 4 MBC species plus at least 5 mallee associated species.
 - Category D - 3 to 4 MBC species plus at least 20 or more terrestrial bird species.



8.1.4 Presence within the Impact Site

Presence of Mallee

The Impact Site contains two Plant Community Types that conform to the definition of ‘mallee’. These are:

- PCT 170 Chenopod sandplain mallee woodland/shrubland.
- PCT 171 Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion.

Suitable MBC habitat

Bio Aus defined ‘suitable habitat’ for the Mallee Bird Community TEC according to the EPBC Conservation advice (DAWE 2021) as follows:

- Vegetation community consistent with Mallee PCTs 170 and 171;
- Native vegetation (50% or more native crown cover and 50% or more native perennial cover less than 2 m) patch is at least 10 ha with at least 5 ha of mallee;
- Tree canopy crown cover is between 5% and 70%;
- Mallee eucalypt trees are the dominant tree canopy type present; and
- At least three specialist or dependent bird species (Table 6) recorded from survey.

Using Geographic Information Systems analysis to determine where these two mallee PCTs existed as patches of at least 5 ha within larger patches of native vegetation of at least ten (10) ha, Bio Aus found that none of the areas of the mallee PCTs within the Impact Site itself complied with the patch size (Figure 5). However, The Project requires a new road to be built from Silver City Highway to the Mine Site area, and vegetation along this Linear Corridor met the patch size criteria (Figure 6).

Table 7: Mallee communities in Impact Site

PCT	Total Area on Mine Site and Linear Corridor	Total Area meeting MBC patch size criteria
170	15.60 ha	10.17 ha
171	12.11 ha	6.56 ha
Total	27.71 ha	16.74 ha



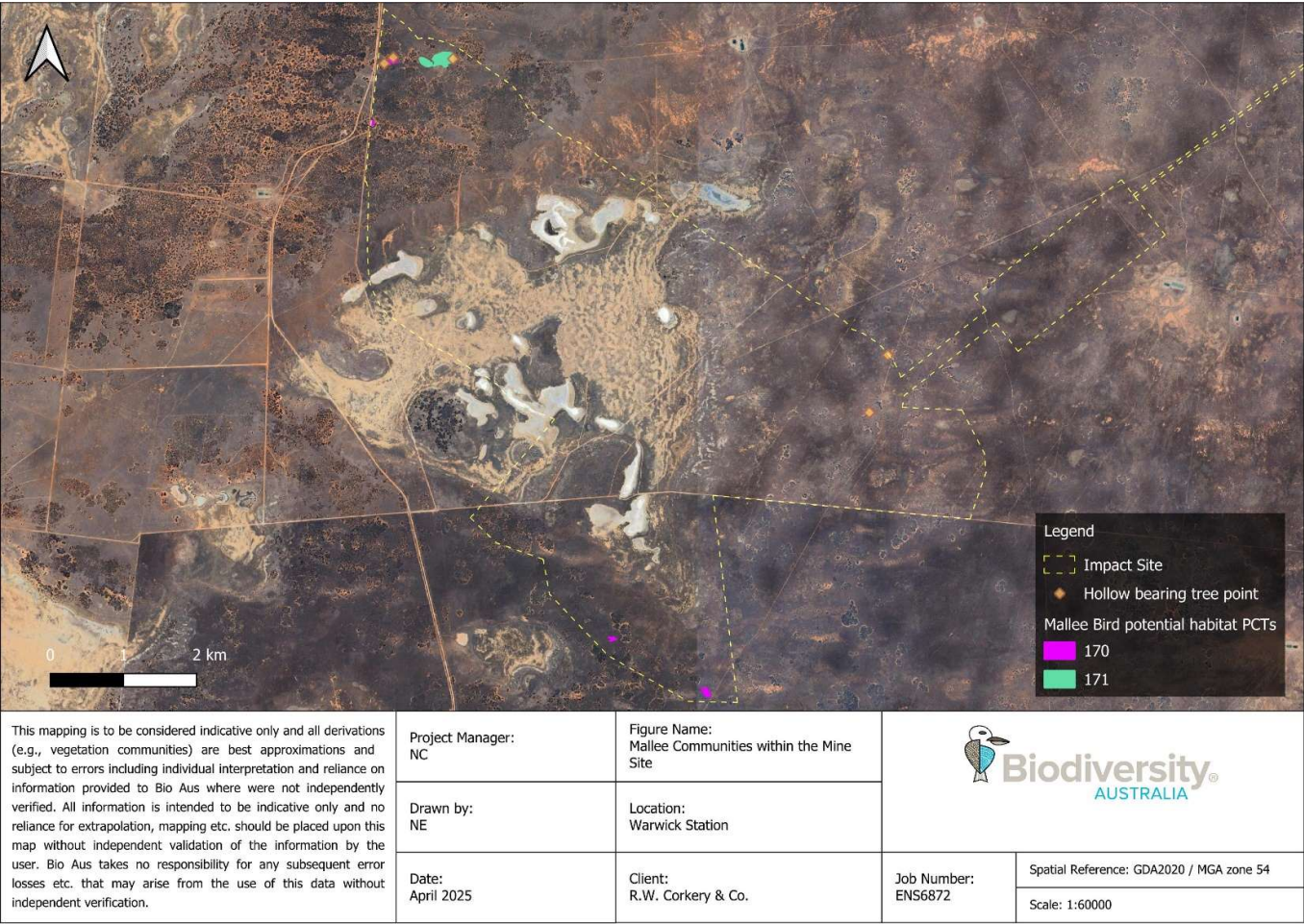


Figure 5: Mallee Communities within the Impact Site - Mine Site area

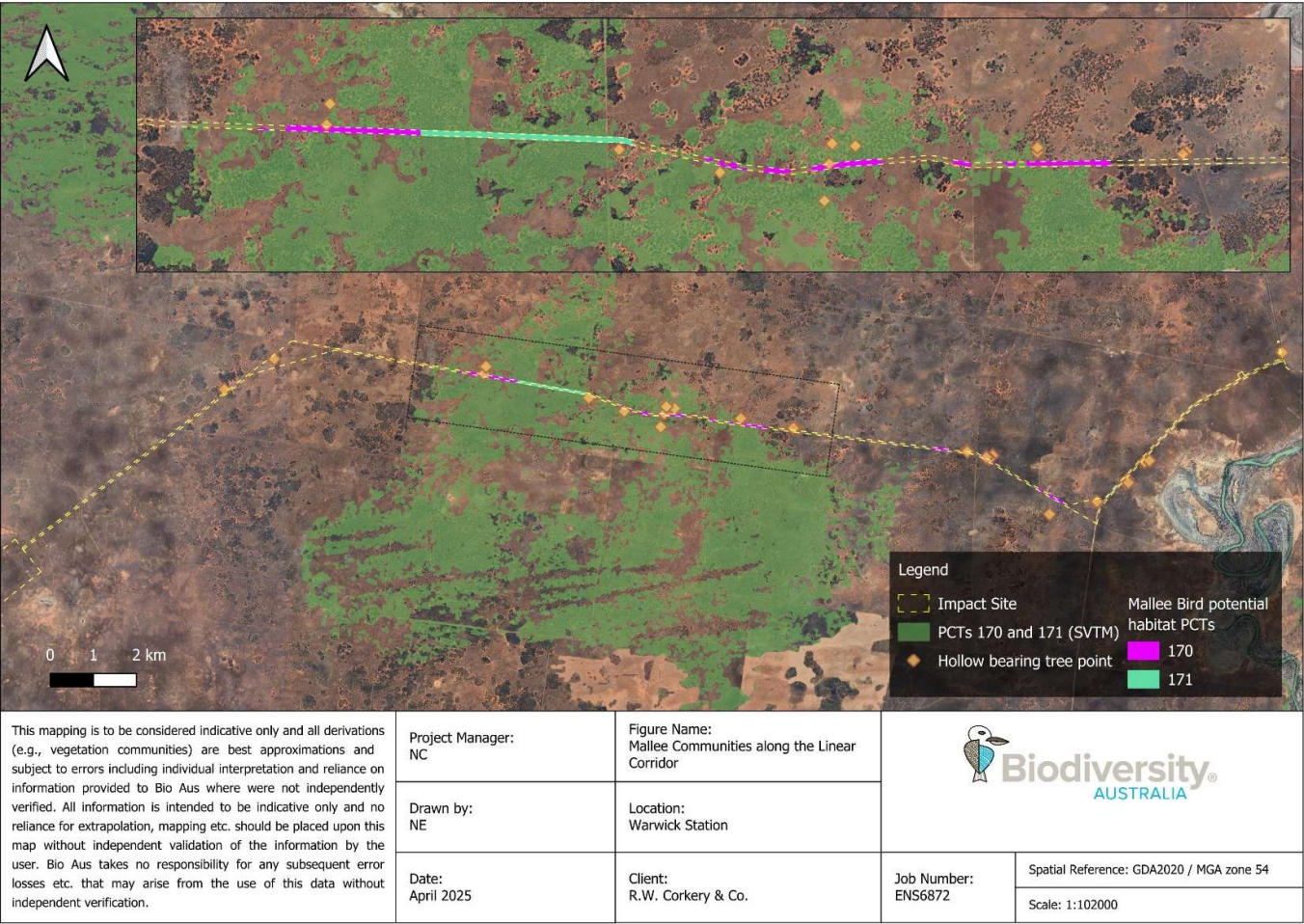


Figure 6: Mallee Communities within the Impact Site - Linear Corridor

8.1.5 Bird survey effort

To determine whether the Mallee Bird Community was present, extensive bird surveys were conducted in accordance with the listing guidelines (DAWE 2021). Survey included:

- 20 min dawn and dusk diurnal bird surveys for sightings and vocalisation totalling 4,860 minutes (81 hours) at 243 locations between January 2018 and February 2025.
- A total of 12 recording days using call playback for Striated Grasswren, Red-lored Whistler and Black-eared Miner (at the end of each survey above).
- A song meter activated in 39 sites between March 2018 and March 2022 for 3.5 hours per day (dawn and dusk), a total of 42 hours in 2022.
- Camera traps deployed for 87 days/nights.
- Five days of 500 m dawn and dusk area surveys from 25 to 29 November 2024.
- A general bird of prey survey as well as Nest and Area Searches on foot and from vehicle from 4-19 December 2024.
- Targeted morning searches around water sources and hollows from 4-19 December 2024.
- Opportunistic observations undertaken during all site visits, which included threatened flora surveys using a 100 m grid over the whole Impact Site.
- Targeted dawn searches along the Linear Corridor from 5 February to 12 February 2025 at sites representative of the broader patch in terms of fire-age, soil type and understorey type. Three (3) survey points were selected per patch >5 ha and survey was undertaken for 30 minutes over 2 ha, as well as 500 metre area searches > 30 minutes duration per site. Eight repeat surveys were conducted.

8.1.6 Bird survey results

Two bird species from the Mallee Bird Community were recorded in mallee on and adjacent to the Linear Corridor where vegetation meets the patch size criteria. These are:

Crested Bellbird (*Oreoica gutturalis*)

Jacky Winter (*Microeca fascinans*)

Within and adjacent to the Mine Site, field surveys identified five mallee dependent species (as listed below) and reported as 'occurring in vegetation communities within the Impact Site that have overstorey species' (EnviroKey, 2024). Birds recorded are:

- Crested Bellbird (*Oreoica gutturalis*).
- Grey-fronted Honeyeater (*Ptilotula plumula*).
- Jacky Winter (*Microeca fascinans*).
- Splendid Fairy-wren (*Malurus splendens*).
- Yellow-plumed Honeyeater (*Ptilotula ornata*).

One mallee specialist, the Chestnut Quail-thrush (*Cinclosoma castanotum*) was recorded outside The impact Site (a single bird on a single occasion) (Figure 7).



Four mallee-associated species were also recorded being Blue Bonnet (*Northiella haematogaster*), Pink Cockatoo (*Lophochroa leadbeateri*) and Weebill (*Smicrornis brevirostris*) in the Linear Corridor area and Spiny-cheeked Honeyeater (*Acanthagenys rufogularis*) in the Mine Site however, these are not diagnostic species in the absence of at least three (3) MBC listed birds.

Further analysis was undertaken to determine whether additional mallee specialist or mallee dependent species had been recorded within the Impact Site as listed on the Atlas of Living Australia (ALA) or NSW BioNet species records. The results (Figure 7) indicate only two species within the area of mallee habitat with suitable patch size were recorded, they included the Crested Bellbird and Jacky Winter. The broad extent of potential foraging and breeding habitat (associated PCTs 170 & 171) for the Mallee Bird Community is illustrated in Figure 8 and is shown in context of the broader landscape, surrounding the Impact Site at a radius of 50 km.



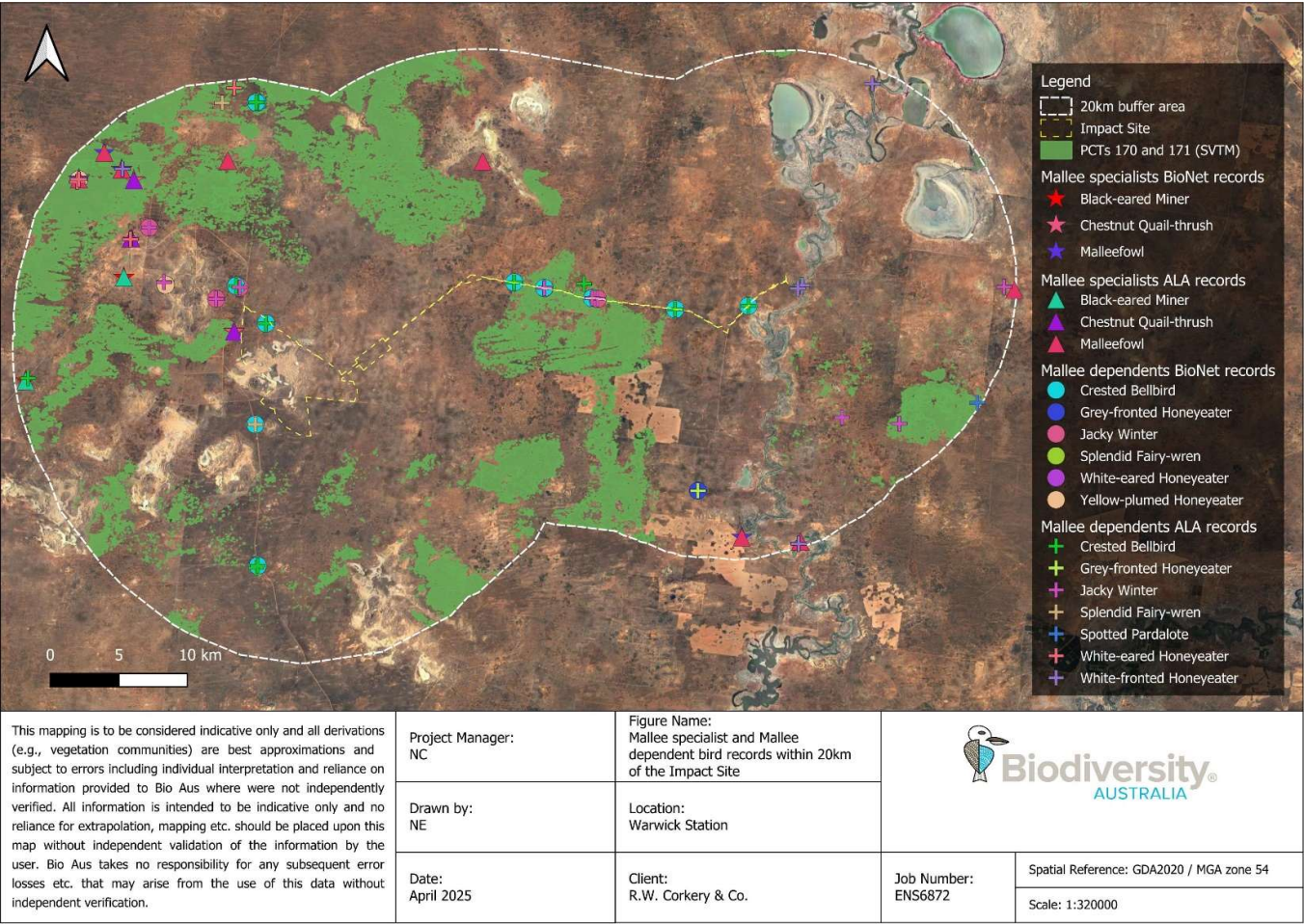


Figure 7: Mallee specialist and mallee dependent bird records within 20 km of the Impact Site

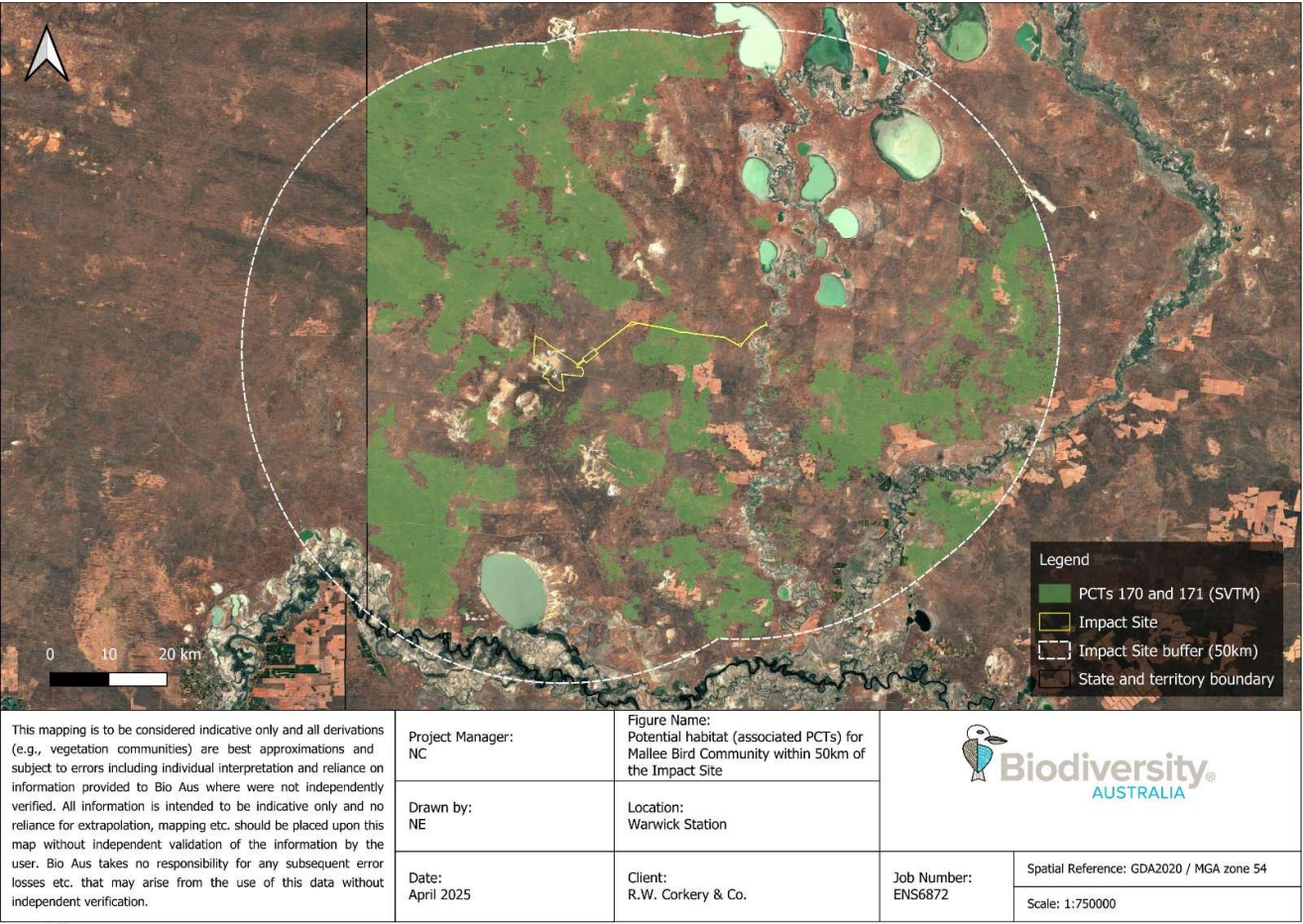


Figure 8: Potential habitat (associated PCTs) for Mallee Bird Community within 50 km of the Impact Site

8.1.7 Conclusion

The Impact Site contains two Mallee communities providing potential habitat for the Mallee Bird Community:

- PCT 170 Chenopod sandplain mallee woodland/shrubland.
- PCT 171 Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion.

Applying the patch size criteria, only vegetation patches along the Linear Corridor area met the criteria, with 10.17 ha of PCT 170 and 6.56 ha of PCT 171. Loss of this mallee vegetation will occur from the Linear Corridor construction, though this represents less than 0.21% of mallee within a 20 km radius of the Impact Site. Further, the Mallee community within much of the Impact Site has been heavily degraded as a result of historic and ongoing grazing and damage arising from feral goats and sheep, as well as the absence of fire activity.

The Conservation Advice (DAWE 2021) states the TEC is only present when at least three (3) terrestrial bird species from the list of MBC diagnostic birds are present. Extensive bird surveys conducted in these areas recorded only two diagnostic species. Based on the information above, the *Mallee Bird Community of the Murray Darling Depression bioregion* TEC is not considered to be present within the Impact Site. Therefore, The Action will have less than a remote chance of causing a significant impact on the TEC, and referral to the Commonwealth Minister is not warranted.



8.2 South-eastern Hooded Robin (*Melanodryas cucullata cucullata*)

8.2.1 Conservation status

The South-eastern Hooded Robin is listed as Endangered under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). The main factor that makes the subspecies eligible for listing in the Endangered category is that the population has declined by >50% over the last ten years (one generation 3.0 years) (Ford et al. 2021). From 2000–2018, reporting rates from surveys and searches declined by 65% and 63% respectively (DCCEEW, 2023). Both the EOO and AOO estimates for the subspecies have contracting trends (Ford et al. 2021).

8.2.2 Species Range and Distribution

The Hooded Robin is widespread, found across Australia, except for the driest deserts and the wetter coastal areas - northern and eastern coastal Queensland and Tasmania. However, it is common in few places and rarely found on the coast (OEH 2023). The south-eastern form (subspecies *cucullata*) is found from Brisbane to Adelaide and throughout much of inland NSW, with the exception of the extreme northwest, where it is replaced by subspecies *picata*. Two other subspecies occur outside NSW. The south-eastern subspecies is now absent from many formerly occupied sites, particularly in the wetter areas of the south and east (Barrett et al. 1994; Paton et al. 1994; Ford et al. 2009).

The distribution of the South-eastern Hooded Robin is presented in Figure 9.



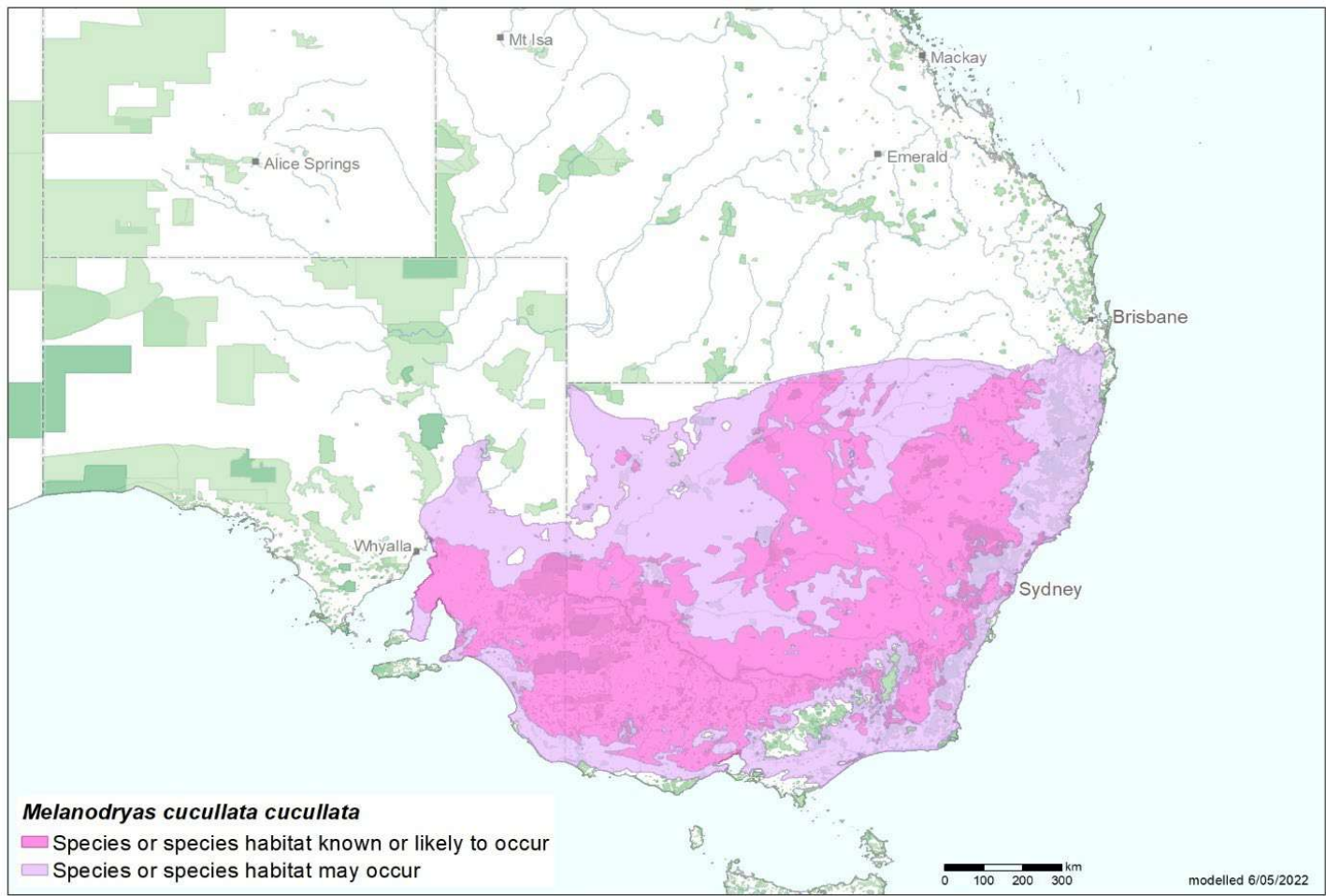


Figure 9: South-eastern Hooded Robin range and distribution from Conservation Advice (Comm DCCEEW 2023)

8.2.3 Presence within the Impact Site

Desktop results

The Impact Site is within the known distribution of the species. A search of available species records identified two (2) records within The Impact Site and 35 records within 50 km of The Impact Site (Atlas of Living Australia (ALA) and BioNet 2025). BioNet records within the last ten years indicate native vegetation connectivity to records within 20 km of the Site.

Field results

Extensive bird surveys were conducted between 2018 and 2025, including survey in accordance with the *Survey guidelines for Australia threatened birds – EPBC Act survey guidelines 6.2* (Survey Guidelines) (Department of the Environment, Water, Heritage and the Arts, 2010).

The Hooded Robin was recorded on several occasions during the field surveys, with the common theme being that these observations were at edges of treed or tall shrub plant communities (i.e. not bluebush/saltbush dominated communities) where they adjoined open areas.

Records of Hooded Robin within the locality are presented in Figure 10.

Potential habitat

Potential habitat for the species within the Impact Site is associated with the following Plant Community Types (OEH 2025):

- PCT 58: Black Oak – Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion.
- PCT 170 - Chenopod sandplain mallee woodland/shrubland.
- PCT 171: Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
- PCT 221: Black Oak – Pearl Bluebush open woodland of the sandplains of the semi-arid warm and arid climate zones.
- PCT 254: Black Oak - Bladder Saltbush on light clays in the arid zone.

Potential habitat for Hooded Robin within the Impact Site Mine Site area is presented in Figure 11, and within the Linear Corridor is presented in Figure 12.



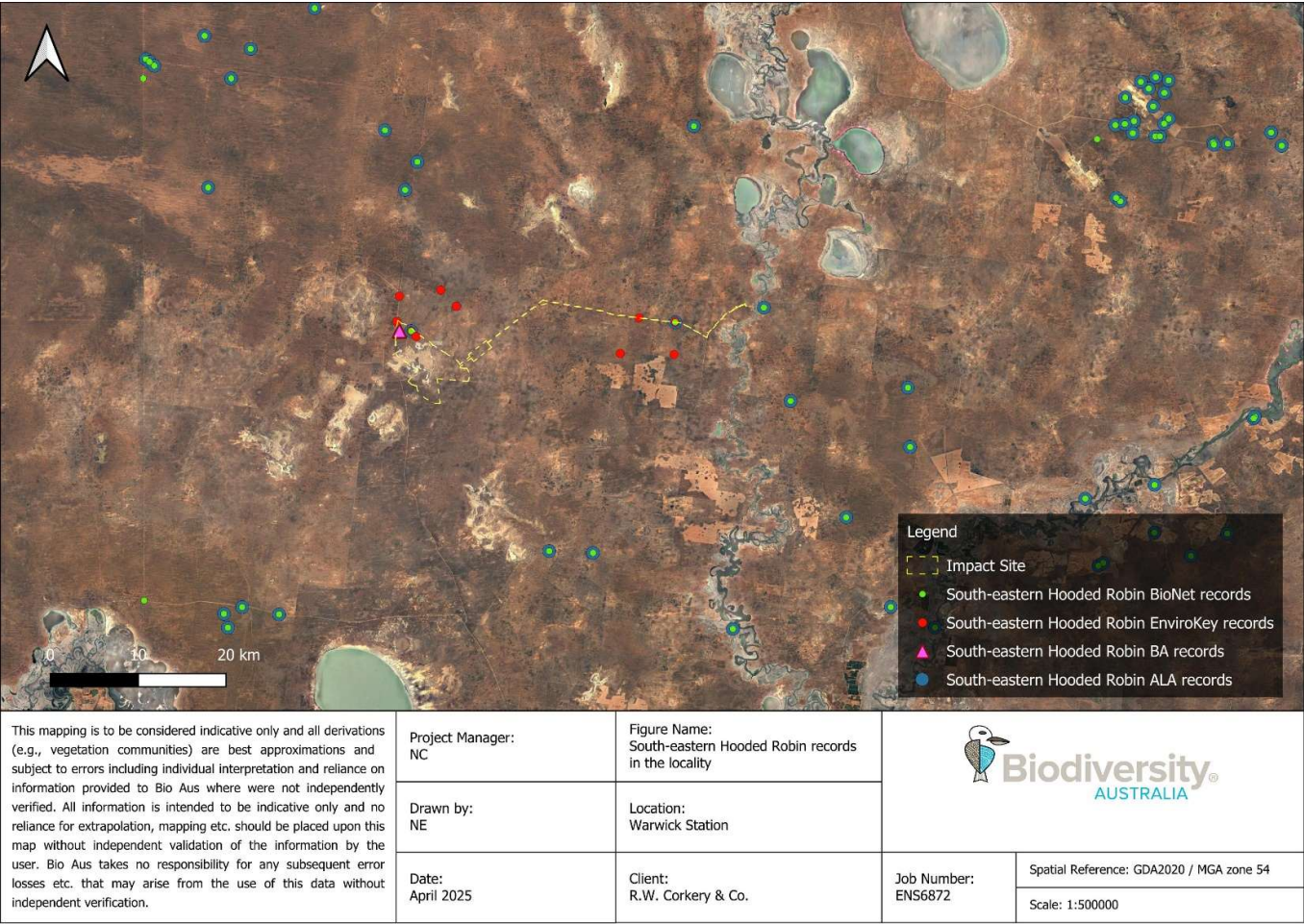


Figure 10: South-eastern Hooded Robin records in the locality

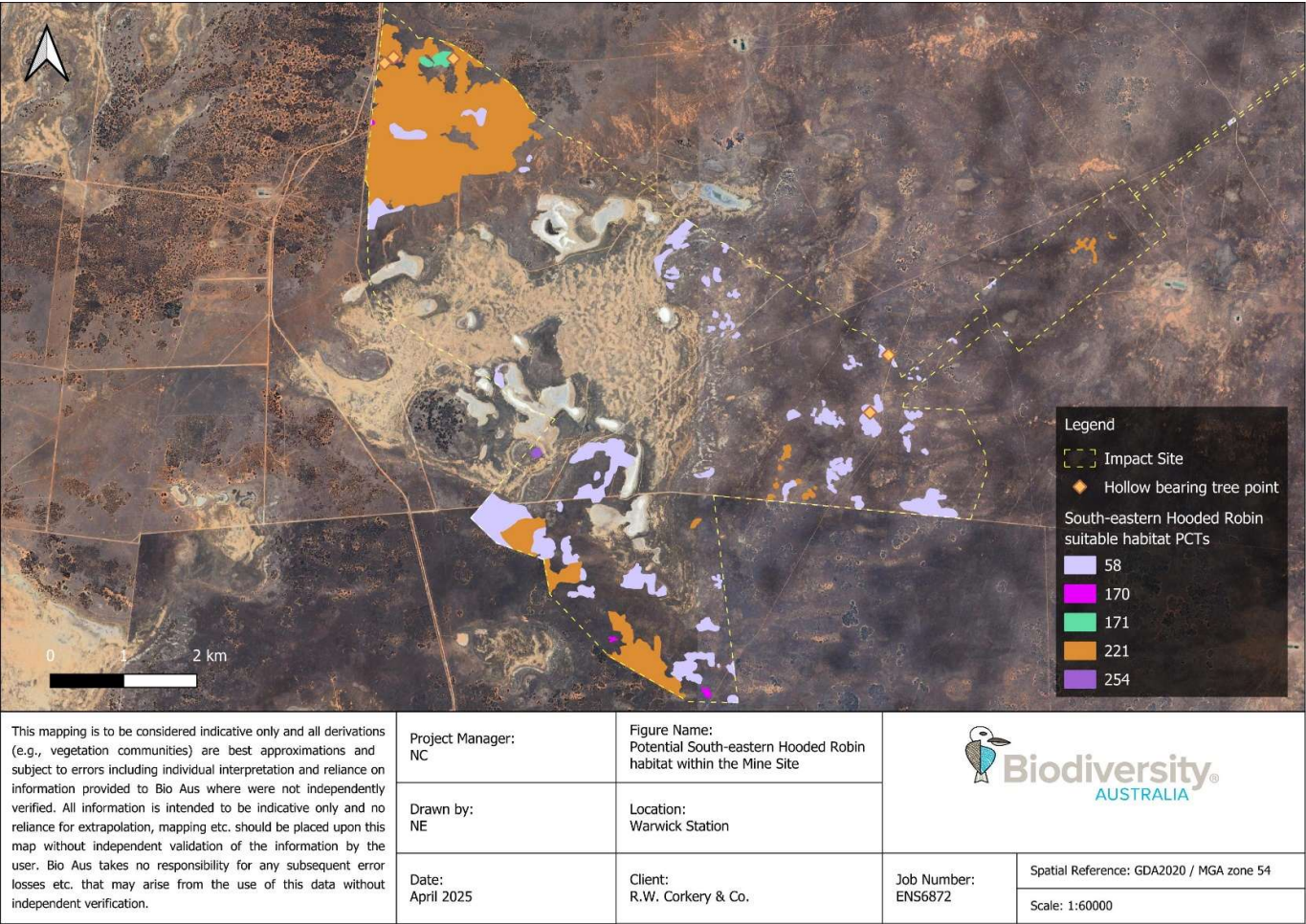


Figure 11: Potential Hooded Robin habitat on the Mine Site

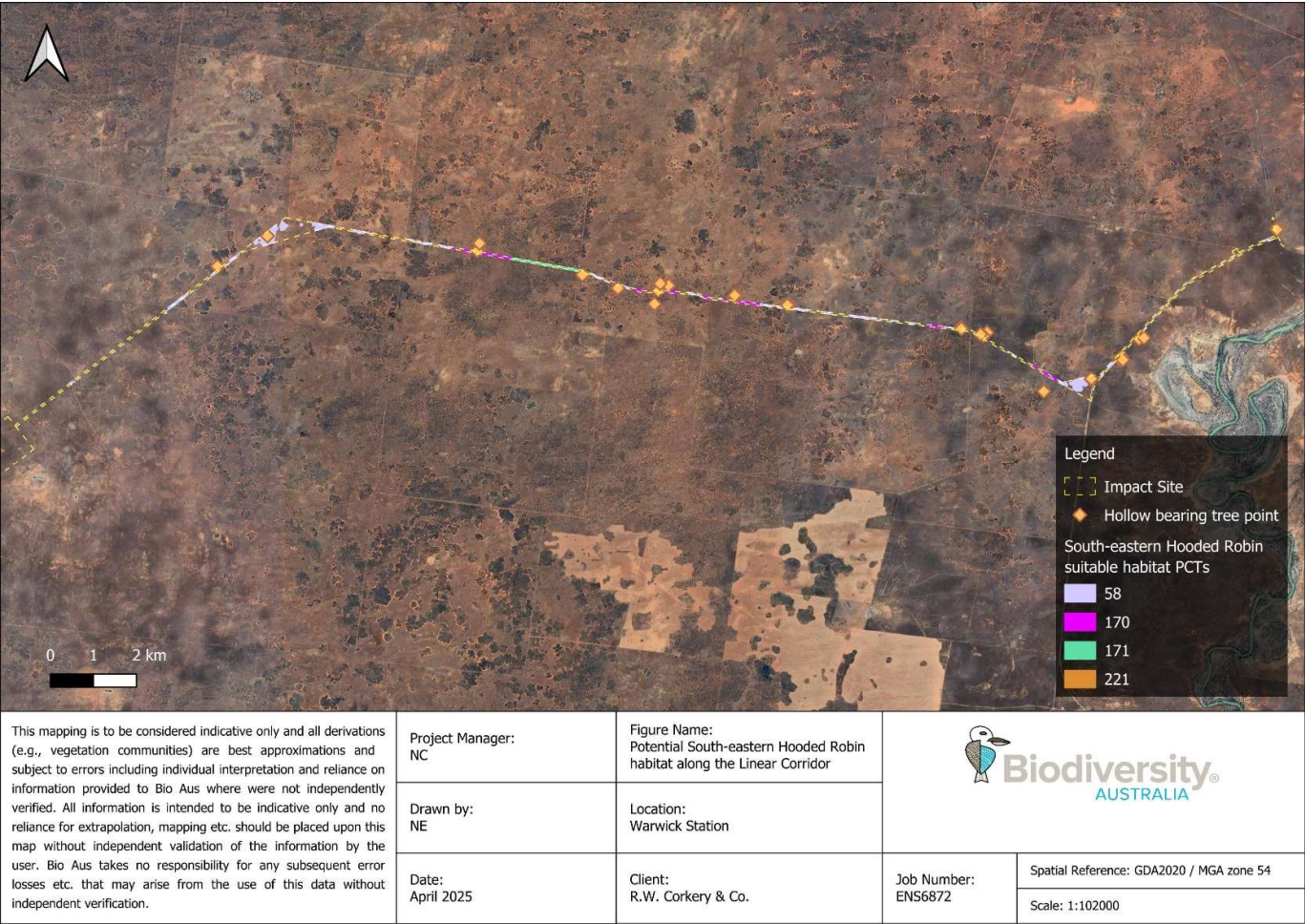


Figure 12: Potential South-eastern Hooded Robin habitat along the Linear Corridor





Figure 13: Potential habitat (associated PCTs) for South-eastern Hooded Robin within 50 km of the Impact Site

8.2.4 Habitat requirements

The species occupies a variety of habitats including dry eucalypt and acacia woodlands and shrublands with an open understorey and grassy areas (DCCEEW, 2023). They generally avoid woodlands with tall trees or dense tree cover (Garnett and Baker, 2020d). Structurally diverse habitats are necessary (DCCEEW, 2023). While they can occur in patches as small as 2.9 ha (Montague-Drake et al. 2009), in agricultural landscapes they prefer larger patches greater than 10 ha (Watson et al. 2000).

Priday (2009) found a positive association between the presence of the Hooded Robin and the edges of open vegetation dominated by ungrazed or lightly grazed grassy ground cover in which species of native perennial tussock-grass predominate, adjoining timbered native vegetation cover, on moderately deep to deep soils.

Birds tend to forage on insects and small lizards taken from the ground (Antos et al. 2008). They hunt for invertebrates by 'perch and pounce' in grassy clearings where rocks and fallen timber litter the ground (Sullivan 1993). Fitri and Ford (2003) found Hooded Robins foraged mainly by pouncing or gleaning on the ground for invertebrates, with an increase of gleaning in winter. Less frequently they hawked for flying insects and gleaned or snatched prey from bark, both of which were more common in summer and autumn. Although branches were the most frequent perches from which foraging was initiated, Robins also foraged from trunks, stumps and logs and an array of artificial structures.

Perches were typically close to the ground, though hawking, gleaning and snatching were usually carried out 3-8 metres above the ground. A heterogeneous ground layer is required (Antos et al, 2008) and dead timber, standing and fallen, is highlighted as important components of habitat for the species (Reid, 1999).

