

EA APPLICATION SUPPORTING REPORT

SAVANNAH GOLDFIELDS LTD

Appendix 5 Terrestrial Flora and Fauna Baseline (SLR Consulting, 2021)

AGATE CREEK

Terrestrial Flora and Fauna Baseline Assessment

Prepared for:

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BASIS OF REPORT

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DOCUMENT CONTROL

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1 Introduction

1.1 Project background

Laneway Resources Ltd hold the Agate Creek mining lease (ML) 100030, which encompasses ~691ha and is located ~45km to the south west of Forsayth. Environmentally relevant activities within this ML are regulated under environmental authority (EA) EPSL03068015, which contains standard conditions outlined within the Code of Environmental Compliance for Mining Lease Projects Version 1.1 (EHP, 2013) made under the Environmental Protection Regulation 2008 (EP Regulation).

Laneway Resources Ltd commissioned SLR Consulting Pty Ltd (SLR) to undertake baseline flora and fauna assessments within the ML to support site-specific EA application processes. These baseline assessments were undertaken during the early dry season, from 25 to 29 May 2020, and during the early wet season from 30 November to the 4 December 2020

1.2 Study area description

The study area for the field surveys included all areas within ML 100030 (Appendix A), which occurs on the boundary of the Gulf Plains and Einasleigh Uplands bioregions and to the north east of the Rungulla National Park (NP) and Rungulla Resource Reserve (RR). The western portion of the study area is bordered by the Gregory Range, which includes steep sandstone scarps and formations. The central western portion of the study area is characterised by steeply undulating hills, which form sheltered gullies in some areas. However, most of the study area is dominated by gently undulating open woodland on seasonal floodplains. Agate Creek is a fourth order ephemeral watercourse that dissects the central northern portion of the study area flowing from the south east to north west. Several other smaller ephemeral watercourses also occur throughout the study area.

Existing mining infrastructure and disturbance was present at the time of the baseline assessments, which included a central haul road, run of mine, mining camp and workshop facilities, open-cut pit, and waste rock dump.

1.3 Purpose and objectives

The objective of this report is to describe current biodiversity values and relevant Matters of State and National Environmental Significance (MSES & MNES), in accordance with current State and Commonwealth legislation, that occur within the study area.

The above was achieved through a desktop and field assessments examining:

- The occurrence of MSES and MNES in accordance with current State and Commonwealth legislation;
- The terrestrial flora and fauna biodiversity values within the study area; and
- The presence and status of species and communities identified to occur within the study area based on ground-truthing field assessments.

This is the first known terrestrial flora and fauna assessment conducted specifically to inform environmental approvals for development of the study area.

1.4 Regulatory framework

1.4.1 Commonwealth legislation

Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is administered by the Australian Government Department of Agriculture, Water and the Environment (DAWE). The EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places, which are defined in the EPBC Act as MNES. The MNES listed in the EPBC Act that are relevant to this report are:

- Nationally threatened species and ecological communities
- Migratory species.

Database searches and field assessments should be conducted as part of any flora and fauna impact assessment. The results of these assessments can be used to determine the presence or likelihood of the presence of any MNES within the study area. If any species or communities listed under the EPBC Act are present or likely to be present, an assessment of significance is required. If the proposed action may have a significant impact on a MNES, it must be referred to DAWE for assessment. If DAWE determines that the proposed action is likely to have significant impacts despite any suggested mitigation strategies, the project will be considered as a controlled action and will require formal assessment and approval. If the proposed action is not likely to be significant, approval is not required if the action is taken in accordance with the referral. Consequently, the action can proceed, subject to any state or local government requirements.

1.4.2 State legislation

Environmental Protection Act 1994

The *Environmental Protection Act 1994* (EP Act) is intended “to protect Queensland’s environment while allowing for development that improves total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends (ecologically sustainable development)”. The EP Act regulates environmentally relevant activities (ERAs). The Queensland Department of Environment and Science (DES) assesses applications to undertake ERAs, and issues Environmental Authorities (EAs) that identify environmental conditions to be met to ensure the prevention or minimisation of environmental harm caused by the authorised ERAs. An assessment of environmental impacts on identified environmental values is required as part of the EA application.

Environmentally Sensitive Areas (ESAs) are defined under Schedule 12 of the Environmental Protection Regulation 2008 (EP Regulation). ERAs and/or exploration and/or mining activities within and adjacent to ESAs are regulated by DES in accordance with the following documents:

- *Eligibility criteria and standard conditions for exploration and mineral development projects – Version 2*; and
- *Eligibility criteria and standard conditions for mining lease activities – Version 2*.

Vegetation Management Act 1999

The *Vegetation Management Act 1999* (VM Act) is administered by the Queensland Department of Natural Resources, Mines and Energy (DNRME) and protects Queensland’s biodiversity by conserving native vegetation and addressing land degradation issues.

Queensland's vegetation management framework regulates the clearing of certain native vegetation. The VM Act incorporates the RE classification scheme to regulate the clearing of native vegetation. REs are remnant vegetation communities in a bioregion that are consistently associated with a particular combination of geology, landform and soil. Remnant vegetation is defined under the VM Act as vegetation where the dominant canopy layer has greater than 70% of the height and greater than 50% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy.

The Queensland Herbarium has mapped the remnant extent of REs for much of the state using a combination of satellite imagery, aerial photography and on-ground studies (ground-truthing). RE maps published by DNRME describe the extent and conservation status of remnant vegetation as REs. REs are classified in the following vegetation management class and biodiversity status categories:

- Remnant Vegetation—Category B
 - Endangered—less than 10% remains
 - Of Concern—10-30% remains
 - No Concern at Present—>30% remains, >10,000ha remains
- Regrowth
 - High Value Regrowth—Category C
 - Reef Regrowth Watercourse Veg—Category R
- Non-remnant—Category X.

The classification of REs is relevant to identifying vegetation communities of conservation significance in a regional context, including those classified as ESAs, and potential environmental offset requirements under the Queensland environmental offsets framework.

In association with the VM Act, essential habitat mapping is available for protected flora and fauna, encompassing areas that the chief executive reasonably believes are areas of essential habitat. Essential habitat is mapped over areas of remnant vegetation, usually within 2.5km of a reported location of a threatened species, that are likely to contain either three or more essential habitat factors for the relevant species, or presence of the relevant species at any stage of its life cycle (DNRME, 2018b). Essential habitat factors for protected flora and fauna incorporate components of a species habitat and can be characterised by a landform, pollinator, regional ecosystem, soil type and water body that is necessary or desirable for the species at any stage of its life cycle.

