



**Central Queensland Coal Project
Appendix 9c – Threatened Fauna
Investigation – Deep Creek**

Central Queensland Coal

CQC SEIS, Version 3

October 2020

Threatened Fauna Investigations - Deep Creek, Central Queensland

Central Queensland Coal Project

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1. Introduction

1.1. Background and Purpose

Central Queensland Coal Pty Ltd and Fairway Coal Pty Ltd, both wholly-owned subsidiaries of Mineralogy Pty Ltd, are the proponents for development of a greenfield open-cut coal mine and associated project infrastructure within the Styx Basin, in central eastern Queensland. The project would involve the extraction of up to ten million tonnes per annum (Mtpa) of product thermal and coking coal for the export market over a life of 20 years. The project also includes development of a train loadout facility.

The proposed mine is located within the southern part of the Styx Basin, approximately 130 kilometres north-west of Rockhampton and approximately 25 km north-west of Marlborough. The proposed project is to be located within Mining Lease Applications 80187 and 700022, covering an area of 3,028 hectares.

The proposed project was determined to be a controlled action (EPBC 2016/7851) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*¹ (hitherto referred to as the EPBC Act). The project is being assessed under the bilateral agreement between the Commonwealth and the State of Queensland (section 45 of the EPBC Act).

The proponent has prepared an Environmental Impact Statement (November 2017), a Supplementary Environmental Impact Statement (May 2018), and an Amended Supplementary Environmental Impact Statement (December 2018) for the proposed project under the *Environmental Protection Act 1994*.

This report provides information to address issues raised by the Queensland Department of Environment and Science (DES) in regard to survey adequacy for threatened fauna within the section of Deep Creek downstream of the Bruce Highway, including the area relevant to the proposed haul road crossing of Deep Creek. For this investigation, particular attention has been directed to surveying for, and assessing habitat values for, the Koala *Phascolarctos cinereus* and Greater Glider *Petauroides volans*². Additional survey work for both species appeared warranted and a more comprehensive understanding of their distribution considered highly relevant in regard to future impact assessments and potential mitigation in regard to the in regard to the proposed haul road crossing of Deep Creek.

Microbat call detection surveys and assessments of fauna more generally were implemented to compliment previous site work and improve an understanding of the distribution and extent of fauna within the Deep Creek area.

1.2. Terminology, Nomenclature and Acronyms

The **study site** is located within Mining Lease Applications 80187 and 700022 (the **project area**). The project area is centred on ‘Mamelon Station’, a grazing property intersected by the Bruce Highway, 25 km north of Marlborough³. The train loading facility servicing the proposed mine is located on the adjoining ‘Strathmuir’ property⁴, while a section of the haul road to the train loading facility is located on the ‘Brussels’ property⁵.

¹ The controlling provision relevant to this report are sections 18 and 18A (listed threatened species and communities).

² Both species were also identified in the DEE (2018) and DES (2019a) report as relevant to the area (**Attachment C**).

³ ‘Mamelon’ property described as real property Lot 9 on CP MC496, Lot 10 on CP MC493, Lot 11 on CP MC23 and leasehold interest RL 35/3001 over Lot 1 on CP RL3001, is currently owned by QNI Metals Pty Ltd. The total area of Mamelon is 60.5 km².

⁴ The “Strathmuir” property, described as real property Lot 9 on MC230.

⁵ The “Brussels” property described as real property Lot 85 on SP164785.the covering an area of 3,028 hectares.

The **surrounding area** refers generally to the lands within approximately 100km of the study site, including the townships of Ogmore to the north and Marlborough in the south.

Nomenclature used for this study follows Bostock & Holland (2010) for flora, Van Dyck and Strahan (2008) for non-flying mammals, Churchill (2008) and Reardon *et al.* (2008) for bats, Christidis and Boles (2008) for birds, Cogger (2000) for amphibians, and Wilson (2009) for reptiles. The common names for frogs follow the nomenclature of Ingram *et al.* (1993).

The **conservation status** of a species is described in accordance with the Commonwealth EPBCA (e.g. *Endangered, Vulnerable, or Migratory*) and, for completeness where relevant, the Queensland *Nature Conservation Act 1992* (NCA) and its regulations and amendments (e.g. *Endangered, Vulnerable, Regionally Vulnerable, Near Threatened*⁶ or *Least Concern*).

The definition of a **Regional Ecosystem** (RE) follows that provided by Sattler and Williams (1999), *i.e.*, a vegetation community in a bioregion that is consistently associated with a particular combination of geology, landform and soil. This definition forms the basis of the Queensland *Vegetation Management Act 1999* (VMA⁷), which also defines the '*pre-clearing extent*' of a regional ecosystem as the extent of the regional ecosystem before it was cleared. *Regrowth vegetation* means woody vegetation that is not remnant as defined under the VMA.

The conservation status (under the VMA) of REs follows that of the Regional Ecosystem Description Database (REDD) published and maintained by Queensland Herbarium (2018). Each RE is assigned status under the VMA as *Endangered, Of Concern* or *Least Concern*. The status of all REs mapped for Queensland is provided in the VMA Vegetation Management Regulation 2000 (VMR): VMR Schedule 1 - *Endangered* Regional Ecosystems; VMR Schedule 2 - *Of Concern* Regional Ecosystems; and VMR Schedule 3 - *Least Concern* Regional Ecosystems.

Acronyms and Terms used in this report are provided in **Tables 1-1 and 1-2**.

⁶ Previous reports referred to in this report have included reference to *Rare* species. This conservation status was superseded by the status *Near Threatened* with the introduction of the *Nature Conservation (Wildlife) Amendment Regulation (No. 1) 2010*.

⁷ Under the VMA, remnant vegetation is defined as 'vegetation that had at least 70% of the height and 50% of the cover of the dominant stratum, relative to the undisturbed height and cover of that stratum and was dominated by species characteristic of the vegetation's undisturbed canopy' (Wilson *et al.* 2002). Only vegetation that falls within this definition is mapped as a regional ecosystem in Queensland. Mapped regional ecosystems thus include 'vegetation that has not been cleared or has been lightly thinned or vegetation that has been cleared or heavily thinned but substantially regrown' (Wilson *et al.* 2002).

Table 1-1 Report Acronyms

Acronym	Name, Term or Expression
ALA	Atlas of Living Australia
ANZECC	Australian and New Zealand Environment and Conservation Council
BPA	Biodiversity Planning Assessment
BoM	Bureau of Meteorology (Queensland)
DAF	Queensland Department of Agriculture and Fisheries
DE	Former Commonwealth Department of the Environment
DEE	Commonwealth Department of the Environment and Energy
DEHP	Former Queensland Department of Environment and Heritage Protection
DERM	Former Queensland Department of Environment and Resource Management
DES	Queensland Department of Environment and Science
DEWHA	Former Commonwealth Department of Environment, Water, Heritage and the Arts
BBR	Brigalow Belt Bioregion
EHP	Queensland Department of Environment and Heritage Protection
EIS	Environment Impact Statement
EMP	Environmental Management Plan
EPBCA	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
Ha	Hectares
Km	Kilometre
LPA	Queensland <i>Land Protection (Pest and Stock Route Management) Act 2002</i>
LPR	Queensland <i>Land Protection (Pest and Stock Route Management) Regulation 2002</i>
ML	Mining Lease
MNES	Matter of National Environmental Significance (as defined under the EPBCA)
MSES	Matter of State Environmental Significance (as defined under the NCA)
NCA	Queensland <i>Nature Conservation Act 1992</i>
RE	Regional Ecosystem (as defined under the VMA)
REDD	Regional Ecosystem Description Database
SEWPaC	Former Commonwealth Department of Sustainability, Environment, Water, Population & Communities
SEIS	Supplementary Environment Impact Statement
sp.	Species (singular)
spp.	Species (plural)
SPP	State Planning Policy
VMA	Queensland <i>Vegetation Management Act 1999</i>
WoN	Weed of National Significance as listed by the Australian Weeds Committee 2012

Table 1-2 Selected Report Terms

Term	Description
Carrying capacity	The maximum population size of the species that an environment can sustain indefinitely, given the availability of food, habitat, water, and other important resources (e.g., nest and shelter sites). In population biology, carrying capacity is defined as the maximum number of animals (of one or more species) an area of habitat can support in the long-term (after Hui 2006).
Declared plant	Refers to a species declared under the Queensland LPR.
Ecology	The totality or pattern of relations between organisms and their environment. Note that ecology is the study and the science of the interrelations between living organisms and their environment. The term ecology is now frequently misused, usually as "the ecology", when what is meant is a particular ecosystem, a set of ecosystems or the environment.
Ecosystem	A community of living things and the non-living environment functioning together as a system - an ecological system.
Ecosystem resilience	The capacity of an ecosystem to cope with disturbances, such as drought, fire or grazing, without shifting into a qualitatively different state.
Endemic	Native to a particular area and found nowhere else in the wild.
Environmental weed	Refers to any plant that survives in a natural area where its presence is undesirable, harmful or troublesome to native biodiversity.
Invasive species	A species spreading beyond its accepted normal distribution and which threatens valued environmental, agricultural or personal resources by the disruption it causes.
Threatened	A common use term to collectively describe species listed as Critically Endangered, Endangered or Vulnerable species under Commonwealth EPBCA and/or the Queensland VCA.
Threatened ecological community	A threatened ecological community (TEC) is a naturally occurring ecological community listed under section 181 of the Environment Protection and Biodiversity Conservation Act 1999. Categories for listing TECs under the EPBCA are: critically endangered; endangered; or vulnerable.

2. Project Area and Study Site Characteristics

2.1. Project Area

The project area is located approximately 25 km north-west of Marlborough, about 23 kilometres inland from the central Queensland coast. The project area is bisected by the Bruce Highway and a railway line transects the eastern most part of the project area (**Figure 2-1**).

The project area is representative of the wider region and landscape with over 79% of the project area cleared and currently mapped as non-remnant (CDM Smith 2018). Cattle grazing remains the dominant land use within the project area and surrounding lands. Remnant vegetation is largely confined to the south and western portions of the project area (CDM Smith 2018). The majority of remnant vegetation within the project area comprises communities listed as *Of Concern* and *Least Concern* under the VMA (CDM Smith 2018).

The majority of the project area lies within the Styx River catchment, east of the Connors and Broadsound Ranges. The Styx River and its tributaries (including Deep, Barrack, and Tooloombah Creeks) flow into the Broad Sound, to the north-east of the project area.

The project area lies within the Marlborough Plains subregion of the Brigalow Belt North bioregion. Vegetation within the Marlborough Plains subregion is dominated by alluvial plains and colluvial slopes, usually supporting eucalypt woodlands to open forests characterised by Poplar Gum *Eucalyptus platyphylla*, Ghost Gum *Corymbia dallachiana*, Forest Red Gum *Eucalyptus tereticornis*, and paperbarks (*Melaleuca spp.*) with low rises supporting Narrow-leaved Ironbark *Eucalyptus crebra* (DES 2018).

DES (2018) describes two areas of special fauna biodiversity value, one to the north-east and the other to the west of the project area. The *Torilla Plain and Broadsound* is located approximately 20 km downstream of the project area. This area is regarded as a nationally important wetland system which supports substantial populations of waterbirds, including migratory shorebirds (DES 2018).

The *Southern Connors / Broadsound Range* is located approximately 20 km west of the project area. DES (2018) notes that the *Southern Connors / Broadsound Range* supports a high density and size range of hollow-bearing trees which are an important feature of this area for both the Greater Glider *Petauroides volans* and Yellow-bellied Glider *Petaurus australis*. Other threatened or priority taxa⁸ include the Squatter Pigeon *Geophaps s. scripta* and Koala *Phascolarctos cinereus*.

2.2. Study Site

The study site is located within the eastern part of the project area (**Figure 2-1**) and includes:

- areas of riparian vegetation along a 6.5 km section of Deep Creek downstream of the Bruce Highway through to its confluence with Surveyor's Creek (app. 150 ha),
- riparian vegetation along Surveyor's Creek (app. 32 ha); and
- riparian vegetation at the confluence of Barrack Creek and Deep Creek, 2.5 km downstream of the Bruce Highway.

Patches of remnant woodland adjacent to the upstream (app. 22 ha) and central sections of Deep Creek (app. 50 ha) were also included in the study area given their proximity to Deep Creek and potential habitat

⁸ Priority taxa are non-EVNT species that are considered to be of particular conservation significance in the bioregion. The rationale for inclusion is based upon the eligibility criteria described in DES (2018).

suitability for the target species (i.e., the Koala and Great Glider) (**Figure 2-1**). In total, the study site covered an area of approximately 255 ha.

Deep, Surveyor's and Barrack Creeks are all regarded as non-perennial and were largely dry at the time when surveys were undertaken in November 2019. Both Deep and Barrack's Creeks are mapped as wildlife corridors of regional importance (DES 2019a & b; **Attachment D**).

Both outlines of the project area and the study site are shown on **Figure 2-1**.

2.3. Previous Fauna Surveys and Habitat Assessments of Deep Creek

Figure 2-2 describes the locations of a variety of fauna survey activities associated with Deep Creek and near surrounds which contributed to the previous EIS and SEIS for the project. Survey effort and activities for other parts of the project area are described in CDM Smith (2018).

The project area has been subject to a variety of fauna assessments since 2011, including:

1. A fauna assessment of (Exploration Permit for Coal [EPC] 1029) was carried out under summer-season conditions over five days in March 2011 (Meyer 2011a). A wide variety of methodologies were used to sample the diversity of fauna potentially present. EPC 1029 included the project area and study site.
2. A fauna assessment of EPC 1029 was also carried out under early spring (dry season) over five days in September 2011 (Meyer 2011b). Again, a wide variety of standardised and non-standardised methodologies were employed to sample a diversity of fauna potentially present. EPC 1029 included the project area and study site.
3. The fauna surveys in February 2012 used a variety of survey methods designed to target conservation significant fauna species (listed under NCA and/or EPBCA) throughout EPC 1029 (Meyer 2012). EPC 1029 included the project area and study site.
4. A baseline fauna assessment program focusing on the project area and staged throughout 2017 (CDM Smith 2018). The project area includes the study site.
5. A series of surveys throughout the project area in 2018 using a variety of survey methods designed to target threatened fauna species (listed under NCA and/or EPBCA) (CDM Smith 2018). The project area includes the study site.

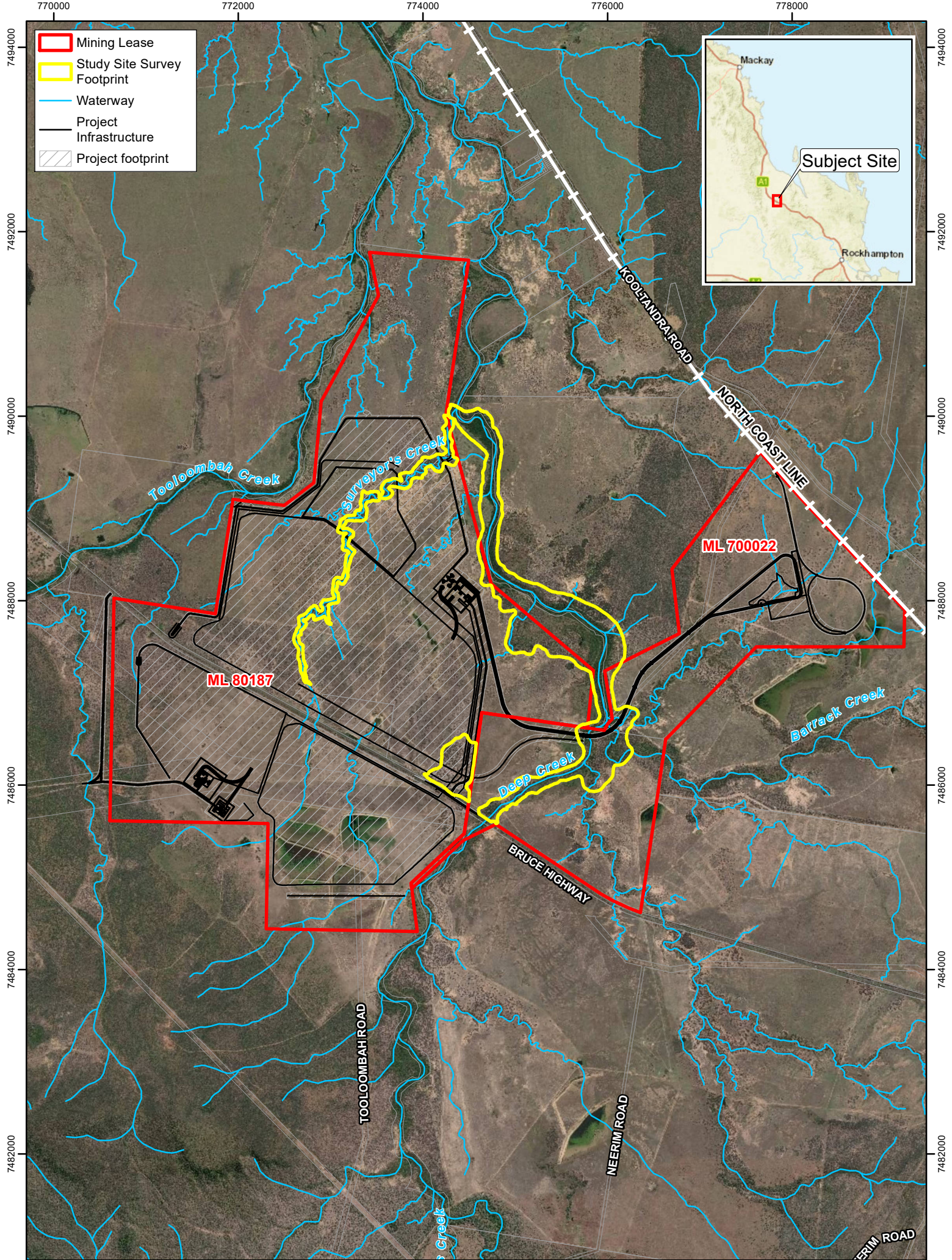
Various components of the abovementioned suite of fauna survey programs are relevant to Deep Creek and near surrounds (see **Figure 2-2**). These include:

- Systematic fauna survey site - including trapping (Elliot Type A & B box traps, pitfall traps, & funnel traps), bird surveys, diurnal ground searches for herpetofauna, spotlight searches, microbat call detection surveys, camera trapping, and call playback – three locations.
- Microbat call detection surveys –approximately 20 detector-nights - five locations.
- Call playback surveys – four locations.
- Diurnal ground search site – one location.
- Fauna habitat assessments – seven locations.
- Remote camera surveys - approximately 30 camera-nights - three locations.
- Vehicle-based spotlight searches - approximately nine survey kilometres.

The suite of locations and variety of methodologies employed provide a useful basis to consider the distribution and extent of fauna in the Deep Creek area.

Given the reporting structure of the SEIS, it is not possible to collate a complete fauna species list that has resulted from the above-mentioned survey activities. Those results which can be confidently attributed to work within the Deep Creek area, have been collated and are presented in **Attachment A**.

That review provides a total of 61 native fauna species for the Deep Creek area, i.e. comprising 13 mammal species, eight reptile species, seven frog species, and 33 bird species.



STYX COAL PROJECT

Source:
 DCDs: DNRME 2019
 Mining Leases: DNRME 2019
 Waterway: DNRME 2016
 Imagery: DigitalGlobe 2016

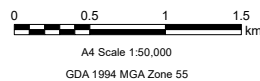


Figure 2-1:
 Study Site and Project Area

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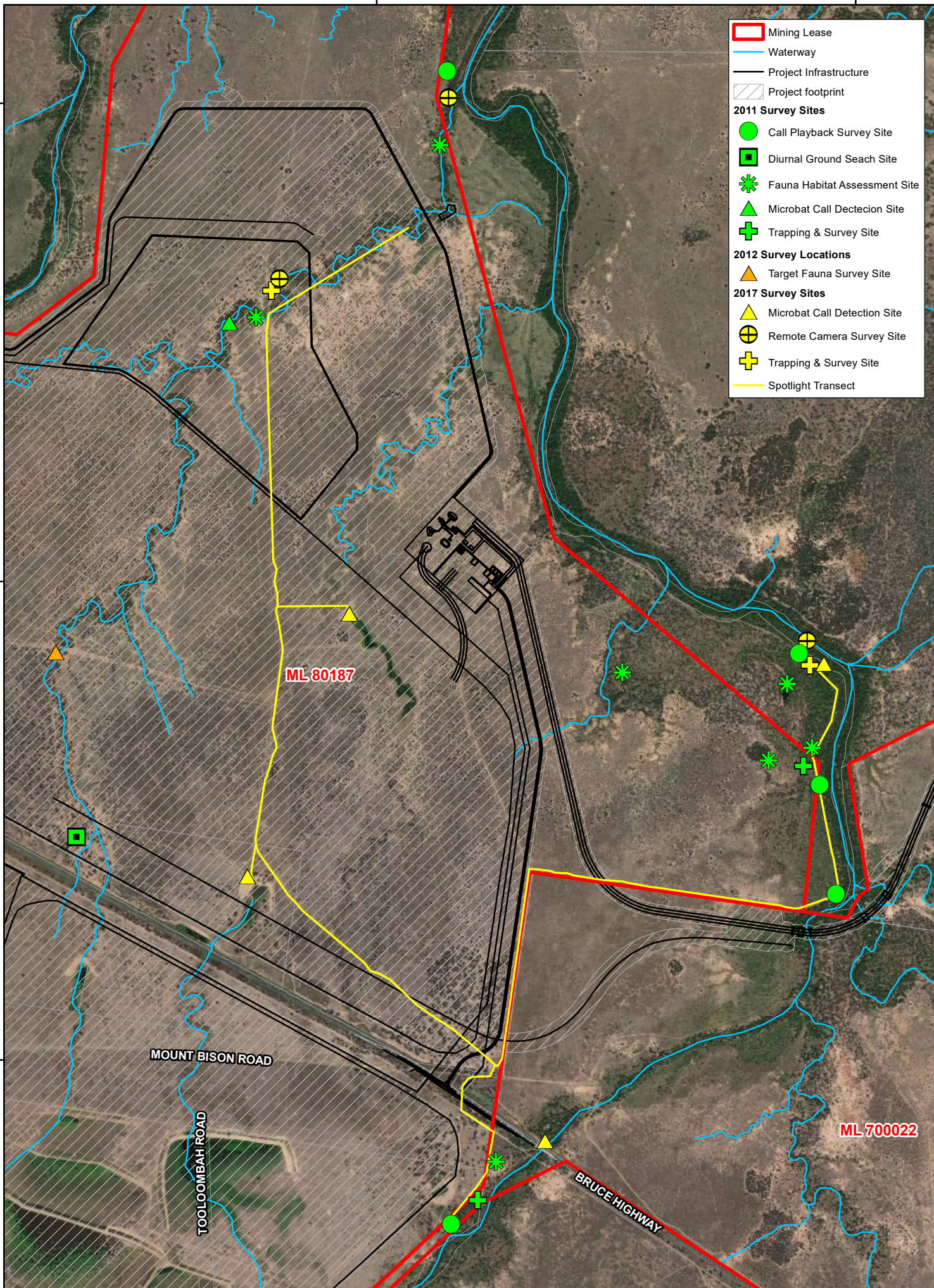
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STYX COAL PROJECT

Source:
 DCDS: DNRME 2019
 Mining Leases: DNRME 2019
 Waterway: DNRME 2016
 Surveys: CDM Smith 2018

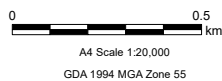


Figure 2-2:
 Fauna Survey Locations
 2011 to 2017

3. Methodology

3.1. Existing Information Reviews

There have been a wide variety of vertebrate fauna surveys implemented across the project area and its near surrounds since 2010. These surveys have included a strong focus on implementing targeted survey methodologies for threatened fauna (Meyer 2011a; Meyer 2011b; Meyer 2012; and CDM Smith 2018).

Field work has been implemented under both dry and wet season conditions to address seasonal variation in species' abundance and detectability⁹, has been widespread to account for representation of a diversity of vegetation communities and habitat types, and has included a variety of methodologies to target conservation significant species.

In regard to threatened fauna, the design and implementation of the field survey work undertaken across the project area is considered to be consistent with the survey guidelines as provided in DEWHA (2010a & b), BBRW (2010), SEWPaC (2011a, b, & c), and Eyre *et al.* (2012).

These project-related reports were reviewed and authors consulted in regard to information of relevance to the current focus of investigation for this report.

To provide additional information on threatened species, a variety of databases were queried, and various reports and studies reviewed. These investigations included:

- An interrogation of the Wildlife Online database (DSITIA 2019) was based on a wide variety of search area buffers (i.e. 1, 2, 3, 4, 5, 10, 20, 30, 50, 75, and 100km) from the centre of the project area¹⁰;
- Searches of the Wildlife Online database (DSITIA 2019) for threatened fauna records within protected areas and forestry areas within the surrounding area, being: Tooloombah Creek Conservation Area; Bukkulla Conservation Park; Mount Buffalo State Forest; Marlborough State Forest, and Eugene State Forest;
- A search of the EPBCA Protected Matters Tool (DEE 2019) based on a 30km buffer search area from the centre point of the project area¹¹;
- Regional biodiversity and fauna assessment reports, e.g.: Agnew 2007; Flint & Melzer 2013; Melzer *et al.* 2014; DES 2018; and Melzer *et al.* 2018;
- Australian Government threatened species conservation advice statements, including: TSSC 2005a; TSSC 2005b; SEWPaC 2012; SEWPaC 2013; DE 2014a, b, & c; DE 2015a & b; TSSC 2015a, b, & c; DE 2015a & b; and TSSC 2016;
- Threatened species profiles, including: DEE 2018 a-n;
- National threatened species recovery plans, including: QPWS 2001; Richardson 2006; Hill & Ward 2010; and DERM 2012b; and
- Australian Government threatened species impact assessment and/or referral guidelines, including: DEWHA 2009a; SEWPaC 2011a; and DE 2016.

A number of Geographical Information System (GIS) datasets were integrated to reassess baseline information. The datasets included: rectified aerial photography, cadastre and lease boundaries (supplied by Waratah Coal); Queensland Government Queensland Globe online interactive mapping; and Google Earth imagery.

⁹ Wet season work undertaken in March 2011, February 2011, and February 2017. Dry season surveys undertaken in September 2011.

¹⁰ -22.7045 149.6867

A series of environmental reports were prepared for the project area through the Queensland Government online reporting portal (Environmental Reports Online; DES 2019 a & b). Those reports provide current information relevant to threatened fauna habitat, and include the following:

- Regional Ecosystems and vegetation community description and mapping (Version 10);
- Regional Ecosystem Biodiversity Status and known special values associated with a Regional Ecosystem type;
- Pre-clearing remnant vegetation description and mapping;
- Distribution of and description of mapped wetland systems, including those natural wetlands that are of “High Ecological Significance”;
- BioCondition benchmarks for Regional Ecosystems or component vegetation community; and
- Biodiversity Significance of habitats.

Key information sources described above are provided in **Attachment D**, which includes the:

- Queensland Government Wildlife Online database extracts (DSITIA 2019);
- Commonwealth Government EPBCA Protected Matters Report (DEE 2019);
- Queensland Government Biodiversity and Conservation Values Environmental Report (DES 2019a); and
- Queensland Government Matters of State Environmental Significance Environmental Report (DES 2019b).

3.2. Survey Program

As noted previously, work undertaken for this report provides information to address issues raised by the Queensland Department of Environment and Science in regard to survey adequacy for threatened fauna within the section of Deep Creek downstream of the Bruce Highway, including the area relevant to the proposed haul road crossing of Deep Creek (near the confluence with Barracks Creek).

Thus, the survey program was focussed on the riparian vegetation of that section of the waterway, and timbered habitats within close proximity. The survey program was designed around the requirements to assess the presence and distribution of two key threatened fauna species, the Koala *Phascolarctos cinereus* and Greater Glider *Petauroides volans*.

The survey program was implemented over a five-day / four-night period, being 9 to 13 November 2019. The field work comprised two key components, being diurnal and nocturnal searches to assess presence of Koalas and Greater Gliders.

Diurnal searches comprised wide ranging foot-based searches for diagnostic signs of presence (scats of both species)¹¹, tree trunk scratching (mainly Koala), canopy searches for Koalas, and assessing presence of potentially suitable hollow-bearing trees which might indicate local presence of Greater Gliders (and inform nocturnal search efforts). Diurnal searches were implemented from about 0800 hrs to 1430 hrs.

Nocturnal searches provided wide ranging foot-based spotlight searches to detect the presence of Greater Gliders and Koalas. Nocturnal searches were undertaken between 2000 and 0030 hrs.

During both activities, where observers worked in relatively close proximity to each other, they regularly referenced their position (via visual and vocal cues) and cross-checked Koala / Greater Glider observations to confirm that the observation did not represent a double count. For an observation of a Koala or Greater Glider, the following was undertaken as a minimum: GPS location recorded and identification of the tree

¹¹ The use of indirect methods, such as faecal pellet detection and counts such as the Spot Assessment Method have been found to be unreliable predictors of tree preferences and estimators of occupancy. In this study, pellet records are only used to assist in the understanding the distribution of Koala presence within the study site.

species. Additional information included an assessment of a Koala's condition, and age and gender. All survey transects were also recorded with GPS units.

In addition to surveys targeting Koala and Greater Glider, microbat call detection surveys were implemented to compliment previous site work. To survey microchiropteran bats, two Anabat Express detectors (Titley Scientific, Brisbane) were deployed along Deep Creek. Each detector was programmed to record between dusk and dawn on each of four consecutive nights. Incidental records of other vertebrate species encountered during surveys were also recorded.

There were no major site access constraints impacting surveys. Dense infestations of *Lantana camara* did however hinder movement through some areas of riparian habitat along Deep Creek, potentially reducing detectability of target species in some parts of the Study Site. Conditions during nocturnal surveys were warm, fine and still. With clear skies and a near full moon, moonlight was strong during nocturnal surveys. Despite this, larger arboreal mammals (including the target species) were readily detectable during spotlight surveys, as evidenced by the number of Greater Gliders observed after dark (see below).

3.3. Personnel and Permits

Field investigators for this study were Lindsay Agnew and Dr Ed Meyer. Both have previous site experience, especially Ed Meyer (Meyer 2011a & b, and 2012), and both have wide experience in designing and implementing surveys for threatened fauna in central Queensland. Both are acknowledged contributors to national survey guidelines and impact assessment guidelines prepared for threatened and migratory species listed under the EPBCA.

All survey methodologies implemented as part of this study were employed in accordance with Austecology's:

- Scientific Research Purposes Permit – Queensland Department of Environment and Science;
- Animal Ethics Approvals - Queensland Department of Agriculture and Fisheries; and
- Scientific User Certificate – Queensland Department of Agriculture and Fisheries.