Breeding for the species generally occurs between July and November, often rearing several broods (DCCEEW 2023). Birds form monogamous pairs and tend to breed in the same breeding site. The female incubates the eggs (typical clutch size is 2-3) and both parents defend the nest. Birds usually return to the same breeding site where they typically rear several broods each season. Nests comprise small, neat cups of bark and grasses bound with webs (Fitri & Ford, 2003), and are situated in a tree fork or crevice, from less than 1 m to 5 m above the ground. Territories range from around 10 ha during the breeding season to 30 ha in the non-breeding season (OEH 2023).

8.2.5 Habitat critical to the survival of the species

The EPBC Act provides for the maintenance of a register of critical habitat. That is, habitat that is identified by the minister as being critical to the survival of a listed threatened species or ecological community. No habitat critical to the survival of the species is listed in the species' Conservation Advice - Threatened Species Scientific Committee (TSSC 2016) or listed on the Register of Critical Habitat maintained by the minister under the EPBC Act.

The *Environment Protection and Biodiversity Conservation Act 1999* (and Regulations) refer to habitat of threatened species and ecological communities and listed migratory species as *habitat*, *important habitat*, *critical habitat*, *habitat critical to the survival of a species*, and *expected habitat*. This ambiguity in terminology causes confusion for stakeholders, proponents, and decision makers, and has potentially diminished environmental outcomes for listed species and ecological communities as MNES. As such, it is of critical importance that the term Habitat Critical to the Survival of the Species is clearly defined, as it relates to the Hooded Robin.



Habitat Critical to the Survival of the species is defined in the MNES Significant Impact Guidelines 1.1, it 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.

This definition is further supported by LEX77012 of the Conservation Planning Reform – Definition and Description of Habitat for Listed Threatened Species, Ecological Communities and Migratory Species, proposed definitions for Critical Habitat – *spatially defined subset of habitat for which there is high confidence that it is irreplaceable to the persistence of a listed threatened species, ecological community or migratory species in the wild.*

Habitat critical to the survival of the Hooded Robin (south-eastern) as listed in the species Conservation Advice (DCCEE 2023) includes areas of:

- Dry eucalypt and acacia woodlands and shrublands remnants with an open understorey, some grassy areas and a complex ground layer, often in or near clearings or open areas.
- Structurally diverse habitats featuring: mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses.
- Standing dead or live trees and tree stumps are also essential for nesting, roosting and foraging.
- Moderately deep to deep soils, rocks and fallen timber which provides essential foraging habitat.

Bio Aus have defined critical habitat for the species in the Impact Site as:

Foraging habitat

Treed communities - PCTs 58, 170, 171, 221 and 254 in moderate to good condition (not significantly impacted by goats) where they:

- Contain mature eucalypts (>10% cover) and saplings (>10% cover) and shrubs (<2 m height and > 10% cover) and grasses (>0.5 m height and >20% cover).
- Have an open understorey (height 1-2 m and cover <30%).
- Have a complex understorey (fallen timber > 10% cover).
- The patch is adjacent open areas (<10% total cover).

Breeding habitat

- The above with standing dead trees and/or tree stumps, or
- Live trees with a tree fork or crevice, from less than 1 m to 5 m above the ground.

Habitat containing all the above features is absent from the Impact Site due largely to impacts arising from agriculture and feral goats.



Figure 13 illustrates the broad extent of potential foraging and breeding habitat (associated PCTs 58, 170, 171, 221 and 254) for the South-eastern Hooded Robin in the context of the broader landscape, surrounding the Impact Site at a radius of 50 km.

Photograph Plate 1: Plant community Types in the Impact Site



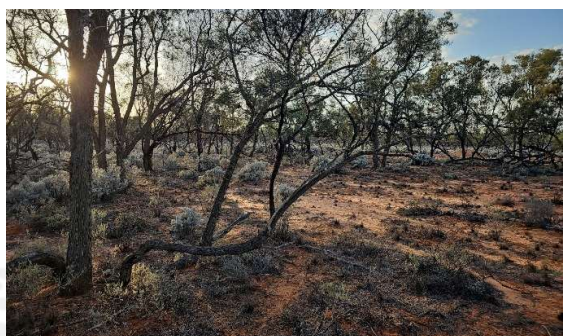
PCT 58



PCT 170



PCT 171



PCT 221



PCT 254



8.2.6 Key threats

Historical habitat clearance that destroyed native vegetation has left a legacy of fragmentation and degradation (Ford 2011), where nest predation is too high to compensate for adult mortality (Ford et al. 2009), and they have to compete with noisy miners (*Manorina melanocephala*) (Maron & Lill 2005). Other possible threats are likely to be by-products of fragmentation.

Key threats to the species arise from:

- Ongoing impacts of habitat fragmentation and land clearing for agriculture.
- Habitat degradation caused by livestock grazing or rabbit and deer grazing.
- Invasive weeds.
- Firewood collection.
- Increased likelihood of extreme events (i.e., wildfire, heatwave, and drought).
- Noisy miner territorial competition.
- Inappropriate fire regimes.
- Cat and fox predation.

8.2.7 The Action

The PCTs with which South-eastern Hooded Robin is associated would be cleared, with areas of each associated PCT contained below.

Table 8: PCTs associated with South-eastern Hooded Robin to be cleared

PCT	Area (ha)	PCT name
58	238.42	Black Oak – Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
170	15.6	Chenopod sandplain mallee woodland/shrubland
171	12.11	Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
221	395.14	Black Oak – Pearl Bluebush open woodland of the sandplains of the semi-arid warm and arid climate zones
254	1.16	Black Oak - Bladder Saltbush on light clays in the arid zone
Total	662.43	

The vegetation to be affected provides forage and refuge habitat, with parts of the Impact Site also providing suitable roosting and nesting habitat for the species. Clearing will be undertaken progressively and the Mine Site rehabilitated following mineral sand extraction.

8.2.8 Mitigation Measures

8.2.8.1 Pre-clearing Survey and Clearing Supervision

The clearing extent is to be inspected for fauna by a suitably qualified or experienced person immediately prior to commencement of any vegetation removal involving machinery and/or tree-felling. This is to occur each morning if clearing spans over multiple days/weeks. Pre-clearing checks would include searches of



habitat and searches for bird nests. If possible, any detected fauna is to be relocated off-site to nearby suitable areas (preferably within their natural home range) prior to clearing.

During the pre-inspection, any habitat features detected (e.g. hollows, logs, nests) are to be clearly marked with flagging tape to allow easy identification during clearing.

A suitably qualified or experienced person is to be present on site to supervise all clearing works to retrieve any fauna detected during works and undertake appropriate action (e.g. humanely euthanise severely injured animals and/or relocate uninjured animals where possible). A suitably qualified fauna spotter must also be present during de-watering of any temporary water bodies on the Site to rescue and relocate any potential stranded aquatic fauna species.

A report detailing the results of the clearing monitoring is to be provided to the consent authority within 14 days of works completion.



8.2.9 Significant Impact Assessment

An assessment of impacts of The Action on the Hooded Robin has been undertaken using the endangered criteria listed in the Significant Impact Guidelines 1.1 (DotE, 2013). The assessment is provided in Table 9.

Table 9: Significant Impact Assessment – Hooded Robin

Criteria	Assessment
An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:	
Lead to a long-term decrease in the size of a population.	Less than remote chance Field surveys have confirmed that a population is present within the Impact Site. While the exact extent of that population is unknown, previous work confirms that the total number of populations across their range is greater than 10 and that there are already fragmented populations across this range. The total number of mature individuals is estimated to be 68,000 (36,000–113,000), however the reliability of this estimate is low (DCCEE, 2023). The Action will remove a total of approximately 662 ha of potential habitat for the species based on associated vegetation types. Areas that satisfy all of the species 'critical habitat' requirements suitable for all lifecycle phases are absent. Review of the NSW State vegetation type mapping and satellite imagery shows that the locality contains large tracts of native vegetation, with an analysis of only two mallee vegetation communities (known habitat for this species) confirming that the mapped extent within a 20 km buffer of the Impact Site contains about 59,284 hectares. Given the species territories range from around 10 ha during the breeding season to 30 ha in the non-breeding season (OEH 2023), that the species has a short generation time (3 years) and that multiple breeding events per season are recorded, The Action will have a short-term impact on birds currently relying on the Site but will have a less than remote chance to lead to a long-term decrease in population.
Reduce the Area of Occupancy of the species.	A real chance The current AOO is estimated to be 30,000 km² (16,000–50,000 km²) or about 3,000,000 hectares. The Action would result in direct impacts to a total of 662 ha of potential habitat, which equates to about 0.02% of the AOO. While The Action would reduce the AOO for local individuals, it is a less than remote chance that The Action would lead to a long-term decrease in the Area of Occupancy (AOO) of the species.
Fragment an existing population into two or more populations.	Less than remote chance The population is highly mobile and already considered to be = fragmented across its range. While the path of the Action within the Impact Site is generally linear, the development of the Impact Site would not occur all at once. The mining process would be undertaken over many years, meaning that the clearing (and subsequent rehabilitation of areas) would also take place over many years, confirming that direct impacts would be gradual. Given this mosaic approach of the Action, it would not cause a significant barrier for the species, and it is likely that the Hooded Robin will be able to continue to move across and between habitats given that they are noted to move across roads and cleared areas (as noted onsite with individuals moving across Nulla Road).
Adversely affect habitat critical to the survival of a species.	A remote chance Habitats considered critical to the survival of the species include woodlands and shrublands with an open understory and a complex and structurally diverse ground layer, which includes tussocks of native grasses within open areas. Habitat with all these features is absent within the Impact Site, largely due to impacts from agriculture and feral goats. The Action will directly impact approximately 662 ha of habitat suitable for foraging. However, these habitats are not limited to the Impact Site and are widespread across the locality and the region, so there will be significant areas (~99%) of Hooded Robin habitat beyond the Impact Site not directly impacted by The Action that can act as refuge for the



Criteria	Assessment
An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:	
	species. In addition, clearing will be undertaken progressively as the mine proceeds and rehabilitated progressively. Some habitat known to be used by the species will be impacted.
Disrupt the breeding cycle of a population.	Less than remote chance The species breeds seasonally, defending territories of ~10 ha, with pairs often returning to the same roost site. Loss of habitat may disrupt breeding for individuals of the population but is a less than remote chance to affect the population as a whole.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	Less than remote chance The Action will destroy approximately 662 ha of potential habitat for the species, most of which is degraded - constitutes 0.92% of the overall Subject Land, in which 68,330 ha will be retained. Areas with trees often lack a shrub layer and/or a grass layer and/or logs. Due to the extent of alternate habitat in the locality, the widespread population extent and reasonably high population numbers, The Action has a less than remote chance to cause a decline in the species as a whole.
Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat.	Less than remote chance Invasive weeds and predation by feral cats are known threats to the species. There are a number of invasive species already present including feral goats, foxes, cats, rabbits and pigs so The Action would not result in the introduction of invasive fauna species not already present. However, it will implement a control program to assist in managing populations of these species. Standard biological hygiene controls will be adopted throughout the Impact Site and weeds controlled within restoration areas.
Introduce disease that may cause the species to decline.	Less than remote chance Disease is not listed as a key threat in the species' Conservation Advice (TSSC, 2015). Regardless, standard biological hygiene controls will be adopted throughout the Impact Site. As such, the potential to introduce disease that may cause the species to decline is considered low.
Interfere with the recovery of the species.	Less than remote chance The Action is moderate in severity occurring progressively over a medium period of time and impacting less than 3% of the species habitat within the locality. It is a less than remote chance to interfere with the recovery of the species.



7.2.10 Conclusion

South-eastern Hooded Robin was recorded in the Impact Site on multiple occasions between 2018 and 2025. Plant Community Types associated with the species and present within the Impact Site include PCTs 58, 170, 171, 254 and 221. The total area proposed to be cleared that could be occupied by these species is approximately 662 ha.

Habitat critical to the survival of the species as listed in the species Conservation Advice (DCCEEW 2023) includes areas of:

- Dry eucalypt and acacia woodlands and shrublands remnants with an open understorey, some grassy areas and a complex ground layer, often in or near clearings or open areas.
- Structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses.
- Standing dead or live trees and tree stumps are also essential for nesting, roosting and foraging.
- Moderately deep to deep soils, rocks and fallen timber which provides essential foraging habitat.

None of the habitat on site meets all of the above criteria, primarily due to the loss of native grasses and ground layer complexity due to impacts arising from agriculture, feral goats and sheep.

The land surrounding the Impact Site at the Mine Site and along the Linear Corridor contains large swathes of PCTs 58, 170, 171, 254 and 221, which are in the same condition or similar to that proposed for removal. The removal of 662 ha of vegetation constitutes 0.92% of the overall Subject Land, in which 68,330 ha will be retained. Therefore, the vegetation to be removed within the Impact Site is a relatively minor proportion and not considered habitat critical to the survival of the South-eastern Hooded Robin.

Based on the information above, the impacts of The Action on South-eastern Hooded Robin habitat are not considered to be significant under the EPBC guidelines.



8.3 Southern Whiteface (*Aphelocephala leucopsis*)

8.3.1 Conservation status

The Southern Whiteface is listed as Vulnerable under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the NSW *Biodiversity Conservation Act 2016*. The main factor that makes the species eligible for listing in the Vulnerable category is that the population has declined substantially by an estimated 30 to 50% every ten years (one generation span is 2.9 years) since 1999, with no indication that the decline is slowing (Ehmke et al. 2021). Evidence for loss is now strong and is based largely on reporting rate data (Ehmke et al. 2021).

8.3.2 Species Range and Distribution

The Southern Whiteface occurs across most of mainland Australia south of the tropics, from the north-eastern edge of the Western Australian wheatbelt, east to the Great Dividing Range (Schodde & Mason 1999). There is a broad hybrid zone between the two subspecies extending north from the western edge of the Nullarbor Plain. The northern boundary extends to about Carnarvon in the west, to the southern Northern Territory in central Australia, but is slightly further south in Queensland where the species is largely confined to the south-west of the Mitchell Grass Downs and along the southern state border (Schodde & Mason 1999).

Two subspecies are recognised: *A. l. leucopsis* (South-eastern Southern Whiteface), the dominant subspecies found throughout south-eastern and central Australia; and *A. l. castaneiventris* (South-western Southern Whiteface) found in central and southern of Western Australia (DCCEEW, 2023). The South-eastern Southern Whiteface is known or likely to occur over most of NSW apart from the coastal belt and is the subject of this report.

The distribution of the Southern Whiteface is presented in Figure 14.



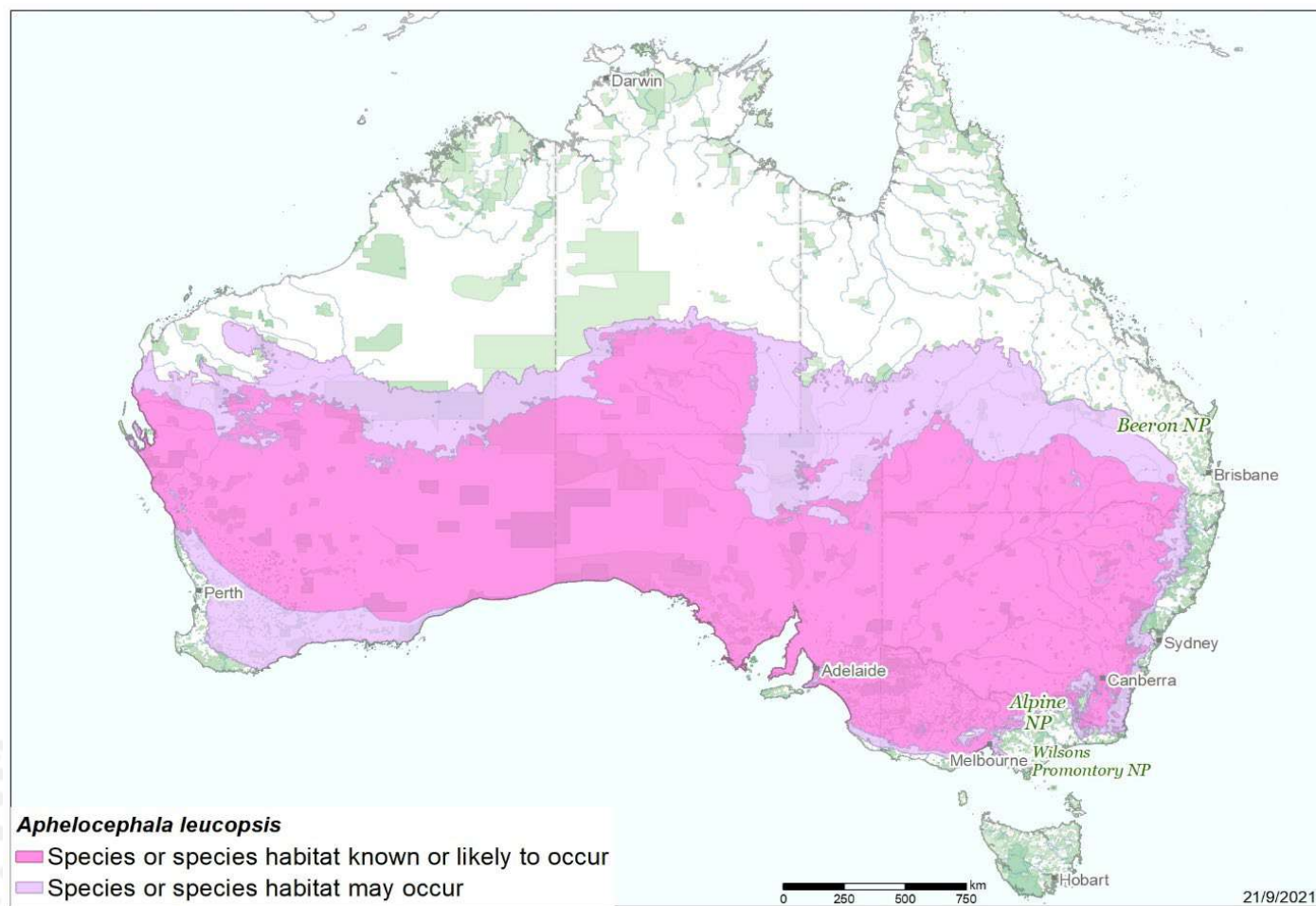


Figure 14: Southern Whiteface range and distribution



8.3.3 Presence within the Impact Site

Desktop results

The Impact Site is within the known distribution of the species. A search of available species records identified 27 records within 10 km of The Impact Site (Atlas of Living Australia (ALA) and NSW BioNet Atlas 2025). BioNet records within the last ten years indicate native vegetation connectivity to records within 20 km of the Site.

Field results

Extensive bird surveys were conducted between 2018 and 2025, including survey in accordance with the *Survey guidelines for Australia threatened birds – EPBC Act survey guidelines 6.2* (Survey Guidelines) (DEWHA, 2010).

The Southern Whiteface was recorded in the Impact Site on several occasions during the field surveys.

Records of Southern Whiteface within the region are presented in Figure 15.

Potential habitat

Potential habitat for the species within the Impact Site is associated with the following Plant Community Types (PCT) (OEH 2025):

- PCT 28 - White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone.
- PCT 58: Black Oak – Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion.
- PCT 143 - Narrow-leafed Hopbush – Scrub Turpentine – Senna shrubland on semi-arid and arid sandplains and dunes.
- PCT 152 - Lunette chenopod shrubland mainly of the Murray Darling Depression Bioregion.
- PCT 154 - Pearl Bluebush low open shrubland of the arid and semi-arid plains.
- PCT 157 - Bladder Saltbush shrubland on alluvial plains in the semi-arid (warm) zone including Riverina Bioregion,
- PCT 170 - Chenopod sandplain Mallee woodland/shrubland,
- PCT 171 - Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion.
- PCT 215 - Woollybutt Grass open grassland on red earths of the inland plains.
- PCT 253 - Gypseous shrubland on rises in the semi-arid and arid plains.

Potential habitat for the Southern Whiteface within the Impact Site Mine Site is presented in Figure 16 and within the Linear Corridor in Figure 17.



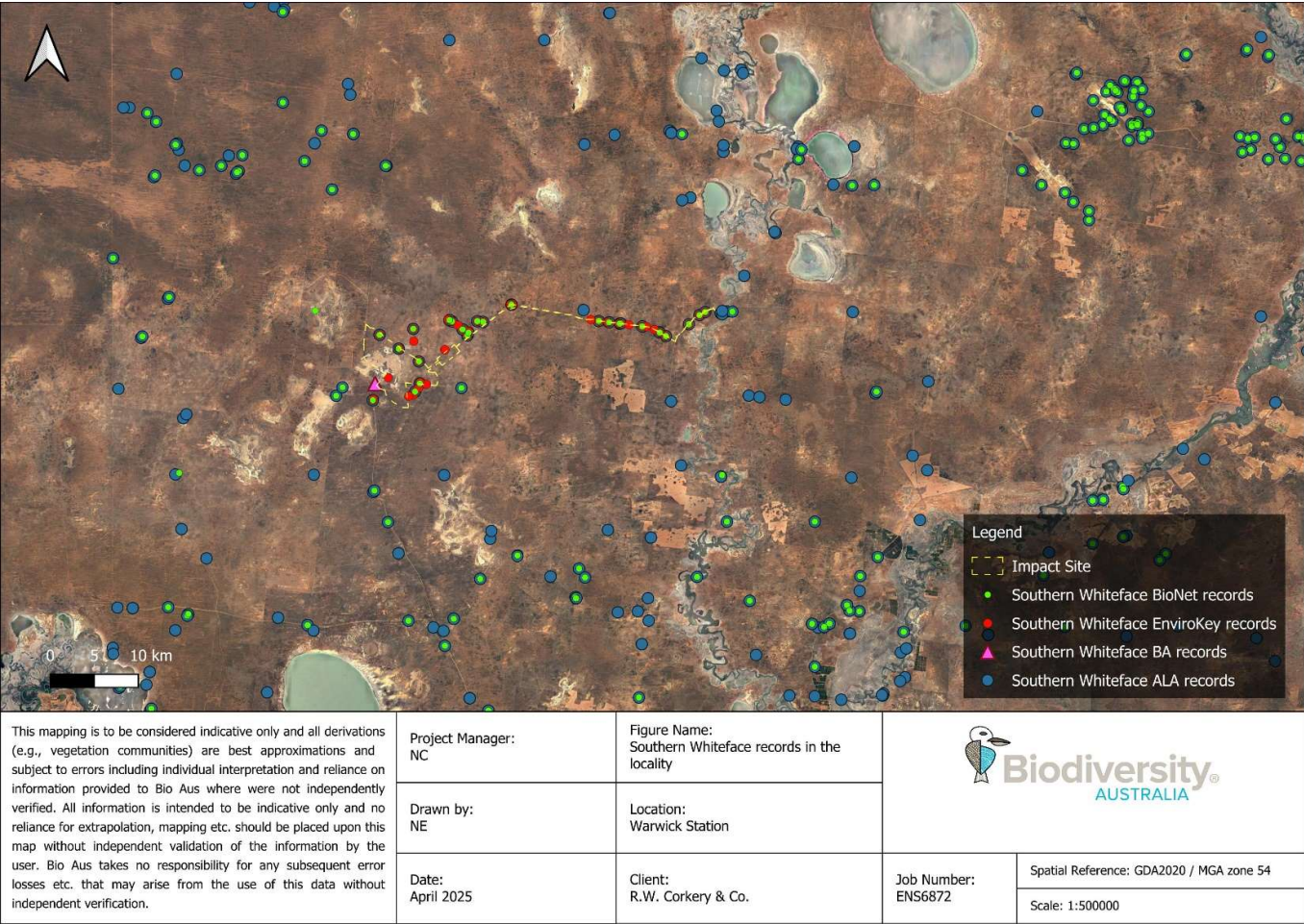


Figure 15: Regional Southern Whiteface records

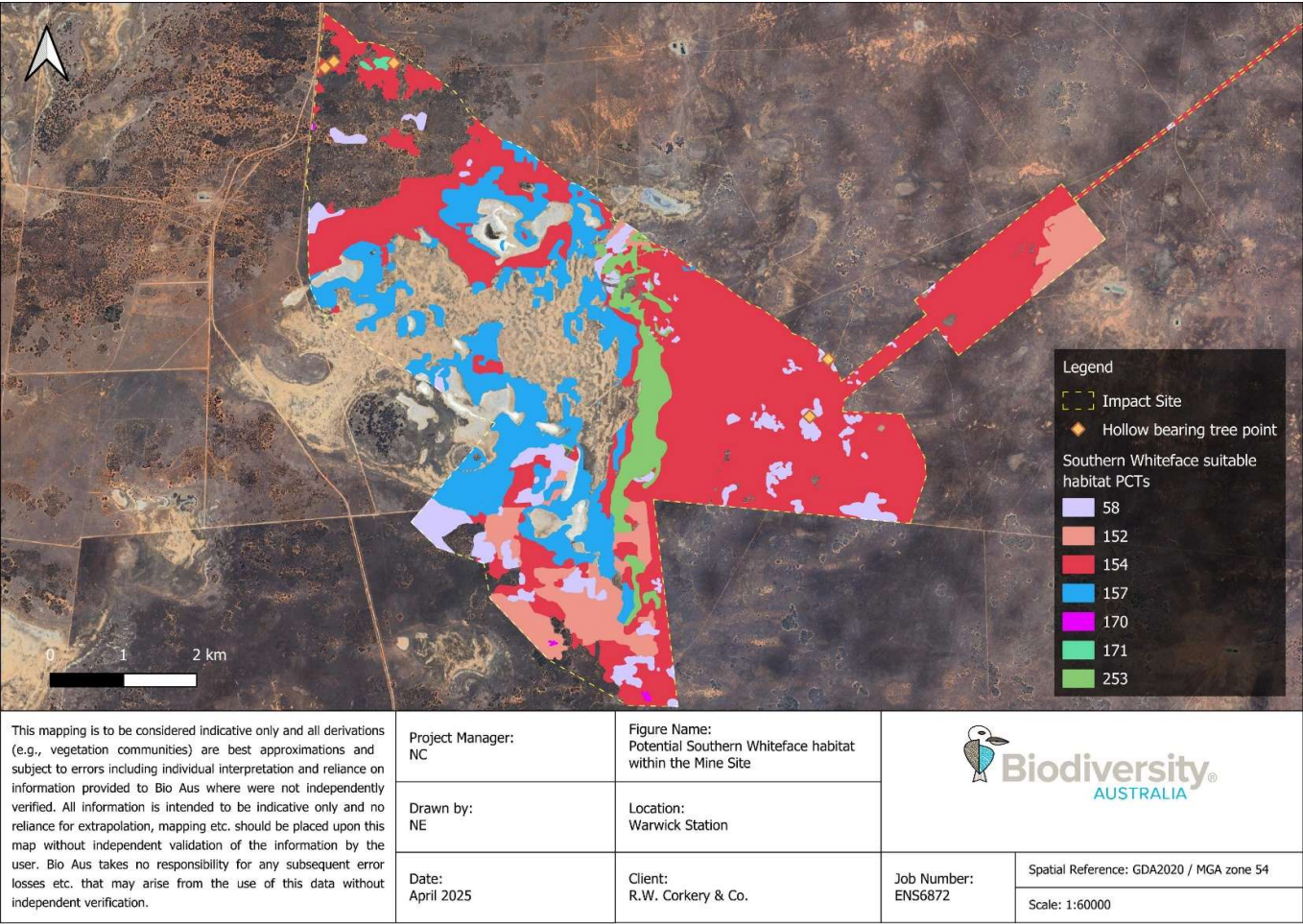


Figure 16: Potential Southern Whiteface habitat on the Mine Site



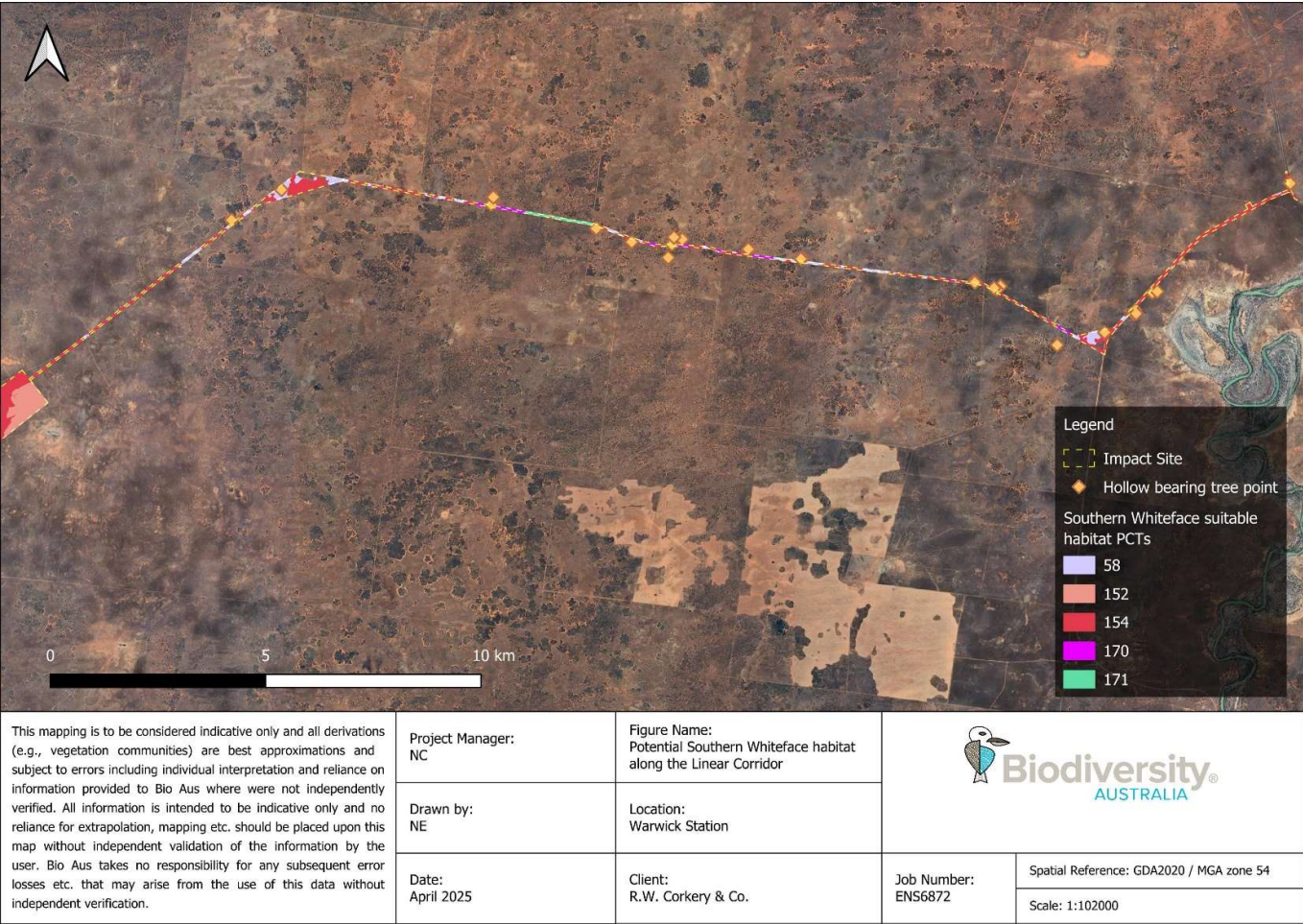


Figure 17: Potential Southern Whiteface habitat along the Linear Corridor

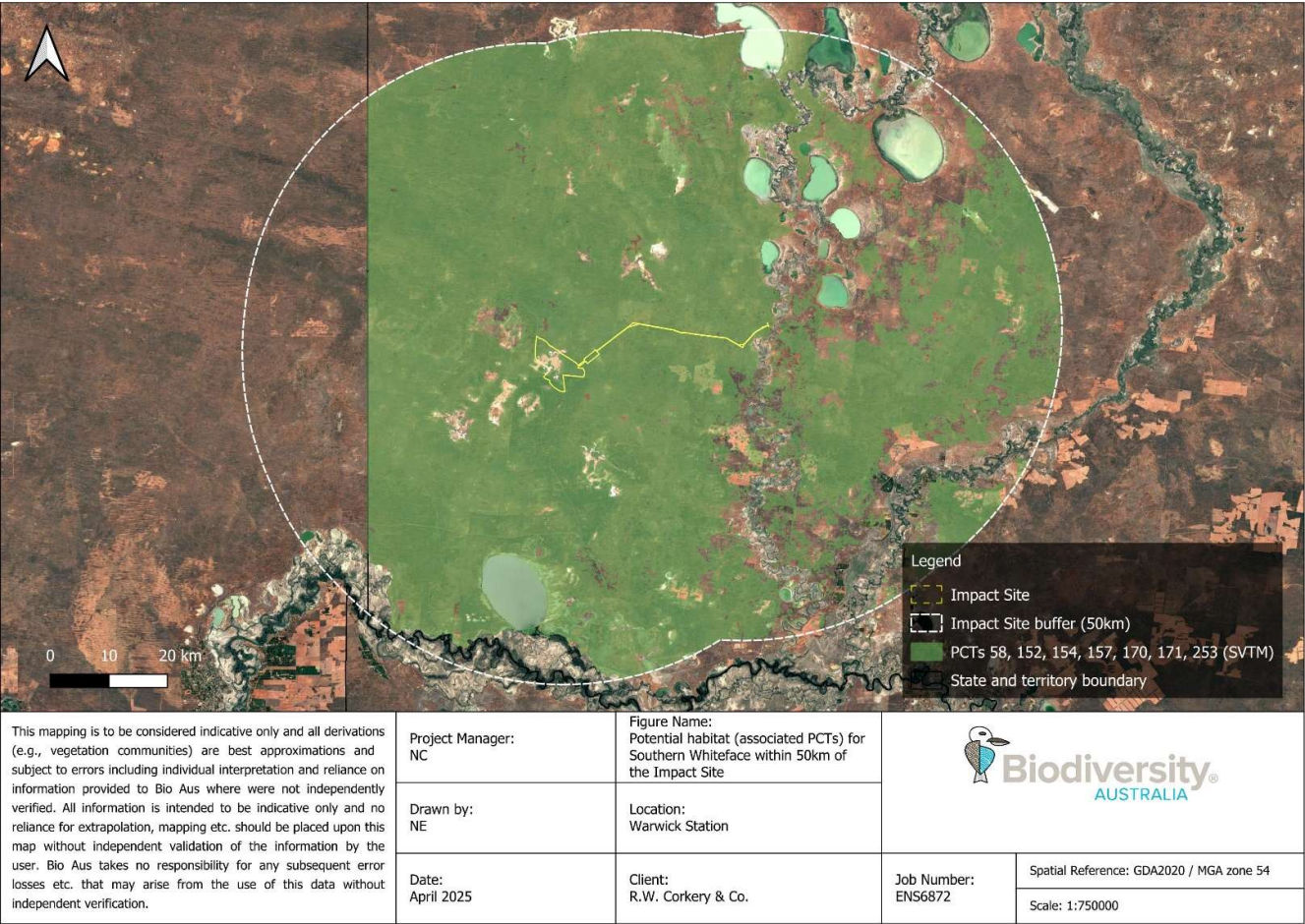


Figure 18: Potential habitat (associated PCTs) for Southern Whiteface within 50km of the Impact Site

8.3.4 Important population

There are no important populations identified in the Conservation Advice for the Southern Whiteface (DCCEEW, 2023) or the *Action Plan for Australian Birds* (Garnett and Baker, 2020), and no Recovery Plan has been completed for the species. The MNES Significant Impact Guidelines 1.1 (DOtE, 2013) state: An ‘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.

There is no evidence to suggest that an “important population” occurs within the Impact Site. The Impact Site is not at or near the limit of the species range, the region is not identified as a key source population, and the population is not considered to be severely fragmented, genetically distinct or have limitations to dispersal. Indeed, the Action Plan (Garnett and Baker 2021) states that there are no impediments to dispersion across the species large range.

The overall population size is estimated to be about 477,000 individuals (DCCEEW, 2023). Southern Whiteface records are relatively widespread across the locality and the Impact Site is part of a much larger continuous area of habitat in the region, given the extent of native vegetation identified on the NSW SVTM.

8.3.5 Habitat requirements

Southern Whitefaces inhabit open woodlands and shrublands dominated by acacias or eucalypts with an understorey of grasses or shrubs or both (DCCEEW, 2023). They forage mostly on the ground eating insects, spiders and seeds found in leaf litter. Few trees and herbaceous litter cover is important for foraging and Hollow Bearing Trees are important for roosting and nesting (EPSDD, 2025). The species tends to be sedentary, but during drought years, individuals may move into wetter areas outside their normal range (Higgins et al., 2001).

Breeding takes place from July to October throughout most of the species’ range; however, the timing of breeding can be affected by rainfall in arid regions (Higgins & Peter 2002). Birds may breed outside of their usual season following sufficient rainfall or may not breed at all during drought. The species builds large bulky domed nest of grass, bark and roots, usually in a hollow or crevice, although sometimes in low bushes (Higgins & Peter 2002). A clutch size of 3–4 eggs is typical. The length of the incubation period is unknown, but young fledge between 14–19 days after hatching (Higgins & Peter 2002). The generation length is estimated at 2.8 years (Bird et al. 2020).



8.3.6 Habitat critical to the survival of the species

The EPBC Act provides for the maintenance of a register of critical habitat. That is, habitat that is identified by the minister as being critical to the survival of a listed threatened species or ecological community. No habitat critical to the survival of the species is listed in the species' Conservation Advice (TSSC, 2016) or listed on the Register of Critical Habitat maintained by the minister under the EPBC Act.

The *Environment Protection and Biodiversity Conservation Act 1999* (and Regulations) refer to habitat of threatened species and ecological communities and listed migratory species as *habitat*, *important habitat*, *critical habitat*, *habitat critical to the survival of a species*, and *expected habitat*. This ambiguity in terminology causes confusion for stakeholders, proponents, and decision makers, and has potentially diminished environmental outcomes for listed species and ecological communities as MNES. As such, it is of critical importance that the term Habitat Critical to the Survival of the Species is clearly defined, as it relates to the Southern Whiteface.

Habitat Critical to the Survival of the Species is defined in the MNES Significant Impact Guidelines 1.1, it 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.

This definition is further supported by LEX77012 of the Conservation Planning Reform – Definition and Description of Habitat for Listed Threatened Species, Ecological Communities and Migratory Species, proposed definitions for Critical Habitat – *spatially defined subset of habitat for which there is high confidence that it is irreplaceable to the persistence of a listed threatened species, ecological community or migratory species in the wild.*

Habitat critical to the survival of the Southern Whiteface (South-eastern) as listed in the species Conservation Advice (DCCEEW 2023) includes areas of:

- Relatively undisturbed open woodlands and shrublands with an understorey of grasses or shrubs, or both.
- Habitat with low tree densities and an herbaceous understorey litter cover which provides essential foraging habitat.
- Living and dead trees with hollows and crevices which are essential for roosting and nesting.

Bio Aus have defined critical habitat for the species in the Impact Site as:

Foraging habitat:

Tree and shrub communities - PCTs 28, 58, 143, 152, 154, 157, 170, 171, 215 and 253 in moderate to good condition (not badly impacted by goats) where they:

- have a tree cover <30%.
- a shrub cover >30% and/or native grass cover >30%.
- an herbaceous understorey litter cover >30%.



Breeding habitat

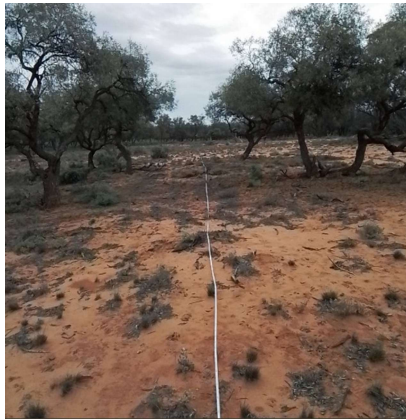
- The above with living or dead Hollow Bearing Trees or tree crevices which are essential for roosting and nesting.

Habitat containing all the above features is absent from the Impact Site due largely to disturbance impacts arising from agriculture and feral goats. Where trees are present, shrubs and grasses are largely absent. Where shrubs or grasses are present, litter cover is largely absent.

Figure 18 illustrates the broad extent of potential foraging and breeding habitat (associated PCTs 28, 58, 143, 152, 154, 157, 170, 171, 221 and 253) for the Southern Whiteface in the context of the broader landscape, surrounding the Impact Site at a radius of 50 km.



Photograph Plate 2: Plant community Types in the Impact Site.



PCT 28



PCT 58



PCT 143



PCT 152



PCT 154



PCT 157





PCT 170



PCT 171



PCT 215



PCT 253



8.3.7 Key threats

Habitat loss and fragmentation is likely the cause of the species decline, especially in the parts of the species' range where there has been complete removal of habitat for intensive agriculture (Ehmke et al. 2021). Droughts may have local impacts (Ellis & Taylor 2014) and are likely to become more frequent and severe (Evans et al. 2017).

Key threats to the species arise from:

- Habitat loss caused by clearing for agriculture.
- Habitat degradation caused by livestock grazing or feral pest grazing.
- Increased frequency or length of droughts.
- Increased likelihood of extreme events (i.e., wildfire, heatwave, and drought).