Nature Conservation Act 1992

The *Nature Conservation Act 1992* (NC Act) is administered by DES and provides the framework for the declaration and management of protected areas, and protection of wildlife listed under the Nature Conservation (Wildlife) Regulation 2006 (NC Regulation).

Protected areas

Protected areas are declared under the NC Act for the conservation of Queensland's natural and cultural resources. Classes of protected areas under the NC Act include national parks, regional parks, resource reserves and nature refuges. An environmental offset may be required for actions resulting in significant residual impacts within a protected area.

Under the Queensland environmental offsets framework, an impact on a protected area is significant if a prescribed activity results, or is likely to result, in one or more of the following:

- Authorised clearing or inundation of all or part of the protected area for the construction of private or publicly owned infrastructure on the area
- The exclusion of, or reduction in, the public use or enjoyment of all or part of the protected area
- A reduction in the natural or cultural values of all or part of the protected area.

Protected wildlife

The purpose of the NC Regulation is to prescribe wildlife as one of the following classes of wildlife:

- Extinct in the wild
- Endangered
- Vulnerable
- Near threatened
- Least concern.

Threatened wildlife under the NC Act is wildlife that is prescribed under the Act as extinct in the wild, endangered or vulnerable. All native flora and fauna species are protected under the Act, and 'permits to take' protected wildlife are required from DES.

DES provides the Wildlife Online database, which can be searched to generate a list of all species recorded within a specified area. This tool is useful for determining the presence or likelihood of occurrence of threatened species in an area.

A Protected Plants Flora Survey Trigger Map is also available, which shows high risk areas for protected plants (those considered as endangered, vulnerable and near threatened (EVNT) species) and is used to help determine flora survey and clearing permit requirements for a specified area. If the study area is located within a high-risk area, a comprehensive flora survey is required to be undertaken before any clearing of protected plants can occur. This survey will need to comply with Queensland's *Flora Survey Guidelines – Protected Plants* v2.01 (DES, 2020a).

If threatened plants are found to occur within the high-risk area during the field survey and these are likely to be cleared or impacted by the proposed project, an application for a clearing permit from DES will be required. This application will need to be accompanied by the flora survey results and potential impact management options for the protected plants that include appropriate avoidance, mitigation or offsetting measures.

In addition, if threatened plants are found outside a high-risk area during the field survey, and these plants are likely to be cleared or impacted by the proposed project, a clearing permit will also be required. Where a flora survey identifies that there are no protected plants present or impacts can be avoided, clearing will be exempt from requiring a permit under the NC Act.

Biosecurity Act 2014

The *Biosecurity Act 2014* commenced on 1 July 2016 with the aim to ensure a consistent, modern, risk-based and less prescriptive approach to biosecurity in Queensland. The *Biosecurity Act 2014* replaced the many separate pieces of legislation that were previously used to manage biosecurity. Under this Act, the Biosecurity Regulation 2016 sets out how the Act is implemented and applied.

Under the *Biosecurity Act 2014*, there are three types of invasive plant species:

- Prohibited invasive plants
- Restricted Invasive plants
- Invasive plants.

Prohibited invasive plants are not considered to be present in Queensland and would seriously threaten Queensland's primary industries, natural environment, livestock, human health and people's livelihoods. If a prohibited invasive plant is found in Queensland, it must be reported to Biosecurity Queensland within 24 hours of the sighting.

Restricted invasive plants also seriously threaten Queensland's primary industries, natural environment, livestock, human health and people's livelihoods, but are already established in Queensland. Under the *Biosecurity Act 2014*, restricted invasive plants may fall into one or more categories, with different restrictions relevant to each category.

Restricted invasive plant categories and restrictions:

- Category 2: the invasive plant must be reported within 24 hours Biosecurity Queensland
- Category 3: the invasive plant must not be distributed or released into the environment
- Category 4: the invasive plant must not be moved
- Category 5: the invasive plant must not be kept.

Invasive plants include species that are not listed as prohibited or restricted invasive plants, but the species has, or is likely to have, an adverse impact on a biosecurity consideration because of the introduction, spread or increase in population size of the species in an area. Everyone is required under their 'general biosecurity obligation' (GBO) to take all reasonable and practical steps to minimise the risks associated with invasive plants under their control. Under the Act, local governments are required to have a Biosecurity Plan for managing biosecurity matters within its local government area and may also declare additional pest species using a local law under the *Local Government Act 2009*. Local governments and Biosecurity Queensland provide weed control support services but may also enforce landowner responsibilities if necessary.

Invasive animals are classified in a similar manner to plants and include prohibited and restricted classifications. Landholder responsibilities and restrictions pertaining to these classifications are specific for each category and an invasive animal may be listed under multiple categories. Category actions that must, or must not, be carried out are defined under the *Biosecurity Act 2014*, however, additional obligations may be specified in the relevant local government Biosecurity Plan.

Queensland environmental offsets framework

The Queensland environmental offsets framework includes an Act, a regulation and a single policy, which replaces the five previous single-issue policies.

The Environmental Offsets Regulation 2014 (EO Regulation) provides details of the prescribed activities regulated under legislation and the prescribed environmental matters (MSES) to which the framework applies. Examples of MSES include:

- Wetlands and watercourses
- Endangered and of concern REs
- Connectivity areas
- Protected wildlife habitat.

For any new development, all impacts to MSES must be avoided or minimised where possible. Where there is a *significant residual impact* to MSES, an environmental offset may be required in accordance with the Queensland Environmental Offsets Policy.

2 Flora and Fauna Assessment Methodology

2.1 Overall assessment methodology

SLR employed a joint approach of desktop analysis and field surveys in this study. The study team implemented best practice recommendations from sources such as:

- *Terrestrial Vertebrate Fauna Survey Guidelines for Queensland* (Eyre *et al.*, 2018)
- *Methodology for survey and mapping of REs and Vegetation Communities in Queensland* (Neldner *et al.*, 2020)
- *Flora Survey Guidelines—protected plants* (DES, 2020a).

The methodology encompassed two phases – scoping and field surveys. The scoping phase encompassed:

- Project planning and definition of objectives
- Assignment of qualified ecologists
- Detailed desktop studies
- Review of previous studies
- Collation of existing records
- Literature review of species and potential threats and impacts.

