

Appendix G Evolve Ecology Report 4

Lansdown Eco-Industrial Precinct, Woodstock



Habitat Quality Assessment Report: Road and Water Pipeline Alignments

Job Number: VS0366

27/04/2023

Evolve Environmental Solutions Pty. Ltd.

Document Control

Document Name: *Habitat Quality Assessment Report: Road and Water Pipeline Alignments – Lansdown Eco-Industrial Precinct, Woodstock*

Document Issue

Issue	Date	Prepared By	Checked By
Issue A	10.03.2023	RH	AH
Issue B	16.03.2023	RH	AH
Issue C	27.04.2023	RH	AH

Prepared by

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ABN: 16 155 844 232

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1 Introduction & Purpose

Evolve Environmental Solutions (**Evolve**) was contracted by CDM Smith to assess the modified habitat quality using the Modified Habitat Quality Assessment methodology on the Lansdown Eco-industrial Precinct roadway and water supply infrastructure alignment to assess the potential species-specific impact as per the preliminary documentation determination. The ecological surveys contained within this report represent works conducted on the alignment area between 6th and 10th February 2023.

Previous vegetation and waterway assessments of project road alignments were conducted between 28th March to 1st April and reported in *Ecological Assessment Report – Lansdown Eco-Industrial Precinct, Woodstock* issued on 29th April 2022. Previous ecological survey works for the project conducted by Evolve between 22nd and 27th May, inclusive of waterway, vegetation and fauna surveys relevant to the road alignment area were reported in *Ecological Assessment Report: Week Two – Lansdown Eco-Industrial Precinct, Woodstock* Issued on 6th October 2022.

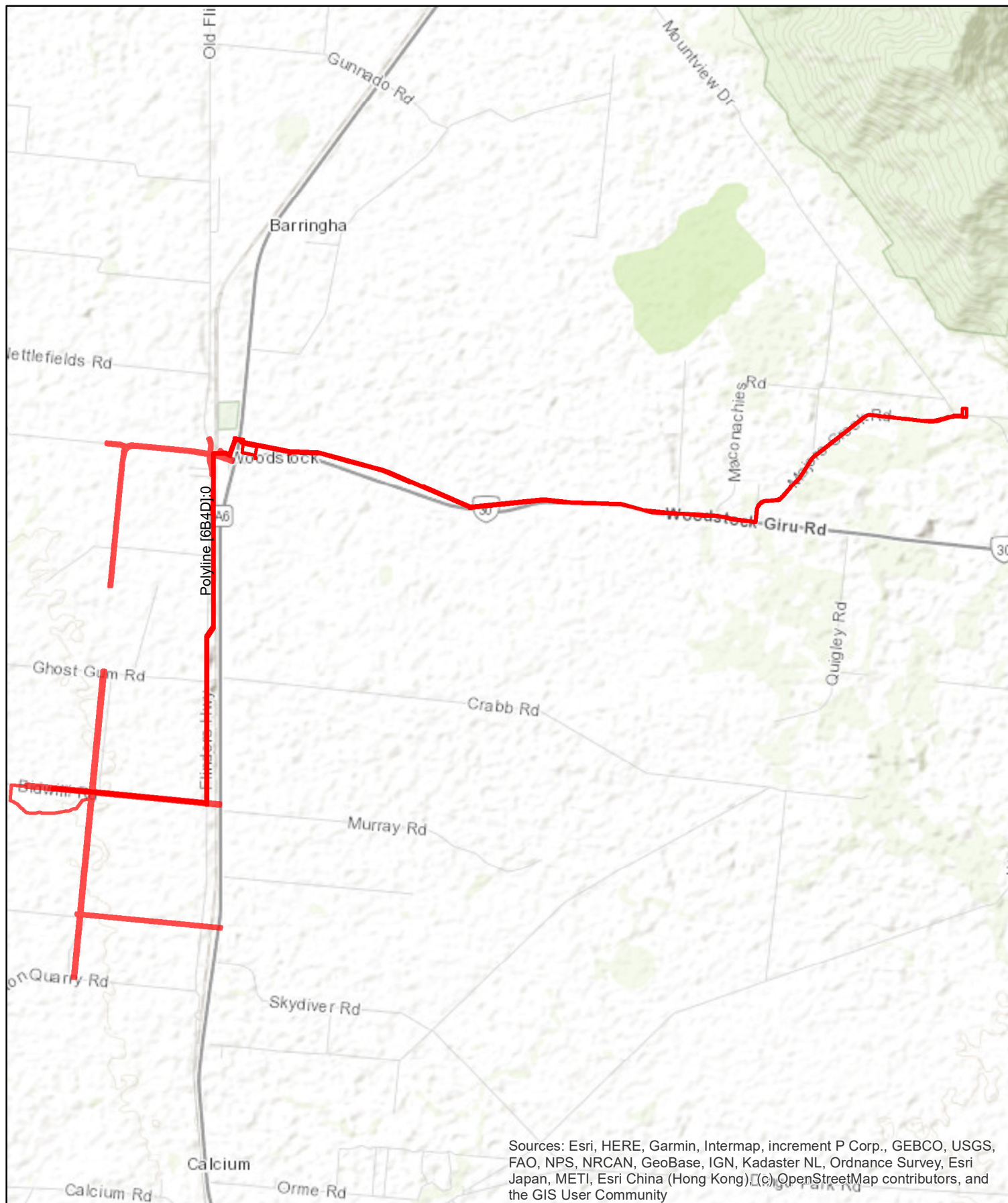
Survey works were undertaken in accordance with relevant Department of Environment and Science, Department of Agriculture and Fisheries and the Unpublished MQHA methodologies and guidelines as outlined in **Section 3: Ecological Methodology**, with the aim to:

- Undertake habitat assessments,
- Survey for threatened fauna; and
- Complete waterway assessments suitable for Operational Works development approvals for waterway barrier works.

2 Site Context

The Lansdown Eco-Industrial Precinct Project is located approximately 38km south of Townsville along the western side of the Flinders Highway. The precinct road and water infrastructure alignments traverse Ghost Gum Road, Bidwilli Road, Manton Quarry Road and associated easements (see **Figure 1**)





Legend

Site

— Extent of impact

0 0.5 1 Kilometers



Figure 1 Site Context Precinct Lansdown A
14/03/2023

Figure 1: Site Context



Client: CDM Smith Australia Pty Ltd
Address: Lansdown Eco-Industrial Precinct

3 Ecological Methodology

3.1 Survey Timing

Motion sensor cameras, Audiomoth acoustic recording devices and Anabat passive bat detectors were deployed for 3–4-night periods during on-site survey works. Fauna observations, and waterway and vegetation assessments, additional to those previously conducted between the 28th March and 14th October 2022 were conducted over the entirety of the survey period 6th to 10th February 2023.

Weather conditions for the assessment dates are provided below in **Table 1**.

Table 1: Weather conditions during site surveys (Source: www.bom.gov.au)

Date	Day	Min Temp (°C)	Max Temp (°C)	Relative Humidity (9am)	Wind speed (9am)	Rainfall (mm)
06/02/2023	Monday	23.1	31.5	94%	6	64.2
07/02/2023	Tuesday	24.5	33.2	79%	4	4.4
08/02/2023	Wednesday	25.1	33.1	74%	15	10.0
09/02/2023	Thursday	25.2	33.6	69%	7	0
10/02/2023	Friday	25.2	33.4	66%	6	0

Climatic records are drawn from the closest BOM station to the survey area, located in Mount Stuart (Station 032195).

3.2 Survey Equipment Specifications

Survey equipment specifications are provided below in **Table 2**.

Table 2: Survey equipment specifications for the devices utilised in-field.

Device Type	Unit Type	Unit Specifications
GPS	Arrow 100 Submeter GNSS Receiver	<ul style="list-style-type: none"> Multi-constellation GNSS receiver that utilises differential corrections to achieve sub meter accuracy.
Camera trap	Infrared Motion sensing cameras	<ul style="list-style-type: none"> Trigger distance up to 23m when at temperatures below 25°C, full field of view trigger distance at temperatures between 25oC and 60oC. 70°PIR sensor detect wide and night vision up to 23m Trigger time in 0.3 second
Audiomoth	Audiomoth 1.2.0	<ul style="list-style-type: none"> 6.0 kHz minimum recording frequency Recording period from 1830 to 0600 Cyclic sampling cycle of 1 minute recording per half hour. Using Firmware version 1.8.1
Anabat	Anabat Swift Passive Detector	<ul style="list-style-type: none"> Full Spectrum and Zero Crossing Recording Built-in GPS for site location, transect mode, setting the clock, and calculating sunset and sunrise times for automatic night recording Records temperature and battery voltage



3.3 Modified Habitat Quality Assessment (MHQA)

Assessment of fauna species habitat quality was carried out as per guidelines published in Chapter 2.4 of *Guide to determining terrestrial habitat quality-Methods for assessing habitat quality under the Queensland Environmental Offsets Policy. Version 1.3.* and *BioCondition-A Condition Assessment Framework for Terrestrial Biodiversity in Queensland Assessment Manual Queensland Herbarium Version 2.2.*

Habitat Quality was scored for five keystone species deemed likely to occur in the area, identified from previous surveys. These Species were the Southern Squatter Pidgeon (*Geophaps scripta scripta*), Black-throated Finch (*Poephila cincta cincta*), Bare-rumped Sheathtail Bat (*Saccolaimus saccolaimus nudiclunatus*), Koala (*Phascolarctos cinereus*) and Painted Snipe (*Rostratula australis*). Habitat Quality was scored using a weighted table of five habitat quality criteria calculated from measured site attributes for each species as well as thirteen site reference criteria and 4 site context criteria undertaken as per the BioCondition methodology. The Habitat quality criteria assessed for each species were:

- Quality and Availability of food and foraging habitat,
- quality and availability of shelter and breeding habitat,
- role of site location to overall population in the state,
- threats to species, and
- the support for mobility of the surrounding habitat.

Habitat scoring parameters for each assessed species as defined for the purposes of the MHQA are provided in **Appendix F**.

Where previous vegetation survey data exist for the sample location, in the form of BioCondition or Secondary vegetation transects only additional data required to meet Habitat Quality Assessment Standard Guidelines was collected from the sample location.

3.3.1.1 BioCondition Assessment

BioCondition Assessment was undertaken by the methodology detailed in the BioCondition Manual (Eyre, et. al., 2015) in accordance with BioCondition sampling effort recommendations published in Table 1.2 of Guide to determining terrestrial habitat quality V1.3 (Department of Environment and Science, 2020)

3.3.2 Quality and Availability of Food and Foraging Habitat

3.3.2.1 Southern Black Throated Finch

Site attributes indicating quality of food and foraging habitat for the Black-throated finch were averaged to produce a score for the criteria overall, these were:

- Abundance of food grass: The average coverage of preferred food grasses across 5 1x1 metre BioCondition quadrats was measured. The Southern Black Throated Finch is primarily granivorous, and grass seed availability is an indicator of foraging habitat quality. Greater than 25% cover is favorable (NRA, 2011)
- Species richness of food grasses: Number of preferred grass feed species detected within the standard BioCondition Plot is an indicator of foraging habitat quality as a higher species diversity and a mixture of annuals and perennial species allows for a broader time period which seed production occurs. Six or more species of food grasses within a plot is indicative of sufficient habitat (NRA, 2011). Favorable food grass species include *U. mosambicensis*, *Digitaria ciliaris* (crabgrass), *Melinis repens* (red Natal grass) *Enteropogon acicularis* (curly



windmill grass), *Panicum decompositum* (native millet), *Panicum effusum* (hairy panic), *Dichanthium sericeum* (bluegrass), *Alloteropsis semialata* (cockatoo grass), *Eragrostis sororia* (woodland lovegrass) and *Themeda triandra* (kangaroo grass) and *Chloris inflata* (purple-top chloris) (Mitchell, 1996; NRA, 2007).

- Mosaic of bare patches and grasses: The average coverage of bare ground across 5 1x1 metre BioCondition quadrats was measured. Southern Black Throated Finch require sufficient bare ground patches to access the seed bank. Areas with $40.59\% \pm 19.28\%$ Bare ground cover with a maximum of 85% have been seen to have a positive association with the subspecies (Rechetelo, 2015).

3.3.2.2 Southern Squatter Pigeon

Abundance of food grass was used as the site attribute indicating quality of food and foraging habitat for the Southern Squatter Pigeon. The average coverage of preferred food grasses was measured across 5 1x1 metre BioCondition quadrats. The species is predominately granivorous with approximately 95% of its diet composing of seeds (Crome 1976b).

3.3.2.3 Koala

Site attributes indicating quality of food and foraging habitat for the Koala were averaged to produce a score for the criteria overall, these were:

- Species Richness of locally preferred food trees: Koalas have been shown to occur in higher densities ecosystems with higher food tree species richness (Munks et al. 1996).
- Abundance of locally preferred food trees: locally important food trees as specified by Youngentob et al. (2021) that met non-juvenile habitat tree status were counted within the 50 x 100m BioCondition Plot.

3.3.2.4 Bare-rumped Sheathtail Bat

Presence of mature remnant woodland was used as the site attribute indicating quality of food and foraging habitat for the Bare-rumped Sheathtail Bat. The species is known to forage in a wide variety of habitats, occurring more commonly in near coastal eucalypt forests and woodlands (TSSC 2016).

3.3.2.5 Painted Snipe

Site attributes indicating quality of food and foraging habitat for the Painted Snipe were averaged to produce a score for the criteria overall, these were:

- Abundance of food grass: The average coverage of preferred food grasses across 5 1x1 metre BioCondition quadrats.
- Coverage of seasonal wetland: Coverage of seasonal wetland for each plot was measured by intersection with the transect and was expressed as a percentage of coverage.

The painted snipe has a combined diet of grains and invertebrate which are typically foraged for in rank tussocky freshwater wetland habitats (Marchant & Higgins 1993).

3.3.3 Quality and Availability of Shelter and Breeding Habitat

The quality and availability of breeding habitat for each species was scored out of 25 based on criteria determined on a species-by-species basis to indicate quality shelter and breeding habitat. These are detailed below.

3.3.3.1 Southern Black Throated Finch

Site attributes indicating quality of shelter and breeding habitat for the Southern Black Throated Finch were averaged to produce a score for the criteria overall, these were:



- Abundance of preferable nesting tree species: Suitable nesting species were considered to be *E. platyphylla*, *Melaleuca viridiflora*, *C. tessellaris* and *C. dallachiana* (Rechetelo 2015). Abundance was measured by coverage of canopy intersecting with the transect.
- Distance to water: Distance to permanent water source for each habitat assessment was measured using by desktop analysis. The Southern black throated finch is an obligate drinker, requiring a constantly available water source. Nesting habitat is typically found close to permanent water sources, typically within 200m and not more than 400m. (NRA 2011).

3.3.3.2 Southern Squatter Pigeon

Site attributes indicating quality of shelter and breeding habitat for the Southern Squatter Pigeon were averaged to produce a score for the criteria overall, these were:

- Mosaic of bare ground and grass cover: the Southern Squatter Pigeon nests in a scraped depression in the dirt, sheltered by organic matter (Lord 1956), vegetation cover in these areas is typically a patchy mix of perennial tussock grasses with or without low shrubs or forbs, vegetation coverage rarely exceeds 33% (Squatter Pigeon Workshop 2011).
- Distance to water- subspecies is likely to be sedentary where reliable year-round water sources are available (Squatter Pigeon Workshop 2011).

3.3.3.3 Koala

Site attributes indicating quality of shelter and breeding habitat for the Koala were averaged to produce a score for the criteria overall, these were:

- Species richness of non-juvenile koala habitat trees: The species richness of non-juvenile koala habitat trees as defined by the QLD Offsets Policy was measured in each 100m by 50m BioCondition plot, species richness of habitat trees is seen as a significant indicator of shelter habitat quality (Youngentob et al. 2021).
- Abundance of non-juvenile koala habitat trees: abundance of non-juvenile koala habitat trees as defined by the QLD Offsets Policy was measured in each 100m by 50m BioCondition plot by stem count, this serves to measure the quantity of shelter resources available in the habitat (Youngentob et al. 2021).

3.3.3.4 Bare-rumped Sheathtail Bat

Site attributes indicating quality of shelter and breeding habitat for the Bare-rumped Sheathtail Bat were averaged to produce a score for the criteria overall, these were:

- Abundance of preferred tree species: The species is likely to roost in hollows of mature Eucalyptus or Melaleuca species (Schulz and Thomson 2007), Stems of mature preferred species within an 50m by 100m Plot were counted.
- Presence of deep hollows: potentially deep hollows were identified within the 100m by 50m BioCondition plots and counted. The Bare-rumped Sheathtail requires deep hollows to nest in (Milne et al. 2009), generally in mature Eucalyptus or Melaleuca species (Schulz and Thomson 2007).

3.3.3.5 Painted Snipe

Site attributes indicating quality of shelter and breeding habitat for the Painted Snipe were averaged to produce a score for the criteria overall, these were:

- Coverage of seasonal wetland: Seasonal wetland areas intersecting with the 100m transect were recorded. Wetland should be shallow with exposed mud (Rogers et al. 2005).



3.3.4 Role of Site Location to Overall Population in the State

This value was obtained from the species stocking rate, adjusted to a score of 10, as detailed in Section 4.2 of the *Commonwealth How to Use the Offsets Assessment Guide*.

3.3.5 Threats to Species

Threats to species were calculated using a threat matrix as per methodology detailed in *Guide to Determining Terrestrial Habitat Quality* (DES, 2020). For each species absence of threat was given a score out of 25 using the threat matrix is illustrated below in **Table 3**.

The Final score is the lowest possible score for an individual identified threat.

Table 3; Threat assessment matrix (DES, 2020)

Threat Matrix			Severity				
			Very High	High	Medium	Low	Very Low
			1	2	3	4	5
Scope	Very High	1	1	2	3	4	5
	High	2	2	4	6	8	10
	Medium	3	3	6	9	12	15
	Low	4	4	8	12	16	20
	Very Low	5	5	10	15	20	25

3.3.5.1 Southern Black Throated Finch

Significant threats which were identified to the Southern Black Throated Finch were as follows:

- Reduction In water availability: Southern Black Throated Finch is an obligate drinker and reduction in water availability, by drought for example, without sustained permanent water sources would significantly impact the ability for the Southern Black Throated Finch to utilize the habitat (DEWHA, 2009).
- Intensive grazing regimes: Overgrazing to the point of food seed depletion may reduce the capacity of the habitat to produce sufficient food for the Southern Black Throated Finch (DEWHA, 2009).
- Risk of fire: Fire during breeding season can cause disturbance to nesting habitat and failure of breeding (DEWHA, 2009).
- Exotic weed dominance: Exotic weeds can reduce availability of quality habitat and food grasses to the Southern Black (DEWHA, 2009).

3.3.5.2 Southern Squatter Pigeon

Significant threats which were identified to the Southern Squatter Pigeon were as follows:

- Predator attack (Dog, Cat, Fox, Snake or Predatory bird): In most cases, decline of sub populations of Southern Squatter Pigeon coincides with high fox abundance (Garnett & Crowley 2000).
- Exotic Weeds: Degradation of habitat by exotic weed introduction has been identified as a threat to the Southern Squatter Pigeon (Squatter Pigeon Workshop 2011).
- Habitat Loss and Fragmentation: Habitat loss and fragmentation by agricultural clearing has been identified as a threat to the Southern Squatter Pigeon (Squatter Pigeon Workshop 2011).
- Overgrazing: Overstocking with livestock has found to be a threat to the Southern Squatter Pigeon (Squatter Pigeon Workshop 2011).



3.3.5.3 Koala

Significant threats which were identified to the Koala by Department of Agriculture, Water and the Environment (2022), *Conservation advice for Phascolarctos cinereus* were as follows:

- Dog attack: The koala is susceptible to attack from both domestic dogs, wild dogs and dingoes while traversing the landscape. Domestic dog risk is generally higher in peri urban environments, while wild dogs and dingoes are more prevalent in agricultural areas.
- Vehicle strike: The koala is susceptible to vehicle collisions while crossing busy roads, this threat is substantial in urban and peri urban areas.
- Bushfire: The koala is a slow-moving animal and is susceptible to uncontrolled bushfire, inappropriate fire regimes leading to increased fuel loads can increase this threat
- Drought: Extreme drought can reduce food and shelter availability.

3.3.6 Bare-rumped Sheathtail Bat

The significant threat identified by the national recovery plan for the Bare-rumped Sheathtail (Schulz and Thomson 2007), to the species is Exotic weed dominance, due to impacts on access to roosting habitat.

3.3.6.1 Painted Snipe

Significant threats which were identified to the Painted Snipe were as follows:

- Reduction in water quality: This can be due to increased nutrient and saline content (Rogers et al. 2005).

3.3.7 Species Mobility Capacity

The species mobility capacity was scored out of 25 based on the criteria listed below.

3.3.7.1 Southern Black Throated Finch

The species mobility capacity of the habitat for Southern Black Throated Finch was assessed as follows:

- Coverage of shrub species, including native and introduced species: This was measured by intersection with a 100m transect. Flocks of the subspecies are negatively associated with excessive shrub cover (Rechetelo 2015).
- Presence of open grassy woodland vegetation structure: In each 100m by 50m BioCondition plot the vegetation was assessed for quality and connectivity of open woodland structure.

3.3.7.2 Southern Squatter Pigeon

The species mobility capacity of the habitat for Southern Squatter Pigeon was assessed as follows:

- Connectivity between suitable habitats: dispersal habitat can be considered any forest or woodland habitat with sufficient water available occurring between foraging or breeding habitat (Squatter Pigeon Workshop 2011).

3.3.7.3 Koala

The species mobility capacity of the habitat for Koala was assessed as follows:

- Connectivity between suitable habitats: Connectivity score was assigned based on the following criteria: 5 (totally isolated), 10 partially isolated, 15 (periodically isolated), 20 major connectivity, 25 (totally connected).

3.3.7.4 Bare-rumped Sheathtail Bat

The species mobility capacity of the habitat for Bare-rumped Sheathtail Bat was assessed as follows:



- Connectivity between suitable habitats: Connectivity score was assigned based on the following criteria: 5 (totally isolated), 10 partially isolated, 15 (periodically isolated), 20 major connectivity, 25 (totally connected). Availability of mature woodland in the surrounding landscape was used as an indicator of mobility (Schulz & Thomson 2007; Reardon et al. 2010; Dennis 2012).

3.3.7.5 Painted Snipe

The species mobility capacity of the habitat for Painted Snipe was assessed as follows:

- Connectivity between suitable habitats: the species is migratory and is therefore mobile regardless of immediate surrounding landscape, the main factor determining choice of habitat is availability of wetland area (Marchant & Higgins 1993). This criterion was scored based on the percentage land cover of suitable seasonal wetland within 1 kilometer of the Assessment location

3.3.8 Species Stocking Rate

Species stocking rate was calculated for each assessment unit using the scoring system provided by the EPBC Act *How to Use the Offsets Assessment Guide*. Four criteria were assessed, Species presence on or adjacent to the site, Species usage of the site, approximate density per hectare and Importance of the species on the site.

3.4 Habitat Mapping Methodologies

Habitat was mapped for four significant species, Southern Black-throated Finch, Southern Squatter Pigeon, Koala and Bare-rumped Sheath-tail Bat. Methodologies for each species are detailed below.