EES (2024) list the following detail regarding threats to the species:

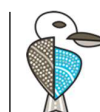
- Degradation of ground-level vegetation and loss of standing dead timber due to agricultural intensification and inappropriate grazing regimes resulting in loss of foraging and nesting habitat.
- Clearing of woody vegetation for agriculture leading to loss of available nesting sites and reduction in recruitment of future hollows.
- Loss of standing dead timber and fallen woody debris due to firewood collection, fire management and land management causing simplification of habitat.
- Aggressive exclusion from forest and woodland habitat by over-abundant noisy miners (*Manorina melanocephala*).

8.3.8 The Action

The PCTs with which the Southern Whiteface is associated would be cleared, with areas of each associated PCT contained below.

Table 10: PCTs associated with Southern Whiteface to be cleared

PCT	Area (ha)	PCT name
28	0.77	White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone
58	238.42	Black Oak – Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
143	17.52	Narrow-leafed Hopbush – Scrub Turpentine – Senna shrubland on semi-arid and arid sandplains and dunes
152	250.43	Lunette chenopod shrubland mainly of the Murray Darling Depression Bioregion
154	1669.79	Pearl Bluebush low open shrubland of the arid and semi-arid plains
157	495.28	Bladder Saltbush shrubland on alluvial plains in the semi-arid (warm) zone including Riverina Bioregion
170	15.60	Chenopod sandplain mallee woodland/shrubland
171	12.11	Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
215	5.91	Woollybutt Grass open grassland on red earths of the inland plains
253	139.72	Gypseous shrubland on rises in the semi-arid and arid plains
Total	2845.55	



The vegetation to be affected provides forage and refuge habitat, with parts of the site also providing suitable roosting and nesting habitat for the species. Clearing will be undertaken progressively and the Mine Site rehabilitated following mineral sand extraction.

8.3.9 Mitigation Measures

Pre-clearing Survey and Clearing Supervision

The clearing extent is to be inspected for fauna by a suitably qualified or experienced person immediately prior to commencement of any vegetation removal involving machinery and/or tree-felling. This is to occur each morning if clearing spans over multiple days/weeks. Pre-clearing checks would include searches of habitat and searches for bird nests. If possible, any detected fauna is to be relocated off-site to nearby suitable areas (preferably within their natural home range) prior to clearing.

During the pre-inspection, any habitat features detected (e.g. hollows, logs, nests) are to be clearly marked with flagging tape to allow easy identification during clearing.

A suitably qualified or experienced person is to be present on site to supervise all clearing works to retrieve any fauna detected during works and undertake appropriate action (e.g. humanely euthanise severely injured animals and/or relocate uninjured animals where possible). An ecologist must also be present during de-watering of any temporary water bodies on the Site to rescue and relocate any potential stranded aquatic fauna species.

A report detailing the results of the clearing monitoring is to be provided to the consent authority within 14 days of works completion.



8.3.10 Significant Impact Assessment

An assessment of impacts of The Action on the Southern Whiteface has been undertaken using the endangered criteria listed in the Significant Impact Guidelines 1.1 (DotE, 2013). The assessment is provided in Table 11.

Table 11: Significant Impact Assessment - Southern Whiteface

Criteria	Assessment
An action is likely to have a significant impact on an endangered 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.	Less than a remote chance Field surveys have confirmed that a population is present within The Impact Site; however, there is no evidence to suggest the population recorded at the site represents an important population as the Impact Site is not at or near the limit of the species range, the region is not identified as a key source population, and the population is not considered to be severely fragmented or have limitations to dispersal. The total number of mature individuals is estimated to be 410,000 (range 200,000–820,000) <i>A. l. leucopsis</i> individuals. The loss of 2846 ha of potential habitat will have a short-term impact on birds currently relying on the Site but is a less than remote chance to lead to a long-term decrease in the size of an important population. The loss constitutes 3.93% of the overall Subject Land, in which 68,330 ha will be retained.
Reduce the Area of Occupancy of an important population.	Less than a remote chance The extent of occurrence (EOO) for the species is estimated to be 4,910,000 km² (Australian Government 2021) with a stable trend (Ehmke et al. 2021), however the AOO is contracting and is estimated to be 70,000 km² or 7 million hectares (range 34,400–140,000 km²) (Ehmke et al. 2021). The Action would result in direct impacts to a total of 2846 ha of potential habitat, which equates to about 0.04% of the AOO. While The Action may reduce the AOO for local individuals, there is a less than remote chance that The Action would lead to a long-term decrease in the AOO of an important population.
Fragment an existing important population into two or more populations.	Less than a remote chance The species is highly mobile, and the population is not considered to be severely fragmented or have limitations to dispersal (DCCEEW, 2023a, Garnett and Baker, 2020e). The mining process would be undertaken over many years, meaning that the clearing (and subsequent rehabilitation of areas) would also take place over many years, so that direct impacts to vegetation would be gradual. Given this mosaic, it is likely that the Southern Whiteface will be able to continue to move across and between habitats, and the extent of native vegetation remaining in the locality is large. Given the species ability to fly, The Action has a less than remote chance of fragmenting a population into two or more populations.
Adversely affect habitat critical to the survival of a species.	Less than a remote chance Habitat critical to the survival of the species is defined as <i>relatively undisturbed</i> open woodlands and shrublands with an understorey of grasses or shrubs or both and an herbaceous understorey litter cover and living and dead trees with hollows and crevices. Habitats on site are degraded through overgrazing by sheep and feral goats and are not considered to meet the criteria recognised as 'habitat critical to the survival of the species'. Hollow Bearing Trees are scarce.
Disrupt the breeding cycle of an important population.	Less than a remote chance Breeding takes place from July to October throughout most of the species' range and birds build large bulky domed nest of grass, bark and roots, usually in a hollow or crevice, although sometimes in low bushes (Higgins & Peter 2002). Nesting is often observed to involve pairs, but there have also been multiple occurrences of co-operative breeding recorded, with up to four adults participating in chick rearing (Higgins & Peter 2002). There is no indication in the literature that birds return to the same place to nest.



Criteria	Assessment
An action is likely to have a significant impact on an endangered species if there is a real chance or possibility that it will:	
	Loss of habitat may disrupt breeding for individuals of the population but is a less than remote chance of affecting any important population.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	Less than a remote chance The Action will destroy approximately 2846 ha of potential habitat for the species, most of which is degraded and lacks one or more features of 'critical habitat'. Where trees are present, shrubs and grasses are largely absent. Where shrubs or grasses are present, litter cover is largely absent and suitable trees for nesting are absent. Due to the extent of alternate habitat in the locality, the widespread population extent and reasonably high population numbers, The Action has a less than remote chance to cause a decline in the species as a whole.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Less than a remote chance There are a number of invasive species already present including feral goats, foxes, cats, rabbits and pigs so The Action would not result in the introduction of invasive fauna species not already present. However, it will implement a control program to assist in managing populations of these species. Standard biological hygiene controls will be adopted throughout the Impact Site and weeds controlled within restoration areas.
Introduce disease that may cause the species to decline	Less than a remote chance Disease is not listed as a key threat in the species' Conservation Advice (TSSC, 2015). Regardless, standard biological hygiene controls will be adopted throughout the Impact Site. As such, the potential to introduce disease that may cause the species to decline is considered low.
Interfere substantially with the recovery of the species.	Less than a remote chance The Action is moderate in severity occurring progressively over a medium period of time and impacting less than 1% of the species habitat within the locality. It has a less than remote chance to interfere with the recovery of the species.



8.3.11 Conclusion

The Southern Whiteface was recorded in the Impact Site on multiple occasions between 2018 and 2025. Plant Community Types associated with the species and present within the Impact Site include PCTs 28, 58, 143, 152, 154, 157, 170, 171, 215 and 253. The total area proposed to be cleared that could be occupied by these species is approximately 2846 ha.

The Impact Site is not at or near the limit of the species range, the region is not identified as a key source population, and the population is not considered to be severely fragmented, genetically distinct or have limitations to dispersal, therefore the population in the Impact Site is not considered to represent an important population.

Habitat critical to the survival of the species as listed in the species Conservation advice (DCCEEW 2023) includes areas of:

- Relatively undisturbed open woodlands and shrublands with an understorey of grasses or shrubs, or both.
- Habitat with low tree densities and an herbaceous understorey litter cover which provides essential foraging habitat.
- Living and dead trees with hollows and crevices which are essential for roosting and nesting.

None of the habitat in the Impact Site meets all the above criteria; primarily due to habitat degradation leading to the loss of trees, shrubs or native grasses and herbaceous ground litter, arising from impacts of agriculture and feral goats.

The land surrounding the Impact Site at the Mine Site and along the Linear Corridor contains large swathes of PCTs 28, 58, 143, 152, 154, 157, 170, 171, 215 and 253, which are in the same condition or similar to that proposed for removal. The removal of the 2846 ha of vegetation constitutes 3.93% of the overall Subject Land, in which 68,330 ha will be retained. Therefore, the vegetation to be removed within the Impact Site is a relatively minor proportion and not considered to be habitat critical to the survival of the Southern Whiteface.

Based on the above, the Impact on the Southern Whiteface by The Action is not considered significant under the EPBC guidelines.



8.4 Pink Cockatoo (*Lophochroa leadbeateri leadbeateri*)

8.4.1 Conservation status

The Pink Cockatoo is listed as Endangered under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). *Lophochroa leadbeateri leadbeateri* is a subspecies of the Pink Cockatoo, with the other subspecies *L.l. mollis* occurring in central and Western Australia.

The severe reduction in Pink Cockatoo population numbers is the main factor that makes the species eligible for listing in the Endangered category. The population of the Pink Cockatoo was estimated (with low reliability) to be 15,000 mature individuals in 2011, based on the Area of Occupancy (AOO) and a density of 1 pair per 30 km² (Garnett et al. 2011). There are no more recent estimates (DCCEEW, 2023). This estimate in comparison to the estimated 50,000 mature individuals in 2000 (Garnett & Crowley 2000), represents a decrease of 67% in mature individuals within one generation, though the reliability of estimation of population size has always been low (Garnett & Crowley 2000; Garnett et al. 2011; Hurley & Garnett 2021). Based on the average reporting rates from a range of surveys in the subspecies' 10 core bioregions between 1977 and 2019, an average of 54% decline over three generations is estimated (DCCEEW, 2023).

8.4.2 Species Range and Distribution

The Pink Cockatoo occurs in the Murray-Darling, Eyre and Bulloo River basins. Its distribution, shown in Figure 19, ranges from Isisford and Roma, QLD in the north, through to western New South Wales, northwest Victoria and eastern South Australia (Ewart et al., 2021, Val et al., 2012, Shelly, 2000, Rowley and Chapman, 1991, Sass, 2022, DCCEEW, 2023b, Garnett and Baker, 2020c).

The species is normally found in pairs or small groups, though flocks of hundreds may be found where food is abundant (OEH, 2023).



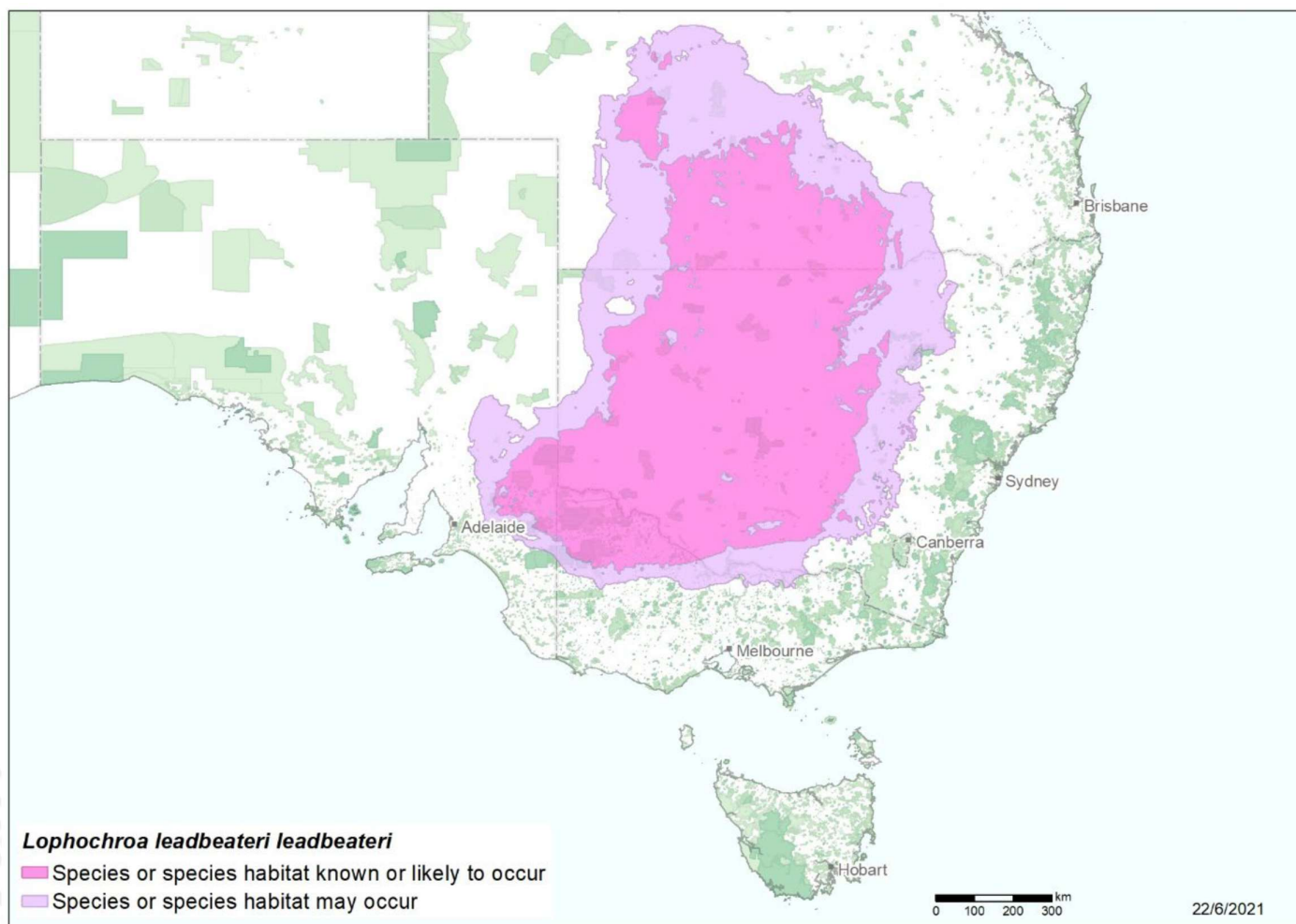


Figure 19: Known and modelled distribution of the Pink Cockatoo (DCCEEW, 2023)



8.4.3 Habitat requirements

The Pink Cockatoo occurs in arid and semi-arid woodlands dominated by mulga (*Acacia aneura*), mallee and box eucalypts, cypress pine (*Callitris gracilis*) or belah (*Casuarina cristata*) communities (Garnett and Baker, 2020c). Within these vegetation types, the species' main requirements are to be always within easy reach of fresh surface water, and trees with suitable nesting hollows (Higgins 1999; OEH 2017).

The species feeds mostly on the ground, especially on the seeds of native and exotic melons and on the seeds of species of saltbush, wattles and cypress pines (OEH 2024). The species diet consists of seeds of native shrubs and trees, and sometimes roots, bulbs, insect larvae and seeds of crops and weeds (Higgins 1999; Moonlit Sanctuary 2020). They are often found feeding on the ground or near water sources (Moonlit Sanctuary 2020). They are normally found in pairs or small groups, though flocks of hundreds may be found where food is abundant (OEH 2017). The Pink Cockatoo prefers to feed in or close to wooded areas, and they also use wooded areas for travel between feeding areas and nesting or roosting sites. In fragmented landscapes, the birds tend to travel along vegetated corridors to move between nesting and feeding sites, including roadside remnants (DSE 2004).

Nesting occurs in tree hollows throughout the second half of the year (OEH, 2023) and hollows greater than 10 cm in size are preferred (Threatened Species Database Collection (TBDC), retrieved from BioNet Atlas). Nesting hollows are usually well-spaced, with nests at least 1 km apart and no more than one breeding pair every 30 square kilometres (OEH, 2023, Hurley 2006). Breeding pairs usually renest in the same area each season and stay together throughout the year. The clutch size is usually three or four eggs, laid in August or September (DCEEW, 2023).

8.4.4 Presence within the Impact Site

Desktop results

Figure 20 shows the results of a systematic 10 km grid survey with numerous records of Pink Cockatoo in the region surrounding the Impact Site. Fourteen records are listed on NSW BioNet for the species within 10 km of the Impact Site.

Given the lakes located within the Impact Site are too salty to provide drinking water, satellite photography of the surrounding land, showing farm dams, (seemingly non-ephemeral) was examined to determine the distance from non-saline water sources to associated PCTs within the Impact Site. None of the relevant PCTs for this species were found to be within 500 m of a permanent non-saline water source.

Field results

Pink Cockatoos have been recorded in the Impact Site and adjacent land, primarily in the northeastern corner of the Mine Site and along the Linear Corridor (Figure 20). Mapping and examination of live and dead Hollow Bearing Trees was undertaken in early February. Although a total of 40 tree hollows greater than 10 cm in diameter (suitable breeding habitat) were located from 26 Hollow Bearing Trees during targeted surveys, no breeding activity was observed. However, the Hollow Bearing Tree search occurred in February 2025, outside the optimum nesting period (August to November).

Previous surveys undertaken between January 2018 and October 2023 recorded the species on multiple occasions. On 40 out of 42 of these targeted surveys, a single or pair of birds were recorded. It is uncertain if these were the same birds or different birds given their ability to move over large distances. However, in January 2024 at the Warwick station homestead (see red cross on Figure 20), a pair and a single begging young bird was recorded. These birds stayed within the precinct of the homestead and



shearing shed and regularly drank from a local water source. In March 2022 to the south of the Linear Corridor, a flock of about 40 Pink Cockatoo were observed south of the Impact Site. This flock were observed feeding within Western Rosewood (*Alectryon oleifolius* (equating to PCT 58 in the Impact Site)) but eventually moved east and dispersed.

Potential habitat

The Pink Cockatoo is associated with all PCTs on The Impact Site apart from PCT 64 and PCT 157. Potential habitat for the species equates to treed communities, being PCTs 58, 170, 171, 221, 253, 254. Potential habitat for the Pink Cockatoo within the Mine Site is presented in Figure 21. Potential habitat for the species along the Linear Corridor is presented in Figure 22.

Suitable habitat

Bio Aus have defined 'suitable habitat' for the Pink Cockatoo in the Impact Site as follows:

Foraging habitat:

Treed communities, equating to PCTs 58, 170, 171, 221, 253, 254 on site where they are:

- Within 500 m of permanent fresh water.
- Within patches of at least 5ha of intact native vegetation and corridors.

Nesting habitat:

Hollows greater than 10 cm in diameter (TBDC, retrieved from BioNet Atlas).

8.4.5 Habitat critical to the survival of the species

The EPBC Act provides for the maintenance of a register of critical habitat. That is, habitat that is identified by the minister as being critical to the survival of a listed threatened species or ecological community. No habitat critical to the survival of the species is listed in the species' Conservation Advice (TSSC, 2016) or listed on the Register of Critical Habitat maintained by the minister under the EPBC Act.

The *Environment Protection and Biodiversity Conservation Act 1999* (and Regulations) refer to habitat of threatened species and ecological communities and listed migratory species as *habitat*, *important habitat*, *critical habitat*, *habitat critical to the survival of a species*, and *expected habitat*. This ambiguity in terminology causes confusion for stakeholders, proponents, and decision makers, and has potentially diminished environmental outcomes for listed species and ecological communities as MNES. As such, it is of critical importance that the term habitat critical to the survival of the Species is clearly defined, as it relates to the Pink Cockatoo.

Habitat critical to the survival of the Species is defined in the MNES Significant Impact Guidelines 1.1, it 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.



This definition is further supported by LEX77012 of the Conservation Planning Reform – Definition and Description of Habitat for Listed Threatened Species, Ecological Communities and Migratory Species, proposed definitions for Critical Habitat – *spatially defined subset of habitat for which there is high confidence that it is irreplaceable to the persistence of a listed threatened species, ecological community or migratory species in the wild.*

The species Conservation Advice (DCCEEW, 2023) states that habitat critical to the survival of the Pink Cockatoo consist of:

- Arid and semi-arid woodlands dominated by mulga (*Acacia aneura*), mallee and box eucalypts, slender cypress pine (*Callitris gracilis*) or belah (*Casuarina cristata*).
- Known habitat containing suitable attributes, including potential habitat for the subspecies (see Figure 21 and Figure 22), especially where there are large mature trees with suitable hollows.
- Surrounding matrix of these areas for the role of providing movement corridors for dispersal across the landscape.

Figure 23 illustrates the broad extent of potential foraging and breeding habitat (associated PCTs 58, 170, 171, 221, 253 and 254) for the Pink Cockatoo in the context of the broader landscape, surrounding the Impact Site at a radius of 50 km.

8.4.6 Key threats

The main threat causing the decline of the subspecies is habitat loss and degradation. A major aspect of habitat loss is the loss of large Hollow Bearing Trees which provide nest sites. There has also been a lack of regeneration due to grazing by invasive species (DSE 2004). Clearing of native vegetation, grazing, inappropriate fire regimes, competition for hollows, extreme weather events, vehicle strike, bird and egg collection and Psittacine Beak and Feather Disease (Pbfd) also threaten the species (DCCEEW, 2023).



**Map removed due to sensitive
threatened species information**

Figure 20: Records for the Pink Cockatoo surrounding the Impact Site



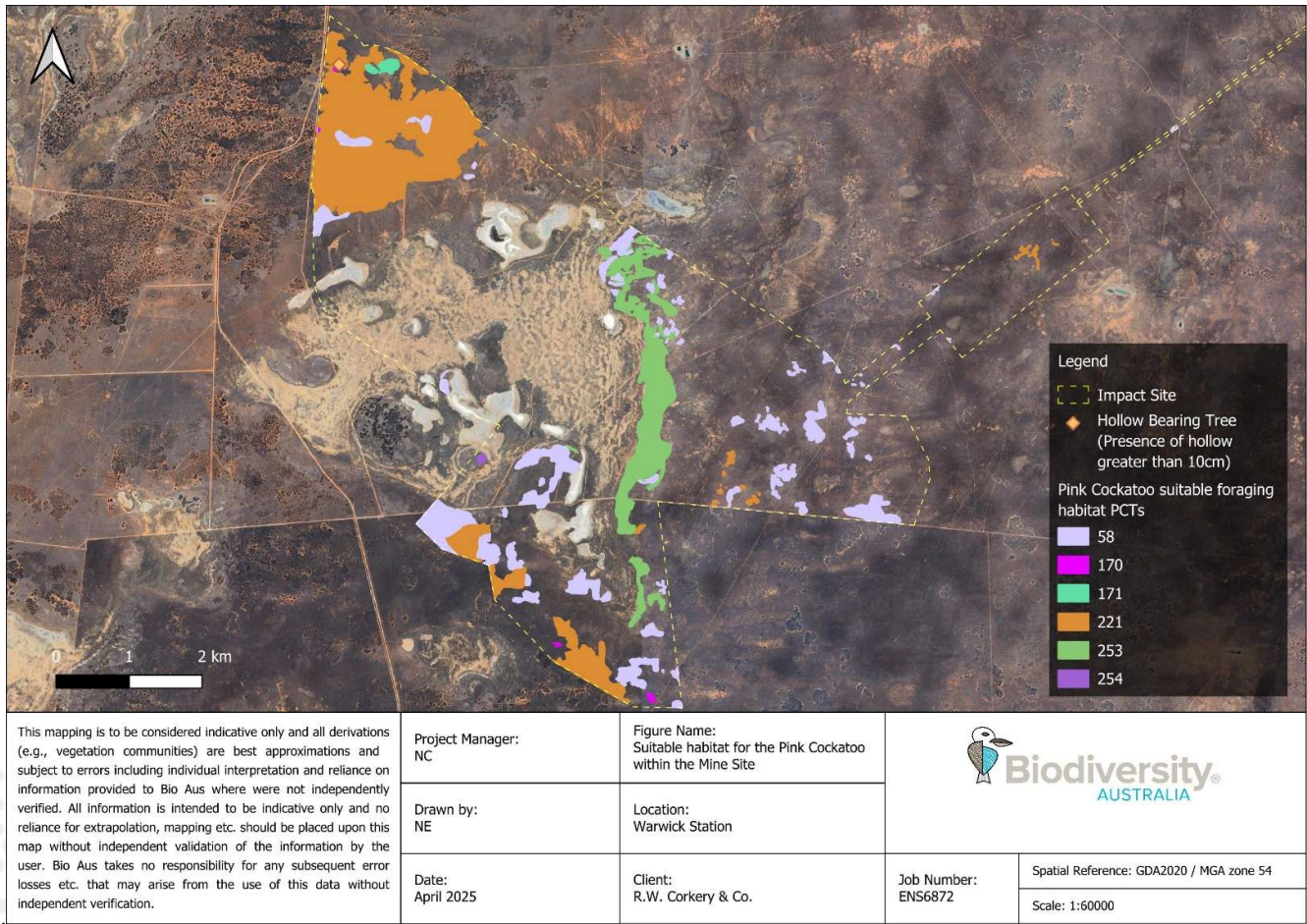


Figure 21: Suitable habitat for the Pink Cockatoo within the Mine Site



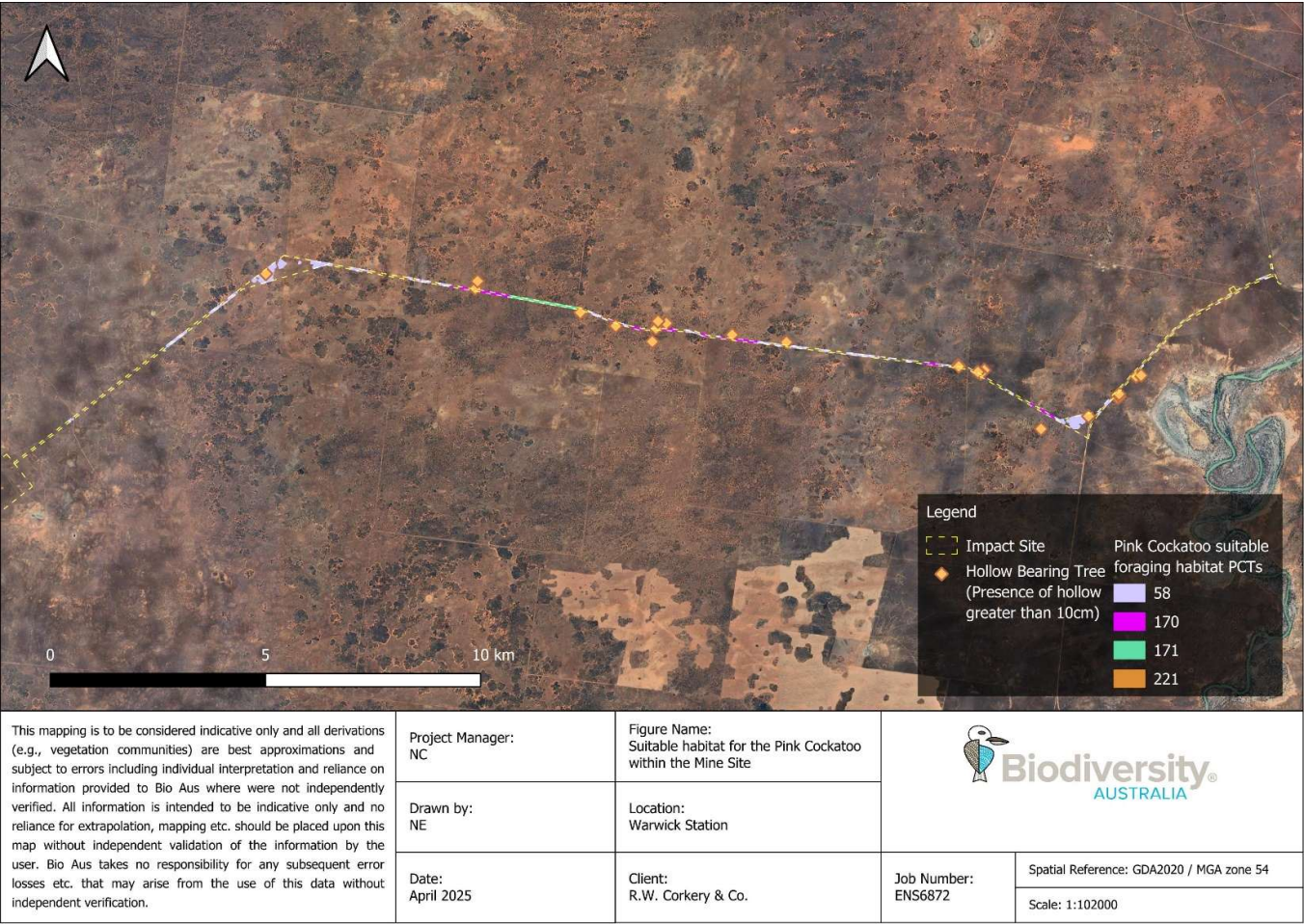


Figure 22: Suitable habitat for the Pink Cockatoo along the Linear Corridor



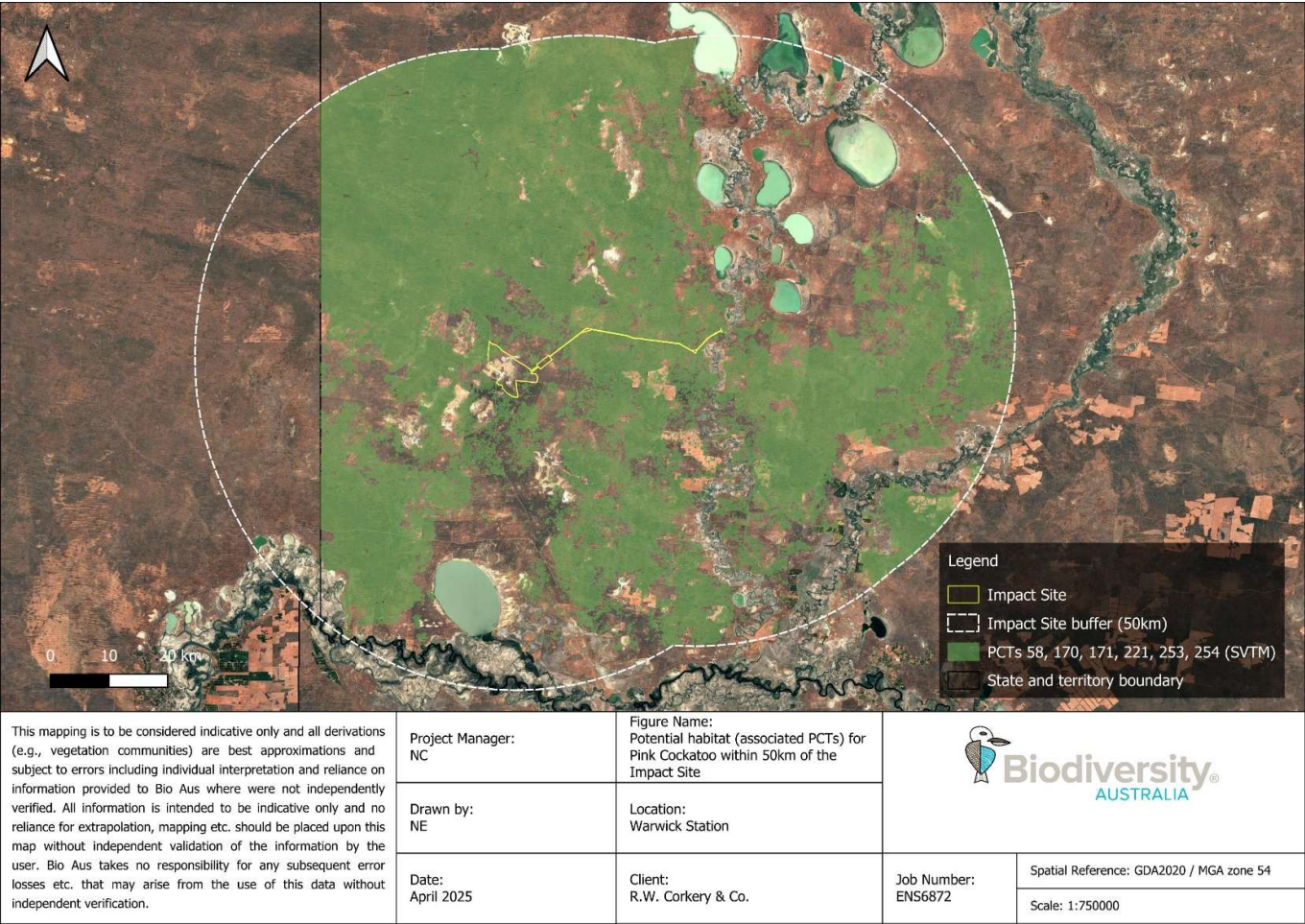


Figure 23: Potential habitat (associated PCTs) for Pink Cockatoo within 50 km of the Impact Site



8.4.7 The Action

The PCTs with which Pink Cockatoo is associated would be cleared, with areas of each associated PCT contained below.

Table 12: PCTs associated with Pink Cockatoo to be cleared

PCT	Area (ha)	PCT name
58	238.42	Black Oak – Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
170	15.6	Chenopod sandplain Mallee woodland/shrubland
171	12.11	Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
221	395.14	Black Oak – Pearl Bluebush open woodland of the sandplains of the semi-arid warm and arid climate zones
253	139.72	Gypseous shrubland on rises in the semi-arid and arid plains
254	1.16	Black Oak - Bladder Saltbush on light clays in the arid zone
Total	802.15	

The vegetation to be affected provides forage and roosting habitat for the species. At least 9 of the Hollow Bearing Trees identified within the Impact Site have the potential to provide nesting habitat for the species and will be removed - five (5) from within the Impact Site - Mine Site area and four (4) from the Linear Corridor). Those from within the Mine Site area possess a total of 8 hollows, of which 6 were greater than or equal to 10 cm in diameter and 1 hollow was greater than or equal to 20 cm in diameter.

8.4.8 Mitigation Measures

8.4.8.1 Pre-clearing Survey and Clearing Supervision

The clearing extent is to be inspected for fauna by a suitably qualified or experienced person immediately prior to commencement of any vegetation removal involving machinery and/or tree-felling. This is to occur each morning if clearing spans over multiple days/weeks. During the pre-inspection, any habitat features detected (e.g. hollows, logs, nests) are to be clearly marked with flagging tape to allow easy identification during clearing. A suitably qualified or experienced person is to be present on site to supervise all clearing work.

8.4.8.2 Hollow Bearing Tree Removal Protocol

Hollow Bearing Trees are to be felled in a manner that will minimise the risk of injury/mortality of denning/roosting fauna within the limitation of Work Health and Safety (WHS) Guidelines. This is suggested to be achieved by the following general procedure:

The Hollow Bearing Trees are to be gently bumped several times prior to removal to encourage any fauna present to vacate. Trees are to be felled in a manner that minimises injury to fauna. This includes gently pushing or 'soft felling' with an excavator or gradual cut down by an arborist

A suitably qualified or experienced person is to be present during felling and sectioning of the hollow-bearing tree (at the proponent's cost) in case of animal injury. Hollows are to be inspected for fauna once the tree is deposited. All uninjured animals are to be released in the retained habitat on site.



Upon completion of this exercise, a brief written report (with photos) detailing the above is to be submitted within 14 days of the removal of the Hollow Bearing Trees.

8.4.9 Significant Impact Assessment

A Significant Impact Assessment for the Pink Cockatoo has been undertaken using the vulnerable criteria listed in the *Significant Impact Guidelines 1.1* (DotE, 2013). The assessment is provided in Table 13.

Table 13: Significant Impact Assessment - Pink Cockatoo

Criteria	Assessment
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 a population.	A less than remote chance The Action would remove approximately 802 ha of potential habitat, though this is from within a locality containing large tracts of native vegetation, which would remain unaffected. Field surveys have confirmed that a population of Pink Cockatoo is present within the Impact Site. While the exact size of the population is unknown, the estimated density is one per 3,000 hectares (OEH, 2023). On this basis, the Impact Site as a whole could support one to two pairs. To date, single and pairs of Pink Cockatoo have been recorded across The Impact Site and surrounds, with a larger flock to the east of the Mine Site. It is likely that multiple pairs forage at the Site. During the extensive field surveys across multiple years and seasons, the observation in January 2024 is the only one containing a begging young bird (indicating breeding activity). Trees containing suitable hollows are scarce within the Impact Site. Suitable hollows have been mapped and five will be lost from the Mine Site as well as four from the Linear Corridor (in an area with 23 mapped). Should a HBT that is returned to by a pair year after year be removed, breeding success for that pair could be affected. However, since permanent freshwater is a limiting factor, it is considered a less than remote chance that the Impact Site represents important breeding habitat, and it is therefore a less than remote chance that The Action will lead to a long-term decrease in population size.
Reduce the area of occupancy of the species.	A real chance The current AOO is estimated to be 225,000 km² (150,000-300,000 km²) (Ford et al. 2021) or about 3,000,000 hectares. The Action would result in direct impacts to approximately 802 ha of potential habitat, known to be used for forage resource. This equates to approximately 0.03% of the AOO. Forage habitats are extensive across the locality, evidenced by ALA records of the species (Figure 20) and while some known habitats would be removed, they are degraded by feral herbivores such as goats and sheep. Removal from agricultural activity and improved pest control will enable regeneration of areas outside the Impact Site and rehabilitation of the Mine Site will occur upon cessation of mining. Overall, The Action will result in a slight reduction of the AOO for a limited period until restoration.
Fragment an existing population into two or more populations.	A less than remote chance The Linear Corridor increases risk of road strike on the species but is a less than remote chance to fragment any existing population in two or more populations since Pink Cockatoo occupy large areas of habitat (>30 km²) and The Action occurs largely as a long, linear shape. Given this mosaic, Pink Cockatoo will be able to continue to move amongst the surrounding matrix of retained vegetation.
Adversely affect habitat critical to the survival of a species.	A less than remote chance The Site contains vegetation types associated with the species and tree hollows suitable for breeding, both factors considered critical to the survival of the species. However, no permanent fresh water source occurs within 500 m of any of the potential habitat, therefore, the Site cannot be considered to contain all required elements critical to the survival of the species.



Criteria	Assessment
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
Disrupt the breeding cycle of a population.	A real chance Pink Cockatoo adults pair for life and may return to the same nest year after year. Mating pairs are very territorial, needing to nest at least one kilometre or more from other pairs and having an average of 30 km² home range (AAV 2025). The species has an average of 2-3 eggs in a clutch and both parents contribute to the incubation and rearing of the chicks (Moonlit Sanctuary 2025). The incubation period is 23 to 30 days, with the young remaining in the nest for a period of 6 to 8 weeks before fledging. The fledglings continue to be fed, mostly by the male, for 8 more weeks. The young and their parents form small, family groups, staying together for some time after the chicks have reached independence. Young birds become reproductively mature between 3 and 4 years of age (Animalia - <i>Major Mitchell's Cockatoo</i>, 2025). Loss of Hollow Bearing Trees is a threat to the species and reduces available nesting sites essential for breeding. Removal of nine trees with hollows suitable for breeding could disrupt the breeding cycle of a pair if that pair relied on one of the particular hollows to breed. This is not considered likely given the lack of nearby access to permanent fresh water.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	A less than remote chance The Action would remove known forage habitat for the species and therefore cause disruption to Pink Cockatoos using the Site. However, the species is regarded as nomadic (Birdlife, 2025), moving to take advantage of seasonal fruiting and therefore has a less than remote chance to rely permanently on the forage resources at the Site. The Action has a less than remote chance to reduce habitat availability such that the species is likely to decline.
Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat.	A less than remote chance There are a number of invasive species already present in the Impact Site including feral goats, foxes, cats, rabbits and pigs, therefore, The Action would not result in these species becoming established. Invasive species are not listed as key threat to the species.
Introduce disease that may cause the species to decline.	A less than remote chance Psittacine Beak and Feather Disease is a potentially fatal disease caused by psittacine circovirus and is a threat to the species. However, it typically transfers between adults, nestlings and contaminated nest hollows (DEE 2016). The proposed Action is a less than remote chance to introduce disease to the species.
Interfere with the recovery of the species.	A less than remote chance The Pink Cockatoo is regarded as nomadic (Birdlife, 2025), moving to take advantage of seasonal fruiting. Birds have an average of 30 km² home range and dislike nesting in proximity to other breeding pairs. The Action will result in the loss of approximately 802 ha of forage habitat as well as nine Hollow Bearing Trees. The Action will cause an impact on the species habitat in the local area, and the loss of nine suitable Hollow Bearing Trees increases the level of threat to the species by reducing potential breeding habitat. However, given the distance to permanent fresh water, it is a less than remote chance that The Action would interfere with the recovery of the Pink Cockatoo.