The field surveys phase encompassed:

- Systematic, targeted and incidental flora surveys
- Vegetation community mapping and assessments
- Systematic, targeted and incidental fauna surveys.

SLR is a registered scientific user with ethics approval to conduct fauna studies from the Department of Agriculture and Fisheries Animal Ethics Committee. The survey work involved in this report was conducted under Scientific Purposes Permit number WA0009163.

2.2 Desktop analysis

2.2.1 Database searches

The DAWE Protected Matters Search Tool (PMST) and the Queensland Government Wildlife Online (WO) database were utilised to determine species, communities and areas of conservation significance with potential relevance to the study area. Both searches included a 20km buffer around a central co-ordinate within the study area (-18.9972° S, 143.5455° E), which includes the entire study area and a large buffer incorporating similar habitat in the surrounding landscape.

The results of database searches and their relevance to the study area are discussed in the Results section of this report. SLR has developed an approach for ranking threatened species and communities recorded from the desktop searches in terms of their likelihood of occurring within the study area. The approach is based on the presence of local records and the habitat requirements for each species, which are recommended criteria for desktop impact assessment in State published survey guideline documents, such as Eyre *et al.* (2018).

Details of the criteria used to assess the likelihood of occurrence for threatened and near threatened species are provided in **Table 1**. The potential impacts to threatened species that may occur within the study area are discussed in the Impacts Assessment and Management section of this report.

It is possible that some locally occurring near threatened or threatened species may not be recorded in the State and Commonwealth databases. The field survey component of this assessment is therefore an important aspect of the assessment process, to determine the presence of any threatened species that have not been previously recorded in the local area.

Table 1 Key assessment criteria for likelihood of occurrence of threatened and near threatened species

Likelihood of occurring	Key criteria	Definition
Present	Present during survey or historical records in the study area	Species was recorded during field surveys or a historical record of the species was located in the study area
High	Known records (<20km) or within species known range AND Suitable habitat of high quality is present	Historical records of the species occur within a 20km radius of the study area or the study area is within the species known range Suitable habitat of high quality exists with the study area
Moderate	Known records (<20km) or within species known range AND Suitable habitat is present, but degraded	Historical records of the species occur within a 20km radius of the study area or the study area is within the species known range Suitable habitat is present but is significantly degraded or fragmented
Low	No records (<20km) and not within species known range OR Habitat present is unsuitable, absent, or highly degraded	No historical records of this species occur within a 20km radius of the study area and/or the study area is not within the known range for this species OR The habitat within the study area is not suitable and/or is in extremely poor condition, or is absent for the species

2.2.2 Mapping

The following mapping resources were reviewed as part of the desktop analysis:

- Queensland Globe interactive mapping (QLD Globe, 2020):
 - Surface geology maps
 - Regulated vegetation maps (including DNRME, 2020)
 - Protected plants flora survey trigger map
 - Essential habitat map
- Referable wetlands (DES, 2020c)
- ESAs Map (DES, 2020d)

- Atlas of Living Australia (ALA) species occurrence maps (ALA, 2020)

2.3 Nomenclature and taxonomy

Apart from technical descriptions and tables, all flora and fauna species are referred to by their common names throughout this report, with their scientific names given in brackets after the first reference. Scientific names for flora species within this report follow the *Census of the Queensland Flora* (Brown & Bostock, 2019). Where no common name is provided in reference texts, a search was conducted for other accepted common names and, if none were found, only the scientific name was used. An asterisk is used to denote species that are not native to Australia. The taxonomic sequence of birds within Appendix G, is structured in accordance with Gill and Donsker (2015).

The use of scientific and common names for fauna species is in accordance with the following:

- Birds: Australian Bird Guide (ABG): Menkhorst *et al.* (2017)
- Amphibians: Vanderduys (2012)
- Reptiles: Wilson & Swan (2017) for all reptiles except the Silver-eyed Velvet Gecko (*Oedura argentea*) and Gilbert Ground Gecko (*Lucasium iris*) where names are used in accordance with Hoskin *et al.* (2018) and Vanderduys *et al.* (2020), respectively.
- Mammals (except bats): Van Dyck *et al.* (2013)
- Bats: Reardon *et al.* (2015).

2.4 Flora Survey Methodology

2.4.1 Overall methodology

Techniques described in the Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland (Neldner *et al.*, 2020) were used to collect sufficient data during the field vegetation assessments to verify the RE codes of the State mapped remnant vegetation in the study area. The key features recorded in the field relevant to this report are:

- Vegetation structure including height of each stratum and cover density
- Key species within each stratum
- Geology, landform and other landzone characteristics.

The species composition and structure for each community were compared to the technical descriptions provided in the Regional Ecosystem Description Database (REDD) (Queensland Herbarium, 2019). The landzone characteristics of each site were compared to the descriptions provided in Wilson and Taylor (2012). This information provided the basis for determining the appropriate RE code for each community. The information in these documents was also used in conjunction with site observations to determine appropriate values for the factors relating to remnant status.

Vegetation surveys were conducted during the early dry season, from 25 to 29 May 2020, and during the early wet season from 30 November to 4 December 2020. The purpose of the survey was to:

- Determine the appropriate RE code, extent and remnant status of vegetation communities throughout the study area

- Perform targeted searches for threatened flora species identified during desktop analyses
- Compile a flora species inventory for the study area.

2.4.2 Vegetation assessment sites

Site selection

Ground-truthing of the remnant vegetation mapping involved assessments of the floristic structure and composition at various locations within the study area. Assessment sites were selected where they would provide representative data for the vegetation community that was the subject of the assessment.

The location of the assessment sites and the survey techniques employed were selected to achieve the following:

- Accurately determine of the extent of each vegetation type
- Resolve heterogeneous polygons
- Determine the remnant status of vegetation
- Provide data on the vegetation community condition
- Target threatened flora species identified during desktop assessments and their habitat
- Compile a species inventory for the entire study area.

Survey techniques

39 quaternary and eight secondary vegetation assessments, in accordance with Neldner *et al.* (2020), were conducted over the survey period. Vegetation assessment sites were distributed over the study area to incorporate variations in community composition or structure and to assess the accuracy of State mapped vegetation community polygons (Appendix A).

Quaternary assessment sites were sampled to validate the vegetation community mapping and to capture any variability in the structure and composition of the community. Data collected at quaternary sites included species composition and structural information for the canopy layer. In general, focus was given to the dominant species, crown cover and median height of the ecologically dominant layer, which is used to define each community and determine the appropriate RE code and remnant status.