4. Assessment Findings

4.1. Overview

The survey program provided eight spotlighting survey person-nights and nine diurnal survey person-days.

The on-ground survey protocol provided near-comprehensive coverage of the study site with observers working in unison to surveying areas of potential habitat for both target species and /or indirect evidence of both target species (e.g., scats and scratches).

A total of approximately 85 kilometres of foot-based searches provided coverage of the full extent of the Study Site (see **Figure 4-1**). This comprised 44 kilometres of diurnal survey transects and 41 kilometres of nocturnal survey transects.

The survey program provided a total of 22 observational records of the Greater Glider (see **Figure 4-2**). It is believed that this result represents 21 individual gliders. The majority of these records were of Greater Gliders within the riparian vegetation along Deep Creek.

The survey program yielded a total of 10 observational records of Koala (see **Figure 4-3**). This result represents observations of eight individual Koalas, including an adult female with joey. Survey records were widespread and included five Koalas observed within riparian vegetation – four associated with Deep Creek and one along Surveyor's Creek (a tributary of Deep Creek).

Ground searches also yielded indirect evidence of the target species (i.e., scats and/or scratches attributable to the Koala and Greater Glider) across much of the study site. The evidence gathered during these searches indicates that both species utilise habitat along all surveyed sections of Deep Creek and its tributary, Surveyor's Creek (see **Figures 4-2 and 4-3**). It is highly likely that potentially suitable habitat downstream and upstream of the study site would support both target species.

The Microbat echolocation call detection survey program provided eight detector-survey nights. A total of 13 microchiropteran bats species were recorded (**Attachment C**). All of these species have been recorded in previous surveys throughout the surrounds (see Meyer 2012 and Attachment A). No threatened microbat species were recorded during the survey.

The survey program also provided observations of 119 vertebrate fauna species. This included 113 native species and six introduced fauna species. Meyer (2012) provides the most comprehensive listing of records for the site and the surrounding area (EPC 1029), with 239 terrestrial vertebrate fauna species recorded (including six introduced fauna species). Records from Meyer (2012), and those derived from the current survey of the study site, are provided in **Attachment A**.

The current survey program does not provide any new native or introduced species records, and the suite of native wildlife detected is considered to be representative of the broader suite of species previously recorded within similar habitats across the project area.

Two Squatter Pigeons (*Geophaps scripta scripta*) were recorded on one occasion within cleared grazing land adjacent to the Bruce Highway within the south-west part of the study site (-22.705332° 149.663913°). The Squatter Pigeon (southern) is the only other threatened fauna species which could be expected to occur within habitats associated with the section of Deep Creek surveyed in this study.

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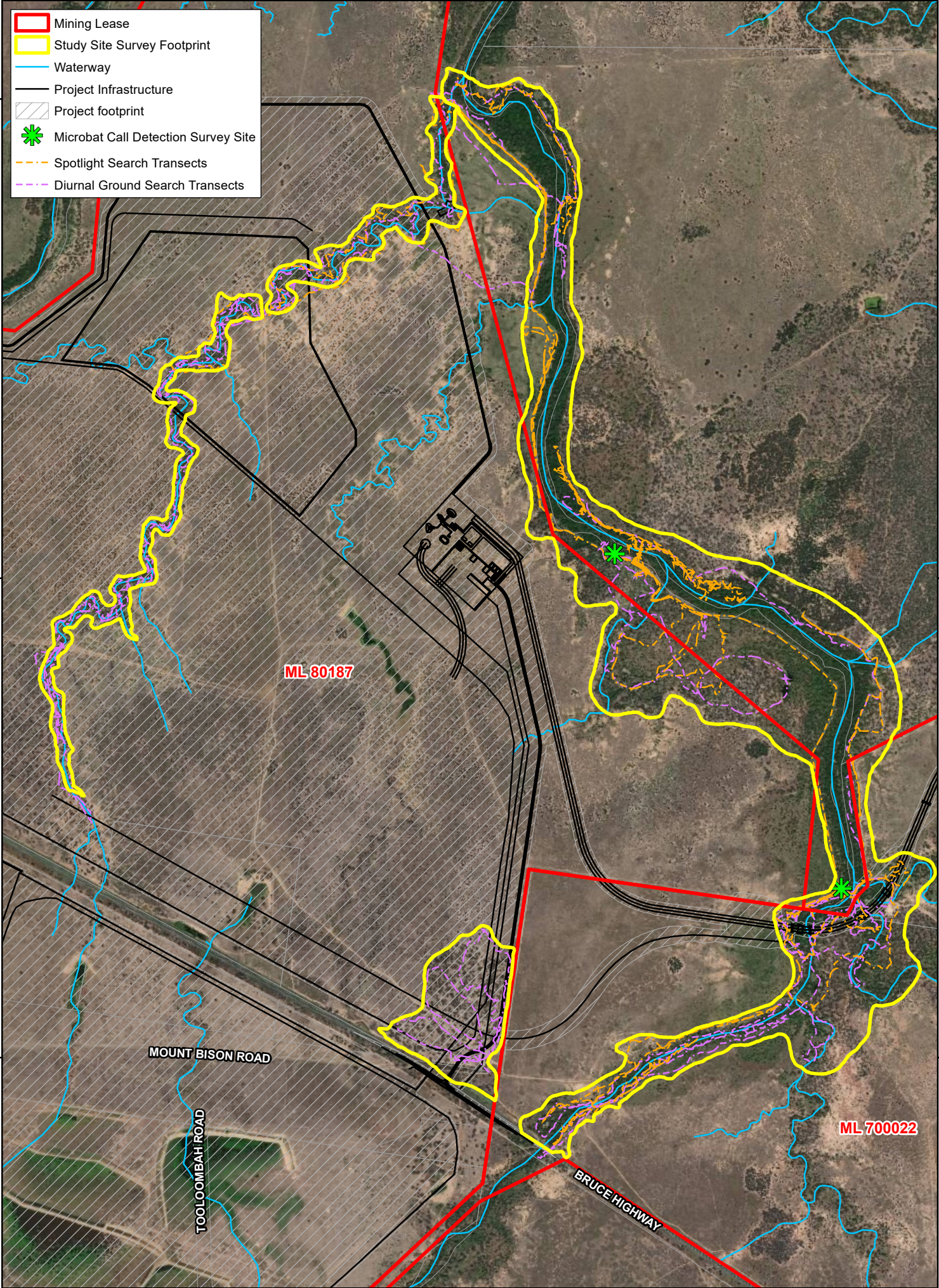
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- Mining Lease
- Study Site Survey Footprint
- Waterway
- Project Infrastructure
- Project footprint
- ✱ Microbat Call Detection Survey Site
- Spotlight Search Transects
- Diurnal Ground Search Transects



STYX COAL PROJECT

Source: DCDs: DNRME 2019
 Mining Leases: DNRME 2019
 Waterway: DNRME 2016
 Imagery: DigitalGlobe 2016

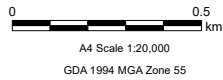


Figure 4-1: Survey Transects and Locations

4.2. Target Species

4.2.1. Greater Glider

The Greater Glider *Petauroides volans* was listed as Vulnerable under the EPBCA in May 2016. The listing status of the Greater Glider in Queensland is Vulnerable under the NCA.

The following summarises key aspects of the Greater Glider's biology and ecology (see Woinarski *et al.* 2014, TSSC 2016, and DEE 2018c and detail provided therein):

- Arboreal and nocturnal, largely restricted to eucalypt forests and woodlands.
- Primarily folivorous, with a diet mostly comprising eucalypt leaves, and occasionally flowers.
- Typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows.
- Favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species. Distribution may be patchy even in suitable habitat.
- Shelters in tree hollows by day; favours large hollows in large, old trees.
- The abundance of Greater Gliders has been strongly linked to relative abundance of tree hollows.
- The species is thought to require a variety of den trees which are used at different times within habitat occupied.
- Home ranges are typically relatively small (1–4 ha) but are larger in lower productivity forests and more open woodlands (up to 16 ha).
- Considered to be particularly sensitive to forest clearance, habitat fragmentation and wildfire, and have relatively low persistence in small forest fragments.
- Poor disperser across areas of open/cleared and vegetation that is not native forest.
- Low reproductive rate (with generation length likely to be 7-8 years) rendering small isolated populations in small remnants prone to extinction.

4.2.1.1. Previous Records for the Project Area

Greater Gliders were previously recorded at locations to the south-west of the highway in 2011 and 2017 and CDM Smith (2018) summarises those observations as follows –

“Two individuals recorded in woodland habitat (RE11.11.15a) in south of ML in February 2017. One individual recorded in riparian habitat (RE11.3.25) along Deep Creek south of the highway in November 2017. A further two individuals recorded in same area in June 2018. Also noted in February 2012 survey but no location provided. No database records from wider area. EPBC Online search only. Nearest records from mainland adjacent to Shoalwater Bay. Suitable habitat in southern and eastern extent of ML where continuous forest with large hollows remain.”

“Two individuals were recorded during spotlighting surveys of the site in February 2017. The individuals were recorded in the continuous tracts of eucalypt woodland that characterise the southern portion of ML 80187 and well to the south of the closest disturbance area. Another individual was observed in riparian Forest Red Gum on Deep Creek in December 2017 which remains connected to the woodlands further south. Two individuals were recorded in the same area in June 2018. There are no database records of the species occurrence from the wider area surrounding the Project. Suitable habitat within or near the Project is likely to be restricted to this area due to the extensive clearing carried out elsewhere.”

CDM Smith (2018) considered that REs 11.3.4, 11.3.25, 11.10.7 and 11.11.15a constituted potentially suitable habitat, provided large mature trees with large tree hollows are present in suitable abundance.

4.2.1.2. Records from the surrounds of the Project Area

Searches of the Queensland Government's Wildlife Online database show that there is one record within 1- 2km and a further 2 records within 4-5km of the centre of the investigation area. It is presumed that these are the records described in CDM Smith (2018). There are a further seven records between 30-50km of the centre of the investigation area (DSITIA 2019; **Attachment D**).

There were no records for Bukkulla Conservation Park, Tooloombah Creek Conservation Park, Marlborough State Forest, Eugene State Forest, or Mount Buffalo State Forest (DSITIA 2019; **Attachment D**). Searches of the Atlas of Living Australia database did not provide any records additional to the above.

Whether the paucity of previous records from these areas is due to limited survey effort/coverage or reflects a patchy/sparse distribution in the region is not known.

4.2.1.3. Study Site Records

The survey program provided a total of 22 observational records of the Greater Glider (see **Figure 4-2**). It is believed that this result represents 21 individual Greater Gliders.

With the exception of an observation of three gliders in one tree (approximately 600 m downstream of the Bruce Highway), all remaining Greater Glider records represent observations of single animals. The majority of these records are from riparian vegetation fringing Deep Creek. A high proportion of these were of gliders observed within *Corymbia tessellaris* (Carbeen), a feed tree species which is common along Deep Creek. Other glider records were mostly of animals observed in large, hollow-bearing *Eucalyptus tereticornis* (Forest Red Gum) which were relatively common along Deep Creek. Hollows in these trees are likely to serve as diurnal shelter/den sites for Greater Gliders.

In addition to the animals recorded from riparian vegetation during surveys, another three Greater Gliders were recorded in an area of woodland extending west from the central section of Deep Creek (**Figure 4-2**). Two of these animals were observed within the canopy of *Eucalyptus platyphylla* (Poplar Gum) trees. Dominant tree species within this patch were Poplar Gum, *Corymbia clarksoniana* (Clarkson's Bloodwood), Forest Red Gum, Carbeen and *Eucalyptus crebra* (Narrow-leaved Ironbark). Very large hollow-bearing Forest Red Gums were present nearby (fringing a seasonal wetland) and the presence of these larger den trees is considered important in maintaining Greater Gliders within this part of the study site.

The results of scat searches indicate the presence of Greater Gliders throughout the extent of treed habitats along Deep Creek¹². In comparison with Deep Creek, evidence of Greater Glider along Surveyor's Creek was scarce and much patchier. The narrow strip of riparian vegetation along this creek contains relatively few hollow-bearing trees suitable for Greater Glider and, as such, is unlikely to support high densities of this species – *cf.* habitats of comparatively higher carrying capacity along Deep Creek.

Areas of riparian habitat outside of the study site were not assessed in detail during our surveys. However, observations during the current survey suggest that suitable habitat for Greater Glider occurs further downstream (Deep Creek) and upstream (Barrack Creek) of the study site. Remnant woodland to the north-west of the upper reaches of Surveyor's Creek (adjacent to the Bruce Highway) and remnant woodland to the east of the central section of Deep Creek also appear to support potentially suitable habitat for Greater Gliders.

¹² Significant areas of riparian habitat along Deep Creek are infested with the introduced weed *Lantana camara*, limiting access during ground searches for scats. Scat search results may therefore underestimate the extent of habitat usage by Greater Gliders along Deep Creek.

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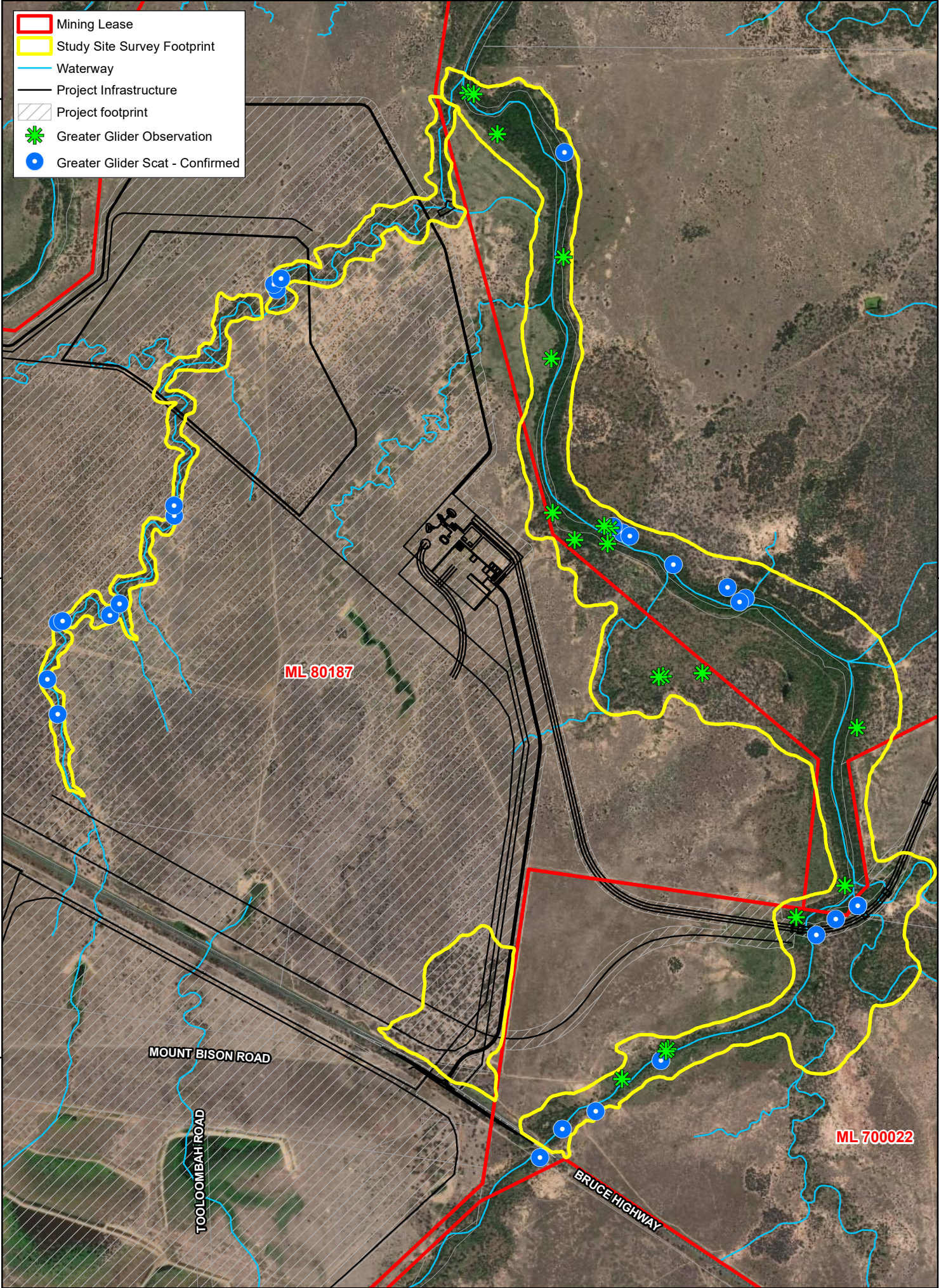
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- Mining Lease
- Study Site Survey Footprint
- Waterway
- Project Infrastructure
- Project footprint
- ✱ Greater Glider Observation
- Greater Glider Scat - Confirmed



ML 80187

ML 700022

MOUNT BISON ROAD

TOOLOOMBAH ROAD

BRUCE HIGHWAY

STYX COAL PROJECT

Source: DCD; DNRME 2019
 Mining Leases: DNRME 2019
 Waterway: DNRME 2016
 Imagery: DigitalGlobe 2016

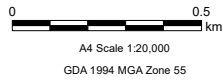


Figure 4-2:
 Greater Glider Survey Records

4.2.2. Koala

The Koala *Phascolarctos cinereus* was listed as *Vulnerable* under the EPBCA in May 2012. The listing status of the Koala in Queensland is *Vulnerable* under the NCA.

Key aspects of the Koala's biology and ecology are summarised below (see Melzer & Tucker 2011, Flint & Melzer 2013, Melzer *et al.* 2014 & 2018, Ellis *et al.* 2018, and detail provided therein):

- The Koala is a folivore, with a diet restricted mainly to leaves of *Eucalyptus* spp. and related genera (including *Corymbia* spp., *Angophora* spp. and *Lophostemon* spp).
- The diet of individual Koalas is usually limited to one or a few of the species present at a site. Dietary preferences (i.e., preferred tree species) can vary between regions or seasons.
- In areas of suitable habitat, Koalas also show strong preferences for individual trees.
- In humid tropical woodlands/forests of the Central Queensland Coast Bioregion, higher Koala densities have been associated with communities where *Eucalyptus tereticornis*, *E. platyphylla*, *E. drepanophylla*, and/or *Corymbia clarksoniana* have been abundant. Within the Brigalow Belt North bioregion, tree species thought to be favoured in subhumid tropical woodland / forests include *E. coolabah*, *E. tereticornis*, *E. populnea*, and *E. crebra*. A study within the Clarke Connors Range (134 observational records and analysis of faecal samples) suggest a preference for *E. tereticornis*, with *E. drepanophylla* / *E. crebra* also forming part of the diet of Koalas in this area.
- Research in part of the Central Queensland Coast (CQC) Bioregion (around St. Lawrence) indicates that eucalypt forests and woodlands in lower-lying, better-watered parts of the landscape are the main koala habitat in this region. Vegetation communities ranked with the highest likelihood for Koala occurrence were REs 11.3.4¹³, 11.3.25¹⁴, and 11.3.29¹⁵.
- The Koala is not territorial and individual home ranges extensively overlap. Individuals tend to use the same set of trees, but generally not at the same time.
- Individual home ranges are variable, with animals in 'poorer' habitats having larger home ranges than animals in areas of higher quality habitat¹⁶. On average, males usually have larger home ranges than female Koalas. Koalas are known to increase movement and home range size during the breeding season between September and March.
- Female Koalas can potentially produce up to one offspring each year (with an average of 0.3 - 0.8 offspring per year), with births occurring between October and May. Young Koalas are independent from 12 months of age.
- Longevity in the wild is >15 years for females and >12 years for males. Generation length has been estimated to be 6-8 years.
- Average Koala densities within the Brigalow Belt North Bioregion have been variously estimated at 0.155 and 0.01 to 0.005 Koalas per ha. A study conducted approximately 45 km to the north of the study site provided an estimated density of 0.12 koalas per ha (based on 64 km of linear transect surveyed in woodland near St. Lawrence).
- The key identified threats to Koalas are habitat loss and fragmentation, vehicle strike, disease, and predation by dogs. Drought and extreme heat are also known to cause significant mortality amongst Koalas, and post-drought recovery may be substantially impaired by other threatening factors.
- Loss of habitat, attrition of populations due to mortality of animals on roads and rail lines and increasing development along resource corridors have been identified as key threats to Koala populations in central Queensland.

¹³ *Eucalyptus tereticornis* and/or *Eucalyptus* spp. tall woodland on alluvial plains.

¹⁴ *Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines.

¹⁵ *Eucalyptus crebra*, *E. exserta*, *Melaleuca* spp. woodland on alluvial plains.

¹⁶ Ellis *et al.* (2018) assessed radio-tracking data for Koalas throughout parts of the Clarke Connors Range and considered home ranges in the order of 3-10 ha as standard in woodlands of central Queensland (though also noting considerable variation between individuals), compared to larger ranges of up to 100 ha observed further inland (e.g. Blair Athol; Ellis *et al.* 2002b).

4.2.2.1. Previous Records for the Project Area

Koalas have previously been recorded within the southern part of the project area (two records; south-west of the Bruce Highway) and in the north-west corner of the project area (three records; either side of the Bruce Highway). There is also one record from within the study site (remnant vegetation patch adjacent to the Bruce Highway). CDM Smith (2018) summarises those observations on the project area as follows –

“Scats recorded in both 2011 surveys. Species recorded on six occasions within ML in 2017 including Poplar Box (*Eucalyptus populnea*) woodland (RE11.4.2) (February and September 2017 and June 2018 surveys), Poplar Gum (*Eucalyptus platyphylla*) woodland (RE11.5.8a) (November survey) and on camera in Lancewood (*Acacia shirleyi*) woodland (October 2017) and Narrow-leaf Ironbark (*E. crebra*) woodland (RE 11.10.7). Forest Red Gum along creeks likely the most favoured habitat for this species although species evidently occurs in low population density throughout the area. Eleven Wildlife Online records from wider area.”

4.2.2.2. Records from the surrounds of the Project Area

Searches of the Queensland Government Wildlife Online show that there is one record within 1- 2km and a further three records within 4-5km of the centre of the study site. It is presumed that these are the records as described by CDM Smith (2018). There are a further 11 records between 20-30km of the centre of the investigation area (see **Attachment D**).

There were no records for Bukkulla Conservation Park, Tooloombah Creek Conservation Park, Marlborough State Forest, Eugene State Forest, or Mount Buffalo State Forest (see **Attachment D**). Searches of the Atlas of Living Australia database did not provide any records additional to the above. Whether the paucity of Koala records in these areas reflects limited survey effort/coverage or a patchy/sparse distribution in the region is unclear.

Melzer *et al.* (2018) describe a series of Koala records extending north approximately 25 km to 45 km north of the study site¹⁷, as well as scattered Koala records to the near west of Mount Buffalo State Forest, approximately 35 km north-west of the study site.

4.2.2.3. Study Site Survey Records

The survey program provided a total of 10 observational records of Koala (see **Figure 4-3**). This total represents observations of eight individual Koalas, including an adult female with joey. Two records represent a repeat observation of two Koalas on separate days: one a young female within non-riparian remnant woodland adjacent to the Bruce Highway, and the other a male Koala observed around the confluence of Deep and Barrack Creeks.

Four Koalas were observed within riparian vegetation along Deep Creek, including a female with her joey. Ground searches provided widespread records of Koala pellets along Deep Creek (see **Figure 4-3**). In some sections of Deep Creek, ground searches were constrained by dense thickets of *Lantana camara*. Thus, the recorded distribution of Koala scats may not reflect the extent of habitat use by Koalas. Movement of Koalas through these thickets, however, is likely to be limited with dense Lantana likely to constrain ground movement and access to feed trees¹⁸.

¹⁷ Melzer and Tucker (2011) systematically surveyed forest and woodlands near the Bruce Highway from the junction of the Bruce Highway with St Lawrence Connection Road (-22.3721, 149.4693) south to Granite Creek (-22.612, 149.5387). In this area, koalas were associated with alluvial and gently undulating plains where associated low hills and rises support woodlands with *Eucalyptus crebra*, *E. platyphylla*, and *E. exserta*, as well as *E. tereticornis*.

¹⁸ *cf.* Greater Gliders which do not rely on ground movement to the same extent as Koalas do.

During the current survey, a single male Koala was recorded along the lower reaches of Surveyor's Creek, while scats attributable to Koala were located at numerous locations in the lower and upper reaches of Surveyor's Creek. Koala scats were also recorded in the middle reaches of Surveyor's Creek, but at comparatively fewer sites. The variable abundance of Koala scats along this creek reflects differences in the extent and quality of habitat along and adjacent Surveyor's Creek, including the presence of remnant woodland adjacent to the upper reaches of Surveyor's Creek. The lower reaches of Surveyor's Creek also support a higher density of larger feed trees in proximity to higher quality habitat along Deep Creek.

During surveys, three Koalas (two females and a male) were also recorded from a 20-ha patch of non-riparian woodland habitat adjacent the Bruce Highway, within the south-west part of the Study Site. Tree cover in this part of the Study Site is dominated by Gum-topped box (*Eucalyptus moluccana*) Gum-topped, Clarkson's Bloodwood and Narrow-leaved Ironbark. The high density of pellet evidence recorded within this area suggests a high level of usage by Koalas (see **Figure 4-3**).

Ground searches within non-riparian woodland on the western side of Deep Creek also yielded evidence of Koala (scats), though no Koalas were observed at this location. This woodland patch of approximately 35 hectares supports a suite of known feed tree species for Koala, including Poplar Gum, Clarkson's Bloodwood, Forest Red Gum, Carbeen and Narrow-leaved Ironbark.

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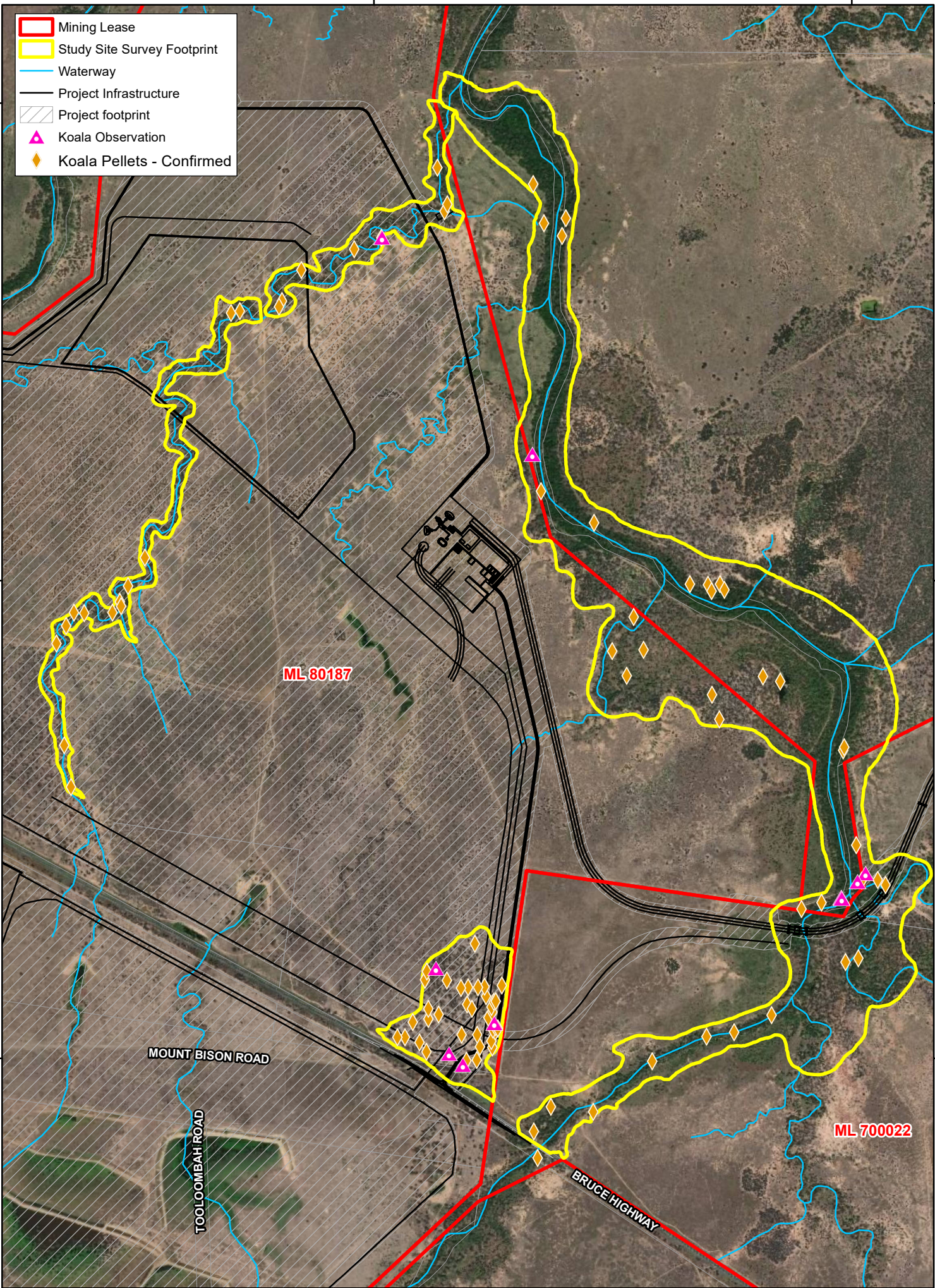
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- Mining Lease
- Study Site Survey Footprint
- Waterway
- Project Infrastructure
- Project footprint
- ▲ Koala Observation
- ◆ Koala Pellets - Confirmed



STYX COAL PROJECT

Source: DCD; DNRME 2019
 Mining Leases: DNRME 2019
 Waterway: DNRME 2016
 Imagery: DigitalGlobe 2016

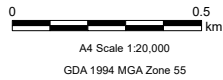


Figure 4-3:
 Koala Survey Records

4.3. Other Fauna – Species Richness and Threatened Fauna

The Microbat echolocation call detection survey program provided eight detector-survey nights. A total of 13 microchiropteran bats species were recorded (**Attachment C**). All of these species have been recorded in previous surveys throughout the surrounds (see Meyer 2012 and **Attachment A**). No threatened microbat species were recorded during the survey, nor were they expected.

The survey program provided observations of 119 vertebrate fauna species. This included 113 native species and six introduced fauna species. The current survey program does not provide any new native or introduced species records for the project area. The suite of native wildlife detected is considered to be representative of the broader suite of species previously recorded within similar habitats across the project area.