3.4.1 Southern Black-throated Finch

The Black-throated finch inhabits woodland savannahs, and areas of riverine vegetation. As a general rule areas of seeding grass within 5km of a permanent water source can be considered habitat in the species model distribution area. The second detailed survey had one positive species sighting close to Serpentine Lagoon just off Woodstock Giru Road. The alignment of the road and water pipeline crosses several drainage and creek crossings, and traverses near both natural and man-made permanent water bodies. The whole of the alignment provides either suitable foraging or breeding habitat for this species. Vegetated areas have been noted as breeding due to the species nesting requirements, whilst grassland only areas have been noted as foraging. Regularly slashed and maintained roadsides such as along Woodstock Giru Road have been excluded from foraging habitat as this species feed on the seeds of grasses and this would be largely absent from these areas.

3.4.2 Southern Squatter Pigeon

The squatter pigeon (southern) inhabits grassy understories of grassy eucalypt open woodland. It is nearly always sighted near water. Species was sighted during the second targeted survey period adjacent to Majors Creek Road in open Eucalypt Woodland. This location is approximately 400m from a permanent water source and has several ephemeral or man-made water sources close by. Species was additionally sighted twice by Evolve during October surveys on lot 87 RP911426 within 200m of a permanent farm dam.

Mapping has been provided based on the following habitat requirements (according to SPRAT):

- Breeding habitat: remnant/regrowth open forest to sparse open woodland within 1km of suitable permanent waterbody (Stream order 3 to 5 and perennial watercourses have been considered)



- Foraging habitat: remnant/regrowth open forest to sparse open woodland within 3km of suitable seasonal or permanent waterbody
- Dispersal habitat: any forest or woodland occurring between breeding and foraging habitat, or pasture with scattered trees <100m apart.

3.4.3 Koala

The Koala is known to inhabit areas of native Australian woodland that contains a variety of Koala habitat and food trees. There has been much published about the Koala. Based on the description of habitat and known distribution of the Koala as modelled by DCCEEW. Evolve has mapped a potential 48.8ha of potential Koala Habitat. Whilst it is noted that the alignment does contain Koala habitat the likelihood of an active Koala presence on the alignment is low. There are no records of Koala being sighted in the area that are publicly available.

3.4.4 Bare-rumped Sheath-tail Bat

Very little is known about the Bare-rumped sheath-tail bat. The survey conducted in June 2022 by EMM the species was located via the use of song meters. In both the EMM and surveys conducted by Evolve no known roosts have been confirmed to date. Foraging habitat can be noted on the alignment as the species has a fast, direct flight and is likely to forage primarily for aerial insects over the woodland/forest canopy but may fly lower when foraging over open situations. All areas of the alignment provide this foraging habitat. It is highly unlikely that roost sites are to be found unless hollows are expertly assessed, as the species remains silent at roosting sites and is only audible when disturbed. Vegetation with hollows at around 200mm diameter constitute possible roosting habitat.

3.5 Fauna Assessment Methodologies

Fauna assessments have been carried out as per survey guidelines published in *Terrestrial Vertebrate Fauna Survey Assessment Guidelines for Queensland*, Eyre et. al. (2018) and *Significant impact guidelines for the endangered black-throated finch (southern) (Poephila cincta cincta)* (2009). Refer **Plan 2** for locations of these surveys.

3.5.1 Camera Trapping

Two (2) motion sensor cameras were deployed for four (4) nights during the survey week (see **Table 1** for survey timing). The following methodology was employed during the camera trapping surveys:

- Cameras were installed in key locations on site;
- Cameras securely attached 10 – 50 cm from the ground on a tree or post;
- Cameras were not baited; and
- Cameras were set on the burst function of 3 photos per trigger.

3.5.2 Anabat passive detectors

Three (3) Anabat devices were similarly deployed over 3-4 nights in key locations where bats were previously observed or where potential roosting habitat in the form of tree hollows and shedding bark was recorded. Audio recordings were taken for the duration of each night over the time they were deployed, volume and frequency thresholds were set to reduce non-bat recording, volume was set in-situ based on background noise, Frequency was set to 12000 KHz as the target species have calls above this frequency. Data was analysed by spectrograph using the Anabat Insight program and compared to calls of species which have a range coinciding with the site.



3.6 Waterway Assessment

Waterways and drainage features were walked and captured by GPS. Photo points and aquatic features were noted at certain points along and near the crossing points, and additional crossing sections were noted that were not mapped as fisheries waterways but still would meet the definition of a waterway defined by the Department of Agriculture and Fisheries (DAF) as exhibiting at-least one of the following attributes:

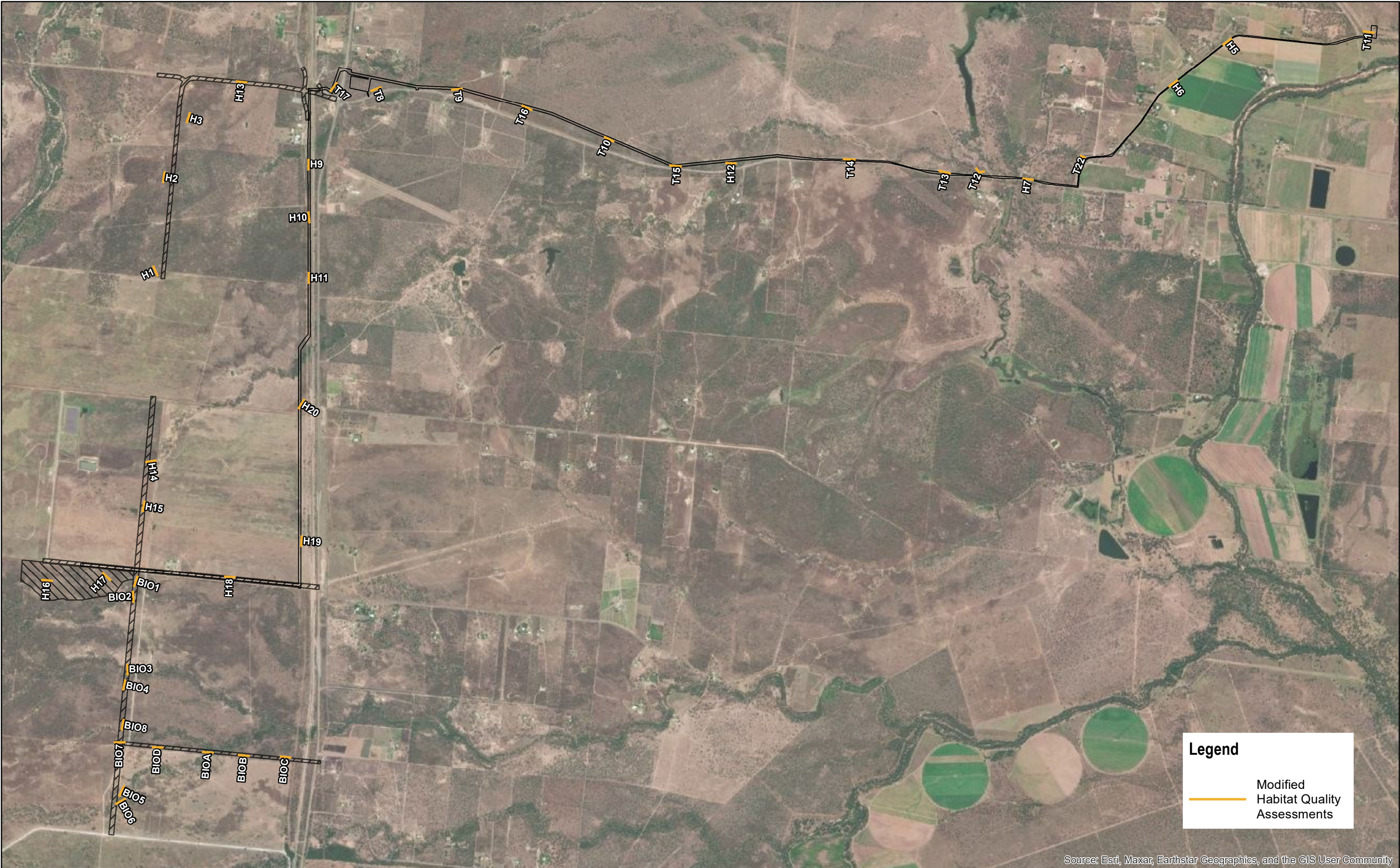
1. *Defined bed and banks*
The bed and banks need to be continuous upstream and downstream of the site rather than isolated and broken sections of a depression.
2. *An extended, if non-permanent, period of flow*
Flow must continue beyond the duration of a rain event and have some reliability attached to rainfall. There is a need to distinguish between channels that funnel immediate localised rainfall; and waterways where flow has arisen from an upstream catchment.
3. *Flow adequacy*
The flow needs to be sufficient to sustain basic ecological processes and habitats, and to maintain biodiversity within or across the feature. The adequacy of the flow depends on the ecological function of the channel e.g. waterways that connect to fish habitat like a wetland or waterhole may only need infrequent and short-duration flows to provide connectivity for fish.
4. *Fish habitat at, or upstream of, the site*
Most instream features provide habitat for fish under adequate flow conditions or, in the case of pools, during dry periods. Therefore, it is important to have some knowledge of the fish species for the site and their habitat use, particularly in headwater streams. Periodic connectivity to upstream and off stream fish habitat are also considered fish habitat.

Six (6) waterway locations were assessed within or adjoining the road and water pipeline alignment during the survey period. These were done to supplement previous waterway assessments completed for the surveys between 28th March and 14th October 2022.

Refer to **Plan 3** for locations of these assessments.



Plan 1: Habitat Assessment Locations



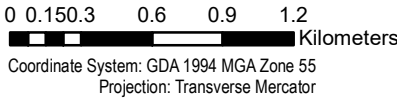
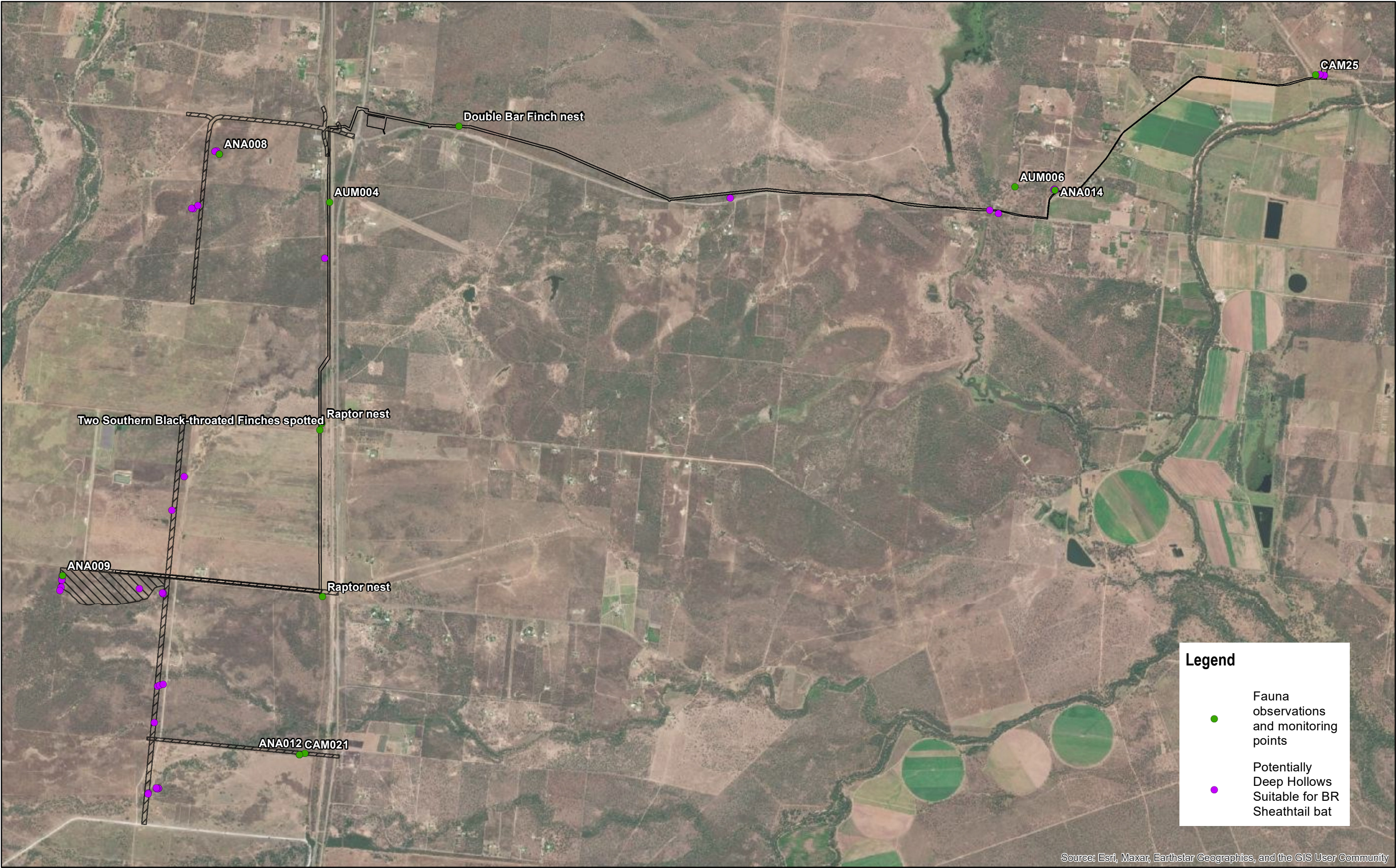
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Kilometers
Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

Issue	Date	Description	Drawn	Checked
A	13/03/2023	Preliminary	RH	AH

Lansdown Eco-Industrial Precinct

Date: 13/03/2023
Plan 1 Habitat Quality Assessments A

Plan 2: Fauna Observation Points

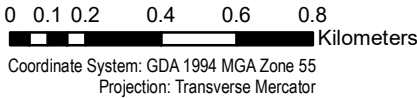
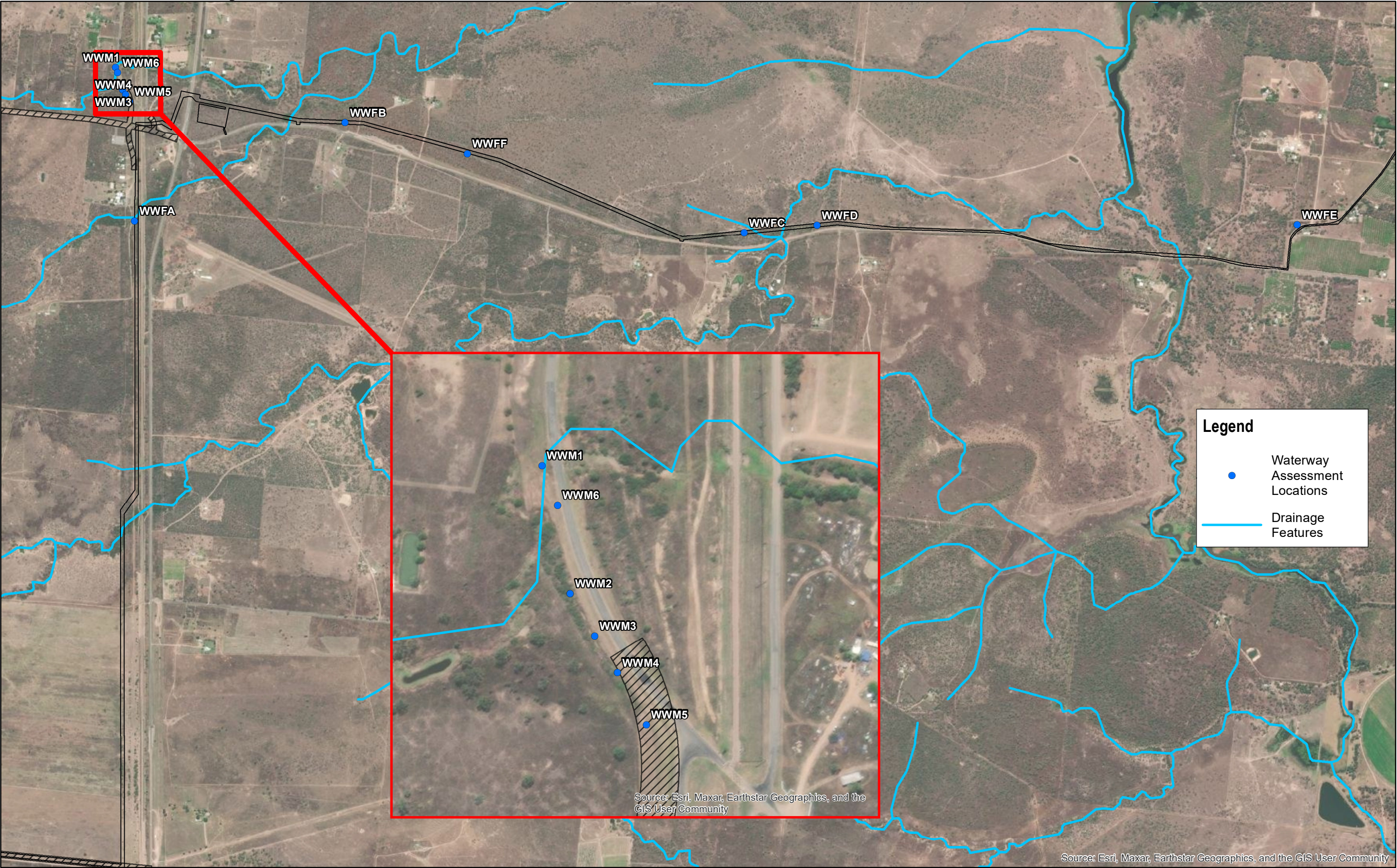


Issue	Date	Description	Drawn	Checked
A	14/03/2023	Preliminary	RH	AH

Lansdown Eco-Industrial Precinct

Date: 14/03/2023
Plan 2 Fauna Survey Locations A

Plan 3: Waterway Assessment Locations



Issue	Date	Description	Drawn	Checked
A	14/03/2023	Preliminary	RH	AH

Lansdown Eco-Industrial Precinct

Date: 14/03/2023
Plan 3 Waterway Assessments A

This map displays Assessment Units (AUs) overlaid on aerial imagery. The AUs are color-coded according to their status and associated vegetation type:

- AU1 (Remnant 11.3.30)**: Dark blue
- AU2 (Nonremnant 11.3.30)**: Light blue
- AU3 (Remnant 11.3.35)**: Green
- AU4 (Nonremnant 11.3.35)**: Bright green
- AU5 (Remnant 11.3.27b)**: Purple
- AU6 (Remnant 11.3.25e)**: Orange
- AU7 (Remnant 11.3.12)**: Brown/tan
- Pre-clear RE**: White outline
- Remnant mapped vegetation**: Light gray fill

The map shows numerous labeled areas corresponding to these units, such as 11.3.35, 11.3.30, 11.3.12, 11.3.25b, 11.3.27e, 11.3.31, and 11.3.4. A legend in the bottom right corner provides the key for these colors and labels.

4 Ecological survey results

4.1 Fauna Habitat Impact

Total area of impacted habitat for each species as mapped from ground truthing survey can be found in **Table 4** below.

Table 4; Area of species habitat impacts.

Species	Area of Habitat (Ha)
Southern Black Throated Finch	52.58
Southern Squatter Pigeon	44.14
Koala	44.43
Australian Painted Snipe	1.19
Bare Rumped Sheathtail Bat	44.43

4.2 Modified Habitat Quality Assessments

Forty-one (41) Modified Habitat Quality Assessment transects were conducted within and adjacent to the proposed impact area between the 6th and 10th February 2023 as shown in **Plan 1**, Modified Habitat Quality Assessment data from these transects is provided in **Appendix E**.

For the purposes of Habitat Quality Assessment, the following assessment units were defined based upon Regional Ecosystem and Vegetation Condition; a summary of Assessment Units can be found in **Table 5**.

Table 5; Assessment Units for the Modified Habitat Quality Assessment

Assessment Unit	Description	Sample Units
AU1	RE 11.3.30 Remnant	BIOA, BIOC, T8, T9, T10, T14, T15, T16, H1, H3, H10
AU2	RE 11.3.30 Non-remnant	BIOB, BIOD, BIO1, BIO2, BIO3, BIO4, BIO5, BIO7, BIO8, T17, H13, H14, H16, H17, H18, H20
AU3	RE 11.3.35 Remnant	BIO6, T11, T22, H2, H9, H11
AU4	RE 11.3.35 Non-remnant	H5, H6, H15, H19
AU5	RE 11.3.27e Remnant	H7
AU6	RE 11.3.25b Remnant	T12, H12
AU7	RE 11.3.12 Remnant	T13

4.2.1 Quality of Habitats within the Impact area

Average BioCondition scores for each assessment unit were low to intermediate ranging from 5% to 65% of maximum score. BioCondition scores are shown in **Table 6**.

Two regional Ecosystems occurred on site in both remnant and non-remnant forms these were RE 11.3.30 and RE 11.3.35. Overall, the condition of both remnant and non-remnant RE 11.3.35, AU3 and AU4 respectively, were the lowest among other remnant and non-remnant vegetation groups



occurring on site. AU3 scored 28 percent of the maximum vegetation quality score and AU4 scored 5 percent of the maximum vegetation quality score.

AU5 and AU7 occurred in regional ecosystems without a benchmark and so due to the small size and degraded ecological value of these assessment units, as well as lack of availability of accessible benchmark survey sites, a rapid assessment method was used to assume a score of 70% of the maximum for attributes which could not be assessed against a benchmark as described in Guide to Determining Terrestrial Habitat Quality v1.3. Non-native cover was excluded from this as the benchmark for this attribute is always 0 and was instead calculated as per normal BioCondition methodology.



Table 6; BioCondition assessment results summarised by assessment unit

	AU1	AU2	AU3	AU4	AU5	AU6	AU7
Regional Ecosystem	Remnant 11.3.30	Non-remnant 11.3.30	Remnant 11.3.35	Non-remnant 11.3.35	Remnant 11.3.27e	Remnant 11.3.25b	Remnant 11.3.12
Recruitment	0.00	0.19	0.50	0.00	3.50	0.00	3.50
Native plant species richness - trees	3.41	3.13	2.50	0.63	3.50	2.50	3.50
Native plant species richness - shrubs	2.73	0.47	2.08	0.00	3.50	2.50	3.50
Native plant species richness - grasses	1.36	1.56	2.08	0.63	3.50	5.00	3.50
Native plant species richness - forbs	1.36	0.78	0.42	0.00	3.50	2.50	3.50
Tree canopy height (average of emergent, canopy and sub canopy)	4.55	3.69	3.83	1.25	3.50	5.00	3.50
Tree canopy cover (average of emergent, canopy and sub canopy)	2.18	1.13	2.17	0.00	3.50	2.50	3.50
Shrub canopy cover	1.82	1.06	1.67	0.00	3.50	1.50	3.50
Native perennial grass cover	1.09	1.38	1.00	0.25	3.50	1.00	3.50
Organic litter	3.73	3.13	2.67	1.25	3.50	4.00	3.50
Large trees	2.27	2.19	0.83	0.00	10.50	2.50	10.50
Coarse woody debris	0.36	0.50	1.33	0.00	3.50	3.50	3.50
Non-native plant cover	3.36	2.06	1.50	0.00	0.00	4.00	3.00
Total (out of 80)	28.23	21.25	22.58	4.00	49.00	36.50	52.00
Score out of 1	0.35	0.27	0.28	0.05	0.61	0.46	0.65

4.2.2 Habitat Scores for the Southern Black Throated Finch

A summary of scores for each criteria of the habitat quality for Southern Black Throated Finch, including overall habitat quality are presented in **Table 7**. Habitat quality scores were intermediate ranging from 5.19 to 6.63.