Secondary assessments included a 50m x 10m vegetation transect within each of the RE assessment sites within the study area. Within these transects, a combination of quantitative and qualitative techniques was employed. A summary of vegetation survey techniques and measures is presented in **Table 2**. Quantitative measurements such as canopy height and cover were used to describe the structural form of each community and determine the remnant status of the vegetation. Species composition and structure were used to determine the relevant RE code for each community and remnant status.

Table 2 Attributes measured at secondary assessment sites

Survey area	Attributes measured
Survey plot (50 x 10m)	Key species of each stratum Median height of each stratum Complete species list Land zone characteristics Central coordinate Basal area of woody stems
Along 50m transect	Percentage cover of each stratum Stem density measures of abundance
Greater area encompassing the present vegetation community	A list of species present Additional relevant notes, including those pertaining to environmental condition and landzone that communities occur on.

2.4.3 Vegetation mapping

Mapping of vegetation communities was performed using a combination of vegetation traverses and aerial imagery. Using the information gained at each of the vegetation assessment sites, and observations made when traversing the study area, the boundaries of vegetation communities were recorded using handheld GPS devices.

2.5 Fauna Survey Methodology

2.5.1 Survey timing and environmental conditions

The fauna survey generally incorporated survey timing and effort recommendations outlined in the '*Terrestrial Vertebrate Survey Guidelines for Queensland*' (Eyre *et al.*, 2018). Surveys were conducted between 25 and 29 May 2020 and 30 November to 4 December 2020, which are in the 'early dry season' (May – July) and 'early wet season' (November – January) survey periods as recommended in Eyre *et al.* (2018) for the Einasleigh Uplands and Gulf Plains bioregions.

Weather data relevant to the fauna survey periods was obtained from the Bureau of Meteorology (BoM) Georgetown Airport weather station (Station number 30124) for temperature data and the Robin Hood Station weather station (Station number 30107) for local rainfall. Daily minimum and maximum temperature and rainfall (BoM, 2020) data for these periods are provided in **Table 3**. Conditions were cool during the early dry season survey and conditions were considered unfavourable for the detection of reptile species during most parts of the day. However, conditions were contrastingly hot during the early wet season survey, which resulted in traps having to be closed during the day. Overall, between the two surveys, conditions were considered to be favourable for the detection of most faunal groups.

The local area was dry during both surveys, however rainfall in the days prior to the early dry season survey (32mm; BoM, 2020) resulted in some surface water pools and vegetation being more readily identifiable. Approximately 42mm of rain fell within the local area in the month prior to the early wet season survey, however conditions were distinctly drier compared to the early dry season survey (BoM, 2020).

Table 3 Temperature and rainfall conditions during the early dry and late wet season surveys

Date	Temperature		Rainfall (mm)
	Minimum	Maximum	
Early Dry Season Survey			
25/05/2020	6.5	23.8	0
26/05/2020	7.9	25.9	0
27/05/2020	9.1	27.7	0
28/05/2020	10.6	29	0
29/05/2020	14.1	29.3	0
Early Wet Season Survey			
30/09/2020	23.8	38.6	0
01/12/2020	26.1	39.6	0
02/12/2020	23.9	39.6	0
03/12/2020	25.3	38.8	0
04/12/2020	23.1	38.1	0

2.5.2 Systematic survey sites

During the survey period six systematic survey sites were established and an array of fauna trapping and survey techniques were employed at each site. The systematic survey sites were positioned to provide an appropriate spatial distribution within the study area while encompassing different habitat types. A description of the habitat present at each systematic survey site is provided in **Table 4**. In addition to the systematic survey sites, several other areas of interest were identified and used as additional locations for bat detectors. The location of each survey site is depicted in the fauna survey map in Appendix A.

Table 4 Systematic fauna survey sites and corresponding habitat

Site number and location	Habitat description	Representative photograph
Site 1: Located in the central portion of the study area to the south west of the existing ROM pad.	Situated within RE 9.5.10a on mostly flat terrain at the base of hills. Gilbert river box (<i>Eucalyptus microneura</i>) open woodland on light red-brown clay loam with sub-surface cobbles and boulders.	

Site number and location	Habitat description	Representative photograph
Site 2: Located to the west of the existing Agate Creek pit and WRD.	Situated within RE 2.10.5a on hill crest with weathered sandstone remnants. Habitat dominated by Lancewood (<i>Acacia shirleyi</i>) woodland with Narrow-leaved ironbark (<i>Eucalyptus crebra</i>) dominant to the south on steep hill slopes.	
Site 3: Located to the east of the existing Agate Creek pit and WRD.	Situated within RE 9.3.13 in River red gum (<i>Eucalyptus camaldulensis</i>) and Melaleuca dominated riparian vegetation fringing a fourth order ephemeral watercourse	
Site 4: Located within the north eastern portion of the study area.	Situated on the boundary of REs 9.11.16 and 9.12.11. Open woodland habitat dominated by Narrow-leaved Ironbark on steep to moderately steep hilly terrain with an abundance of cobbles, boulders, and igneous and metamorphic outcropping.	

Site number and location	Habitat description	Representative photograph
Site 5: Located to the south east of the existing Agate Creek pit and WRD.	Situated within RE 2.10.5a adjacent to sandstone outcropping and plateaus. Habitats dominated by Lancewood woodland with Paperbark gum (<i>Eucalyptus chartaboma</i>) dominated plateaus to the immediate west.	
Site 6: Located to the west of the existing Agate Creek pit and WRD.	Situated in RE 9.12.11 at the base of a gully within steep, hilly terrain. Habitats dominated by Narrow-leaved Ironbark with a narrow drainage line dominated by Black tea-tree (<i>Melaleuca bracteata</i>) at the base of the gully.	

2.5.3 Survey techniques

The survey techniques employed at the systematic survey sites and additional areas of interest are detailed in **Table 5**.

Table 5 Fauna survey methods employed throughout the study area

Survey method	Description
Elliott traps	20 type-A Elliott style traps were placed on the ground approximately 5–10m apart in a straight line for four nights at each systematic survey site. All traps were baited with a mixture of rolled oats, peanut butter and honey.