8.4.10 Conclusion

Key findings:

- The Impact Site is within the known distribution of the Pink Cockatoo and the species has been recorded within the Impact Site on multiple occasions.
- Habitat critical to the survival of the species is present on the site in terms of vegetation types associated with the species and 34 trees bearing hollows greater than 10 cm in diameter; however, the lack of fresh water is likely to limit reliance on the Impact Site for nesting.
- The Action would remove approximately 802 ha of potential habitat from a locality where forage habitat is not scarce and the habitat on site is heavily impacted by goats.
- The Action would remove nine Hollow Bearing Trees suitable for Pink Cockatoo breeding: five from the Mine Site (where Hollow Bearing Trees are scarce) and four from the Linear Corridor (where 23 were recorded). The Linear Corridor would also introduce a threat from traffic strike.
- No breeding activity has been recorded within the Impact Site during multiple surveys over eight years.
- The proposed Action is considered moderate based on it being considered:
 - Medium term / reversible – suitable habitat will be restored upon cessation of mining.

Based on the above information and in Table 13 Significant impact assessment, the Impact caused by The Action to the Pink Cockatoo and its habitat has a less than remote chance of being significant under the EPBC guidelines.

In summary: land surrounding the Impact Site at the Mine Site and along the Linear Corridor contains large swathes of native vegetation, which is in the same condition or similar, and contains habitat (such as Hollow Bearing Tree density) of equal or higher value to that proposed for removal. The removal of 802 ha of potential habitat constitutes 1.1% of the overall Subject Land, in which 68,330 ha will be retained. Therefore, the vegetation to be removed within the Impact Site is a relatively minor proportion and not considered to be habitat critical to the survival of the Pink Cockatoo.



8.5 Corben's Long-eared Bat (*Nyctophilus corbeni*)

8.5.1 Conservation status

Until recently the Corben's Long-eared bat was included as a distinct form of the greater Long-eared bat (*Nyctophilus timoriensis*) complex and was listed as such under the EPBC Act. In 2009 it was formally described as a separate species, *Nyctophilus corbeni* (South-eastern Long-eared Bat or Corben's Long-eared Bat), by Parnaby (2009).

Based on evidence presented in the Action Plan for Australian Bats, the TSSC (2015) determined that the Corben's Long-eared Bat is eligible for listing as Vulnerable under the EPBC Act. The main factor that makes the Corben's Long-eared Bat eligible for listing in the Vulnerable category is that it has undergone, is suspected to have undergone or is likely to undergo in the immediate future a substantial reduction in numbers (TSSC, 2015).

8.5.2 Species Range and Distribution

The Greater Long-eared Bat was originally considered to be found across temperate southern Australia; however, this is most likely incorrect due to the separation of the taxon into three different species; therefore, the historic distribution of Corben's Long-eared Bat is unclear (Duncan et al., 1999; Parnaby 2009).

Corben's Long-eared Bat is found in southern central Queensland, central western New South Wales, north-western Victoria and eastern South Australia, where it is patchily distributed, with most of its range in the Murray Darling Basin (Duncan et al., 1999; Turbill and Ellis 2006). Most records are from inland of the Great Dividing Range (Parnaby, 2009). The species is uncommon within this distribution and is rarely recorded (Department of the Environment 2013), except in some areas including the Nandewar and Brigalow Belt South bioregions in New South Wales and Queensland (Figure 24 and Figure 25).

The species occurs throughout much of inland New South Wales with at least 50% of the species' known distribution occurring in this state (Parnaby et al., 2011). New South Wales Office of Environment and Heritage (NSW OEH) (2012) state that the Pilliga scrub region is a distinct stronghold for this species.



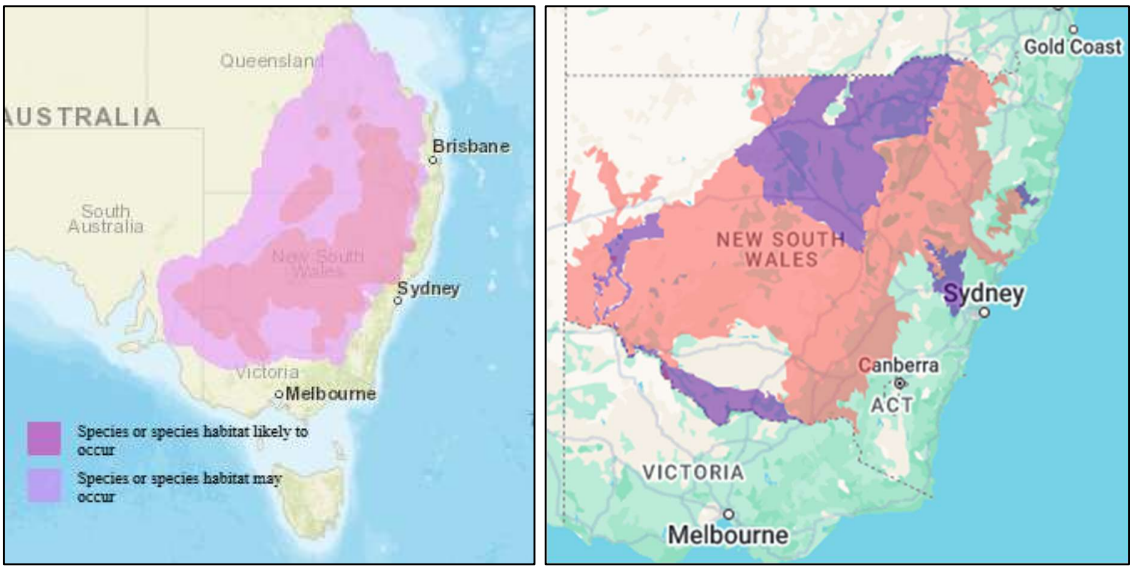


Figure 24: Indicative distribution of Corben's Long-eared bat based in Australia (left) and NSW (right) (DCCEW, 2025)

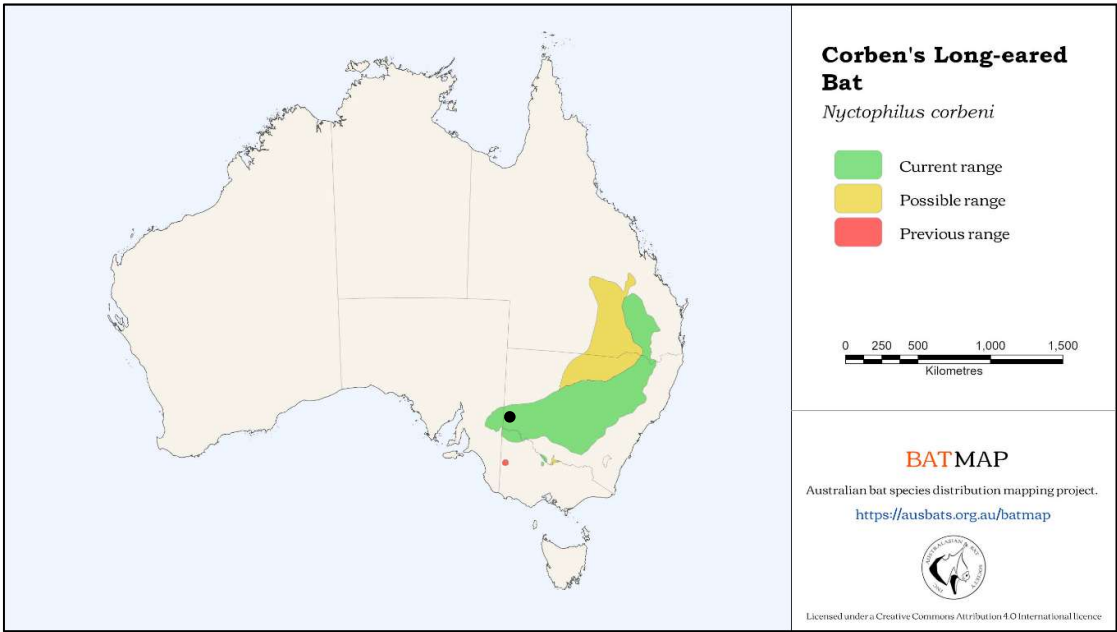


Figure 25: *Nyctophilus corbeni* range with approximate location of The Impact Site shown as black dot



8.5.3 Habitat requirements

Corben's Long-eared Bat is found in a wide range of inland woodland vegetation types. These include box / ironbark / cypress pine woodlands, Buloke woodlands, Brigalow woodland, Belah woodland, smooth-barked apple woodland, river red gum forest, black box woodland, and various types of tree Mallee (Duncan et al., 1999; Schulz and Lumsden 2010; Woinarski et al., 2014)

In Queensland and New South Wales, it inhabits a variety of vegetation types, but it is distinctly more common in box / ironbark / cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of New South Wales and southern Queensland (NSW OEH 2012). In Victoria most records are from *Eucalyptus gracilis* Mallee, Buloke and Black Box Woodlands (Lumsden 1994) while in South Australia it is confined to tall mallee shrublands (Duncan et al., 1999).

The species is more abundant in extensive stands of vegetation in comparison to smaller woodland patches (Turbill and Ellis 2006), suggesting its home range is probably large (Lumsden et al., 2008). It appears that old-growth vegetation is a critical habitat component in the Victorian distribution (Lumsden et al., 2008). The species has also been found to be much more abundant in habitats that have a distinct tree canopy and a dense, cluttered understorey layer (Turbill and Ellis, 2006).

The Corben's Long-eared Bat is an insectivorous bat that hunts by taking flying prey or by foliage-gleaning in flight or by foraging on the ground. Foraging appears to be concentrated around patches of trees in the landscape, with many individuals from different species of bat sharing the same foraging area (Department of the Environment, 2013).

Studies have found that the Corben's Long-eared Bat roosts solitarily, mainly in dead trees or dead spouts of live trees (TSSC 2015). In studies of roosting behaviour in Victoria, most bats were found roosting individually in mallee eucalypts in areas of long-unburnt Mallee, with some under bark or in fissures of dead Buloke (*Allocasuarina leuhmannii*) or Belah (*Casuarina cristata*) trees (Lumsden et al., 2008). A study in New South Wales found maternity colonies, consisting of 10-20 individuals, roosting in dead trees including ironbarks, cypress and buloke (Schulz and Lumsden 2010). It appears that most roost sites are used just for a single day and large distances are travelled at night, with consecutive roost sites generally within four km (Lumsden et al., 2008).

Parnaby et al (2011), studying issues influencing the management of hollow-dependent bats in the Pilliga forests of inland NSW, concluded that the protection of remaining Hollow Bearing Trees is the only effective option for managing the hollow-dependent bats in the Pilliga. They predicted that local extinctions of a range of hollow-using bat species will occur without active management and monitoring to protect the remaining Hollow Bearing Trees, and the intermediate-aged, hollow-recruit trees, from logging and fire.

There is little available information on the species' reproductive biology. Breeding is likely to be seasonal, with pregnant and lactating females having been trapped in Queensland and New South Wales in November (Schulz and Lumsden 2010).

8.5.4 Presence within the Impact Site

Desktop results

The Impact Site is within the known distribution of the species; however, Corben's Long-eared Bat has not been historically recorded within the Impact Site (ALA 2025; BioNet Atlas 2025), nor within 10 km of the Impact Site. The nearest record of Corben's Long-eared Bat was recorded in December 1999 and is



located on the Murray River near the Victorian border, approximately 23 km southwest of Wentworth, and 65 km southeast of the Impact Site.

Records for Corben's Long-eared Bat in the locality are presented in Figure 26.

Field results

Anabat surveys were conducted in January and February 2025 within the Mine Site and along the Linear Corridor. The total dataset included 28,687 acoustic sequence files, with ninety-two (92) calls attributable to *Nyctophilus* species. *Nyctophilus* species cannot be reliably differentiated using call characteristics, so detected calls could belong to either or both of *N. geoffroyi* (Lesser Long-eared Bat) or the target species *N. corbeni* (Corben's Long-eared Bat). The only acceptable method to confirm the presence of *N. corbeni* is to undertake a trapping program (see Reardon 2010). Due to The project timelines and extensive area, Corben's Long-eared Bat has been assumed as present in Impact Site.

Suitable habitat

Suitable habitat for the species within the Impact Site is associated with a wide range of inland woodlands, more commonly in box / ironbark / cypress-pine vegetation. Plant Community Types associated with the species within Impact Site (OEH 2025) are:

- PCT 58: Black Oak – Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion.
- PCT 170 - Chenopod sandplain Mallee woodland/shrubland.
- PCT 171: Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion.
- PCT 221: Black Oak – Pearl Bluebush open woodland of the sandplains of the semi-arid warm and arid climate zones.

Suitable habitat for the Corben's Long-eared Bat within the Impact Site is present in Figure 27 and Figure 28.

Roosting habitat has been defined by mapping Hollow Bearing Trees throughout the Site and is presented in Figure 27.

The broad extent of potential foraging and breeding habitat (associated PCTs 58, 170, 171, 221, 253 and 254) is illustrated in Figure 29 for Corben's Long-eared Bat in the context of the broader landscape, surrounding the Impact Site at a radius of 50 km.

8.5.5 Important population

No important populations of Corben's Long-eared Bat have been listed in the species' Conservation Advice (TSSC, 2015). There is little information currently available regarding population numbers and population structure for the Corben's Long-eared Bat. Currently all population information is based on trapping results and no detailed demographic studies have been conducted (Schulz and Lumsden 2010). The Advice identifies a research priority to 'identify important populations based on both the genetic qualities of the species across its range and by high densities as indicated by high records of incidence'.

Using this basis, NSW OEH (2012) state that the Pilliga scrub region is a distinct stronghold for this species. Turbill and Ellis (2006) studied the distribution and abundance of Corben's Long-eared Bat throughout south-eastern Australia and found 'no captures from the Darling Riverine Plains Bioregion', and 'that the large vegetation remnants of Goonoo, Pilliga West and Pilliga East study areas are a distinct stronghold



in the distribution of the Corben's Long-eared Bat'. It is inferred from this information that the Piliga scrub region contains an important (sub) population.

The Significant Impact Guidelines 1.1 (DotE, 2013) outline an 'important population' as 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.

As the species has been assumed to present, any population could represent an important population as the Impact Site could provide genetic diversity or be a key source for dispersal and / or breeding.

8.5.6 Habitat critical to the survival of the species

No Critical Habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat. Furthermore, no habitat critical to the survival of the species is listed in the species' Conservation Advice. Nevertheless, the species is dependent on tree hollows for roosting (Lentini et al 2024), who found roosts (from a newly discovered population in Victoria on the Murray River) to be a mix of small-diameter (19.5–36 cm Diameter at Breast Height (DBH)), typically multi-stemmed, live, dying and dead Eucalyptus species, and concluded that while day roosts did not appear to be limiting for this species in this location, further research is needed to understand what trees are being used as maternity roosts (which may be more specialized). Maternity roosts are considered to represent habitat critical to the survival of the species, but their characteristics are not well understood.

8.5.7 Key threats

Due to the lack of data available to assess the population decline of Corben's Long-eared Bat, providing a detailed assessment of the current threats to the survival of this species is difficult. However, it is likely that AOO is declining due to habitat loss, particularly in New South Wales and Queensland, and to habitat degradation associated with altered fire regimes, timber extraction, mining and other factors (Woinarski et al., 2014). Habitat loss and fragmentation are considered here as known threats, with potential threats discussed following these known threats.

- Habitat loss and fragmentation - Extensive clearing of woodland and mallee vegetation is likely to have been a major factor in the decline of the Corben's Long-eared Bat. Agriculture has been the greatest cause of land clearing in the mallee and woodland habitats, however increasingly extractive industries are targeting the remaining areas (Schulz and Lumsden, 2010). Habitat loss threatens the species by reducing habitat availability, such as important roosting sites (Schulz and Lumsden 2010). Given the species' requirements for large areas of land, smaller fragments may not provide viable habitat for the species (Woinarski et al., 2014), leaving bats more vulnerable to local extinction and reductions in fitness (Schulz and Lumsden, 2010). Fragmentation of habitat may also exacerbate other threats to the species.
- Fire - Bushfires are suspected to be a threat in the remaining uncleared areas of the Corben's Long-eared Bat's habitat (Duncan et al., 1999). Bushfires pose a threat to the conservation of the species by both causing direct mortality during bushfire events and through the loss of foraging habitat and roosting sites, which take a long time to develop (Schulz and Lumsden 2010).



- Reduction in hollow availability -The availability of suitable roosting habitats is essential for the conservation of the Corben's Long-eared Bat. This species mainly roosts in tree hollows and so a reduction in hollow availability would likely put pressure on the species (Schulz and Lumsden, 2010). The loss of hollows is a threat on its own to the species; however, habitat loss also leads to increased competition for remaining hollows from other animals (Reardon, 2012).
- Exposure to agrichemicals - As an insectivorous species and a species that occurs in habitat in, or adjacent to, agricultural areas, the Corben's Long-eared Bat may be susceptible to exposure from insecticides. This can occur by direct application or spray drift in agricultural areas, or through bio-accumulation of some chemicals through the ingestion of prey that has been exposed to agrichemicals (Schulz and Lumsden, 2010).
- Grazing - Grazing in the habitat of the Corben's Long-eared Bat is a suspected threat in the uncleared areas of habitat (Duncan et al., 1999) as it may reduce foraging habitat through the removal of shrubs and by limiting regeneration, as well as potentially causing significant changes to the structure and diversity of such habitats (Schulz and Lumsden, 2010). The relative impact of grazing as a threat to the species is unknown however and requires further investigation.
- Predation by feral animals - Predation of Corben's Long-eared Bat by introduced species, such as the feral cat or red fox, has not been demonstrated (Woinarski et al., 2014) and therefore the risk to the species is unknown.



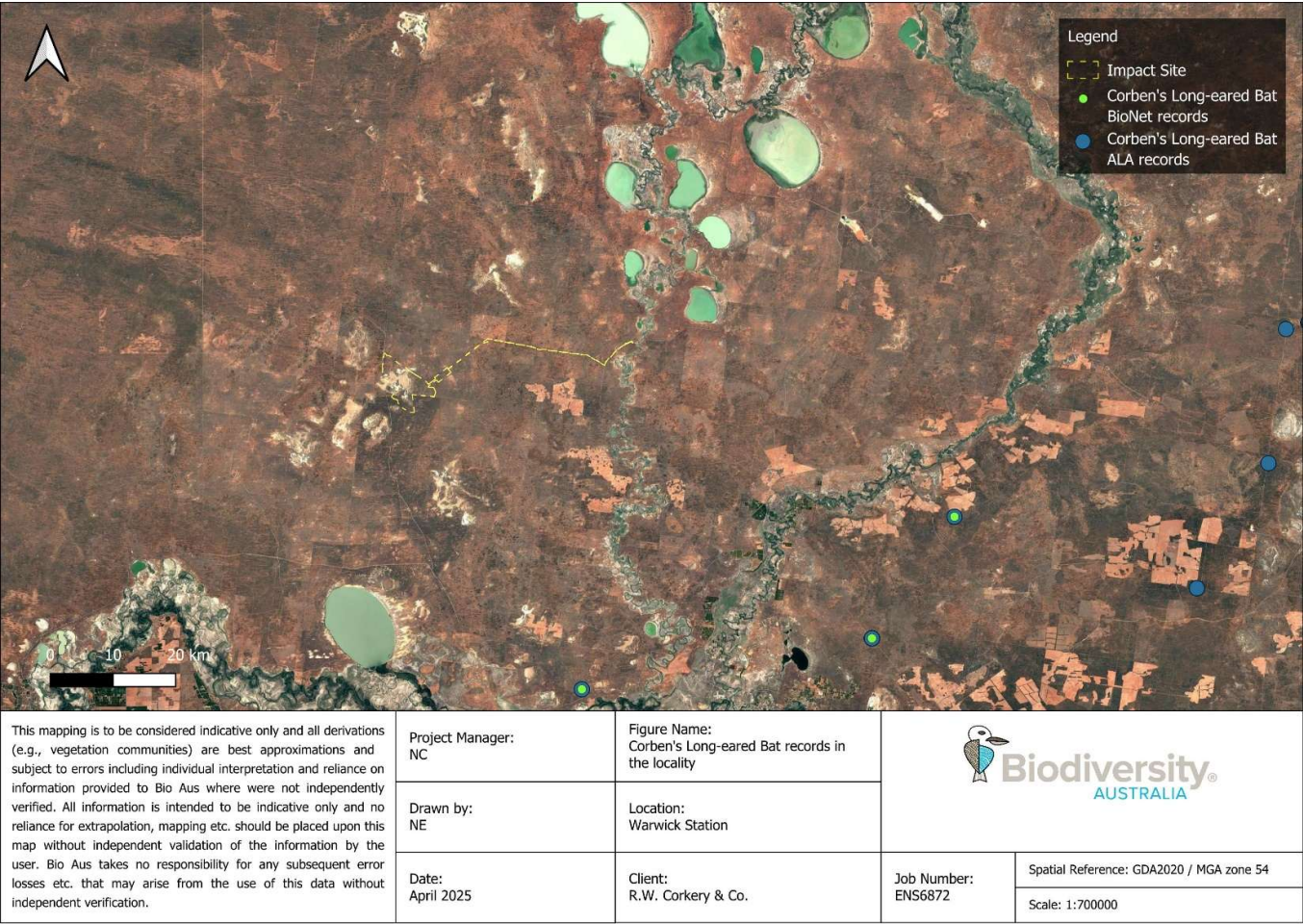


Figure 26: Corben's Long-eared Bat records in locality

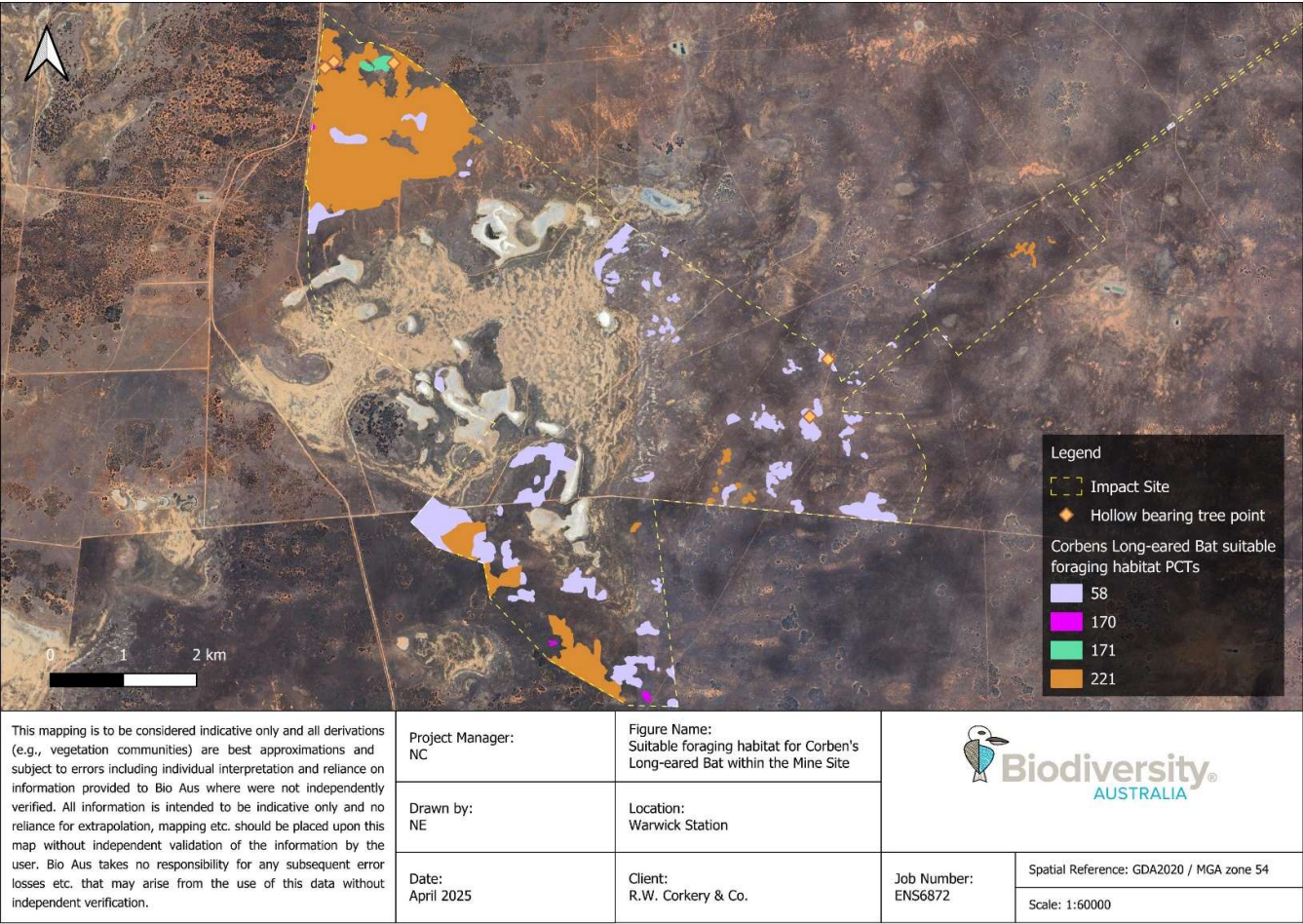


Figure 27: Suitable foraging habitat for Corben’s Long-eared Bat within the Mine Site

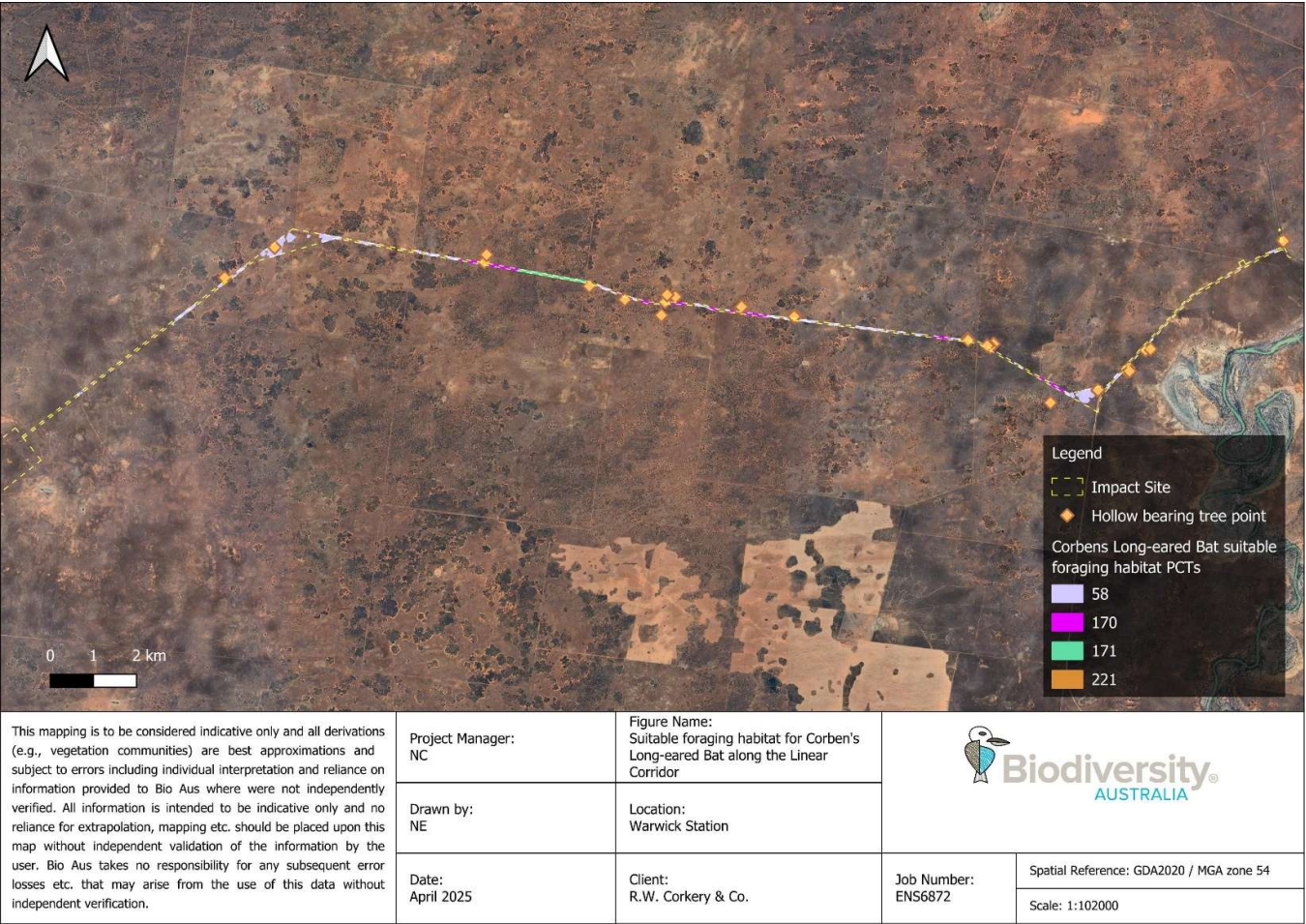


Figure 28: Suitable foraging and roosting habitat for Corben’s Long-eared Bat within the Linear Corridor

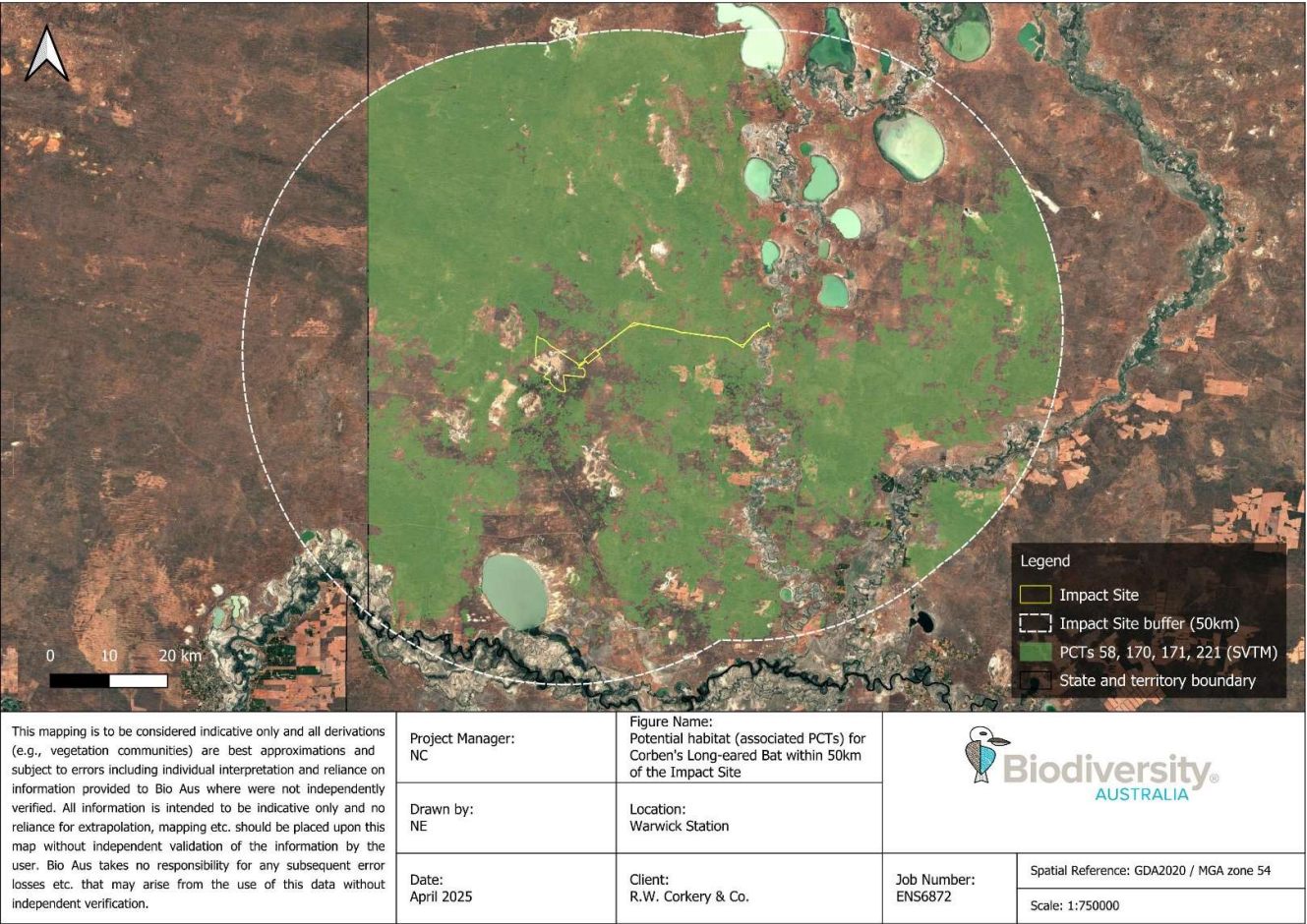


Figure 29: Potential habitat (associated PCTs) for Corben's Long-eared Bat within 50 km of the Impact Site

8.5.8 The Action

The PCTs with which Corben's Long-eared Bat is associated would be cleared, with areas of each associated PCT contained below.

Table 14: PCTs associated with Corbens Long-eared Bat to be cleared

PCT	Area (ha)	PCT name
58	238.42	Black Oak – Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion
170	15.60	Chenopod sandplain Mallee woodland/shrubland
171	12.11	Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion
221	395.14	Black Oak – Pearl Bluebush open woodland of the sandplains of the semi-arid warm and arid climate zones
Total	661.27	

The vegetation to be affected provides forage, refuge, and roosting habitat for the species. At least 9 of the Hollow Bearing Trees identified within the Impact Site have the potential to provide nesting/denning habitat for hollow-obligate fauna species and will be removed (five (5) from within the mine site area and four (4) from the linear corridor). Those from within the mine site area possess a total of 8 hollows, of which 6 were greater than or equal to 10 cm in diameter and one hollow was greater than or equal to 20 cm in diameter. Clearing will be undertaken progressively and the Impact Site rehabilitated following mineral sand extraction.

8.5.9 Mitigation Measures

8.5.9.1 Pre-clearing Survey and Clearing Supervision

The clearing extent is to be inspected for fauna by a suitably qualified or experienced person immediately prior to commencement of any vegetation removal involving machinery and/or tree-felling. This is to occur each morning if clearing spans over multiple days/weeks. Pre-clearing checks would include searches of habitat (e.g. lifting and destructive searches of logs) and searches for bird nests. If possible, any detected fauna is to be relocated off-site to nearby suitable areas (preferably within their natural home range) prior to clearing.

During the pre-inspection, any habitat features detected (e.g. hollows, logs, nests) are to be clearly marked with flagging tape to allow easy identification during clearing.

A suitably qualified or experienced person is to be present on site to supervise all clearing works to retrieve any fauna detected during works and undertake appropriate action (e.g. humanely euthanise severely injured animals and/or relocate uninjured animals where possible). The fauna spotter must also be present during de-watering of any temporary water bodies on the Site to rescue and relocate any potential stranded aquatic fauna species.

A report detailing the results of the clearing monitoring is to be provided to the consent authority within 14 days of works completion.



8.5.9.2 Hollow Bearing Tree Removal Protocol

Hollow Bearing Trees are to be felled in a manner that will minimise the risk of injury/mortality of denning/roosting fauna within the limitation of WHS Guidelines. This is suggested to be achieved by the following general procedure:

- The Hollow Bearing Trees are to be gently bumped several times prior to removal to encourage any fauna present to vacate.
- Trees are to be felled in a manner that minimises injury to fauna. This includes gently pushing or 'soft felling' with an excavator or gradual cut down by an arborist.
- A qualified ecologist is to be present during felling and sectioning of the Hollow Bearing Tree (at the proponent's cost) in case of animal injury. Hollows are to be inspected for fauna once the tree is deposited. All uninjured animals are to be released in the retained habitat on site.
- If the hollow is determined to be occupied and fauna do not require assistance (e.g. roosting bats), the entrance is to be blocked, and the log placed in a shaded and protected area on the edge of the site. The obstacle is to be removed just prior to dusk to allow passive escape of the fauna within. The log may then be removed if required.
- Upon completion of this exercise, a brief written report (with photos) detailing the above is to be submitted to Council within 14 days of the removal of the Hollow Bearing Trees.



8.5.10 Significant Impact Assessment

A Significant Impact Assessment for the Corben's Long-eared Bat has been undertaken using the vulnerable criteria listed in the *Significant Impact Guidelines 1.1* (DotE, 2013). The assessment is provided in Table 15.

Table 15: Significant Impact Assessment - Corben's long-eared Bat

Criteria	Assessment
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.	A less than remote chance No important populations have been identified in the species' Conservation Advice (TSSC, 2015), though the Piliga Scrub is recognised as the district stronghold for the species in the Murray Darling Basin (OEH 2017). Plant Community Types 58, 170, 171 and 221 are present in the Impact Site, are known to be utilised as habitat for the species (see Section 8.5.5) and will be lost from the Mine Site. Although the species has been known to utilise all these habitats, it is distinctly more common in box / ironbark / cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of New South Wales and southern Queensland (NSW OEH 2012). This means the mallee communities PCT 170 and PCT 171 are likely to be most utilised by the species in the Impact Site and together comprise a lesser area of 27.7 ha. While The Action represents a moderate impact on potential Corben's Long-eared Bat habitat and will occur over the medium to long term (26 years): - The species is more abundant in extensive stands of vegetation in comparison to smaller woodland patches (Turbill and Ellis 2006), therefore its home range is probably large (Lumsden et al., 2008). - It appears that old-growth vegetation is a critical habitat component (Lumsden et al., 2008) and Hollow Bearing Trees for roosting and breeding activity are scarce in the Mine Site, though less scarce along the Linear Corridor (23 recorded) - The species has been found to be much more abundant in habitats that have a distinct tree canopy and a dense, cluttered understorey layer (Turbill and Ellis, 2006), while the understorey layer in much of the Site has been significantly impacted by feral goats and is often missing. - No records of the species are found on BioNet or ALA within 50 km of Impact Site. The proposed action is a less than remote chance to lead to a long-term decrease in the size of an important population of the Corben's Long-eared Bat.
Reduce the area of occupancy of an important population	A real chance The Impact Site is within the known distribution of the species habitat, though known locations within the distribution are scattered and few. The Extent of Occurrence of the species is large, coinciding generally with Murray-Darling Basin. No estimates of the AOO for the Corben's Long-eared Bat are provided in the species' Conservation Advice or on the SPRAT Profile and no definition of important population is given for the species. Areas of suitable habitat for the species coincide with vegetation which will be cleared; however, the species use of these habitats is unknown. The Action represents a moderate impact on potential Corben's Long-eared Bat habitat, is medium term and reversible in the longer term, but could reduce the AOO for the local population (if present) through habitat removal.
Fragment an existing important population into two or more populations	A less than remote chance Important populations have not been defined for the species. The overall Corben's Long-eared Bat population is considered fragmented, as it occurs in isolated subpopulations caused by agricultural practices (DAWE, 2021). If a population occurs within the Impact Site, it is likely that individuals use large home ranges and are not limited to the Impact Site. Habitat loss threatens the species by reducing habitat availability, such as important



Criteria	Assessment
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
	roosting sites (Schulz and Lumsden 2010). Given the species' requirements for large areas of land, smaller fragments may not provide viable habitat for the species (Woinarski et al., 2014), leaving bats more vulnerable to local extinction and reductions in fitness (Schulz and Lumsden 2010). Large tracts of native vegetation surround The Impact Site so, although The Action will cause habitat fragmentation, it is a less than remote chance to fragment a population into two or more subpopulations.
Adversely affect habitat critical to the survival of a species.	A real chance Habitat critical to the survival of the species has not been defined, however, as presented in Section 8.4.5, habitat where the species has been most frequently recorded represents box / ironbark / cypress-pine vegetation with a diverse understorey (a condition which is largely absent from the Impact Site) and Hollow Bearing Trees. Studies have found that Corben's Long-eared Bat roosts solitarily, mainly in dead trees or dead spouts of live trees. It appears that most roost sites are used just for a single day and large distances are travelled at night, with consecutive roost sites generally within four km (Lumsden et al., 2008). Hollows may be considered critical habitat, and nine Hollow Bearing Trees are proposed for removal (five (5) within the Mine Site and four (4) from the 23 available adjacent suitable habitat along the Linear Corridor).
Disrupt the breeding cycle of an important population.	A real chance There is little available information on the species' reproductive biology. Breeding is likely to be seasonal, with pregnant and lactating females having been trapped in Queensland and New South Wales in November (Schulz and Lumsden 2010). A study in New South Wales found maternity colonies, consisting of 10-20 individuals, roosting in dead trees including ironbarks, cypress and buloke (Schulz and Lumsden 2010). While the species has not been recorded within 50 km of the Impact Site and the likelihood of a breeding population being present is considered low, mitigation measures include timing of Hollow Bearing Tree removal outside the Spring/ Summer period and felling in a manner that will minimise the risk of injury/mortality of denning/roosting fauna. This includes gently pushing or 'soft felling' with an excavator or gradual cut down by an arborist. A qualified ecologist is to be present during felling and sectioning of the Hollow Bearing Tree (at the proponent's cost) in case of animal injury. Hollows are to be inspected for fauna once the tree is deposited. All uninjured animals are to be released in the retained habitat on site.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	A real chance Extensive clearing of woodland and mallee vegetation is likely to have been a major factor in the decline of Corben's Long-eared Bat (TSSC, 2015). Given the species' requirements for large areas of land, smaller fragments may not provide viable habitat for the species (Woinarski et al., 2014), leaving bats more vulnerable to local extinction and reductions in fitness (Schulz and Lumsden 2010). This species mainly roosts in tree hollows and so a reduction in hollow availability (though few) could put pressure on the species. Given the large home range of the species, the loss of habitat proposed is a less than remote chance to decrease the availability of habitat such 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.	A less than remote chance Predation of Corben's Long-eared Bat by introduced species, such as the feral cat or red fox, has not been demonstrated (Woinarski et al., 2014) and therefore the risk to the species is unknown. While new vehicle access points /roads could provide a pathway to improve access by feral animals, the Impact Site's surrounds are generally open and provide little impediment to feral animal access at present. So, the risk would not be substantially increased. Mitigation measures to be used include trapping and baiting programs in conjunction with the local land authority. Due to the widespread occupation by feral cats and foxes, The Action has a less than remote chance to result in an invasive species that is harmful to the Corben's Long-eared Bat becoming established in the species' habitat.