Table 7; Habitat quality assessments of the Southern Black Throated Finch summarised by assessment unit

Assessment Unit	AU1	AU2	AU3	AU4	AU5	AU6	AU7
Regional Ecosystem	Remnant 11.3.30	Non-remnant 11.3.30	Remnant 11.3.35	Non-remnant 11.3.35	Remnant 11.3.27e	Remnant 11.3.25b	Remnant 11.3.12
Foraging Habitat							



Abundance of preferable grass species	14.55	13.44	13.33	22.50	20.00	10.00	15.00
Species richness of preferable food grasses	16.82	12.19	12.50	11.25	15.00	25.00	25.00
Mosaic of bare ground and grass cover	14.55	15.00	7.50	5.00	5.00	7.50	20.00
Average Score	15.30	13.54	11.11	12.92	13.33	14.17	20.00
Shelter Habitat							
Nesting tree availability	13.64	10.74	14.17	5.00	15.00	17.50	20.00
Distance to water	17.73	21.25	21.67	17.50	25.00	25.00	20.00
Average Score	15.68	15.99	17.92	11.25	20.00	21.25	20.00
Role of site to overall population	5	5	5	5	5	5	5
Threats							
Reduction In water availability	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Intensive grazing regimes	15.45	11.25	13.33	15.00	20.00	20.00	20.00
Risk of fire	20.00	20.00	20.00	20.00	20.00	20.00	20.00
Exotic weed dominance	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Lowest score	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Species Mobility							
Coverage of shrub species, including native and introduced species	24.55	25.00	25.00	25.00	25.00	20.00	25.00
Presence of open grassy woodland vegetation structure	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Average Score	19.77	20.00	20.00	20.00	20.00	17.50	20.00
Species habitat score	6.45	5.19	5.48	5.45	6.63	6.27	6.57

4.2.2.1 Foraging Habitat Scores

Average foraging habitat scores for each AU were intermediate to high, ranging from 11.11 to 20 out of 25. A mosaic of bare ground and grass cover of intermediate to high quality was recorded in AU1, AU2 and AU7, ranging from scores of 14.55 to 20; however was seen to a lesser degree in AU3, AU4, AU5 and AU6 with scores ranging from 5 to 7.5. An overabundance of pasture legumes, primarily shrubby stylo, across all AUs was a large driver of reduced bare ground coverage.

4.2.2.2 Shelter Habitat Scores

Average shelter habitat scores for each AU were intermediate to high, ranging from 11.25 to 21.25. Permanent water availability was generally high due to a number of dams waterways and cattle watering points spread across the surrounding landscape; average water availability scores ranged from 17.5 to 25. Nesting Tree availability varied greatly between AUs ranging from scores of 5 to 20, and was lower in Non remnant AUs, AU2 and AU4 with scores of 10.74 and 5 respectively.



4.2.2.3 Species Mobility Scores

Average species mobility scores were high ranging from 17.5 to 20. Shrub coverage scores were generally high with scores ranging from 20 to 25 out of 25, this is due to a sparse shrub layer throughout all assessment units. Vegetation structure had generally high grass species diversity, however, the ground layer coverage was generally dominated by introduced species in many cases and canopy layers were generally degraded leading each AU to have an average score for the criteria of presence of open grassy woodland vegetation structure to be 15.

4.2.2.4 Species Stocking Rate

The Southern Black Throated Finch was allocated a species stocking rate of 55 out of 70 for the site. Scoring is shown in **Table 8**

Table 8; Species stocking rate calculation for the Southern Black Throated Finch

Species Stocking Rate (SSR)					
Presence detected on or adjacent to site (neighbouring property with connecting habitat)	Score	0	5		10
		No	Yes - adjacent		Yes - on site
Species usage of the site (habitat type & evidenced usage)	Score	0	5	10	15
		Not habitat	Dispersal	Foraging	Breeding
Approximate density (per ha)	Score	0	10	20	30
Role/importance of species population on site*	Score	0	5	10	15
		0	5 - 15	20 - 35	40 - 45
Total SRR score (out of 70)	55				
SRR Score (out of 4)	3.14				

4.2.3 Habitat Scores for the Southern Squatter Pigeon

A summary of scores for each criteria of the habitat quality for Southern Squatter Pigeon, including overall habitat quality are presented in **Table 9**. Habitat quality scores were intermediate ranging from 5.23 to 6.55.

Table 9; Habitat quality assessments of the Southern Squatter Pigeon summarised by assessment unit

Assessment Unit	AU1	AU2	AU3	AU4	AU5	AU6	AU7
Regional Ecosystem	Remnant 11.3.30	Non-remnant 11.3.30	Remnant 11.3.35	Non-remnant 11.3.35	Remnant 11.3.27e	Remnant 11.3.25b	Remnant 11.3.12
Foraging Habitat							
Abundance of preferable grass species	14.55	13.44	13.33	22.50	20.00	10.00	15.00
Average Score	14.55	13.44	13.33	22.50	20.00	10.00	15.00
Shelter Habitat							
Bare ground coverage	14.55	15.00	7.50	5.00	5.00	7.50	20.00
Distance to water	17.73	21.25	21.67	17.50	25.00	25.00	20.00
Average Score	16.14	18.13	14.58	11.25	15.00	16.25	11.25
Role of site to overall population	5	5	5	5	5	5	5



Threats							
Predator attack	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Reduction in water availability	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Habitat loss and fragmentation	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Overgrazing	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Lowest score	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Species Mobility							
Connectivity of suitable habitats	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Average Score	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Species habitat score	5.58	5.72	6.02	5.23	5.91	6.55	6.02

4.2.3.1 Foraging Habitat Scores

Foraging habitat scores for each AU were intermediate to high, ranging from 13.33 to 22.5 out of 25.

4.2.3.2 Shelter Habitat Scores

Average shelter habitat scores for each AU were intermediate to high, ranging from 11.25 to 18.13. Permanent water availability was generally high due to a number of dams waterways and cattle watering points spread across the surrounding landscape; average water availability scores ranged from 17.5 to 25. Bare ground coverage was low in AU3, AU4, AU5 and AU6 scoring between 5 and 7.5 out of 25. Bare ground coverage was intermediate to high in AU1, AU2 and AU7, scores ranged from 14.55 to 20 out of 25. An overabundance of pasture legumes, primarily shrubby stylo, across all AUs was a large driver of reduced bare ground coverage.

4.2.3.3 Species Mobility Scores

Average species mobility scores were intermediate averaging 15 out of 25 in all Assessment Units.

4.2.3.4 Species Stocking Rate

The Southern Squatter Pigeon was allocated a species stocking rate of 55 out of 70 for the site. Scoring is shown in **Table 10**

Table 10; Species stocking rate calculation for the Southern Squatter Pigeon

Species Stocking Rate (SSR)					
Presence detected on or adjacent to site (neighboring property with connecting habitat)	Score	0	5		10
		No	Yes - adjacent		Yes - on site
Species usage of the site (habitat type & evidenced usage)	Score	0	5	10	15
		Not habitat	Dispersal	Foraging	Breeding
Approximate density (per ha)	Score	0	10	20	30
Role/importance of species population on site*	Score	0	5	10	15
		0	5 - 15	20 - 35	40 - 45
Total SRR score (out of 70)	55				
SRR Score (out of 4)	3.14				



4.2.4 Habitat Scores for the Koala

A summary of scores for each criterion of the habitat quality for Koala, including overall habitat quality are presented in **Table 11**. Habitat quality scores were intermediate ranging from 1.78 to 4.53.

Table 11; Habitat quality assessments of the Koala summarised by assessment unit.

Assessment Unit	AU1	AU2	AU3	AU4	AU5	AU6	AU7
Regional Ecosystem	Remnant 11.3.30	Non-remnant 11.3.30	Remnant 11.3.35	Non-remnant 11.3.35	Remnant 11.3.27e	Remnant 11.3.25b	Remnant 11.3.12
Foraging Habitat							
Species richness of food trees	19.55	16.88	18.33	10.00	15.00	22.50	20.00
Abundance of food trees	14.09	9.38	16.67	7.50	10.00	20.00	25.00
Average Score	16.82	13.13	17.50	8.75	12.50	21.25	22.50
Shelter Habitat							
Species richness of habitat trees	19.55	16.88	18.33	10.00	15.00	22.50	20.00
Abundance of habitat trees	14.09	9.38	16.67	7.50	10.00	20.00	25.00
Average Score	16.82	13.13	17.50	8.75	12.50	21.25	22.50
Role of site to overall population	5	5	5	5	5	5	5
Threats							
Dog Attack	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Vehicle Strike	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Risk of uncontrolled wildfire	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Drought	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Lowest score	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Species Mobility							
Connectivity between suitable habitats	21.36	5.00	16.67	5.00	25.00	25.00	25.00
Average Score	21.36	5.00	16.67	5.00	25.00	25.00	25.00
Species habitat score	3.83	2.19	3.50	1.78	3.28	4.53	3.84

4.2.4.1 Foraging Habitat Scores

Foraging habitat scores for each AU were distributed from low high, ranging from 8.75 to 22.5 out of 25. Assessment units, AU2, AU4 and AU5 had low scores of 13.13, 8.75 and 12.5 out of 25 respectively. Assessment units AU1, AU3, AU6 and AU7 were scored moderate to high ranging from 16.82 to 22.50 out of 25.

4.2.4.2 Shelter Habitat Scores

Scores for shelter habitat were identical to foraging habitat score because the mature habitat trees recorded were generally also preferred food species.

4.2.4.3 Species Mobility Scores

Average species mobility scores ranged from low to high with scores ranging from 5 to 25 out of 25. Assessment units AU5, AU6 and AU7 scored highest at 25 out of 25. Non remnant assessment units



AU2 and AU4 scored lowest at 5 out of 25. AU1 and AU3 scored intermediate to high with scores of 21.36 and 16.67 out of 25 respectively.

4.2.4.4 Species Stocking Rate

The Koala was allocated a species stocking rate of 10 out of 70 for the site. Scoring is shown in **Table 12**.

Table 12; Species stocking rate calculation for the Koala

Species Stocking Rate (SSR)					
Presence detected on or adjacent to site (neighbouring property with connecting habitat)	Score	0	5		10
		No	Yes - adjacent		Yes - on site
Species usage of the site (habitat type & evidenced usage)	Score	0	5	10	15
		Not habitat	Dispersal	Foraging	Breeding
Approximate density (per ha)	Score	0	10	20	30
Role/importance of species population on site*	Score	0	5	10	15
		0	5 - 15	20 - 35	40 - 45
Total SRR score (out of 70)	10				
SRR Score (out of 4)	0.57				

4.2.5 Habitat Scores for the Bare-rumped Sheath-tail Bat

A summary of scores for each criterion of the habitat quality for Bare-rumped Sheath-tail Bat, including overall habitat quality are presented in **Table 13**. Habitat quality scores were intermediate ranging from 2.52 to 5.41.

Table 13; Habitat quality assessments of the Bare-rumped Sheath-tail Bat summarised by assessment unit.

Assessment Unit	AU1	AU2	AU3	AU4	AU5	AU6	AU7
Regional Ecosystem	Remnant 11.3.30	Non-remnant 11.3.30	Remnant 11.3.35	Non-remnant 11.3.35	Remnant 11.3.27e	Remnant 11.3.25b	Remnant 11.3.12
Foraging Habitat							
Presence of mature remnant woodland	16.36	5.00	15.83	5.00	20.00	17.50	15.00
Average Score	16.36	5.00	15.83	5.00	20.00	17.50	15.00
Shelter Habitat							
Preferred tree species	6.82	5.63	10.83	5.00	10.00	17.50	25.00
Presence of deep hollows	7.73	9.38	14.17	6.25	15.00	10.00	5.00
Average Score	7.27	7.50	12.50	5.63	12.50	13.75	15.00
Role of site to overall population	5	5	5	5	5	5	5
Threats							
Exotic weed dominance	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Lowest score	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Species Mobility							
Connectivity of suitable habitats	21.36	5.00	16.67	5.00	25.00	25.00	25.00



Average Score	21.36	5.00	16.67	5.00	25.00	25.00	25.00
Species habitat score	4.74	3.22	4.60	2.52	4.59	5.41	3.88

Foraging habitat scores for each AU ranged from 5 to 20 out of 25, with non-remnant assessment units AU2 and AU4 scoring lowest at 5 out of 25. AU1, AU3, AU6 and AU7 had intermediate foraging habitat quality with scores ranging from 15 to 17.5 out of 25. AU5 had a high foraging habitat quality score of 20 out of 25.

4.2.5.2 Shelter Habitat Scores

Average shelter habitat scores for each AU were low to intermediate, ranging from 5.63 to 15 out of 25. Shelter habitat quality was limited due to a low abundance of hollow bearing trees in the modified agricultural landscape in which the site is located.

4.2.5.3 Species Mobility Scores

Average species mobility scores were low in non-remnant assessment units AU2 and AU4 with scores of 5 out of 25. Scores of AU1 and AU3 were intermediate to high with scores of 21.36 and 16.67 out of 25 respectively. AU5, AU6 and AU7 had high mobility scores of 25 out of 25.

4.2.5.4 Species Stocking Rate

The Bare-rumped Sheathtail was allocated a species stocking rate of 30 out of 70 for the site. Scoring is shown in **Table 14**.

Table 14; Species stocking rate calculation for the Bare-rumped Sheathtail

Species Stocking Rate (SSR)					
Presence detected on or adjacent to site (neighbouring property with connecting habitat)	Score	0	5	10	
		No	Yes - adjacent	Yes - on site	
Species usage of the site (habitat type & evidenced usage)	Score	0	5	10	15
		Not habitat	Dispersal	Foraging	Breeding
Approximate density (per ha)	Score	0	10	20	30
Role/importance of species population on site*	Score	0	5	10	15
		0	5 - 15	20 - 35	40 - 45
Total SRR score (out of 70)	30				
SRR Score (out of 4)	1.71				

4.2.6 Habitat Scores for the Painted Snipe

A summary of scores for each criterion of the habitat quality for Painted Snipe, including overall habitat quality are presented in **Table 15**. Habitat quality scores were intermediate ranging from 1.53 to 3.11.

Table 15; Habitat quality assessments of the Painted Snipe summarised by assessment unit

Assessment Unit	AU1	AU2	AU3	AU4	AU5	AU6	AU7
Regional Ecosystem	Remnant 11.3.30	Non-remnant 11.3.30	Remnant 11.3.35	Non-remnant 11.3.35	Remnant 11.3.27e	Remnant 11.3.25b	Remnant 11.3.12
Foraging Habitat							



Abundance of preferable grass species	14.55	13.44	13.33	22.50	20.00	10.00	15.00
Coverage of rank wetland	5.00	5.00	5.00	5.00	10.00	7.50	10.00
Average Score	9.77	9.22	9.17	13.75	15.00	8.75	12.50
Shelter Habitat							
Coverage of rank wetland	5.00	5.00	5.00	5.00	10.00	7.50	10.00
Average Score	5.00	5.00	5.00	5.00	10.00	7.50	10.00
Role of site to overall population	5	5	5	5	5	5	5
Threats							
Reduction In water availability	10	10	10	10	10	10	10
Lowest score	10	10	10	10	10	10	10
Species Mobility							
Presence of rank wetland	21.36	5.00	16.67	5.00	25.00	25.00	25.00
Average Score	21.36	5.00	16.67	5.00	25.00	25.00	25.00
Species habitat score	3.11	1.85	2.74	1.53	2.22	2.92	2.26

Foraging habitat scores for each assessment unit were low to intermediate, ranging from 8.75 to 15 out of 25. Coverage of wetland which the species is heavily associated with was low on site.

4.2.6.2 Shelter Habitat Scores

Average shelter habitat scores for each AU were low, ranging from 5 to 10 out of 25. Coverage of wetland which the species is heavily associated with was low on site.

4.2.6.3 Species Mobility Scores

Average Species Mobility scores ranged from 5 to 25 out of 25 in all Assessment Units.

4.2.6.4 Species Stocking Rate

The Painted Snipe was allocated a species stocking rate of 5 out of 70 for the site. Scoring is shown in **Table 16**

Table 16; Species stocking rate calculation for the Painted Snipe

Species Stocking Rate (SSR)					
Presence detected on or adjacent to site (neighbouring property with connecting habitat)	Score	0	5	10	
		No	Yes - adjacent	Yes - on site	
Species usage of the site (habitat type & evidenced usage)	Score	0	5	10	15
		Not habitat	Dispersal	Foraging	Breeding
Approximate density (per ha)	Score	0	10	20	30
Role/importance of species population on site*	Score	0	5	10	15
		0	5 - 15	20 - 35	40 - 45
Total SRR score (out of 70)	5				
SRR Score (out of 4)	0.29				



4.3 Waterways

Under the *Fisheries Act 1994*, a waterway includes a river, creek, stream, watercourse, drainage feature or inlet of the sea. From publicly available information provided by DAF, to meet the definition of a waterway at least one of the following attributes must be met:

1. *Defined bed and banks*
The bed and banks need to be continuous upstream and downstream of the site rather than isolated and broken sections of a depression.
2. *An extended, if non-permanent, period of flow*
Flow must continue beyond the duration of a rain event and have some reliability attached to rainfall. There is a need to distinguish between channels that funnel immediate localised rainfall; and waterways where flow has arisen from an upstream catchment.
3. *Flow adequacy*
The flow needs to be sufficient to sustain basic ecological processes and habitats, and to maintain biodiversity within or across the feature. The adequacy of the flow depends on the ecological function of the channel e.g. waterways that connect to fish habitat like a wetland or waterhole may only need infrequent and short-duration flows to provide connectivity for fish.
4. *Fish habitat at, or upstream of, the site*
Most instream features provide habitat for fish under adequate flow conditions or, in the case of pools, during dry periods. Therefore, it is important to have some knowledge of the fish species for the site and their habitat use, particularly in headwater streams. Periodic connectivity to upstream and off stream fish habitat are also considered fish habitat.

Assessment of six (6) waterway locations within the project area were conducted using the four criteria above along with any other distinguishable features. Refer **Table 17** for waterway assessment.



Table 17; Waterways assessment

Name	Defined bed and banks	An extended, if non-permanent, period of flow	Flow adequacy	Fish habitat at, or upstream of, the site	Distinguishable features
WWFA 08/02/2023 146.835667 -19.598920	Yes - defined top of bank is approximately 40cm high from lowest point of bed and 9m wide between top banks.	Yes – water to an approximate depth of 20cm during time of survey.	Yes – strong flow observed at time of survey. A deposit of brown coloured sediment was observed. The water was turbid. There was evidence of erosion with uprooted grass.	Yes – a significant quantity of flowing water was present at the time of observation.	Vegetation species found near bed and banks included <i>Lantana camara</i> , <i>Ziziphus mauritiana</i> , <i>Hyparrhenia rufa</i> & <i>Megathyrsus maximus</i>
WWFB 08/02/2023 146.847051 -19.593886	Yes - defined top of bank is approximately 25cm high from lowest point of bed and 3.5m wide between top banks.	Potentially – water to an approximate depth of 20cm was present during time of survey. Waterway became indistinct and was observed as a contained pond with moderately clear water.	Potential- Flow was not evident at the time of survey low observed.	Yes – water was present and small (<2.5cm) fish were observed	Vegetation species found near bed and banks included <i>Marsilea mutica</i> , <i>Ludwigia octovalvis</i> , <i>Cyperus spp.</i>
WWFC 08/02/2023 146.868612 -19.599558	Yes - defined top of bank is approximately 50cm high from lowest point of bed and 3m wide between top banks.	Yes – water was present during time of survey.	Yes – flow was observed at time of survey. Sediment deposits varied with fine silt and clay and rocks up to 4cm diameter in areas of stronger flow. Water was slightly tannin stained/yellow coloured. Erosion was evident on the banks.	Yes – small fish were observed.	There were wetland indicator species. Vegetation species found near bed and banks included <i>Lantana camara</i> , <i>Corymbia dallachiana</i> , <i>Corymbia platyphylla</i> , <i>Eremophila mitchellii</i> , <i>Stylosanthes scabra</i> & <i>Cryptostegia grandiflora</i> .



WWFD 08/02/2023 146.872544 -19.599183	Yes - defined top of bank is approximately 40cm high from lowest point of bed and 3m wide between top banks.	Yes – water to an approximate depth of 30cm was present during time of survey.	Yes – slow flow was observed at time of survey. There were deposits of fine silt. Water was slightly tannin stained.	Yes – a small fish was observed	Vegetation species found near bed and banks included <i>Megathyrsus maximus</i> , <i>Cryptostegia grandiflora</i> , <i>Corymbia dallachiana</i> , <i>Corymbia platyphylla</i> , <i>Echinochloa sp.</i> & <i>Marsilea mutica</i>
WWFE 07/02/2023 146.898486 -19.599165	Yes - defined top of bank is approximately 50cm high from lowest point of bed and 15m wide between top banks.	Yes – water to an approximate depth of 20cm was present during the survey. Water was slightly tannin stained.	Yes – no flow was observed at time of survey but snags were observed to 40cm.	Yes – fish were observed	Vegetation species found near bed and banks included <i>Melaleuca sp.</i> , <i>Cyperus sp.</i> & <i>Juncus sp.</i>
WWFF 08/02/2023 146.853653 -19.595488	No – a waterway bed and bank was not clearly defined.	Potentially – an artificial drain may contribute to water movement. Water to a depth of 2.5cm was present with a clay substrate.	Potential- flow was not evident at the time of observation.	Yes – a small fish was observed.	Vegetation species found near bed and banks included <i>Cyperus sp.</i> , <i>Ludwigia octovalvis</i> , <i>Marsilea mutica</i> & <i>Eclipta prostrata</i>
WWM1 02/03/2023 146.834649 -19.591056	Yes- Culvert under road. 50cm deep from top of bank to mid channel, 5m wide between top banks.	Potentially – fringing grasses were fattened in the direction of flow.	Potential – Water pooled downstream of assessment point location, on opposite side of road.	Yes – small fish were observed in pooled water upstream of the assessment location, at WWM2.	<i>Ludwigia octovalvis</i> , <i>Alternanthera denticulata</i> in channel. <i>Echinochloa muricata</i> and <i>Paspalum conjugatum</i> present along banks.



WWM2 02/03/2023 146.834852 -19.591923	Yes – 8m width between top of bank to mid-channel.	Potentially – Pooled, tannin stained water to approximately 30cm in depth was present at the time of assessment.	Potential – sediment deposition of clay.	Yes – small fish were observed in pooled water at the time of assessment. An empty Bi-valve shell was observed at the assessment location.	Dominated by <i>Ziziphus mauritiana</i> and <i>Cryptostegia grandiflora</i> . <i>Cyperus</i> sp. and <i>Bolboschoenus</i> sp. were observed on waters edge.
WWM3 02/03/2023 146.835029 -19.592211	Yes – 5.5m between top banks, 80cm depth from top of bank.	Potentially – Pooled water with algal growth to a depth of 30cm.	Potential – sediment deposition of clay.	Yes – pooled water was observed upstream of the assessment location, at WWM4.	Leucas lavandulifolia and <i>Ziziphus mauritiana</i> present within water channel. Channel fringed by mixed grass species.
WWM4 02/03/2023 146.835192 -19.59246	Yes – 4.5m wide between top banks, 70cm bank height.	Potentially – Pooled water to 10cm depth.	Potential – sediment deposition of clay.	Potentially - Waterway bed and banks become undefined within 5m upstream of assessment location.	<i>Eclipta prostrata</i> , <i>Ludwigia octovalvis</i> and algal growth present in channel. <i>Clitoria ternatea</i> , <i>Cryptostegia grandiflora</i> and <i>Heteropogon contortus</i> fringing channel.
WWM5 02/03/2023 146.8354 -19.592812	Yes – 8.5m wide between top banks, 50cm bank height.	Potential – No evidence of flow in the form of vegetation snags or bank erosion, defined channel persist and clay deposition present in channel.	Potential – sediment deposition of clay.	Yes – small fish were observed in pooled water upstream of the assessment location, at WWM2.	Alternanthera denticulata growing amongst low grass cover.