Survey method	Description
Pitfall and funnel traps	Drift fence lines incorporating pitfall and funnel traps were established for four nights at sites 1-3 and sites 5-6. Three pitfall traps (20L buckets) were buried flush with the ground surface with the drift fence intersecting the centre of each bucket at sites 1-3 and site 5. Only two pitfall traps were installed at site 6 and none were installed at site 4 due to rocky ground inhibiting the ability to install the buckets. For the above reasons, no drift fence was installed at site 4. Six funnel traps were located along the drift fencing at each of these sites where one was installed. Additionally, six funnel traps were installed at site 4, however these were scattered within suitable habitat. A shade cloth covering each funnel trap was deployed to protect trapped species from exposure.
Cage traps	Four cage traps were placed at each site for four nights and were baited with a mixture of rolled oats, peanut butter and honey in addition to a variety of different meats.
Bat detectors	An Anabat SM4 bat call detector was deployed for one night at systematic sites 1–6 The bat detector was also deployed for two nights at additional areas of interest within the study area.
Active diurnal searches	Active diurnal searches were undertaken concurrently with vegetation assessments throughout the study area. This technique involved intensive investigation of ground layer habitat features (such as under logs, rocks and leaf litter), low vegetation (under bark and tree stumps) for cryptic fauna, particularly reptiles. Searches were focussed during times of the day when reptile activity was likely to be at its peak.
Diurnal bird surveys	Birds were surveyed within each vegetation community for a total of at least one hour at multiple periods throughout the day, but with a particular focus during peak activity in the morning and around waterbodies. Incidental observations made whilst conducting other survey techniques were also recorded. Birds were identified from either direct observation or by their calls.
Nocturnal surveys	High-powered spotlights were used to survey nocturnal mammals (flying, arboreal and terrestrial), birds (active nocturnal species, and roosting diurnal species), reptiles and frogs in areas identified as suitable for nocturnal EVNT species and at each systematic trapping site.
Camera trapping	Camera traps (motion-sensing infrared cameras) were utilised at systematic fauna survey sites 1–6 to target fauna that may be too cryptic to be detected by other trapping and survey techniques.

2.5.4 Survey effort

The survey effort employed for each of the fauna survey techniques is outlined in **Table 6**. However, it should be noted that fauna species were continually observed throughout the survey period and incidental records were frequently obtained throughout the survey. Any observations, tracks, scats or other signs of fauna were recorded with reference to the location and habitat type.

Table 6 Fauna survey effort for each technique

Method	Site survey effort	Total survey effort
Elliott traps	Sites 1 – 80 trap nights (20 traps x 4 nights) Sites 2 – 80 trap nights (20 traps x 4 nights) Sites 3 – 80 trap nights (20 traps x 4 nights) Sites 4 – 80 trap nights (20 traps x 4 nights) Sites 5 – 80 trap nights (20 traps x 4 nights) Sites 6 – 80 trap nights (20 traps x 4 nights)	480 trap nights
Pitfall traps	Site 1 - 12 trap nights (3 traps x 4 nights) Site 2 - 12 trap nights (3 traps x 4 nights) Site 3 - 12 trap nights (3 traps x 4 nights) Site 4 - Nil Site 5 - 12 trap nights (3 traps x 4 nights) Site 6 - 8 trap nights (2 traps x 4 nights)	56 trap nights
Funnel traps	Site 1 – 24 trap nights (6 traps x 4 nights) Site 2 – 24 trap nights (6 traps x 4 nights) Site 3 – 24 trap nights (6 traps x 4 nights) Site 4 – 24 trap nights (6 traps x 4 nights) Site 5 – 24 trap nights (6 traps x 4 nights) Site 6 – 24 trap nights (6 traps x 4 nights)	144 trap nights
Cage traps	Site 1 – 16 trap nights (4 traps x 4 nights) Site 2 – 16 trap nights (4 traps x 4 nights) Site 3 – 16 trap nights (4 traps x 4 nights) Site 4 – 16 trap nights (4 traps x 4 nights) Site 5 – 16 trap nights (4 traps x 4 nights) Site 6 – 16 trap nights (4 traps x 4 nights)	96 trap nights
Echolocation call detection	1 detector x 8 nights	8 detector nights
Diurnal active search	2 person-hours x 2 people x 8 days	32 person-hours
Diurnal bird survey	20 person-minutes x 2 people x 8 days	5.3 person-hours
Spotlight/ nocturnal searches	1-hour search x 2 people x 6 nights	12 person-hours
Camera trapping	3 cameras x 8 nights	24 trap nights

3 Desktop Analysis Results

3.1 Database searches

The EPBC Act PMST (DAWE, 2020a) and WO Database extract (DES, 2020b) are included in Appendix B and Appendix C, respectively. The WO extract and PMST identified seven EVNT flora species, 10 EVNT fauna species and 11 migratory fauna species as potentially occurring within the study area.

3.1.1 Protected wildlife and essential habitat

Several protected wildlife (vulnerable and endangered) and essential habitat areas are State mapped to occur to the south of the study area, however all these areas are >2.3kms from the study area (QLD Globe, 2020).

3.1.2 Protected areas

There are two MSES protected areas mapped to the southwest of the study area, which include the Rungulla Resources Reserve (RR) and Rungulla National Park (NP). The nearest boundary of the Rungulla RR occurs ~200m to the west of the central western boundary of the study area (QLD Globe, 2020; DES, 2020d) (Appendix A). Additionally, the nearest boundary of the Rungulla NP occurs ~1km to the south of the southernmost portion of the study area, with all other parts of Rungulla NP occurring >2km from the study area (QLD Globe, 2020; DES, 2020d) (Appendix A).

3.1.3 Environmentally Sensitive Areas (ESAs)

No ESAs are shown within the study area on the map of ESAs (DES, 2020d). However, several ESAs are mapped nearby, which include:

- Category A ESA – Rungulla NP
- Category C ESA – Rungulla RR

These areas are considered as ESAs under the Eligibility criteria and standard conditions for mining lease activities (Version 1.1).

3.1.4 Watercourses and wetlands

Numerous VM Act watercourses/drainage features occur within the study area (QLD Globe, 2020). The study area is primarily dominated by first order watercourses, which are State mapped across the study area. A small section of a second order watercourse is located within the eastern portion of the study area; however, this watercourse is mapped to skirt the boundary of the study area. Most State mapped first and second order watercourses within the study area drain into Agate Creek, a fourth order watercourse that dissects the central portion of the study area, flowing from the south east to north west. However, first order watercourses within the northern most portion of the study area drain to the north into Cave Creek (QLD Globe, 2020).