Criteria	Assessment
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
Introduce disease that may cause the species to decline.	A less than remote chance The proposed works have a less than remote chance to result in the introduction of a disease that could cause the Corben's Long-eared Bat to decline. Disease is not listed a key threat to the Corben's Long-eared Bat in the species' Conservation Advice (TSSC, 2015) and the likelihood of disease transmission is considered low. Furthermore, as outlined in Section 8.2.7, the proposed works are a less than remote chance to involve direct interactions with the species that could result in the transmission of disease. Standard hygiene protocols will be adopted to protect vehicles and machinery, as such, the risk is considered low.
Interfere substantially with the recovery of the species.	A less than remote chance Studies listed above indicate the species is expected to utilise large home ranges and move roost sites frequently, making it less reliant on any one area for all components of its' lifecycle. Large areas of native vegetation surround the Impact Site, including extensive mallee communities which include old-growth trees. The Action will remove potential forage habitat in low to moderate condition, as well as limited Hollow Bearing Trees. The proposed works are a less than remote chance to interfere substantially with the recovery of the Corben's Long-eared Bat.



8.5.11 Conclusion

The current literature states:

- The Impact Site is within the known distribution of the Corben's Long-eared Bat. The species has not been definitively recorded within the Impact Site but it is assumed present in the absence of a broader detailed survey, since Anabat survey recorded a *Nyctophilus* species at the Site. *Nyctophilus* species cannot be reliably differentiated using call characteristics, so detected calls could belong to either or both of *N. geoffroyi* (Lesser Long-eared Bat, not listed as a threatened species) or the target species *N. corbeni* (Corben's Long-eared Bat) (Balance Environmental 2025).
- No BioNet or ALA records for the species occur within 50 km of the Impact Site; however suitable habitat occurs within the Impact Site.
- No important populations of the Corben's Long-eared Bat have been listed in the species' Conservation Advice (TSSC, 2015). Using the precautionary principle, any population found within the site could be regarded as an important population when using the *Significant Impact Guidelines 1.1* (DEWHA, 2013).
- Habitat critical to the survival of the species has not been defined, however the species is known from four Plant Community Types which are present in the Impact Site (Figure 27 and Figure 28), along with Hollow Bearing Trees (considered essential breeding habitat), with some or both proposed for progressive removal.
- The species is considered to have large home ranges, and most roost sites are used for a single day only. Large distances are travelled at night, with consecutive roost sites generally within 4 km (TSSC 2015). This appears to indicate lesser reliance on any one habitat area in a mosaic of large tracts of native vegetation, as occurs in the region.
- The Proposed Action is considered of moderate severity based on it being considered:
 - Moderate-high impact through vegetation clearing as a single event in any one area and medium-long term (26 years) but reversible with progressive habitat rehabilitation following cessation of mining.

Based on the above the Impact caused by The Action to the Corben's Long-eared Bat and its habitat is not considered a significant impact under the EPBC guidelines.



9. Entities With a Lower Risk of a Real Chance of Significance Assessments

9.1 Flora species with potential to occur on site and targeted during detailed survey

Targeted threatened flora survey was undertaken as follows:

- Between 2019 and 2023, a total of 166.35 km of walking transects and intensive area searches around VI plots compliant with NSW BioBanking Assessment Methodology (BBAM 2010 to 2022) and BAM 2020, totalling 206.50 ha.
- In November 2024, a 100 m grid pattern was overlaid over the entire Impact Site (e.g. Figure 30), including the Linear Corridor and radial searches conducted at each grid intersection in line with the EPBC Act large Area Threatened Flora survey guidelines.
- A total of 101 VI plots completed in line with BAM 2020 prior to 2024, plus 80 VI plots in 2024, totalling 181 plots.



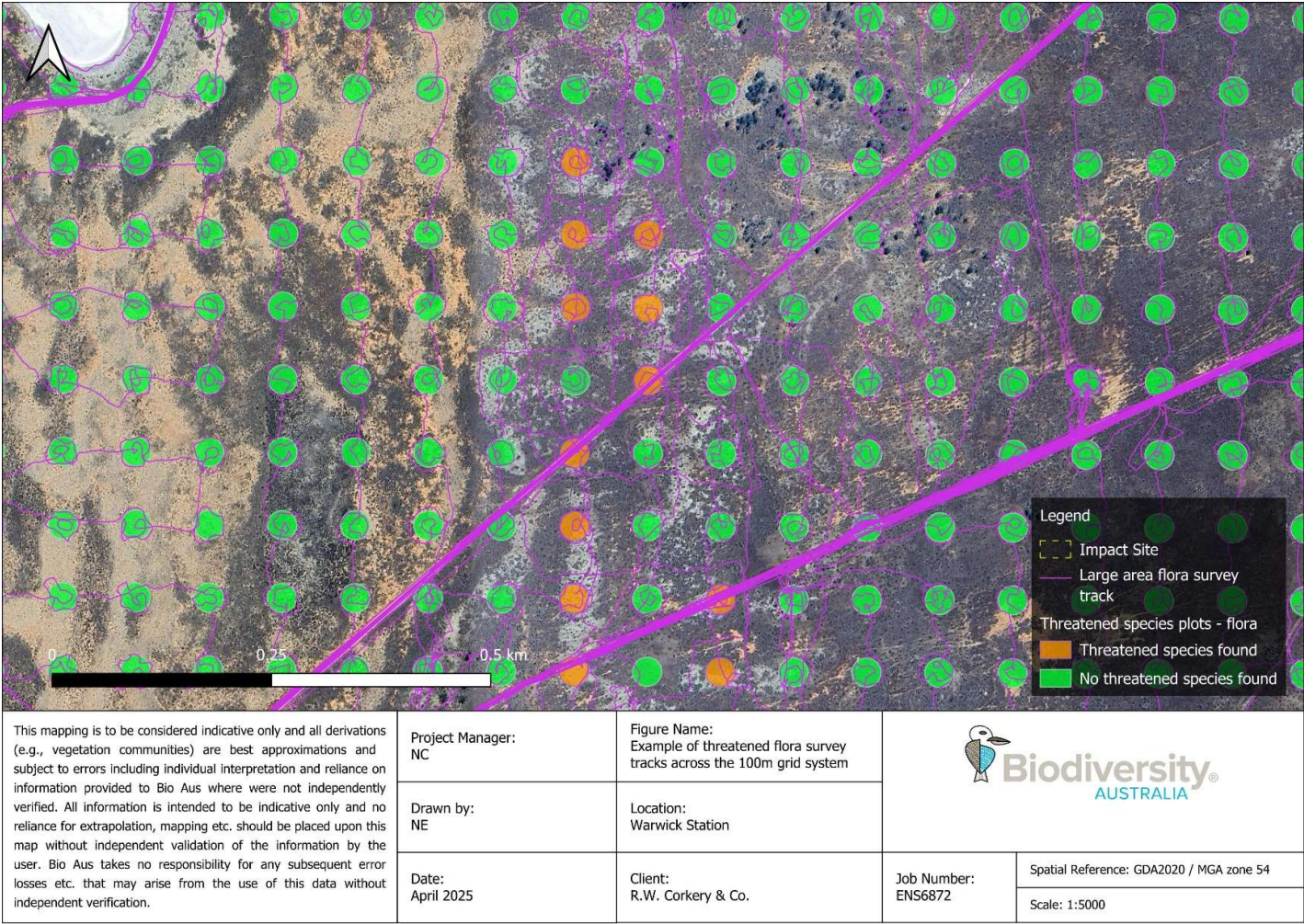


Figure 30: Example of threatened flora survey tracks across the 100 m grid system



A Saltbush (*Atriplex infrequens*)

EPBC Act Status: Vulnerable

Distribution

Atriplex infrequens occurs in western NSW, within the northern and southern far western plains regions. It is not known to occur within a conservation reserve (Briggs & Leigh, 1996) and has been recorded from the drier regions of the Bourke District, such as Lake Parnamaroo in 1860; Delalah Downs, undated; and Tarcoola in 1920; and from the Murray-Darling Depression (Wilson, 1984; Morton et al., 1995; Ayers et al., 1996). This species occurs within the Lower Murray Darling and Western (NSW) Natural Resource Management Regions. In NSW the species is confined to the far western plains. North western records recorded from east of Tibooburra, south east of Brewarrina and near Wilcannia with isolated collections from the Pooncarie area in the south.

Threats

The main identified threats to *A. infrequens* are broad-scale habitat clearing (modification and loss of essential habitat, including relatively undisturbed and ungrazed drainage lines and flats); increasing fragmentation and loss of remnants; disturbances from rabbits (*Oryctolagus cuniculus*); and overgrazing by stock and native herbivores (ANRA, 2007a & 2007b; DECC, 2008).

The main potential threats to *A. infrequens* include habitat loss; changed fire regimes; fragmentation; and overgrazing and invasions by the weed *Prosopis* spp. are occurring in some places (Morton et al., 1995; ANRA, 2007a & 2007b; DECC, 2008). Fire should not occur more than once every 10 years and there should be no slashing, trittering, or tree removal (NSW RFS, 2004).

Survey Results

There is one NSW BioNet record within 10 km of the Subject Site. The species was not found in 5,500 threatened flora surveys undertaken across a 100 m grid of over the whole of the Impact Site (survey undertaken after significant rainfall) nor in any of the more than 80 VI plots undertaken by Bio Aus.

Significant Impact Criteria

Table 16: Significant impact assessment – *Atriplex infrequens*

Significant Impact Criteria	Details	Resulting Impact
a) Lead to a long-term decrease in the size of an important population of a species.	No <i>Atriplex infrequens</i> grass was identified within the Subject Site, thus is a less than remote chance the proposed action will lead to any long-term decreases in the size of an important population of a species.	No significant impact
b) Reduce the area of occupancy of an important population.	No <i>Atriplex infrequens</i> grass was identified within the Subject Site therefore the proposed action will not reduce the AOO of the population.	No significant impact
c) Fragment an existing important population into two or more populations	No <i>Atriplex infrequens</i> grass was identified within the Subject Site therefore the proposed action will not result in fragmentation of an existing population.	No significant impact
d) Adversely affect habitat critical to the survival of a species.	No <i>Atriplex infrequens</i> grass was identified within the Subject Site therefore the proposed action is a less than remote chance to have a significant impact on critical habitat.	No significant impact



Significant Impact Criteria	Details	Resulting Impact
e) Disrupt the breeding cycle of an important population.	No <i>Atriplex infrequens</i> grass was identified within the Subject Site therefore the proposed action is not anticipated to disrupt the breeding cycle of the species.	No significant impact
f) Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the Species is likely to decline.	No <i>Atriplex infrequens</i> grass was identified within the Subject Site. Thus, the removal of vegetation within the subject site is not considered to result in species decline.	No significant impact
g) Result in invasive species that are harmful (by competition, modification of habitat, or predation) to a vulnerable species, becoming established in the vulnerable species' habitat.	The proponent will exercise its Biosecurity obligations to prevent weed spread. No new species that affects <i>Atriplex infrequens</i> is likely to be introduced as a direct result of the proposal.	No significant impact
h) Introduce a disease that may cause a species to decline.	No diseases that affect the <i>Atriplex infrequens</i> are likely to be introduced as a direct or indirect result of the proposed action.	No significant impact
i) Interferes substantially with the recovery of the species.	The proposal is not anticipated to interfere with the recovery of the species.	No significant impact

The above assessment has determined that the proposed Action does not significantly impact *Atriplex infrequens*. Referral to the Department of Conservation, Climate Change, Environment, Energy and Water (DCCEEW) is not required for this Species.



Winged Peppergrass (*Lepidium monophlooides*)

EPBC Act Status: Endangered

Distribution

Winged peppergrass is widespread in the semi-arid western plains regions of NSW. Collected from widely scattered localities, with large numbers of historical records but few recent collections. There is a single collection from Broken Hill and only two collections since 1915, the most recent being 1950. Also previously recorded from Bourke, Cobar, Urana, Lake Cargelligo, Balranald, Wanganella and Deniliquin. Recorded more recently from the Hay Plain, south-eastern Riverina, and from near Pooncarie.

The species occurs in open, sparsely vegetated sites in a range of habitats on heavy clay or clay-loam soils, usually on sites that are seasonally flooded or prone to waterlogging, in arid to semi-arid areas with an average rainfall range of 200–450 mm per year. Vegetation communities in which the species occurs include grasslands, wetlands and floodplain woodlands dominated by *Eucalyptus coolabah* and *Eucalyptus largiflorens*, and chenopod shrublands dominated by *Atriplex*, *Maireana* and/or *Nitraria* species. It has also been recorded from samphire communities dominated by *Halosarcia* species and temperate woodlands with *Eucalyptus microcarpa* and *Allocasuarina luehmannii* on the southern margins of its range. The Winged Peppergrass occurs in association with a wide range of herbs and grasses including *Austrodanthonia* species, *Austrostipa* species, *Rumex brownii* and *Spergularia rubra*. Locations where the species occurs tend to be ephemeral, and it may be an opportunistic species able to take advantage of seasonally available habitat

Threats

- **Altered hydrology:** The Winged Peppergrass grows at sites that are seasonally wet, either through periodic flooding or where rainfall runoff collects, and a regular wetting and drying regime is probably required to maintain an open habitat and facilitate seed germination. Many shallow freshwater marshes have been drained, while other sites have prolonged inundation through irrigation supply and runoff, reducing the availability of suitable habitat for the species.
- **Increasing salinity:** The elevated levels of saline groundwater and the steady spread of saline effected areas, especially in northern Victoria, are likely to be a threat to some populations of Winged Peppergrass.
- **Weed invasion:** Almost all sites are at risk from weed invasion, including from exotic annual grass species including *Vulpia*, *Bromus*, *Lolium* and *Avena* species, with Patterson's Curse, Horehound and African Boxthorn being problems at a few Sites.
- **Grazing:** The Winged Peppergrass is highly palatable and as a result is very susceptible to grazing. Populations on private land, Department of Defence land and roadsides are at risk from domestic stock (roadside populations are on travelling stock routes), while high densities of kangaroos and rabbits pose a threat to populations in parks and reserves. Wild pigs may be a threat to some populations in NSW. Grazing may threaten the species by reducing the amount of seed produced by individuals through defoliation, prior to critical periods of flowering and seed production.
- **Physical damage:** Several sites where Winged Peppergrass occurs are close to vehicle tracks, and off-road vehicle movement has caused some damage to sites and drainage lines leading to sites. Road works are a major risk to roadside populations, and livestock can cause damage, especially when the soil is wet, through trampling and pugging of sites. Future development on the Department of Defence land may result in habitat degradation or loss.
- **Drought and climate change:** Virtually the entire range of the Winged Peppergrass has suffered extensive drought for over a decade now, and it is not known how long seed can remain viable in the



soil between wetting periods. Climate change is likely to be a major medium to long term threat, with the predicted increased temperatures, decreased rainfall and increased evaporation rates further reducing the availability of seasonally wet habitats favoured by the species.

Survey Results

There are no NSW BioNet records within 10 km of the Subject Site. The species was not found in 5,500 threatened flora surveys undertaken across a 100 m grid of over whole of the Impact Site nor in any of the more than 80 VI plots undertaken by Bio Aus.

Significant Impact Criteria

Table 17: Significant impact assessment – *Lepidium monoplocoides*

Significant Impact Criteria	Details	Resulting Impact
a) Lead to a long-term decrease in the size of a population.	No <i>Lepidium monoplocoides</i> was identified within the Subject Site, thus is a less than remote chance the proposed action will lead to any long-term decreases in the size of an important population of a species.	No significant impact
b) Reduce the area of occupancy of the species.	No <i>Lepidium monoplocoides</i> was identified within the Subject Site therefore the proposed action will not reduce the AOO of the population.	No significant impact
c) Fragment an existing population into two or more populations.	No <i>Lepidium monoplocoides</i> was identified within the Subject Site therefore the proposed action will not result in fragmentation of an existing population.	No significant impact
d) Adversely affect habitat critical to the survival of a species.	No <i>Lepidium monoplocoides</i> was identified within the Subject Site therefore the proposed action is a less than remote chance to have a significant impact on critical habitat.	No significant impact
e) Disrupt the breeding cycle of a population.	No <i>Lepidium monoplocoides</i> was identified within the Subject Site therefore the proposed action is not anticipated to disrupt the breeding cycle of the species.	No significant impact
f) Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the Species is likely to decline.	No <i>Lepidium monoplocoides</i> was identified within the Subject Site. Thus, the removal of vegetation within the Subject Site is not considered to result in species decline.	No significant impact
g) Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat.	The proponent will exercise its Biosecurity obligations to prevent weed spread. No new species that affects <i>Lepidium monoplocoides</i> is likely to be introduced as a direct result of the proposal.	No significant impact
h) Introduce a disease that may cause a species to decline.	No diseases that affect the <i>Lepidium monoplocoides</i> are likely to be introduced as a direct or indirect result of the proposed Action.	No significant impact
i) Interfere with the recovery of the species	The proposal is not anticipated to interfere with the recovery of the species.	No significant impact



The above assessment has determined that the proposed Action does not significantly impact *Lepidium monolocoides*. Referral to the Department of Conservation, Climate Change, Environment, Energy and Water (DCCEEW) is not required for this Species.



Desert Greenhood (*Pterostylis xerophila*)

EPBC Act Status: Vulnerable

Distribution

The Desert Greenhood is endemic to inland south-eastern Australia, in the Murray-Darling Depression, Eyre-York Block, Gawler and Great Victoria Desert IBRA bioregions. The National Recovery Plan for *Pterostylis xerophila* (Duncan 2010) listed eight known wild subpopulations that contained only 150 plants in total, located in Vic. and SA (Duncan 2010). The species distribution in NSW is modelled to extend from west of Broken Hill south to Mildura and beyond, generally within the Murray Darling Basin.

Little is known of the precise habitat requirements of *P. xerophila*. In South Australia, *P. xerophila* occurs in dry woodland on fertile red loamy soils (Bates & Weber 1990), on or around granite or quartzite rock outcrops (Jessop & Toelken 1986).

Threats

Virtually nothing is known of the previous distribution or abundance of the Desert Greenhood, so it is not possible to determine if there has been any decline in range and/or abundance. Historically, there has been substantial loss of mallee habitat, especially in South Australia, which may have had an impact on the distribution and abundance of *P. xerophila*.

Little is known of the extent or impact of current threats to populations, although several threats are evident. These include:

- Grazing by native and/or introduced herbivores may be a threat at all sites. Feral goats and rabbits are present at most sites, and grazing by kangaroos may also be a problem. Heavy grazing by rabbits and goats can also cause severe habitat degradation.
- Weed invasion, especially Paterson's Curse *Echium plantagineum* and Ward's Weed *Carrichtera annua* are a minor problem at some sites in the Gawler Ranges National Park (D. Bickerton DEH DA, pers. comm.).
- Disturbance: Accidental destruction by vehicle movement and trampling by people is a potential threat at sites where plants occur close to tracks and/or roadsides; one site in Murray-Sunset National Park is at high risk.
- Fire: The use of prescribed burning for fuel management or asset protection (or wildfires early in the season) during the growing/flowering/seeding period of *P. xerophila* (June to December) is likely to be detrimental to this species. Prescribed burning at *P. xerophila* sites should be avoided when plants are actively growing and flowering.
- Climate change probably poses the most significant long-term threat to the Desert Greenhood. Many of the rufa group *Pterostylis* species are adapted to dry conditions. However, with the predicted decrease in rainfall and increase in temperatures and evaporation rates resulting from climate change, environmental conditions for *P. xerophila* are likely to become even more marginal, with a reduction in opportunities for flowering, pollination, seed production and recruitment of plants to the adult population, as well as increasing mortality of existing plants. The frequency of wildfires may also increase with climate change.

Survey Results

There are no NSW BioNet record within 10 km of the Subject Site. The species was not found in 5,500 threatened flora surveys undertaken across a 100 m grid of over whole of the Impact Site nor in any of the more than 80 VI plots undertaken by Bio Aus.



Significant Impact Criteria

Table 18: Significant impact assessment – *Pterostylis xerophila*

Significant Impact Criteria	Details	Resulting Impact
a) Lead to a long-term decrease in the size of an important population of a species.	No <i>Pterostylis xerophila</i> were identified within the Subject Site, thus is a less than remote chance the proposed action will lead to any long-term decreases in the size of an important population of a species.	No significant impact
b) Reduce the area of occupancy of an important population.	No <i>Pterostylis xerophila</i> were identified within the Subject Site therefore the proposed action will not reduce the AOO of the population.	No significant impact
c) Fragment an existing important population into two or more populations.	No <i>Pterostylis xerophila</i> were identified within the Subject Site therefore the proposed action will not result in fragmentation of an existing population.	No significant impact
d) Adversely affect habitat critical to the survival of a species.	No <i>Pterostylis xerophila</i> grass were identified within the Subject Site therefore the proposed action is a less than remote chance to have a significant impact on critical habitat.	No significant impact
e) Disrupt the breeding cycle of an important population.	No <i>Pterostylis xerophila</i> grass were identified within the Subject Site therefore the proposed action is not anticipated to disrupt the breeding cycle of the species.	No significant impact
f) Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the Species is likely to decline.	No <i>Pterostylis xerophila</i> grass were identified within the Subject Site. Thus, the removal of vegetation within the subject site is not considered to result in species decline.	No significant impact
g) Result in invasive species that are harmful (by competition, modification of habitat, or predation) to a vulnerable species, becoming established in the vulnerable species' habitat.	The proponent will exercise its Biosecurity obligations to prevent weed spread. No new species that affects <i>Pterostylis xerophila</i> is likely to be introduced as a direct result of the proposal.	No significant impact
h) Introduce a disease that may cause a species to decline.	No diseases that affect the <i>Pterostylis xerophila</i> are likely to be introduced as a direct or indirect result of the proposed action.	No significant impact
i) Interferes substantially with the recovery of the species.	The proposal is not anticipated to interfere with the recovery of the species.	No significant impact

The above assessment has determined that the proposed Action does not significantly impact *Atriplex frequens*. Referral to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) is not required for this species.



Menindee Nightshade (*Solanum karsense*)

EPBC Act Status: Vulnerable

Distribution

Menindee Nightshade is a species of *Solanum* endemic to NSW, restricted to the far south-western plains, extending up the Darling River to the Menindee and Wilcannia districts. Mainly restricted to the area between the Darling and Lachlan Rivers. Localities include Kars Station, Lake Tandou, Lake Cawndilla, Oxley area, between Broken Hill and Menindee, and the Darling River. It has been recorded from Kinchega National Park and Nearie Lake Nature Reserve. Areas in which this species occurs can be generally defined as habitat connected to the Darling and Lachlan Rivers and their tributaries (NSW SC, 2000). Locations have also been recorded outside of river systems as the result of good rainfall, livestock introduction or other disturbance (NSW SC, 2000).

Grows in occasionally flooded depressions with heavy soil, including level river floodplains of grey clay with Black Box and Old Man Saltbush, and open treeless plains with solonized brown soils. Habitats are generally lake beds or floodplains of heavy grey clays with a highly self-mulching surface. Also found on sandy floodplains and ridges and in calcareous soils, red sands, red-brown earths and loamy soils.

Threats

The main identified threat to Menindee Nightshade is that much of the original dry lake habitat has been modified, due to lake bed cropping. This species still occupies the margins of suitable habitat, and due to its capacity to tolerate disturbance is regarded by some as a weed (DECC, 2005a). The main potential threats to Menindee Nightshade include its susceptibility to grazing by a combination of stock, rabbits (*Oryctolagus cuniculus*), kangaroos (*Macropus* spp.), and goats (*Capra hircus*). Kangaroos have increased in number because of the watering facilities developed by the grazing industry. Other potential threats are changes in hydrology, salinity, ephemeral weeds and continued lake-bed cropping (DEWHA, 2008).

Threats include:

- Habitat loss.
- Trampling, browsing or grazing.

Survey Results

There are six NSW BioNet records within 10 km of the Subject Site. The species was not found in 5,500 threatened flora surveys undertaken across a 100 m grid of over whole of the Impact Site nor in any of the more than 80 VI plots undertaken by Bio Aus.

Significant Impact Criteria

Table 19: Significant impact assessment – *Solanum karsense*

Significant Impact Criteria	Details	Resulting Impact
a) Lead to a long-term decrease in the size of an important population of a species.	No <i>Solanum karsense</i> were identified within the Subject Site, thus is a less than remote chance the proposed action will lead to any long-term decreases in the size of an important population of a species.	No significant impact



Significant Impact Criteria	Details	Resulting Impact
b) Reduce the area of occupancy of an important population.	No <i>Solanum karsense</i> were identified within the Subject Site therefore the proposed action will not reduce the AOO of the population.	No significant impact
c) Fragment an existing important population into two or more populations.	No <i>Solanum karsense</i> were identified within the Subject Site therefore the proposed action will not result in fragmentation of an existing population.	No significant impact
d) Adversely affect habitat critical to the survival of a species.	No <i>Solanum karsense</i> grass were identified within the Subject Site therefore the proposed action is a less than remote chance to have a significant impact on critical habitat.	No significant impact
e) Disrupt the breeding cycle of an important population.	No <i>Solanum karsense</i> grass were identified within the Subject Site therefore the proposed action is not anticipated to disrupt the breeding cycle of the species.	No significant impact
f) Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the Species is likely to decline.	No <i>Solanum karsense</i> grass were identified within the Subject Site. Thus, the removal of vegetation within the Subject Site is not considered to result in species decline.	No significant impact
g) Result in invasive species that are harmful (by competition, modification of habitat, or predation) to a vulnerable species, becoming established in the vulnerable species' habitat.	The proponent will exercise its Biosecurity obligations to prevent weed spread. No new species that affects <i>Solanum karsense</i> is likely to be introduced as a direct result of the proposal.	No significant impact
h) Introduce a disease that may cause a species to decline.	No diseases that affect the <i>Solanum karsense</i> are likely to be introduced as a direct or indirect result of the proposed action.	No significant impact
i) Interferes substantially with the recovery of the species.	The proposal is not anticipated to interfere with the recovery of the species.	No significant impact

The above assessment has determined that the proposed Action does not significantly impact *Solanum karsense*. Referral to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) is not required for this species.



Slender Darling-pea (*Swainsona murrayana*)

EPBC Act Status: Vulnerable

Distribution

Slender Darling-pea occurs from South Australia through south-west Victoria and central NSW to southeast Queensland (DECC, 2005a). In NSW, this species occurs in the central western slopes, the Western Division, and the Riverina area (DECC, 2005a). Slender Darling-pea is found in grassland, herbland, and open Black-box Woodland, often in depressions (DSE, 2001; Harden, 2002; DECC, 2005a). This species grows in heavy grey or brown clay, loam, or red cracking clays (DSE, 2001; DECC, 2005a). It is often associated with low chenopod shrubs (*Maireana* spp.), wallaby-grass (*Austrodanthonia* spp), and spear grass (*Austrostipa* spp.) (DSE, 2001; Harden, 2002). The species may require some disturbance and has been known to occur in paddocks that have been moderately grazed or occasionally cultivated (DECC, 2005a).

Threats

The main identified threats to Slender Darling-pea include grazing from domestic stock and rabbits (*Oryctolagus cuniculus*); weed invasion; cultivation; and roadside maintenance activities (Ayres et al., 1996; DSE, 2001; DECC, 2005a). The main potential threats to the species include habitat destruction by goats (*Capra hircus*) and feral pigs (*Sus scrofa*); salinisation of habitat; urban development in grassland habitat; and inappropriate fire regimes (Ayres et al., 1996; DECC, 2005a). This species should not be burnt more frequently than once every ten years (NSW RFS, 2004).

Survey Results

There are no NSW BioNet records within 10 km of the Subject Site. The species was not found in 5,500 threatened flora surveys undertaken across a 100 m grid of over whole of the Impact Site nor in any of the more than 80 VI plots undertaken by Bio Aus.

Significant Impact Criteria

Table 20: Significant impact assessment – *Swainsona murrayana*

Significant Impact Criteria	Details	Resulting Impact
a) Lead to a long-term decrease in the size of an important population of a species.	Insufficient information is available to describe important populations of this species. All populations should be considered important. No <i>Swainsona murrayana</i> plants or subpopulations were found during extensive survey within the Subject Site, thus is a less than remote chance the proposed action will lead to any long-term decreases in the size of any important population of a species.	No significant impact
b) Reduce the area of occupancy of an important population.	The Site is outside the known or predicted extent for the species. No <i>Swainsona murrayana</i> were identified within the Subject Site therefore the proposed action will not reduce the AOO of the population.	No significant impact
c) Fragment an existing important population into two or more populations.	No <i>Swainsona murrayana</i> were identified within the Subject Site therefore the proposed action will not result in fragmentation of an existing population.	No significant impact
d) Adversely affect habitat critical to the survival of a species.	No habitat critical to the survival of the species has been identified in the Conservation Advice or listed on the register of critical habitat. No <i>Swainsona murrayana</i> were identified within the Subject Site therefore the proposed action is a less than remote chance to have a significant impact on critical habitat.	No significant impact



Significant Impact Criteria	Details	Resulting Impact
e) Disrupt the breeding cycle of an important population.	No <i>Swainsona murrayana</i> were identified within the Subject Site therefore the proposed action is not anticipated to disrupt the breeding cycle of the species.	No significant impact
f) Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the Species is likely to decline.	No <i>Swainsona murrayana</i> were identified within the Subject Site. Thus, the removal of vegetation within the subject site is not considered to result in species decline.	No significant impact
g) Result in invasive species that are harmful (by competition, modification of habitat, or predation) to a vulnerable species, becoming established in the vulnerable species' habitat.	The proponent will exercise its Biosecurity obligations to prevent weed spread. No new species that affects <i>Swainsona murrayana</i> is likely to be introduced as a direct result of the proposal.	No significant impact
h) Introduce a disease that may cause a species to decline.	No diseases that affect the <i>Swainsona murrayana</i> are likely to be introduced as a direct or indirect result of the proposed action.	No significant impact
i) Interferes substantially with the recovery of the species.	The proposal is not anticipated to interfere with the recovery of the species.	No significant impact

The above assessment has determined that the proposed Action does not significantly impact *Swainsona murrayana*. Referral to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) is not required for this species.



Yellow Swainson-pea (*Swainsona pyrophila*)

EPBC Act Status: Vulnerable

Distribution

The Yellow Swainson-pea occurs in mallee vegetation communities in inland south-eastern Australia, where it is widely distributed from the northern Eyre Peninsula in South Australia (SA) to north-western Victoria (Vic) and western New South Wales (NSW). The number and size of subpopulations of Yellow Swainson-pea is unknown. The number of mature individuals fluctuates as plants only appear for a few years after fire. The NSW species profile states Yellow Swainson-pea is “recorded in small to moderately large subpopulations, including 3, 20, 50, 250 and 300 plants, often scattered” (OEH 2018).

The species grows in mallee scrub on sandy or loamy soil, usually found only after fire. Sites include cleared and burnt mallee scrub on red loam to sand, previously burnt *Eucalyptus dumosa* mallee, disturbed woodland in sheltered aspects, a bulldozed firebreak adjacent to wheat paddocks, roadsides, claypans and at the edge of fire ash.

Threats

Yellow Swainson-pea plants only appear following fire or disturbance and only survive for 1–2 years. Survival of the species relies on seeds stored in the soil. The soil seedbank must be able to persist between fires and must be sufficiently replenished to grow the next generation of Yellow Swainson-pea after the next fire. It is not known if mechanical disturbance of the soil within a subpopulation triggers significant germination, as can occur in some other native legumes. These characteristics make the Yellow Swainson-pea susceptible to threats during the short time it exists as an above-ground plant, and to threats that impact the persistence of a soil seedbank. Other threatening processes include fire regimes that cause declines in biodiversity, loss of mallee woodland habitat, or activities that degrade habitat by causing intense physical damage to soils or increasing competition from other plants. Threats may be summarised as:

- Habitat destruction (clearing and agricultural activities).
- Altered fire regimes (dependent upon fire to stimulate germination).
- Feral animal disturbance (goat and rabbit invasion in sandy habitats may precipitate soil erosion and vegetation loss, especially in vulnerable post-fire sites).
- Viability of seeds in the soil seedbank.
- Younger plants may be palatable to goats and stock.
- Insufficient understanding of distribution.
- Insufficient understanding of threats.

Survey Results

There are no NSW BioNet records within 10 km of the Subject Site. The species was not found in 5,500 threatened flora surveys undertaken across a 100 m grid of over whole of the Impact Site nor in any of the more than 80 VI plots undertaken by Bio Aus.

Significant Impact Criteria



Table 21: Significant impact assessment – *Swainsona pyrophila*

Significant Impact Criteria	Details	Resulting Impact
a) Lead to a long-term decrease in the size of an important population of a species.	Insufficient information is available to describe important populations of this species. All populations should be considered important. No <i>Swainsona pyrophila</i> plants or subpopulations were found during extensive survey within the Subject Site, thus is a less than remote chance the proposed action will lead to any long-term decreases in the size of any important population of a species.	No significant impact
b) Reduce the area of occupancy of an important population.	The Site is outside the known or predicted extent for the species. No <i>Swainsona pyrophila</i> were identified within the Subject Site therefore the proposed action will not reduce the AOO of the population.	No significant impact
c) Fragment an existing important population into two or more populations.	No <i>Swainsona pyrophila</i> were identified within the Subject Site therefore the proposed action will not result in fragmentation of an existing population.	No significant impact
d) Adversely affect habitat critical to the survival of a species.	No habitat critical to the survival of the species has been identified in the Conservation Advice or listed on the register of critical habitat. No <i>Swainsona pyrophila</i> were identified within the Subject Site therefore the proposed action is a less than remote chance to have a significant impact on critical habitat.	No significant impact
e) Disrupt the breeding cycle of an important population.	No <i>Swainsona pyrophila</i> were identified within the Subject Site therefore the proposed action is not anticipated to disrupt the breeding cycle of the species.	No significant impact
f) Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the Species is likely to decline.	No <i>Swainsona pyrophila</i> were identified within the Subject Site. Thus, the removal of vegetation within the Subject Site is not considered to result in species decline.	No significant impact
g) Result in invasive species that are harmful (by competition, modification of habitat, or predation) to a vulnerable species, becoming established in the vulnerable species' habitat.	The proponent will exercise its Biosecurity obligations to prevent weed spread. No new species that affects <i>Swainsona pyrophila</i> is likely to be introduced as a direct result of the proposal.	No significant impact
h) Introduce a disease that may cause a species to decline.	No diseases that affect the <i>Swainsona pyrophila</i> are likely to be introduced as a direct or indirect result of the proposed action.	No significant impact
i) Interferes substantially with the recovery of the species.	The proposal is not anticipated to interfere with the recovery of the species.	No significant impact

The above assessment has determined that the proposed Action does not significantly impact *Swainsona pyrophila*. Referral to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) is not required for this species.



9.2 Fauna species with potential to occur on site and targeted during detailed survey (all birds)

Bird survey effort undertaken in accordance with all relevant EPBC Act and BC Act Targeted Threatened Survey guidelines (Raptors, Birds of prey, Parrots and Woodland Birds) comprised the following:

- 20 min dawn and dusk diurnal bird surveys for sightings and vocalisation totalling 4,860 minutes (81 hours) at 243 locations between January 2018 and October 2023.
- A total of 12 recording days call playback for Striated Grasswren, Red-lored Whistler and Black-eared Miner (at the end of each survey above).
- A song meter was activated in 39 sites between March 2018-March 2022 for 3.5 hours per day (dawn and dusk), a total of 42 hours in 2022.
- Camera traps were deployed for 87 days/nights.
- A general bird of prey survey as well as Nest and Area Searches on foot and from vehicle from 4-19 December 2024.
- Targeted Morning searches around water sources and hollows from 4-19 December 2024.
- Opportunistic observations were undertaken during all site visits.
- Targeted bird surveys within mallee vegetation communities in February 2025.
- Hollow Bearing Trees were recorded.
- Targeted bird of prey surveys in February 2025.



Murray Mallee Striated Grasswren (*Amytornis striatus howei*)

EPBC Act Status: Endangered

Distribution

The Murray Mallee Striated Grasswren occurs in New South Wales, South Australia and Victoria. In NSW recent records are in the Murray Mallee region and restricted to Scotia and Tarawi in the west (OEH 2024).

The species is confined to areas with well-developed Porcupine Grass (*Triodia irritans*), usually in association with mallee eucalypts and sandy soils. It is known to re-occupy burnt vegetation 6 to 8 years following fire and prefers areas with large hummocks of spinifex which is greatest 25 to 40 years post-fire. Feeds on the ground upon small invertebrates and seeds.

Nests are a substantial dome of interwoven grasses, bark and spinifex, well-hidden towards the top of a spinifex clump. Usually recorded in pairs, though sometimes in small parties, and first often detected by its call. Can be shy and difficult to observe, though may also be inquisitive and respond to observers, particularly during the breeding season (TSSC 2023).

Threats

- Risk of large-scale intense wildfire reducing habitat and resource availability and infrequent fire impacting the structural suitability of habitat.
- Overgrazing and browsing from feral goats impacting habitat structure, condition, and resources for foraging and breeding. This threat is exacerbated after fire and during drought periods.
- Habitat degradation and loss due to overgrazing and burrowing by rabbits.
- Overgrazing and browsing from both domestic stock (e.g. Dorper and Merino sheep) and goats (both feral and commercial) impacting habitat structure, condition, and resources for foraging and breeding. This threat is exacerbated after fire and during drought.
- Increased predation risk from introduced predators (cats and foxes), especially after fire (reducing suitable vegetation cover with birds occupying lower quality habitat within refugia). Increased predation risk from introduced predators (cats and foxes), especially after fire (reducing suitable vegetation cover with birds occupying lower quality habitat within refugia).
- Small and declining population size susceptible to demographic threats and stochastic events. The NSW population is estimated to be only a few hundred individuals.
- Clearing of habitat for agriculture and grazing (DCCEEW 2023).

Survey Results

The species was not found during extensive bird surveys between 2018 and 2025.

Significant Impact Criteria

Significant impact guidelines for an endangered species are defined by DotE (2013) and are addressed below.



Table 22: Significant impact assessment – Murray Mallee Striated Grasswren

Significant Impact Criteria	Details	Resulting Impact
a) Lead to a long-term decrease in the size of a population of a species.	No population or individuals of the species was found on site during extensive surveys between 2018 and 2025, including mallee-specific surveys. It is submitted that no Murray Mallee Striated Grasswren population occurs within the Impact Site.	No significant impact
b) Reduce the area of occupancy of a population.	The AOO was estimated to be 2800 km ² with low reliability (TSSC 2023). The AOO at should not be reduced by the proposal since the species was not found to be occupying the Impact Site.	No significant impact
c) Fragment an existing population into two or more populations.	No population or individuals of the species was not found on site during extensive surveys between 2018 and 2025. It is submitted that no Murray Mallee Striated Grasswren occurs within the Impact Site.	No significant impact
d) Adversely affect habitat critical to the survival of a species.	Habitat critical to the survival of the species has not been defined, however, the species is known to require Triodia grassland and prefer areas with large hummocks of spinifex, greatest 25 to 40 years post-fire. Such habitat is absent from the Impact Site.	No significant impact
e) Disrupt the breeding cycle of a population.	The proposed activity is not likely to disrupt the breeding cycle of a population, due to the points described above. No breeding population is known or likely to occur within the Impact Site.	No significant impact
f) Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the Species is likely to decline.	Habitat at the Site does not represent critical or preferred habitat, so it is a less than remote chance that the removal will lead to the species decline.	No significant impact
g) Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat.	Feral cats and foxes are already present within the Impact Site so will not be introduced. Weed introduction will be avoided through general biosecurity measures.	No significant impact
h) Introduce a disease that may cause a species to decline.	Disease is not considered a key threat to the species. No diseases that affect the Striated Grasswren are likely to be introduced as a direct or indirect result of the proposed action	No significant impact
i) Interferes with the recovery of the species.	The proposal is not anticipated to interfere with the recovery of the species.	No significant impact

The above assessment has determined that the proposal is not considered likely to have a significant impact on the Striated Grasswren. Significant survey effort over eight years have failed to record the species. Referral to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) is not required for this Species.



Malleefowl (*Leipoa ocellata*)

EPBC Act Status: Vulnerable

Distribution

The stronghold for this species in NSW is the mallee in the southwest centred on Mallee Cliffs NP and extending east to near Balranald and scattered records as far north as Mungo NP. West of the Darling River a population also occurs in the Scotia mallee including Tarawi NR and Scotia Sanctuary and is part of a larger population north of the Murray River in South Australia.