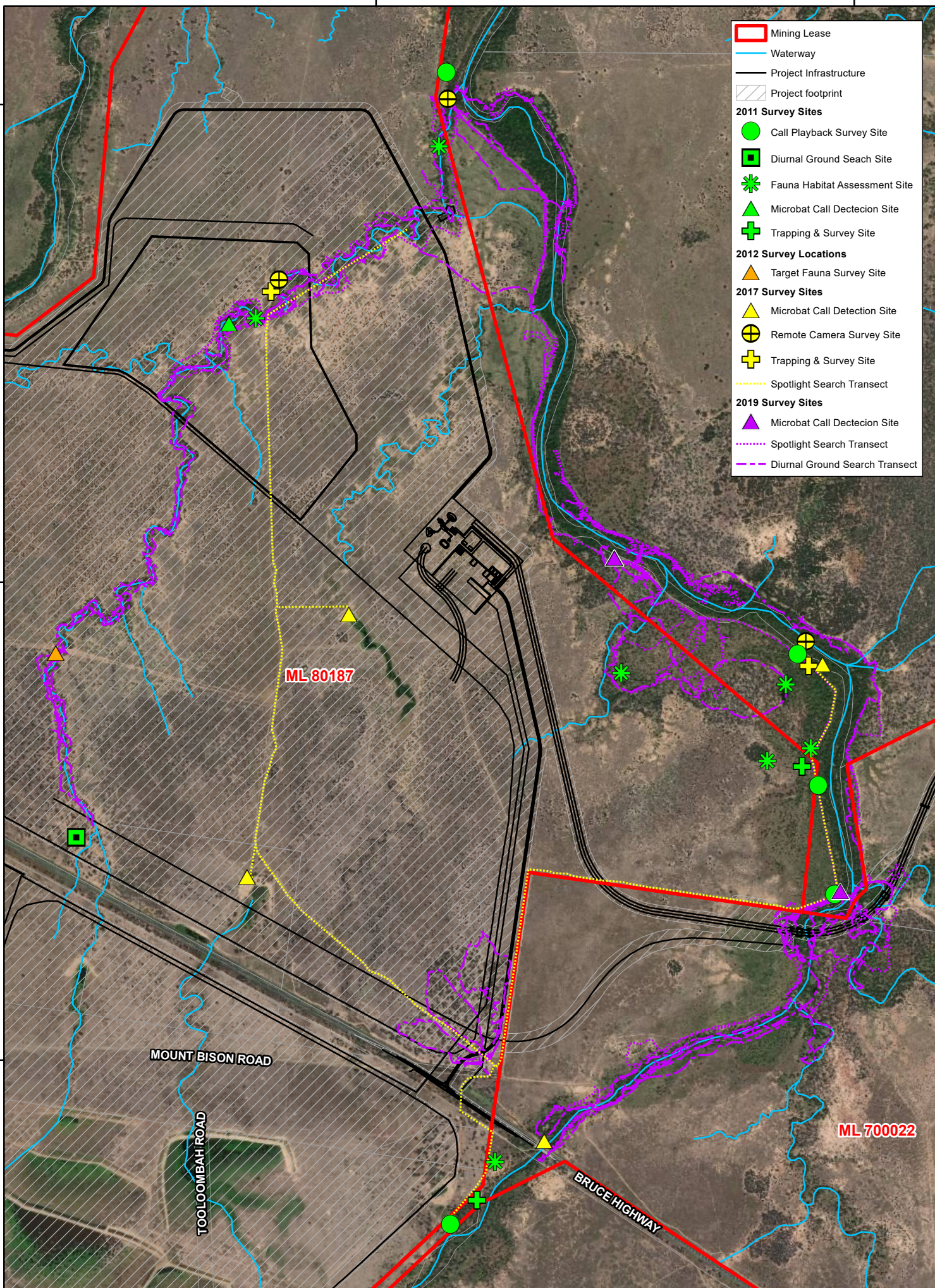
When the results of the current assessments and combined with those extracted from previous work described in the SEIS (CDM Smith 2018), the total species richness result for the Deep Creek area is 136 fauna species. This is comprised of 33 mammal species, 11 reptile species, nine amphibians, and 83 bird species. The total species richness result also includes seven introduced species, i.e. *Bos taurus*, *Felis catus*, *Oryctolagus cuniculus*, *Mus musculus*, *Sus scrofa*, *Rhinella marina*, and *Acridotheres tristis*.

Meyer (2012) provides the most comprehensive listing of records for the project area / study site, and surrounding area (being EPC 1029). That work identifies 239 terrestrial vertebrate fauna species, including six introduced fauna species. Records from Meyer (2012), and those derived from the current survey and previous SEIS surveys for Deep Creek area, are provided in **Attachment A**.

The current survey provided a record of two Squatter Pigeons (*Geophaps scripta scripta*) on one occasion within cleared grazing land adjacent to the Bruce Highway within the south-west part of the study site (-22.705332° 149.663913°). The Squatter Pigeon (southern) may occur within the surveyed open forest / woodland habitat patch (REs 11.3.5 and 11.4.2) adjacent to the western side of Deep Creek. The Squatter Pigeon (southern) is the only other threatened fauna species which could have be expected to occur within habitats associated with the section of Deep Creek surveyed in this study.

Figure 4-4 describes the location of the suite of fauna survey activities for the Deep Creek area which were reported in the SEIS (CDM Smith 2018). **Figure 4-4** also includes a description of the survey activities undertaken as part of the current study.

Together, the suite of locations and variety of methodologies employed provide a sound basis to consider the distribution and extent of fauna in the Deep Creek area.



STYX COAL PROJECT

Source:
 DCDB: DNRME 2019
 Mining Leases: DNRME 2019
 Waterway: DNRME 2016
 Surveys: Austecology 2019 &
 CDM Smith 2018
 Imagery: DigitalGlobe 2016

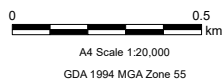


Figure 4-4:
 Fauna Survey Locations
 2011 to 2019

5. Conclusions

Surveys undertaken by Austecology in November 2019 show that Koala and Greater Glider are more widespread and abundant within the project area than previous surveys would suggest. The discrepancy with previous survey results may be attributed in large part to more intensive, targeted survey effort within areas of riparian habitat along Deep Creek (downstream of the Bruce Highway) during the current survey.

In regards to site coverage and survey effort, it is noted that the November 2019 survey program addresses a different set of assessment requirements to fauna surveys conducted previously in other parts of the project area, with general fauna surveys by Meyer (2011, 2011b and 2012) pre-dating the listing of Koala and Greater Glider under the EPBC Act.

In the current study, there was widespread evidence of the occurrence of both Koalas and Greater Gliders within the project area along Deep Creek, downstream of the Bruce Highway. The abundance and distribution of Greater Gliders along this section of creek may be attributed to the abundance of large hollow-bearing eucalypts providing den/shelter sites, as well as the diversity of suitable feed trees, i.e. *Eucalyptus* / *Corymbia* spp.

The presence of Koalas along Deep Creek reflects an abundance of feed trees favoured by Koalas elsewhere in the CQC region (e.g. *Eucalyptus tereticornis* and *E. drepanophylla / crebra*) as well as shade trees such as *Melaleuca leucadendra*. Densities of Koalas along Deep Creek were nevertheless low, due most likely to the presence of dense thickets of *Lantana camara* constraining the movement of Koalas and limiting access to feed trees.

During surveys, evidence of Koala and Greater Glider were also detected along Surveyor's Creek, a tributary of Deep Creek in the north-east of the Project Area. Riparian vegetation along this tributary was notably narrower and sparser than on Deep Creek and habitat along Surveyor's Creek appears to support fewer Koala and Greater Gliders. Numbers of Greater Glider along Surveyor's Creek are likely limited by the relative paucity of hollow-bearing trees providing suitable den / shelter sites.

Evidence of Koala and Greater Glider was also recorded within non-riparian woodland adjoining the western side of Deep Creek. This area of mixed eucalypt woodland is likely to be important for the maintenance of Koala and Greater Glider populations associated with Deep Creek. During surveys, Koalas were also recorded in a small area of non-riparian woodland adjacent the Bruce Highway in the south-west of the study site.

Whilst not subject to the current study, preliminary observations suggest that potentially suitable habitat for both Koala and Greater Glider is likely present downstream of the study site within riparian habitat of Deep Creek (towards the confluence with Tooloombah Creek), within remnant vegetation to the east of Deep Creek, and riparian vegetation extending a short distance upstream of the study site along Barrack Creek.

Of these habitats, the downstream section of Deep Creek may support comparatively higher value to Greater Glider if the presence of large hollow-bearing Forest Red Gum reflects that which was observed immediately upstream within the study site. Further ground-based surveys are needed to better understand habitat values Koala and Greater Glider in these areas.

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Attachment A Fauna Species Lists - Study Site and Project Area

Table Notes

Column 1: NCA listing status, i.e. V (Vulnerable), NT (Near Threatened), SLC (Special Least Concern), and LC (Least Concern).

Column 2: EPBCA listing status, i.e. V (Vulnerable), and M (Migratory).

Column 3: Species recorded within EPC 1029 between 2011 to 2018 (Meyer 2012 and CDM Smith 2018).

Column 4: Species recorded within the Deep Creek area – records derived from 2018 SEIS (CDM Smith 2018).

Column 5: Species recorded within the Deep Creek area during surveys in November 2019 (Austecology 2019).

Class	Family	Scientific name	Common name	1	2	3	4	5
amphibians	Bufoidea	<i>Rhinella marina</i>	cane toad			1	1	1
amphibians	Hylidae	<i>Cyclorana alboguttata</i>	greenstripe frog	LC		1		
amphibians	Hylidae	<i>Cyclorana novaehollandiae</i>	eastern snapping frog	LC		1	1	
amphibians	Hylidae	<i>Litoria caerulea</i>	common green treefrog	LC		1		1
amphibians	Hylidae	<i>Litoria fallax</i>	eastern sedgefrog	LC		1	1	
amphibians	Hylidae	<i>Litoria inermis</i>	bumpy rocketfrog	LC		1	1	1
amphibians	Hylidae	<i>Litoria latopalmata</i>	broad palmed rocketfrog	LC		1		
amphibians	Hylidae	<i>Litoria nasuta</i>	striped rocketfrog	LC		1		
amphibians	Hylidae	<i>Litoria rothii</i>	northern laughing treefrog	LC		1		
amphibians	Hylidae	<i>Litoria rubella</i>	ruddy treefrog	LC		1	1	1
amphibians	Hylidae	<i>Litoria wilcoxii</i>	stony creek frog	LC		1		
amphibians	Myobatrachidae	<i>Crinia deserticola</i>	chirping froglet	LC		1	1	
amphibians	Myobatrachidae	<i>Limnodynastes ornatus</i>	ornate burrowing frog	LC		1		1
amphibians	Myobatrachidae	<i>Limnodynastes salmini</i>	salmon striped frog	LC		1	1	
amphibians	Myobatrachidae	<i>Limnodynastes tasmaniensis</i>	spotted grassfrog	LC		1	1	
amphibians	Myobatrachidae	<i>Limnodynastes terraereginae</i>	scarlet sided pobblebonk	LC		1		
birds	Acanthizidae	<i>Gerygone albogularis</i>	white-throated gerygone	LC		1		1
birds	Acanthizidae	<i>Sericornis frontalis</i>	white-browed scrub-wren	LC		1		1
birds	Acanthizidae	<i>Smicromis brevirostris</i>	weebill	LC		1	1	1
birds	Accipitridae	<i>Accipiter cirrocephalus</i>	collared sparrowhawk	LC		1		
birds	Accipitridae	<i>Accipiter fasciatus</i>	brown goshawk	LC		1		1
birds	Accipitridae	<i>Aquila audax</i>	wedge-tailed eagle	LC		1		1
birds	Accipitridae	<i>Aviceda subcristata</i>	Pacific baza	LC		1		1
birds	Accipitridae	<i>Circus assimilis</i>	spotted harrier	LC		1		
birds	Accipitridae	<i>Circus approximans</i>	swamp harrier	LC		1		
birds	Accipitridae	<i>Elanus axillaris</i>	black-shouldered kite	LC		1		
birds	Accipitridae	<i>Haliaeetus leucogaster</i>	white-bellied sea-eagle	LC		1		
birds	Accipitridae	<i>Haliastur sphenurus</i>	whistling kite	LC		1		1
birds	Accipitridae	<i>Lophoictinia isura</i>	square-tailed kite	LC		1		
birds	Accipitridae	<i>Milvus migrans</i>	black kite	LC		1		

Class	Family	Scientific name	Common name	1	2	3	4	5
birds	Acrocephalidae	<i>Acrocephalus australis</i>	Australian reed-warbler	LC		1		
birds	Aegothelidae	<i>Aegotheles cristatus</i>	Australian owl-nightjar	LC		1		1
birds	Alaudidae	<i>Mirafra javanica</i>	Horsfield's bushlark	LC		1		1
birds	Alcedinidae	<i>Ceyx azureus</i>	azure kingfisher	LC		1	1	
birds	Anatidae	<i>Anas gracilis</i>	grey teal	LC		1		
birds	Anatidae	<i>Anas superciliosa</i>	Pacific black duck	LC		1		1
birds	Anatidae	<i>Chenonetta jubata</i>	Australian wood duck	LC		1		
birds	Anatidae	<i>Dendrocygna arcuata</i>	wandering whistling-duck	LC		1		
birds	Anatidae	<i>Dendrocygna eytoni</i>	plumed whistling-duck	LC		1		
birds	Anatidae	<i>Nettapus coromandelianus</i>	cotton pygmy-goose	LC		1		
birds	Anatidae	<i>Tadorna radjah</i>	radjah shelduck	LC		1		
birds	Anhingidae	<i>Anhinga novaehollandiae</i>	darter	LC		1		
birds	Anseranatidae	<i>Anseranas semipalmata</i>	magpie goose	LC		1		
birds	Apodidae	<i>Apus pacificus</i>	fork-tailed swift	LC	M	1		
birds	Ardeidae	<i>Ardea modesta</i>	eastern great egret	LC		1		
birds	Ardeidae	<i>Ardea ibis</i>	cattle egret	LC		1		
birds	Ardeidae	<i>Ardea intermedia</i>	intermediate egret	LC		1		
birds	Ardeidae	<i>Ardea pacifica</i>	white-necked heron	LC		1		1
birds	Ardeidae	<i>Egretta novaehollandiae</i>	white-faced heron	LC		1		
birds	Ardeidae	<i>Ixobrychus flavicollis</i>	black bittern	LC		1		
birds	Ardeidae	<i>Nycticorax caledonicus</i>	nankeen night heron	LC		1		
birds	Artamidae	<i>Artamus cinereus</i>	black-faced woodswallow	LC		1		
birds	Artamidae	<i>Artamus leucorhynchus</i>	white-breasted woodswallow	LC		1		1
birds	Artamidae	<i>Cracticus nigrogularis</i>	pied butcherbird	LC		1		1
birds	Artamidae	<i>Cracticus tibicen</i>	Australian magpie	LC		1	1	1
birds	Artamidae	<i>Cracticus torquatus</i>	grey butcherbird	LC		1		
birds	Artamidae	<i>Strepera graculina</i>	pied currawong	LC		1		
birds	Burhinidae	<i>Burhinus grallarius</i>	bush stone-curlew	LC		1		
birds	Cacatuidae	<i>Cacatua galerita</i>	sulphur-crested cockatoo	LC		1	1	1
birds	Cacatuidae	<i>Calyptorhynchus banksii</i>	red-tailed black cockatoo	LC		1		1
birds	Cacatuidae	<i>Eolophus roseicapillus</i>	galah	LC		1		1
birds	Campephagidae	<i>Coracina maxima</i>	ground cuckoo-shrike	LC		1		
birds	Campephagidae	<i>Coracina novaehollandiae</i>	black-faced cuckoo-shrike	LC		1	1	1
birds	Campephagidae	<i>Coracina papuensis</i>	white-bellied cuckoo-shrike	LC		1	1	1
birds	Campephagidae	<i>Coracina tenuirostris</i>	cicadabird	LC		1	1	1
birds	Campephagidae	<i>Lalage leucomela</i>	varied triller	LC		1	1	1
birds	Campephagidae	<i>Lalage sueurii</i>	white-winged triller	LC		1		1
birds	Casuariidae	<i>Dromaius novaehollandiae</i>	emu	LC		1		1
birds	Caprimulgidae	<i>Caprimulgus macrurus</i>	large-tailed nightjar	LC		1		1

Class	Family	Scientific name	Common name	1	2	3	4	5
birds	Caprimulgidae	<i>Eurostopdous myystacalis</i>	white-throated night-jar			1		
birds	Charadriidae	<i>Vanellus miles novaehollandiae</i>	masked lapwing (southern)	LC		1		1
birds	Cisticolidae	<i>Cisticola exilis</i>	golden-headed cisticola	LC		1		
birds	Cisticolidae	<i>Cisticola juncidis laveryi</i>	zitting cisticola	LC		1		
birds	Columbidae	<i>Chalcophaps indica</i>	emerald dove	LC		1		
birds	Columbidae	<i>Geopelia humeralis</i>	bar-shouldered dove	LC		1		1
birds	Columbidae	<i>Geopelia striata</i>	peaceful dove	LC		1	1	1
birds	Columbidae	<i>Geophaps scripta scripta</i>	squatter pigeon (southern)	V	V	1		1
birds	Columbidae	<i>Ocyphaps lophotes</i>	crested pigeon	LC		1		1
birds	Coraciidae	<i>Eurystomus orientalis</i>	dollarbird	LC		1		1
birds	Corcoracidae	<i>Struthidea cinerea</i>	apostlebird	LC		1		1
birds	Corvidae	<i>Corvus orru</i>	Torresian crow	LC		1	1	1
birds	Cuculidae	<i>Centropus phasianinus</i>	pheasant coucal	LC		1		1
birds	Cuculidae	<i>Cuculus pallidus</i>	pallid cuckoo	LC		1		
birds	Cuculidae	<i>Chalcites basalis</i>	Horsefield's bronze-cuckoo	LC		1		1
birds	Cuculidae	<i>Chalcites minutillus minutillus</i>	little bronze-cuckoo	LC		1	1	1
birds	Cuculidae	<i>Cuculus optatus</i>	oriental cuckoo	SLC	M	1	1	
birds	Cuculidae	<i>Eudynamys scolopacea</i>	common koel	LC		1		1
birds	Cuculidae	<i>Scythrops novaehollandiae</i>	channel-billed cuckoo	LC		1		1
birds	Dicruridae	<i>Dicrurus bracteatus bracteatus</i>	spangled drongo (eastern Australia)	LC		1	1	1
birds	Estrildidae	<i>Lonchura castaneothorax</i>	chestnut-breasted mannikin	LC		1		
birds	Estrildidae	<i>Neochmia modesta</i>	plum-headed finch	LC		1		
birds	Estrildidae	<i>Taeniopygia bichenovii</i>	double-barred finch	LC		1	1	1
birds	Estrildidae	<i>Taeniopygia guttata</i>	zebra finch	LC		1		
birds	Falconidae	<i>Falco berigora</i>	brown falcon	LC		1		
birds	Falconidae	<i>Falco cenchroides</i>	nankeen kestrel	LC		1		1
birds	Gruidae	<i>Grus rubicunda</i>	brolga	LC		1		
birds	Halcyonidae	<i>Dacelo leachii</i>	blue-winged kookaburra	LC		1		1
birds	Halcyonidae	<i>Dacelo novaeguineae</i>	laughing kookaburra	LC		1	1	1
birds	Halcyonidae	<i>Todiramphus macleayi</i>	forest kingfisher	LC		1	1	1
birds	Halcyonidae	<i>Todiramphus pyrrhopygius</i>	red-backed kingfisher	LC		1	1	
birds	Halcyonidae	<i>Todiramphus sanctus</i>	sacred kingfisher	LC		1		
birds	Hirundinidae	<i>Hirundo neoxena</i>	welcome swallow	LC		1		1
birds	Jacanidae	<i>Irediparra gallinacea</i>	comb-crested jacana	LC		1		
birds	Laridae	<i>Strena caspia</i>	Caspian tern	LC	M	1		
birds	Laridae	<i>Sterna nilotica</i>	gull-billed tern	LC		1		
birds	Maluridae	<i>Malurus melanocephalus</i>	red-backed fairy-wren	LC		1		1
birds	Megaluridae	<i>Cinclorhampus cruralis</i>	brown songlark	LC		1		
birds	Megaluridae	<i>Cinclorhampus mathewsi</i>	rufous songlark	LC		1	1	

Class	Family	Scientific name	Common name	1	2	3	4	5
birds	Megaluridae	<i>Megalurus gramineus</i>	little grassbird	LC		1		
birds	Megaluridae	<i>Megalurus timoriensis</i>	tawny grassbird	LC		1		
birds	Megapodiidae	<i>Alectura lathami</i>	Australian brush-turkey	LC		1		
birds	Meliphagidae	<i>Entomyzon cyanotis</i>	blue-faced honeyeater	LC		1	1	1
birds	Meliphagidae	<i>Lichenostomus fasciocularis</i>	mangrove honeyeater	LC		1		
birds	Meliphagidae	<i>Lichenostomus flavus</i>	yellow honeyeater	LC		1	1	1
birds	Meliphagidae	<i>Lichmera indistincta</i>	brown honeyeater	LC		1		1
birds	Meliphagidae	<i>Manorina flavigula</i>	yellow-throated miner	LC		1		1
birds	Meliphagidae	<i>Manorina melanocephala</i>	noisy miner	LC		1		
birds	Meliphagidae	<i>Meliphaga lewinii</i>	Lewin's honeyeater	LC		1		1
birds	Meliphagidae	<i>Melithreptus albogularis</i>	white-throated honeyeater	LC		1	1	1
birds	Meliphagidae	<i>Myzomela sanguinolenta</i>	scarlet honeyeater	LC		1	1	
birds	Meliphagidae	<i>Philemon citreogularis</i>	little friarbird	LC		1	1	1
birds	Meliphagidae	<i>Philemon corniculatus</i>	noisy friarbird	LC		1		1
birds	Meliphagidae	<i>Plectorhyncha lanceolata</i>	striped honeyeater	LC		1	1	1
birds	Meropidae	<i>Merops ornatus</i>	rainbow bee-eater	LC	M	1		1
birds	Monarchidae	<i>Grallina cyanoleuca</i>	magpie-lark	LC		1		1
birds	Monarchidae	<i>Myiagra rubecula</i>	leaden flycatcher	LC		1		1
birds	Motacillidae	<i>Anthus novaeseelandiae</i>	Australasian pipit	LC		1		1
birds	Nectariniidae	<i>Dicaeum hirundinaceum</i>	mistletoebird	LC		1	1	1
birds	Nectariniidae	<i>Nectarina jugularis</i>	olive-backed sunbird	LC		1		
birds	Oriolidae	<i>Oriolus sagittatus</i>	olive-backed oriole	LC		1		1
birds	Oriolidae	<i>Sphecotheres vielloti</i>	Australian figbird	LC		1	1	1
birds	Otididae	<i>Ardeotis australis</i>	Australian bustard	LC		1		1
birds	Pachycephalidae	<i>Colluricincla harmonica</i>	grey shrike-thrush	LC		1	1	
birds	Pachycephalidae	<i>Colluricincla megarhyncha</i>	little shrike-thrush	LC		1		1
birds	Pachycephalidae	<i>Pachycephala rufiventris</i>	rufous whistler	LC		1	1	1
birds	Pardalotidae	<i>Pardalotus striatus</i>	striated pardalote	LC		1	1	1
birds	Pelecanidae	<i>Pelecanus conspicillatus</i>	Australian pelican	LC		1		
birds	Petroicidae	<i>Microeca flavigaster</i>	lemon-bellied flycatcher	LC		1		1
birds	Phalacrocoracidae	<i>Phalacrocorax sulcirostris</i>	little black cormorant	LC		1		
birds	Phalacrocoracidae	<i>Microcarbo melanoleucos</i>	little pied cormorant	LC		1		
birds	Phasianidae	<i>Coturnix ypsilophora</i>	brown quail	LC		1		1
birds	Podargidae	<i>Podargus strigoides</i>	tawny frogmouth	LC		1		1
birds	Podicipedidae	<i>Tachybaptus novaehollandiae</i>	Australasian grebe	LC		1		
birds	Pomatostomidae	<i>Pomatostomus temporalis rubeculus</i>	grey-crowned babbler	LC		1	1	1
birds	Psittacidae	<i>Aprosmictus erythropterus</i>	red-winged parrot	LC		1		1
birds	Psittacidae	<i>Platycercus adscitus</i>	pale-headed rosella (southern form)	LC		1	1	1
birds	Psittacidae	<i>Trichoglossus haematodus moluccanus</i>	rainbow lorikeet	LC		1	1	1

Class	Family	Scientific name	Common name	1	2	3	4	5
birds	Ptilonorhynchidae	<i>Ptilonorhynchus maculatus</i>	spotted bowerbird	LC		1		1
birds	Rallidae	<i>Gallinulatenebrosa</i>	dusky moorhen	LC		1		
birds	Rallidae	<i>Gallirallus philippensis</i>	buff-banded rail	LC		1		
birds	Rallidae	<i>Porphyrio porphyrio</i>	purple swamphen	LC		1		
birds	Recurvirostridae	<i>Himantopus himantopus</i>	black-winged stilt	LC		1		
birds	Rhipiduridae	<i>Rhipidura leucophrys leucophrys</i>	willie wagtail (southern)	LC		1		1
birds	Rhipiduridae	<i>Rhipidura rufifrons</i>	rufous fantail	LC	M	1		
birds	Scolopacidae	<i>Limosa lapponica</i>	bar-tailed godwit	LC	M	1		
birds	Scolopacidae	<i>Numenius madagascariensis</i>	Eastern curlew	E	CE	1		
birds	Scolopacidae	<i>Numenius phaeopus</i>	whimbrel	LC	M	1		
birds	Strigidae	<i>Ninox connivens</i>	barking owl	LC		1		
birds	Strigidae	<i>Ninox novaeseelandiae</i>	southern boobook	LC		1		1
birds	Threksiornithidae	<i>Plegadis falcinellus</i>	glossy ibis	LC	M	1		
birds	Threksiornithidae	<i>Threskiornis spinicollis</i>	straw-necked ibis	LC		1		1
birds	Threksiornithidae	<i>Threskiornis molucca</i>	Australian white ibis	LC		1		
birds	Threksiornithidae	<i>Platalea regia</i>	royal spoonbill	LC		1		
birds	Turnicidae	<i>Turnix varius</i>	painted button-quail	LC		1		
birds	Turnicidae	<i>Turnix velox</i>	little button-quail	LC		1		
birds	Tytonidae	<i>Tyto javanica</i>	eastern barn owl	LC		1		
birds	Hirundinidae	<i>Petrochelidon ariel</i>	fairy martin	LC		1		
birds	Sturnidae	<i>Acridotheres tristis</i>	common mynah					1
mammals	Bovidae	<i>Bos taurus</i>	European cattle			1	1	1
mammals	Canidae	<i>Canis lupus dingo</i>	dingo			1		1
mammals	Dasyuridae	<i>Plaingale maculata</i>	common planigale	LC		1	1	
mammals	Emballonuridae	<i>Saccolaimus flaviventris</i>	yellow-bellied sheathtail bat	LC		1	1	1
mammals	Equidae	<i>Equus caballus</i>	horse			1		
mammals	Felidae	<i>Felis catus</i>	cat			1	1	1
mammals	Leporidae	<i>Oryctolagus cuniculus</i>	rabbit			1		1
mammals	Macropodidae	<i>Macropus agilis</i>	agile wallaby	LC		1	1	1
mammals	Macropodidae	<i>Macropus giganteus</i>	eastern grey kangaroo	LC		1		1
mammals	Macropodidae	<i>Macropus parryi</i>	whiptail wallaby	LC		1		
mammals	Macropodidae	<i>Wallabia bicolor</i>	swamp wallaby	LC		1	1	
mammals	Miniopteridae	<i>Miniopterus australis</i>	little bentwing bat	LC		1		1
mammals	Miniopteridae	<i>Miniopterus orianae oceanensis</i>	eastern bentwing bat	LC		1	1	1
mammals	Molossidae	<i>Austronomus (Tadarida) australis</i>	white-striped freetail bat	LC		1		1
mammals	Molossidae	<i>Chaerephon jobensis</i>	northern freetail bat	LC		1	1	1
mammals	Molossidae	<i>Mormopterus beccarii</i>	Beccari's freetail bat	LC		1	1	
mammals	Molossidae	<i>Mormopterus (Ozimops) lumsdenae</i>	northern freetail bat	LC				1
mammals	Molossidae	<i>Mormopterus (Ozimops) ridei</i>	Ride's freetail bat	LC		1	1	1

Class	Family	Scientific name	Common name	1	2	3	4	5
mammals	Muridae	<i>Hydromys chrysogaster</i>	water rat	LC		1		
mammals	Muridae	<i>Melomys cervinipes</i>	fawn-footed melomys	LC		1		
mammals	Muridae	<i>Mus musculus</i>	house mouse			1	1	
mammals	Muridae	<i>Pseudomys gracilicaudatus</i>	eastern chestnut mouse	LC		1		
mammals	Peramelidae	<i>Isoodon macrourus</i>	northern brown bandicoot	LC		1		
mammals	Petauridae	<i>Petaurus norfolcensis</i>	sugar glider	LC		1		
mammals	Petauridae	<i>Petaurus breviceps</i>	squirrel glider	LC		1	1	1
mammals	Phalangeridae	<i>Trichosurus vulpecula</i>	common brushtail possum	LC		1	1	1
mammals	Phascolarctidae	<i>Phascolarctos cinereus</i>	koala	V	V	1		1
mammals	Potoroidae	<i>Aepyprymnus rufescens</i>	rufous bettong	LC		1		
mammals	Pseudocheiridae	<i>Petauroides volans</i>	greater glider	LC		1		1
mammals	Pteropodidae	<i>Pteropus alecto</i>	black flying-fox	LC		1		1
mammals	Pteropodidae	<i>Pteropus scapulatus</i>	little red flying-fox	LC		1		1
mammals	Suidae	<i>Sus scrofa</i>	pig			1		1
mammals	Tachyglossidae	<i>Tachyglossus aculeatus</i>	short-beaked echidna	SLC		1	1	1
mammals	Vespertilionidae	<i>Chalinolobus gouldii</i>	Gould's wattled bat	LC		1		1
mammals	Vespertilionidae	<i>Chalinolobus morio</i>	chocolate wattled bat	LC		1	1	1
mammals	Vespertilionidae	<i>Chalinolobus nigrogriseus</i>	hoary wattled bat	LC		1		1
mammals	Vespertilionidae	<i>Chalinolobus picatus</i>	little pied bat	LC		1		1
mammals	Vespertilionidae	<i>Scotorepens balstoni</i>	inland broad-nosed bat	LC		1		
mammals	Vespertilionidae	<i>Scotorepens greyii</i>	little/northern broad-nosed bat	LC				1
mammals	Vespertilionidae	<i>Scotorepens sanborni</i>	northern broad-nosed bat	LC				1
mammals	Vespertilionidae	<i>Scotorepens greyii/sanborni</i>	little broad-nosed bat	LC		1		
mammals	Vespertilionidae	<i>Nyctophilus sp</i>	long-eared bat	LC		1	1	1
mammals	Vespertilionidae	<i>Vespadelus trougtoni</i>	eastern cave bat	LC		1		1
reptiles	Agamidae	<i>Diporiphora australis</i>	tommy roundhead	LC		1		1
reptiles	Agamidae	<i>Physignathus lesueurii</i>	water dragon	LC		1		
reptiles	Agamidae	<i>Pogona barbata</i>	bearded dragon	LC		1		1
reptiles	Boidae	<i>Antaresia maculosa</i>	spotted python	LC		1		
reptiles	Boidae	<i>Aspitides melanocephalus</i>	black-headed python	LC		1		
reptiles	Boidae	<i>Morelia spilota</i>	carpet python	LC		1		1
reptiles	Chelidae	<i>Chelodina canni</i>	Cann's longneck turtle	LC		1		
reptiles	Chelidae	<i>Chelodina longicollis</i>	eastern snake-necked turtle	LC		1		
reptiles	Colubridae	<i>Boiga irregularis</i>	brown tree snake	LC		1		
reptiles	Colubridae	<i>Dendrelaphis punctulata</i>	common tree snake	LC		1		
reptiles	Colubridae	<i>Tropidonophis mairii</i>	freshwater snake	LC		1		
reptiles	Diplodactylidae	<i>Oedura monilis</i>	velvet gecko	LC		1	1	1
reptiles	Elapidae	<i>Demansia psammophis</i>	yellow-faced whip-snake	LC		1		
reptiles	Elapidae	<i>Demansia vestigiata</i>	lesser black whip-snake	LC		1		

Class	Family	Scientific name	Common name	1	2	3	4	5
reptiles	Elapidae	<i>Denisonia maculata</i>	ornamental snake	V	V	1		
reptiles	Elapidae	<i>Hoplocephalus bitorquatus</i>	pale-headed snake	LC		1		
reptiles	Elapidae	<i>Pseudonaja textilis</i>	eastern brown snake	LC		1		
reptiles	Elapidae	<i>Oxyuranus scutellatus</i>	coastal taipan	LC		1		
reptiles	Gekkonidae	<i>Gehyra dubia</i>	common dtella	LC		1	1	1
reptiles	Gekkonidae	<i>Heteronotia binoei</i>	Bynoe's gecko	LC		1	1	1
reptiles	Pygopodidae	<i>Paradelma orientalis</i>	Brigalow Scaly-foot	V	V	1		
reptiles	Scincidae	<i>Carlia pectoralis</i>	lively skink	LC		1	1	1
reptiles	Scincidae	<i>Carlia munda</i>		LC		1	1	
reptiles	Scincidae	<i>Carlia schmeltzii</i>		LC		1		
reptiles	Scincidae	<i>Cryptoblepharus pulcher pulcher</i>	snake-eyed skink	LC		1	1	1
reptiles	Scincidae	<i>Cryptoblepharus metallicus</i>	metallic snake-eyed skink	LC		1		
reptiles	Scincidae	<i>Ctenotus taeniolatus</i>	copper-tailed skink	LC		1		
reptiles	Scincidae	<i>Eulamprus sp. cf tenuis</i>		LC		1		
reptiles	Scincidae	<i>Glaphyromorphus punctulatus</i>		LC		1	1	
reptiles	Scincidae	<i>Lygisaurus (Carlia) foliorum</i>		LC		1	1	
reptiles	Scincidae	<i>Morethia boulengeri</i>		LC		1		
reptiles	Scincidae	<i>Morethia taeniopleura</i>		LC		1		

Attachment B Fauna Habitat Photographs – Study Site



Above and below – Section of Deep Creek upstream of (west of) the Bruce Highway.