No wetlands of international importance (Ramsar wetlands) are located within the study area. One wetland of general ecological significance occurs >5.5km's to the north west of the study area, however no wetlands of high ecological significance are present (QLD Globe, 2020; DES, 2020c).

3.1.5 Threatened ecological communities

No threatened ecological communities (TECs), as defined under the EPBC Act, were identified as potentially occurring within a 20km radius of the study area on the PMST.

3.1.6 Threatened and near threatened flora species

A total of seven EVNT flora species were returned in the database searches. These included two species from the PMST (DAWE, 2020a; see appendix B) and five species from the WO extract (DES, 2020b; see Appendix C). **Table 7** shows all EVNT flora species recorded from the database searches and their status under State and Commonwealth legislation, as well as their likelihood of occurring within the study area.

Appendix D provides justification for the likelihood of occurrence determination for each species. Of the seven flora species returned in the desktop analyses, four were considered to have a high likelihood of occurring within the study area and two were considered to have a moderate likelihood of occurrence. The remaining species was considered to have a low likelihood of occurring. Additional details on the classification of the likelihood of occurrence is included in Appendix D.

3.1.7 Threatened and near threatened fauna species

A total of 10 EVNT fauna species were returned from the database searches. These included 10 species from the PMST (DAWE, 2020a, see Appendix B) and one of the same species (Koala) from the WO extract (DES, 2020b, see Appendix C). The results of these searches have been combined in **Table 8**, which also provides an assessment of the potential likelihood for each of these species to occur within the study area. Appendix D provides justification for how the potential likelihood of occurrence was determined for each species.

Three species were identified as being moderately likely to occur in the study area and the remaining seven species were considered to have a low likelihood of occurring.

3.1.8 Migratory species

The EPBC Act PMST identified 11 migratory terrestrial species with potential to occur within 20km of the study area, none of which were returned within a WO extract of all species within 20km of the study area. All of these were deemed to have a low likelihood of occurring within in the study area (**Table 9**).

Table 7 Near threatened and threatened flora species identified from database searches

Status ¹		Family	Scientific name	Common name	Source ²	WO records	Likelihood of occurrence
NCA	EPBC						
E	-	Asteraceae	<i>Pluchea punctata</i>	-	WO	2	Moderate
V	V	Cycadaceae	<i>Cycas platyphylla</i>	-	PM	0	Low
NT	-	Leguminosae	<i>Labichea brassii</i>	-	WO	7	High
NT	-	Myrtaceae	<i>Leptospermum pallidum</i>	-	WO	2	High
LC	V	Poaceae	<i>Dichanthium setosum</i>	-	PM	0	Moderate
V	-	Rutaceae	<i>Drummondita calida</i>	-	WO	1	High
V	-	Solanaceae	<i>Solanum carduiforme</i>	-	WO	2	High

- Status: LC = Least Concern, V = Vulnerable, NT = Near Threatened
- 20km search radius for records. WO = Wildlife online database, PM = EPBC Act Protected Matters Report

Table 8 Near threatened and threatened fauna species identified from database searches

Status ¹		Family	Scientific name	Common name	Source ²	WO records	Likelihood of occurrence
NCA	EPBC						
BIRDS							
E	V	Accipitridae	<i>Erythrotriorchis radiatus</i>	Red goshawk	PM	0	Low
E	E	Estrildidae	<i>Erythrura gouldiae</i>	Gouldian finch	PM	0	Low
E	E	Rostratulidae	<i>Rostratula australis</i>	Australian painted snipe	PM	0	Low
E	CE, M, Ma	Scolopacidae	<i>Calidris ferruginea</i>	Curlew sandpiper	PM	0	Low
V	V	Tytonidae	<i>Tyto novaehollandiae kimberli</i>	Masked owl	PM	0	Low
MAMMALS							
LC	E	Dasyuridae	<i>Dasyurus hallucatus</i>	Northern quoll	PM	0	Low
E	V	Emballonuridae	<i>Saccolaimus saccolaimus nudicluniatu</i> s	Bare-rumped sheath-tail bat	PM	0	Low
E	V	Megadermatidae	<i>Macroderma gigas</i>	Ghost bat	PM	0	Moderate
V	V	Phascolarctidae	<i>Phascolarctos cinereus</i>	Koala	WO/PM	3	Moderate
E	V	Rhinolophidae	<i>Rhinolophus robertsi</i>	Large-eared horseshoe bat	PM	0	Moderate

- Status: LC = Least Concern, V = Vulnerable, E = Endangered, CE = Critically Endangered, M = Migratory, Ma = Marine
- 20km search radius for records. WO = Wildlife online database, PM = EPBC Act Protected Matters Report

Table 9 Migratory terrestrial fauna species identified from database searches

Status ¹		Family	Scientific name	Common name	Source ²	WO records	Likelihood of occurrence
NCA	EPBC						
BIRDS							
SLC	M, Ma	Apodidae	<i>Apus pacificus</i>	Fork-tailed swift	PM	0	Low
SLC	M, Ma	Cuculidae	<i>Cuculus optatus</i>	Oriental cuckoo	PM	0	Low
SLC	M, Ma	Hirundinidae	<i>Hirundo rustica</i>	Barn swallow	PM	0	Low
SLC	M, Ma	Motacillidae	<i>Motacilla cinerea</i>	Grey wagtail	PM	0	Low
SLC	M, Ma	Motacillidae	<i>Motacilla flava</i>	Yellow wagtail	PM	0	Low
SLC	M, Ma	Pandionidae	<i>Pandion haliaetus</i>	Osprey	PM	0	Low
SLC	M, Ma	Scolopacidae	<i>Actitis hypoleucos</i>	Common sandpiper	PM	0	Low
SLC	M, Ma	Scolopacidae	<i>Calidris acuminata</i>	Sharp-tailed sandpiper	PM	0	Low
E	CE, M, Ma	Scolopacidae	<i>Calidris ferruginea</i>	Curlew sandpiper	PM	0	Low
SLC	M, Ma	Scolopacidae	<i>Calidris melanotos</i>	Pectoral sandpiper	PM	0	Low
SLC	M, Ma	Scolopacidae	<i>Gallinago hardwickii</i>	Latham’s snipe	PM	0	Low

1. Status: SLC = Special Least Concern, E = Endangered, CE – Critically Endangered, M = Migratory, Ma = Marine.
2. 20km search radius for records. WO = Wildlife online database, PM = EPBC Act Protected Matters Report

3.2 Regional Ecosystem mapping

The study area is located within a broad area of remnant vegetation, as shown on the Vegetation Management Supporting Map (DNRME, 2020), which classifies remnant vegetation under the VM Act. DNRME (2020) and QLD Globe (2020) shows the study area to contain seven remnant regional ecosystems (REs) that are shown in **Table 10**. State mapped REs occur as distinct REs and do not occur as heterogeneous polygons.