WWM6 02/03/2023 146.834762 -19.591324	Yes – Bank height to 1.2m from lowest point.	Potential – Pooled water present at time of survey.	Potential – sediment deposition of clay.	<i>Marsilea mutica</i> , <i>Alternanthera denticulata</i> , <i>Potamogeton tricarinatus</i> and <i>Nymphoides crenata</i> growing in water pool. <i>Ludwigia octovalvis</i> , <i>Alternanthera denticulata</i> , <i>Clitoria ternatea</i> , <i>Cyperus sp</i> , and <i>Heteropogon contortus</i> dominated mixed grasses present on banks.
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All waterway observation points in **Table 17** meet the definition of a waterway under the *Fisheries Act 1994*.

4.4 Fauna survey results

Four additional fauna species not recorded by previous site surveys were observed during survey works conducted between 6th and 10th February 2023;

- Three Least Concern microbat species;
 - *Chalinolobus nigrogriseus* (Hoary wattled bat)
 - *Miniopterus orianae oceanensis* (Large bent-winged bat)
 - *Vespadelus pumilus* (Eastern Forest bat)
- One Least Concern reptile species;
 - *Carlia pectoralis* (Open-Litter Rainbow-Skink)

These species are included in an updated site fauna species list in **Appendix C**.

Ninety-three (93) fauna species have been recorded in total during the field survey effort within 1km of the road alignment shown in **Figure 1**, including domestic species. Seventy-seven (77) of the detected species were native, with the majority (70) being avian species.

A pair of Southern Black-throated finch (*Poephila cincta cincta*) were observed foraging adjacent to the pipeline alignment, the location of this confirmed sighting is shown on **Plan 2**. Southern Black-throated finch has previously been recorded elsewhere adjacent to the alignment.



Photo Plate 1; Southern Black-throated finch observed foraging adjacent to the pipeline alignment.

4.4.1 Threatened and migratory fauna species

Two (2) threatened species have been detected by on-ground survey effort, being the Southern squatter pigeon *Geophaps scripta scripta*, listed as vulnerable under the *NCA* and *EPBC* and the Southern black-throated finch *Poephila cincta cincta*, listed as endangered under the *NCA* and *EPBC*.

Two (2) species listed as migratory by the *EPBC Act 1999* were recorded, being the Black-faced monarch (*Monarcha melanopsis*) and the Barn swallow (*Hirundo rustica*).



Foraging habitat for the Bare-rumped Sheathtail bat (*Saccolaimus saccolaimus nudicluniatus*) is present within the road alignment in the form of woodland and grassland supporting flying insect species. Greater than thirty potential microbat roosting sites in the form of hollows and exfoliating bark have been identified by Evolve within and adjacent to the alignment. Potential roosting hollows require expert assessment to confirm microbat usage due to issues of safe access and species behaviour of being silent at roosting sites.

A summary of threatened and migratory fauna species considered to have a likely or known occurrence within the precinct road alignment based on site surveys is provided in **Table 18**. For a full fauna species likelihood of occurrence assessment for the precinct road and water pipeline alignment, refer to **Appendix F**.

Table 18; Fauna species likelihood of occurrence summary.

Class	Scientific name	Common name	EPBC Status	Act	Likelihood of occurrence
Aves	<i>Hirundo rustica</i>	Barn Swallow	Migratory		Known
Aves	<i>Cuculus optatus</i>	Oriental cuckoo	Migratory		Likely
Aves	<i>Poephila cincta cincta</i>	Black throated finch (white rumped)	E		Known
Aves	<i>Geophaps scripta scripta</i>	Squatter pigeon (southern)	V		Known
Aves	<i>Monarcha melanopsis</i>	Black-faced monarch	Migratory Marine		Known
Mammalia	<i>Saccolaimus saccolaimus nudicluniatus</i>	Bare-rumped Sheathtail bat	V		Likely

4.4.1.1 Threatened granivorous species: Black-throated finch and Southern squatter pigeon

The Southern black-throated finch and Southern squatter pigeon are both granivorous species, dependent on seeding grasses as a primary food source.

Both northern and southern sub-species of the Black-throated Finch are considered to occur within 5km of water sources. Based upon delineation from permanent water sources visible from aerial imagery, including farm dams, all of the proposed impact area falls within 5km of a water source. It is noted that disused finch nests from unknown species were located on site during the September surveys (Refer **Photo Plate 4**) and two sightings of Black-throated finch have now been recorded by survey works, one of unconfirmed subspecies in May 2022 and two individuals confirmed to belong to the listed southern subspecies in February 2023, see **Photo Plate 1**.

Southern Squatter pigeon forage within 3km of suitable permanent or seasonal water bodies and breed on stony rises on sandy or gravelly soil within 1km of a suitable water source. Species breeding and foraging habitat maps are provided in **Appendix H**. Southern Squatter Pigeon has been recorded three times near the alignment by Evolve surveys, locations of these sightings are provided in **Plan 2**.

Although undergoing seasonal variation in abundance, seeding grass species, including introduced species were recorded across the alignment.





Photo Plate 4; Two of the disused finch-nests found on-site during September surveys, bottle-shaped structure typical of Black-throated finch and other finch species known to be on-site is clearly visible in the RHS nest.

5 Conclusion

Evolve Environmental Solutions were commissioned to conduct ecological survey works to support the implementation of the Lansdown Eco-Industrial Precinct Road Alignment Project. Site surveys have been conducted to assess the following:

- Habitat Quality Assessment;
- Waterway and wetland values; and
- Fauna species presence.

Habitat quality assessment surveys found that moderate habitat quality on site for Southern Squatter Pigeon and Southern Black-throated Finch, low to moderate habitat quality for Bare-rumped Sheathail Bat and low habitat quality for Koala and Painted Snipe.

An observation of Southern Black-throated Finch was made, adding to previous observations of Southern Black-throated Finch and Southern Squatter Pigeon.

Waterway Assessments WWFA, WWFB, WWFC, WWFD, WWFE and WWFF were found to meet the definition of a waterway and fish habitat under the Fisheries Act 1994.

No threatened flora species were located by on-site surveys. Flora likelihood of occurrence assessment concluded that threatened flora species to occur within the project area (Refer to **Appendix C**).



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7 Appendices

Appendix A – Protected Matters Report

Appendix B – Wildnet species record list

Appendix C – Site Fauna species record list

Appendix D – Flora Likelihood of Occurrence Assessment

Appendix E – Fauna Likelihood of Occurrence Assessment

Appendix F – MHQA Habitat scoring parameters for each species

Appendix G – Modified Habitat Quality Assessment Survey Data and Findings

Appendix H – Southern squatter pigeon, *Geophaps scripta scripta* habitat maps

Appendix I – Southern black-throated finch, *Poephila cincta cincta* habitat maps

Appendix J – Bare-rumped sheath-tail bat, *Saccolaimus saccolaimus nudiclunatus* habitat maps

Appendix K – Koala, *Phascolarctos cinereus* habitat maps



Appendix A. Protected Matters Report





Australian Government

Department of Climate Change, Energy,
the Environment and Water

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: 14-Mar-2023

[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	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	25
Listed Migratory Species:	16

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:	21
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:	None
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	5
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	
Bowling green bay	20 - 30km upstream from Ramsar site	

Listed Threatened Species	[Resource Information]
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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
BIRD		
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Geophaps scripta scripta Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Neochmia ruficauda ruficauda Star Finch (eastern), Star Finch (southern) [26027]	Endangered	Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Poephila cincta cincta Southern Black-throated Finch [64447]	Endangered	Species or species habitat known to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Tyto novaehollandiae kimberli Masked Owl (northern) [26048]	Vulnerable	Species or species habitat likely to occur within area
MAMMAL		
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat likely to occur within area
Hipposideros semoni Semon's Leaf-nosed Bat, Greater Wart-nosed Horseshoe-bat [180]	Vulnerable	Species or species habitat may occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
Petauroides minor Greater Glider (northern), Greater Glider (north-eastern Queensland) [92008]	Vulnerable	Species or species habitat likely to occur within area
Petauroides volans Greater Glider (southern and central) [254]	Endangered	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat likely to occur within area
Rhinolophus robertsi Large-eared Horseshoe Bat, Greater Large-eared Horseshoe Bat [87639]	Vulnerable	Species or species habitat likely to occur within area
Saccolaimus saccolaimus nudicluniatus Bare-rumped Sheath-tailed Bat, Bare-rumped Sheathtail Bat [66889]	Vulnerable	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
PLANT		
Bulbophyllum globuliforme Miniature Moss-orchid, Hoop Pine Orchid [6649]	Vulnerable	Species or species habitat likely to occur within area
Dichanthium setosum bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus raveretiana Black Ironbox [16344]	Vulnerable	Species or species habitat may occur within area
Leichhardtia brevifolia listed as Marsdenia brevifolia [91893]	Vulnerable	Species or species habitat likely to occur within area
Omphalea celata [64586]	Vulnerable	Species or species habitat likely to occur within area
Tephrosia leveillei [16946]	Vulnerable	Species or species habitat may occur within area
REPTILE		
Egernia rugosa Yakka Skink [1420]	Vulnerable	Species or species habitat may occur within area
Listed Migratory Species [Resource Information]		
Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Marine Species		
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area
Symposiachrus trivirgatus as Monarcha trivirgatus Spectacled Monarch [83946]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species	[Resource Information]	
Scientific Name	Threatened Category	Presence Text
Bird		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area overfly marine area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat likely to occur within area overfly marine area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat likely to occur within area overfly marine area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat may occur within area overfly marine area
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely to occur within area overfly marine area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area overfly marine area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat likely to occur within area overfly marine area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area
Symposiachrus trivirgatus as Monarcha trivirgatus Spectacled Monarch [83946]		Species or species habitat known to occur within area overfly marine area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat may occur within area overfly marine area

Reptile	
Crocodylus porosus	
Salt-water Crocodile, Estuarine Crocodile [1774]	Species or species habitat likely to occur within area

Extra Information

EPBC Act Referrals [Resource Information]			
Title of referral	Reference	Referral Outcome	Assessment Status
Lansdown Eco-Industrial Precinct ? Enabling Infrastructure	2022/09383		Assessment
Queensland Pacific Metals - Townsville Energy Chemicals Hub TECH Project	2021/9033		Post-Approval
Controlled action			
Gas pipeline	2002/728	Controlled Action	Post-Approval
Not controlled action			
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed

Not controlled action (particular manner)

Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action (particular manner)			
275kV Transmission Line from Ross substation to Strathmore Substation (approx 180km)	2008/4390	Not Controlled Action (Particular Manner)	Post-Approval

Caveat

1 PURPOSE

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

The report contains the mapped locations of:

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

2 DISCLAIMER

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

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

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

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

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

4 LIMITATIONS

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

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

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

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

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

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

Acknowledgements

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

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

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

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

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Appendix B. Wildnet Species Record List





Queensland Government

WildNet species list

Search Criteria: Species List for a Specified Point
Species: All
Type: All
Queensland status: All
Records: All
Date: All
Latitude: -19.6464
Longitude: 146.8209
Distance: 8
Email: rhayward@evolveenvironmental.com.au
Date submitted: Tuesday 14 Mar 2023 09:23:24
Date extracted: Tuesday 14 Mar 2023 09:30:08

The number of records retrieved = 324

Disclaimer

Information presented on this product is distributed by the Queensland Government as an information source only. While every care is taken to ensure the accuracy of this data, the State of Queensland makes no statements, representations or warranties about the accuracy, reliability, completeness or suitability of any information contained in this product.

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Information about your Species lists request is logged for quality assurance, user support and product enhancement purposes only.

The information provided should be appropriately acknowledged as being derived from WildNet database when it is used. As the WildNet Program is still in a process of collating and vetting data, it is possible the information given is not complete. Go to the WildNet database webpage (<https://www.qld.gov.au/environment/plants-animals/species-information/wildnet>) to find out more about WildNet and where to access other WildNet information products approved for publication. Feedback about WildNet species lists should be emailed to wildlife.online@des.qld.gov.au.

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	amphibians	Bufo	<i>Rhinella marina</i>	cane toad	Y			6
animals	amphibians	Hylidae	<i>Cyclorana alboguttata</i>	greenstripe frog		C		1
animals	amphibians	Hylidae	<i>Cyclorana novaehollandiae</i>	eastern snapping frog		C		1
animals	amphibians	Hylidae	<i>Litoria caerulea</i>	common green treefrog		C		3
animals	amphibians	Hylidae	<i>Litoria inermis</i>	bumpy rocketfrog		C		1
animals	amphibians	Hylidae	<i>Litoria rubella</i>	ruddy treefrog		C		4
animals	amphibians	Limnodynastidae	<i>Limnodynastes terraereginae</i>	scarlet sided pobblebonk		C		2/2
animals	amphibians	Limnodynastidae	<i>Platyplectrum ornatum</i>	ornate burrowing frog		C		1
animals	birds	Acanthizidae	<i>Gerygone olivacea</i>	white-throated gerygone		C		6
animals	birds	Acanthizidae	<i>Gerygone palpebrosa</i>	fairy gerygone		C		2
animals	birds	Acanthizidae	<i>Smicromis brevirostris</i>	weebill		C		1
animals	birds	Accipitridae	<i>Accipiter cirrocephalus</i>	collared sparrowhawk		C		2
animals	birds	Accipitridae	<i>Accipiter fasciatus</i>	brown goshawk		C		9
animals	birds	Accipitridae	<i>Accipiter novaehollandiae</i>	grey goshawk		C		1
animals	birds	Accipitridae	<i>Aquila audax</i>	wedge-tailed eagle		C		13
animals	birds	Accipitridae	<i>Aviceda subcristata</i>	Pacific baza		C		4
animals	birds	Accipitridae	<i>Circus approximans</i>	swamp harrier		C		5
animals	birds	Accipitridae	<i>Circus assimilis</i>	spotted harrier		C		6
animals	birds	Accipitridae	<i>Elanus axillaris</i>	black-shouldered kite		C		13
animals	birds	Accipitridae	<i>Haliaeetus leucogaster</i>	white-bellied sea-eagle		C		16
animals	birds	Accipitridae	<i>Haliastur indus</i>	brahmyny kite		C		3
animals	birds	Accipitridae	<i>Haliastur sphenurus</i>	whistling kite		C		37
animals	birds	Accipitridae	<i>Hieraaetus morphnoides</i>	little eagle		C		1
animals	birds	Accipitridae	<i>Milvus migrans</i>	black kite		C		48
animals	birds	Acrocephalidae	<i>Acrocephalus australis</i>	Australian reed-warbler		C		1
animals	birds	Aegothelidae	<i>Aegotheles cristatus</i>	Australian owl-nightjar		C		1
animals	birds	Alaudidae	<i>Mirafra javanica</i>	Horsfield's bushlark		C		7
animals	birds	Alcedinidae	<i>Ceyx azureus</i>	azure kingfisher		C		2
animals	birds	Alcedinidae	<i>Dacelo leachii</i>	blue-winged kookaburra		C		47
animals	birds	Alcedinidae	<i>Dacelo novaeguineae</i>	laughing kookaburra		C		28
animals	birds	Alcedinidae	<i>Todiramphus macleayi</i>	forest kingfisher		C		42
animals	birds	Alcedinidae	<i>Todiramphus pyrrhopygius</i>	red-backed kingfisher		C		7
animals	birds	Alcedinidae	<i>Todiramphus sanctus</i>	sacred kingfisher		C		24
animals	birds	Anatidae	<i>Anas gracilis</i>	grey teal		C		7
animals	birds	Anatidae	<i>Anas superciliosa</i>	Pacific black duck		C		32
animals	birds	Anatidae	<i>Aythya australis</i>	hardhead		C		9
animals	birds	Anatidae	<i>Chenonetta jubata</i>	Australian wood duck		C		4
animals	birds	Anatidae	<i>Cygnus atratus</i>	black swan		C		14
animals	birds	Anatidae	<i>Dendrocygna arcuata</i>	wandering whistling-duck		C		12
animals	birds	Anatidae	<i>Dendrocygna eytoni</i>	plumed whistling-duck		C		15
animals	birds	Anatidae	<i>Nettapus coromandelianus</i>	cotton pygmy-goose		C		6
animals	birds	Anatidae	<i>Nettapus pulchellus</i>	green pygmy-goose		C		8
animals	birds	Anhingidae	<i>Anhinga novaehollandiae</i>	Australasian darter		C		30
animals	birds	Anseranatidae	<i>Anseranas semipalmata</i>	magpie goose		C		29
animals	birds	Apodidae	<i>Aerodramus terraereginae</i>	Australian swiftlet		C		1
animals	birds	Ardeidae	<i>Ardea alba modesta</i>	eastern great egret		C		22

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Ardeidae	<i>Ardea intermedia</i>	intermediate egret		C		20
animals	birds	Ardeidae	<i>Ardea pacifica</i>	white-necked heron		C		15
animals	birds	Ardeidae	<i>Bubulcus ibis</i>	cattle egret		C		7
animals	birds	Ardeidae	<i>Egretta garzetta</i>	little egret		C		8
animals	birds	Ardeidae	<i>Egretta novaehollandiae</i>	white-faced heron		C		18
animals	birds	Ardeidae	<i>Ixobrychus flavicollis</i>	black bittern		C		1
animals	birds	Ardeidae	<i>Nycticorax caledonicus</i>	nankeen night-heron		C		4
animals	birds	Artamidae	<i>Artamus cinereus</i>	black-faced woodswallow		C		21
animals	birds	Artamidae	<i>Artamus leucorhynchus</i>	white-breasted woodswallow		C		29
animals	birds	Artamidae	<i>Artamus personatus</i>	masked woodswallow		C		2
animals	birds	Artamidae	<i>Artamus superciliosus</i>	white-browed woodswallow		C		3
animals	birds	Artamidae	<i>Cracticus nigrogularis</i>	piebald butcherbird		C		27
animals	birds	Artamidae	<i>Cracticus torquatus</i>	grey butcherbird		C		10
animals	birds	Artamidae	<i>Gymnorhina tibicen</i>	Australian magpie		C		34
animals	birds	Artamidae	<i>Strepera graculina</i>	piebald currawong		C		14
animals	birds	Burhinidae	<i>Burhinus grallarius</i>	bush stone-curlew		C		3
animals	birds	Cacatuidae	<i>Cacatua galerita</i>	sulphur-crested cockatoo		C		29
animals	birds	Cacatuidae	<i>Calyptorhynchus banksii</i>	red-tailed black-cockatoo		C		33
animals	birds	Cacatuidae	<i>Eolophus roseicapilla</i>	galah		C		1
animals	birds	Cacatuidae	<i>Nymphicus hollandicus</i>	cockatiel		C		3
animals	birds	Campephagidae	<i>Coracina maxima</i>	ground cuckoo-shrike		C		1
animals	birds	Campephagidae	<i>Coracina novaehollandiae</i>	black-faced cuckoo-shrike		C		32
animals	birds	Campephagidae	<i>Coracina papuensis</i>	white-bellied cuckoo-shrike		C		44
animals	birds	Campephagidae	<i>Edolisoma tenuirostre</i>	common cicadabird		C		2
animals	birds	Campephagidae	<i>Lalage leucomela</i>	varied triller		C		1
animals	birds	Campephagidae	<i>Lalage tricolor</i>	white-winged triller		C		25
animals	birds	Caprimulgidae	<i>Caprimulgus macrurus</i>	large-tailed nightjar		C		2
animals	birds	Casuariidae	<i>Dromaius novaehollandiae</i>	emu		C		1
animals	birds	Charadriidae	<i>Elseyornis melanops</i>	black-fronted dotterel		C		5
animals	birds	Charadriidae	<i>Vanellus miles</i>	masked lapwing		C		25
animals	birds	Charadriidae	<i>Vanellus tricolor</i>	banded lapwing		C		2
animals	birds	Ciconiidae	<i>Ephippiorhynchus asiaticus</i>	black-necked stork		C		9
animals	birds	Cisticolidae	<i>Cisticola exilis</i>	golden-headed cisticola		C		10
animals	birds	Columbidae	<i>Geopelia cuneata</i>	diamond dove		C		4
animals	birds	Columbidae	<i>Geopelia humeralis</i>	bar-shouldered dove		C		18
animals	birds	Columbidae	<i>Geopelia placida</i>	peaceful dove		C		50
animals	birds	Columbidae	<i>Geophaps scripta</i>	squatter pigeon		C		15
animals	birds	Columbidae	<i>Ocyphaps lophotes</i>	crested pigeon		C		37
animals	birds	Columbidae	<i>Phaps chalcoptera</i>	common bronzewing		C		2
animals	birds	Coraciidae	<i>Eurystomus orientalis</i>	dollarbird		C		18
animals	birds	Corcoracidae	<i>Corcorax melanorhamphos</i>	white-winged chough		C		5
animals	birds	Corcoracidae	<i>Struthidea cinerea</i>	apostlebird		C		18
animals	birds	Corvidae	<i>Corvus coronoides</i>	Australian raven		C		25
animals	birds	Corvidae	<i>Corvus orru</i>	Torresian crow		C		25
animals	birds	Corvidae	<i>Corvus sp.</i>			C		1
animals	birds	Cuculidae	<i>Cacomantis flabelliformis</i>	fan-tailed cuckoo		C		6