Above – Upper reaches of Deep Creek downstream of (east of) the Bruce Highway.

Below – Section of Deep Creek upstream of confluence with Barrack Creek.





Above and Below – Riparian habitat representative of the middle and lower reaches of the surveyed section of Deep Creek. Very large hollow-bearing *Eucalyptus tereticornis* are common along this section of Deep Creek.





Above – Very large hollow-bearing *Eucalyptus tereticornis* within the downstream section of Deep Creek.

Below – Introduced *Lantana camara* form dense thickets within the lower part of the surveyed section of Deep Creek





Above – Large hollow-bearing *Eucalyptus tereticornis* around edges of seasonal wetland. Remnant woodland patch adjacent to western side of Deep Creek.

Below – Ironbark community forming part of the remnant woodland patch adjacent to western side of Deep Creek.





Above – *Eucalyptus platyphylla* (foreground) and *E. tessellaris* (background) forming part of the remnant woodland patch adjacent to western side of Deep Creek.

Below – Small pools of water remaining within a relic anabranch of Deep Creek – within the remnant woodland patch adjacent to western side of Deep Creek.





Above – The upper third of Surveyor’s Creek is narrow and poorly defined in places. Typically, riparian vegetation is often limited to almost a single row of trees with little or no understorey.

Below - Near the Bruce Highway, the drainage line forms the southern edge of a remnant woodland patch with extends northwards into the north-west corner of the project area. Hollow-bearing trees are absent.





Above – Tree and shrub cover increases through the middle reaches of Surveyor’s Creek, though is highly variable.

Below – Soils associated with Surveyor’s Creek are highly dispersive. Eroded and poorly vegetated sections of waterway banks are not uncommon.





Above – Deeper incised channel and tree and shrub cover representative of the lower reach of Surveyor's Creek.

Below – Lower reaches of Surveyor's Creek adjacent the confluence with Deep Creek.





Above and Below – Remnant woodland patch with understorey cleared and heavily grazed by cattle. This patch is approximately 22 hectares and located within the south-west part of the study site – adjacent to the Bruce Highway. It is located approximately 300 metres to the north of Deep Creek. Three adult Koalas were recorded in this habitat.



Attachment C Microbat Call Detection Survey – Analysis Report

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Microbat Call Identification Report

Prepared for (“Client”):	Austecology
Survey location/project name:	Deep Creek, central Qld
Survey dates:	9-12 November 2019
Client project reference:	Warratah Styx Deep Creek
Job no.:	AUS-1901
Report date:	29 November 2019

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Methods

Data received and post-processing

Balance! Environmental received eight Anabat ZCA files and accompanying detector LOG files, recorded by two Anabat Express detectors (Titley Scientific, Brisbane) over four consecutive nights (9th – 12th November 2019).

Anabat Insight (version 1.9.1; Titley Scientific, Brisbane) was used to convert the raw ZCA files to zero-crossing analysis format bat-call sequence files (ZC files). A noise filter was applied during the conversion process to exclude all files that contained only non-bat background noise.

Call identification

All files that passed the noise filter were analysed in *Anabat Insight*. The data were first processed through a Decision Tree analysis to group and label calls according to zero-crossing analysis metrics (primarily characteristic frequency, Fc). Each group was then reviewed manually to verify call identities and confirm or adjust species labels. Species identification was achieved by comparing the ZC call spectrograms with those of reference calls from central and southern Queensland and/or with published call descriptions (e.g. Reinhold et al. 2001). Published distribution and habitat information (e.g. Churchill 2008; van Dyck *et al.* 2013) and on-line fauna database records (<http://www.ala.org.au>) were also consulted to determine probability of species' presence in the study area and enhance the viability of the species identifications obtained in the analysis.

Reporting standard

The format and content of this report follows Australasian Bat Society standards for the interpretation and reporting of bat call data (Reardon 2003), available on-line at <http://www.ausbats.org.au/>.

Species nomenclature follows Jackson & Groves (2015).

Results & Discussion

The ZCA conversion process yielded 5506 ZC sequence files; however, 2658 of those files contained only background noise and/or low-quality bat calls that were of no use for species identification. Within the remaining 2848 files, some 3213 individual bat calls were identified.

Approximately 44% (1399) of the detected calls were reliably identifiable to species level, with 13 species positively identified (see **Table 1**). The other 1814 files (56%) each potentially represented two or more species and could not be reliably identified. These “unresolved” calls were allocated to one of seven multi-species groups, with all members of each group given a presence rating of “possible” for a detector night (see **Table 1**) unless other calls were reliably identified to one or more group members for the same detector-night.

Table 1 provides a summary of species recorded per detector-night and **Table 2** gives a breakdown of relative activity levels throughout the survey in terms of number of calls identified per detector-night for each species and unresolved group.

Table 1. Microbats recorded during the Deep Creek survey, 9-12 November 2019.

- ◆ = 'definite' - at least one call from the site was attributed unequivocally to the species
 □ = 'probable' - calls similar to those of the species were recorded, but not reliably identified

Detector / serial number:	AE1 SN307604				AE2 SN307648			
	Date:	9/11	10/11	11/11	12/11	9/11	10/11	11/11
<i>Chalinolobus gouldii</i>	◆	◆	◆	◆	◆	□	◆	◆
<i>Chalinolobus morio</i>			◆	◆	◆	◆	◆	◆
<i>Chalinolobus nigrogriseus</i>	◆	◆	◆	◆	◆	□	□	□
<i>Chalinolobus picatus</i>	◆	◆	◆	◆	◆	◆	◆	◆
<i>Myotis macropus</i>							□	□
<i>Nyctophilus</i> sp.							□	□
<i>Scotorepens greyii</i>	◆	◆	◆	◆	◆	□	◆	◆
<i>Scotorepens sanborni</i>	◆	◆	◆	◆	◆	◆	◆	◆
<i>Vespadelus trougtoni</i>	◆	◆	◆	◆			◆	□
<i>Vespadelus</i> sp.		□	□	□			□	□
<i>Miniopterus australis</i>					◆		◆	◆
<i>Miniopterus oriana oceanensis</i>		◆	◆	◆		◆	◆	◆
<i>Chaerephon jobensis</i>	◆	◆	◆	◆	◆	◆	◆	◆
<i>Ozimops lumsdenae</i>	◆	◆	◆	◆	◆		◆	◆
<i>Ozimops ridei</i>	◆	◆	◆	◆	◆	◆	◆	◆
<i>Saccolaimus flaviventris</i>	◆			□	◆	◆	◆	◆

Most of the “unresolved” calls belonged to species that were also positively identified from more typical calls (see **Table 2**); however, two of the “unresolved” call-type groups represented at least one and possibly three or four additional species. These calls were allocated to the following groups:

- *Myotis macropus* / *Nyctophilus* species
 - Steep, near-linear FM calls with broad-band frequency sweep down to ~35-45 kHz
 - Almost impossible to distinguish based on call characteristics
 - Up to three *Nyctophilus* species may occur in the study area – *N. bifax*, *N. geoffroyii* and *N. gouldi*
 - *M. macropus* is also likely to be present along waterways or over waterbodies
- *Miniopterus oriana oceanensis* / *Vespadelus* species
 - *M. o. oceanensis* was reliably identified from several calls with relatively long duration FM-qCF pulses and flat-to-diagonal pulse-bodies at Fc~44-47 kHz
 - Several calls in the same frequency range had shorter duration pulses, broader bandwidth and strongly curved or “hooked” pulse bodies, which are characteristics more typical of *Vespadelus* species
 - *V. trougtoni* was positively identified from calls of this type but at a higher frequency (Fc~49-50 kHz) and it is the only species confirmed to occur in the local area within which this survey was undertaken
 - The calls in question are more typical of *V. vulturnus*, which could be present but no confirmed records are known for the local region

Table 2. Relative activity levels (no. of calls/detector-night) of bats at Deep Creek, 9-12 November 2019.

Detector & serial number:	AE1_SN307604				AE2_SN307648				Species Total
	Date:	9/11	10/11	11/11	12/11	9/11	10/11	11/11	
Positively identified calls									
<i>Chalinolobus gouldii</i>	2	4	4	9	2		5	37	63
<i>Chalinolobus morio</i>			6	4	3	6	3	5	27
<i>Chalinolobus nigrogriseus</i>	9	26	22	4	1				62
<i>Chalinolobus picatus</i>	10	8	13	10	62	70	182	230	585
<i>Scotorepens greyii</i>	65	7	150	18	8		2	3	253
<i>Scotorepens sanborni</i>	7	5	16	14	5	4	15	14	80
<i>Vespadelus troughtoni</i>	4	4	2	8			1		19
<i>Miniopterus australis</i>					1		2	2	5
<i>Miniopterus orianae oceanensis</i>		4	1	11		1	4	5	26
<i>Chaerephon jobensis</i>	9	6	25	25	17	20	37	45	184
<i>Ozimops lumsdenae</i>	7	1	2	7	6		1	7	31
<i>Ozimops ridei</i>	6	2	4	12	5	2	7	6	44
<i>Saccolaimus flaviventris</i>	3				11	1	2	3	20
Unresolved calls									
<i>C. gouldii</i> / <i>O. ridei</i>	14	12	8	11	88	77	386	477	1073
<i>C. nigrogriseus</i> / <i>S. greyii</i>	121	44	132	199	5	1	1	1	504
<i>C. picatus</i> / <i>S. sanborni</i>	13	8	28	30	17	12	22	13	143
<i>Myotis macropus</i> / <i>Nyctophilus</i> sp.							3	1	4
<i>S. greyii</i> / <i>S. sanborni</i>	8	13	24	13	3	3	2	8	74
<i>M. o. oceanensis</i> / <i>Vespadelus</i> sp.		1	2	3			1	5	12
<i>S. flaviventris</i> / <i>C. jobensis</i>				2	1	1			4
Detector-night Total	278	145	439	380	235	198	676	862	3213

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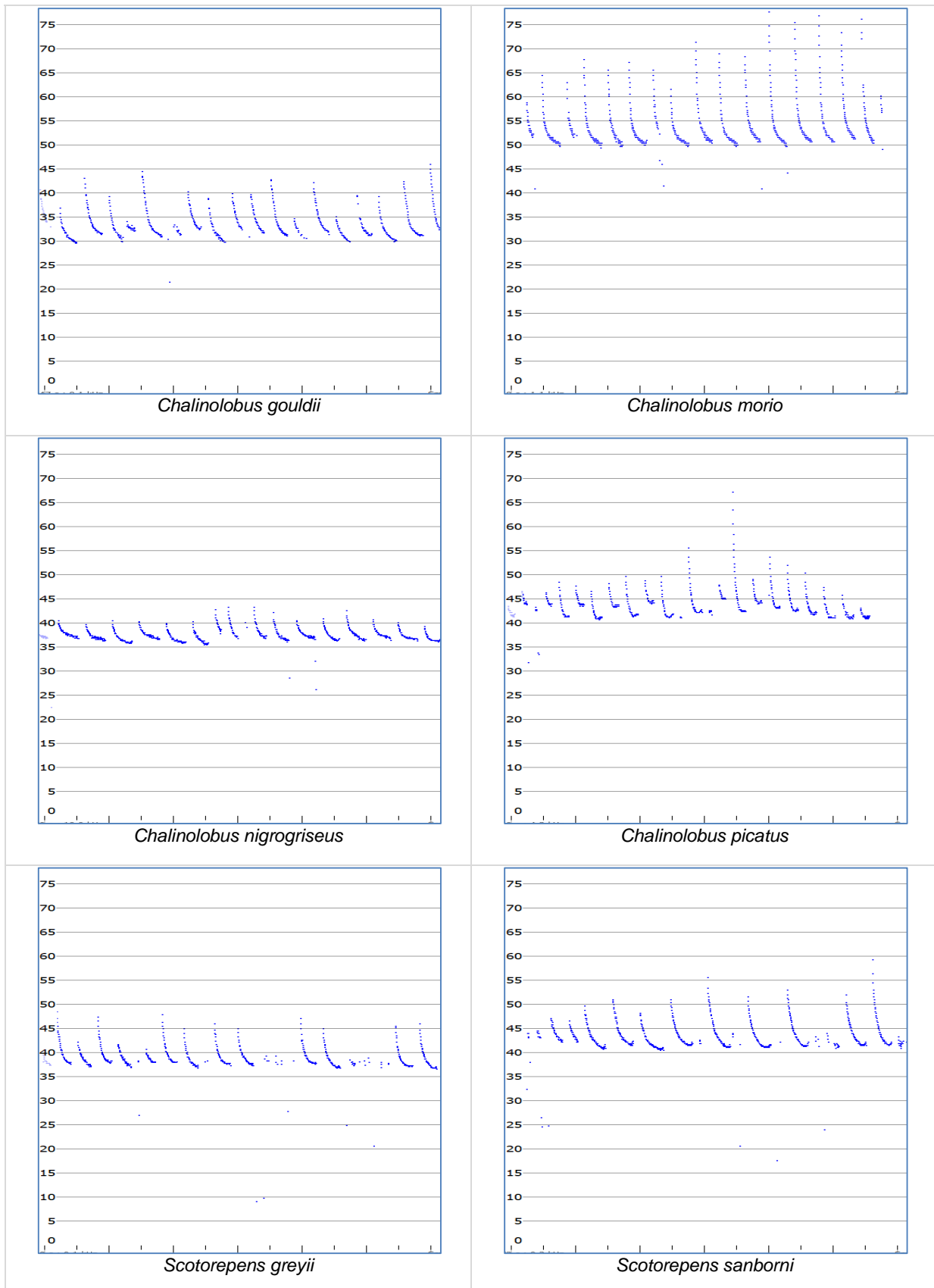
Glossary

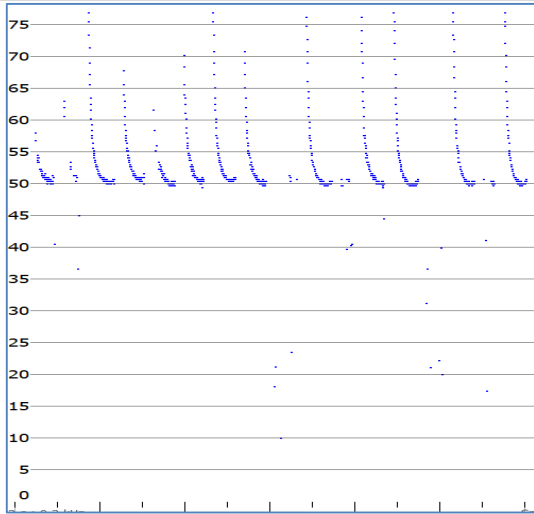
Technical terms used in this report are described in the following table.

Approach phase	The part of a bat <i>call</i> emitted as the bat starts to home in on a detected prey item; a transitional series of <i>pulses</i> between the <i>search phase</i> and <i>feeding buzz</i> , that become progressively steeper and shorter in duration.
Call	Refers to a single bat call, made up of a series of individual sound <i>pulses</i> in one or more <i>phases</i> (<i>search, approach, feeding buzz</i>).
CF (=Constant Frequency)	A type of <i>pulse</i> in which the dominant component consists of a more-or-less ‘pure tone’ of sound at a Constant Frequency; with <i>shape</i> appearing flat on the sonogram. Often also contains a brief <i>FM</i> component at the beginning and/or end of the CF component (<i>viz.</i> FM-CF-FM).
Characteristic frequency (Fc)	The frequency of the flattest part of a <i>pulse</i> ; usually the lowest frequency reached in the <i>qCF</i> component of a pulse. This is often the primary diagnostic feature for species identification.
Duration	The time period from the beginning of a <i>pulse</i> to the end of the pulse.
Feeding buzz	The terminal part of a <i>call</i> , following the <i>approach phase</i> , emitted as the bat catches a prey item; a distinctive, rapid series of very steep, very short-duration pulses.
FM (=Frequency Modulated)	A type of <i>pulse</i> in which there is substantial change in frequency from beginning to end; <i>shape</i> ranges from almost vertical and linear through varying degrees of curvature.
FC range	Refers to the range of frequencies occupied by the <i>characteristic frequency</i> section of <i>pulses</i> within a call or set of calls.
Frequency sweep or “band-width”	The range of frequencies through which a <i>pulse</i> sweeps from beginning to end; Maximum frequency (Fmax) – minimum frequency (Fmin).
Knee	The transitional part of a <i>pulse</i> between the initial (usually steeper) frequency sweep and the <i>characteristic frequency</i> section (usually flatter); time to knee (Tk) and frequency of knee (Fk) can be diagnostic for some species.
Pulse	An individual pulse of sound within a bat <i>call</i> ; the <i>shape, duration</i> and <i>characteristic frequency</i> of a pulse are the key diagnostic features used to differentiate species.
Pulse body	The part of the <i>pulse</i> between the <i>knee</i> and <i>tail</i> and containing the <i>characteristic frequency</i> section.
Pulse shape	The general appearance of a <i>pulse</i> on the sonogram, described using relative terms related to features such as slope and degree of curvature. See also <i>CF, qCF</i> and <i>FM</i> .
qCF (=quasi Constant Frequency)	A type of <i>pulse</i> in which there is very little change in frequency from beginning to end; <i>shape</i> appears to be almost flat. Some pulses also contain an <i>FM</i> component at the beginning and/or end of the qCF component (<i>viz.</i> FM-qCF).
Search phase	The part of a bat <i>call</i> generally required for reliable species diagnosis. A consistent series of <i>pulses</i> emitted by a bat that is searching for prey or and/or navigating through its habitat. Search phase pulses generally have longer duration, flatter slope and more consistent shape than <i>approach phase</i> and <i>feeding buzz</i> pulses.
Sequence	Literally, a sequence of <i>pulses</i> that may be from one or more bats; but generally refers to a <i>call</i> or part (e.g. <i>phase</i>) of a call.
Tail	The final component of a <i>pulse</i> , following the <i>characteristic frequency</i> section; may consist of a short or long sweep of frequencies either upward or downward from the Fc; or may be absent.

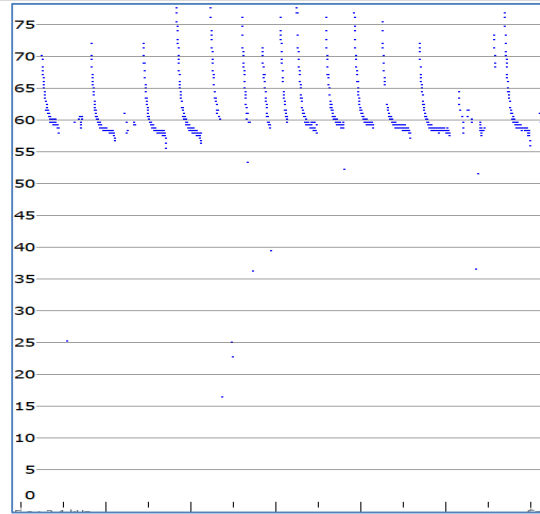
Appendix 1 Representative bat calls from the Deep Creek dataset recorded November 2019.

Axes: X=10 msec per tick (time between pulses removed); Y=kHz (log. scale)

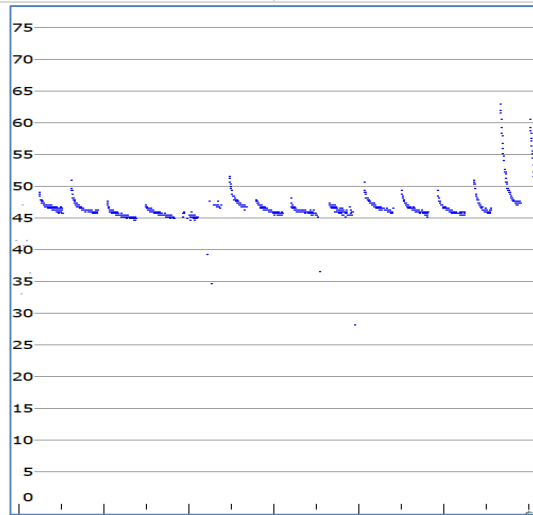




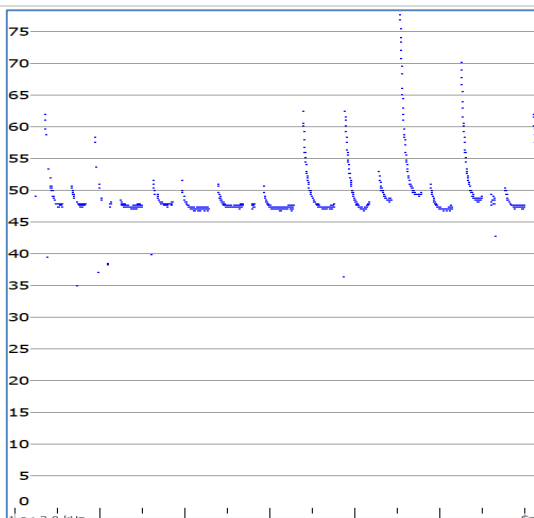
Vespadelus trougtoni



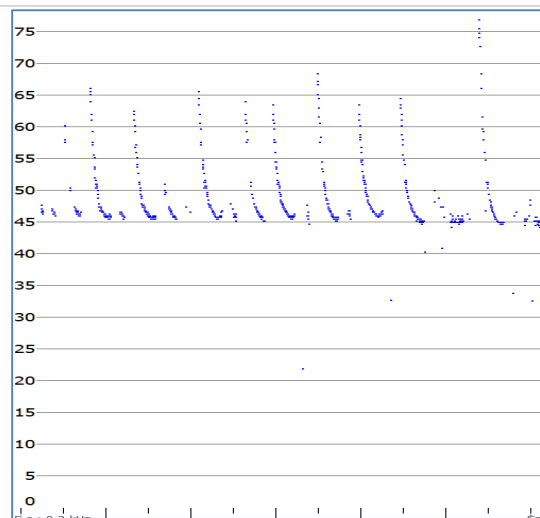
Miniopterus australis



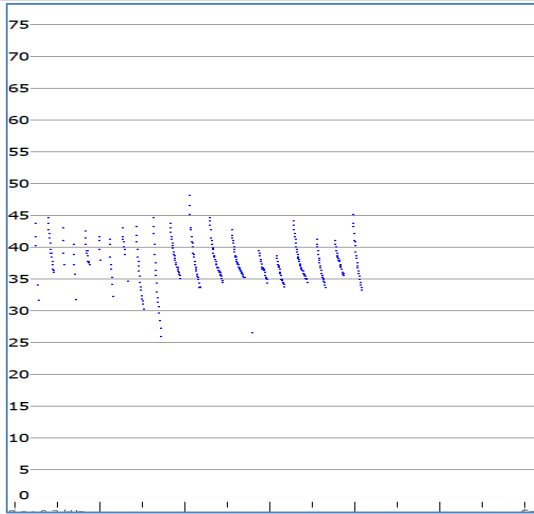
Miniopterus orianae oceanensis



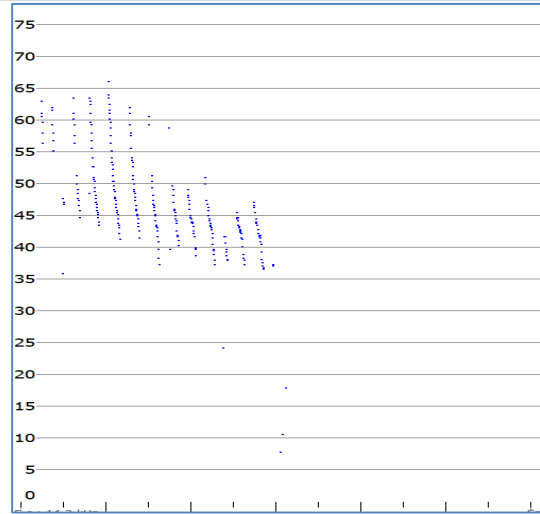
M. o. oceanensis / Vespadelus trougtoni



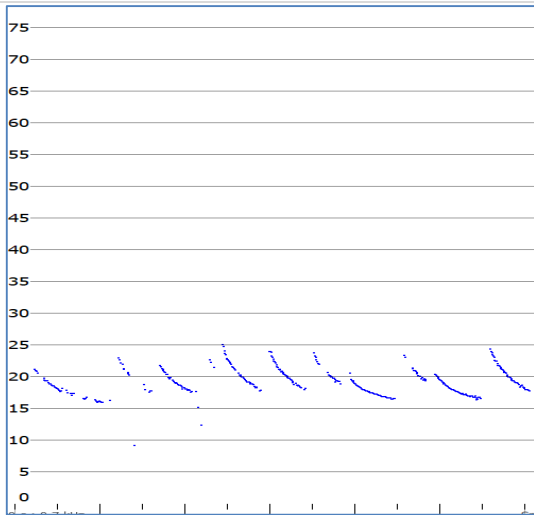
M. o. oceanensis / Vespadelus vulturinus



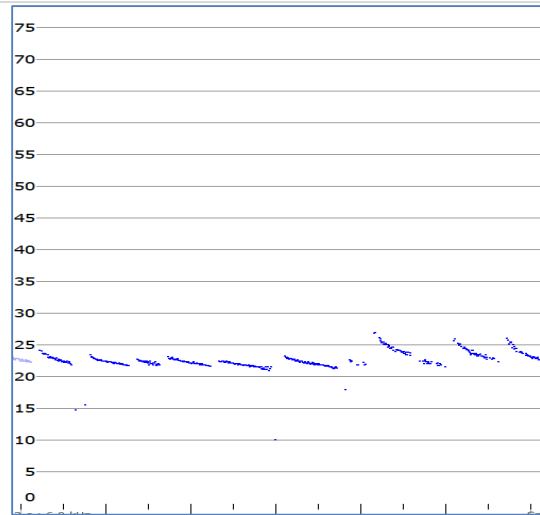
Probably *Myotis macropus*



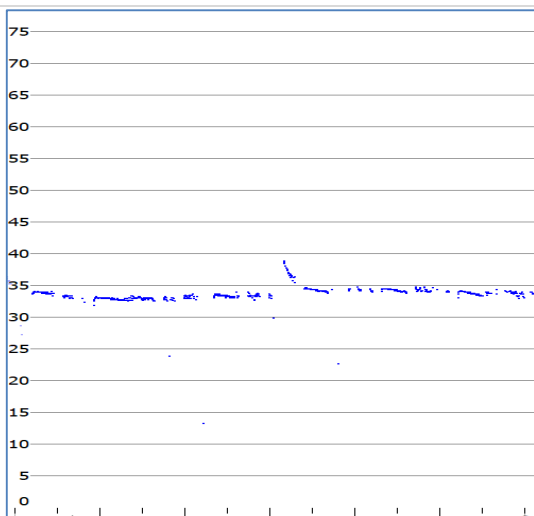
Probably *Nyctophilus* sp.