The species predominantly inhabits mallee communities, preferring the tall, dense and floristically-rich mallee found in higher rainfall (300 - 450 mm mean annual rainfall) areas. Utilises mallee with a spinifex understorey, but usually at lower densities than in areas with a shrub understorey. Less frequently found in other eucalypt woodlands, such as Inland Grey Box, Ironbark or Bimble Box Woodlands with thick understorey, or in other woodlands such dominated by Mulga or native Cypress Pine species. Prefers areas of light sandy to sandy loam soils and habitats with a dense but discontinuous canopy and dense and diverse shrub and herb layers

Threats

Loss of habitat, fragmentation, degradation of habitat, inappropriate fire regimes, predation by cats and foxes, disturbance to active mound nests by feral goats and pigs, climate change are the main factors of the species population decline.

Survey Results

Direct surveys for the species were conducted, with call play backs and visual surveys conducted in areas where suitable habitat was observed. No birds, mounds or tracks were found during extensive surveys over eight years. Records of the species only occur north of the Subject Site.

Significant Impact Criteria

Significant impact guidelines for a vulnerable species are defined by DotE (2013) and are addressed below.

Table 23: Significant impact assessment – Malleefowl (*Leipoa ocellata*)

Significant Impact Criteria	Details	Resulting Impact
a) Lead to a long-term decrease in the size of a population of a species	No population, individuals or evidence of the species was found on site during extensive surveys between 2018 and 2025, including mallee-specific surveys. It is submitted that no Malleefowl population occurs within the Impact Site.	No significant impact
b) Reduce the area of occupancy of a population.	The AOO of the species is not stated, however, the lack of the species presence indicates the species is not reliant on the habitat to be cleared and therefore the AOO is a less than remote chance to be reduced by The Action.	No significant impact
c) Fragment an existing population into two or more populations.	There is little suitable Malleefowl habitat within the Impact Site and no population has been recorded nor evidence of the species found over many surveys.	No significant impact
d) Adversely affect habitat critical to the survival of a species.	Habitat critical to the survival of the species is poorly understood. in reserve systems in the Murray mallee of NSW, habitats on sandy substrates that support <i>Tridodia</i> were of greatest importance (e.g. Woorinen and Red swale mallee sands) (DCCEEW, 2024). Approximately 12 ha of mallee habitat will be cleared, none of which represent preferred habitat for the species.	No significant impact



Significant Impact Criteria	Details	Resulting Impact
e) Disrupt the breeding cycle of a population.	The proposed activity is not likely to disrupt the breeding cycle of a population, due to the points described above.	No significant impact
f) Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the Species is likely to decline.	Due to the lack of the species presence in the Impact Site, it is considered a less than remote chance that the development will modify, destroy, remove or isolate habitat to such an extent that it will cause further species decline.	No significant impact
g) Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat.	No new invasive species that affects the Malleefowl are likely to be introduced as a direct or indirect result of the proposed action.	No significant impact
h) Introduce a disease that may cause a species to decline.	No diseases that affect the Malleefowl are likely to be introduced as a direct or indirect result of the proposed action.	No significant impact
i) Interferes with the recovery of the species.	The proposal is not anticipated to interfere with the recovery of the species.	No significant impact

The above assessment has determined that the proposal is not considered likely to have a significant impact on Malleefowl. Significant survey effort over eight years have failed to record the species or any evidence of the species within the Impact Site. Referral to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) is not required for this Species.



Grey Falcon (*Falco hypoleucos*)

EPBC Act Status: Vulnerable

Distribution

The Grey Falcon is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. The species is restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions and also occurs near wetlands where surface water attracts prey. Grey Falcon preys primarily on birds, especially parrots and pigeons.

Threats

- Grazing and clearing of arid and semi-arid zone rangelands.
- Secondary poisoning through mouse and locust control programs.
- Taking of eggs and young for collections and falconry.
- Insufficient understanding of distribution. (OEH 2022s).

Survey Results

The Grey Falcon was not recorded within or near the Impact Site. NSW Bionet records search shows five 95) records within 10 km of the study site, with records all occurring close to the Anabranch to the east of the Impact Site.

Significant Impact Criteria

Significant impact guidelines for a vulnerable species are defined by DotE (2013) and are addressed below in Table 24.

Table 24: Significant impact assessment – Grey Falcon (*Falco hypoleucos*)

Significant Impact Criteria	Details	Resulting Impact
a) Lead to a long-term decrease in the size of an important population of a species.	One man-made ephemeral waterbody occurs onsite and will be retained during the dredging process. Salinity levels are very high such that it would be regarded as a salt water system, generally unsuitable as a water source for the species' prey. The species was not recorded during extensive survey. No important population is present within the Impact Site.	No significant impact
b) Reduce the area of occupancy of an important population.	No important population is considered to occur so the proposal would not likely reduce the AOO of any potential population.	No significant impact
c) Fragment an existing important population into two or more populations.	The Impact Site is not considered to support an important population.	No significant impact
d) Adversely affect habitat critical to the survival of a species.	Habitat critical to the survival has not been defined. The species frequents timbered lowland plains, particularly acacia shrublands that are crossed by tree-lined watercourses. Such habitat is not available at or near the Impact Site.	No significant impact
e) Disrupt the breeding cycle of an important population.	It is a less than remote chance the proposed activity will disrupt the breeding cycle of a population of Grey Falcon because no individuals have been observed within the site and are a less than remote chance to breed without the presence of fresh water watercourses.	No significant impact



Significant Impact Criteria	Details	Resulting Impact
f) Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the Species is likely to decline.	Due to the already fragmented state of the proposed development site, any further development is a less than remote chance to impact negatively on the quality of habitat potentially available to the species.	No significant impact
g) result in invasive species that are harmful to a V species becoming established in the V species' habitat.	The proponent will exercise their biosecurity obligations and will ensure potential harmful species to the Grey Falcon are not introduced.	No significant impact
h) Introduce a disease that may cause a species to decline.	Disease is not a recognised threat to the species.	No significant impact
i) Interferes with the recovery of the species.	There is no adopted or made Recovery Plan for this species (DCCEEW 2023). The proposed action does not interfere with any of the management objectives, actions within Key management sites or critical actions for this species as outlined by OEH (2022e). The Action will not interfere substantially with the recovery of the species.	No significant impact

The above assessment has determined that the proposal is not considered likely to have a significant impact on the Grey Falcon. Referral to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) is not required for this Species.



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11. Appendices

A-1 Protected matters search tool results





EPBC Act Protected Matters Report

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

Report created: 15-Jan-2025

[Summary](#)

[Details](#)

[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar)	3
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	38
Listed Migratory Species:	9

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	15
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

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

State and Territory Reserves:	2
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	8
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar Wetlands) [Resource Information]

Ramsar Site Name	Proximity	Buffer Status
Banrock station wetland complex	50 - 100km upstream from Ramsar site	In buffer area only
Riverland	10 - 20km upstream from Ramsar site	In buffer area only
The coorong, and lakes alexandrina and albert wetland	200 - 300km upstream from Ramsar site	In buffer area only

Listed Threatened Ecological Communities [Resource Information]

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

Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions	Endangered	Community may occur within area	In feature area
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	Endangered	Community may occur within area	In buffer area only
Mallee Bird Community of the Murray Darling Depression Bioregion	Endangered	Community likely to occur within area	In feature area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.

Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Amytornis striatus howei	Endangered	Species or species habitat known to occur within area	In feature area
Murray Mallee Striated Grasswren, Striated Grasswren (sandplain) [91648]			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Aphelocephala leucopsis Southern Whiteface [529]	Vulnerable	Species or species habitat known to occur within area	In feature area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area	In buffer area only
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat may occur within area	In feature area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat may occur within area	In feature area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat known to occur within area	In feature area
Lophochroa leadbeateri leadbeateri Major Mitchell's Cockatoo (eastern), Eastern Major Mitchell's Cockatoo, Pink Cockatoo (eastern) [82926]	Endangered	Species or species habitat known to occur within area	In feature area
Manorina melanotis Black-eared Miner [449]	Endangered	Species or species habitat known to occur within area	In feature area
Melanodryas cucullata cucullata South-eastern Hooded Robin, Hooded Robin (south-eastern) [67093]	Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Pachycephala rufogularis Red-lored Whistler [601]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Pedionomus torquatus Plains-wanderer [906]	Critically Endangered	Species or species habitat may occur within area	In feature area
Polytelis anthopeplus monarchoides Regent Parrot (eastern) [59612]	Vulnerable	Breeding likely to occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area	In feature area
Stagonopleura guttata Diamond Firetail [59398]	Vulnerable	Species or species habitat may occur within area	In feature area
FISH			
Bidyanus bidyanus Silver Perch, Bidyan [76155]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Craterocephalus fluviatilis Murray Hardyhead [56791]	Endangered	Species or species habitat may occur within area	In buffer area only
Galaxias rostratus Flathead Galaxias, Beaked Minnow, Flat-headed Galaxias, Flat-headed Jollytail, Flat-headed Minnow [84745]	Critically Endangered	Species or species habitat may occur within area	In feature area
Maccullochella macquariensis Trout Cod [26171]	Endangered	Species or species habitat may occur within area	In buffer area only
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Macquaria australasica			
Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area	In buffer area only
FROG			
Litoria raniformis			
Southern Bell Frog,, Growling Grass Frog, Green and Golden Frog, Warty Swamp Frog, Golden Bell Frog [1828]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
MAMMAL			
Bettongia lesueur lesueur			
Burrowing Bettong (Shark Bay), Boodie [66659]	Vulnerable	Translocated population known to occur within area	In buffer area only
Leporillus conditor			
Wopilkara, Greater Stick-nest Rat [137]	Vulnerable	Translocated population known to occur within area	In buffer area only
Myrmecobius fasciatus			
Numbat [294]	Endangered	Translocated population known to occur within area	In buffer area only
Nyctophilus corbeni			
Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Onychogalea fraenata			
Bridled Nail-tail Wallaby, Bridled Nailtail Wallaby [239]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)			
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat may occur within area	In buffer area only
PLANT			
Atriplex infrequens			
[4143]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Lepidium monoplacoides			
Winged Pepper-cress [9190]	Endangered	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Pterostylis xerophila Desert Greenhood [7997]	Vulnerable	Species or species habitat may occur within area	In feature area
Solanum karsense Menindee Nightshade [7776]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Swainsona murrayana Slender Darling-pea, Slender Swainson, Murray Swainson-pea [6765]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Swainsona pyrophila Yellow Swainson-pea [56344]	Vulnerable	Species or species habitat may occur within area	In feature area

REPTILE

Hemiaspis damelii Grey Snake [1179]	Endangered	Species or species habitat may occur within area	In feature area
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Listed Migratory Species [\[Resource Information \]](#)

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area

Migratory Terrestrial Species

Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area	In buffer area only
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area

Migratory Wetlands Species

Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat may occur within area	In feature area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area	In buffer area only

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]	
Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat known to occur within area overfly marine area	In feature area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat may occur within area overfly marine area	In feature area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area	In buffer area only
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area
Neophema chrysostoma Blue-winged Parrot [726]	Vulnerable	Species or species habitat likely to occur within area overfly marine area	In feature area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area	In buffer area only
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area overfly marine area	In feature area

Extra Information

State and Territory Reserves [Resource Information]

Protected Area Name	Reserve Type	State	Buffer Status
Scotia	Private Nature Reserve	NSW	In buffer area only
Tarawi	Nature Reserve	NSW	In buffer area only

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Lake Victoria Wind Farm	2024/09965		Referral Decision	In feature area

Controlled action

Electricity Transmission Line	2001/380	Controlled Action	Completed	In buffer area only
EnergyConnect NSW - Western Section	2020/8673	Controlled Action	Post-Approval	In buffer area only
Great Darling Anabranch - pipeline construction and environmental water flow ma	2004/1319	Controlled Action	Post-Approval	In buffer area only

Not controlled action

Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
INDIGO Central Submarine Telecommunications Cable	2017/8127	Not Controlled Action	Completed	In feature area
Release of Captive Bridled Nailtail Wallabies	2010/5447	Not Controlled Action	Completed	In buffer area only

Not controlled action (particular manner)

INDIGO Marine Cable Route Survey (INDIGO)	2017/7996	Not Controlled Action (Particular Manner)	Post-Approval	In feature area
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Caveat

1 PURPOSE

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

The report contains the mapped locations of:

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

2 DISCLAIMER

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

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

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

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

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

4 LIMITATIONS

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

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

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

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

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

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

Acknowledgements

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

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

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

Please feel free to provide feedback via the [Contact us](#) page.

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Department of Climate Change, Energy, the Environment and Water

GPO Box 3090

Canberra ACT 2601 Australia

+61 2 6274 1111

A-2 Likelihood of occurrence assessment

Table 25: Likelihood of Occurrence Assessment Summary

Scientific name	Common Name	EPBC Act	Distribution	Required Habitat	Likelihood of Occurrence	Justification	BioNet records within 10km
Ecological Communities							
<i>Mallee Bird Community of the Murray Darling Depression Bioregion</i>	Mallee Bird Community (MBC)	E	Entire Murray-Darling Depression IBRA bioregion, as well as NE Victoria and SE South Australia	Mallee communities, generally associated with unconsolidated sands and low rainfall (250-300mm annually). Coincides with PCTs 170 and 171 in the Impact Site. - Mallee communities in MDD - unconsolidated sands - low rainfall (250-300mm annually).	Moderate	Suitable habitat occurs within and adjacent to Linear Corridor	1
<i>Coolibah Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions</i>	Coolibah-Black Box Woodlands	E	Associated with the floodplains and drainage areas of the Darling Riverine Plains and the Brigalow Belt South IBRA bioregions.	Found on the grey, self-mulching clays of periodically waterlogged floodplains, swamp margins, ephemeral wetlands, and stream levees. <i>Eucalyptus coolabah</i> subsp. <i>coolabah</i> (Coolibah, Coolabah) and/or <i>Eucalyptus largiflorens</i> (Black Box) are the dominant canopy species and where the understory tends to be grassy.	Unlikely	The Impact Site is outside IBRA bioregion. Dominant species not recorded. Soils are sand based, not clay.	0
<i>Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions</i>	Buloke Woodlands	E	SW New South Wales, NW Victoria and eastern South Australia. In NSW occurs in the Riverina and Murray-Darling Depression Bioregions. In the north of the Murray-Darling Depression bioregion, restricted to near freshwater river systems (notably the Murray and Wimmera Rivers) or adjacent to sites of ground water discharge, such as Pink Lakes, the Raak Plain and Rocket Lake.	Dominated by <i>Allocasuarina luehmannii</i> or grey box <i>Eucalyptus microcarpa</i> and slender cypress-pine <i>Callitris gracilis</i> . Presence of clayey and/or alkaline sub-soils.	Unlikely	The Impact Site is distant from permanent freshwater systems. Dominant species are absent, clayey subsoils absent.	0
Birds							



Scientific name	Common Name	EPBC Act	Distribution	Required Habitat	Likelihood of Occurrence	Justification	BioNet records within 10km
<i>Amytornis striatus howei</i>	Murray Mallee Striated Grasswren	E	NSW, SA and Vic. in the Murray Mallee region where they now occur patchily through the Riverland Biosphere Reserve in South Australia, as well as in the adjacent Scotia in western New South Wales. In 2021, EOO was estimated to be 41,200 (40,000-43,000) km ² with high reliability. AOO was estimated to be 2,800 (1,400-5,600) km ² with low reliability – both declining.	Habitat is sandplains dominated by mature spinifex (<i>Triodia</i> spp.), typically with an overstorey of mallee eucalypts (Verdon et al. 2021). Confined to areas with well-developed Porcupine Grass, usually in association with mallee eucalypts and sandy soils. Prefers areas with large hummocks of spinifex which is greatest 25 to 40 years post-fire. are a substantial dome (with a side entrance) of interwoven grasses, bark and spinifex, well-hidden towards the top or edge of a spinifex clump (Rowley et al. 2020; DPIE 2021a). Breeding has been recorded Aug–Jan and following rainfall (Rowley et al. 2020). Breeding territory of the striated grasswren is approximately three hectares.	Moderate	Extensive field surveys to date have not detected the species	0
<i>Apeloecephala leucopsis</i>	Southern Whiteface	V	Occur across most of mainland Australia south of the tropics, from the northeastern edge of the Western Australian wheatbelt, east to the Great Dividing Range	There is a wide range of open woodlands and shrublands where there is an understory of grasses or shrubs, or both. These areas are usually in habitats dominated by acacias or eucalypts on ranges, foothills and lowlands, and plains. Favour habitat with low tree densities and an herbaceous understory litter cover.	High	Recorded across the Impact Site	
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E	widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far northwest.	Prefers permanent freshwater wetlands with tall, dense vegetation. Spends the day in reeds or rushes and feeds mostly at night.	Unlikely	Suitable habitat absent	0
<i>Calidrus acuminata</i>	Sharp-tailed Sandpiper	V	Occurs in Australia during the non-breeding part of the year. Found on both the coast and inland areas. widespread in most regions of New South Wales and Victoria, especially in coastal areas. Flies north to Siberia to breed.	utilises fresh and hypersaline environments, feeding along the edge of water on mudflats, coastal and inland wetlands, and sewage ponds. On migration, the species forages and roosts on rocky and sandy beaches, freshwater habitats, and inland saltwater habitats	Low	Salt lake only available during infrequent wet periods	0
<i>Calidrus ferruginea</i>	Curlew Sandpiper	CE Marine	distributed around most of the Australian coastline (including Tasmania). It occurs along the	generally, occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts.	Low	Wet habitat only available during	3



Scientific name	Common Name	EPBC Act	Distribution	Required Habitat	Likelihood of Occurrence	Justification	BioNet records within 10km
			entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater wetlands in the Murray-Darling Basin. Inland records are probably mainly of birds pausing for a few days during migration. The Curlew Sandpiper breeds in Siberia and migrates to Australia (as well as Africa and Asia) for the non-breeding period, arriving in Australia between August and November, and departing between March and mid-April	It also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes inland. It forages in or at the edge of shallow water, occasionally on exposed algal mats or waterweed, or on banks of beach-cast seagrass or seaweed. It roosts on shingle, shell or sand beaches; spits or islets on the coast or in wetlands; or sometimes in salt marsh, among beach-cast seaweed, or on rocky shores. Curlew Sandpipers are omnivorous, feeding on worms, molluscs, crustaceans, insects and some seeds.		infrequent wet periods	
<i>Falco hypoleucos</i>	Grey Falcon	V	Occurs in arid and semi-arid Australia, including the Murray-Darling Basin, Eyre Basin, central Australia and Western Australia. Sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range	Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast. Also occurs near wetlands where surface water attracts prey. Species is highly vagrant.	Low	Vagrant, no wooded watercourses within 10km	5
<i>Gallinago hardwickii</i>	Latham's Snipe	V Marine	a non-breeding visitor to south-eastern Australia, west of the Great Dividing Range in New South Wales. breed in Hokkaido and highland areas of Honshu in Japan, and in Sakhalin and the nearby Kuril Islands of far eastern Russia	Habitat in Australia includes permanent and ephemeral wetlands. feed in soft mudflats or shallow water typically at night, early morning, or evening. omnivorous and feeds on seeds and other plant material of reeds and grasses. Roost in adequate shallow flooded or inundated substrate with dense cover comprising sedges, grasses, lignum, reeds, and rushes	Low	Ephemeral wetlands available only occasionally after significant rainfall	0
<i>Grantiella picta</i>	Painted Honeyeater	V	nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of	inhabits mistletoes in eucalypt forests/woodlands, riparian woodlands of black box and river red gum, box-ironbark-yellow gum woodlands, acacia-dominated woodlands, paperbarks, casuarinas, Callitris, and trees on farmland or	Low	Mistletoes uncommon	0



Scientific name	Common Name	EPBC Act	Distribution	Required Habitat	Likelihood of Occurrence	Justification	BioNet records within 10km
			the Great Dividing Range in NSW, Victoria and southern Queensland. exhibits seasonal north-south movements governed principally by the fruiting of mistletoe. During the winter it is more likely to be found in the north of its distribution. 100 per cent of mature individuals exist in one subpopulation	gardens. The species prefers woodlands which contain a higher number of mature trees, Inhabits Boree/Weeping Myall (<i>Acacia pendula</i>), Brigalow (<i>A. harpophylla</i>) and Box-Gum Woodlands and Box-Ironbark Forests. Feeds on mistletoes preferably the genus <i>Amyema</i> ., occasionally insects and nectar from mistletoe and eucalypts			
<i>Leipoa ocellata</i>	Malleefowl	V	Occurs in mallee in the NSW southwest centred on Mallee Cliffs NP and extending east to near Balranald and scattered records as far north as Mungo NP. West of the Darling River a population also occurs in the Scotia mallee including Tarawi NR and Scotia Sanctuary.	Predominantly inhabit mallee communities, preferring the tall, dense and floristically-rich mallee found in higher rainfall (300- 450 mm mean annual rainfall) areas. Utilises mallee with a spinifex understorey, but usually at lower densities than in areas with a shrub understorey. Semi-arid to arid shrublands and low woodlands dominated by mallee and associated habitats, such as broom-bush <i>Melaleuca uncinata</i> and native pine <i>Callitris</i> spp. scrub (Frith 1962a, b; Marchant & Higgins 1993; Benshemish 1999; Garnett & Crowley 2000). Favours mallee that is long unburnt and ungrazed (that is, old growth).	Moderate	Not recorded during extensive surveys, mounds should be noticeable, never seen by owner but known from Scotia & Tarawi NR and mallee present in Impact Site.	84
<i>Lophochroa leadbeateri leadbeateri</i>	Pink Cockatoo	E	Found across the arid and semi-arid inland, from south-western Queensland south to northwest Victoria, through most of South Australia, north into the south-west Northern Territory and across to the west coast between Shark Bay and about Jurien. In NSW it is found regularly as far east as about Bourke and Griffith, and sporadically further east than that.	Inhabits a wide range of treed and treeless inland habitats, always within easy reach of water. Nests in large old Hollow Bearing Trees.	High	Recorded	162
<i>Manorina melanotis</i>	Black-eared Miner	E		Birds are restricted to large tracts (30,000 hectares or greater) of mature, unfragmented mallee on the more fertile soils. Occupies	Fair	Not detected by survey or call playback	19



Scientific name	Common Name	EPBC Act	Distribution	Required Habitat	Likelihood of Occurrence	Justification	BioNet records within 10km
				vegetation with a post fire age of greater than 25 years but is most abundant in areas with a post fire age of 50 years or more. Restricted to mature mallee eucalypt woodland, favouring areas that have not been burnt for at least 50 years and have not been cleared (Starks 1987; McLaughlin 1990; Muir et al. 1999). Nests are built in upright forks of mallee eucalypts or dense epicormic shoots (McLaughlin 1990; Higgins et al. 2001). Habitat quality declines in long unburnt sites after several decades and senescent spinifex is unsuitable habitat for this species (Verdon et al. 2021).			
<i>Melanodryas cucullata cucullata</i>	South-eastern Hooded Robin	E	South-eastern Australia from far southeast Queensland to Yorke Peninsula, South Australia EOO and AOO are estimated at 1,200,000 km ² (range 1,100,000–1,400,000 km ²) and 30,000 km ² (16,000–50,000 km ²), respectively (Ford et al. 2021). Both the EOO and AOO estimates for the subspecies have contracting trends (Ford et al. 2021).	Found in open eucalypt woodlands, acacia scrub and mallee, often in or near clearings or open areas. Requires diverse habitats with mature eucalypts, saplings, small shrubs and moderately tall native grasses. Often perches on low dead stumps and fallen timber or on low-hanging branches, using a perch-and-pounce method of hunting insect prey.	High	Recorded on the Impact Site	35
<i>Neophema chrysostoma</i>	Blue-winged Parrot	V	Found from coastal, sub-coastal and inland areas, through to semi-arid zones. During the non-breeding period, from autumn to early spring, birds are recorded from northern Victoria, eastern South Australia, south-western Queensland and western New South Wales. breed on mainland Australia south of the Great Dividing Range in southern Victoria, far southeast of	Habitat critical to the survival of the blue-winged parrot include areas that include: • Foraging and staging habitats found from coastal, sub-coastal and inland areas, right through to semi-arid zones including: grasslands, grassy woodlands and semi-arid chenopod shrubland with native and introduced grasses, herbs and shrubs. • Wetlands both near the coast and in semi-arid zones used for foraging and staging. • Eucalypt forests and woodlands within the breeding range in Tasmania, coastal south eastern South Australia and southern Victoria.	Moderate	Potential foraging habitat, outside breeding range	6



Scientific name	Common Name	EPBC Act	Distribution	Required Habitat	Likelihood of Occurrence	Justification	BioNet records within 10km
			South Australia, and the north-western, central and eastern parts of Tasmania	• Live and dead trees and stumps with suitable hollows within the breeding range.			
<i>Pachycephala rufogularis</i>	Red-lored Whistler	V		Found in mallee woodland with a shrub layer, usually of Broombush and native pine such as Mallee Pine (<i>Callitris verrucosa</i>), with occasional patches of spinifex and emergent mallee, forming a relatively dispersed canopy.	Fair	Scattered habitat present	3
<i>Pedionomus torquatus</i>	Plains-wanderer	CE		Plains-wanderers live in semi-arid, lowland native grasslands that typically occur on hard red-brown soils. These grasslands support a high diversity of plant species, including a number of state and nationally threatened species.	Low	Soils are sand-based not clay	1
<i>Polytelis anthopeplus monarchoides</i>	Regent Parrot	V	South-western NSW and Victoria. In NSW it occurs along the Murray River downstream of Tooleybuc, the Wakool River downstream of Kyalite, and the Murrumbidgee River immediately upstream from the junction with the Murray River and adjoining areas of mallee.	Occurs in riverine river red gum woodlands, adjacent black box, belah, buloke and cypress pine woodlands, and mallee woodlands and shrublands (Beardsell 1985; Burbidge 1985; Webster 1991; Emison et al. 1987). Often occurs in farmland Most feeding activity is on the ground, foraging for grass seed. They also seek seed and blossoms in the limbs of trees, usually acacia and eucalypt species. Nesting is at the base of a tree hollow of great depth, up to fifteen feet within the main stem of the plant. The site is usually a large eucalyptus, with a hollow in the trunk that may reach almost to ground level Habitat constraint is living or dead Eucalyptus camaldulensis with hollows >5 cm, more than 5 m above the ground, OR trees with DBH greater than 40 cm within 1 km of watercourses or billabongs. Trees can be isolated but within 20 km of mallee habitats. Surveys for this species can be limited by restricting surveys to within 1km of waterways and where suitable trees occur. As per the TBDC, breeding habitat is identified by an observed nest or observation of two or more birds on site	Low	Impact Site is greater than 30 km from the Murray and Murrumbidgee Rivers	



Scientific name	Common Name	EPBC Act	Distribution	Required Habitat	Likelihood of Occurrence	Justification	BioNet records within 10km
<i>Rostratula australis</i>	Australian Painted Snipe	E		Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	None	Ephemeral wetlands available only occasionally after significant rainfall	0
<i>Stagonopleura guttata</i>	Diamond Firetail	V		Found in grassy woodlands including Box-Gum Woodlands and Snow Gum Woodland.	None	Suitable habitat absent. Not recorded during extensive surveys. No records in locality.	0
Frogs							
<i>Litoria raniformis</i>	Southern Bell Frog	E	In NSW the species occurs from Bombala in the far south-eastern corner of the state, through the Southern Tablelands, and along the Murrumbidgee and Murray Rivers (Pyke 2002). Suitable breeding and non-breeding shelter habitat consists of any waterbody with emergent aquatic vegetation and preferably without the plague minnow (<i>Gambusia holbrooki</i>). Foraging habitat and migratory habitat are areas of native and nonnative vegetation connected to the identified breeding habitat.	Usually found in or around permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps or billabongs along floodplains and river valleys. Breeding is triggered by flooding of ephemeral waterbodies during spring or summer. Does not occur in waterbodies where salinity levels exceed 7.0 ms/cm for lengthy periods. Large, continuous areas containing both permanent and ephemeral waterbodies that undergo regular flooding and are surrounded by areas containing suitable refugia in the form of ground debris, vegetation cover and cracking soils.	Low	Breeding habitat absent, no permanent water on site, salinity levels in saltpan /wetland too high as flooding is irregular. Refugia may be available on site.	14
Reptiles							
<i>Hemiaspis damelii</i>	Grey Snake	E	The distribution and ecology of <i>H. damelii</i> is poorly known. Existing records of the grey snake are most commonly found in south-eastern Queensland and north-central New South Wales, however	It tends to favour dry sclerophyll forests and woodlands on clay soils where water bodies or gullies are present. It shelters under rocks, logs and other debris, as well as in cracks in soil.	Low	Suitable habitat absent. Reptile hand searches undertaken at 74 locations for 30 minutes each. Total	



Scientific name	Common Name	EPBC Act	Distribution	Required Habitat	Likelihood of Occurrence	Justification	BioNet records within 10km
			small populations have also been found to occur in north-eastern South Australia and south-western New South Wales.			survey effort was 2,220 person minutes. Not recorded.	
Mammals							
<i>Bettongia leueur leueur</i>	Burrowing Bettong	V	Extinct in the area. Translocated population known in Scotia sanctuary	Known from translocated population in Scotia sanctuary	Unlikely	Suitable habitat absent. Extinct in wild in NSW. captive bred translocated to Scotia sanctuary	0
<i>Leporillus conditor</i>	Greater Stick-nest Rat	V	Extinct historical in the area Translocated population known to occur within area	Known from translocated population in Scotia sanctuary	Unlikely	Suitable habitat absent. Extinct in wild in NSW. captive bred translocated to Scotia sanctuary	0
<i>Myrmecobius fasciatus</i>	Numbat	E	Extinct in the area Translocated population known to occur within area	Known from translocated population in Scotia sanctuary	Unlikely	Extinct in wild in NSW. captive bred translocated to Scotia sanctuary	0
<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat	V	Found across the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for this species	Inhabits a variety of vegetation types, including mallee, bullock <i>Allocasuarina leuhmanni</i> and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and Southern Qld.	Fair	Mallee habitat present Results of anabat surveys?	0
<i>Onychogalea fraenata</i>	Bridled Nail-tail Wallaby	E		Known from translocated population in Scotia sanctuary	Unlikely	Suitable habitat absent. Extinct in wild in NSW. captive bred translocated to Scotia sanctuary	
<i>Phascolarctos cinereus</i>	Koala	E	typically occurs in eastern Australian forests and	habitat that is critical to the survival of a species:	Unlikely		0



Scientific name	Common Name	EPBC Act	Distribution	Required Habitat	Likelihood of Occurrence	Justification	BioNet records within 10km
<i>(combined populations of Qld, NSW and ACT)</i>	Important population defined as • have the potential to act as source populations to adjacent areas of suitable, or potentially suitable, habitat; • exist in areas of climatically suitable refugia during periods of environmental stress including droughts, heatwaves, and long-term climate change; • are genetically diverse; • are disease free and/or exhibit low rates of infection with important pathogens; • contain genes which may confer adaptation to current and future environmental		woodlands of predominantly Eucalyptus species. listed population of the koala has a wide but patchy distribution that spans the coastal and inland areas of Queensland north to the Herberton area, extending westwards into hotter and dryer semi-arid climates of central Queensland, New South Wales and the Australian Capital Territory. In NSW include Murray Darling Depression bioregion stressors; • are geographical or environmental outliers within the species range.	(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. New South Wales has identified critical koala populations as “areas of currently known high koala occupancy”		No koala records and no evidence of koalas recorded during survey. Suitable habitat absent	
Plants							



Scientific name	Common Name	EPBC Act	Distribution	Required Habitat	Likelihood of Occurrence	Justification	BioNet records within 10km
<i>Atriplex infrequens</i>	A Saltbush	V		Occurs in a broad range of drainage tracts, clay flats and possibly occasionally inundated habitats	Low	Not found in 5,500 threatened flora surveys undertaken across a 100m grid of over whole of the Impact Site nor in any VI plots totalling 80 + previous	1
<i>Lepidium monoplacoides</i>	Winged Pepper-cress	E		Occurs on seasonally moist to waterlogged sites, on heavy fertile soils, with a mean annual rainfall of around 300-500 mm Predominant vegetation is usually an open woodland dominated by <i>Allocasuarina leuhmannii</i> (Bullock) and/or eucalypts, particularly <i>Eucalyptus largiflorens</i> (Black Box) or <i>Eucalyptus populnea</i> (Poplar Box).	Low	Not found in 5,500 threatened flora surveys undertaken across a 100m grid of over whole of the Impact Site	0
<i>Pterostylis xerophila</i>	Desert Greenhood	V		Occurs in generally remote locations in semi-desert environments, growing mostly on rock outcrops under low shrubs. Only eight populations containing about 150 plants are known	Low	Not found in 5,500 threatened flora surveys undertaken across a 100m grid of over whole of the Impact Site No rock outcrops present	0
<i>Solanum karsense</i>	Menindee Nightshade	V		Grows in occasionally flooded depressions with heavy soil, including level river floodplains of grey clay with Black Box and Old Man Saltbush, and open treeless plains with solonized brown soils • Habitats are generally lake beds or floodplains of heavy grey clays with a highly self-mulching surface. Also found on sandy floodplains and ridges and in calcareous soils, red sands, red-brown earths and loamy soils. • This species is ephemeral in nature, appearing following rainfall events. It also tolerates disturbance	Low	Not found in 5,500 threatened flora surveys undertaken across a 100m grid of over whole of the Impact Site	6



Scientific name	Common Name	EPBC Act	Distribution	Required Habitat	Likelihood of Occurrence	Justification	BioNet records within 10km
<i>Swainsona murrayana</i>	Slender Darling-pea	V		The species has been collected from clay-based soils, ranging from grey, red and brown cracking clays to red-brown earths and loams.	Low	Not found in 5,500 threatened flora surveys undertaken across a 100m grid of over whole of the Impact Site	0
<i>Swainsona pyrophila</i>	Yellow Swainson-pea	V		Found in Box-Gum Woodland in the Southern Tablelands and Southwest Slopes. • Sometimes found in association with cypress-pines <i>Callitris</i> spp.	Low	Not found in 5,500 threatened flora surveys undertaken across a 100m grid of over whole of the Impact Site	0
Migratory Marine species							
<i>Apus pacificus</i>	Fork-tailed Swift	MM	occur over inland plains but sometimes above foothills or in coastal areas. They often occur over cliffs and beaches and also over islands and sometimes well out to sea				1
Migratory Terrestrial species							
<i>Motacilla cinerea</i>	Grey Wagtail	MM					
<i>Motacilla flava</i>	Yellow Wagtail	MM					
Migratory Wetland species							
<i>Actitis hypoleucos</i>	Common Sandpiper	MW	A small sandpiper that is widely distributed in small numbers along the coast of Australia and in many inland regions.				1
<i>Calidris acuminata</i>	Calidris acuminata	MW					
<i>Calidris melanotos</i>	Pectoral Sandpiper	MW	A small to medium sandpiper. In Australia it can be found in both				0



Scientific name	Common Name	EPBC Act	Distribution	Required Habitat	Likelihood of Occurrence	Justification	BioNet records within 10km
			shallow fresh and salt water. The sandpiper flies to Russia and Northern America to breed.				
<i>Pandion haliaetus</i>	Osprey	MW					
Marine							
<i>Bubulcus ibis as Ardea ibis</i>	Cattle Egret	Marine	The Cattle Egret occurs in tropical and temperate grasslands, and terrestrial wetlands. It has occasionally been seen in arid and semi-arid regions however this is extremely rare.				
<i>Chalcites osculans as Chrysococcyx oscula</i>	Black-eared Cuckoo	Marine					
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	Marine					
<i>Hydroprogne caspia</i>	Caspian Tern	-	breeding habitat is large lakes and ocean coasts in Australasia.	Sheltered coastal embayments, estuaries, and sandy or muddy shorelines, roost and loaf on sandbars, exposed sand or shell spits, and beaches. Inland wetlands or in large lakes (including ephemeral lakes), waterholes, reservoirs, rivers, and creeks are utilized.	Low	Not found in 5,500 threatened flora surveys undertaken across a 100m grid or over whole of the Impact Site. No suitable habitat for the Species on the Impact Site.	1
<i>Merops ornatus</i>	Rainbow Bee-eater	Marine					

*Note: Where species fall into more than one category, they are listed in the uppermost category in Table 2.



Table 3: EPBC Act listed TECs and threatened species recorded or with high likelihood of occurring in the Impact Site

Common name	Scientific name	Listing status	Occurrence assessment	Habitat critical to the survival	Habitat within the Study Area and/ or Impact Site
		EPBC Act			
		Threatened Ecological Communities			
Mallee Bird Community	<i>Mallee Bird Community of the Murray Darling Basin</i>	E	Moderate likelihood – Mine Site mallee does not meet TEC size criteria. Linear Corridor mallee likely meets size criteria. No mallee specialists or dependents recorded in or adjacent to Linear Corridor. Across the site, field surveys identified one mallee specialist (Chestnut Quail-thrush) on a single occasion as a single bird) and several mallee dependent species, being: - Crested Bellbird - Grey-fronted Honeyeater - Jacky Winter - Splendid Fairy-wren - Yellow-plumed Honeyeater	- Known populations of threatened mallee birds listed individually under national environment law, especially the limited range mallee specialists - Areas where several members of the Mallee Bird community are known to occur - Areas where several members of the Mallee Bird community were formerly known to occur (recorded) within at least the past ten years and bird populations and/or mallee habitats - Areas where there has been long-term monitoring of either bird populations and/or mallee habitats may regenerate Areas of high value: - Mallee habitats that are most intact, larger and retain mid to old growth mallee trees (particularly those with hollows) and support a diversity of bird species. - Occurrences outside of conservation tenure that function as wildlife corridors that connect conservation areas where the Mallee Birds occur, or function as havens for some populations of Mallee Birds - Occurrences in habitats that have surrounding, adjacent and/or buffering areas of native vegetation. - Occurrences that are in areas where the ecological community has been most heavily impacted, or that are at the natural edge of some species' range. - Areas of woodland that contain nationally or state-listed threatened species, not limited to members of the Mallee Bird Community. - Mallee areas where key threats are relatively low level or where these can be managed efficiently, notably for pest animal impacts.	TEC = Mallee PCTs 170 and 171 where: - Native vegetation (<i>50% or more native crown cover and 50% or more native perennial cover less than 2m</i>) patch is at least 10 ha with at least 5 ha of mallee with: - Tree canopy crown cover of at least 5% and <70% - Mallee eucalypt trees as the dominant tree canopy type present - At least 3 specialist or dependent bird species recorded



Common name	Scientific name	Listing status	Occurrence assessment	Habitat critical to the survival	Habitat within the Study Area and/ or Impact Site
		EPBC Act			
		Threatened Fauna			
Pink Cockatoo		E	Recorded	• Arid and semi-arid woodlands dominated by mulga (<i>Acacia aneura</i>), mallee and box eucalypts, slender cypress pine (<i>Callitris gracilis</i>) or belah (<i>Casuarina cristata</i>). • Known habitat containing suitable attributes, including potential habitat for the subspecies, especially where there are large mature trees with suitable hollows; and • Surrounding matrix of these areas for the role of providing movement corridors for dispersal across the landscape. •Nests occur in very old trees with large hollows	• Treed PCTs 154, 170, 171, 221, 253, 254 • Within 500m of water • >5ha of intact vegetation and corridors • For nesting – • Mature trees with DBH >34 to <150cm with • Hollows greater than 10 cm in diameter (TBDC, retrieved from BioNet Atlas), or • Hollows with entrance minimum 8cm horizontal x 9 cm vertical - larger better (up to 30x80) and depth 19-180cm (Hurley & Harris, 2014)
South-eastern Hooded Robin		E	Recorded	• dry eucalypt and acacia woodlands and shrublands remnants with an open understorey, some grassy areas and a complex ground layer, often in or near clearings or open areas; • structurally diverse habitats featuring: mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses; • standing dead or live trees and tree stumps are also essential for nesting, roosting and foraging; • moderately deep to deep soils, rocks and fallen timber which provides essential foraging habitat.	Treed communities - PCTs 58, 170, 171, 221 and 254 in moderate to good condition - not badly impacted by goats • With an open understorey • Containing or adjacent open areas • Complex understorey • Deep soils • Rocks and fallen timber> 10% cover • Standing dead trees and tree stumps
Southern Whiteface	<i>Aphelocephala leucopsis</i>	V	Recorded	• areas of relatively undisturbed open woodlands and shrublands with an understorey of grasses or shrubs, or both; • habitat with low tree densities and an herbaceous understorey litter cover which provides essential foraging habitat; • living and dead trees with hollows and crevices which are essential for roosting and nesting. Breeding season typically occurs between July to October but can vary in the arid regions depending on rainfall and birds may not breed at all during periods of drought (Higgins and	Open woodlands and shrublands with grassy or shrubby understorey or herbaceous understorey litter cover • All PCTs (except 64) in good condition - not impacted by goats • Hollow Bearing Trees



Common name	Scientific name	Listing status	Occurrence assessment	Habitat critical to the survival	Habitat within the Study Area and/ or Impact Site
		EPBC Act			
				Peter 2002). Nests are made of grass, bark and roots in a large bulky dome shape usually in a hollow or crevice, or sometimes in low bushes.	
Striated Grasswren	<i>Amytornis striatus howei</i>	V	Moderate likelihood	A spinifex obligate species known to occur with or without an overstorey of mallee eucalypts, on sand plains and dunes in south-western NSW, eastern SA, and north-western Victoria	PCTs 170 and 171
Malleefowl	<i>Leipoa ocellata</i>	V	Low likelihood	Not well understood In MDD - habitats on sandy substrates that support <i>Triodia</i> . Prefer old growth mallee (40+ years). Abundance of leaf litter necessary for nesting. Utilises mallee with a spinifex understorey, but usually at lower densities than in areas with a shrub understorey. Abundance of food plants (esp. leguminous shrubs and herbs) may be important.	PCTs 170 and 171 with <i>Triodia</i>
Grey Falcon	<i>Falco hypoleucos</i>	V	Low likelihood	Not specifically listed. Use arid timbered lowland plains, particularly acacia shrublands that are crossed by tree-lined water courses. Prey species presence, including doves, pigeons, small parrots and cockatoos, and finches. The nests chosen are usually in the tallest trees along watercourses, particularly River Red Gum (<i>Eucalyptus camaldulensis</i>) and Coolibah (<i>E. coolabah</i>), but falcons also nest in telecommunication towers	- Tall trees - No tree-lined watercourses within 20km - No permanent water on site
Corben's Long-eared Bat	<i>Nyctophilus corbeni</i>	V	Fair likelihood	Not specifically listed. Old-growth vegetation is a critical habitat component in the Victorian distribution. Dead trees or dead spouts of live trees important for roosting. The species has also been found to be much more abundant in habitats that have a distinct tree canopy and a dense, cluttered understorey layer and is more abundant in extensive stands of vegetation in comparison to smaller woodland patches.	- Old growth- Hollow Bearing Trees, dead trees - PCTs





Common name	Scientific name	Listing status	Occurrence assessment	Habitat critical to the survival	Habitat within the Study Area and/ or Impact Site
		EPBC Act			
				Species is distinctly more common in box / ironbark / cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of New South Wales	



A-3 Details Targeted Threatened Species Survey Effort

A-3-1 Flora Species

Two-phase Grid-based systematic large Area survey

A targeted survey for threatened flora species was undertaken over the Impact Site between 11th November and 30th November 2024.