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Cuculidae	<i>Cacomantis pallidus</i>	pallid cuckoo		C		11
animals	birds	Cuculidae	<i>Cacomantis variolosus</i>	brush cuckoo		C		20
animals	birds	Cuculidae	<i>Centropus phasianinus</i>	pheasant coucal		C		28
animals	birds	Cuculidae	<i>Chalcites basal</i>	Horsfield's bronze-cuckoo		C		8
animals	birds	Cuculidae	<i>Chalcites lucidus</i>	shining bronze-cuckoo		C		1
animals	birds	Cuculidae	<i>Chalcites minutillus</i>	little bronze-cuckoo		C		7
animals	birds	Cuculidae	<i>Chalcites minutillus russatus</i>	Gould's bronze-cuckoo		C		4
animals	birds	Cuculidae	<i>Eudynamys orientalis</i>	eastern koel		C		7
animals	birds	Cuculidae	<i>Scythrops novaehollandiae</i>	channel-billed cuckoo		C		8
animals	birds	Dicaeidae	<i>Dicaeum hirundinaceum</i>	mistletoebird		C		12
animals	birds	Dicruridae	<i>Dicrurus bracteatus</i>	spangled drongo		C		37
animals	birds	Estrildidae	<i>Heteromunia pectoralis</i>	pictorella mannikin		C		1
animals	birds	Estrildidae	<i>Lonchura castaneothorax</i>	chestnut-breasted mannikin		C		17
animals	birds	Estrildidae	<i>Lonchura punctulata</i>	nutmeg mannikin	Y			4
animals	birds	Estrildidae	<i>Neochmia modesta</i>	plum-headed finch		C		16
animals	birds	Estrildidae	<i>Neochmia phaeton</i>	crimson finch		C		2
animals	birds	Estrildidae	<i>Neochmia temporalis</i>	red-browed finch		C		1
animals	birds	Estrildidae	<i>Poephila cincta cincta</i>	black-throated finch (white-rumped subspecies)		E	E	13
animals	birds	Estrildidae	<i>Taeniopygia bichenovii</i>	double-barred finch		C		42
animals	birds	Estrildidae	<i>Taeniopygia guttata</i>	zebra finch		C		14
animals	birds	Eurostopodidae	<i>Eurostopodus argus</i>	spotted nightjar		C		3
animals	birds	Falconidae	<i>Falco berigora</i>	brown falcon		C		18
animals	birds	Falconidae	<i>Falco cenchroides</i>	nankeen kestrel		C		15
animals	birds	Falconidae	<i>Falco longipennis</i>	Australian hobby		C		5
animals	birds	Falconidae	<i>Falco peregrinus macropus</i>	Australian peregrine falcon		C		4
animals	birds	Gruidae	<i>Antigone rubicunda</i>	broilga		C		10
animals	birds	Hirundinidae	<i>Hirundo neoxena</i>	welcome swallow		C		8
animals	birds	Hirundinidae	<i>Petrochelidon ariel</i>	fairy martin		C		15
animals	birds	Hirundinidae	<i>Petrochelidon nigricans</i>	tree martin		C		10
animals	birds	Jacanidae	<i>Irediparra gallinacea</i>	comb-crested jacana		C		19
animals	birds	Laridae	<i>Gelochelidon nilotica</i>	gull-billed tern		SL		2
animals	birds	Laridae	<i>Hydroprogne caspia</i>	Caspian tern		SL		5
animals	birds	Locustellidae	<i>Cincloramphus mathewsi</i>	rufous songlark		C		11
animals	birds	Locustellidae	<i>Cincloramphus timoriensis</i>	tawny grassbird		C		2
animals	birds	Maluridae	<i>Malurus melanocephalus</i>	red-backed fairy-wren		C		23
animals	birds	Megapodiidae	<i>Alectura lathami</i>	Australian brush-turkey		C		2
animals	birds	Meliphagidae	<i>Conopophila rufogularis</i>	rufous-throated honeyeater		C		15
animals	birds	Meliphagidae	<i>Entomyzon cyanotis</i>	blue-faced honeyeater		C		30
animals	birds	Meliphagidae	<i>Lichmera indistincta</i>	brown honeyeater		C		28
animals	birds	Meliphagidae	<i>Manorina flavigula</i>	yellow-throated miner		C		14
animals	birds	Meliphagidae	<i>Manorina melanocephala</i>	noisy miner		C		1
animals	birds	Meliphagidae	<i>Meliphaga lewinii</i>	Lewin's honeyeater		C		7
animals	birds	Meliphagidae	<i>Melithreptus albogularis</i>	white-throated honeyeater		C		40
animals	birds	Meliphagidae	<i>Melithreptus gularis</i>	black-chinned honeyeater		C		7
animals	birds	Meliphagidae	<i>Myzomela obscura</i>	dusky honeyeater		C		1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Meliphagidae	<i>Philemon buceroides</i>	helmeted friarbird		C		6
animals	birds	Meliphagidae	<i>Philemon citreogularis</i>	little friarbird		C		36
animals	birds	Meliphagidae	<i>Philemon corniculatus</i>	noisy friarbird		C		15
animals	birds	Meliphagidae	<i>Ramsayornis fasciatus</i>	bar-breasted honeyeater		C		3
animals	birds	Meliphagidae	<i>Ramsayornis modestus</i>	brown-backed honeyeater		C		21
animals	birds	Meliphagidae	<i>Stomiopera flava</i>	yellow honeyeater		C		47
animals	birds	Meropidae	<i>Merops ornatus</i>	rainbow bee-eater		C		41
animals	birds	Monarchidae	<i>Grallina cyanoleuca</i>	magpie-lark		C		47
animals	birds	Monarchidae	<i>Monarcha melanopsis</i>	black-faced monarch		SL		1
animals	birds	Monarchidae	<i>Myiagra inquieta</i>	restless flycatcher		C		9
animals	birds	Monarchidae	<i>Myiagra rubecula</i>	leaden flycatcher		C		30
animals	birds	Monarchidae	<i>Symposiachrus trivirgatus</i>	spectacled monarch		SL		1
animals	birds	Motacillidae	<i>Anthus novaeseelandiae</i>	Australasian pipit		C		8
animals	birds	Nectariniidae	<i>Cinnyris jugularis</i>	olive-backed sunbird		C		24
animals	birds	Neosittidae	<i>Daphoenositta chrysoptera</i>	varied sittella		C		1
animals	birds	Oriolidae	<i>Oriolus sagittatus</i>	olive-backed oriole		C		17
animals	birds	Oriolidae	<i>Sphecotheres vieilloti</i>	Australasian figbird		C		13
animals	birds	Otididae	<i>Ardeotis australis</i>	Australian bustard		C		16
animals	birds	Pachycephalidae	<i>Colluricincla megarhyncha</i>	little shrike-thrush		C		7
animals	birds	Pachycephalidae	<i>Pachycephala rufiventris</i>	rufous whistler		C		23
animals	birds	Pardalotidae	<i>Pardalotus punctatus</i>	spotted pardalote		C		1
animals	birds	Pardalotidae	<i>Pardalotus striatus</i>	striated pardalote		C		29
animals	birds	Passeridae	<i>Passer domesticus</i>	house sparrow	Y			1
animals	birds	Pelecanidae	<i>Pelecanus conspicillatus</i>	Australian pelican		C		12
animals	birds	Petroicidae	<i>Microeca fascinans</i>	jacky winter		C		9
animals	birds	Petroicidae	<i>Microeca flavigaster</i>	lemon-bellied flycatcher		C		30
animals	birds	Petroicidae	<i>Petroica goodenovii</i>	red-capped robin		C		1
animals	birds	Petroicidae	<i>Poecilodryas superciliosa</i>	white-browed robin		C		1
animals	birds	Phalacrocoracidae	<i>Microcarbo melanoleucos</i>	little pied cormorant		C		23
animals	birds	Phalacrocoracidae	<i>Phalacrocorax carbo</i>	great cormorant		C		9
animals	birds	Phalacrocoracidae	<i>Phalacrocorax sulcirostris</i>	little black cormorant		C		21
animals	birds	Phalacrocoracidae	<i>Phalacrocorax varius</i>	pied cormorant		C		1
animals	birds	Phasianidae	<i>Synoicus ypsilophorus</i>	brown quail		C		5
animals	birds	Podargidae	<i>Podargus strigoides</i>	tawny frogmouth		C		1
animals	birds	Podicipedidae	<i>Podiceps cristatus</i>	great crested grebe		C		4
animals	birds	Podicipedidae	<i>Tachybaptus novaehollandiae</i>	Australasian grebe		C		7
animals	birds	Pomatostomidae	<i>Pomatostomus temporalis</i>	grey-crowned babbler		C		7
animals	birds	Psittaculidae	<i>Aprosmictus erythropterus</i>	red-winged parrot		C		16
animals	birds	Psittaculidae	<i>Melopsittacus undulatus</i>	budgerigar		C		4
animals	birds	Psittaculidae	<i>Platycercus adscitus</i>	pale-headed rosella		C		42
animals	birds	Psittaculidae	<i>Trichoglossus chlorolepidotus</i>	scaly-breasted lorikeet		C		17
animals	birds	Psittaculidae	<i>Trichoglossus moluccanus</i>	rainbow lorikeet		C		24
animals	birds	Ptilonorhynchidae	<i>Chlamydera nuchalis</i>	great bowerbird		C		19
animals	birds	Rallidae	<i>Fulica atra</i>	Eurasian coot		C		3
animals	birds	Rallidae	<i>Gallinula tenebrosa</i>	dusky moorhen		C		1
animals	birds	Rallidae	<i>Porphyrio melanotus</i>	purple swamphen		C		1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Recurvirostridae	<i>Himantopus leucocephalus</i>	pied stilt		C		1
animals	birds	Rhipiduridae	<i>Rhipidura albiscapa</i>	grey fantail		C		32
animals	birds	Rhipiduridae	<i>Rhipidura leucophrys</i>	willie wagtail		C		36
animals	birds	Rhipiduridae	<i>Rhipidura rufifrons</i>	rufous fantail		SL		3
animals	birds	Rhipiduridae	<i>Rhipidura rufiventris</i>	northern fantail		C		1
animals	birds	Scolopacidae	<i>Gallinago hardwickii</i>	Latham's snipe		SL		1
animals	birds	Strigidae	<i>Ninox boobook</i>	southern boobook		C		4
animals	birds	Strigidae	<i>Ninox connivens</i>	barking owl		C		12
animals	birds	Threskiornithidae	<i>Platalea flavipes</i>	yellow-billed spoonbill		C		13
animals	birds	Threskiornithidae	<i>Platalea regia</i>	royal spoonbill		C		13
animals	birds	Threskiornithidae	<i>Plegadis falcinellus</i>	glossy ibis		SL		2
animals	birds	Threskiornithidae	<i>Threskiornis molucca</i>	Australian white ibis		C		20
animals	birds	Threskiornithidae	<i>Threskiornis spinicollis</i>	straw-necked ibis		C		31
animals	birds	Turnicidae	<i>Turnix maculosus</i>	red-backed button-quail		C		3
animals	birds	Turnicidae	<i>Turnix pyrrhorthorax</i>	red-chested button-quail		C		2
animals	birds	Turnicidae	<i>Turnix velox</i>	little button-quail		C		1
animals	birds	Tytonidae	<i>Tyto javanica</i>	eastern barn owl		C		4
animals	mammals	Macropodidae	<i>Lagorchestes conspicillatus</i>	spectacled hare-wallaby		C		1
animals	mammals	Macropodidae	<i>Macropus giganteus</i>	eastern grey kangaroo		C		2
animals	mammals	Macropodidae	<i>Notamacropus agilis</i>	agile wallaby		C		1
animals	mammals	Suidae	<i>Sus scrofa</i>	pig	Y			3
animals	reptiles	Agamidae	<i>Diporiphora australis</i>	tommy roundhead		C		1
animals	reptiles	Chelidae	<i>Chelodina canni</i>	Cann's longneck turtle		C		1
animals	reptiles	Chelidae	<i>Emydura macquarii krefftii</i>	Krefft's river turtle		C		1/1
animals	reptiles	Colubridae	<i>Tropidonophis mairii</i>	freshwater snake		C		1
animals	reptiles	Diplodactylidae	<i>Amalosia rhombifer</i>	zig-zag gecko		C		1/1
animals	reptiles	Diplodactylidae	<i>Diplodactylus platyurus</i>	eastern fat-tailed gecko		C		1/1
animals	reptiles	Diplodactylidae	<i>Oedura castelnaui</i>	northern velvet gecko		C		1/1
animals	reptiles	Elapidae	<i>Cryptophis nigrostriatus</i>	black-striped snake		C		1/1
animals	reptiles	Elapidae	<i>Furina diadema</i>	red-naped snake		C		1/1
animals	reptiles	Elapidae	<i>Pseudonaja nuchalis sensu lato</i>	western brown snake		C		1
animals	reptiles	Elapidae	<i>Suta suta</i>	myall snake		C		1/1
animals	reptiles	Gekkonidae	<i>Heteronotia binoei</i>	Bynoe's gecko		C		1
animals	reptiles	Pygopodidae	<i>Delma tincta</i>	excitable delma		C		1/1
animals	reptiles	Pygopodidae	<i>Lialis burtonis</i>	Burton's legless lizard		C		1/1
animals	reptiles	Scincidae	<i>Praeteropus gowi</i>	speckled worm-skink		C		1
animals	reptiles	Typhlopidae	<i>Anilius affinis</i>	small-headed blind snake		C		4/4
animals	reptiles	Typhlopidae	<i>Anilius ligatus</i>	robust blind snake		C		1/1
animals	reptiles	Varanidae	<i>Varanus scalaris</i>	spotted tree monitor		C		1/1
animals	uncertain	Indeterminate	<i>Indeterminate</i>	Unknown or Code Pending				1/1
plants	land plants	Acanthaceae	<i>Graptophyllum excelsum</i>			NT		1/1
plants	land plants	Amaranthaceae	<i>Amaranthus interruptus</i>			C		1/1
plants	land plants	Amaranthaceae	<i>Amaranthus spinosus</i>	needle burr	Y			1/1
plants	land plants	Amaranthaceae	<i>Gomphrena humilis</i>			C		1/1
plants	land plants	Anacardiaceae	<i>Euroschinus falcatus</i> var. <i>angustifolius</i>			C		1/1
plants	land plants	Apocynaceae	<i>Cryptostegia grandiflora</i>	rubber vine	Y			3

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	land plants	Apocynaceae	<i>Cynanchum pedunculatum</i>			C		1/1
plants	land plants	Apocynaceae	<i>Parsonsia lenticellata</i>	narrow-leaved parsonsia		C		3/3
plants	land plants	Apocynaceae	<i>Wrightia saligna</i>			C		1/1
plants	land plants	Asteraceae	<i>Camptacra barbata</i>			C		1/1
plants	land plants	Asteraceae	<i>Cyanthillium cinereum</i>			C		1/1
plants	land plants	Asteraceae	<i>Ozothamnus cassinioides</i>			C		1/1
plants	land plants	Asteraceae	<i>Peripleura hispidula</i> var. <i>setosa</i>			C		1/1
plants	land plants	Asteraceae	<i>Peripleura scabra</i>			C		1/1
plants	land plants	Asteraceae	<i>Pterocaulon ciliosum</i>			C		1/1
plants	land plants	Asteraceae	<i>Pterocaulon serrulatum</i> var. <i>serrulatum</i>			C		1/1
plants	land plants	Boraginaceae	<i>Trichodesma zeylanicum</i> var. <i>zeylanicum</i>			C		1/1
plants	land plants	Campanulaceae	<i>Lobelia quadrangularis</i>			SL		1/1
plants	land plants	Chenopodiaceae	<i>Chenopodium murale</i>	green fat-hen	Y			1/1
plants	land plants	Commelinaceae	<i>Commelina ensifolia</i>	scurvy grass		C		1/1
plants	land plants	Convolvulaceae	<i>Ipomoea brassii</i>			C		1/1
plants	land plants	Convolvulaceae	<i>Ipomoea polymorpha</i>			C		1/1
plants	land plants	Convolvulaceae	<i>Polymeria marginata</i>			C		1/1
plants	land plants	Convolvulaceae	<i>Xenostegia tridentata</i>			C		1/1
plants	land plants	Cornaceae	<i>Alangium polyosmoides</i> subsp. <i>tomentosum</i>			C		1/1
plants	land plants	Cyperaceae	<i>Cyperus concinnus</i>			C		1/1
plants	land plants	Cyperaceae	<i>Cyperus distans</i>			C		1/1
plants	land plants	Cyperaceae	<i>Cyperus gracilis</i>			C		1/1
plants	land plants	Cyperaceae	<i>Cyperus platystylis</i>			C		1/1
plants	land plants	Cyperaceae	<i>Cyperus procerus</i>			C		1/1
plants	land plants	Cyperaceae	<i>Eleocharis geniculata</i>			C		1/1
plants	land plants	Cyperaceae	<i>Fimbristylis littoralis</i>			C		1/1
plants	land plants	Cyperaceae	<i>Fimbristylis sieberiana</i>			C		1/1
plants	land plants	Cyperaceae	<i>Schoenus falcatus</i>			C		1/1
plants	land plants	Cyperaceae	<i>Scleria brownii</i>			C		1/1
plants	land plants	Cyperaceae	<i>Scleria sphacelata</i>			C		1/1
plants	land plants	Ebenaceae	<i>Diospyros geminata</i>	scaly ebony		C		1/1
plants	land plants	Gentianaceae	<i>Canscora diffusa</i>			C		1/1
plants	land plants	Lamiaceae	<i>Anisomeles moschata</i>			C		1/1
plants	land plants	Lamiaceae	<i>Coleus congestus</i>			C		1/1
plants	land plants	Lamiaceae	<i>Teucrium modestum</i>			C		1/1
plants	land plants	Leguminosae	<i>Acacia jackesiana</i>			C		1/1
plants	land plants	Leguminosae	<i>Acacia salicina</i>	doolan		C		1/1
plants	land plants	Leguminosae	<i>Acaciella</i>					1/1
plants	land plants	Leguminosae	<i>Acaciella angustissima</i>	white ball acacia	Y			5/5
plants	land plants	Leguminosae	<i>Albizia</i>					1/1
plants	land plants	Leguminosae	<i>Butea monosperma</i>		Y			1/1
plants	land plants	Leguminosae	<i>Crotalaria spectabilis</i>	showy rattlepod	Y			1/1
plants	land plants	Leguminosae	<i>Crotalaria verrucosa</i>			C		2/2
plants	land plants	Leguminosae	<i>Erythrina vespertilio</i> subsp. <i>vespertilio</i>			C		1/1
plants	land plants	Leguminosae	<i>Falcataria toona</i>			C		2/2
plants	land plants	Leguminosae	<i>Flemingia parviflora</i>	flemingia		C		1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	land plants	Leguminosae	<i>Indigofera polygaloides</i>			C		1/1
plants	land plants	Leguminosae	<i>Indigofera tryonii</i>			C		1/1
plants	land plants	Leguminosae	<i>Senegalia</i>					1/1
plants	land plants	Leguminosae	<i>Senna occidentalis</i>	coffee senna	Y			1/1
plants	land plants	Leguminosae	<i>Tephrosia astragaloides</i>			C		1/1
plants	land plants	Leguminosae	<i>Tephrosia juncea</i>			C		1/1
plants	land plants	Leguminosae	<i>Vachellia bidwillii</i>			C		1/1
plants	land plants	Lentibulariaceae	<i>Utricularia aurea</i>	golden bladderwort		SL		1/1
plants	land plants	Lythraceae	<i>Ammannia multiflora</i>	jerry-jerry		C		1/1
plants	land plants	Lythraceae	<i>Lythrum paradoxum</i>			C		1/1
plants	land plants	Malpighiaceae	<i>Stigmaphyllon australiense</i>			C		2/2
plants	land plants	Malvaceae	<i>Abutilon micropetalum</i>			C		1/1
plants	land plants	Myrtaceae	<i>Eucalyptus brownii</i>	Reid River box		C		2/2
plants	land plants	Myrtaceae	<i>Eucalyptus persistens</i>			C		1/1
plants	land plants	Myrtaceae	<i>Eucalyptus xanthoclada</i>	yellow-branched ironbark		C		1/1
plants	land plants	Myrtaceae	<i>Eugenia reinwardtiana</i>	beach cherry		C		1/1
plants	land plants	Myrtaceae	<i>Gossia bidwillii</i>			C		1/1
plants	land plants	Myrtaceae	<i>Lophostemon grandiflorus subsp. riparius</i>			C		2/2
plants	land plants	Myrtaceae	<i>Melaleuca bracteata</i>			C		1/1
plants	land plants	Phyllanthaceae	<i>Phyllanthus novae-hollandiae</i>			C		1/1
plants	land plants	Poaceae	<i>Arthrargrostis deschampsoides</i>			C		1/1
plants	land plants	Poaceae	<i>Arundinella setosa</i>			C		1/1
plants	land plants	Poaceae	<i>Chionachne cyathopoda</i>	river grass		C		1/1
plants	land plants	Poaceae	<i>Cynodon aethiopicus</i>		Y			1/1
plants	land plants	Poaceae	<i>Dinebra decipiens var. asthenes</i>			C		1/1
plants	land plants	Poaceae	<i>Eragrostis parviflora</i>	weeping lovegrass		C		1/1
plants	land plants	Poaceae	<i>Oryza</i>					1/1
plants	land plants	Poaceae	<i>Panicum trichoides</i>			C		2/2
plants	land plants	Polypodiaceae	<i>Drynaria sparsisora</i>			SL		1/1
plants	land plants	Putranjivaceae	<i>Drypetes deplanchei</i>	grey boxwood		C		1/1
plants	land plants	Rhamnaceae	<i>Ventilago viminalis</i>	supplejack		C		1/1
plants	land plants	Rhamnaceae	<i>Ziziphus mauritiana</i>	Indian jujube	Y			1
plants	land plants	Rubiaceae	<i>Pavetta australiensis var. australiensis</i>			C		1/1
plants	land plants	Rubiaceae	<i>Psychotria fitzalanii</i>			C		1/1
plants	land plants	Rubiaceae	<i>Scleromitron polycladum</i>			NT		2/2
plants	land plants	Rubiaceae	<i>Spermacoce brachystema</i>			C		1/1
plants	land plants	Rubiaceae	<i>Timonius timon var. timon</i>			C		1/1
plants	land plants	Sapindaceae	<i>Alectryon tomentosus</i>			C		1/1
plants	land plants	Sapindaceae	<i>Harpullia pendula</i>			C		1/1
plants	land plants	Sapotaceae	<i>Amorphospermum antilogum</i>			C		1/1
plants	land plants	Solanaceae	<i>Nicotiana glauca</i>	tree tobacco	Y			1/1
plants	land plants	Solanaceae	<i>Solanum cookii</i>			C		1/1
plants	land plants	Sparrmanniaceae	<i>Grewia</i>					1/1
plants	land plants	Sparrmanniaceae	<i>Grewia savannicola</i>			C		1/1
plants	land plants	Thymelaeaceae	<i>Pimelea sericostachya</i>			C		1/1
plants	land plants	Vitaceae	<i>Causonis trifolia</i>			C		1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	land plants	Vitaceae	<i>Cissus oblonga</i>			C		1/1
plants		Mimosoid clade	<i>Leucaena leucocephala</i>		Y			10
plants		Papilionoideae	<i>Tephrosia brachyodon</i>			C		1/1

CODES

I - Y indicates that the taxon is introduced to Queensland and has naturalised.

Q - Indicates the Queensland conservation status of each taxon under the *Nature Conservation Act 1992*.

The codes are Extinct (EX), Extinct in the Wild (PE), Critically Endangered (CR), Endangered (E), Vulnerable (V), Near Threatened (NT), Special Least Concern (SL) and Least Concern (C).

A - Indicates the Australian conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act 1999*.

The values of EPBC are Extinct (EX), Extinct in the Wild (XW), Critically Endangered (CE), Endangered (E), Vulnerable (V) and Conservation Dependent (CD).

Records - The first number indicates the total number of records of the taxon (wildlife records and species listings for selected areas).

This number is output as 99999 if it equals or exceeds this value. A second number located after a / indicates the number of specimen records for the taxon.

This number is output as 999 if it equals or exceeds this value.