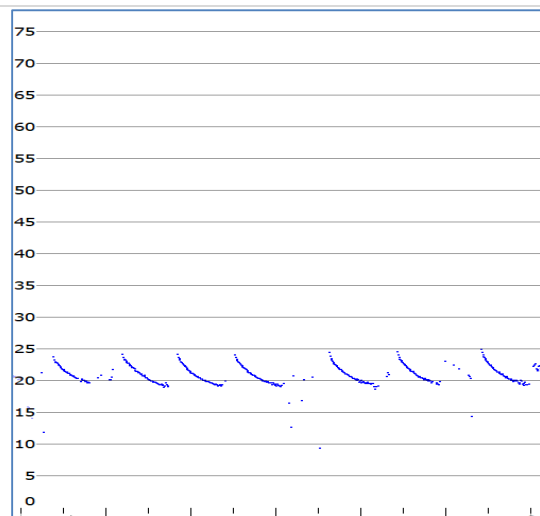
Chaerephon jobensis



Ozimops lumsdenae



Ozimops ridei



Saccolaimus flaviventris

Attachment D Fauna Database Extracts, and MNES / MSES Assessment Reports

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Queensland Government

Wildlife Online Extract

Search Criteria: Species List for a Specified Point
Species: Animals
Type: Native
Status: Rare and threatened species
Records: Confirmed
Date: Since 1980
Latitude: -22.7045
Longitude: 149.6867
Distance: 1
Email: lindsay@austecology.com.au
Date submitted: Monday 30 Sep 2019 14:08:49
Date extracted: Monday 30 Sep 2019 14:10:21

There were no records retrieved for your selection

Disclaimer

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Queensland Government

Wildlife Online Extract

Search Criteria: Species List for a Specified Point
Species: Animals
Type: Native
Status: Rare and threatened species
Records: Confirmed
Date: Since 1980
Latitude: -22.7045
Longitude: 149.6867
Distance: 2
Email: lindsay@austecology.com.au
Date submitted: Monday 30 Sep 2019 14:09:02
Date extracted: Monday 30 Sep 2019 14:10:03

The number of records retrieved = 3

Disclaimer

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Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Columbidae	<i>Geophaps scripta scripta</i>	squatter pigeon (southern subspecies)		V	V	4
animals	mammals	Phascolarctidae	<i>Phascolarctos cinereus</i>	koala		V	V	1
animals	mammals	Pseudocheiridae	<i>Petauroides volans</i>	greater glider		V	V	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 in the Wild (PE), Endangered (E), Vulnerable (V), Near Threatened (NT), Least Concern (C) or Not Protected ().

A - Indicates the Australian conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act 1999*. The values of EPBC are Conservation Dependent (CD), Critically Endangered (CE), Endangered (E), Extinct (EX), Extinct in the Wild (XW) and Vulnerable (V).

Records – The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).

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

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



Queensland Government

Wildlife Online Extract

Search Criteria: Species List for a Specified Point
Species: Animals
Type: Native
Status: Rare and threatened species
Records: Confirmed
Date: Since 1980
Latitude: -22.7045
Longitude: 149.6867
Distance: 3
Email: lindsay@austecology.com.au
Date submitted: Monday 30 Sep 2019 14:09:13
Date extracted: Monday 30 Sep 2019 14:10:16

The number of records retrieved = 3

Disclaimer

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Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Columbidae	<i>Geophaps scripta scripta</i>	squatter pigeon (southern subspecies)		V	V	6
animals	mammals	Phascolarctidae	<i>Phascolarctos cinereus</i>	koala		V	V	1
animals	mammals	Pseudocheiridae	<i>Petauroides volans</i>	greater glider		V	V	1

CODES

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

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A - Indicates the Australian conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act 1999*. The values of EPBC are Conservation Dependent (CD), Critically Endangered (CE), Endangered (E), Extinct (EX), Extinct in the Wild (XW) and Vulnerable (V).

Records – The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).

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

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



Queensland Government

Wildlife Online Extract

Search Criteria: Species List for a Specified Point
Species: Animals
Type: Native
Status: Rare and threatened species
Records: Confirmed
Date: Since 1980
Latitude: -22.7045
Longitude: 149.6867
Distance: 4
Email: lindsay@austecology.com.au
Date submitted: Monday 30 Sep 2019 14:09:23
Date extracted: Monday 30 Sep 2019 14:10:14

The number of records retrieved = 3

Disclaimer

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Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Columbidae	<i>Geophaps scripta scripta</i>	squatter pigeon (southern subspecies)		V	V	7
animals	mammals	Phascolarctidae	<i>Phascolarctos cinereus</i>	koala		V	V	1
animals	mammals	Pseudocheiridae	<i>Petauroides volans</i>	greater glider		V	V	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 in the Wild (PE), Endangered (E), Vulnerable (V), Near Threatened (NT), Least Concern (C) or Not Protected ().

A - Indicates the Australian conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act 1999*. The values of EPBC are Conservation Dependent (CD), Critically Endangered (CE), Endangered (E), Extinct (EX), Extinct in the Wild (XW) and Vulnerable (V).

Records – The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).

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

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



Queensland Government

Wildlife Online Extract

Search Criteria: Species List for a Specified Point
Species: Animals
Type: Native
Status: Rare and threatened species
Records: Confirmed
Date: Since 1980
Latitude: -22.7045
Longitude: 149.6867
Distance: 5
Email: lindsay@austecology.com.au
Date submitted: Monday 30 Sep 2019 13:52:11
Date extracted: Monday 30 Sep 2019 14:00:07

The number of records retrieved = 3

Disclaimer

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Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Columbidae	<i>Geophaps scripta scripta</i>	squatter pigeon (southern subspecies)		V	V	7
animals	mammals	Phascolarctidae	<i>Phascolarctos cinereus</i>	koala		V	V	4
animals	mammals	Pseudocheiridae	<i>Petauroides volans</i>	greater glider		V	V	3

CODES

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

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Records – The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).

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

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



Queensland Government

Wildlife Online Extract

Search Criteria: Species List for a Specified Point
Species: Animals
Type: Native
Status: Rare and threatened species
Records: Confirmed
Date: Since 1980
Latitude: -22.7045
Longitude: 149.6867
Distance: 10
Email: lindsay@austecology.com.au
Date submitted: Monday 30 Sep 2019 13:52:22
Date extracted: Monday 30 Sep 2019 14:00:29

The number of records retrieved = 4

Disclaimer

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Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Apodidae	<i>Hirundapus caudacutus</i>	white-throated needletail		V	V	1
animals	birds	Columbidae	<i>Geophaps scripta scripta</i>	squatter pigeon (southern subspecies)		V	V	7
animals	mammals	Phascolarctidae	<i>Phascolarctos cinereus</i>	koala		V	V	5
animals	mammals	Pseudocheiridae	<i>Petauroides volans</i>	greater glider		V	V	3

CODES

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Records – The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).

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

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



Queensland Government

Wildlife Online Extract

Search Criteria: Species List for a Specified Point
Species: Animals
Type: Native
Status: Rare and threatened species
Records: Confirmed
Date: Since 1980
Latitude: -22.7045
Longitude: 149.6867
Distance: 20
Email: lindsay@austecology.com.au
Date submitted: Monday 30 Sep 2019 13:52:35
Date extracted: Monday 30 Sep 2019 14:00:32

The number of records retrieved = 5

Disclaimer

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Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Apodidae	<i>Hirundapus caudacutus</i>	white-throated needletail		V	V	1
animals	birds	Columbidae	<i>Geophaps scripta scripta</i>	squatter pigeon (southern subspecies)		V	V	11
animals	birds	Turnicidae	<i>Turnix melanogaster</i>	black-breasted button-quail		V	V	2
animals	mammals	Phascolarctidae	<i>Phascolarctos cinereus</i>	koala		V	V	5
animals	mammals	Pseudocheiridae	<i>Petauroides volans</i>	greater glider		V	V	3

CODES

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Records – The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).

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

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



Queensland Government

Wildlife Online Extract

Search Criteria: Species List for a Specified Point
Species: Animals
Type: Native
Status: Rare and threatened species
Records: Confirmed
Date: Since 1980
Latitude: -22.7045
Longitude: 149.6867
Distance: 30
Email: lindsay@austecology.com.au
Date submitted: Monday 30 Sep 2019 13:52:48
Date extracted: Monday 30 Sep 2019 14:00:23

The number of records retrieved = 8

Disclaimer

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Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Apodidae	<i>Hirundapus caudacutus</i>	white-throated needletail		V	V	1
animals	birds	Columbidae	<i>Geophaps scripta scripta</i>	squatter pigeon (southern subspecies)		V	V	21
animals	birds	Falconidae	<i>Falco hypoleucos</i>	grey falcon		V		1
animals	birds	Meliphagidae	<i>Epthianura crocea macgregori</i>	yellow chat (Dawson)		E	CE	11
animals	birds	Turnicidae	<i>Turnix melanogaster</i>	black-breasted button-quail		V	V	2
animals	mammals	Phascolarctidae	<i>Phascolarctos cinereus</i>	koala		V	V	16
animals	mammals	Pseudocheiridae	<i>Petauroides volans</i>	greater glider		V	V	3
animals	reptiles	Chelidae	<i>Elseya albagula</i>	southern snapping turtle		E	CE	3

CODES

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Records – The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).

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

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



Queensland Government

Wildlife Online Extract

Search Criteria: Species List for a Specified Point
Species: Animals
Type: Native
Status: Rare and threatened species
Records: Confirmed
Date: Since 1980
Latitude: -22.7045
Longitude: 149.6867
Distance: 50
Email: lindsay@austecology.com.au
Date submitted: Monday 30 Sep 2019 13:53:00
Date extracted: Monday 30 Sep 2019 14:00:15

The number of records retrieved = 17

Disclaimer

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Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Apodidae	<i>Hirundapus caudacutus</i>	white-throated needletail		V	V	1
animals	birds	Burhinidae	<i>Esacus magnirostris</i>	beach stone-curlew		V		9
animals	birds	Charadriidae	<i>Charadrius mongolus</i>	lesser sand plover		E	E	10
animals	birds	Charadriidae	<i>Charadrius leschenaultii</i>	greater sand plover		V	V	4
animals	birds	Columbidae	<i>Geophaps scripta scripta</i>	squatter pigeon (southern subspecies)		V	V	53/1
animals	birds	Falconidae	<i>Falco hypoleucos</i>	grey falcon		V		1
animals	birds	Meliphagidae	<i>Epthianura crocea macgregori</i>	yellow chat (Dawson)		E	CE	50
animals	birds	Scolopacidae	<i>Calidris canutus</i>	red knot		E	E	10
animals	birds	Scolopacidae	<i>Numenius madagascariensis</i>	eastern curlew		E	CE	35
animals	birds	Scolopacidae	<i>Limosa lapponica baueri</i>	Western Alaskan bar-tailed godwit		V	V	30
animals	birds	Scolopacidae	<i>Calidris tenuirostris</i>	great knot		E	CE	21
animals	birds	Scolopacidae	<i>Calidris ferruginea</i>	curlew sandpiper		E	CE	4
animals	birds	Turnicidae	<i>Turnix melanogaster</i>	black-breasted button-quail		V	V	2
animals	mammals	Phascolarctidae	<i>Phascolarctos cinereus</i>	koala		V	V	48
animals	mammals	Pseudocheiridae	<i>Petauroides volans</i>	greater glider		V	V	10
animals	reptiles	Chelidae	<i>Elseya albagula</i>	southern snapping turtle		E	CE	3
animals	reptiles	Crocodylidae	<i>Crocodylus porosus</i>	estuarine crocodile		V		2

CODES

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A - Indicates the Australian conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act 1999*. The values of EPBC are Conservation Dependent (CD), Critically Endangered (CE), Endangered (E), Extinct (EX), Extinct in the Wild (XW) and Vulnerable (V).

Records – The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).

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

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



Queensland Government

Wildlife Online Extract

Search Criteria: Species List for a Selected Area
Species: Animals
Type: Native
Status: Rare and threatened species
Records: Confirmed
Area: Bukkulla Conservation Park
Email: lindsay@austecology.com.au
Date submitted: Monday 30 Sep 2019 14:28:28
Date extracted: Monday 30 Sep 2019 14:30:06

There were no records retrieved for your selection

Disclaimer

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Feedback about Wildlife Online should be emailed to wildlife.online@science.dsitia.qld.gov.au



Queensland Government

Wildlife Online Extract

Search Criteria: Species List for a Selected Area
Species: Animals
Type: Native
Status: Rare and threatened species
Records: Confirmed
Area: Tooloombah Creek Conservation Park
Email: lindsay@austecology.com.au
Date submitted: Monday 30 Sep 2019 14:27:41
Date extracted: Monday 30 Sep 2019 14:30:08

There were no records retrieved for your selection

Disclaimer

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Queensland Government

Wildlife Online Extract

Search Criteria: Species List for a Selected Area
Species: Animals
Type: Native
Status: Rare and threatened species
Records: Confirmed
Area: Marlborough State Forest
Email: lindsay@austecology.com.au
Date submitted: Monday 30 Sep 2019 14:29:09
Date extracted: Monday 30 Sep 2019 14:30:02

The number of records retrieved = 2

Disclaimer

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Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Columbidae	<i>Geophaps scripta scripta</i>	squatter pigeon (southern subspecies)		V	V	1
animals	birds	Turnicidae	<i>Turnix melanogaster</i>	black-breasted button-quail		V	V	2

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 in the Wild (PE), Endangered (E), Vulnerable (V), Near Threatened (NT), Least Concern (C) or Not Protected ().

A - Indicates the Australian conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act 1999*. The values of EPBC are Conservation Dependent (CD), Critically Endangered (CE), Endangered (E), Extinct (EX), Extinct in the Wild (XW) and Vulnerable (V).

Records – The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).

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

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



Queensland Government

Wildlife Online Extract

Search Criteria: Species List for a Selected Area
Species: Animals
Type: Native
Status: Rare and threatened species
Records: Confirmed
Area: Eugene State Forest
Email: lindsay@austecology.com.au
Date submitted: Monday 30 Sep 2019 14:30:59
Date extracted: Monday 30 Sep 2019 14:40:03

There were no records retrieved for your selection

Disclaimer

As the DSITIA is still in a process of collating and vetting data, it is possible the information given is not complete. The information provided should only be used for the project for which it was requested and it should be appropriately acknowledged as being derived from Wildlife Online when it is used.

The State of Queensland does not invite reliance upon, nor accept responsibility for this information. Persons should satisfy themselves through independent means as to the accuracy and completeness of this information.

No statements, representations or warranties are made about the accuracy or completeness of this information. The State of Queensland disclaims all responsibility for this information and all liability (including without limitation, liability in negligence) for all expenses, losses, damages and costs you may incur as a result of the information being inaccurate or incomplete in any way for any reason.

Feedback about Wildlife Online should be emailed to wildlife.online@science.dsitia.qld.gov.au



Queensland Government

Wildlife Online Extract

Search Criteria: Species List for a Selected Area
Species: Animals
Type: Native
Status: Rare and threatened species
Records: Confirmed
Area: Mount Buffalo State Forest
Email: lindsay@austecology.com.au
Date submitted: Monday 30 Sep 2019 14:30:26
Date extracted: Monday 30 Sep 2019 14:40:07

There were no records retrieved for your selection

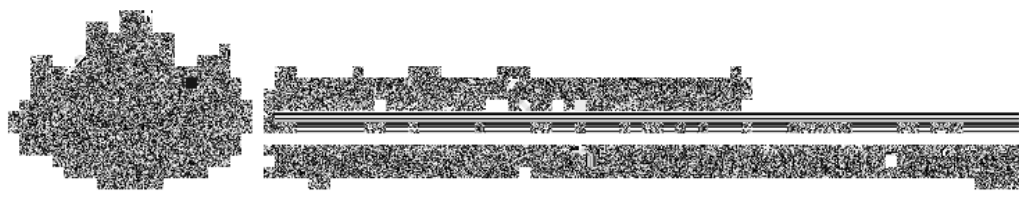
Disclaimer

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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.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 30/09/19 13:40:23

[Summary](#)

[Details](#)

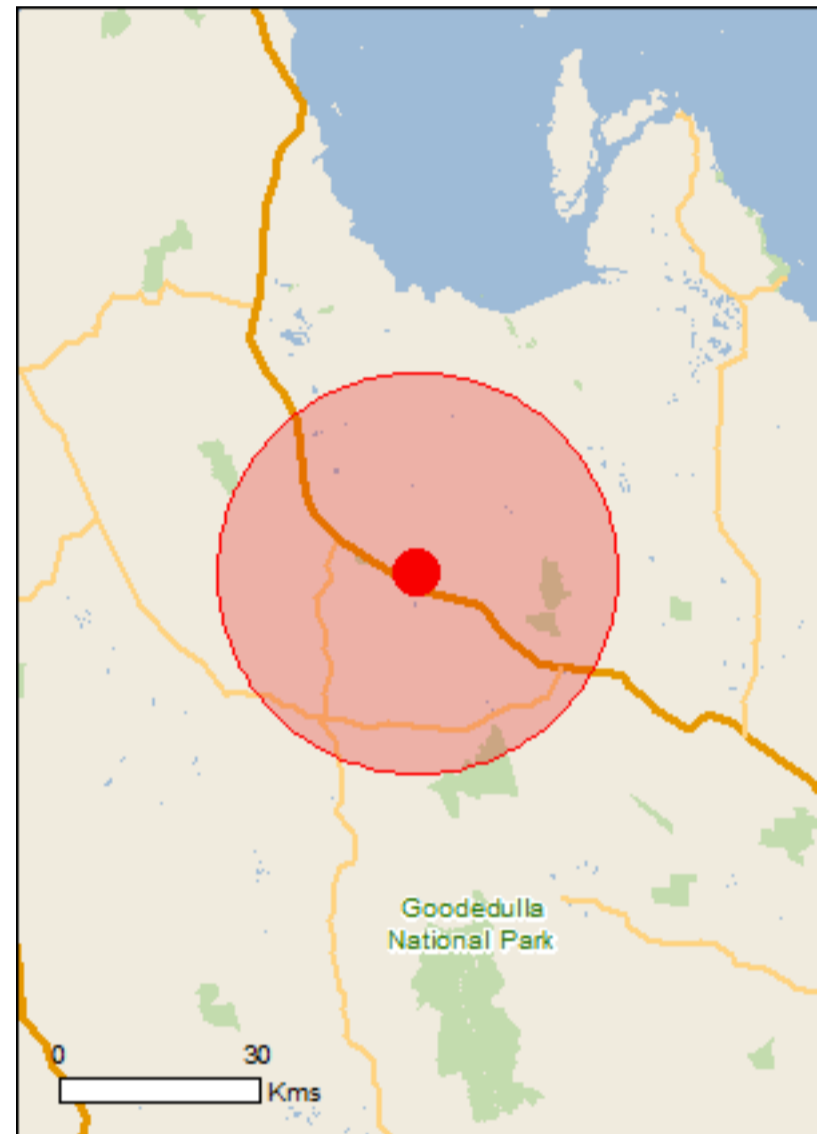
[Matters of NES](#)

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

[Extra Information](#)

[Caveat](#)

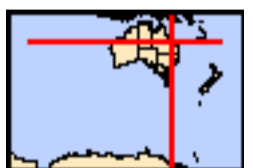
[Acknowledgements](#)



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

[Coordinates](#)

Buffer: 30.0Km



Summary

Matters of National Environmental 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:	1
National Heritage Places:	1
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	6
Listed Threatened Species:	55
Listed Migratory Species:	47

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 <http://www.environment.gov.au/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 Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	90
Whales and Other Cetaceans:	11
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	4
Regional Forest Agreements:	None
Invasive Species:	23
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

World Heritage Properties [\[Resource Information \]](#)

Name	State	Status
Great Barrier Reef	QLD	Declared property

National Heritage Properties [\[Resource Information \]](#)

Name	State	Status
Natural		
Great Barrier Reef	QLD	Listed place

Listed Threatened Ecological Communities [\[Resource Information \]](#)

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

Name	Status	Type of Presence
Brigalow (Acacia harpophylla dominant and co-dominant)	Endangered	Community known to occur within area
Broad leaf tea-tree (Melaleuca viridiflora) woodlands in high rainfall coastal north Queensland	Endangered	Community may occur within area
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	Endangered	Community may occur within area
Natural Grasslands of the Queensland Central Highlands and northern Fitzroy Basin	Endangered	Community may occur within area
Poplar Box Grassy Woodland on Alluvial Plains	Endangered	Community likely to occur within area
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	Endangered	Community likely to occur within area

Listed Threatened Species [\[Resource Information \]](#)

Name	Status	Type of Presence
Birds		
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat likely to occur within area
Epthianura crocea macgregori Capricorn Yellow Chat, Yellow Chat (Dawson) [67090]	Critically Endangered	Species or species habitat likely to occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat known to occur within area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Geophaps scripta scripta Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat may occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat may occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may 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 known to occur within area
Poephila cincta cincta Southern Black-throated Finch [64447]	Endangered	Species or species habitat may occur within area
Pterodroma neglecta neglecta Kermadec Petrel (western) [64450]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Rostratula australis Australian Painted-snipe, Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Turnix melanogaster Black-breasted Button-quail [923]	Vulnerable	Species or species habitat known to occur within area
Mammals		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat likely to occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Nyctophilus corbeni Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat likely to 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]	Vulnerable	Species or species habitat known to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Xeromys myoides Water Mouse, False Water Rat, Yirrkoo [66]	Vulnerable	Species or species habitat likely to occur within area
Plants		
Capparis thozetiana [6021]	Vulnerable	Species or species habitat known to occur within area
Corymbia xanthope Glen Geddes Bloodwood [64021]	Vulnerable	Species or species habitat known to occur within area
Cycas megacarpa [55794]	Endangered	Species or species habitat likely to occur within area
Cycas ophiolitica [55797]	Endangered	Species or species habitat known to occur within area
Dichanthium setosum bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area
Hakea trineura Three-veined Hakea [15931]	Vulnerable	Species or species habitat known to occur within area
Marsdenia brevifolia [64585]	Vulnerable	Species or species habitat known to occur within area
Neoroepera buxifolia [13375]	Vulnerable	Species or species habitat known to occur within area
Omphalea celata [64586]	Vulnerable	Species or species habitat likely to occur within area
Phaius australis Lesser Swamp-orchid [5872]	Endangered	Species or species habitat may occur within area
Pimelea leptospermoides [20849]	Vulnerable	Species or species habitat likely to occur within area
Pultenaea setulosa [2705]	Vulnerable	Species or species habitat known to occur within area
Samadera bidwillii Quassia [29708]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur

Name	Status	Type of Presence within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Delma torquata Adorned Delma, Collared Delma [1656]	Vulnerable	Species or species habitat may occur within area
Denisonia maculata Ornamental Snake [1193]	Vulnerable	Species or species habitat known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Egernia rugosa Yakka Skink [1420]	Vulnerable	Species or species habitat may occur within area
Elseya albagula Southern Snapping Turtle, White-throated Snapping Turtle [81648]	Critically Endangered	Species or species habitat likely to occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding likely to occur within area
Furina dunmalli Dunmall's Snake [59254]	Vulnerable	Species or species habitat may occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Breeding likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Rheodytes leukops Fitzroy River Turtle, Fitzroy Tortoise, Fitzroy Turtle, White-eyed River Diver [1761]	Vulnerable	Species or species habitat known to occur within area
Sharks		
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Breeding may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat may occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat may occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat may occur within

Name	Threatened	Type of Presence area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Sternula albifrons Little Tern [82849]		Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Migratory Marine Species		
Anoxypristis cuspidata Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat likely to occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Dugong dugon Dugong [28]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding likely to occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Breeding likely to occur within area
Manta alfredi Reef Manta Ray, Coastal Manta Ray, Inshore Manta Ray, Prince Alfred's Ray, Resident Manta Ray [84994]		Species or species habitat may occur within area
Manta birostris Giant Manta Ray, Chevron Manta Ray, Pacific Manta Ray, Pelagic Manta Ray, Oceanic Manta Ray [84995]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Orcaella heinsohni Australian Snubfin Dolphin [81322]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Breeding may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Foraging, feeding or related behaviour likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat likely to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may 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 known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius phaeopus Whimbrel [849]		Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to 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 [\[Resource Information \]](#)

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Calidris tenuirostris Great Knot [862]	Critically Endangered	Species or species habitat likely to occur within area
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat may occur within area
Fregata minor Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat may occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat likely to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius phaeopus Whimbrel [849]		Species or species habitat likely to occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Species or species habitat may occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Sterna albifrons Little Tern [813]		Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat may occur within area
Fish		
Acentronura tentaculata Shortpouch Pygmy Pipehorse [66187]		Species or species habitat may occur within area
Campichthys tryoni Tryon's Pipefish [66193]		Species or species habitat may occur within area
Choeroichthys brachysoma Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area
Corythoichthys amplexus Fijian Banded Pipefish, Brown-banded Pipefish [66199]		Species or species habitat may occur within area
Corythoichthys flavofasciatus Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area
Corythoichthys haematopterus Reef-top Pipefish [66201]		Species or species habitat may occur within area
Corythoichthys intestinalis Australian Messmate Pipefish, Banded Pipefish [66202]		Species or species habitat may occur within area
Corythoichthys ocellatus Orange-spotted Pipefish, Ocellated Pipefish [66203]		Species or species habitat may occur within area
Corythoichthys paxtoni Paxton's Pipefish [66204]		Species or species habitat may occur within area
Corythoichthys schultzi Schultz's Pipefish [66205]		Species or species habitat may occur within area
Doryrhamphus excisus Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area
Festucalex cinctus Girdled Pipefish [66214]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus dunckeri Red-hair Pipefish, Duncker's Pipefish [66220]		Species or species habitat may occur within area
Halicampus grayi Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area
Halicampus nitidus Glittering Pipefish [66224]		Species or species habitat may occur within area
Halicampus spirostris Spiny-snout Pipefish [66225]		Species or species habitat may occur within area
Hippichthys cyanospilos Blue-speckled Pipefish, Blue-spotted Pipefish [66228]		Species or species habitat may occur within area
Hippichthys heptagonus Madura Pipefish, Reticulated Freshwater Pipefish [66229]		Species or species habitat may occur within area
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area
Hippocampus bargibanti Pygmy Seahorse [66721]		Species or species habitat may occur within area
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus zebra Zebra Seahorse [66241]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Micrognathus andersonii Anderson's Pipefish, Shortnose Pipefish [66253]		Species or species habitat may occur within area
Micrognathus brevisrostris thorntail Pipefish, Thorn-tailed Pipefish [66254]		Species or species habitat may occur within area
Nannocampus pictus Painted Pipefish, Reef Pipefish [66263]		Species or species habitat may occur within area
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Solenostomus paradoxus Ornate Ghostpipefish, Harlequin Ghost Pipefish, Ornate Ghost Pipefish [66184]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Mammals		
Dugong dugon Dugong [28]		Species or species habitat may occur within area
Reptiles		
Acalyptophis peronii Horned Seasnake [1114]		Species or species habitat may occur within area
Aipysurus duboisii Dubois' Seasnake [1116]		Species or species habitat may occur within area
Aipysurus eydouxii Spine-tailed Seasnake [1117]		Species or species habitat may occur within area
Aipysurus laevis Olive Seasnake [1120]		Species or species habitat may occur within area
Astrotia stokesii Stokes' Seasnake [1122]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Disteira kingii Spectacled Seasnake [1123]		Species or species habitat may occur within area
Disteira major Olive-headed Seasnake [1124]		Species or species habitat may occur within area
Emydocephalus annulatus Turtle-headed Seasnake [1125]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding likely to occur within area
Hydrophis elegans Elegant Seasnake [1104]		Species or species habitat may occur within area
Hydrophis mcdowellii null [25926]		Species or species

Name	Threatened	Type of Presence
Hydrophis ornatus Spotted Seasnake, Ornate Reef Seasnake [1111]		habitat may occur within area Species or species habitat may occur within area
Lapemis hardwickii Spine-bellied Seasnake [1113]		Species or species habitat may occur within area
Laticauda colubrina a sea krait [1092]		Species or species habitat may occur within area
Laticauda laticaudata a sea krait [1093]		Species or species habitat may occur within area
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Breeding likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Pelamis platurus Yellow-bellied Seasnake [1091]		Species or species habitat may occur within area

Whales and other Cetaceans [[Resource Information](#)]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat known to occur within area
Orcaella brevirostris Irrawaddy Dolphin [45]		Species or species habitat may occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Sousa chinensis Indo-Pacific Humpback Dolphin [50]		Foraging, feeding or related behaviour likely to occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves [\[Resource Information \]](#)

Name	State
Bukkulla	QLD
Burwood	QLD
Develin	QLD
Tooloombah Creek	QLD

Invasive Species [\[Resource Information \]](#)

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit, 2001.

Name	Status	Type of Presence
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Birds

Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area

Frogs

Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
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Mammals

Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species

Name	Status	Type of Presence
Feral deer Feral deer species in Australia [85733]		habitat likely to occur within area Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Acacia nilotica subsp. indica Prickly Acacia [6196]		Species or species habitat may occur within area
Cryptostegia grandiflora Rubber Vine, Rubbervine, India Rubber Vine, India Rubbervine, Palay Rubbervine, Purple Allamanda [18913]		Species or species habitat likely to occur within area
Hymenachne amplexicaulis Hymenachne, Olive Hymenachne, Water Stargrass, West Indian Grass, West Indian Marsh Grass [31754]		Species or species habitat likely to occur within area
Jatropha gossypifolia Cotton-leaved Physic-Nut, Bellyache Bush, Cotton-leaf Physic Nut, Cotton-leaf Jatropha, Black Physic Nut [7507]		Species or species habitat likely to occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree, Horse Bean [12301]		Species or species habitat likely to occur within area
Parthenium hysterophorus Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566]		Species or species habitat likely to occur within area
Vachellia nilotica Prickly Acacia, Blackthorn, Prickly Mimosa, Black Piquant, Babul [84351]		Species or species habitat likely to occur within area
Nationally Important Wetlands		[Resource Information]
Name		State
Broad Sound		QLD

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

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

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

Where very little information is available for 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 reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

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

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

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

Coordinates

-22.70428 149.68673

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.



Queensland Government

Department of Environment and Science

Environmental Reports

Biodiversity and Conservation Values

Biodiversity Planning Assessments and Aquatic Conservation Assessments

For the selected area of interest
ml: 700022

Environmental Reports - General Information

The Environmental Reports portal provides for the assessment of selected matters of interest relevant to a user specified location, or Area of Interest (AOI). All area and derivative figures are relevant to the extent of matters of interest contained within the AOI unless otherwise stated. Please note, if a user selects an AOI via the "Central co-ordinates" option, the resulting assessment area encompasses an area extending from 2km radius from the point of interest.