The survey method for the target species followed the *Surveying Threatened Plants and Their Habitats* and the *NSW Survey guide for the Biodiversity Assessment Method 2020* consisting of botanists walking over large areas of suitable habitat using a two-phase grid-based systematic survey approach. Survey locations were positioned on a 100 m grid intersect, facilitating planning and enabling rapid assessment across larger areas. At each survey location (grid intersect), a 40 m diameter area was surveyed (Figure 31, Figure 32, Figure 33, Figure 34, Figure 35). This survey technique typically involves searches along a grid of parallel traverses within the Subject Land.

Multiple threatened plant species were searched during the same traverse. However, to ensure detectability is not compromised the survey followed what is recommended that multiple-species searches should be restricted to a maximum of five species in the same stratum (i.e. search for five ground species, five mid-layer species or five canopy species) per traverse (Table 26). The surveys were conducted within the area covered by the 100-square-metre grid, as the habitat and life forms were similar to the same type and have the same optimal survey time as specified by the TBDC.

If the initial 100 m grid survey (nested within a one-square-kilometre topographic map grid) fails to detect the target species, no further surveys are required in that location (BAM, 2020).

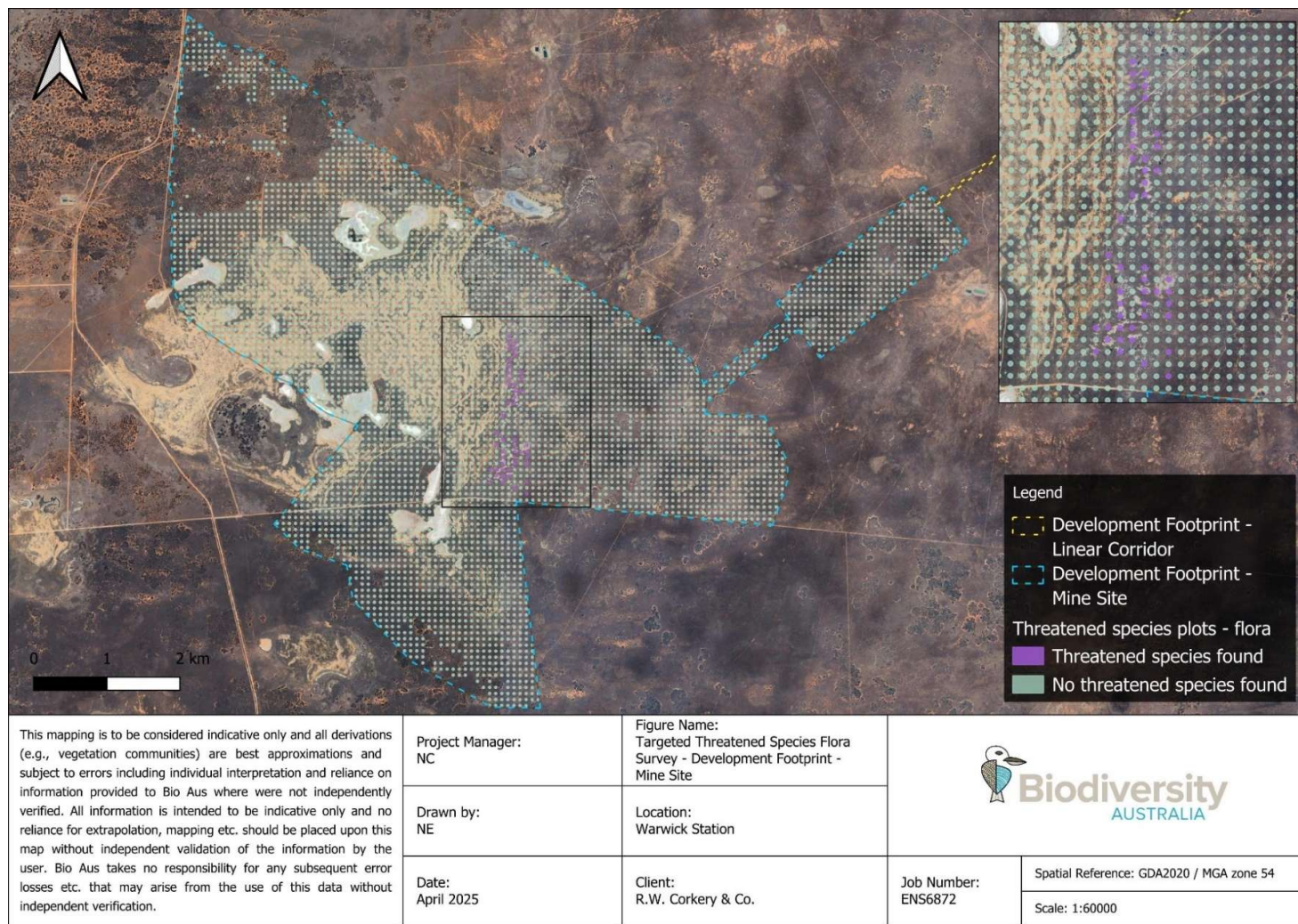


Figure 31: Large area targeted threatened flora surveys within the Impact Site – Mine Site



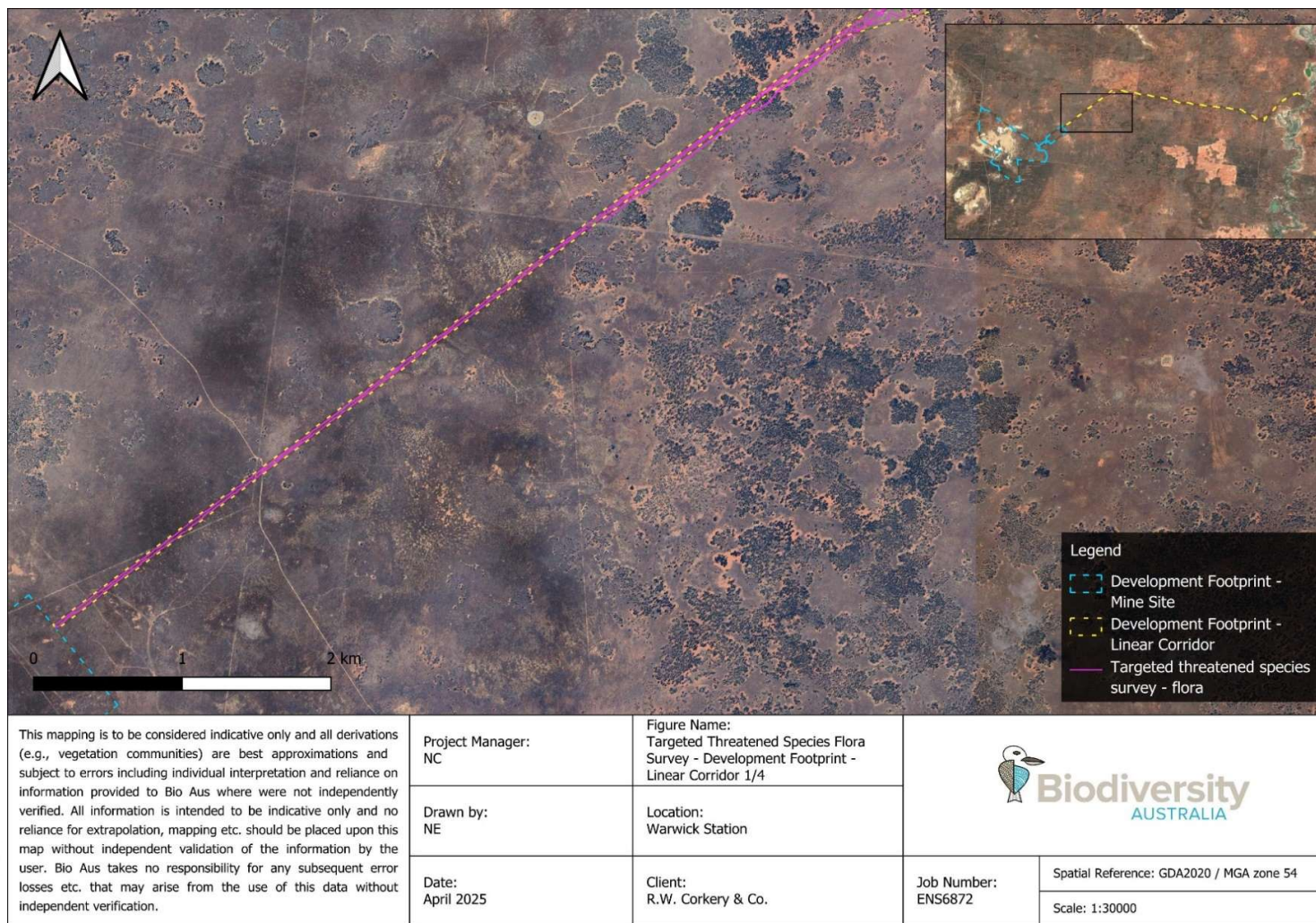


Figure 32: Targeted threatened flora surveys within the Impact Site – Linear Corridor 1/4



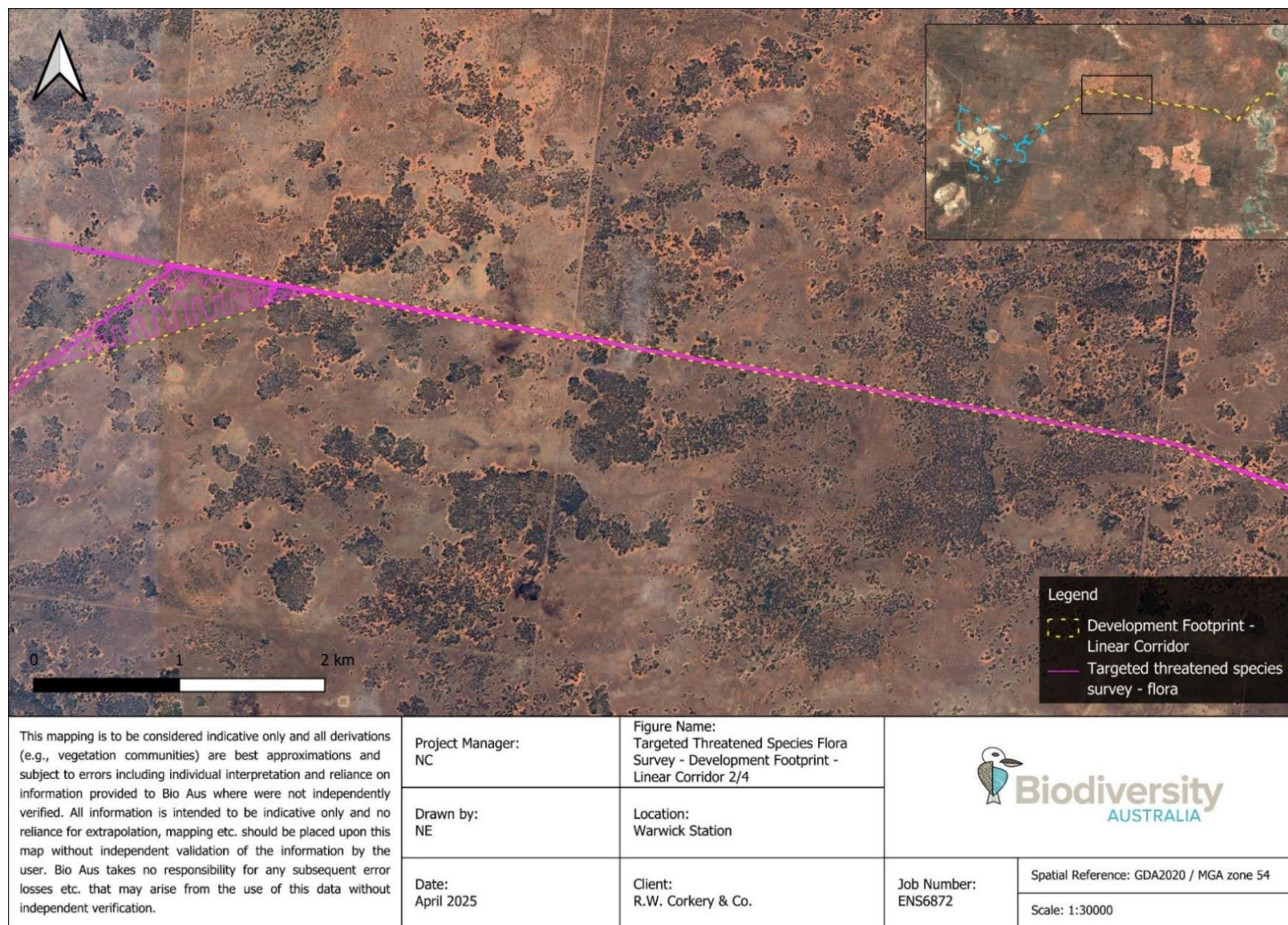


Figure 33: Targeted threatened flora surveys within the Impact Site – Linear Corridor 2/4



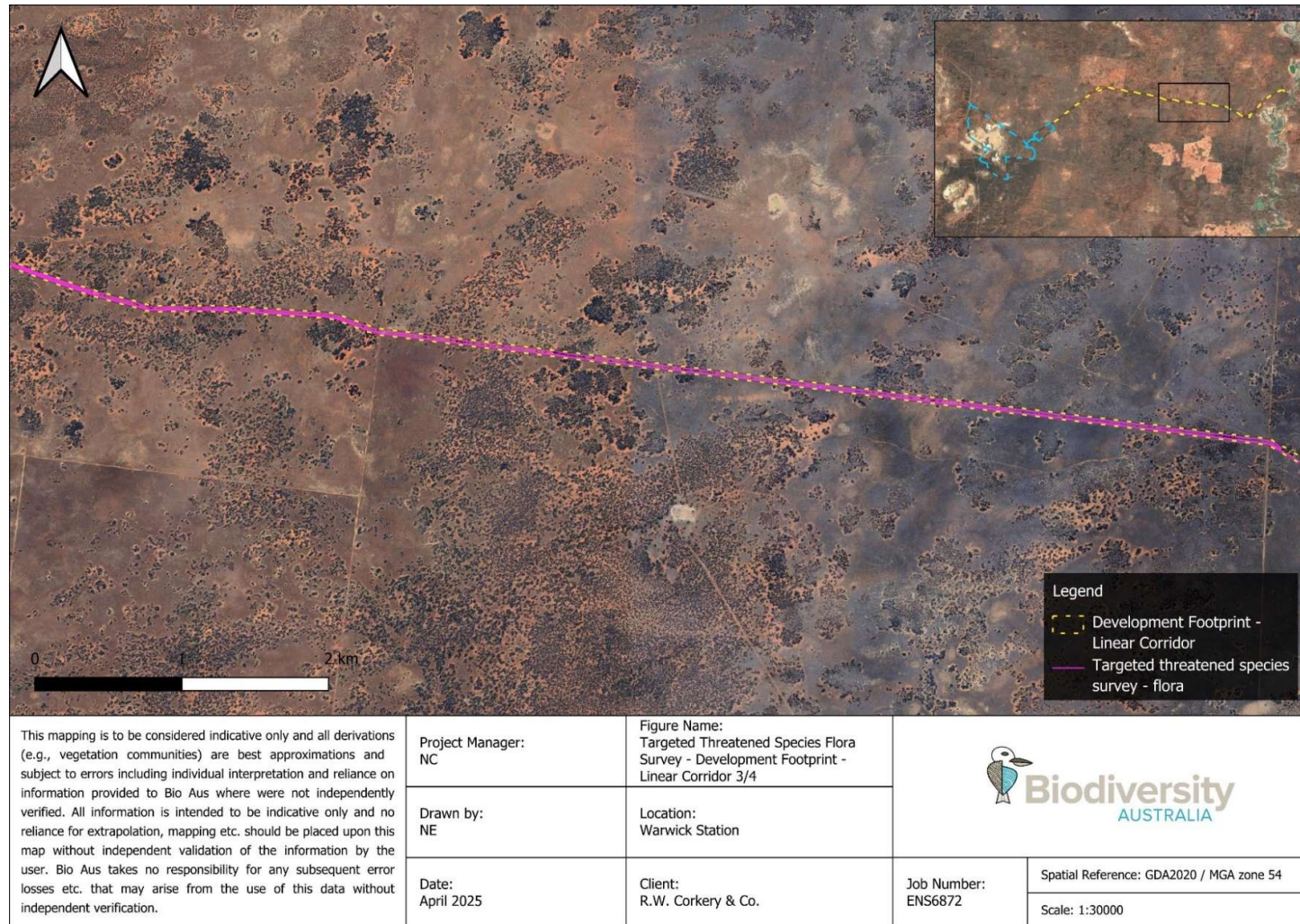


Figure 34: Targeted threatened flora surveys within the Impact Site – Linear Corridor 3/4



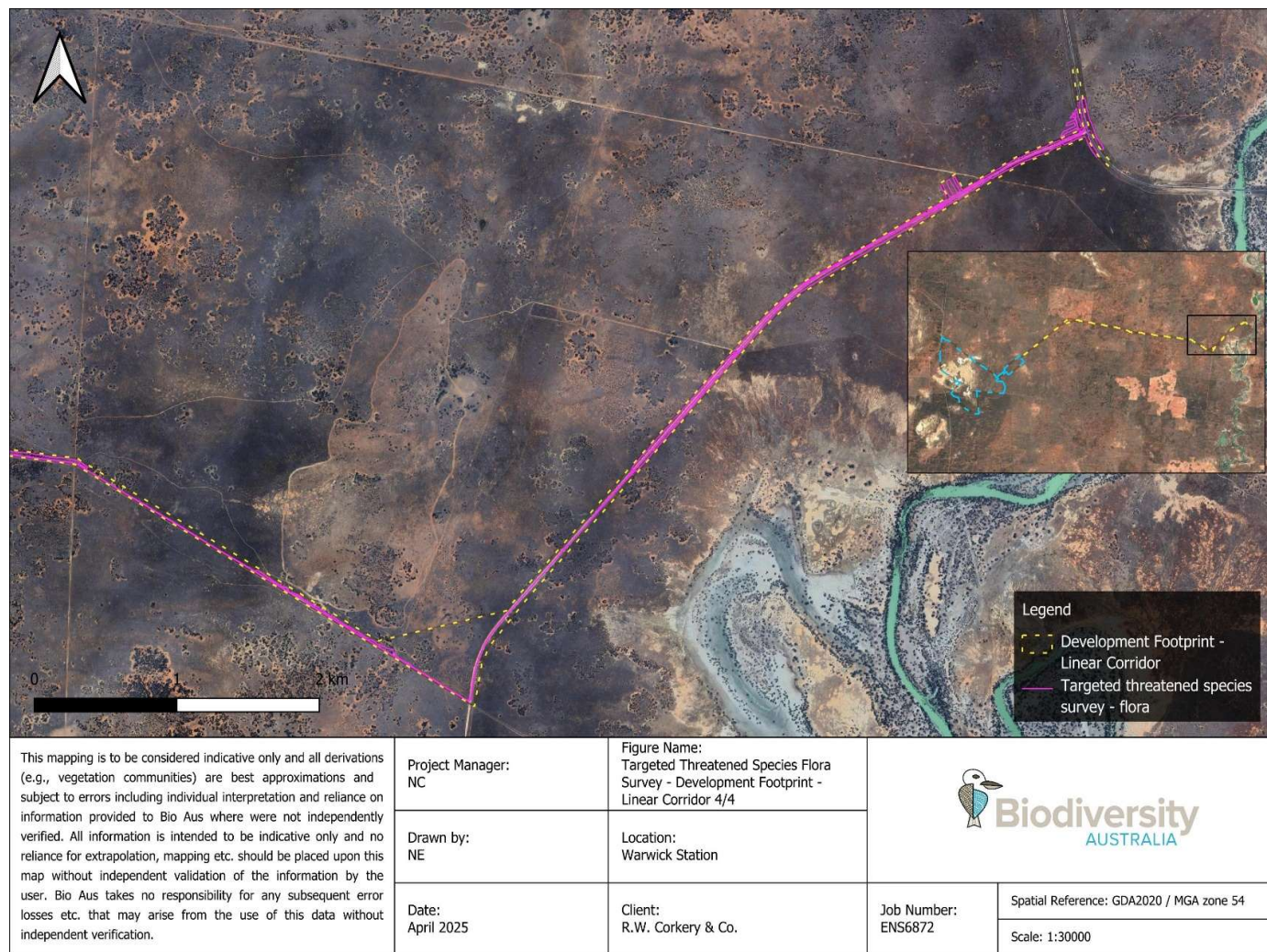


Figure 35: Targeted threatened flora surveys within the Impact Site – Linear Corridor 4/4



Table 26: Threatened plant species grouped by stratum and survey period

Common Name	Scientific Name	BC Status	Survey Timing required	Survey Timing concluded	Method Applied
Shrub					
Harrow Wattle	<i>Acacia acanthoclada</i>	Endangered	Aug-Nov	November	Two-phase grid-based System
Purple-wood Wattle	<i>Acacia carneorum</i>	Vulnerable	All year	November	Two-phase grid-based System
Bluebush Daisy	<i>Cratystylis conocephala</i>	Endangered	All year	November	Two-phase grid-based System
Desert Hopbush	<i>Dodonaea stenozyga</i>	Critically Endangered	All year	November	Two-phase grid-based System
Fleshy Minuria	<i>Kippistia suaedifolia</i>	Endangered	All year	November	Two-phase grid-based System
Pink Velvet Bush	<i>Lasiopetalum behrii</i>	Critically Endangered	All year	November	Two-phase grid-based System
Thyme Rice-Flower	<i>Pimelea serpyllifolia subsp. serpyllifolia</i>	Endangered	Jul-Nov	November	Two-phase grid-based System
Bitter Quandong	<i>Santalum murrayanum</i>	Endangered	All year	November	Two-phase grid-based System
Bladder Senna	<i>Swainsona colutooides</i>	Endangered	All year	November	Two-phase grid-based System
Yellow Swainson-pea	<i>Swainsona pyrophila</i>	Vulnerable	Sep-Nov	November	Two-phase grid-based System
Forb					
A Saltbush	<i>Atriplex infrequens</i>	Vulnerable	Nov-Feb	November	Two-phase grid-based System
Mossgiel Daisy	<i>Brachyscome papillosa</i>	Vulnerable	Sep-Nov	November	Two-phase grid-based System
A Burr-daisy	<i>Calotis moorei</i>	Endangered	Sep-Nov	November	Two-phase grid-based System

Winged Peppergrass	<i>Lepidium monoplacoides</i>	Endangered	Sep-Dec	November	Two-phase grid-based System
Button Immortelle	<i>Leptorhynchus waitzia</i>	Endangered	Sep-Nov	November	Two-phase grid-based System
Greenhood Orchid	<i>Pterostylis cobarensis</i>	Vulnerable	Oct	November	Two-phase grid-based System
Silky Swainson-pea	<i>Swainsona sericea</i>	Vulnerable	Sep-Nov	November	Two-phase grid-based System
Grass					
A Spear-grass	<i>Austrostipa metatoris</i>	Vulnerable	Oct-Nov	November	Two-phase grid-based System
A Spear-grass	<i>Austrostipa nullanulla</i>	Endangered	Sep-Dec	November	Two-phase grid-based System

Austrostipa nullanulla was located, and finer-scale grid surveys were used to locate population extent, which helped define the species polygon. This subsequent phase ensured a greater intensity of survey effort in locations where the target species occurred.

The plot traverses are a set distance apart depending on the life form and type of vegetation and cover the entire extent of potential habitat for each target plant species. Due to the type of extent vegetation on site, traverses were conducted along all vegetated areas and guided by 10 m parallel traverses with occasional random meandering to inspect for smaller or more cryptic species.

Opportunistic searches for threatened flora species were also undertaken during the vegetation plot surveys as well as during other survey-related activities within the Subject Land.

A-3-2 Fauna Species

All threatened fauna species were surveyed in accordance with recommended survey guidelines and during recommended survey periods as detailed in the BioNet TBDC, specific threatened species survey guidelines, and/or other resources (see sections below for specific sources).

A-3-3 Complementary Opportunistic Fauna Surveys

Species targeted: Australian Bustard (*Ardeotis australis*), Bush Stone-curlew (*Burhinus grallarius*), White-bellied Sea-eagle (*Haliaeetus leucogaster*), Black-breasted Buzzard (*Hamirostra melanosternon*), Pink Cockatoo (*Lophochroa leadbeateri*), Square-tailed Kite (*Lophoictinia isura*), Southern Hairy-nosed Wombat (*Lasiorhinus latifrons*).

Opportunistic fauna surveys, complementary to the method-specific targeted surveys detailed below, were conducted on foot across the Impact Site – Mine Site between 11 – 29 November 2024. Qualified fauna ecologists experienced in bird identification and equipped with binoculars and fauna identification resources, traversed the areas between Threatened Flora plots whilst searching for individuals and signs of wildlife. Additional surveys were conducted along tracks outside the Impact Site (Figure 36). Surveyors paid particular attention to soaring birds, stick nests and burrows. All other species encountered incidentally were also recorded. The complementary opportunistic fauna surveys covered approximately 1958.70 km (Figure 36).

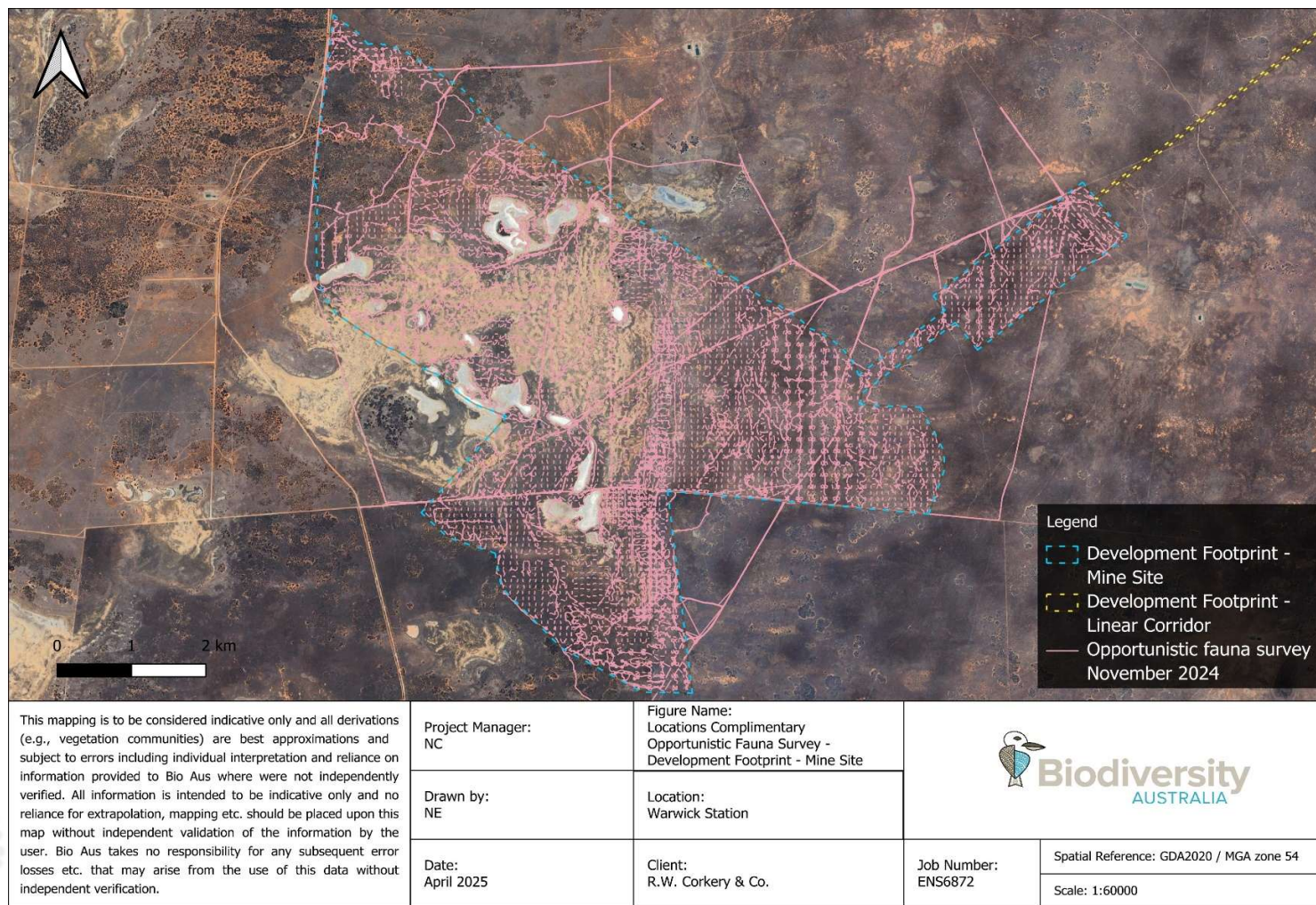


Figure 36: Locations of complimentary opportunistic targeted threatened fauna surveys within the Impact Site – Mine Site



Habitat Constraints

Desktop assessments and field surveys within the Impact Site included assessment of habitat constraints and microhabitats for fauna Species Credit Species. This included desktop assessment of the proximity of the Impact Site to features such as caves, wetlands and waterways and field inspection of microhabitats including leaf litter, stick nests and Hollow Bearing Trees etc.

The fauna surveys undertaken by Biodiversity Australia spanned from November 2024 to February 2024. The EnviroKey fauna surveys were conducted between January 2018 and January 2024. EnviroKey records obtained prior to June 2020 were discarded due to these being gathered outside the 5-year period.

Surveys were undertaken by Accredited Persons and ecologists under both Biodiversity Australia and EnviroKey's scientific licenses and animal research authority. The methods per survey measure are detailed below.

Habitat Evaluation

This was the main survey method employed to assess the suitability habitats for threatened species observed in the Assessment Area, or in broadly similar habitats in the region. Habitats on and adjacent to the Impact Site were defined and assessed according to parameters such as:

- Structural and floristic characteristics of the vegetation e.g. understorey type and development, crown depth, groundcover density, etc.
- Degree and extent of disturbance e.g. fire, grazing by livestock/feral goats, logging, weed invasion, modification to structure and diversity, etc.
- Presence of water in any form e.g. rivers, dams, creeks, drainage lines, soaks.
- Size and abundance of hollows and fallen timber.
- Availability of shelter e.g. rocks, logs, hollows, undergrowth.
- Wildlife corridors, refuges and proximate habitat types.
- Presence of mistletoe, nectar, gum, seed, sap, etc. sources.

This information is considered for evaluation of the potential occurrence of threatened species on or adjacent to the site based on desktop searches including species records, cited ecology and personal experience/knowledge of the species.

A-3-4 Active Herpetological Surveys

Biodiversity Australia

Species targeted: Crowned Gecko (*Lucasium stenodactylum*)

Targeted surveys involved nocturnal spotlight, physical habitat searches, and Elliot and pitfall trapping (see section 4.3.3.8). The nocturnal spotlight surveys were conducted in suitable habitats (PCTs 154, 221) within the Impact Site – Mine Site between 9 – 17th January 2025. The surveys were conducted by scanning for eye-shine with hand-held torches either on foot as a random meander (n = 10; Σ effort = 756 person minutes) or in a slow-moving vehicle (n = 37; Σ effort = 437 person minutes) (Figure 37FigureFigure 38). All observations of eye shine were investigated, and the species responsible was identified.

The physical habitat searches were also conducted in suitable habitat (PCTs 154, 221) and involved lifting timber, rocks and debris, and inspecting dense vegetation and leaf litter to locate and identify gecko species. These searches were done opportunistically during nocturnal spotlighting and other surveys. Any habitat elements that were removed during the searches were replaced in the position in which they were found.

Survey guidelines utilised: NSW Government Department of Planning and Environment (DPE) (2022): Threatened reptiles BAM survey guide.

Survey guideline requirements (per 50 ha suitable habitat):

- Four spotlight surveys spanning 120 person minutes, *or*
- Four pitfall trapping surveys spanning 72 trap days.

Survey guidelines met:

- Yes, 10 spotlight surveys on foot spanning 756 person minutes, 37 spotlight surveys in a slow-moving vehicle spanning 437 person minutes, and 3 pitfall trapping surveys spanning 84 trap days.

EnviroKey BDAR September 2024

Reptile hand searches were conducted by EnviroKey ecologists at 74 locations across the Impact Site and broader Subject Land. Each survey location was systematically searched by an experienced herpetologist for a period of 30 minutes for active and inactive animals during the field surveys. Fallen timber, spinifex grass (live and dead), loose bark, tree and ground hollows, and loose soil and rock were extensively searched by raking and lifting. Total survey effort was 2,220 minutes (37 hours).

A-3-5 Diurnal Bird Surveys

Biodiversity Australia

Diurnal bird census surveys

Species targeted: Black-eared Miner (*Malorina melanotis*); Pink Cockatoo (*Lophochroa leadbeateri*); Red-shouldered Whistler (*Pachycephala rufogularis*); South-eastern Hooded Robin (*Melanodryas cucullata*); Southern Whiteface (*Aphelocephala leucopsis*); White-fronted Chat (*Epthianura albifrons*).

Diurnal bird census surveys targeting the Eastern Mallee Bird TEC and other threatened bird species were conducted in suitable habitat (PCTs 170, 171) within and adjacent to the Impact Sites between 5 – 24 February 2025. The surveys consisted of a 30-minute area search of an area covering 2 ha. During each survey, observers identified and recorded all bird species seen and heard. Surveys were conducted in the early morning (dawn) or late afternoon (dusk) when bird activity was highest. The dawn surveys commenced at daybreak, once lighting was sufficient to adequately identify species (15 minutes after sunrise), and concluded when bird activity waned (2.5 hours after sunrise). The dusk surveys commenced 2 hours before sunset and concluded when either light was insufficient to identify species or when bird activity waned. A total of 42 surveys were conducted for a combined 1,258 minutes (21 hours) over 45.8 kms (Figure 39 and Figure 40).

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

Bionet Threatened Biodiversity Database Collection Threatened biodiversity ecological data – retrieved from [BioNet Atlas](#)

Survey guideline requirements:

- General - Early morning area searches in suitable habitat.
- Black-eared Miner – Minimum 24 hours survey effort over at least 8 days.
- Red-lore Whistler – Minimum 15 hours survey effort over at least 5 days.

Survey guidelines met:

- General – Yes, 21 hours survey effort over 15 days.
- Black-eared Miner – Yes, when combined with EnviroKey bird surveys confirmed to occur within the 5-year window. Between the Bio Aus and EnviroKey surveys, over 46 hours of survey effort were conducted across more than 23 days within the Impact Site. When including surveys from the broader Subject Land, the total survey effort for area searches amounted to 61 hours.
- Red-lore Whistler – Yes, 21 hours survey effort over 15 days.

Diurnal birds of prey surveys

Species targeted: Black-breasted Buzzard (*Hamirostra melanosternon*), Square-tailed Kite (*Lophoictinia isura*), Little Eagle (*Hieraaetus morphnoides*), Australian Bustard (*Ardeotis australis*); Pink Cockatoo (*Lophochroa leadbeateri*)

Combined foot and vehicle surveys were conducted for birds of prey within the Impact Site between 29 November and 4 December 2024. The surveys commenced during the heat of the day when it was expected that conditions for thermal soaring would be optimal. Observers surveyed the sky for soaring individuals and scanned their surroundings for individuals perched on trees. Additionally, observers searched for large stick nests in areas with suitable habitat for nest construction (PCTs 58, 170, 171, 221). Any pink cockatoos or other bird species of interest located opportunistically while surveying for birds of prey were also recorded. In total, six combined foot and vehicle surveys were conducted, resulting in a combined 732 minutes (12 hours) of survey effort over 191.4 km (Figure 39 and Figure 40).

Survey guideline requirements:

- There are no survey guidelines for the abovementioned birds of prey as these species are typically recorded opportunistically given their large foraging ranges. However, these are conspicuous diurnal species which can potentially be detected by aerial surveys/observing from vantage points approaching (and from within) suitable foraging and breeding habitat. Surveys to be conducted in and around the associated PCTs, suitable foraging and breeding habitat described in the TBDC for each species.

Survey guidelines met:

- N/A.

EnviroKey BDAR September 2024

Diurnal bird census surveys including diurnal call playback

EnviroKey ecologists conducted surveys to determine the presence and usage of the Impact Site by diurnal birds in either the early morning or late afternoon to coincide with peak bird activity. These surveys were completed at 243 locations between January 2018 and January 2024 across the Impact Site and Subject Land. Of these surveys, 120 were within the 5-year window (post-June 2020). 76 of the 120 surveys were conducted within the Impact Site, while the remainder were conducted in the broader Subject Land (Figure 39 and Figure 40). They were guided by a standardised technique (20 minutes survey). Observers actively searched for diurnal birds and identified species by sight and by vocalisation during each 20-minute bird survey. Opportunistic data was also collected during the field survey whenever traversing the Impact Site and Assessment Area.

Call playback was conducted at the conclusion of each diurnal bird survey to elicit a response from each of the predicted candidate species. These were (in order of call playback): Striated Grasswren; Red-lored Whistler; Bush Stone Curlew; and Black-eared Miner (for all bird survey locations in PCT 171). The call of each species was played for one minute, followed by a one-minute listening period. The call was then played again, followed by another listening period. Diurnal call playback was about 10 minutes depending on survey location and PCT. For the purpose of this BDAR, minimum survey effort was assumed to be three minutes at each site.

Total survey effort for diurnal bird surveys was 4,860 minutes (81 hours) and diurnal call playback was 729 minutes (12.15 hours). Total survey effort for diurnal bird surveys within the 5-year window was 2,400 minutes (1,520 minutes in the Impact Site and 880 minutes in the broader Subject Land).

Song meters

EnviroKey ecologists used song meter SM4 acoustic recorders during the 2022 field surveys to record bird calls. A song meter was activated at four locations (1 within the Impact Site and 3 within the broader Subject Land) for a total of 3 full days, giving a total of 12 recording days. Song meters were pre-set to begin recording 30 minutes before sunrise, and record for two hours. Song meters also commenced recording 1 hour prior to sunset and recorded for 1.5 hours. Daily recording time for each song meter was 3.5 hours per day. Total recording time for the song meters was 42 hours (10.5 hours within the Impact Site and 31.5 hours within the broader Subject Land).

Data was then analysed by Principal Ecologist Steve Sass.

A-3-6 Hollow Bearing Tree Search

Biodiversity Australia

Species targeted: Pink Cockatoo (*Lophochroa leadbeateri*); Masked Owl (*Tyto novaehollandiae*)

Data on Hollow Bearing Trees and tree hollows were recorded opportunistically while conducting diurnal bird survey and nocturnal spotlighting surveys within and adjacent to the Impact Site between 5 – 23 February 2025. Where tree hollows were located, the number, size, and height above ground of hollows, as well as the Diameter at Breast Height (DBH) and species of the trees in which hollows were located were recorded. Additionally, the coordinates of the Hollow Bearing Trees were recorded using a hand-held Global Positioning System (GPS). To ensure the time allocated to the bird and spotlighting surveys remained unchanged, the time spent recording Hollow Bearing Tree data was added to their duration (Figure 39 and Figure 40).