Appendix C. Site Fauna Species Record List



Class	Scientific name	Common name	Status	Source
Amphibia	<i>Litoria rubella</i>	Red tree-frog	LC	I, S
Amphibia	<i>Rhinella marina</i>	Cane toad	I	A, S
Aves	<i>Accipiter cirrocephalus</i>	Collared sparrowhawk	LC	I
Aves	<i>Acridotheres tristis</i>	Indian myna	LC	D, I
Aves	<i>Anas superciliosa</i>	Pacific black duck	LC	D
Aves	<i>Aprosmictus erythropterus</i>	Red-winged parrot	LC	D
Aves	<i>Ardeotis australis</i>	Australian bustard	LC	I
Aves	<i>Bubulcus ibis</i>	Cattle egret	LC	D
Aves	<i>Burhinus grallarius</i>	Bush Stone-curlew	LC	A, I
Aves	<i>Cacatua galerita</i>	Sulphur-crested cockatoo	LC	D, N
Aves	<i>Cacatua sanguinea</i>	Little corella	LC	D
Aves	<i>Calyptrorhynchus banksii</i>	Red-tailed black-cockatoo	LC	D
Aves	<i>Centropus phasianinus</i>	Pheasant coucal	LC	A, D, I, N
Aves	<i>Cinnyris jugularis</i>	Yellow sunbird	LC	I
Aves	<i>Climacteris picumnus</i>	Brown treecreeper	LC	D
Aves	<i>Coracina novaehollandiae</i>	Black-faced cuckooshrike	LC	D
Aves	<i>Coracina papuensis</i>	White-bellied cuckooshrike	LC	D
Aves	<i>Corvus coronoides</i>	Australian raven	LC	A, C, D
Aves	<i>Coturnix chinensis</i>	King quail	LC	I
Aves	<i>Cracticus nigrogularis</i>	Pied butcherbird	LC	D
Aves	<i>Dacelo leachii</i>	Blue-winged kookaburra	LC	A, I
Aves	<i>Dacelo novaeguineae</i>	Laughing Kookaburra	LC	D, I
Aves	<i>Dicrurus bracteatus</i>	Spangled drongo	LC	D
Aves	<i>Egretta novaehollandiae</i>	White-faced heron	LC	I
Aves	<i>Entomyzon cyanotis</i>	Blue-faced honeyeater	LC	D
Aves	<i>Eolophus roseicapilla</i>	Galah	LC	D
Aves	<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	LC	C
Aves	<i>Falco longipennis</i>	Australian hobby	LC	D
Aves	<i>Gallus gallus domesticus</i>	Domestic chicken	I	A
Aves	<i>Geopelia humeralis</i>	Bar-shouldered dove	LC	D
Aves	<i>Geopelia placida</i>	Peaceful dove	LC	I
Aves	<i>Geophaps scripta scripta</i>	Southern squatter pigeon	V	D
Aves	<i>Grallina cyanoleuca</i>	Mudlark	LC	A, C, D
Aves	<i>Gymnorhina tibicen</i>	Australian magpie	LC	A, C, D
Aves	<i>Haliastur sphenurus</i>	Whistling kite	LC	D, I
Aves	<i>Hirundo rustica</i>	Barn Swallow	LC, M	D, I
Aves	<i>Lonchura castaneothorax</i>	Chestnut-breasted mannikin	LC	D
Aves	<i>Lophoictinia isura</i>	Square-tailed kite	LC	D
Aves	<i>Malurus melanocephalus</i>	Red-backed fairy-wren	LC	I
Aves	<i>Manorina melanocephala</i>	Noisy miner	LC	I
Aves	<i>Meliphaga lewinii</i>	Lewin's honeyeater	LC	D
Aves	<i>Melithreptus albogularis</i>	White-throated honeyeater	LC	D
Aves	<i>Merops ornatus</i>	Rainbow bee-eater	LC	I



Class	Scientific name	Common name	Status	Source
Aves	<i>Microeca fascinans</i>	Jacky winter	LC	I
Aves	<i>Microcarbo niger</i>	Little cormorant	LC	D
Aves	<i>Milvus migrans</i>	Black kite	LC	D
Aves	<i>Monarcha melanopsis</i>	Black-faced monarch	M	I
Aves	<i>Ninox boobook</i>	Southern Boobook	LC	I
Aves	<i>Ocyphaps lophotes</i>	Crested pigeon	LC	D, I
Aves	<i>Pandion haliaetus</i>	Osprey	LC	D
Aves	<i>Pardalotus rubricatus</i>	Red-browed pardalote	LC	D
Aves	<i>Peneothello pulverulenta</i>	Mangrove robin	LC	C, D
Aves	<i>Petrochelidon ariel</i>	Fairy martin	LC	S
Aves	<i>Philemon buceroides</i>	Helmeted friarbird	LC	D
Aves	<i>Philemon corniculatus</i>	Noisy friarbird	LC	A, D
Aves	<i>Platycercus adscitus</i>	Pale-headed rosella	LC	D
Aves	<i>Podargus strigoides</i>	Tawny frogmouth	LC	S
Aves	<i>Poephila cincta cincta</i>	Southern black-throated finch	E	I
Aves	<i>Poodytes gramineus</i>	Little grassbird	LC	D
Aves	<i>Ramsayornis modestus</i>	Brown-backed honeyeater	LC	D
Aves	<i>Rhipidura albiscapa</i>	Grey fantail	LC	D
Aves	<i>Rhipidura leucophrys</i>	Willie wagtail	LC	I
Aves	<i>Sericornis frontalis</i>	White-browed scrubwren	LC	D
Aves	<i>Strepera graculina</i>	Pied currawong	LC	A, I
Aves	<i>Taeniopygia bichenovii</i>	Double-barred finch	LC	D
Aves	<i>Threskiornis molucca</i>	Australian white ibis	LC	D, I, N
Aves	<i>Threskiornis spinicollis</i>	Straw-necked ibis	LC	D, I
Aves	<i>Todiramphus macleayii</i>	Forest kingfisher	LC	D
Aves	<i>Todiramphus sanctus</i>	Sacred kingfisher	LC	D
Aves	<i>Trichoglossus moluccanus</i>	Rainbow lorikeet	LC	A, D
Aves	<i>Vanellus miles</i>	Masked lapwing	LC	A, D, I
Aves	<i>Zosterops luteus</i>	Yellow white-eye	LC	D
Mammalia	<i>Bos taurus</i>	Domestic cattle	I	C, I, S
Mammalia	<i>Canis lupus</i>	Dog	R	C, S
Mammalia	<i>Capra hircus</i>	Domestic goat	I	S
Mammalia	<i>Chalinolobus nigrogriseus</i>	Hoary wattled bat	LC	A, I
Mammalia	<i>Felis catus</i>	Domestic cat	I	C, I
Mammalia	<i>Macropus giganteus</i>	Eastern grey kangaroo	LC	I
Mammalia	<i>Miniopterus orianae oceanensis</i>	Large bent-winged bat	LC	A
Mammalia	<i>Notamacropus agilis</i>	Agile wallaby	LC	C, I, S
Mammalia	<i>Ovis aries</i>	Domestic sheep	I	I
Mammalia	<i>Peramelidae spp.</i>	Bandicoot	LC	S
Mammalia	<i>Rattus sp.</i>	Rat	I	C
Mammalia	<i>Sus scrofa</i>	Feral pig	I	C
Mammalia	<i>Vespadelus pumilus</i>	Eastern forest bat	LC	A
Mammalia	<i>Vulpes vulpes</i>	Red fox	R	I



Class	Scientific name	Common name	Status	Source
Reptillia	<i>Acanthophis praelongus</i>	Northern death adder	LC	I
Reptillia	<i>Carlia pectoralis</i>	Open-Litter Rainbow-Skink	LC	I
Reptillia	<i>Demansia psammophis</i>	Yellow-faced whip snake	LC	I
Reptillia	<i>Dendrelaphis punctulatus</i>	Common green tree snake	LC	I
Reptillia	<i>Lampropholis delicata</i>	Garden skink	LC	I
Reptillia	<i>Pseudonaja textilis</i>	Eastern brown snake	LC	I
Reptillia	<i>Varanus varius</i>	Lace monitor	LC	I

Key for interpretation of fauna species observations.

Code	Observation source	Code	Species status
A	Audio observation	E	Endangered
C	Camera trap	I	Introduced species
D	Targeted diurnal surveys	LC	Least Concern
I	Incidental observation	R	Restricted matter
N	Spotlighting works	V	Vulnerable
S	Identified from traces	M	EPBC Act 1999 listed migratory species



Appendix D. Flora Likelihood of Occurrence Assessment



Family	Scientific Name	Common Name	EPBC Act Status	NC Act Status	Habitat	Likelihood of occurrence
Acanthaceae	<i>Graptophyllum excelsum</i>	Scarlet Fuchsia	-	NT	<i>Graptophyllum excelsum</i> occurs in semi-evergreen vine thickets, although near Chillagoe the species has also been recorded growing in grassy woodland in association with <i>Eucalyptus cullenii</i> and <i>Corymbia erythrophloia</i> . Other associated species include <i>Macropteranthes</i> sp., <i>Gyrocarpus americanus</i> , <i>Lysiphyllum hookeri</i> , <i>Acacia fasciculifera</i> , <i>Brachychiton australis</i> , <i>Polyscias elegans</i> , <i>Archidendropsis thozetiana</i> , <i>Gossia bidwillii</i> , <i>Alstonia constricta</i> , <i>Alyxia ruscifolia</i> and <i>Alchornea ilicifolia</i> .	Unlikely to occur. Ideal vine thicket habitat not found in impact area.
Rubiaceae	<i>Scleromitron polycladum</i>	-	-	NT	Occurs in NEQ and in the northern part of CEQ. Altitudinal range from 160-300 m. Grows along drainage lines in forest and vine thicket, occasionally in woodland.	Unlikely to occur. Ideal habitat not found in impact area, and outside altitudinal range.
Poaceae	<i>Dichanthium setosum</i>	Bluegrass	V	-	<i>Dichanthium setosum</i> is associated with heavy basaltic black soils and red-brown loams with clay subsoil. Associated species include White Box (<i>Eucalyptus albens</i>), Silver-leaved Ironbark (<i>Eucalyptus melanophloia</i>), Yellow Box (<i>Eucalyptus melliodora</i>), Manna Gum (<i>Eucalyptus viminalis</i>), Amulla (<i>Myoporum debile</i>), Purple Wire-grass (<i>Aristida ramosa</i>), Kangaroo Grass (<i>Themeda triandra</i>), Fine-leaved Tussock-grass (<i>Poa sieberiana</i>), Red-leg Grass (<i>Bothriochloa ambigua</i>), Pitted Blue-grass (<i>Bothriochloa decipiens</i>), Macrozamia stenomera, Small Woolly Burr-medic (<i>Medicago minima</i>), Scaly Buttons (<i>Leptorhynchos squamatus</i>), <i>Lomandra</i> aff. <i>longifolia</i> , Australian Bugle (<i>Ajuga australis</i>), Bogan-flea (<i>Calotis hispidula</i>) and <i>Austrodanthonia</i> spp., <i>Dichopogon</i> spp.,	Unlikely to occur. Whilst potential habitat and two associated species (<i>Themeda triandra</i> and <i>Bothriochloa decipiens</i>) were recorded by on-site surveys, the species has not been previously recorded within the proposed impact area or local surrounds.



Family	Scientific Name	Common Name	EPBC Act Status	NC Act Status	Habitat	Likelihood of occurrence
					<p><i>Brachyscome</i> spp., <i>Vittadinia</i> spp., <i>Wahlenbergia</i> spp. and <i>Psoralea</i> spp.</p> <p>Often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture. The species may tolerate or benefit from disturbance, otherwise, disturbance is indicative of threatening processes in its habitat,</p>	
Myrtaceae	<i>Eucalyptus raveretiana</i>	Black Ironbox	V	-	Eucalyptus raveretiana grows along watercourses and occasionally on river flats. It occurs in open forest or woodland communities. The species prefers sites with moderately fertile soil and adequate sub-soil moisture. The alluvial soils in which it grows are sands, loams, light clays or cracking clays.	<p>Unlikely to occur.</p> <p>Not previously recorded within the impact area and local surrounds. Potential habitat occurs within the proposed impact area.</p>
Apocynaceae	<i>Marsdenia brevifolia</i>	-	V	V	North of Rockhampton, M. brevifolia grows on serpentine rock outcrops or crumbly black soils derived from serpentine in eucalypt woodland, often with Broad-leaved Ironbark (<i>Eucalyptus fibrosa</i>) and <i>Corymbia xanthope</i> . At Hidden Valley near Paluma, plants grow in woodland on granite soils dominated by Granite Ironbark (<i>E. granitica</i>), Rustyjacket (<i>C. leichhardtii</i>) and White Mahogany (<i>E. acmenoides</i>). On Magnetic Island the species occurs in open forest on dark acid agglomerate soils dominated by Narrow-leaved Ironbark (<i>E. drepanophylla</i>).	<p>Unlikely to occur.</p> <p>Not previously recorded within the impact area and local surrounds. No potential habitat observed within the impact area and surrounds.</p>
Euphorbiaceae	<i>Omphalea celata</i>	-	V	V	Occurs in fragmented semi evergreen vine thicket or araucarian microphyll vine forest. Recorded along watercourses in steep sided gorges and gullies on weathered metamorphic or granitic soils. Associated species include	<p>Unlikely to occur.</p> <p>Not previously recorded within the impact area and local surrounds. Limited very marginal habitat present within the impact area and surrounds.</p>



Family	Scientific Name	Common Name	EPBC Act Status	NC Act Status	Habitat	Likelihood of occurrence
					<i>Eucalyptus raveretiana</i> , <i>E. tereticornis</i> , <i>Lysiphyllum hookeri</i> and <i>Ficus opposita</i> .	
Fabaceae	<i>Tephrosia leveillei</i> Syn. <i>Tephrosia flagellaris</i>	-	V	-	<p><i>Tephrosia leveillei</i> has been recorded include occurring within the following habitat;</p> <ul style="list-style-type: none"> Cullen's Ironbark (<i>Eucalyptus cullenii</i>) woodland on alluvial plains Gum-topped Bloodwood (<i>Corymbia erythrophloia</i>) and Cooktown Ironwood (<i>Erythrophleum chlorostachys</i>) woodland with Bushman's Clothes-peg (<i>Grevillea glauca</i>) <i>Eucalyptus</i> spp. and <i>Corymbia</i> spp. tall open forest over dense Bunch Spear-grass (<i>Heteropogon contortus</i>) on red sand. 	<p>Unlikely to occur.</p> <p>Not previously recorded within the impact area and local surrounds. Limited very marginal habitat present within the impact area and surrounds.</p>



Appendix E. Fauna Likelihood of Occurrence Assessment



Class	Family	Scientific Name	Common Name	EPBC Act Status	NC Act Status	Habitat	Likelihood of occurrence
Amphibia	Microhylidae	<i>Cophixalus mcdonaldi</i>	Mt Elliot Nursery-frog	CE	CE	Resides in subtropical or tropical moist lowland forests. Eggs laid in a small cluster under leaf litter and logs and guarded by the male. Tadpoles do not swim in water, rather they hatch from the egg as small frogs. Found in a small area called Bowling Green Bay National Park on Mt Elliott, south-east of Townsville in northern Queensland.	Unlikely to occur. No previous records within the locality. Species habitat (subtropical or tropical moist lowland forests) does not occur within the impact area.
Aves	Accipitridae	<i>Erythrotriorchis radiatus</i>	Red Goshawk	V	E	A wide ranging and highly mobile species generally observed over eucalypt habitats. This species prefers forest and woodland with a mosaic of vegetation types, large prey populations (birds) and permanent water. The vegetation types include eucalypt woodland, open forest, tall open forest, gallery rainforest, swamp sclerophyll forest and rainforest	Unlikely to occur. No previous records within the locality. Species habitat occurs within the impact area.
Aves	Apodidae	<i>Apus pacificus</i>	Fork-tailed swift	-	SL	The Fork-tailed Swift is almost exclusively aerial, flying from 1 m to at least 300 m above ground. In Australia, they mostly occur over inland plains but sometimes above foothills or in coastal areas. Often occur over cliffs and beaches and also over islands and sometimes well out to sea. They mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. They are also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-	Unlikely to occur. No previous records within the locality. Species habitat occurs within the impact area.



Class	Family	Scientific Name	Common Name	EPBC Act Status	NC Act Status	Habitat	Likelihood of occurrence
						dunes. The sometimes occur above rainforests, wet sclerophyll forest or open forest or plantations of pines They often occur in areas of updraughts, especially around cliffs. They probably roost aerially, but are occasionally observed to land and have been recorded roosting in trees, using a bare exposed branch emergent above the foliage.	
Aves	Columbidae	<i>Geophaps scripta scripta</i>	Squatter Pigeon (southern)	V	V	This species inhabits open grasslands and woodlands typically with a native understorey although may occur in artificial pasture.	Known. Three birds were incidentally recorded during the survey period. Previously recorded within the locality and habitat values occur within the proposed impact area.
Aves	Charadriidae	<i>Charadrius leschenaultii</i>	Greater Sand Plover	V	V	In the non-breeding grounds in Australasia, the species is almost entirely coastal, inhabiting littoral and estuarine habitats. They mainly occur on sheltered sandy, shelly or muddy beaches with large intertidal mudflats or sandbanks, as well as sandy estuarine lagoons, and inshore reefs, rock platforms, small rocky islands or sand cays on coral reefs. Occasionally recorded on near-coastal saltworks and saltlakes, including marginal saltmarsh, and on brackish swamps. They seldom occur at shallow freshwater wetlands.	Unlikely to occur. No previous records within the locality. Limited marginal habitat (freshwater wetland) occurs adjacent to the proposed impact area.
Aves	Charadriidae	<i>Pluvialis fulva</i>	Pacific golden plover	-	SL	In non-breeding grounds in Australia this species usually inhabits coastal habitats, though it occasionally occurs around	Unlikely to occur. Not previously recorded within the locality and



Class	Family	Scientific Name	Common Name	EPBC Act Status	NC Act Status	Habitat	Likelihood of occurrence
						inland wetlands. Pacific Golden Plovers usually occur on beaches, mudflats and sandflats in sheltered areas including harbours, estuaries and lagoons, and also in evaporation ponds in saltworks. Sometimes recorded on islands, sand and coral cays and exposed reefs and rocks. They are less often recorded in terrestrial habitats, usually wetlands such as fresh, brackish or saline lakes, billabongs, pools, swamps and wet claypans, especially those with muddy margins and often with submerged vegetation or short emergent grass. Other terrestrial habitats inhabited include short (or, occasionally, long) grass in paddocks, crops or airstrips, or ploughed or recently burnt areas, and they are very occasionally recorded well away from water	marginal habitat occurs within the proposed impact area.
Aves	Hirundinidae	<i>Hirundo rustica</i>	Barn Swallow	Migratory	SL	<p>This species seek out open habitats of all types, including agricultural areas, and are commonly found in barns or other outbuildings. They will also build nests under bridges, the eaves of old houses, and boat docks, as well as in rock caves and even on slow-moving trains.</p> <p>While migrating, they tend to fly over open areas, often near water or along mountain ridges.</p>	<p>Known.</p> <p>This species was observed on site during field assessment.</p>
Aves	Cuculidae	<i>Cuculus optatus</i>	Oriental cuckoo	Migratory	SL	Oriental Cuckoos are found in more humid habitats in wet eucalypt forests, river margins and near to mangroves.	<p>Likely to occur.</p> <p>This species was observed within riparian vegetation in the locality in March 2021.</p>



Class	Family	Scientific Name	Common Name	EPBC Act Status	NC Act Status	Habitat	Likelihood of occurrence
						This species visits Australia, particularly northern Australia in the winter and breeds exclusively overseas.	Limited riparian vegetation is available within the road alignment.
Aves	Estrildidae	<i>Poephila cincta cincta</i>	Black-throated finch (white-rumped subspecies)	E	E	The Black-throated Finch (southern) occurs mainly in grassy, open woodlands and forests, typically dominated by Eucalyptus, Corymbia and Melaleuca, and occasionally in tussock grasslands or other habitats (for example freshwater wetlands), often along or near watercourses, or in the vicinity of water. It occurs at two general locations: in the Townsville region, where it is considered to be locally common at a few sites around Townsville and Charters Towers; and at scattered sites in central-eastern Queensland (between Aramac and Great Basalt Wall National Park). It has been absent from Brisbane and its surrounds since the 1930s.	Known to occur. Species recorded adjacent to the alignment (2 individuals). Multiple species records within the locality. Species habitat values including essential habitat values occur within the proposed impact area.
Aves	Falconidae	<i>Falco hypoleucos</i>	Grey falcon	V	V	Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast. Also occurs near wetlands where surface water attracts prey. Preys primarily on birds, especially parrots and pigeons, using high-speed chases and stoops; reptiles and mammals are also taken. Like other falcons it utilises old nests of other birds of prey and ravens, usually high in a living eucalypt near water or a watercourse; peak laying season is in late winter and early spring; two or three	Unlikely to occur. No species records within the locality. Potential habitat is present within the proposed impact area and surrounds.



Class	Family	Scientific Name	Common Name	EPBC Act Status	NC Act Status	Habitat	Likelihood of occurrence
						eggs are laid. 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>).	
Aves	Laridae	<i>Gelochelidon nilotica</i>	Gull-billed tern	-	SL	Inhabits shallow wetlands, including coastal or inland lakes, swamps and lagoons, as well as sheltered bays and estuaries, where it forages for insects and small fish.	Unlikely to occur. Species previously recorded within the locality however ideal habitat is not present within the subject area and surrounds.
Aves	Laridae	<i>Hydroprogne caspia</i>	Caspian tern	-	SL	Found mostly in sheltered coastal embayments (harbours, lagoons, inlets, bays, estuaries and river deltas) and those with sandy or muddy margins are preferred. Also occur on near-coastal or inland terrestrial wetlands that are either fresh or saline, especially lakes (including ephemeral lakes), waterholes, reservoirs, rivers and creeks. They also use artificial wetlands, including reservoirs, sewage ponds and saltworks. In offshore areas the species prefers sheltered situations, particularly near islands, and is rarely seen beyond reefs Large numbers may shelter along the coast, behind coastal sand-dunes or coastal lakes during rough weather, and have been recorded inland after storms.	Unlikely to occur. Species previously recorded within the locality. Potential habitat is present within the locality but not the road alignment.
Aves	Monarchidae	<i>Monarcha melanopsis</i>	Black-faced monarch	Marine Migratory	SL	The Black-faced Monarch mainly occurs in rainforest ecosystems, including semi-deciduous vine-thickets, complex notophyll vine-forest, tropical (mesophyll)	Known. Species recorded from incidental sightings.



Class	Family	Scientific Name	Common Name	EPBC Act Status	NC Act Status	Habitat	Likelihood of occurrence
						<p>rainforest, subtropical (notophyll) rainforest, mesophyll (broadleaf) thicket/shrubland, warm temperate rainforest, dry (monsoon) rainforest and (occasionally) cool temperate rainforest.</p> <p>The species also occurs in selectively logged and 20—30 years old regrowth rainforest, nearby open eucalypt forests, especially in gullies with a dense, shrubby understorey as well as in dry sclerophyll forests and woodlands, often with a patchy understorey. The species especially occurs in 'marginal' habitats during winter or during passage (migration)</p> <p>Other areas in which the Black-faced Monarch may be found include: gullies in mountain areas or coastal foothills softwood scrub dominated by Brigalow, coastal scrub dominated by Coast Banksia (<i>Banksia integrifolia</i>) and Southern Mahogany (<i>Eucalyptus botryoides</i>), occasionally among mangroves and sometimes in suburban parks and gardens.</p>	Species previously recorded within the locality and marginal potential habitat is present within the subject area.
Aves	Monarchidae	<i>Symposiachrus trivirgatus</i>	Spectacled monarch	-	SL	Prefers thick understorey in rainforests, wet gullies and waterside vegetation, as well as mangroves and other densely vegetated areas.	Unlikely to occur. Species previously recorded within the locality, however ideal habitat is limited within the project area.
Aves	Ploceidae	<i>Neochmia ruficauda ruficauda</i>	Star Finch (eastern)	E	E	The Star Finch (eastern) occurs mainly in grasslands and grassy woodlands that are located close to bodies of fresh water,	Unlikely to occur. Suitable grassland habitat is present within the project



Class	Family	Scientific Name	Common Name	EPBC Act Status	NC Act Status	Habitat	Likelihood of occurrence
						including areas dominated by grasses where the native vegetation has been partially cleared. The species also occurs in cleared or suburban areas such as along roadsides and in towns	area, however no previous species records within the locality.
Aves	Rhipiduridae	<i>Rhipidura rufifrons</i>	Rufous fantail	-	SL	In east and south-east Australia, the Rufous Fantail mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts, usually with a dense shrubby understorey often including ferns. They also occur in subtropical and temperate rainforests. They occasionally occur in secondary regrowth, following logging or disturbance in forests or rainforests. When on passage, they are sometimes recorded in drier sclerophyll forests and woodlands, often with a shrubby or heath understorey. They are also recorded from parks and gardens when on passage. In north and north-east Australia, they often occur in tropical rainforest and monsoon rainforests, including semi-evergreen mesophyll vine forests, semi-deciduous vine thickets or thickets of Paperbarks.	Unlikely to occur. Species previously recorded within the locality; however ideal habitat is not present within the project area.
Aves	Rostratulidae	<i>Rostratula australis</i>	Australian Painted Snipe	E	E	The Australian Painted Snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Typical sites include those with rank emergent tussocks of grass, sedges,	Unlikely to occur. Species not previously recorded within the locality and marginal potential habitat is present within the subject area.