All area and area derived figures included in this report have been calculated via reprojecting relevant spatial features to Albers equal-area conic projection (central meridian = 146, datum Geocentric Datum of Australia 1994). As a result, area figures may differ slightly if calculated for the same features using a different co-ordinate system.

Figures in tables may be affected by rounding.

The matters of interest reported on in this document are based upon available state mapped datasets. Where the report indicates that a matter of interest is not present within the AOI (e.g. where area related calculations are equal to zero, or no values are listed), this may be due either to the fact that state mapping has not been undertaken for the AOI, that state mapping is incomplete for the AOI, or that no values have been identified within the site.

The information presented in this report should be considered as a guide only and field survey may be required to validate values on the ground.

Please direct queries about these reports to: biodiversity.planning@des.qld.gov.au

Disclaimer

Whilst every care is taken to ensure the accuracy of the information provided in this report, the Queensland Government makes no representations or warranties about its accuracy, reliability, completeness, or suitability, for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which the user may incur as a consequence of the information being inaccurate or incomplete in any way and for any reason.



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Summary Information

Tables 1 to 8 provide an overview of the AOI with respect to selected topographic and environmental values.

Table 1: Area of interest details: ml: 700022

Size (ha)	744.47
Local Government(s)	Livingstone Shire
Bioregion(s)	Brigalow Belt
Subregion(s)	Marlborough Plains
Catchment(s)	Styx

The following table identifies available Biodiversity Planning Assessments (BPAs) and Aquatic Conservation Assessments (ACAs) with respect to the AOI.

Table 2: Available Biodiversity Planning and Aquatic Conservation Assessments

Assessment Type	Assessment Area and Version
Biodiversity Planning Assessment(s)	Brigalow Belt v2.1
Aquatic Conservation Assessment(s) (riverine)	Great Barrier Reef Catchments v1.3
Aquatic Conservation Assessment(s) (non-riverine)	Great Barrier Reef Catchments v1.3

Table 3: Remnant regional ecosystems within the AOI as per the Qld Herbarium's 'biodiversity status'

Biodiversity Status	Area (Ha)	% of AOI
Endangered	7.13	0.96
Of concern	57.02	7.66
No concern at present	13.61	1.83

The following table identifies the extent and proportion of the user specified area of interest (AOI) which is mapped as being of "State", "Regional" or "Local" significance via application of the Queensland Department of Environment and Science's *Biodiversity Assessment and Mapping Methodology* (BAMM).

Table 4: Summary table, biodiversity significance

Biodiversity significance	Area (Ha)	% of AOI
State Habitat for EVNT taxa	0.0	0.0
State	7.13	0.96
Regional	59.69	8.02
Local or Other Values	33.11	4.45

Table 5: Non-riverine wetlands intersecting the AOI

Non-riverine wetland types intersecting the area of interest	#
(No Records)	

NB. The figures presented in the table above are derived from the relevant non-riverine Aquatic Conservation Assessment(s). Later releases of wetland mapping produced via the Queensland Wetland Mapping Program may provide more recent

information in regards to wetland extent.

Table 6: Named waterways intersecting the AOI

Name	Permanency
BARRACK CREEK	Non-perennial
DEEP CREEK	Non-perennial

Refer to **Map 1** for general locality information.

The following two tables identify the extent and proportion of the user specified AOI which is mapped as being of "Very High", "High", "Medium", "Low", or "Very Low" aquatic conservation value for riverine and non-riverine wetlands via application of the Queensland Department of Environment and Science's *Aquatic Biodiversity Assessment and Mapping Method* (AquaBAMM).

Table 7: Summary table, aquatic conservation significance (riverine)

Aquatic conservation significance (riverine wetlands)	Area (Ha)	% of AOI
Very High	0.0	0.0
High	744.47	100.0
Medium	0.0	0.0
Low	0.0	0.0
Very Low	0.0	0.0

Table 8: Summary table, aquatic conservation significance (non-riverine)

Aquatic conservation significance (non-riverine wetlands)	Area (Ha)	% of AOI
(No Records)		

Biodiversity Planning Assessments

Introduction

The Department of Environment and Science (DES) attributes biodiversity significance on a bioregional scale through a Biodiversity Planning Assessment (BPA). A BPA involves the integration of ecological criteria using the *Biodiversity assessment and Mapping Methodology* (BAMM) and is developed in two stages: 1) **diagnostic criteria**, and 2) **expert panel criteria**. The diagnostic criteria are based on existing data which is reliable and uniformly available across a bioregion, while the expert panel criteria allows for the refinement of the mapped information from the diagnostic output by incorporating local knowledge and expert opinion.

The BAMM methodology has application for identifying areas with various levels of significance solely for biodiversity reasons. These include threatened ecosystems or taxa, large tracts of habitat in good condition, ecosystem diversity, landscape context and connection, and buffers to wetlands or other types of habitat important for the maintenance of biodiversity or ecological processes. While natural resource values such as dryland salinity, soil erosion potential or land capability are not dealt with explicitly, they are included to some extent within the biodiversity status of regional ecosystems recognised by the DES.

Biodiversity Planning Assessments (BPAs) assign three levels of overall biodiversity significance.

- **State significance** - areas assessed as being significant for biodiversity at the bioregional or state scales. They also include areas assessed by other studies/processes as being significant at national or international scales. In addition, areas flagged as being of State significance due to the presence of endangered, vulnerable and/or near threatened taxa, are identified as "State Habitat for EVNT taxa".
- **Regional significance** - areas assessed as being significant for biodiversity at the subregional scale. These areas have lower significance for biodiversity than areas assessed as being of State significance.
- **Local significance and/or other values** - areas assessed as not being significant for biodiversity at state or regional scales. Local values are of significance at the local government scale.

For further information on released BPAs and a copy of the underlying methodology, go to:

<http://www.qld.gov.au/environment/plants-animals/biodiversity/planning/>

The GIS results can be downloaded from the Queensland Spatial Catalogue at:

<http://qspatial.information.qld.gov.au/geoportal/>

The following table identifies the extent and proportion of the user specified AOI which is mapped as being of "State", "Regional" or "Local" significance via application of the BAMM.

Table 9: Summary table, biodiversity significance

Biodiversity significance	Area (Ha)	% of AOI
State Habitat for EVNT taxa	0.0	0.0
State	7.13	0.96
Regional	59.69	8.02
Local or Other Values	33.11	4.45

Refer to **Map 2** for further information.

Diagnostic Criteria

Diagnostic criteria are based on existing data which is reliable and uniformly available across a bioregion. These criteria are diagnostic in that they are used to filter the available data and provide a "first-cut" or initial determination of biodiversity significance. This initial assessment is then combined through a second group of other essential criteria.

A description of the individual diagnostic criteria is provided in the following sections.

Criteria A. Habitat for EVNT taxa: Classifies areas according to their significance based on the presence of endangered, vulnerable and/or rare (EVNT) taxa. EVNT taxa are those scheduled under the *Nature Conservation Act 1992* and/or the

Environment Protection and Biodiversity Conservation Act 1999. It excludes highly mobile fauna taxa which are instead considered in Criterion H and brings together information on EVNT taxa using buffering of recorded sites or habitat suitability models (HSM) where available.

Criteria B. Ecosystem value: Classifies on the basis of biodiversity status of regional ecosystems, their extent in protected areas (presence of poorly conserved regional ecosystems), the presence of significant wetlands; and areas of national importance such as the presence of Threatened Ecological Communities, World Heritage areas and Ramsar sites. Ecosystem value is applied at a bioregional (**B1**) and regional (**B2**) scale.

Criteria C. Tract size: Measures the relative size of tracts of vegetation in the landscape. The size of any tract is a major indicator of ecological significance, and is also strongly correlated with the long-term viability of biodiversity values. Larger tracts are less susceptible to ecological edge effects and are more likely to sustain viable populations of native flora and fauna than smaller tracts.

Criteria D. Relative size of regional ecosystems: Classifies the relative size of each regional ecosystem unit within its bioregion (**D1**) and its subregion (**D2**). Remnant units are compared with all other occurrences with the same regional ecosystem. Large examples of a regional ecosystem are more significant than smaller examples of the same regional ecosystem because they are more representative of the biodiversity values particular to the regional ecosystem, are more resilient to the effects of disturbance, and constitute a significant proportion of the total area of the regional ecosystem.

Criteria F. Ecosystem diversity: Is an indicator of the number of regional ecosystems occurring within an area. An area with high ecosystem diversity will have many regional ecosystems and ecotones relative to other areas within the bioregion.

Criteria G. Context and connection: Represents the extent to which a remnant unit incorporates, borders or buffers areas such as significant wetlands, endangered ecosystems; and the degree to which it is connected to other vegetation.

A summary of the biodiversity status based upon the diagnostic criteria is provided in the following table.

Table 10: Summary of biodiversity significance based upon diagnostic criteria with respect to the AOI

Biodiversity significance	Description	Area (Ha)	% of AOI
State	Remnant contains at least 1 Endangered RE (B1) & Nat. Threatened Ecol. Community (B1)	7.13	0.96
Regional	Remnant contains at least 1 Vulnerable or Near Threatened species (A)	2.91	0.39
Regional	Remnant contains at least one Of Concern RE (B1)	56.78	7.63
Local or Other Values	Refer to diagnostic data for additional information	33.11	4.45

Assessment of diagnostic criteria with respect to the AOI

The following table reflects an assessment of the individual diagnostic criteria noted above in regards to the AOI.

Table 11: Assessment of individual diagnostic criteria with respect to the AOI

Diagnostic Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
A: Habitat for EVNT Taxa			10.04	1.3	76.29	10.2	13.61	1.8
B1: Ecosystem Value (Bioregion)	7.13	1.0	56.78	7.6	13.61	1.8		
B2: Ecosystem Value (Subregion)	7.13	1.0	28.7	3.9	41.69	5.6		
C: Tract Size			5.08	0.7			72.44	9.7
D1: Relative RE Size (Bioregion)							77.52	10.4
D2: Relative RE Size (Subregion)			23.0	3.1	5.08	0.7	49.44	6.6
F: Ecosystem Diversity	16.75	2.2	56.68	7.6	4.09	0.5		
G: Context and Connection	25.06	3.4	16.66	2.2	35.8	4.8		

Other Essential Criteria

Other essential criteria (also known as expert panel criteria) are based on non-uniform information sources and which may rely more upon expert opinion than on quantitative data. These criteria are used to provide a "second-cut" determination of biodiversity significance, which is then combined with the diagnostic criteria for an overall assessment of relative biodiversity significance. A summary of the biodiversity status based upon the other essential criteria is provided in the following table.

Table 12: Summary of biodiversity significance based upon other essential criteria with respect to the AOI

Biodiversity significance	Description	Area (Ha)	% of AOI
Regional	Remnant forms part of a bioregional corridor (J)	30.32	4.07

A description of each of the other essential criteria and associated assessment in regards to the AOI is provided in the following sections.

Criteria H. Essential and general habitat for priority taxa: Priority taxa are those which are at risk or of management concern, taxa of scientific interest as relictual (ancient or primitive), endemic taxa or locally significant populations (such as a flying fox camp or heronry), highly specialised taxa whose habitat requirements are complex and distributions are not well correlated with any particular regional ecosystem, taxa important for maintaining genetic diversity (such as complex spatial patterns of genetic variation, geographic range limits, highly disjunct populations), taxa critical for management or monitoring of biodiversity (functionally important or ecological indicators), or economic and culturally important taxa.

Criteria I. Special biodiversity values: areas with special biodiversity values are important because they contain multiple taxa in a unique ecological and often highly biodiverse environment. Areas with special biodiversity values can include the following:

- Ia - centres of endemism - areas where concentrations of taxa are endemic to a bioregion or subregion are found.
- Ib - wildlife refugia (Morton *et al.* 1995), for example, islands, mound springs, caves, wetlands, gorges, mountain ranges and topographic isolates, ecological refuges, refuges from exotic animals, and refuges from clearing. The latter may include large areas that are not suitable for clearing because of land suitability/capability.
- Ic - areas with concentrations of disjunct populations.
- Id - areas with concentrations of taxa at the limits of their geographic ranges.
- Ie - areas with high species richness.
- If - areas with concentrations of relictual populations (ancient and primitive taxa).
- Ig - areas containing REs with distinct variation in species composition associated with geomorphology and other environmental variables.
- Ih - an artificial waterbody or managed/manipulated wetland considered by the panel/s to be of ecological significance.
- Ii - areas with a high density of hollow-bearing trees that provide habitat for animals.
- Ij - breeding or roosting sites used by a significant number of individuals.
- Ik - climate change refuge.

The following table identifies the value and extent area of the Other Essential Criteria H and I within the AOI.

Table 13: Relative importance of expert panel criteria (H and I) used to assess overall biodiversity significance with respect to the AOI

Expert Panel	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
H: Core Habitat Priority Taxa								
Ia: Centres of Endemism								
Ib: Wildlife Refugia								
Ic: Disjunct Populations								
Id: Limits of Geographic Ranges								
Ie: High Species Richness								
If: Relictual Populations								

Expert Panel	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
Ig: Variation in Species Composition								
Ih: Artificial Wetland								
Ii: Hollow Bearing Trees								
Ij: Breeding or Roosting Site								
Ik: Climate Refugia								

NB. Whilst biodiversity values associated with Criteria I may be present within the site (refer to tables 12 and 15), for the New England Tableland and Central Queensland Coast BPAs, area and % area figures associated with Criteria Ia through to Ij cannot be listed in the table above (due to slight variations in data formats between BPAs).

Criteria J. Corridors: areas identified under this criterion qualify either because they are existing vegetated corridors important for contiguity, or cleared areas that could serve this purpose if revegetated. Some examples of corridors include riparian habitats, transport corridors and "stepping stones".

Bioregional and subregional conservation corridors have been identified in the more developed bioregions of Queensland through the BPAs, using an intensive process involving expert panels. Map 3 displays the location of corridors as identified under the Statewide Corridor network. The Statewide Corridor network incorporates BPA derived corridors and for bioregions where no BPA has been assessed yet, corridors derived under other planning processes. *Note: as a result of updating and developing a statewide network, the alignment of corridors may differ slightly in some instances when compared to those used in individual BPAs.*

The functions of these corridors are:

- **Terrestrial** Bioregional corridors, in conjunction with large tracts of remnant vegetation, maintain ecological and evolutionary processes at a landscape scale, by:

- Maintaining long term evolutionary/genetic processes that allow the natural change in distributions of species and connectivity between populations of species over long periods of time;
- Maintaining landscape/ecosystems processes associated with geological, altitudinal and climatic gradients, to allow for ecological responses to climate change;
- Maintaining large scale seasonal/migratory species processes and movement of fauna;
- Maximising connectivity between large tracts/patches of remnant vegetation;
- Identifying key areas for rehabilitation and offsets; and

- **Riparian** Bioregional Corridors also maintain and encourage connectivity of riparian and associated ecosystems.

The location of the corridors is determined by the following principles:

- Terrestrial

- Complement riparian landscape corridors (i.e. minimise overlap and maximise connectivity);
- Follow major watershed/catchment and/or coastal boundaries;
- Incorporate major altitudinal/geological/climatic gradients;
- Include and maximise connectivity between large tracts/patches of remnant vegetation;
- Include and maximise connectivity between remnant vegetation in good condition; and

- Riparian

- Located on the major river or creek systems within the bioregion in question.

The total extent of remnant vegetation triggered as being of "State", "Regional" or "Local" significance due to the presence of an overlying BPA derived terrestrial or riparian corridor within the AOI, is provided in the following table. For further information on how remnant vegetation is triggered due to the presence of an overlying BPA derived corridor, refer to the relevant landscape BPA expert panel report(s).

Table 14: Extent of triggered remnant vegetation due to the presence of BPA derived corridors with respect to the AOI

Biodiversity Significance	Area (Ha)	% of AOI
State	0.0	0.0
Regional	30.32	4.07
Local	0.0	0.0

NB: area figures associated with the extent of corridor triggered remnant vegetation are only available for those bioregions where a BPA has been undertaken.

Refer to **Map 3** for further information.

Threatening process/condition (Criteria K) - areas identified by experts under this criterion may be used to amend (upgrade or downgrade) biodiversity significance arising from the "first-cut" analysis. The condition of remnant vegetation is affected by threatening processes such as weeds, ferals, grazing and burning regime, selective timber harvesting/removal, salinity, soil erosion, and climate change.

Assessment of Criteria K with respect to the AOI is not currently included in the "Biodiversity and Conservation Values" report, as it has not been applied to the majority of Queensland due to data/information limitations and availability.

Special Area Decisions

Expert panel derived "Special Area Decisions" are used to assign values to Other Essential Criteria. The specific decisions which relate to the AOI in question are listed in the table below.

Table 15: Expert panel decisions for assigning levels of biodiversity significance with respect to the AOI

Decision Number	Description	Panel Recommended Significance	Criteria Values
brbn_I_18b	None	None	None
brbs_I_18b	None	None	None

Expert panel decision descriptions:

brbn_I_18b

None

brbs_I_18b

None

Aquatic Conservation Assessments

Introduction

The Aquatic Biodiversity Assessment and Mapping Method or AquaBAMM (Clayton *et al.* 2006), was developed to assess conservation values of wetlands in Queensland, and may also have application in broader geographical contexts. It is a comprehensive method that uses available data, including data resulting from expert opinion, to identify relative wetland conservation/ecological values within a specified study area (usually a catchment). The product of applying this method is an Aquatic Conservation Assessment (ACA) for the study area.

An ACA using AquaBAMM is non-social, non-economic and identifies the conservation/ecological values of wetlands at a user-defined scale. It provides a robust and objective conservation assessment using criteria, indicators and measures that are founded upon a large body of national and international literature. The criteria, each of which may have variable numbers of indicators and measures, are naturalness (aquatic), naturalness (catchment), diversity and richness, threatened species and ecosystems, priority species and ecosystems, special features, connectivity and representativeness. An ACA using AquaBAMM is a powerful decision support tool that is easily updated and simply interrogated through a geographic information system (GIS).

Where they have been conducted, ACAs can provide a source of baseline wetland conservation/ecological information to support natural resource management and planning processes. They are useful as an independent product or as an important foundation upon which a variety of additional environmental and socio-economic elements can be added and considered (i.e. an early input to broader 'triple-bottom-line' decision-making processes). An ACA can have application in:

- determining priorities for protection, regulation or rehabilitation of wetlands and other aquatic ecosystems
- on-ground investment in wetlands and other aquatic ecosystems
- contributing to impact assessment of large-scale development (e.g. dams)
- water resource and strategic regional planning processes

For a detailed explanation of the methodology please refer to the summary and expert panel reports relevant to the ACA utilised in this assessment. These reports can be accessed at *Wetland Info*:

<http://wetlandinfo.des.qld.gov.au/wetlands/assessment/assessment-methods/aca>

The GIS results can be downloaded from the Queensland Spatial Catalogue at:

<http://qspatial.information.qld.gov.au/geoportal/>

Explanation of Criteria

Under the AquaBAMM, eight criteria are assessed to derive an overall conservation value. Similar to the Biodiversity Assessment and Mapping Methodology, the criteria may be primarily diagnostic (quantitative) or primarily expert opinion (qualitative) in nature. The following sections provide a brief description of each of the 8 criteria.

Criteria 1. Naturalness - Aquatic: This attribute reflects the extent to which a wetland's (riverine, non-riverine, estuarine) aquatic state of naturalness is affected through relevant influencing indicators which include: presence of exotic flora and fauna; presence of aquatic communities; degree of habitat modification and degree of hydrological modification.

Criteria 2. Naturalness - Catchment: The naturalness of the terrestrial systems of a catchment can have an influence on many wetland characteristics including: natural ecological processes e.g. nutrient cycling, riparian vegetation, water chemistry, and flow. The indicators utilised to assess this criterion include: presence of exotic flora and/or fauna; riparian, catchment and flow modification.

Criteria 3. Naturalness - Diversity and Richness: This criterion is common to many ecological assessment methods and can include both physical and biological features. It includes such indicators as species richness, riparian ecosystem richness and geomorphological diversity.

Criteria 4. Threatened Species and Ecosystems: This criterion evaluates ecological rarity characteristics of a wetland. This includes both species rarity and rarity of communities / assemblages. The communities and assemblages are best represented by regional ecosystems. Species rarity is determined by NCA and EPBC status with Endangered, Vulnerable or Near-threatened species being included in the evaluation. Ecosystem rarity is determined by regional ecosystem biodiversity status i.e. Endangered, Of Concern, or Not of Concern.

Criteria 5. Priority Species and Ecosystems: Priority flora and fauna species lists are expert panel derived. These are aquatic, semi-aquatic and riparian species which exhibit at least 1 particular trait in order to be eligible for consideration. For

flora species the traits included:

- It forms significant macrophyte beds (in shallow or deep water).
- It is an important food source.
- It is important/critical habitat.
- It is implicated in spawning or reproduction for other fauna and/or flora species.
- It is at its distributional limit or is a disjunct population.
- It provides stream bank or bed stabilisation or has soil binding properties.
- It is a small population and subject to threatening processes.

Fauna species are included if they meet at least one of the following traits:

- It is endemic to the study area (>75 per cent of its distribution is in the study area/catchment).
- It has experienced, or is suspected of experiencing, a serious population decline.
- It has experienced a significant reduction in its distribution and has a naturally restricted distribution in the study area/catchment.
- It is currently a small population and threatened by loss of habitat.
- It is a significant disjunct population.
- It is a migratory species (other than birds).
- A significant proportion of the breeding population (>one per cent for waterbirds, >75 per cent other species) occurs in the waterbody (see Ramsar criterion 6 for waterbirds).
- Limit of species range.

See the individual expert panel reports for the priority species traits specific to an ACA.

Criteria 6. Special Features: Special features are areas identified by flora, fauna and ecology expert panels which exhibit characteristics beyond those identified in other criteria and which the expert panels consider to be of the highest ecological importance. Special feature traits can relate to, but are not solely restricted to geomorphic features, unique ecological processes, presence of unique or distinct habitat, presence of unique or special hydrological regimes e.g. spring-fed streams. Special features are rated on a 1 - 4 scale (4 being the highest).

Criteria 7. Connectivity: This criterion is based on the concept that appropriately connected aquatic ecosystems are healthy and resilient, with maximum potential biodiversity and delivery of ecosystem services.

Criteria 8. Representativeness: This criterion applies primarily to non-riverine assessments, evaluates the rarity and uniqueness of a wetland type in relation to specific geographic areas. Rarity is determined by the degree of wetland protection within "protected Areas" estate or within an area subject to the *Fisheries Act 1994*, *Coastal Protection and Management Act 1995*, or *Marine Parks Act 2004*. Wetland uniqueness evaluates the relative abundance and size of a wetland or wetland management group within geographic areas such as catchment and subcatchment.

Riverine Wetlands

Riverine wetlands are all wetlands and deepwater habitats within a channel. The channels are naturally or artificially created, periodically or continuously contain moving water, or connecting two bodies of standing water. AquaBAMM, when applied to riverine wetlands uses a discrete spatial unit termed subsections. A subsection can be considered as an area which encompasses discrete homogeneous stream sections in terms of their natural attributes (i.e. physical, chemical, biological and utilitarian values) and natural resources. Thus in an ACA, an aquatic conservation significance score is calculated for each subsection and applies to all streams within a subsection, rather than individual streams as such.

Please note, the area figures provided in Tables 16 and 17, are derived using the extent of riverine subsections within the AOI. Refer to **Map 5** for further information. A summary of the conservation significance of riverine wetlands within the AOI is provided in the following table.

Table 16: Overall level/s of riverine aquatic conservation significance

Aquatic conservation significance (riverine wetlands)	Area (Ha)	% of AOI
Very High	0.0	0.0

Aquatic conservation significance (riverine wetlands)	Area (Ha)	% of AOI
High	744.47	100.0
Medium	0.0	0.0
Low	0.0	0.0
Very Low	0.0	0.0

The individual aquatic conservation criteria ratings for riverine wetlands within the AOI are listed below.

Table 17: Level/s of riverine aquatic conservation significance based on selected criteria

Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
1. Naturalness aquatic							744.47	100.0
2. Naturalness catchment			744.47	100.0				
3. Diversity and richness	744.47	100.0						
4. Threatened species and ecosystems			744.47	100.0				
5. Priority species and ecosystems	744.47	100.0						
6. Special features								
7. Connectivity	744.47	100.0						
8. Representativeness								

The table below lists and describes the relevant expert panel decisions used to assign conservation significance values to riverine wetlands within the AOI.

Table 18: Expert panel decisions for assigning overall levels of riverine aquatic conservation significance

Decision number	Special feature	Catchment	Criteria/Indicator/Measure	Conservation rating (1-4)
(No Records)				

4 is the highest rating/value

Expert panel decision descriptions:

(No Records)

Non-riverine Wetlands

Non-riverine wetlands include both lacustrine and palustrine wetlands, however, do not currently incorporate estuarine, marine or subterranean wetland types. A summary of the conservation significance of non-riverine wetlands within the AOI is provided in the following table. Refer to **Map 6** for further information.

Table 19: Overall level/s of non-riverine aquatic conservation significance

Aquatic conservation significance (non-riverine wetlands)	Area (Ha)	% of AOI
(No Records)		

The following table provides an assessment of non-riverine wetlands within the AOI and associated aquatic conservation criteria values.

Table 20: Level/s of non-riverine aquatic conservation significance based on selected criteria

Criteria	Very High Rating - Area (Ha)	Very High Rating - % of AOI	High Rating - Area (Ha)	High Rating - % of AOI	Medium Rating - Area (Ha)	Medium Rating - % of AOI	Low Rating - Area (Ha)	Low Rating - % of AOI
(No Records)								

The table below lists and describes the relevant expert panel decisions used to assign conservation significance values to non-riverine wetlands within the AOI.

Table 21: Expert panel decisions for assigning overall levels of non-riverine aquatic conservation significance.

Decision number	Special feature	Catchment	Criteria/Indicator/Measure	Conservation rating (1-4)
(No Records)				

4 is the highest rating/value

Expert panel decision descriptions:

(No Records)

Threatened and Priority Species

Introduction

This chapter contains a list of threatened and priority flora and/or fauna species that have been recorded on, or within 4km of the Assessment Area.

The information presented in this chapter with respect to species presence is derived from compiled databases developed primarily for the purpose of BPAs and ACAs. Data is collated from a number of sources and is updated periodically.

It is important to note that the list of species provided in this report, may differ when compared to other reports generated from other sources such as the State government's WildNet, HerbreCs or the federal government's EPBC database for a number of reasons.

Records for threatened and priority species are filtered and checked based on a number of rules including:

- Taxonomic nomenclature - current scientific names and status,
- Location - cross-check co-ordinates with location description,
- Taxon by location - requires good knowledge of the taxon and history of the record,
- Duplicate records - identify and remove,
- Expert panels - check records and provide new records,
- Flora cultivated records excluded,
- Use precise records less than or equal to 2000m,
- Use recent records greater than or equal to 1975 animals, greater than or equal to 1950 plants.

Threatened Species

Threatened species are those species classified as "Endangered" or "Vulnerable" under the *Environment Protection and Biodiversity Conservation Act 1999* or "Endangered", "Vulnerable" or "Near threatened" under the *Nature Conservation Act 1992*.

The following threatened species have been recorded on, or within approximately 4km of the AOI.

Table 22: Threatened species recorded on, or within 4km of the AOI

Species	Common name	NCA status	EPBC status	Back on Track rank	Migratory species*	Wetland species**	Identified flora/fauna
<i>Geophaps scripta scripta</i>	squatter pigeon (southern subspecies)	V	V	Medium			FA
<i>Petauroides volans</i>	greater glider	V	V	Low			FA
<i>Phascolarctos cinereus</i>	koala	V	V	Low			FA

NB. Please note that the threatened species listed in this section are based upon the most recently compiled DES internal state-wide threatened species dataset. This dataset may contain additional records that were not originally available for inclusion in the relevant individual BPAs and ACAs.

*JAMBA - Japan-Australia Migratory Bird Agreement; CAMBA - China-Australia Migratory Bird Agreement; ROKAMBA - Republic of Korea-Australia Migratory Bird Agreement; CMS - Convention on the Conservation of Migratory Species.

**Y - wetland indicator species.

BPA Priority Species

A list of BPA priority species that have been recorded on, or within approximately 4km of the AOI is contained in the following table.

Table 23: Priority species recorded on, or within 4km of the AOI

Species	Common name	Back on Track rank	Identified flora/fauna
<i>Eleocharis blakeana</i>	None	Medium	FL

NB. Please note that the list of priority species is based on those species identified in the BPAs, however records for these species may be more recent than the originals used. Furthermore, the BPA priority species databases are updated from time to time. At each update, the taxonomic details for all species are amended as necessary to reflect current taxonomic name and/or status changes.

ACA Priority Species

A list of ACA priority species used in riverine and non-riverine ACAs that have been recorded on, or within approximately 4km of the AOI are contained in the following tables.