Table 10 State mapped regional ecosystems within the study area

RE Code	VM Act status	Biodiversity status	REDD short description
RE 2.10.5a	Least concern	No concern at present	<i>Acacia shirleyi</i> woodland and <i>Triodia pungens</i> hummock grassland on scarps and stony ledges.
RE 2.11.1a	Least concern	No concern at present	Eucalyptus woodland and deciduous woodland on stony hills on folded sediments.
RE 9.3.20	Least concern	No concern at present	<i>Eucalyptus microneural</i> +/- <i>Corymbia</i> spp. +/- <i>Eucalyptus leptophleba</i> woodland on alluvial plains.
RE 9.5.10a	Least concern	No concern at present	<i>E. microneura</i> +/- <i>Terminalia</i> spp. low woodland on sand sheets
RE 9.11.16	Least concern	No concern at present	<i>E. crebra</i> +/- <i>C. erythrophloia</i> or <i>Corymbia pocillum</i> woodland on steep to rolling hills.
RE 9.11.30b	Least concern	No concern at present	<i>Acacia leptostachya</i> low woodland with emergent on stony and rocky metamorphic hills.
RE 9.12.11	Least concern	No concern at present	<i>Eucalyptus crebra</i> and/or <i>Eucalyptus whitei</i> +/- <i>Corymbia erythrophloia</i> open woodland on steep to rolling hills on igneous rocks.

3.3 Geology mapping

Detailed surface geology mapping for the study area was obtained from QLD Globe (2020). The geology of the study area is shown in **Table 11**.

Table 11 Detailed surface geology descriptions for the study area

Rock Unit	Lithological Summary	Dominant Rock	Rock Type	Age
Robin Hood Granodiorite (Sgr)	Pink to grey hornblende-biotite granodiorite with quartz phenocrysts	Granitoid	Intrusive unit	Silurian
Dead Horse Metabasalt (PLd)	Metabasalt, locally pillowed, hyaloclastic and/or amygdaloidal; minor metadolerite, and metagabbro (unmapped) and interbedded sandstone.	Mafites (Lavas, clastics and high-level intrusives)	Stratified unit (Including volcanic and metamorphic)	Paleoproterozoic
Hampstead Sandstone (Jh)	Clayey, commonly pebbly, quartzose sandstone and conglomerate	Arenite	Stratified unit (Including volcanic and metamorphic)	Middle to late Jurassic

Rock Unit	Lithological Summary	Dominant Rock	Rock Type	Age
Daniel Creek Formation (PLa)	Mudstone, siltstone, and fine subfeldspathic sandstone, locally calcareous and/or dolomitic. Grades into mica schist, quartzite, and minor calc-silicate rocks.	Arenite-mudrock	Stratified unit (Including volcanic and metamorphic)	Paleoproterozoic
Black Soil Andesite (Pvab)	Greyish-green locally sparsely porphyritic augite-hypersthene-basaltic andesite with agate-filled amygdalae; probably includes intrusive equivalents	Mafites (lavas, clastics and high-level intrusives)	Stratified unit (Including volcanic and metamorphic)	Early Permian
Qa-QLD (Qa)	Clay, silt, sand and gravel, flood-plain alluvium	Alluvium	Stratified Unit (Including volcanic and metamorphic)	Quaternary
Corbett Formation (PLco)	Greenish grey mudstone (+/- chloritoid); grades into mica schist (+/- staurolite, andalusite, sillimanite, garnet)	Pelite	Stratified Unit (Including volcanic and metamorphic)	Paleoproterozoic
CPIR-Kennedy Province (CPir)	Mainly buff, paly grey to dark grey or brown, aphyric to highly porphyritic, intrusive rhyolite; commonly flow-banded; locally grades into microgranite	Felsites (Lavas, clastics and high-level intrusives)	Intrusive unit	Late Carboniferous – Early Permian
TQr-QLD (TQr)	Clay, silt, sand, gravel and soil; colluvial and residual deposits (generally on older land surfaces)	Colluvium	Stratified Unit (Including volcanic and metamorphic)	Late Tertiary - Quaternary

3.4 Available literature

No previous literature pertaining to flora and fauna assessments from within the study area were available for review.

4 Flora Survey Results

4.1 Vegetation communities

4.1.1 VM Act Regional Ecosystems

Six vegetation communities equating to VM Act regional ecosystems were ground-truthed within the study area. These communities included RE 2.10.5a, 9.3.13, 9.3.26, 9.5.10a, 9.11.16 and 9.12.11 which were mapped as single vegetation units. Ground-truthed descriptions of these communities are provided below and floristic structure and composition information is provided in Appendix E. All ground-truthed REs have a 'least concern' VM Act status and a 'no concern at present' biodiversity status, except for REs 9.3.13 and 9.3.26, which both have an 'of concern' biodiversity status.

Minor to moderate impacts from cattle grazing and agricultural land-use practices were observed in all vegetation communities, particularly riparian and other communities along or near watercourses.

RE 2.10.5a

This RE dominated sandstone scarps, outcrops and plateaus within the study area. These areas were generally dominated by a sparse scattering of Paperbark gums, with associated tree species including *Corymbia* spp. and Northern cypress pine (*Callitris intratropica*). Lancewood was also locally dominant in some areas. The sub-canopy layer was typically dominated by *Acacia* spp., such as the Showy wattle (*Acacia leptostachya*) and *Acacia julifera*. The shrub layer was generally dominated by the previously mentioned *Acacia* species and Quinine bush (*Petalostigma banksii*), with other species such as Soap bush (*Alphitonia excelsa*) and Tar Grevillia (*Grevillia mimosoides*) often being associated with the shrub layer. Groundcover within this community was sparse during both surveys, with evidence of annual forbs, such as Bunched Gomphrena (*Gomphrena flaccida*) and Oldman's cap (*Polycarpaea corymbosa*), being abundant on plateaus and associated drainage areas during wet periods. A variety of grass species were also observed, including Firegrass (*Schizachyrium fragile*), *Aristida* spp., Spinifex (*Triodia* sp.), River grass (*Arundinella nepalensis*), and Lemon-scented grass (*Cymbopogon bombycinus*). The species richness of the ground layer within this community in the study area is likely to be heavily impacted by the wet-dry cycle, as many annual forbs were found to be desiccated within this community.