Class	Family	Scientific Name	Common Name	EPBC Act Status	NC Act Status	Habitat	Likelihood of occurrence
						rushes or reeds, or samphire; often with scattered clumps of lignum <i>Muehlenbeckia</i> or canegrass or sometimes tea-tree (<i>Melaleuca</i>). The Australian Painted Snipe sometimes utilises areas that are lined with trees, or that have some scattered fallen or washed-up timber	
Aves	Scolopacidae	<i>Calidris ferruginea</i>	Curlew Sandpiper	CE Migratory	CE	Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. In Queensland, scattered records occur in the Gulf of Carpentaria, with widespread records along the coast south of Cairns.	Unlikely to occur. Species not previously recorded within the locality. Potential habitat (dams) are present within the immediate area but not the road alignment.
Aves	Scolopacidae	<i>Gallinago hardwickii</i>	Latham's snipe	-	SL	In Australia, Latham's Snipe occurs in permanent and ephemeral wetlands up to 2000 m above sea-level. They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies. However, they can also occur in habitats with saline or brackish water, in modified or artificial habitats, and in habitats located close to humans or human activity	Unlikely to occur. Species previously recorded within the locality; species habitat values are present within the immediate area but not the road alignment.



Class	Family	Scientific Name	Common Name	EPBC Act Status	NC Act Status	Habitat	Likelihood of occurrence
Aves	Scolopacidae	<i>Numenius madagascariensis</i>	Eastern Curlew	CE	E	The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbors, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. The birds are often recorded among saltmarsh and on mudflats fringed by mangroves, and sometimes use the mangroves. The birds are also found in saltworks and sewage farms.	Unlikely to occur. Species not previously recorded within the locality. Species habitat (coastal, saltmarsh or other saline or brackish waterway or wetland areas) does not occur within the impact area.
Aves	Threskiornithidae	<i>Plegadis falcinellus</i>	Glossy ibis	Migratory Marine	SL	The Glossy Ibis' preferred habitat for foraging and breeding are fresh water marshes at the edges of lakes and rivers, lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation. The species is occasionally found in coastal locations such as estuaries, deltas, saltmarshes and coastal lagoons.	Unlikely to occur. Species previously recorded within the locality; species habitat values are present within the immediate area but not the road alignment.
Aves	Tytonidae	<i>Tyto novaehollandiae kimberli</i>	Masked Owl (northern)	V	V	In northern Australia, the Masked Owl has been recorded from riparian forest, rainforest, open forest, Melaleuca swamps and the edges of mangroves, as well as along the margins of sugar cane fields.	Unlikely to occur. Species not recorded within the locality. Species habitat values do not occur within the proposed impact area.
Aves	Apodidae	<i>Hirundapus caudacutus</i>	White-throated Needletail	V	V	Almost exclusively aerial. Most often recorded above wooded areas, including open forest and rainforest, also commonly occur over heathland.	Unlikely to occur. Species not previously recorded within the locality. Mostly aerial however potential habitat present



Class	Family	Scientific Name	Common Name	EPBC Act Status	NC Act Status	Habitat	Likelihood of occurrence
							within the proposed impact area.
Mammalia	Phascolarctidae	<i>Phascolarctos cinereus</i>	Koala	E	E	Open forest and woodland where food trees are present.	Unlikely to occur. Species not recorded within the locality, however species habitat values do occur within portions of the proposed impact area.
Mammalia	Dasyuridae	<i>Dasyurus hallucatus</i>	Northern Quoll	E	-	The Northern Quoll occupies a diversity of habitats across its range which includes rocky areas, eucalypt forests and woodlands, rainforests, sandy lowlands and beaches, shrubland, grassland and desert. Northern Quoll habitat generally encompasses some form of rocky area for denning purposes with surrounding vegetated habitats used for foraging and dispersal. Eucalypt forest or woodland habitats usually have a high structural diversity containing large diameter trees, termite mounds or hollow logs for denning purposes.	Unlikely to occur. Species not recorded within the locality, and limited species habitat values occur within the proposed impact area.
Mammalia	Emballonuridae	<i>Saccolaimus saccolaimus nudicluniatus</i>	Bare-rumped Sheath-tailed Bat	V	E	The Bare-rumped sheath-tail bat occurs mostly in lowland areas, typically in a range of woodland, forest and open environments. The Bare-rumped sheath-tail bat has been suggested to forage over habitat edges such as the edge of rainforest and in forest clearings.	Likely to occur. Species recorded within the locality by EMM 2021 surveys. Potential species habitat values occur within the proposed impact area, including potential roosting hollows within the road alignment.
Mammalia	Megadermatidae	<i>Macroderma gigas</i>	Ghost Bat	V	E	Ghost Bat roost in caves, old mine tunnels and in deep cracks in rocks. A preference is given to sites with a complex of shafts	Unlikely to occur. Species not recorded within the locality. No suitable



Class	Family	Scientific Name	Common Name	EPBC Act Status	NC Act Status	Habitat	Likelihood of occurrence
						or cavities and several openings to the outside. They usually roost in colonies. Built environments may be used as feeding grounds	roosting habitat was located within the proposed impact area.
Reptillia	Scincidae	<i>Egernia rugosa</i>	Yakka skink	V	V	The Yakka Skink is known to occur in open dry sclerophyll forest, woodland and scrub. Commonly found in cavities under and between partly buried rocks, logs or tree stumps, root cavities and abandoned animal burrows. The species often takes refuge in large hollow logs and has been known to excavate deep burrow systems, sometimes under dense ground vegetation in cleared habitat, this species can persist where there are shelter sites such as raked log piles, deep gullies, tunnel erosion/sinkholes and rabbit warrens. This species is not generally found in trees or rocky habitats	Unlikely to occur. No previous records of the species within the locality. Proposed impact area contains marginal habitat.



Appendix F. MHQA Habitat scoring parameters for each species



Attribute		Scoring System				
		5	10	15	20	25
Bare-rumped Shearwater						
Quality and Availability of Food and Foraging Habitat						
Presence of mature remnant woodland	Absent	No remnant on or adjacent to site	Adjacent to site only	Remnant vegetation in which suitable old growth trees are a component	Undisturbed old remnant growth dominated by suitable trees	
Quality and Availability of Shelter and Breeding Habitat						
Abundance of preferred tree species (Eucalyptus platyphylla or Melaleuca leucadendra)	Absent	1 or 2	3 or 4	5 to 8	9 or greater	
Presence of deep hollows	Absent	1	2	3 or 4	5 or greater	
Quality and Availability Habitat for Mobility						
Connectivity between suitable habitats	Absent	Low	Medium	High	Very High	
Absence of threats						
Exotic weed dominance	Very High	High	Medium	Low	Absent	
Southern Black-throated Finch						
Quality and Availability of Food and Foraging Habitat						
Abundance of preferable grass species	Absent	Present at less than 10% coverage	10% to 25% coverage	25% to 75% coverage	Greater than 75% coverage	
Species richness of preferable food grasses	Absent	1 or 2	3 or 4	5 or greater with only annual species present	6 or greater with annual and perennial species present	
Mosaic of bare ground and grass cover	No Bare Ground, or, 100% weed cover	Less than 5%, or, greater than 85% bare ground cover	Between 5% and 15%, or, between 70% and 85% bare ground cover	Between 15% and 20%, or, between 60% and 70% bare ground cover	Between 20% and 60% bare ground cover	
Quality and Availability of Shelter and Breeding Habitat						
Abundance of preferable nesting tree species	Absent	<i>E. platyphylla</i> , <i>C. tessellaris</i> or <i>C. dallachiana</i> cover 0 – 5%, <i>M. viridiflora</i> canopy < 3 m	<i>E. platyphylla</i> , <i>C. tessellaris</i> or <i>C. dallachiana</i> cover 5 – 15% or > 50%, <i>M. viridiflora</i> canopy 3 - 5 m	<i>E. platyphylla</i> , <i>C. tessellaris</i> or <i>C. dallachiana</i> cover 15 – 20% or 30 - 50%, <i>M. viridiflora</i> canopy 5 - 6 m	<i>E. platyphylla</i> , <i>C. tessellaris</i> or <i>C. dallachiana</i> cover 20 – 30% with hollows, and/or mature <i>M. viridiflora</i> canopy (>6 m) present	Within 200m of a watersource available during breeding season
Distance to water	Greater than 1.5km	1-1.5km	400m-1km of a watersource available during breeding season	200m-400m of a watersource available during breeding season		
Quality and Availability Habitat for Mobility						
Coverage of shrub species, including native and introduced species	Greater than 70% abundance	50% to 70% abundance	30% to 50% abundance	10% to 30% abundance	less than 10% abundance	
Presence of open grassy woodland vegetation structure	Absent	Present with significant degradation understorey and canopy layer	Present with suitable grassland species, but significant degradation of canopy layer	Present with suitable open woodland canopy cover, but low species diversity in grass layer	High quality open woodland with low shrub density	
Absence of threats						
Reduction in water availability	Very High	High	Medium	Low	Absent	
Intensive grazing regimes	Very High	High	Medium	Low	Absent	
Risk of fire	Very High	High	Medium	Low	Absent	
Exotic weed dominance	Very High	High	Medium	Low	Absent	
Koala						
Quality and Availability of Food and Foraging Habitat						
Species Richness of locally preferred food trees	Absent	1	2	3	4 or greater	
Abundance of locally preferred	Absent	1 to 25	26 to 50	51 to 75	Greater than 75	
Quality and Availability of Shelter and Breeding Habitat						
Species richness of Koala habitat trees	Absent	1	2	3	4 or greater	
Abundance of non-juvenile koala habitat trees	Absent	1 to 25	26 to 50	51 to 75	Greater than 75	
Quality and Availability Habitat for Mobility						
Connectivity between suitable habitats	Absent	Low	Medium	High	Very High	
Absence of threats						
Dog attack	Very High	High	Medium	Low	Absent	
Vehicle strike	Very High	High	Medium	Low	Absent	
Bushfire	Very High	High	Medium	Low	Absent	
Drought	Very High	High	Medium	Low	Absent	
Southern Squatter Pidgeon						
Quality and Availability of Food and Foraging Habitat						
Abundance of preferable grass species	Absent	Present at less than 10% coverage	10% to 25% coverage	25% to 75% coverage	Greater than 75% coverage	
Quality and Availability of Shelter and Breeding Habitat						
Mosaic of bare ground and grass cover	No Bare Ground, or, 100% weed cover	Less than 5%, or, greater than 85% bare ground cover	Between 5% and 15%, or, between 70% and 85% bare ground cover	Between 15% and 20%, or, between 60% and 70% bare ground cover	Between 20% and 60% bare ground cover	
Distance to water	Greater than 1.5km	1-1.5km	400m-1km of a watersource available during breeding season	200m-400m of a watersource available during breeding season	Within 200m of a watersource available during breeding season	
Quality and Availability Habitat for Mobility						
Connectivity between suitable habitats	Absent	Low	Medium	High	Very High	
Absence of threats						
Predator attack	Very High	High	Medium	Low	Absent	
Habitat loss and fragmentation	Very High	High	Medium	Low	Absent	
Exotic weeds	Very High	High	Medium	Low	Absent	
Overgrazing	Very High	High	Medium	Low	Absent	
Painted Snipe						
Quality and Availability of Food and Foraging Habitat						
Abundance of preferable grass species	Absent	Present at less than 10% coverage	10% to 25% coverage	25% to 75% coverage	Greater than 75% coverage	
Coverage of rank wetland	Less than 10%	Between 10% and 50%	Between 50% and 75%	Between 75% and 90%	Greater than 90%	

Scores for attributes within each of the four categories for foraging habitat, shelter, Mobility and Threats were averaged and converted to a score out of 25 for each category

Quality and Availability of Shelter and Breeding Habitat					
Coverage of rank wetland	Less than 10%	Between 10% and 50%	Between 50% and 75%	Between 75% and 90%	Greater than 90%
Quality and Availability Habitat for Mobility					
Connectivity between suitable habitats	Absent	Low	Medium	High	Very High
Absence of threats					
Reduction in water availability	Very High	High	Medium	Low	Absent

Appendix G. Modified Habitat Quality Assessment Survey Data and Findings



NIHR Supplementary Table 1			
	Source	Q1	Q3
May source populations for breeding	Source	20	100
	NI	100	100
May source populations for dispersal	Source	20	100
	NI	100	100
Necessary for maintaining genetic diversity	Source	20	100
	NI	100	100
Meet the level of the species range	Source	20	100
	NI	100	100

	Measurement 1 - 2006			Measurement 2 - 2008		
	2006	2007	2008	2006	2007	2008
Final habitat quality score (weighted)						
Use Condition score (mid of 3)	0.86	0.61	0.76	1.57	0.79	1.26
Structure Condition Score (mid of 3)	1.06	0.63	0.76	0.96	0.43	0.70
Shrub Condition Score (mid of 3)	0.96	0.54	0.76	0.96	0.43	0.70
Grass Condition Score (mid of 3)	0.96	0.54	0.76	0.96	0.43	0.70
Overall Quality score (mid of 30)	0.92	0.58	0.76	0.86	0.63	0.86
Measurement 1 score (mid of 30) in disturbance hotspot	0.62	0.3	0.62	0.74	0.3	0.6
Measurement 2 score (mid of 30) in disturbance hotspot	0.62	0.3	0.62	0.74	0.3	0.6
Total impact score (mid of 30) for this MMS	0.62	0.3	0.62	0.74	0.3	0.6
Use Weighting	0.62	0.3	0.62	0.74	0.3	0.6
Structure Weighting	0.62	0.3	0.62	0.74	0.3	0.6
Shrub Weighting	0.62	0.3	0.62	0.74	0.3	0.6
Grass Weighting	0.62	0.3	0.62	0.74	0.3	0.6

Appendix H. Southern squatter pigeon, *Geophaps scripta scripta* habitat maps



Plan 5A: Habitat Map - Squatter Pigeon (southern)



Legend

Known Species Records within 100 km (ALA and Wildnet)

QPM sightings

Evolve sightings (Oct 2022)

Evolve sightings (Feb 2023)

LEIP Enabling Infrastructure R9

Squatter pigeon habitat mapping

Evolve

Breeding

Foraging

Dispersal

N

0 62.5125 250 375 500 625 m

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator



Issue	Date	Description	Drawn	Checked
A	28/02/2023	Preliminary	AL	AH

Lansdown Eco-Industrial Precinct

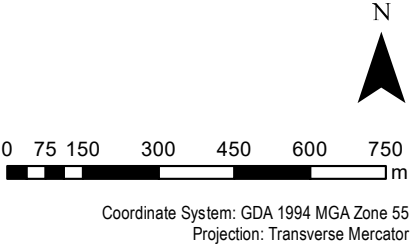
Date: 28/02/2023
Plan 2A SP habitat Lansdown C

Plan 5B: Habitat Map - Squatter Pigeon (southern)



- Legend**
- Known Species Records within 100 km (ALA and Wildnet)
 - QPM sightings
 - Evolve sightings (Oct 2022)
 - Evolve sightings (Feb 2023)
 - LEIP Enabling Infrastructure R9

- Squatter pigeon habitat mapping (Evolve)
- Breeding
 - Foraging
 - Dispersal

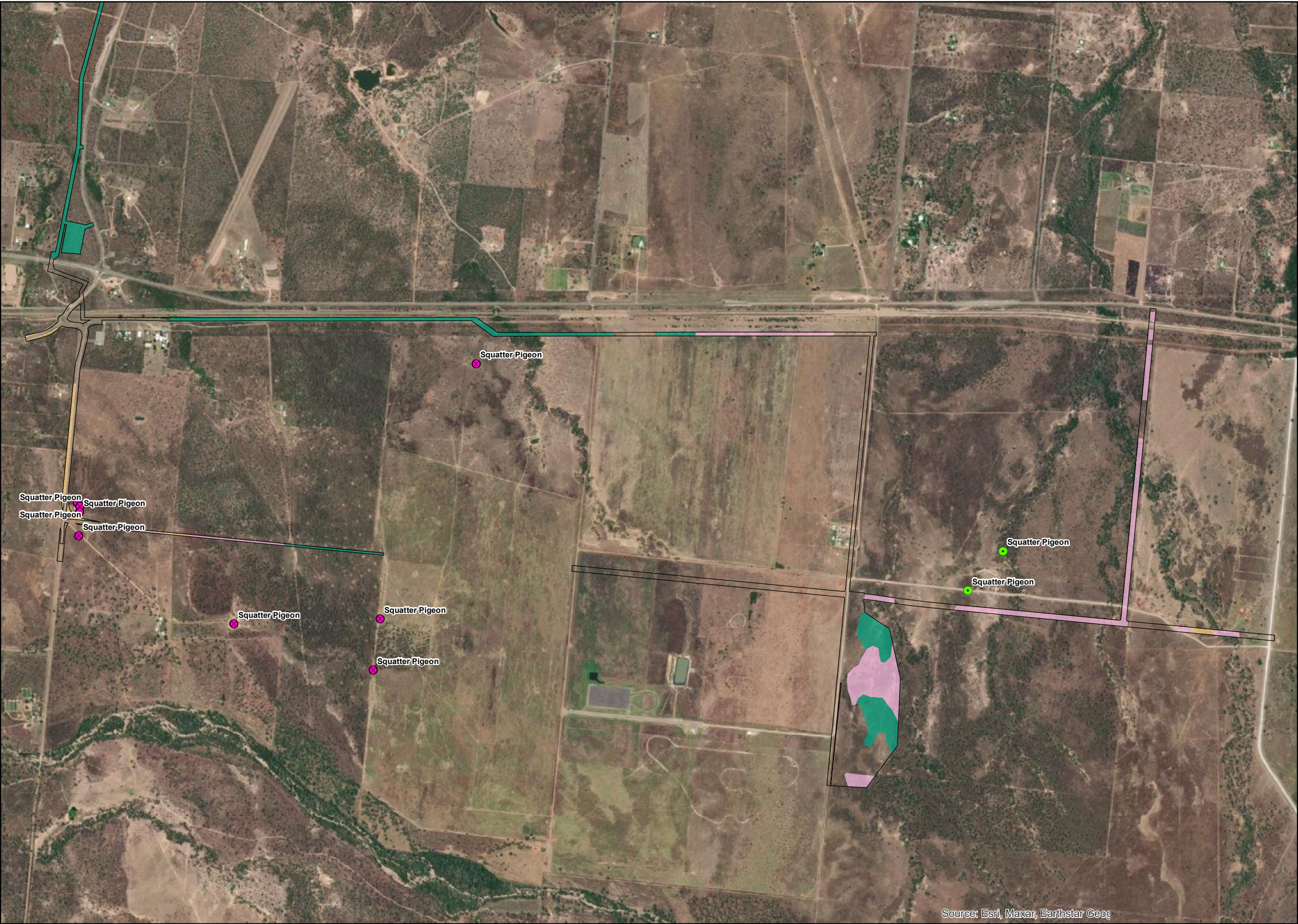


Issue	Date	Description	Drawn	Checked
A	28/02/2023	Preliminary	AL	AH

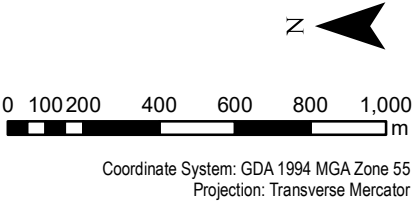
Lansdown Eco-Industrial Precinct

Date: 28/02/2023
Plan 2B SP habitat Lansdown C

Plan 5C: Habitat Map - Squatter Pigeon (southern)



- Legend**
- Known Species Records within 100 km (ALA and Wildnet)
 - QPM sightings
 - Evolve sightings (Oct 2022)
 - Evolve sightings (Feb 2023)
 - LEIP Enabling Infrastructure (Previous DA Removed)
 - Breeding
 - Foraging
 - Dispersal



Source: Esri, Maxar, Earthstar Geog



Issue	Date	Description	Drawn	Checked
A	26/04/2023	Preliminary	AL	AH

Lansdown Eco-Industrial Precinct

Date: 26/04/2023
Plan 2C SP habitat Lansdown C

Appendix I. Southern black-throated finch, *Poephila cincta cincta* habitat maps



Plan 6A: Habitat Map - Black-throated Finch (southern)



Legend

Known Species Records within 100 km (ALA and Wildnet)

QPM sightings

Evolve sightings (Oct 2022)

Evolve sightings (Feb 2023)

LEIP Enabling Infrastructure R9

Black-throated Finch habitat mapping (Evolve)

Breeding and Foraging

Foraging

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

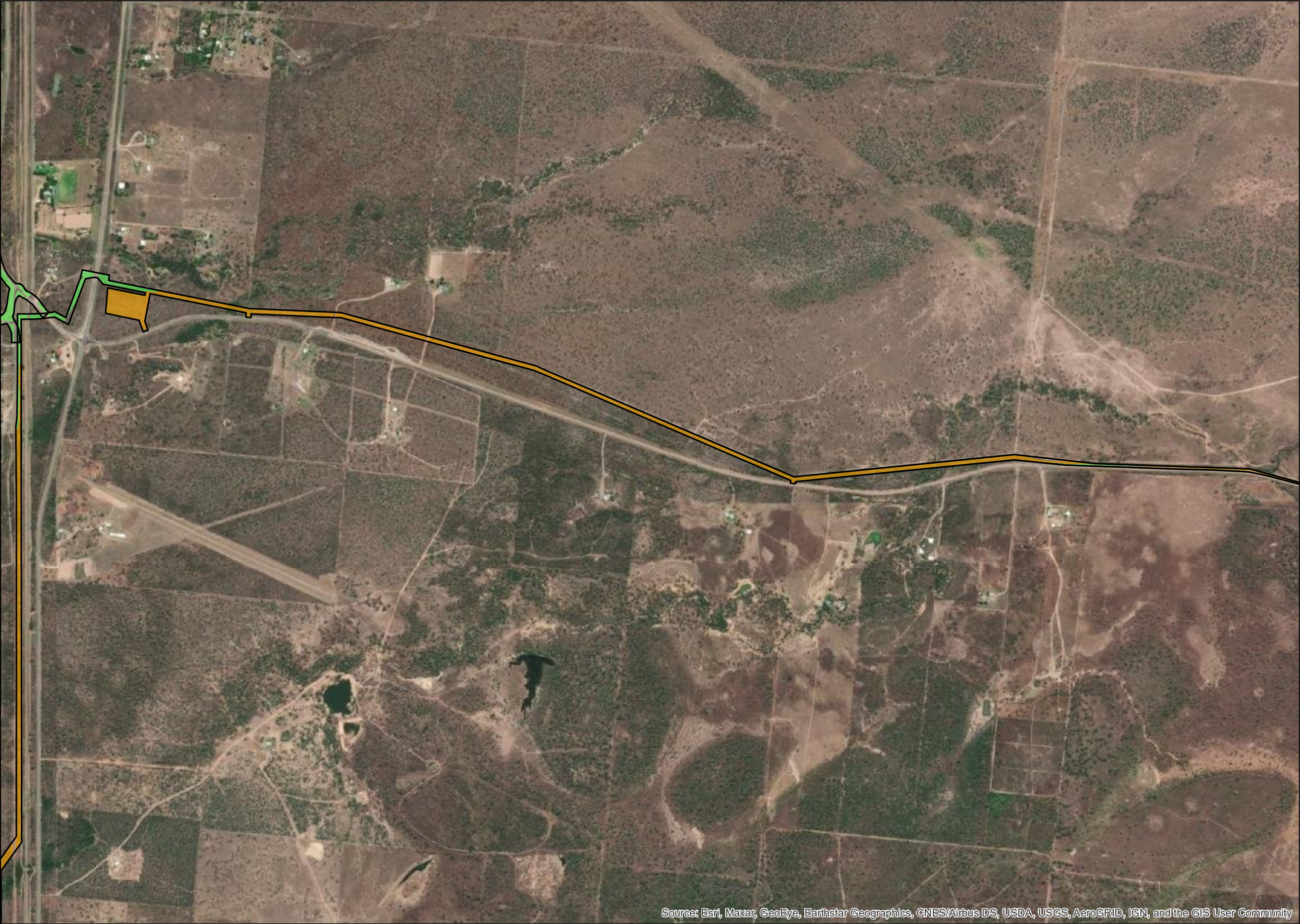


Issue	Date	Description	Drawn	Checked
A	28/02/2023	Preliminary	AL	AH

Lansdown Eco-Industrial Precinct

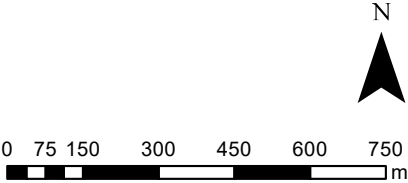
Date: 28/02/2023
Plan 1A BTF habitat Lansdown C