Table 24: Priority species recorded on, or within 4 km of the AOI - riverine

Species	Common name	Back on Track rank	Identified flora/fauna
<i>Melaleuca viminalis</i>		L	FL
<i>Nymphoides indica</i>	water snowflake		FL

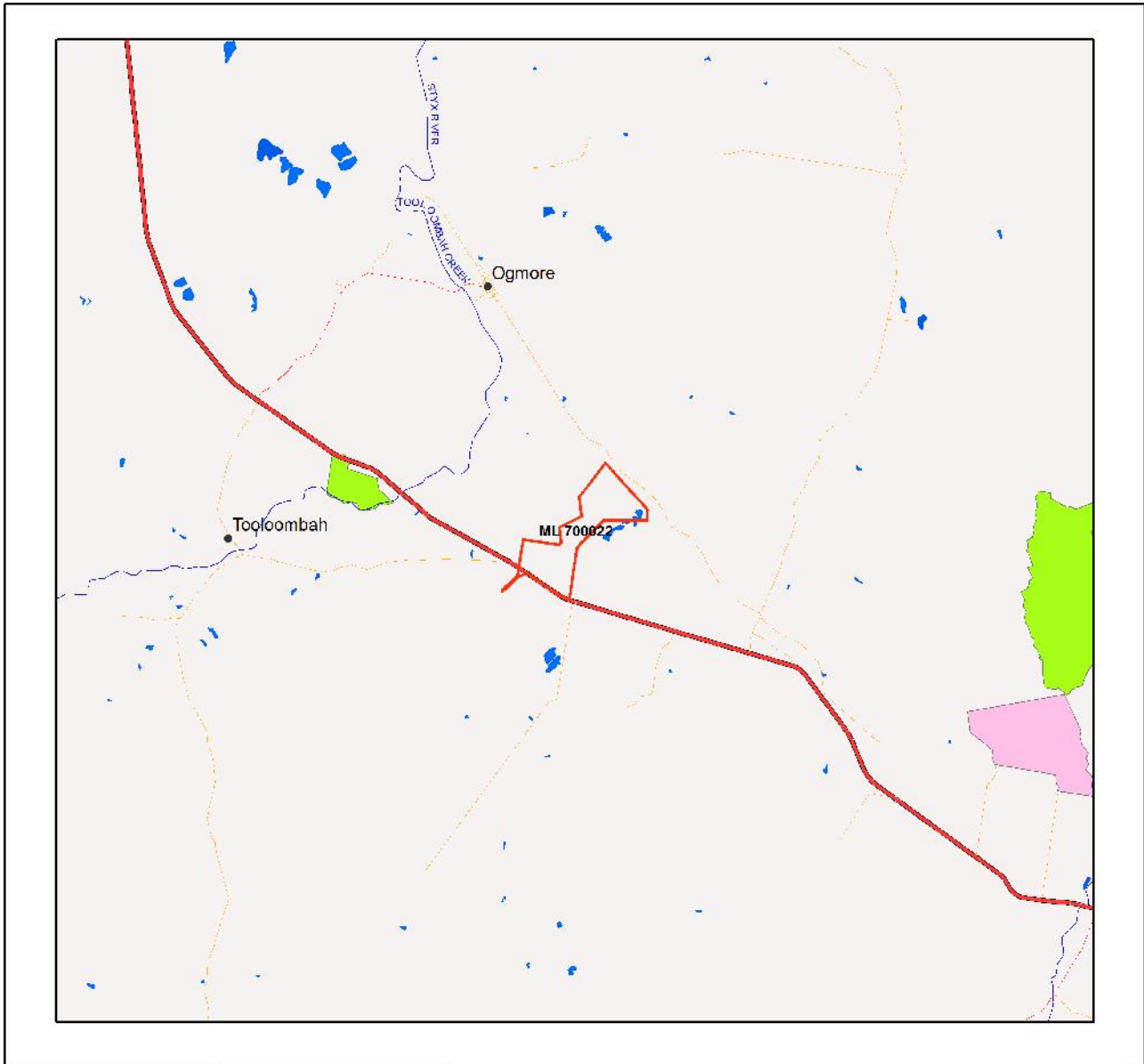
Table 25: Priority species recorded on, or within 4 km of the AOI - non-riverine

Species	Common name	Back on Track rank	Identified flora/fauna
<i>Melaleuca viminalis</i>		L	FL
<i>Nymphoides indica</i>	water snowflake		FL

NB. Please note that the priority species records used in the above two tables are comprised of those adopted for the released individual ACAs. The ACA riverine and non-riverine priority species databases are updated from time to time to reflect new release of ACAs. At each update, the taxonomic details for all ACAs records are amended as necessary to reflect current taxonomic name and/or status changes.

Maps

Map 1 - Locality Map



Locality Map

Legend

- Selected Mining Lease (ML)
- Towns
- Highway Connector
- Street/Local Road
- Reservoirs
- Lakes
- National Park (Scientific)
- National Park
- National Park (CYPAL)
- Conservation Park
- Resources Reserve
- Forest Reserve
- State Forest
- Timber Reserve
- Nature Refuges
- Coordinated Conservation Areas
- Major rivers/creeks
- Queensland

LOCALITY DIAGRAM

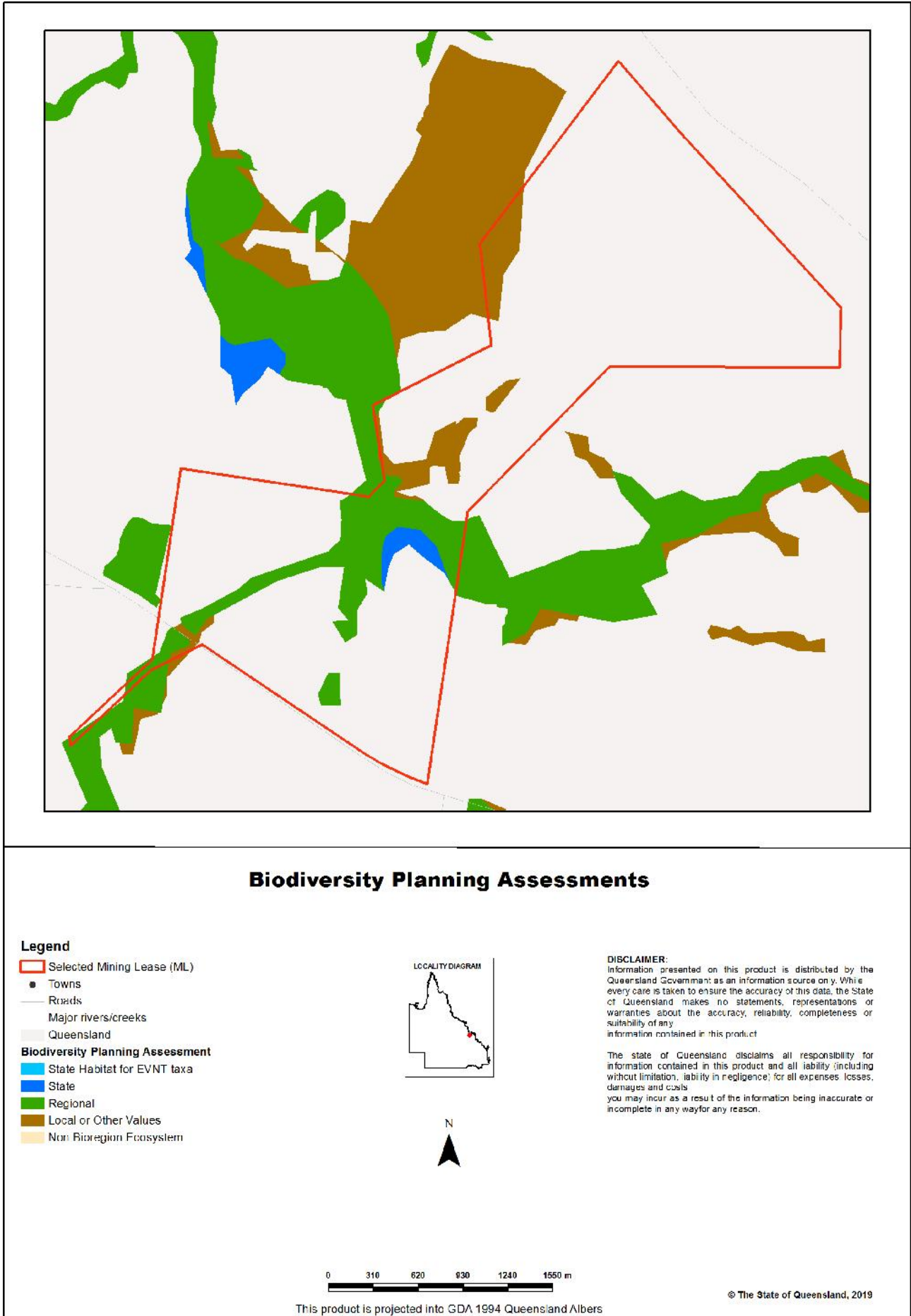


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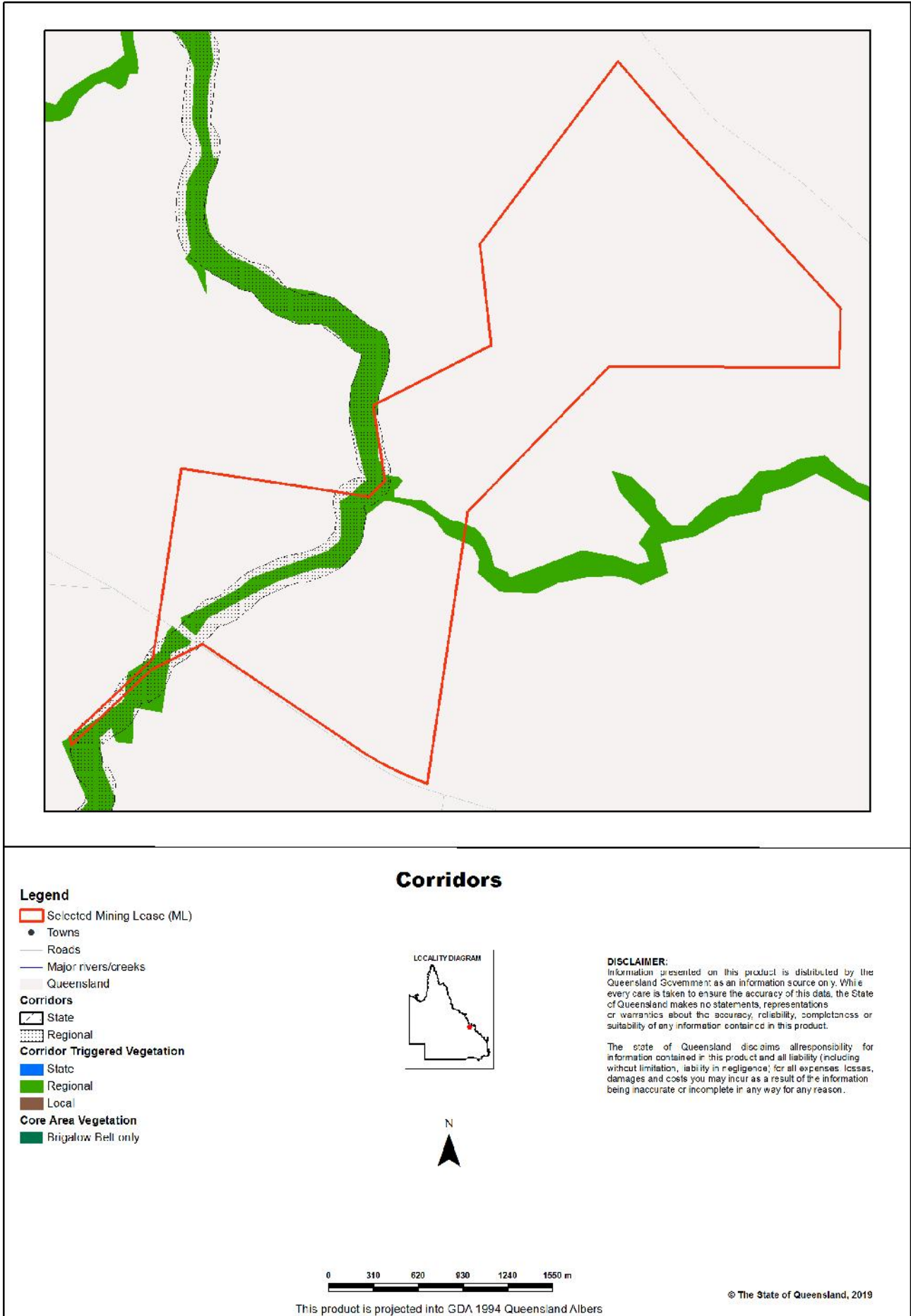
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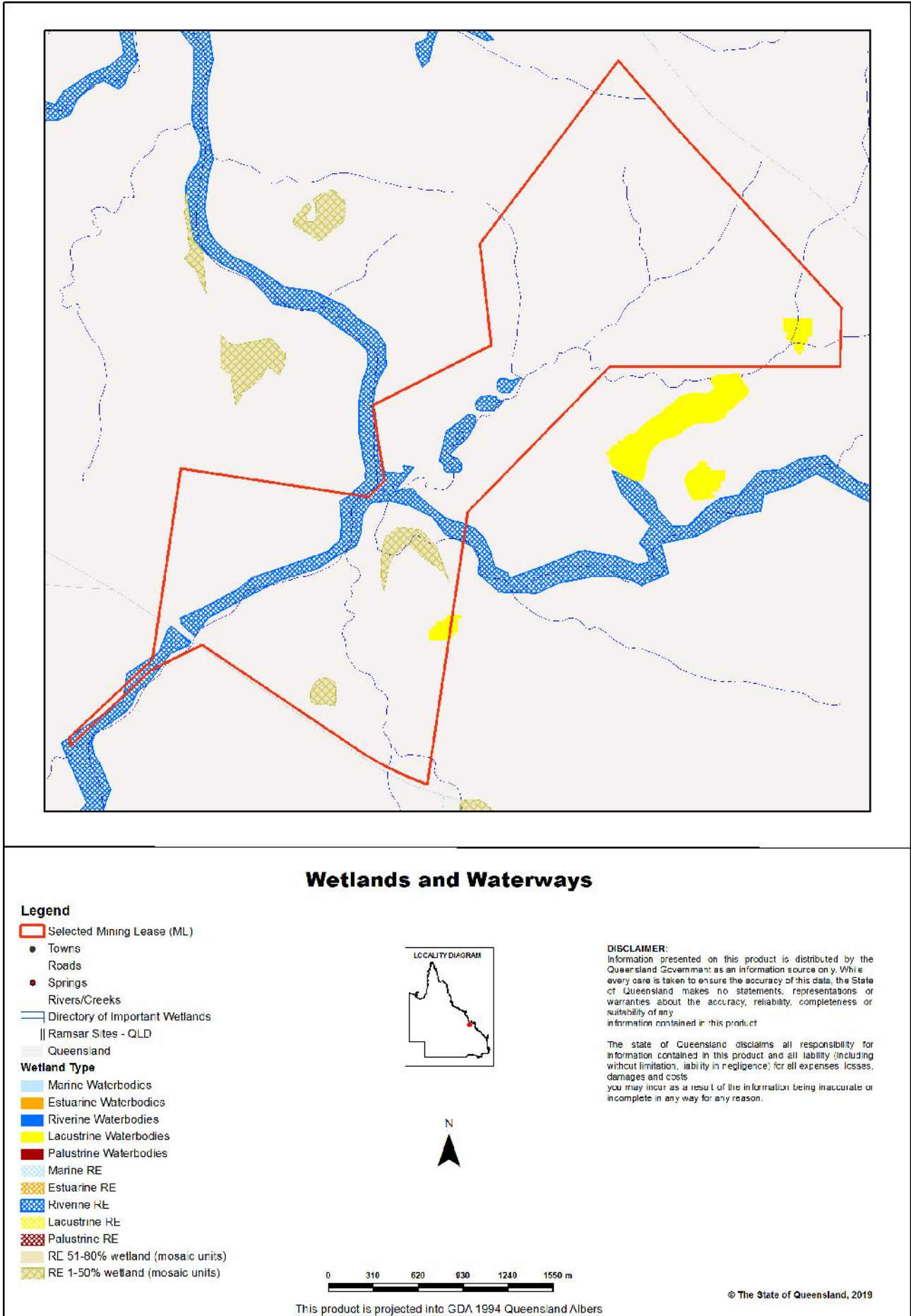
Map 2 - Biodiversity Planning Assessment (BPA)



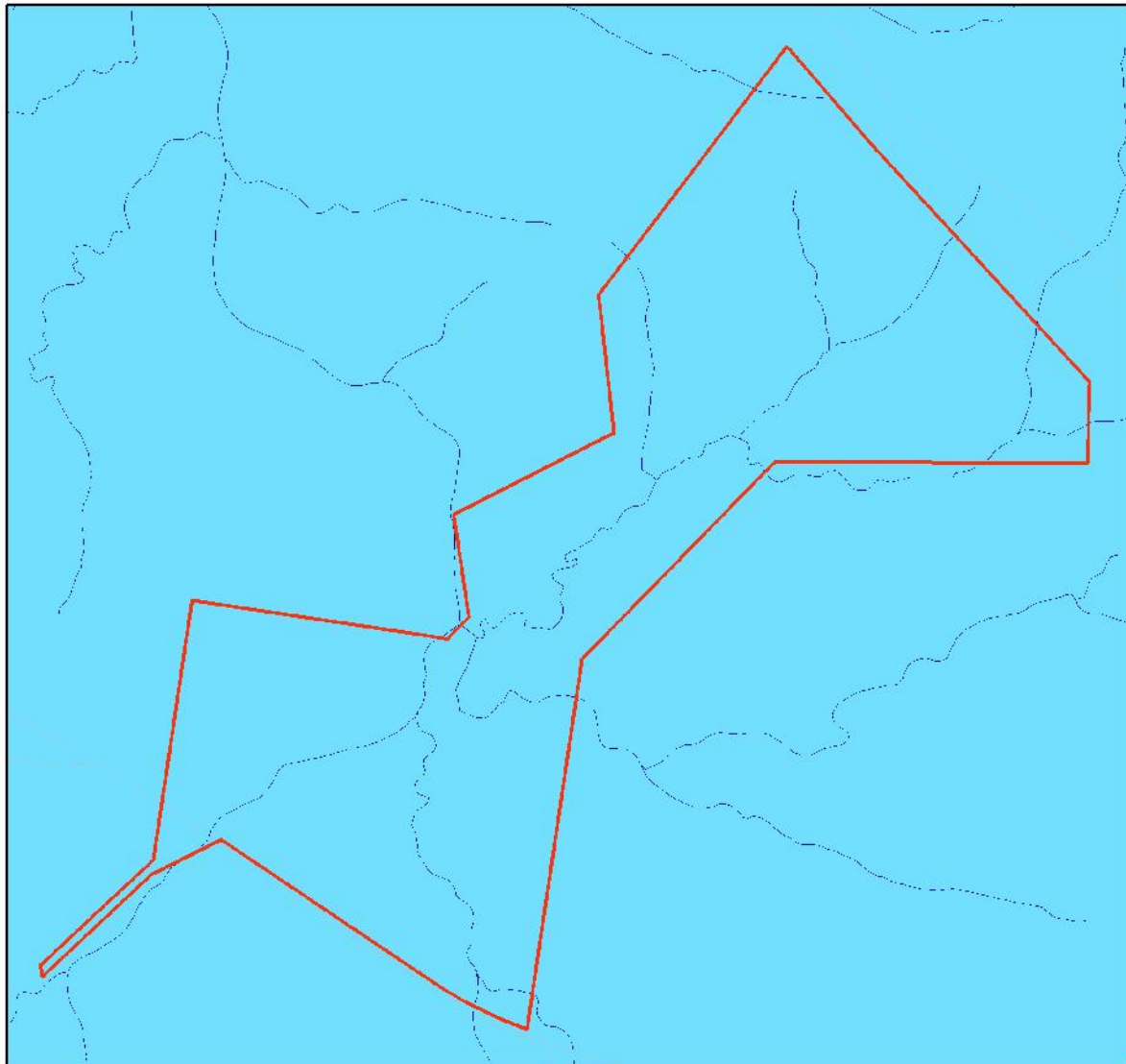
Map 3 - Corridors



Map 4 - Wetlands and waterways



Map 5 - Aquatic Conservation Assessment (ACA) - riverine



Aquatic Conservation Assessment (ACA) - riverine

Legend

- Selected Mining Lease (ML)
- Towns
- Roads
- Rivers/Creeks
- Queensland

ACA Riverine - Subcatchment Significance

- Very High
- High
- Medium
- Low
- Very Low



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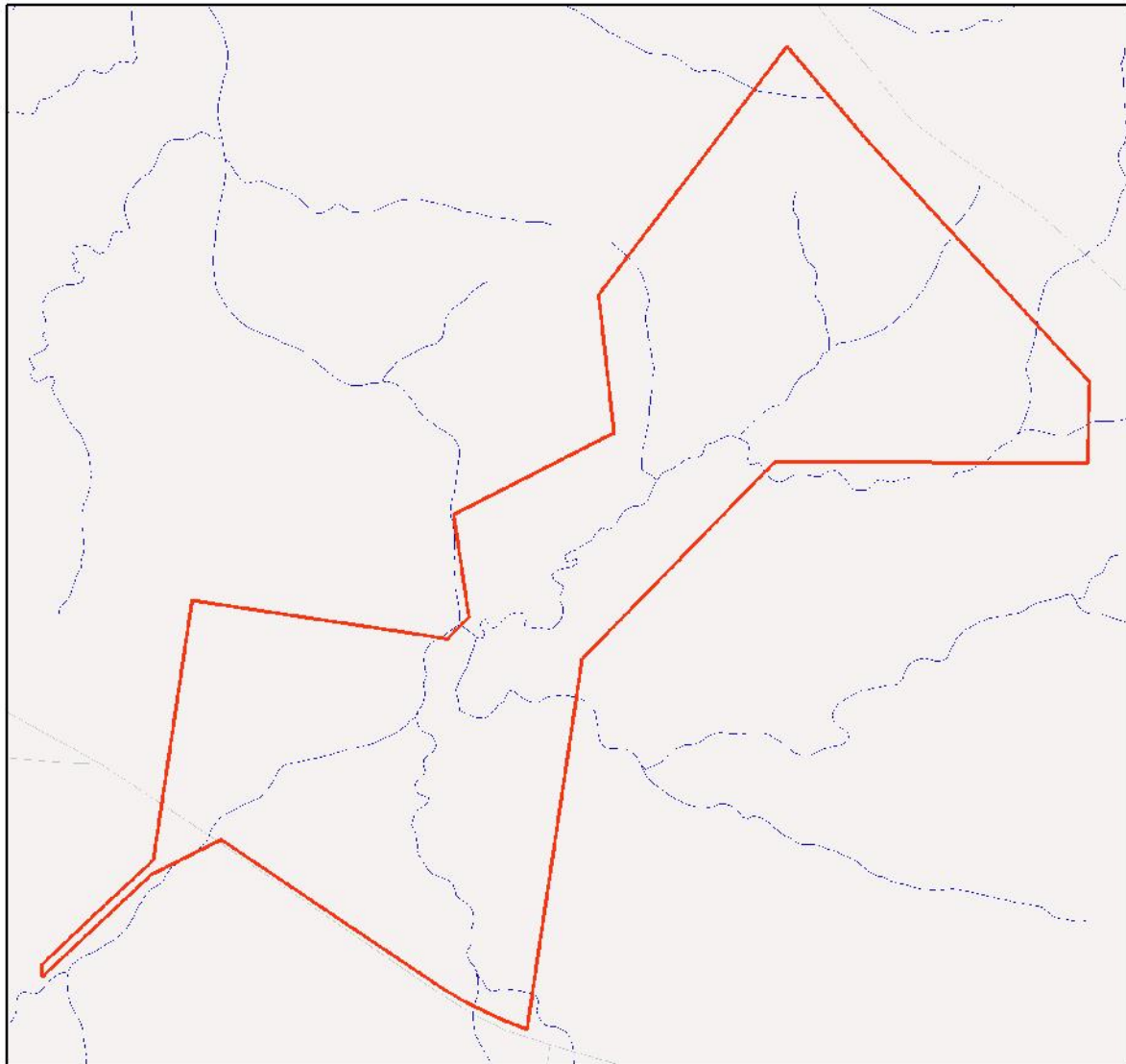
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Map 6 - Aquatic Conservation Assessment (ACA) - non-riverine



Aquatic Conservation Assessment (ACA) - nonriverine

Legend

- Selected Mining Lease (ML)
- Towns
- Roads
- Rivers/Creeks
- Queensland
- ACA Non-riverine**
- Very High
- High
- Medium
- Low
- Very Low



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Appendices

Appendix 1 - Source Data

Theme	Datasets
Aquatic Conservation Assessments Non-riverine*	Combination of the following datasets: Cape York Peninsula Non-riverine v1.1 Eastern Gulf of Carpentaria v1.1 Great Barrier Reef Catchment Non-riverine v1.3 Lake Eyre and Bulloo Basins v1.1 QMDB Non-riverine ACA v1.4 Southeast Queensland ACA v1.1 WBB Non-riverine ACA v1.1
Aquatic Conservation Assessments Riverine*	Combination of the following datasets: Cape York Peninsula Riverine v1.1 Eastern Gulf of Carpentaria v1.1 Great Barrier Reef Catchment Riverine v1.1 Lake Eyre and Bulloo Basins v1.1 QMDB Riverine ACA v1.4 Southeast Queensland ACA v1.1 WBB Riverine ACA v1.1
Biodiversity Planning Assessments*	Combination of the following datasets: Brigalow Belt BPA v2.1 Cape York Peninsula BPA v1.1 Central Queensland Coast BPA v1.3 Channel Country BPA v1.1 Desert Uplands BPA v1.3 Einasleigh Uplands BPA v1.1 Gulf Plains BPA v1.1 Mitchell Grass Downs BPA v1.1 Mulga Lands BPA v1.4 New England Tableland v2.3 Southeast Queensland v4.1
Statewide BPA Corridors*	Statewide corridors v1.4
Threatened Species	An internal DES database compiled from Wildnet, Herbrecks, Corveg, the QLD Museum, as well as other incidental sources.
BPA Priority Species	An internal DES database compiled from Wildnet, Herbrecks, Corveg, the QLD Museum, as well as other incidental sources.
ACA Priority Species	An internal DES database compiled from Wildnet, Herbrecks, Corveg, the QLD Museum, as well as other incidental sources.

*These datasets are available at:

<http://dds.information.qld.gov.au/DDS>

Appendix 2 - Acronyms and Abbreviations

AOI	- Area of Interest
ACA	- Aquatic Conservation Assessment
AQUABAMM	- Aquatic Biodiversity Assessment and Mapping Methodology
BAMM	- Biodiversity Assessment and Mapping Methodology
BoT	- Back on Track
BPA	- Biodiversity Planning Assessment
CAMBA	- China-Australia Migratory Bird Agreement
DES	- Department of Environment and Science
EPBC	- <i>Environment Protection and Biodiversity Conservation Act 1999</i>
EVNT	- Endangered, Vulnerable, Near Threatened
GDA94	- Geocentric Datum of Australia 1994
GIS	- Geographic Information System
JAMBA	- Japan-Australia Migratory Bird Agreement
NCA	- <i>Nature Conservation Act 1992</i>
RE	- Regional Ecosystem
REDD	- Regional Ecosystem Description Database
ROKAMBA	- Republic of Korea-Australia Migratory Bird Agreement



Queensland Government

Department of Environment and Science

Environmental Reports

Matters of State Environmental Significance

For the selected area of interest
ml: 80187

Environmental Reports - General Information

The Environmental Reports portal provides for the assessment of selected matters of interest relevant to a user specified location, or area of interest (AOI). All area and derivative figures are relevant to the extent of matters of interest contained within the AOI unless otherwise stated. Please note, if a user selects an AOI via the "central coordinates" option, the resulting assessment area encompasses an area extending for a 2km radius from the point of interest.

All area and area derived figures included in this report have been calculated via reprojecting relevant spatial features to Albers equal-area conic projection (central meridian = 146, datum Geocentric Datum of Australia 1994). As a result, area figures may differ slightly if calculated for the same features using a different co-ordinate system.

Figures in tables may be affected by rounding.

The matters of interest reported on in this document are based upon available state mapped datasets. Where the report indicates that a matter of interest is not present within the AOI (e.g. where area related calculations are equal to zero, or no values are listed), this may be due either to the fact that state mapping has not been undertaken for the AOI, that state mapping is incomplete for the AOI, or that no values have been identified within the site.

The information presented in this report should be considered as a guide only and field survey may be required to validate values on the ground.

Please direct queries about these reports to: Planning.Support@des.qld.gov.au

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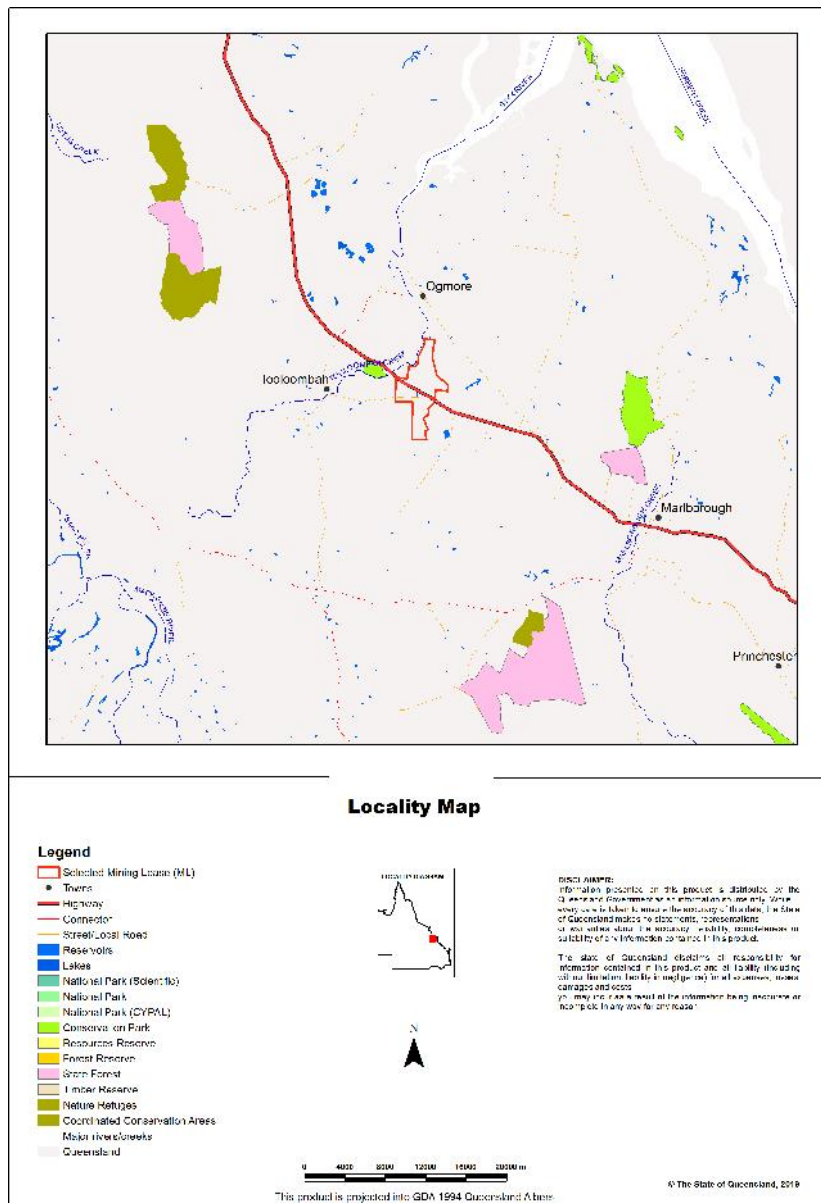
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Assessment Area Details

The following table provides an overview of the area of interest (AOI) with respect to selected topographic and environmental values.