Survey guidelines utilised: Advice from DCCEEW (pers. comm.); NSW Bionet Threatened Biodiversity Database Collection Threatened biodiversity ecological data – retrieved from [BioNet Atlas](#)

Survey guideline requirements:

- Pink Cockatoo – Searches for living or dead trees with hollows greater than 10 cm diameter.

Survey guidelines met:

- General – Yes, 40 tree hollows greater than 10 cm in diameter were located.

EnviroKey BDAR September 2024

No targeted Hollow Bearing Tree searches were reported in EnviroKey BDAR.

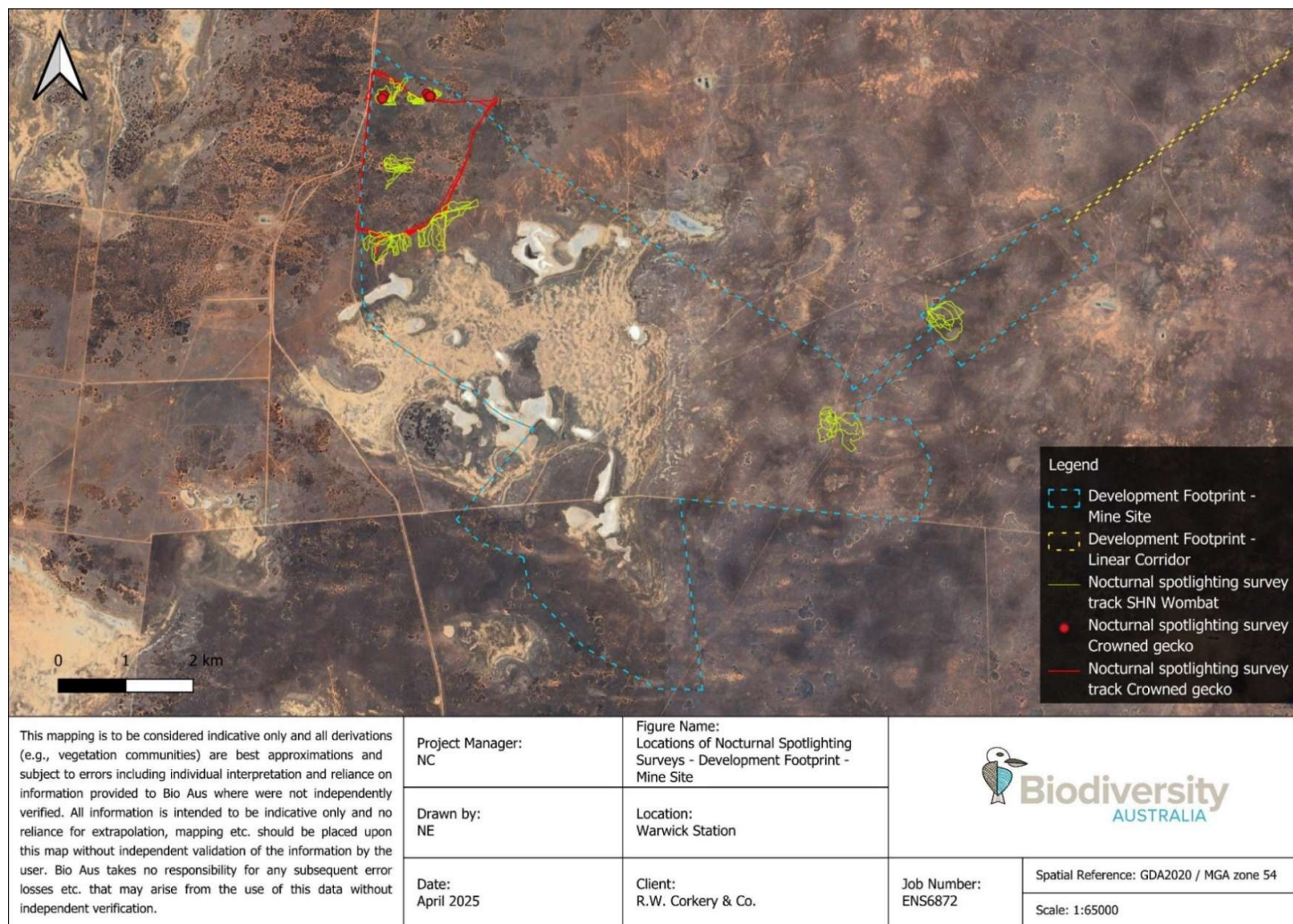


Figure 37: Locations of nocturnal spotlighting surveys - Impact Site - Mine Site



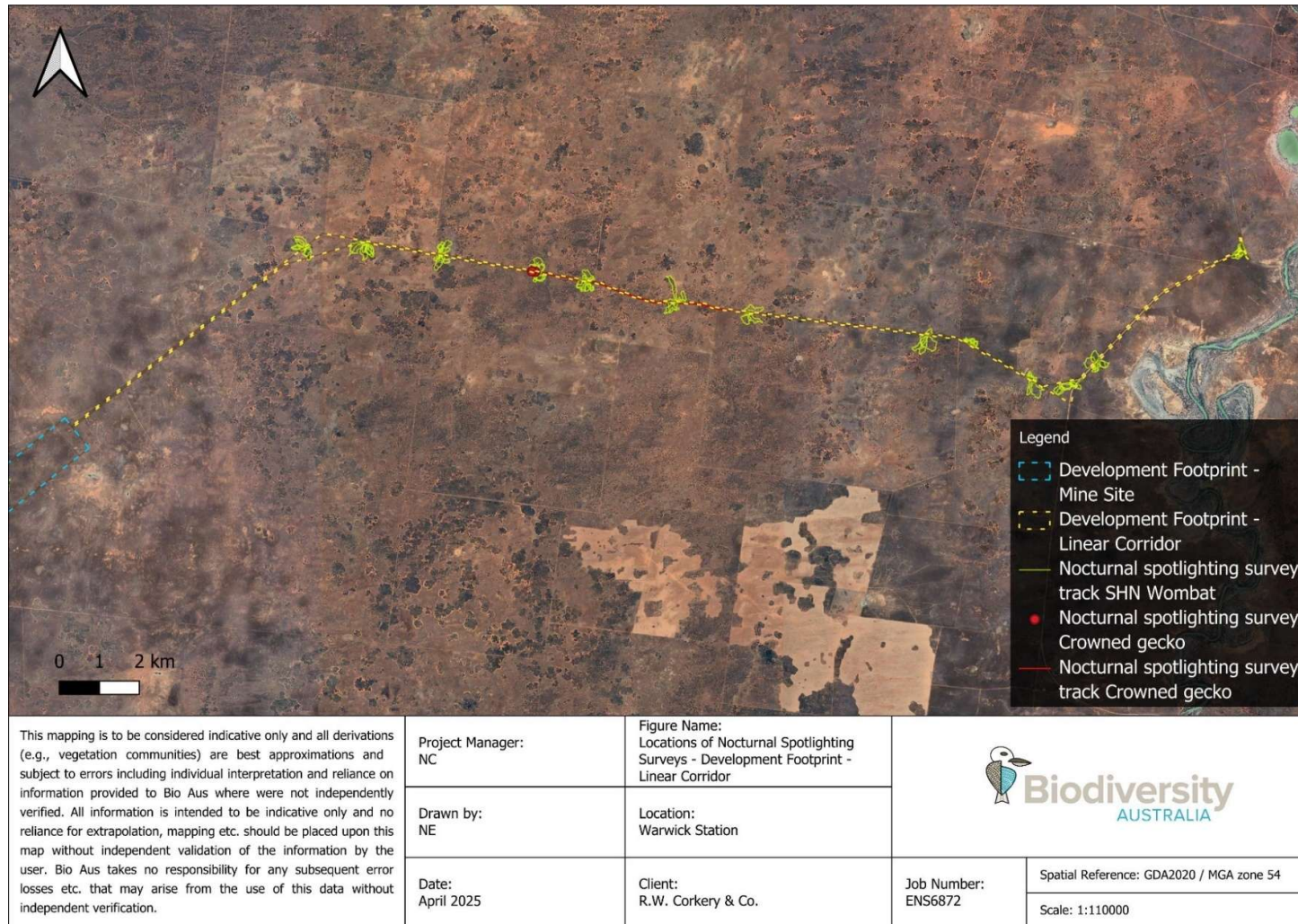


Figure 38: Locations of nocturnal spotlighting surveys - Impact Site – Linear Corridor



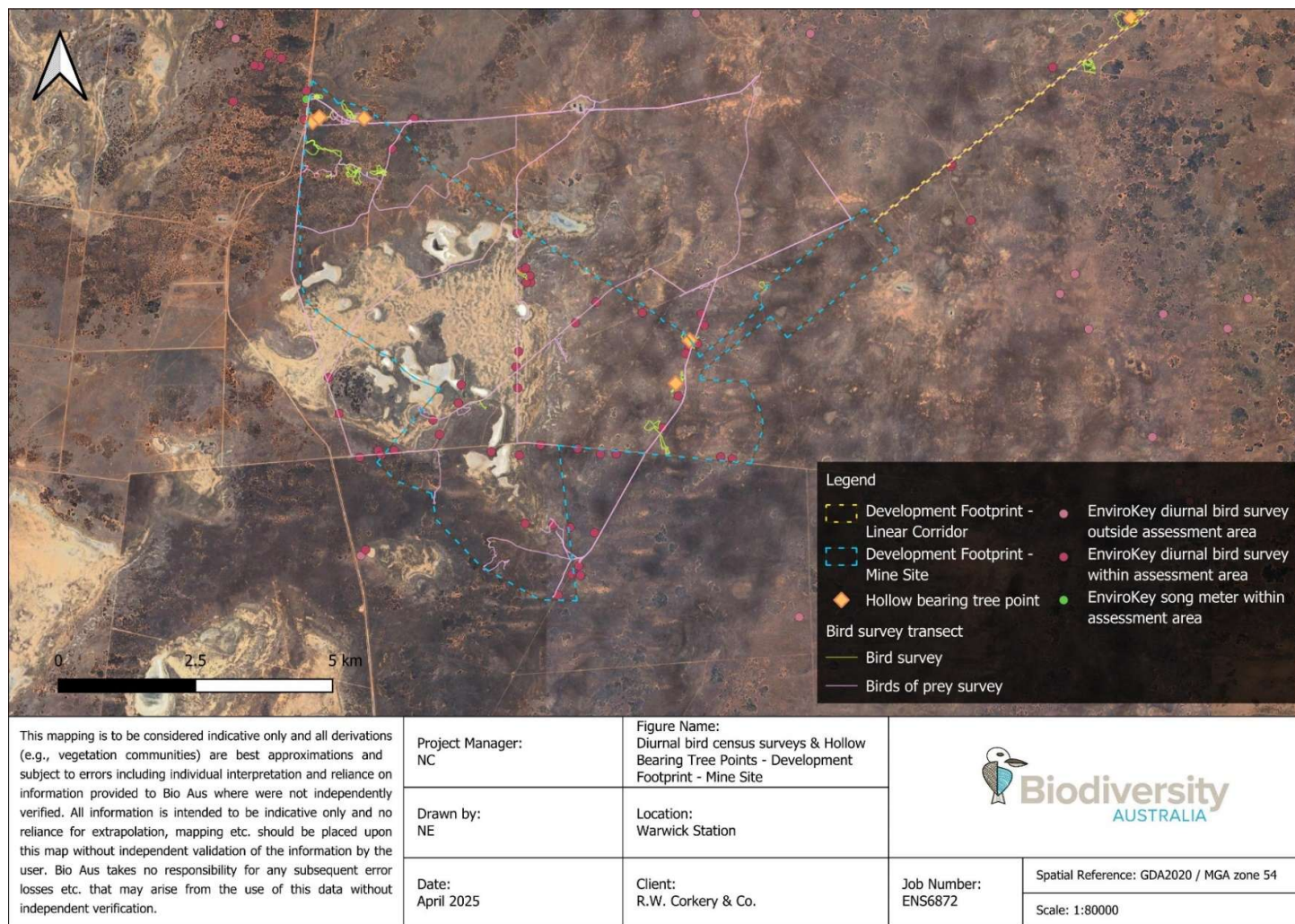


Figure 39: Diurnal bird census surveys & Hollow Bearing Tree points – Impact Site – Mine Site





Figure 40: Diurnal bird census surveys & Hollow Bearing Tree points – Impact Site – Linear Corridor



A-3-7 Nocturnal Spotlighting Surveys

Biodiversity Australia

Species targeted: Southern Hairy-nosed Wombat (*Lasiorhinus latifrons*)

Targeted nocturnal spotlight surveys were conducted within the Impact Site between 5 – 23 February 2025. In areas of suitable habitat (PCTs 58, 152, 154, 170, 171), observers searched for burrows/warrens, scats, and individuals, using high-power hand-held torches and thermal binoculars. Each search spanned a minimum of 60 person minutes and was replicated in the same area on the following night. Searches commenced a minimum of two hours after sundown and were completed a minimum of one hour prior to sunrise. A total of 20 transects were searched, equating to 40 individual surveys conducted over 2827 minutes (47 hours) and 164 kilometres (Figure 37 and Figure 38).

Survey guidelines utilised: Advice from DCCEEW (pers. comm.); NSW Bionet Threatened Biodiversity Database Collection Threatened biodiversity ecological data – retrieved from [BioNet Atlas](#)

Survey guideline requirements (per 100 ha of suitable habitat):

- Spotlighting surveys spanning 60 person minutes and replicated across 2 consecutive nights.

Survey guidelines met:

- Yes, 40 spotlight surveys (20 transects) conducted spanning 2827 person minutes.

EnviroKey BDAR September 2024

No targeted spotlighting surveys for the Southern Hairy-nosed Wombat were conducted by EnviroKey ecologists, though scat and sign searches were conducted. The details of the scat and sign searches are as follows:

While no dedicated scat and sign searches were completed across the Impact Site and Assessment Areas, searches for a period of 10 minutes each were carried out at the conclusion of every Diurnal bird survey resulting in 243 scat and sign searches. In addition, any track and scat of interest observed during the field survey while undertaking other survey methods, was inspected. In the case of scats, identification was made using 'Tracks, Scats and Other Traces: A field guide to Australian Mammals' (Triggs, 2008). Total survey effort was 2,430 minutes.

A-3-8 Nocturnal Call Playback

Biodiversity Australia

Species targeted: Masked Owl (*Tyto novaehollandiae*)

Nocturnal call playbacks were undertaken within the Impact Site between 10 – 17 January 2025. Observers surveyed for the Masked Owl in suitable habitat (PCT 24) by spotlighting with hand-held torches and listening for the species' calls for a period of 10 minutes. If no sightings or calls were registered during this time, the observers broadcast a recording of the Masked Owl's call over a speaker at a volume of 60 decibels (dB) for a period of 15 seconds. This was followed by a wait period of 30 seconds, during which time the observers again searched for the masked owl and listened for its calls. This process was repeated 6 times, with the volume of the recording dialled to 100 dB for the final broadcast. Each of 7 sites was surveyed 6 times, with surveys conducted in the late evening (8 pm – 12 am) and early morning (2:30 – 5:30 am) (Figure 41).

Survey guidelines utilised: Australian Government Department of the Environment, Water, Heritage and the Arts (DEWHA) (2010): Survey guidelines for Australia's threatened birds Guidelines for detecting birds listed as threatened under the *Environment Protection and Biodiversity Conservation Act 1999*. NSW Bionet Threatened Biodiversity Database Collection Threatened biodiversity ecological data – retrieved from [BioNet Atlas](#)

Survey guideline requirements:

- Survey at night during calm and dry weather. Begin with a 10-minute listening and search period. If no owls detected, broadcast prerecorded calls for 15 seconds at a volume of 60 dB, then listen for responses for at least 30 seconds. If no owls detected, repeat this process for a 15-minute period, gradually increasing volume from 60 to 100 dB. After the conclusion of call playbacks, conduct 15 minutes of spotlighting. Repeat call playback surveys 6 times at each site, preferably across multiple weeks.

Survey guidelines met:

- Yes, surveys commenced with a 10 minute spotlight and listening period, followed by 15 minutes of call playback. Surveys were repeated 6 times at each site; however, these were conducted over consecutive nights rather than across multiple weeks.

EnviroKey BDAR September 2024

EnviroKey ecologists conducted nocturnal call playback surveys for the Bush Stone-curlew (*Burhinus grallarius*) but not for the Masked Owl. At each of the three survey locations, call playback survey commenced with an initial listening period of 10 minutes. The call of the target species (Bush Stone curlew) was then transmitted intermittently over a period of five minutes, followed by a five-minute listening period. Spotlighting was undertaken at the conclusion of the call playback, with a minimum of 60 minutes at each site by two persons.

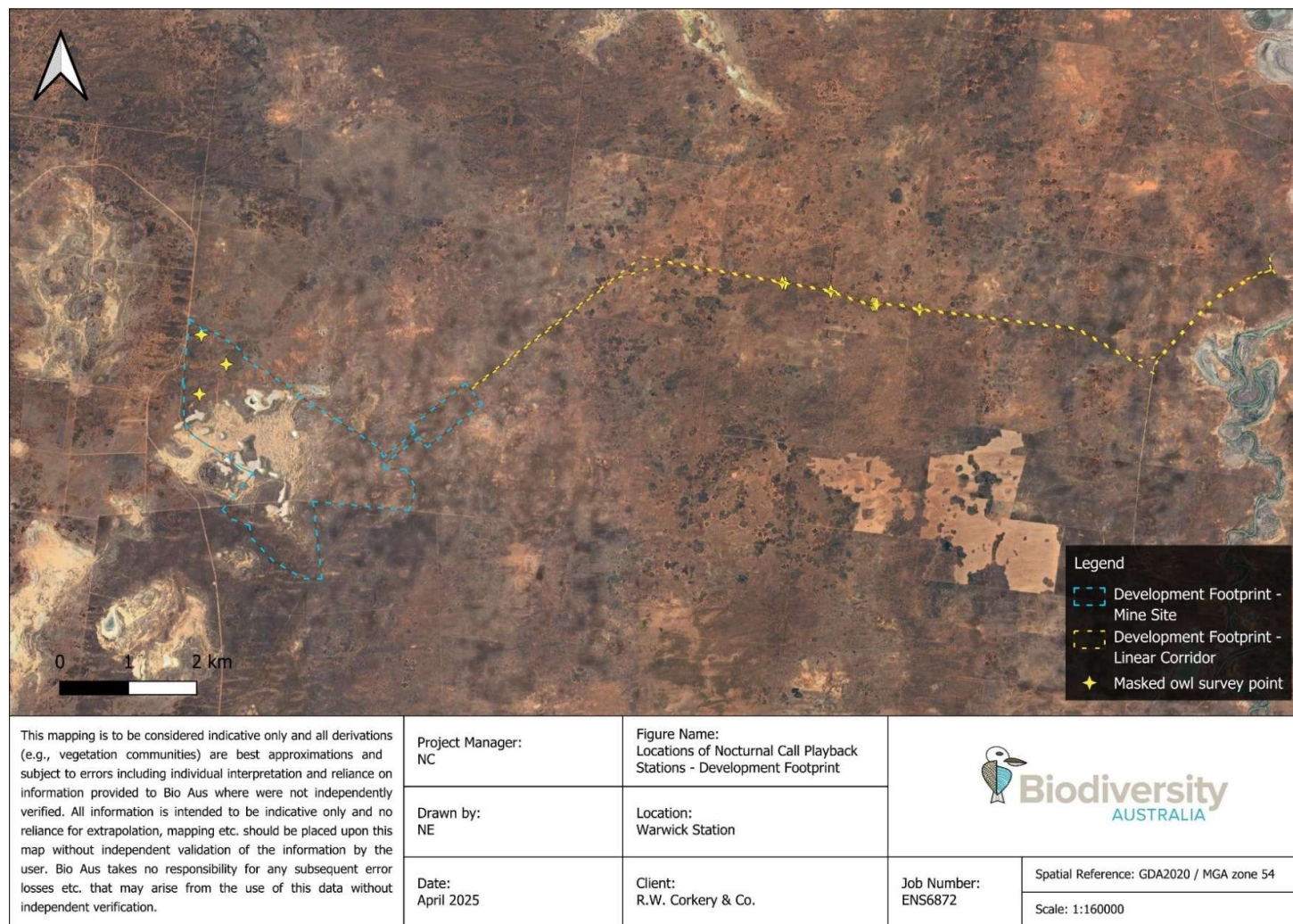


Figure 41: Location of nocturnal Call Playback stations – Impact Site



A-3-9 Elliot and Pitfall Trapping

Biodiversity Australia

Species targeted: Desert Mouse (*Pseudomys desertor*); Crowned Gecko

Concurrent Elliot and pitfall trapping surveys were undertaken within the Impact Site between 10 – 14 December 2024. Three Elliot and pitfall trap arrays were established in suitable habitat (PCTs 171, 221), two within the Impact Site – Mine Site and one along the Impact Site – Linear Corridor (Figure 42 and Figure 55). The pitfall arrays consisted of a 30 m drift fence with 7 buckets distributed along its length. Ten 'A' sized Elliot traps were set in the area surrounding each pitfall array, each baited with a mix of peanut butter, honey, and oats. Both the Elliot and pitfall traps were checked each morning within two hours of sunrise, and any captured fauna was identified and released. The traps were then closed and re-opened/reset within an hour of sunset the following evening. This survey effort resulted in a total of 84 pitfall trap nights and 120 Elliot trap nights.

Survey guidelines utilised: Department of Environment and Conservation (DEC) (2004), Threatened Species Survey and Assessment: Guidelines for developments and activities (working draft), New South Wales Department of Environment and Conservation, Hurstville, NSW; NSW Bionet Threatened Biodiversity Database Collection Threatened biodiversity ecological data – retrieved from [BioNet Atlas](#)

Survey guideline requirements:

- Elliot trapping surveys spanning 100 trap nights over 3 – 4 consecutive nights; or
- Pitfall trapping surveys spanning 24 trap nights over 3 – 4 consecutive nights.

Survey guidelines met:

- Yes, 3 Elliot trapping surveys spanning 120 trap nights over 4 consecutive nights, and 3 pitfall trapping surveys spanning 84 trap nights over 4 consecutive nights.

EnviroKey BDAR September 2024

Prior to the Elliot and pitfall trapping surveys conducted by Biodiversity Australia, several Elliot and funnel trapping surveys targeting the desert mouse were also conducted in suitable habitat (PCT 171) by EnviroKey ecologists. No EnviroKey surveys targeting the Crowned Gecko were conducted in the 5-year window after June 2020. The details of the Elliot and funnel trapping surveys are as follows:

- 'A' sized Elliot traps were baited with a mix of peanut butter, honey and rolled oats to attract small terrestrial mammals. These were spaced about 5 metres (m) apart in transects of 20 traps. They were left in situ for 4 nights during each survey and checked both morning and afternoon. Elliot trapping surveys targeting the desert mouse were conducted at 2 sites within the Impact Sites in March 2021 and 1 site in March 2022. Total survey effort targeting the desert mouse was 240 trap nights (Figure 42 and Figure 43).
- Three pairs of funnel traps (six funnel traps) were established along a 20 m drift fence (a single site) for a maximum of four nights at 10 different locations. Funnel trapping surveys targeting the desert mouse were completed at two sites during the March 2022 field survey. Survey effort was 48 trap nights (Figure 42 and Figure 43).



Figure 42: Locations of Elliot and pitfall trapping arrays - Impact Site - Mine Site



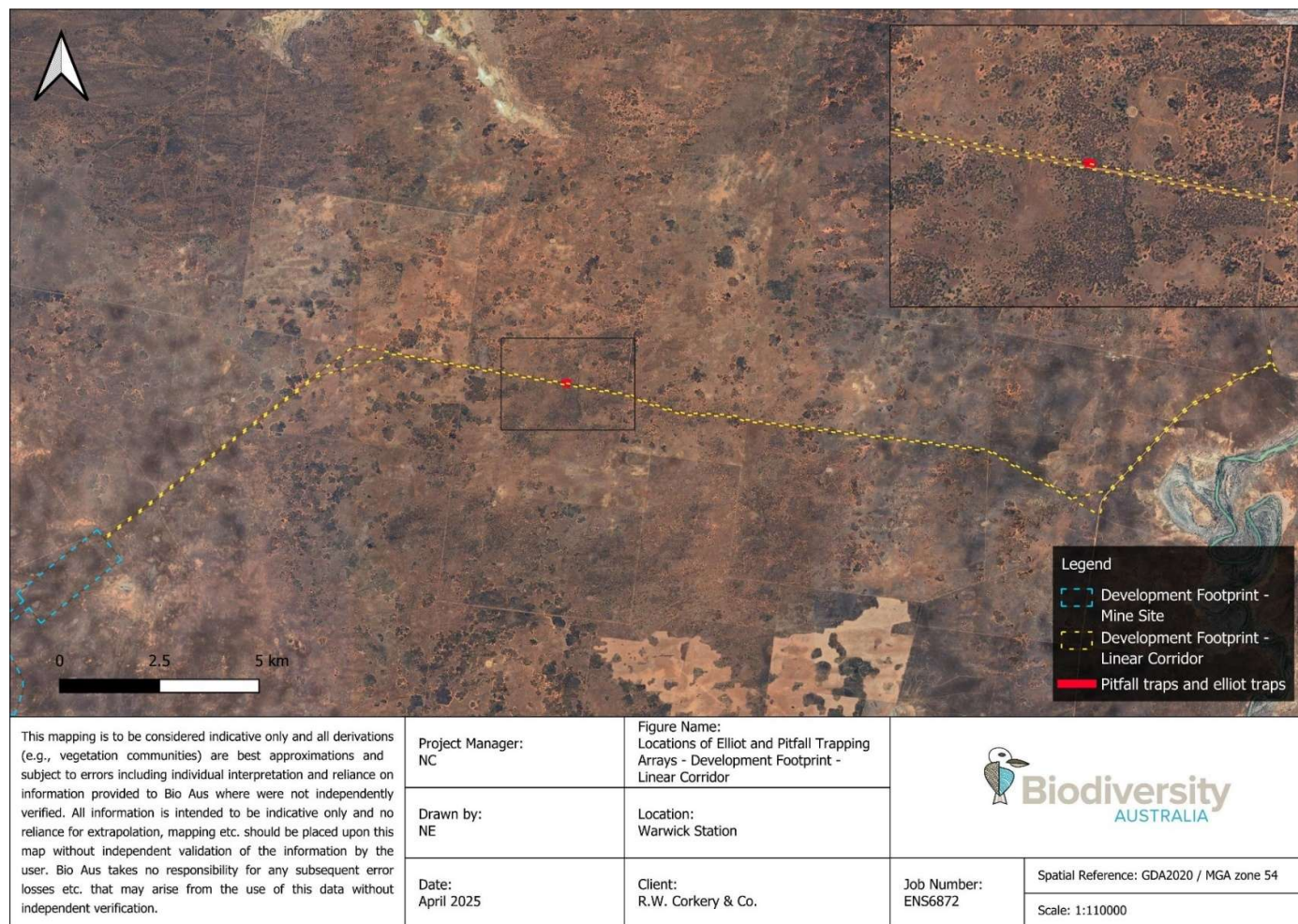


Figure 43: Locations of Elliot and pitfall trapping arrays - Impact Site – Linear Corridor



A-3-10 Microbat Call Recording and Analysis

Biodiversity Australia

Species targeted: Southern Myotis (*Myotis macropus*)

Microchiropteran bat calls were recorded using Anabat Swift, Anabat Chorus, and Anabat Express detectors over four deployment periods in 2025 in suitable habitat (PCTs 58, 170, 171, 221) within the Impact Site. The first deployment was within the Impact Site – Mine Site, occurred between 9 – 12 January, and consisted of one Swift, two Chorus and five Express detectors (Figure 44). Of these, one Express and one Chorus detector failed to record data. The second deployment occurred along the Impact Site – Linear Corridor between 13 – 16 January, and consisted of one Swift, two Express, and three Chorus detectors. The three Chorus detectors failed to record data during this deployment period. The third deployment occurred along the Impact Site – Linear Corridor between 5 – 8 February and consisted of two Express and two Chorus detectors. One of each detector model failed to record data. The fourth and final deployment was also along the Linear Corridor and occurred between 9 – 12 February. This deployment involved two Chorus and one Express detectors, of which the latter failed to record data. The detectors were fixed to trees at a height of 1.5 metres. In total, 24 survey nights of data were recorded from 6 sites in each of the two survey areas (Impact Site - Mine Site and Impact Site - Linear Corridor) (Figure 44).

Survey guidelines utilised: NSW Government Department of Planning, Industry & Environment (DPIE) (2021): 'Species credit' threatened bats and their habitats, NSW survey guide for the BAM.

Survey guideline requirements:

- Acoustic detection spanning 16 trap nights over 4 consecutive nights.

Survey guidelines met:

- Yes, acoustic detection at 12 sites spanning 48 trap nights over 4 consecutive nights.

The data obtained from the Anabat detectors were sent to *Balance! Environmental* for expert analysis. *Balance! Environmental* followed the below method using Anabat Insights (Version 2.1.3; Titley Scientific):

1. The Convert ZCA function was used to extract individual zero-crossing (.ZC) sequence files from the Anabat Express ZCA files.
2. The Search function was then used to scan all resulting ZC files and the Anabat Swift WAV files using a filter designed to find bat calls potentially belonging to *Nyctophilus* spp. and *Myotis macropus*. Filter criteria used in the search included:
 - Characteristic frequency (Fc) minimum 35 kHz – maximum 45 kHz
 - Slope of characteristic section (Sc) minimum 50 octaves per second (OPS)
 - Pulse duration (Dur) minimum 2 ms
 - Difference between maximum frequency and Fc (Fmax-Fc) minimum 5 kHz
 - ZC threshold (relevant only to WAV files) = Auto
 - Smoothness level = 5

- Minimum number of pulses per sequence meeting the above criteria = 4
3. Files that passed the above Search process were then reviewed manually to compare spectrogram characteristics and derived metrics with those of reference calls and published call descriptions (e.g., Pennay et al. 2004) for the target species.

The standard of the report provided by *Balance! Environmental* followed Australasian Bat Society standards for the interpretation and reporting of bat call data (Reardon 2003), available on-line at <http://www.ausbats.org.au/>.

EnviroKey BDAR September 2024

While spotlighting, EnviroKey ecologists targeted microchiropteran bats by using a 'Titley' Anabat SD1 Echolocation Call Recording Unit coupled to a Personal Digital Assistant for active monitoring. Surveys were conducted at three survey locations, with a minimum of 60 minutes at each site by two persons. Additionally, a single stationary Anabat unit was activated at a water point given that microchiropteran bats need to drink regularly when foraging. Mobile monitoring was also conducted while travelling across the Impact Site and Mine Site during nocturnal hours with the use of an Anabat Car Mount with High Mount Microphone. Total survey effort for Anabat surveys was 160 person minutes per location, giving a total of 480 minutes (8 hours).

The use of Echolocation Call Recording Units is consistent with State and Commonwealth guidelines for surveying microchiropteran bats. All data collected from the Anabat SD1 were then analysed and placed into bat and non-bat origin files. These files were then analysed using the software package AnalookW guided by 'Bat Calls of New South Wales: Region based guide to echolocation calls of microchiropteran bats' (Pennay et al., 2004) and the EnviroKey reference call collection. Members of the *Nyctophilus* genus could not be identified to species level due to a lack of differentiation between species and are identified to genus level only. Anabat analysis was conducted by Principal Ecologist Steve Sass, who has analysed more than 100,000 files from across Western and Central NSW.

A call was defined as a sequence of three or more consecutive pulses of similar frequency. Due to variability in the quality of calls and the difficulty in distinguishing some species the identification of each call was assigned a confidence rating as follows.

D = Definite: Species identification not in doubt.

PR = Probable: Call most likely to represent a particular species, but there exists a low probability of confusion with species of similar call types.

PO = Possible: Call characteristics are comparable with the species, but there exists a reasonable probability of confusion with one or more similar Bat species or the quality or length of call prohibits a confident identification.

Those calls unable to be identified due to poor call quality resulting in a lack of diagnostic features were assigned 'Unidentifiable'.

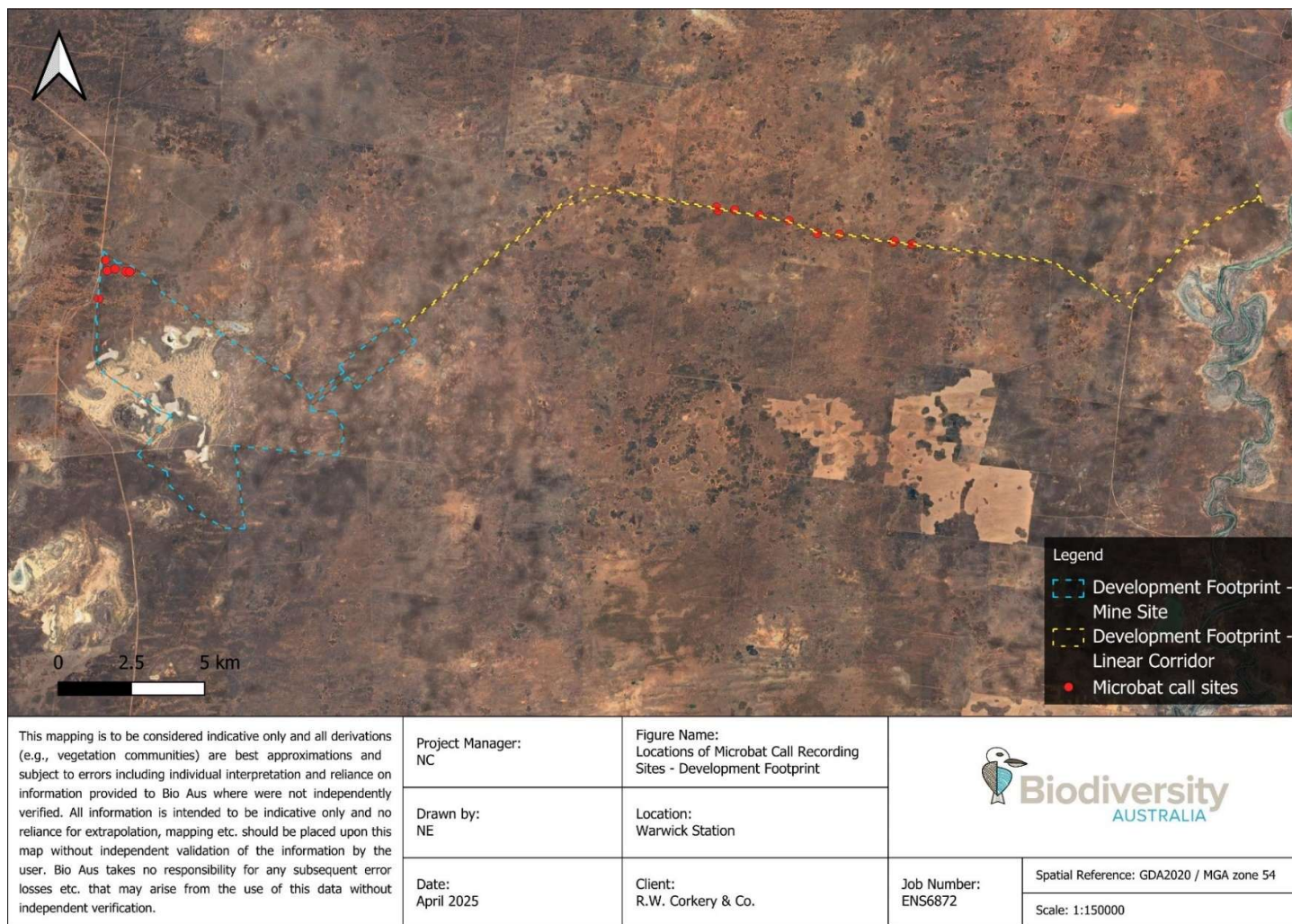


Figure 44: Locations of microbat call recording sites - Impact Site



A-3-11 Acoustic Recorder Surveys

Biodiversity Australia

Species targeted: Painted Burrowing Frog (*Neobatrachus pictus*)

Family: Myobatrachidae

Six (6) Wildlife Acoustics SM4 Song Meter acoustic recorders were deployed within areas of potential breeding habitat (Figure 45) six months after heavy rainfall (>50 millimetres in 24 hrs). Acoustic recordings were required to be captured during the 48 hrs immediately after >50 millimetres of rain in a 24 hr period on. More than 50 mm rain causes inundation of the site containing suitable breeding habitat such as claypans, temporary roadside pools, ditches, mallee swales and dry dams. Recorders were deployed where associated PCTs were incorporated into the 200 m radius from the edge of identified breeding habitat. To date, sufficient rain event has not occurred with the potential habitat areas to trigger the breeding events and as a result no frogs have been identified within the Impact Site.

Survey guidelines utilised: NSW Government Department of Planning, Industry & Environment (DPIE) (2020): NSW Survey Guide for Threatened Frogs; A guide for the survey of threatened frogs and their habitats for the BAM.

Survey guideline requirements:

- 4 call days of Acoustic detection over 2 days after >50 millimetres in 24 hrs.

Survey guidelines met:

- No.

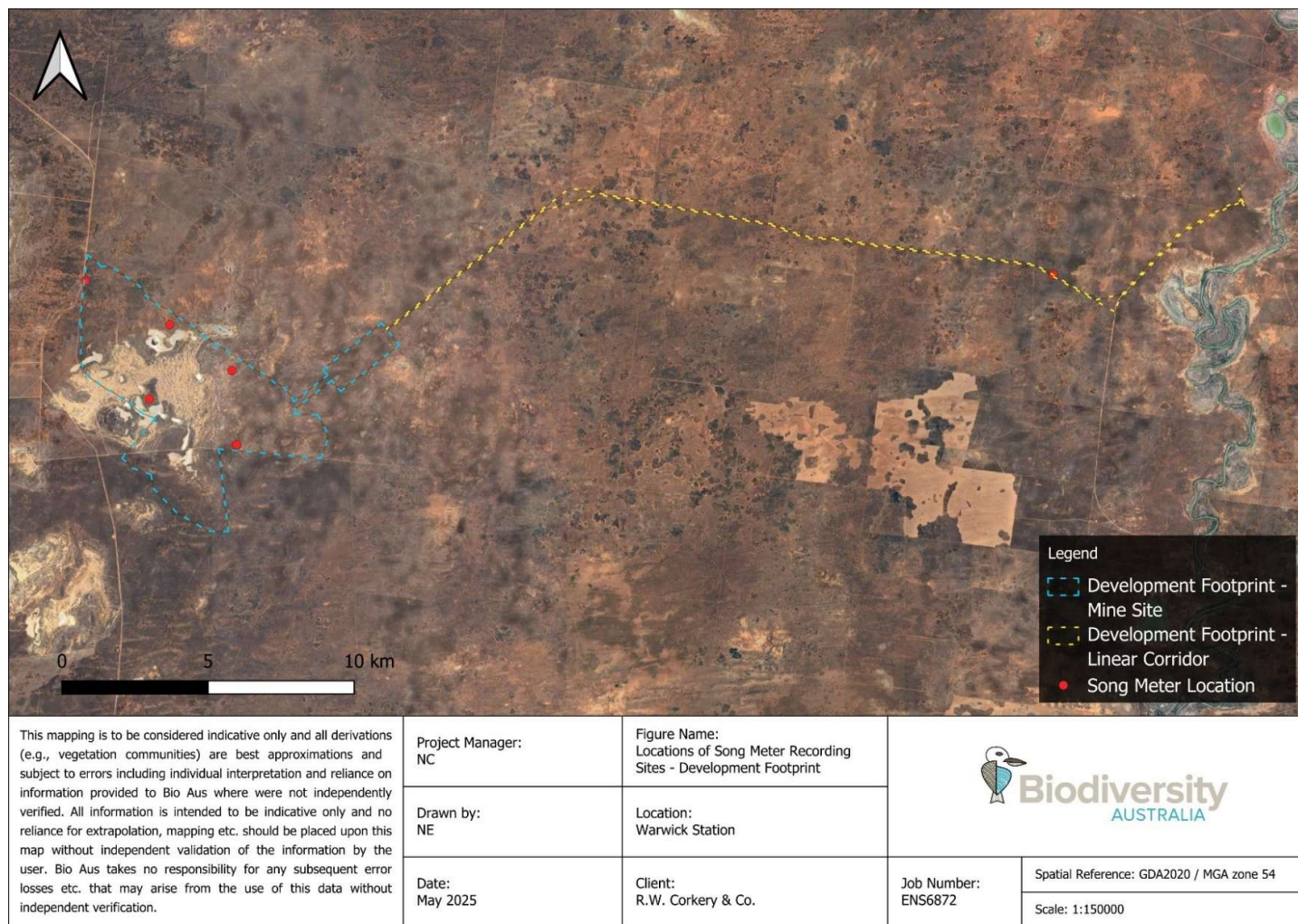


Figure 45: Location of targeted acoustic recorder surveys - Impact Site