Plan 6B: Habitat Map - Black-throated Finch (southern)



- Legend**
- Known Species Records within 100 km (ALA and Wildnet)
 - QPM sightings
 - Evolve sightings (Oct 2022)
 - Evolve sightings (Feb 2023)
 - LEIP Enabling Infrastructure R9

- Black-throated Finch habitat mapping (Evolve)
- Breeding and Foraging
 - Foraging



Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

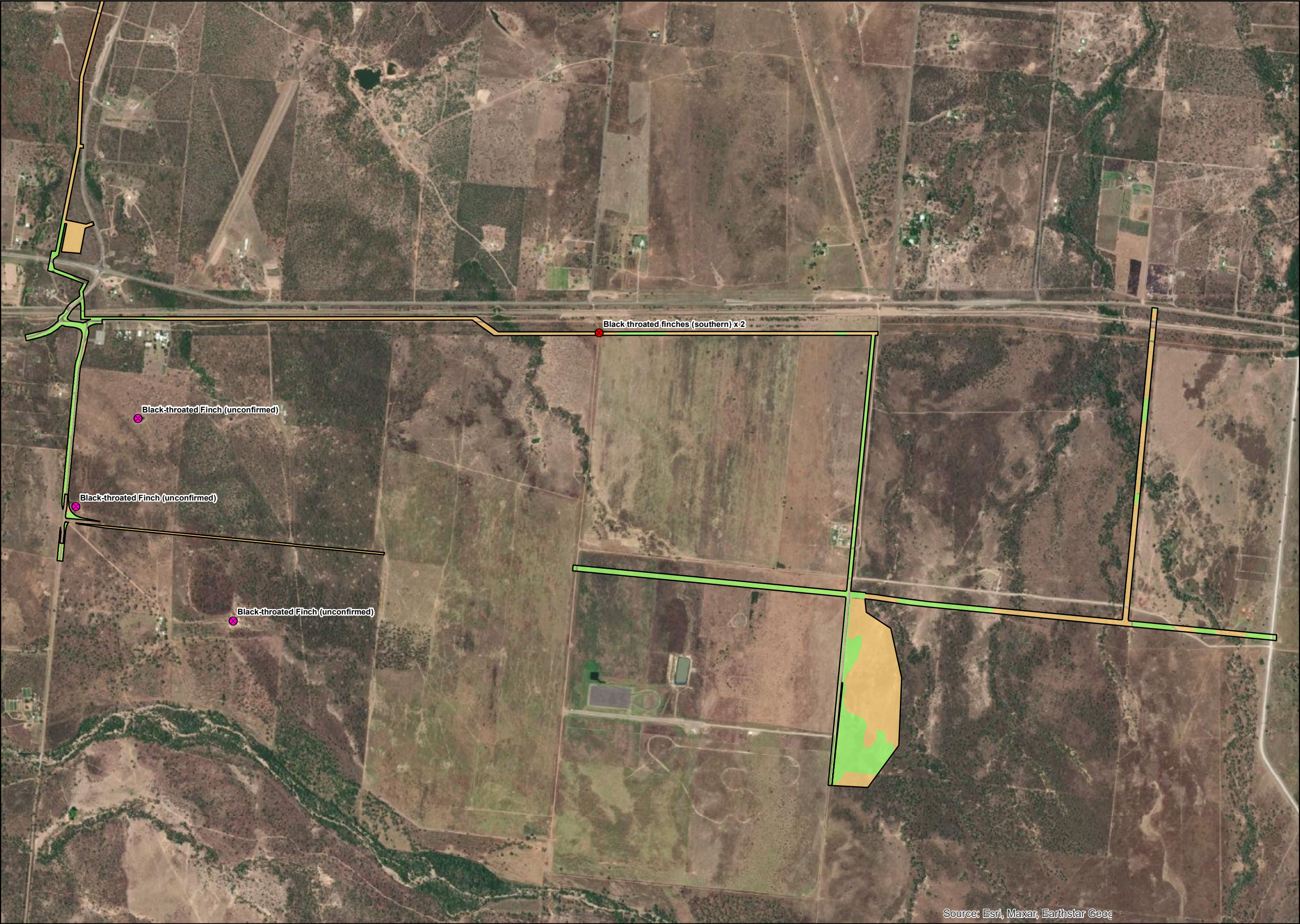


Issue	Date	Description	Drawn	Checked
A	28/02/2023	Preliminary	AL	AH

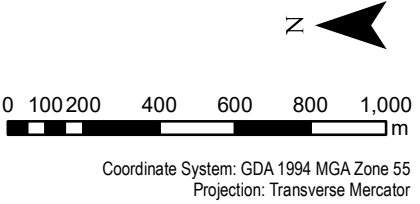
Lansdown Eco-Industrial Precinct

Date: 28/02/2023
Plan 1B BTF habitat Lansdown C

Plan 6C: Habitat Map - Black-throated Finch (southern)



- Legend**
- Known Species Records within 100 km (ALA and Wildnet)
 - QPM sightings
 - Evolve sightings (Oct 2022)
 - Evolve sightings (Feb 2023)
 - LEIP Enabling Infrastructure (Previous DA Removed)
 - Breeding and Foraging
 - Foraging



Source: Esri, Maxar, Earthstar Geog



Issue	Date	Description	Drawn	Checked
A	26/04/2023	Preliminary	AL	AH

Lansdown Eco-Industrial Precinct

Date: 26/04/2023
Plan 1C BTF habitat Lansdown C

Appendix J. Bare-rumped sheath-tail bat,
Saccolaimus saccolaimus nudicluniatatus habitat
maps



Plan 7A: Habitat Map - Bare-rumped Sheathtail Bat



Legend

Known Species Records within 100 km (ALA and Wildnet)

QPM sightings

Evolve sightings (Oct 2022)

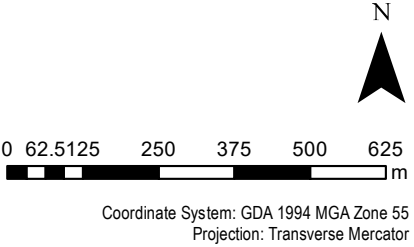
Evolve sightings (Feb 2023)

LEIP Enabling Infrastructure R9

Bare-rumped Sheathtail Bat habitat mapping (Evolve)

Roosting (see arrows for locations)

Foraging



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

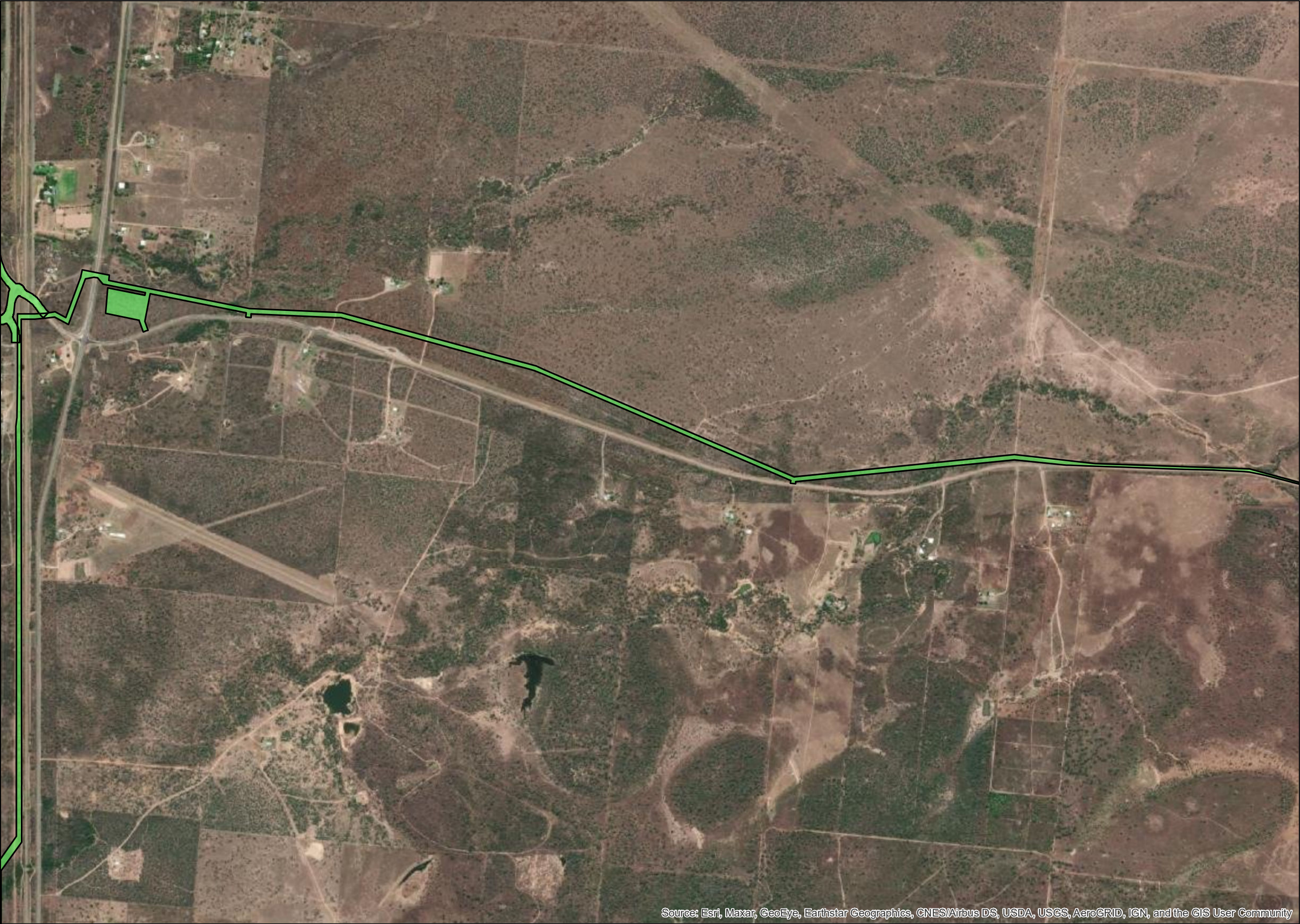


Issue	Date	Description	Drawn	Checked
A	28/02/2023	Preliminary	AL	AH

Lansdown Eco-Industrial Precinct

Date: 28/02/2023
Plan 8A BRBS habitat Lansdown C

Plan 7B: Habitat Map - Bare-rumped Sheathtail Bat

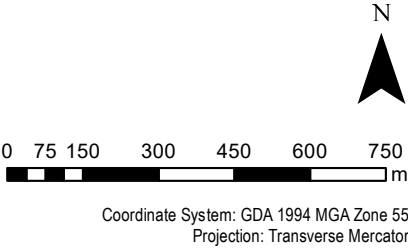


Legend

- Known Species Records within 100 km (ALA and Wildnet)
- QPM sightings
- Evolve sightings (Oct 2022)
- Evolve sightings (Feb 2023)
- LEIP Enabling Infrastructure R9

Bare-rumped Sheathtail Bat habitat mapping (Evolve)

- Roosting (see arrows for locations)
- Foraging

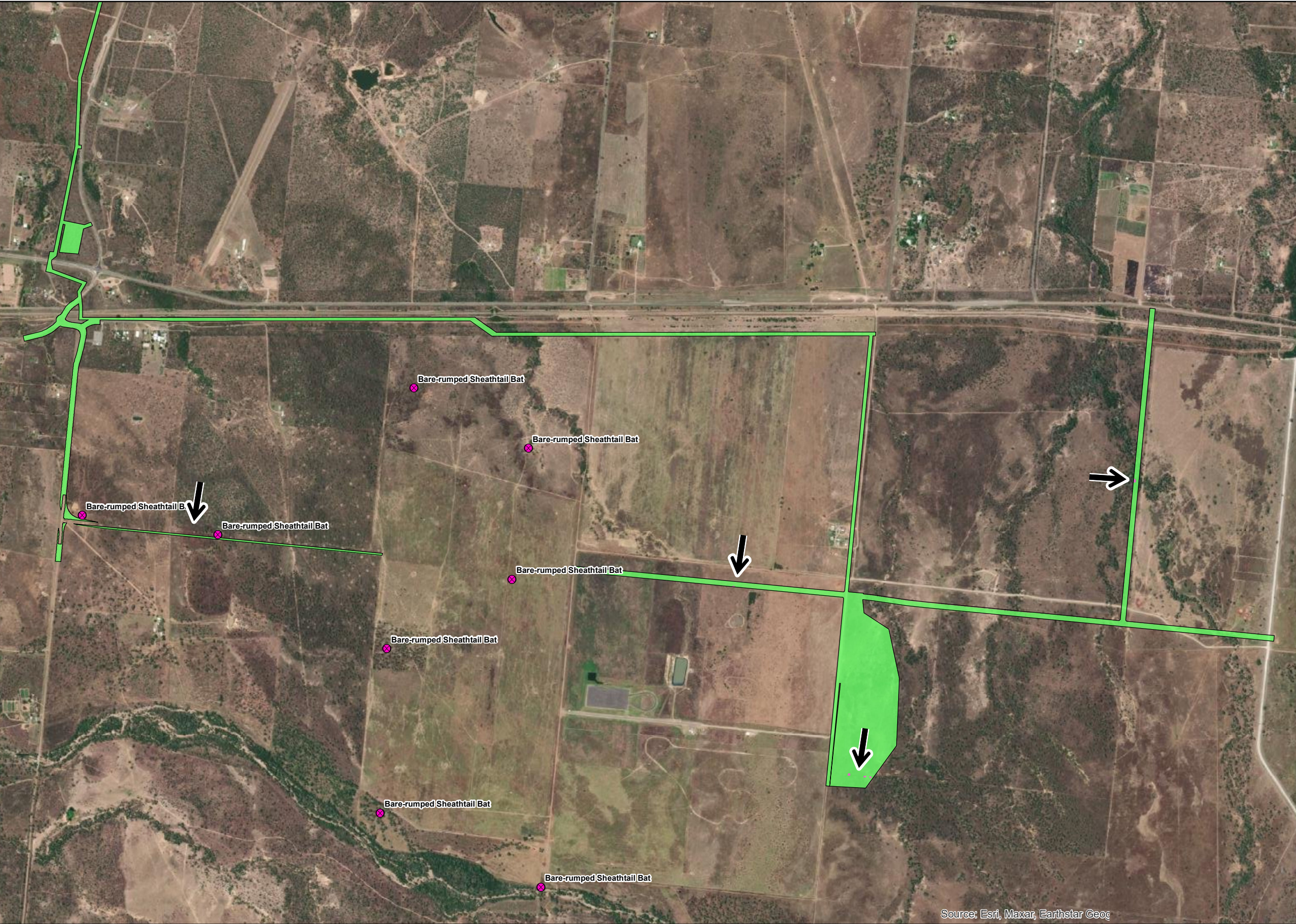


Issue	Date	Description	Drawn	Checked
A	28/02/2023	Preliminary	AL	AH

Lansdown Eco-Industrial Precinct

Date: 28/02/2023
Plan 8B BRBS habitat Lansdown C

Plan 7C: Habitat Map - Bare-rumped Sheathtail Bat



- Legend**
- Known Species Records within 100 km (ALA and Wildnet)
 - QPM sightings
 - Evolve sightings (Oct 2022)
 - Evolve sightings (Feb 2023)
 - LEIP Enabling Infrastructure (Previous DA Removed)
 - Roosting (see arrows for locations)
 - Foraging



Issue	Date	Description	Drawn	Checked
A	26/04/2023	Preliminary	AL	AH

Lansdown Eco-Industrial Precinct

Date: 26/04/2023
Plan 8C BRBS habitat Lansdown C

Appendix K. Koala, *Phascolarctos cinereus* habitat maps



Plan 8A: Habitat Map - Koala



Legend

Known Species Records within 100 km (ALA and Wildnet)

QPM sightings

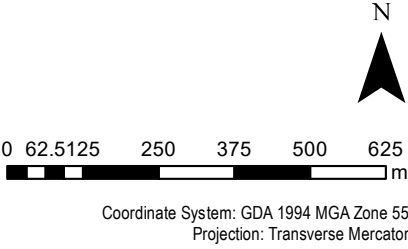
Evolve sightings (Oct 2022)

Evolve sightings (Feb 2023)

LEIP Enabling Infrastructure R9

Koala habitat mapping (Evolve)

Habitat



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

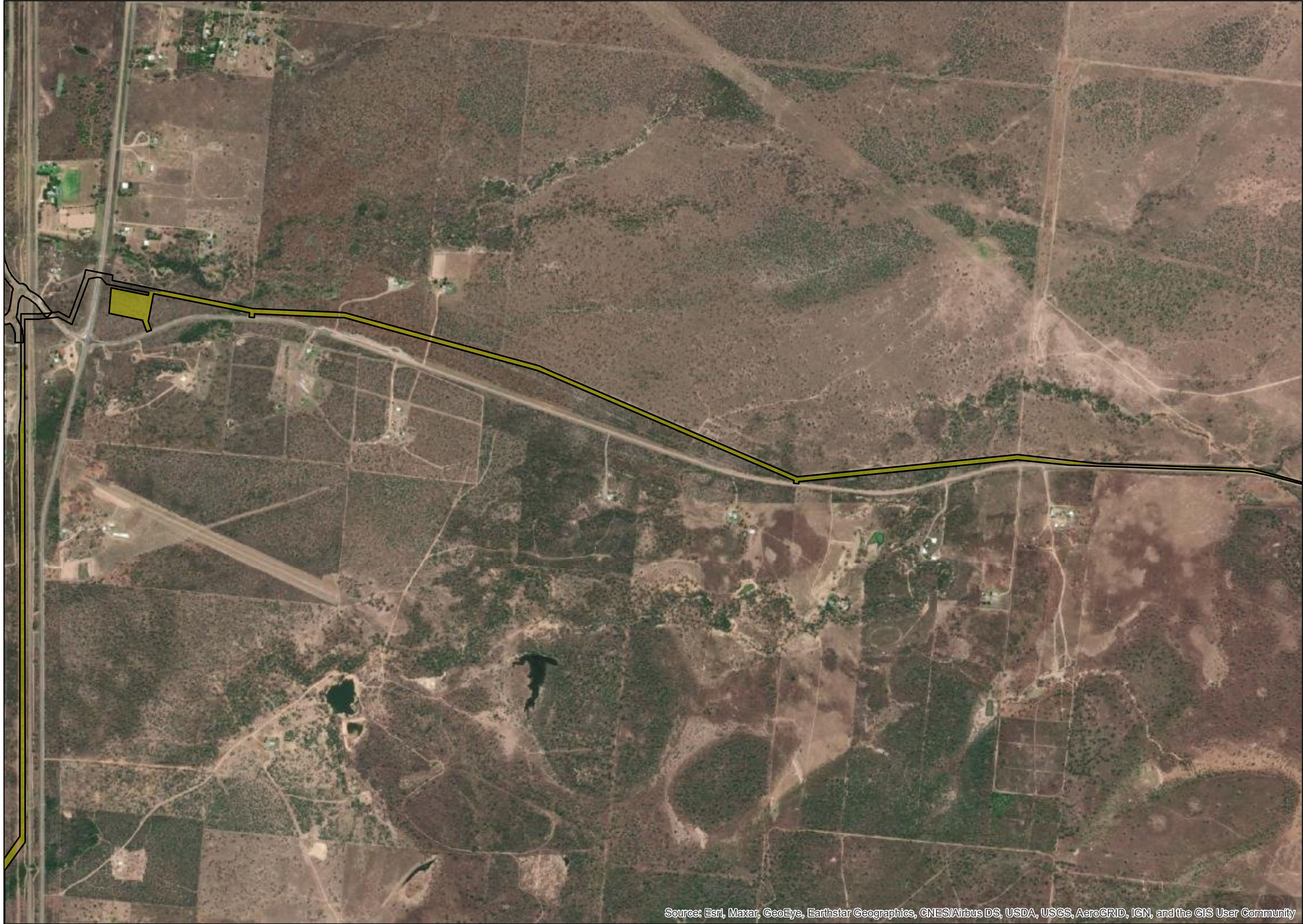


Issue	Date	Description	Drawn	Checked
A	28/02/2023	Preliminary	AL	AH

Lansdown Eco-Industrial Precinct

Date: 28/02/2023
Plan 3A Koala habitat Lansdown C

Plan 8B: Habitat Map - Koala



Legend

- Known Species Records within 100 km (ALA and Wildnet)
- QPM sightings
- Evolve sightings (Oct 2022)
- Evolve sightings (Feb 2023)
- LEIP Enabling Infrastructure R9
- Koala habitat mapping (Evolve)
- Habitat

0 75 150 300 450 600 750 m

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Issue	Date	Description	Drawn	Checked
A	28/02/2023	Preliminary	AL	AH

Lansdown Eco-Industrial Precinct

Date: 28/02/2023
Plan 3B Koala habitat Lansdown C

Plan 8C: Habitat Map - Koala



Legend

Known Species Records within 100 km (ALA and Wildnet)

QPM sightings

Evolve sightings (Oct 2022)

Evolve sightings (Feb 2023)

LEIP Enabling Infrastructure (Previous DA Removed)

Koala Habitat

N

0

100

200

400

600

800

1,000

m

Coordinate System: GDA 1994 MGA Zone 55

Projection: Transverse Mercator

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Issue	Date	Description	Drawn	Checked
A	26/04/2023	Preliminary	AL	AH

Lansdown Eco-Industrial Precinct

Date: 26/04/2023
Plan 3C Koala habitat Lansdown C

Appendix L. Australian Painted Snipe, *Rostratula australis* habitat maps



Plan 9A: Habitat Map - Australian Painted Snipe



Legend

Known Species Records within 100 km (ALA and Wildnet)

QPM sightings

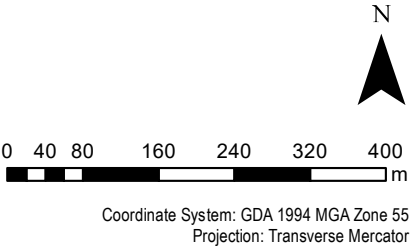
Evolve sightings (Oct 2022)

Evolve sightings (Feb 2023)

LEIP Enabling Infrastructure R9

Australian Painted Snipe habitat mapping (Evolve)

Foraging



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Issue	Date	Description	Drawn	Checked
A	28/02/2023	Preliminary	AL	AH

Lansdown Eco-Industrial Precinct

Date: 28/02/2023
Plan 6A APS habitat Lansdown C