Table 1: Summary table, details for AOI ml: 80187

Size (ha)	2,263.68
Local Government(s)	Livingstone Shire
Bioregion(s)	Brigalow Belt
Subregion(s)	Marlborough Plains, Nebo - Connors Ranges
Catchment(s)	Styx



Matters of State Environmental Significance (MSES)

MSES Categories

Queensland's State Planning Policy (SPP) includes a biodiversity State interest that states:

'The sustainable, long-term conservation of biodiversity is supported. Significant impacts on matters of national or state environmental significance are avoided, or where this cannot be reasonably achieved; impacts are minimised and residual impacts offset.'

The MSES mapping product is a guide to assist planning and development assessment decision-making. Its primary purpose is to support implementation of the SPP biodiversity policy. While it supports the SPP, the mapping does not replace the regulatory mapping or environmental values specifically called up under other laws or regulations. Similarly, the SPP biodiversity policy does not override or replace specific requirements of other Acts or regulations.

The SPP defines matters of state environmental significance as:

- Protected areas (including all classes of protected area except coordinated conservation areas) under the *Nature Conservation Act 1992* ;
- Marine parks and land within a 'marine national park', 'conservation park', 'scientific research', 'preservation' or 'buffer' zone under the *Marine Parks Act 2004* ;
- Areas within declared fish habitat areas that are management A areas or management B areas under the Fisheries Regulation 2008;
- Threatened wildlife under the *Nature Conservation Act 1992* and special least concern animals under the Nature Conservation (Wildlife) Regulation 2006;
- Regulated vegetation under the *Vegetation Management Act 1999* that is:
 - Category B areas on the regulated vegetation management map, that are 'endangered' or 'of concern' regional ecosystems;
 - Category C areas on the regulated vegetation management map that are 'endangered' or 'of concern' regional ecosystems;
 - Category R areas on the regulated vegetation management map;
 - Regional ecosystems that intersect with watercourses identified on the vegetation management watercourse and drainage feature map;
 - Regional ecosystems that intersect with wetlands identified on the vegetation management wetlands map;
- Strategic Environmental Areas under the *Regional Planning Interests Act 2014* ;
- Wetlands in a wetland protection area of wetlands of high ecological significance shown on the Map of Referable Wetlands under the Environmental Protection Regulation 2008;
- Wetlands and watercourses in high ecological value waters defined in the Environmental Protection (Water) Policy 2009, schedule 2;
- Legally secured offset areas.

MSES Values Present

The MSES values that are present in the area of interest are summarised in the table below:

Table 2: Summary of MSES present within the AOI

1a Protected Areas- estates	0.0 ha	0.0 %
1b Protected Areas- nature refuges	0.0 ha	0.0 %
2 State Marine Parks- highly protected zones	0.0 ha	0.0 %
3 Fish habitat areas (A and B areas)	0.0 ha	0.0 %
4 Strategic Environmental Areas (SEA)	0.0 ha	0.0 %
5 High Ecological Significance wetlands on the map of Referable Wetlands	3.42 ha	0.2%
6a High Ecological Value (HEV) wetlands	0.0 ha	0.0 %
6b High Ecological Value (HEV) waterways **	0.0 km	Not applicable
7 Threatened species and Iconic species	0.0 ha	0.0 %
8a Regulated Vegetation - Endangered/Of concern in Category B (remnant)	195.52 ha	8.6%
8b Regulated Vegetation - Endangered/Of concern in Category C (regrowth)	0.0 ha	0.0 %
8c Regulated Vegetation - Category R (GBR riverine regrowth)	13.02 ha	0.6%
8d Regulated Vegetation - Essential habitat	399.22 ha	17.6%
8e Regulated Vegetation - intersecting a watercourse **	25.2 km	Not applicable
8f Regulated Vegetation - within 100m of a Vegetation Management Wetland	18.92 ha	0.8%
9a Legally secured offset areas- offset register areas	0.0 ha	0.0 %
9b Legally secured offset areas- vegetation offsets through a Property Map of Assessable Vegetation	0.0 ha	0.0 %

Additional Information with Respect to MSES Values Present

MSES - State Conservation Areas

1a. Protected Areas - estates

(no results)

1b. Protected Areas - nature refuges

(no results)

2. State Marine Parks - highly protected zones

(no results)

3. Fish habitat areas (A and B areas)

(no results)

Refer to **Map 1 - MSES - State Conservation Areas** for an overview of the relevant MSES.

MSES - Wetlands and Waterways

4. Strategic Environmental Areas (SEA)

(no results)

5. High Ecological Significance wetlands on the Map of Referable Wetlands

Natural wetlands that are 'High Ecological Significance' (HES) on the Map of Referable Wetlands are present.

6a. High Ecological Value (HEV) waters - wetlands

(no results)

6b. High Ecological Value (HEV) waters - waterways

(no results)

Refer to **Map 2 - MSES - Wetlands and Waterways** for an overview of the relevant MSES.

MSES - Species

7. Threatened wildlife and special least concern animal

(no results)

Threatened and special least concern species records

(no results)

Note: The Threatened and Special Least Concern Animal (7) layer originates from the previous MSES version (4.1, dated at 2014). The layer does not represent all currently listed species and is subject to review.

**Nature Conservation Act 1992 (NCA) Status- Endangered (E), Vulnerable (V) or Special Least Concern Animal (SL). Environment Protection and Biodiversity Conservation Act 1999 (EPBC) status: Critically Endangered (CE) Endangered (E), Vulnerable (V)*

To request a species list for an area, or search for a species profile, access Wildlife Online at:

<https://www.qld.gov.au/environment/plants-animals/species-list/>

Refer to **Map 3 - MSES - Species** for an overview of the relevant MSES.

MSES - Regulated Vegetation

8a. Regulated Vegetation - Endangered/Of concern in Category B (remnant)

Regional ecosystem	Vegetation management polygon	Vegetation management status
11.4.2	O-dom	rem_oc
11.4.9	E-dom	rem_end
11.3.4	O-dom	rem_oc

8b. Regulated Vegetation - Endangered/Of concern in Category C (regrowth)

Not applicable

For further information relating to regional ecosystems in general, go to:

<https://www.qld.gov.au/environment/plants-animals/plants/ecosystems/>

For a more detailed description of a particular regional ecosystem, access the regional ecosystem search page at:

<https://environment.ehp.qld.gov.au/regional-ecosystems/>

8c. Regulated Vegetation - Category R (GBR riverine regrowth)

Regulated vegetation map category	Map number	RVM rule
R	8852	4

8d. Regulated Vegetation - Essential habitat

Values are present

8e. Regulated Vegetation - intersecting a watercourse**

A vegetation management watercourse is mapped as present

8f. Regulated Vegetation - within 100m of a Vegetation Management wetland

Regulated vegetation map category	Map number	RVM rule
B	8852	2

Refer to **Map 4 - MSES - Regulated Vegetation** for an overview of the relevant MSES.

MSES - Offsets

9a. Legally secured offset areas - offset register areas

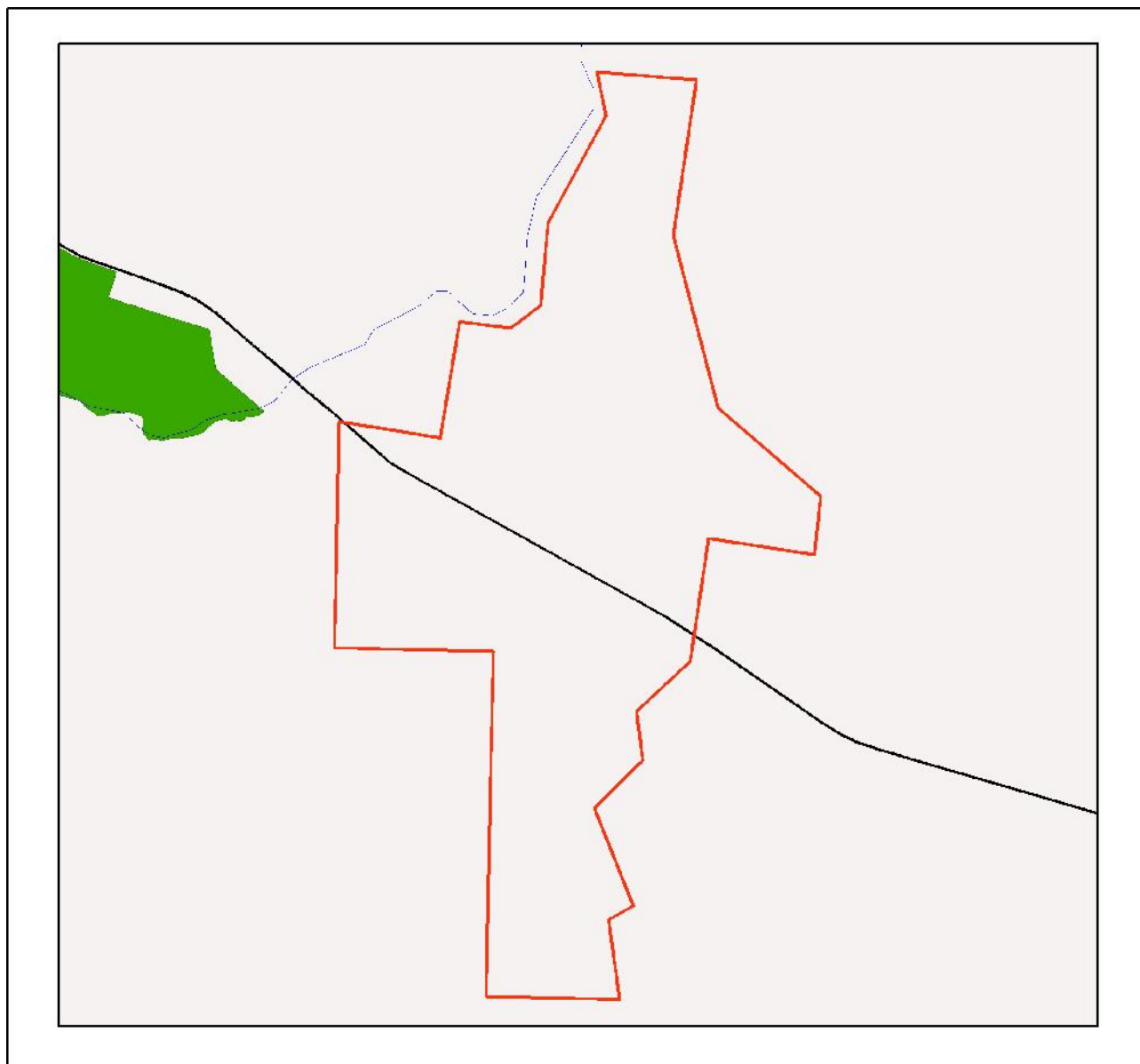
(no results)

9b. Legally secured offset areas - vegetation offsets through a Property Map of Assessable Vegetation

(no results)

Refer to **Map 5 - MSES - Offset Areas** for an overview of the relevant MSES.

Map 1 - MSES - State Conservation Areas



MSES - State Conservation Areas

Area of Interest

- Selected Mining Lease (ML)
- ▲ Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Protected area (estates)
- Declared fish habitat area (A and B areas)
- Marine park (highly protected)



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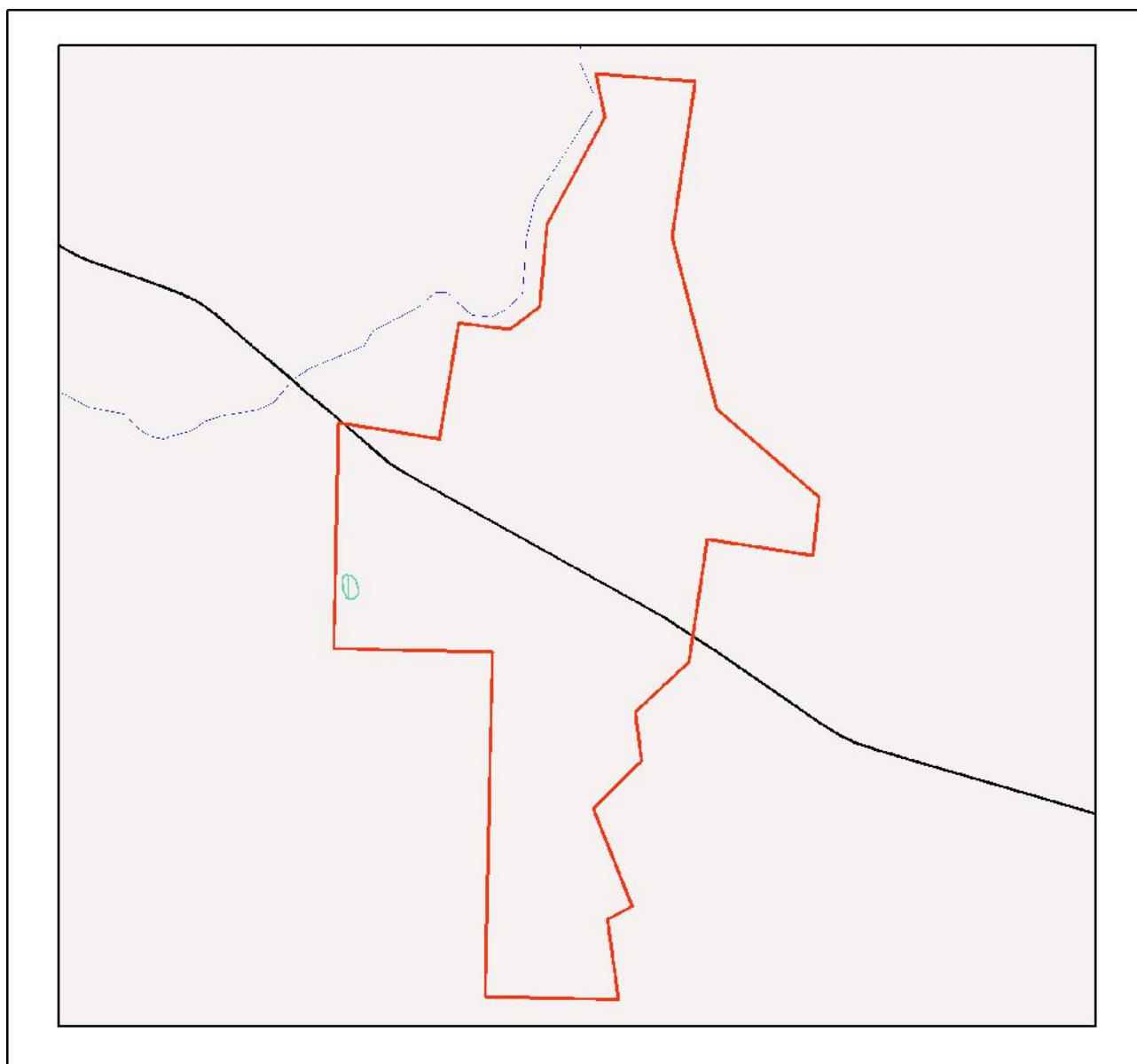
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Map 2 - MSES - Wetlands and Waterways



MSES - Wetlands and Waterways

Area of Interest

- Selected Mining Lease (ML)
- ▲ Towns
- Freeways/Highways
- Secondary roads
- Major rivers/creeks
- Declared high ecological value waters (watercourse)
- Strategic environmental area (designated precinct)
- Declared high ecological value waters (wetland)
- High ecological significance wetlands



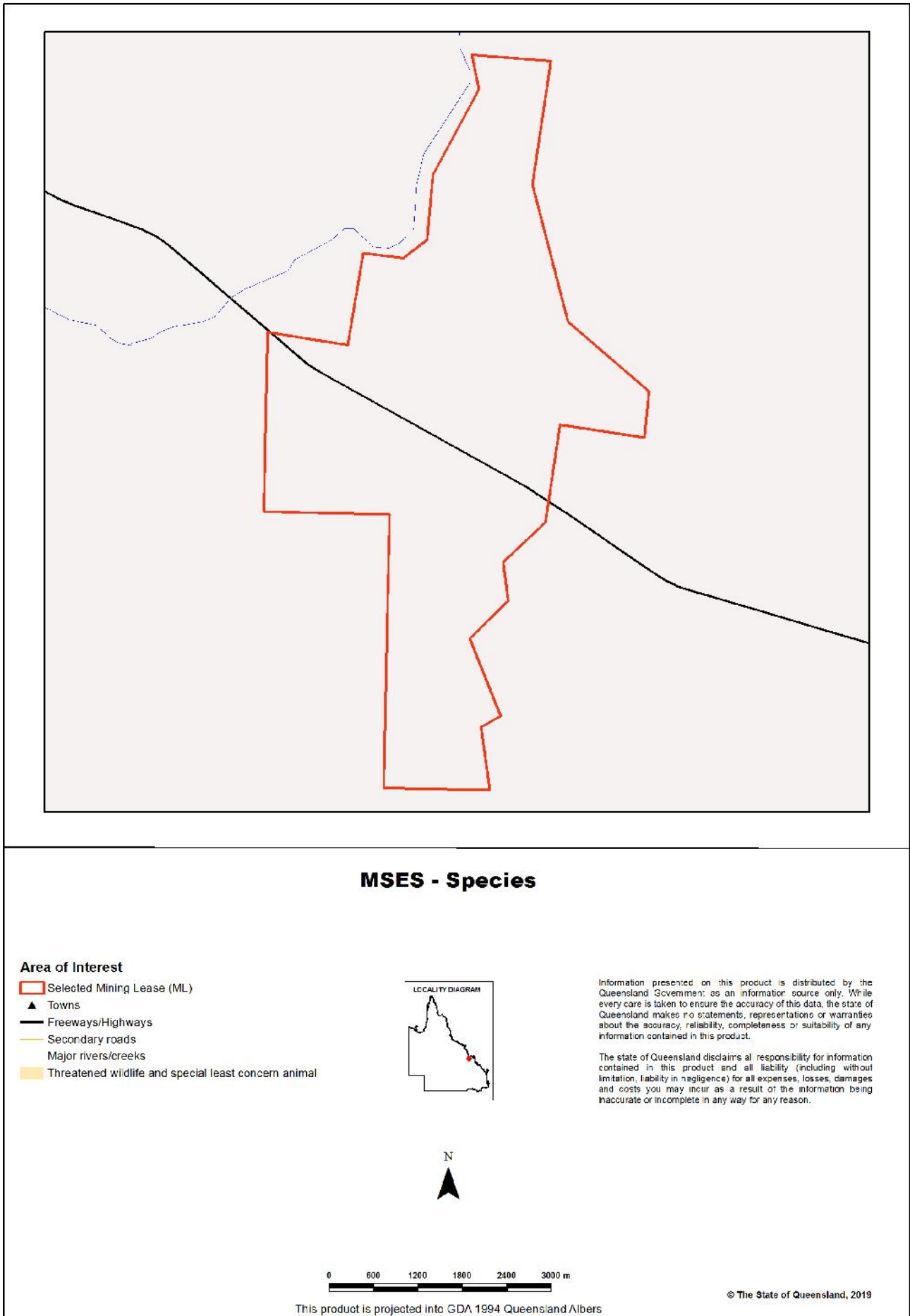
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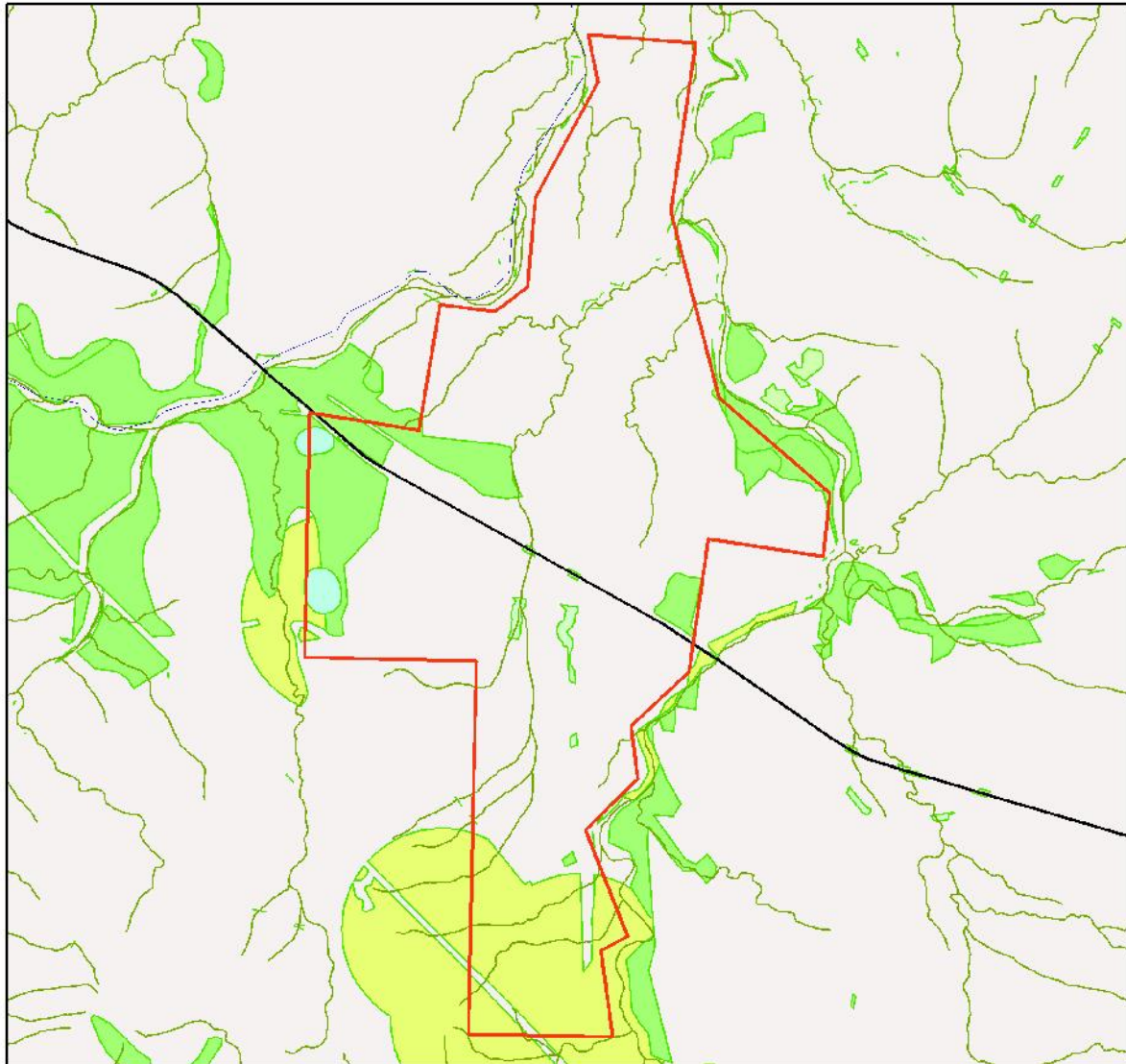
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Map 3 - MSES - Species



Map 4 - MSES - Regulated Vegetation



MSES - Regulated Vegetation

Area of Interest

- Selected Mining Lease (ML)
- Towns
- Freeways/ highways
- Secondary roads
- Major rivers/creeks
- Regulated vegetation (intersecting a watercourse)
- Regulated vegetation (100m from wetland)
- Regulated vegetation (category B - endangered or of concern)
- Regulated vegetation (category C - endangered or of concern)
- Regulated vegetation (category R - GBR riverine)
- Regulated vegetation (essential habitat)



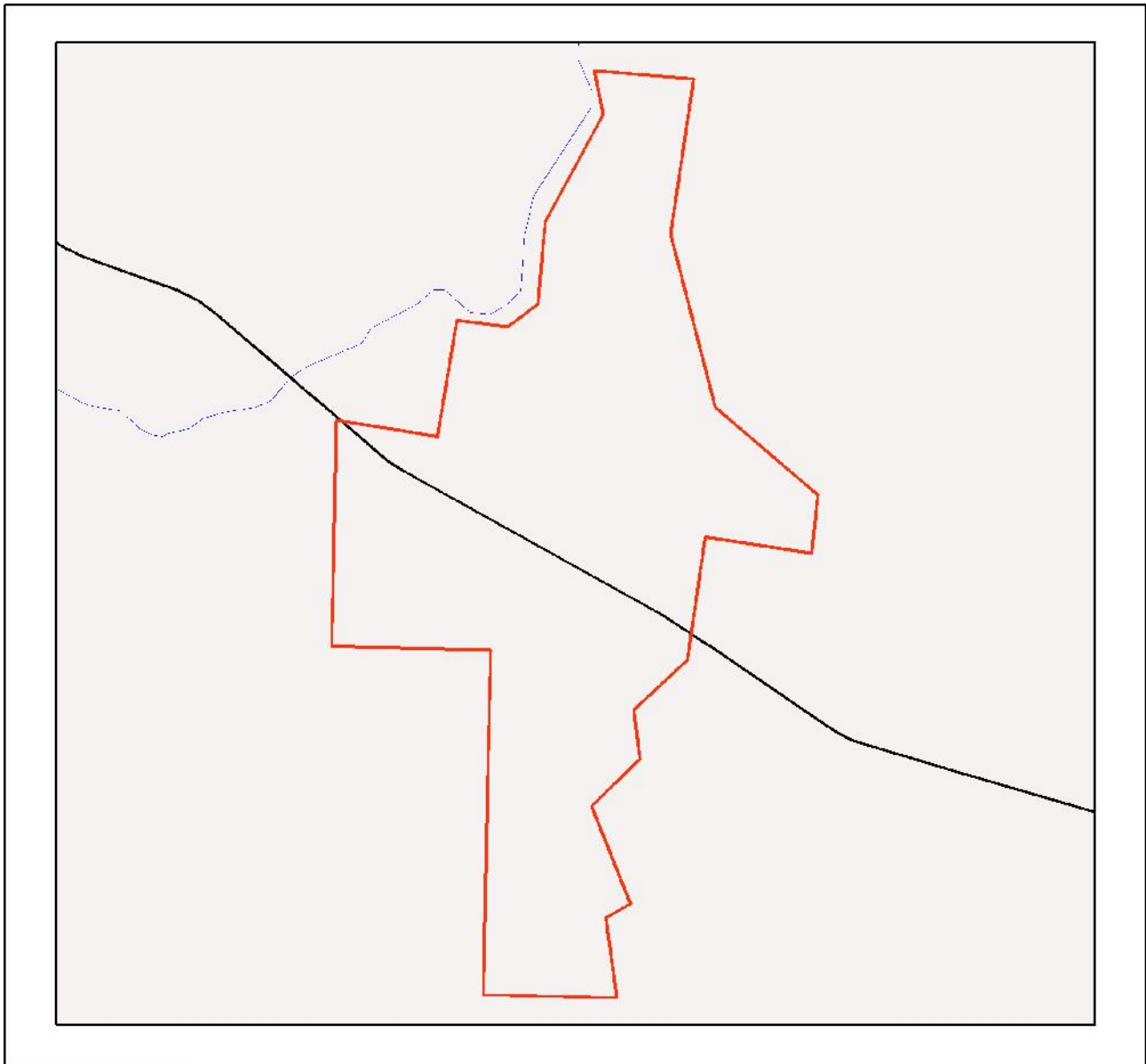
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Map 5 - MSES - Offset Areas



MSES - Offsets

Area of Interest

- Selected Mining Lease (ML)
- ▲ Towns
- Freeways/Highways
- Secondary roads
- ~~~~~ Major rivers/creeks
- Legally secured offset area (offset register)
- Legally secured offset area (vegetation offsets)



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Appendices

Appendix 1 - Matters of State Environmental Significance (MSES) methodology

MSES mapping is a regional-scale representation of the definition for MSES under the State Planning Policy (SPP). The compiled MSES mapping product is a guide to assist planning and development assessment decision-making. Its primary purpose is to support implementation of the SPP biodiversity policy. While it supports the SPP, the mapping does not replace the regulatory mapping or environmental values specifically called up under other laws or regulations. Similarly, the SPP biodiversity policy does not override or replace specific requirements of other Acts or regulations.

The Queensland Government's "Method for mapping - matters of state environmental significance for use in land use planning and development assessment" can be downloaded from:

<http://www.ehp.qld.gov.au/land/natural-resource/method-mapping-mses.html> .

Appendix 2 - Source Data

The datasets listed below are available on request from:

<http://qldspatial.information.qld.gov.au/catalogue/custom/index.page>

- Matters of State environmental significance

Note: MSES mapping is not based on new or unique data. The primary mapping product draws data from a number of underlying environment databases and geo-referenced information sources. MSES mapping is a versioned product that is updated generally on a twice-yearly basis to incorporate the changes to underlying data sources. Several components of MSES mapping made for the current version may differ from the current underlying data sources. To ensure accuracy, or proper representation of MSES values, it is strongly recommended that users refer to the underlying data sources and review the current definition of MSES in the State Planning Policy, before applying the MSES mapping.

Individual MSES layers can be attributed to the following source data available at QSpatial:

MSES layers	current QSpatial data (http://qspatial.information.qld.gov.au)
Protected Areas-Estates and Nature Refuges	- Protected areas of Queensland - Nature Refuges - Queensland
Marine Park-Highly Protected Zones	Moreton Bay marine park zoning 2008
Fish Habitat Areas	Queensland fish habitat areas
Strategic Environmental Areas-designated	Regional Planning Interests Act - Strategic Environmental Areas
HES wetlands	Map of Referable Wetland - wetland layers: - Wetland management area wetlands - Wetland protection area wetlands
wetlands in HEV waters	HEV waters: - EPP Water (multiple locations) intent for waters Source Wetlands: - Queensland Wetland Mapping (Current version 4, 2015) Source Watercourses: - Vegetation management watercourse and drainage feature map (1:100000 and 1:250000) - latest version 1.4
Wildlife habitat (threatened and special least concern)	-WildNet database species records - habitat suitability models (various)
VMA regulated regional ecosystems	Vegetation management regional ecosystem and remnant map - latest version 8.0
VMA Essential Habitat	Vegetation management - essential habitat map - latest version 4.41
VMA Wetlands	Vegetation management wetlands map - latest version 2.41
Legally secured offsets	Vegetation Management Act property maps of assessable vegetation. For offset register data-contact DES
Regulated Vegetation Map	Vegetation management - regulated vegetation management map - latest version 1.41

Appendix 3 - Acronyms and Abbreviations

AOI	- Area of Interest
DES	- Department of Environment and Science
EP Act	- <i>Environmental Protection Act 1994</i>
EPP	- Environmental Protection Policy
GDA94	- Geocentric Datum of Australia 1994
GEM	- General Environmental Matters
GIS	- Geographic Information System
MSES	- Matters of State Environmental Significance
NCA	- <i>Nature Conservation Act 1992</i>
RE	- Regional Ecosystem
SPP	- State Planning Policy
VMA	- <i>Vegetation Management Act 1999</i>