RE 9.3.13

This community occurred along several of the State mapped watercourses within the study area. Most notably, this community was present along the fourth order watercourse, Agate Creek. The canopy layer within this community contained species including River red gum (*Eucalyptus camaldulensis*), Weeping tea-tree (*Melaleuca fluviatilis*), and Swamp box (*Lophostemon grandiflorus*), with the relative dominance of these species switching along the length of the watercourse. Black tea-tree was occasionally dominant within the canopy layer; however, was most frequently dominant within the sub-canopy layer. Other canopy species also occurred within the sub-canopy layer, however, less frequently. The shrub layer often included Black tea-tree, however shrub species from the surrounding communities also infiltrated this stratum of RE 9.3.13. Rubber vine (*Cryptostegia grandiflora*) was found to occur within this community, with evidence of ripe seeds and flowering individuals climbing high into the crowns of dominant trees. The ground layer was generally dominated by a variety of grass species, which includes Green panic (*Megathyrsus maximus*), Indian, Forest and Pitted bluegrass (*Bothriochloa pertusa*, *B. bladhii*, and *B. decipiens*), Queensland bluegrass (*Dichanthium sericeum*), *Panicum* sp. and Pigeon grass (*Setaria surgens*). A variety of Rattlepods (*Crotalaria* spp.) were also abundant within the ground layer of this community.

RE 9.3.26

This community occurred within a small overflow section of Agate Creek to the south east of the mine pit. This area was characterised by an abundance of black soil, a very sparse to sparse canopy and woody shrub layers, and a variety of grass species. Dominant trees within this community primarily consist of Gilbert river box (*Eucalyptus microneura*), with other species, including Broad-leaved carbine (*Corymbia confertiflora*) and River red gum, being scattered associates. Across the extent of this community, a species of *Tephrosia* was the dominant shrub. Other species, such as Rattlepods (*Crotalaria spp.*) were also common, however less abundant. A variety of grass species were present within this community; however, many tussock and smaller species were heavily impacted by cattle grazing, resulting in identification to species level being difficult. A permanent water trough for cattle was present within this community, which likely facilitates the increased grazing pressure compared to other locations within the study area.

RE 9.5.10a

This community was dominant within the lower flood plains of the study area. The canopy layer of this community was dominated by Gilbert river box, however other species such as Desert bloodwood (*Corymbia terminalis*) and Cooktown ironwood (*Erythrophleum chlorostachys*) were also encountered. The density of the sub-canopy layer within this community varied throughout the study area. In some areas, the sub-canopy layer was very sparse to sparse, containing a similar assemblage to the canopy layer with sporadic other species such as Yellowberry bush (*Denhamia cunninghamii*) being present. However, in other areas, the sub-canopy layer was mid-dense to dense and dominated by Gulbarn (*Melaleuca citrolens*). The shrub layer was generally sparse and dominated by Conkerberry (*Carissa lanceolata*). The ground layer was impacted by cattle in many areas leading to tussock and other palatable grass and forb species being difficult to identify. Where identifiable, the dominant species within the ground layer of this community generally comprise *Aristida* spp., Black speargrass (*Heteropogon contortus*), Kangaroo grass (*Themeda triandra*) and Queensland bluegrass.

RE 9.11.16 & RE 9.12.11

The floristic and structural components of these two communities throughout the study area are very similar and the main difference between these communities is the surface geology on which they occur. RE 9.11.16 occurs within the north eastern portion of the study area on folded metamorphics, whereas RE 9.12.11 occurs within the southern and central portions of the study area on igneous rocks. Both communities were dominated by Narrow-leaved ironbark, with a variable sub-canopy to shrub layer that may include a combination of Quinine bush, Showy wattle, Silver oak (*Grevillea parallela*), Soapbush, or several other species. The ground layer in these communities were typically dominated by *Aristida* spp., Kangaroo grass or Black speargrass. These communities occur on the steep slopes or crests of hills, or on the low undulations at the base of hills within the study area.

4.1.2 Non-remnant vegetation

Only small sections within the study area were comprised of non-remnant vegetation. These included the existing Agate Creek pit, waste rock dump, run of mine, mining camp, workshop facilities, and a previously cleared area within the north east portion of the ML.

4.1.3 EPBC Act TECs

No vegetation communities consistent with EPBC Act TECs were ground-truthed to occur within the study area, therefore any impacts to, or management of, EPBC Act TECs will not be discussed further in this report.

4.1.4 Environmentally Sensitive Areas

No ESAs are State mapped, or were ground-truthed, to occur within the study area. One Category A ESA, the Rungulla NP, is State mapped to the southwest of the study area and one Category C ESA, the Rungulla RR, is also State mapped to the southwest of the study area. It should be noted that the study area occurs within the 2km buffer zone of the Rungulla NP Category A ESA. ESA buffer zones are discussed further in Section 6.4 of this report.

No ground-truthed REs equate to ESAs under the Code of Environmental Compliance for Mining Lease Activities.

4.2 Flora species

A total of 147 flora species from 51 families were recorded within the study area (Appendix F). Most flora species observed are common and widespread within similar habitats in the Gulf Plains and Einasleigh Uplands bioregions. Floristic composition throughout the study area was generally consistent with several State mapped RE units and all identified species are common within similar habitats throughout the local area and broader region. Several invasive non-native (pest) flora species were observed throughout the study area. A full list of flora species identified during flora surveys is included in Appendix E.

No threatened flora species, as listed under the NC Act and EPBC Act, were identified to occur within the study area.

A total of 17 non-native pest flora species were identified within the study area (Appendix F). Most of the pest flora species identified within the study area are environmental weeds or flora introduced for the purpose of pasture improvement. However, one of these species, Rubber Vine, is listed as a Category 3 restricted invasive flora under the *Biosecurity Act 2014*. Rubber Vine was found to occur within riparian vegetation along Agate Creek.

5 Fauna Survey Results

5.1 Fauna habitat features

The study area provides a variety of habitat for a range of fauna species, which primarily occur as micro- and macro-habitats within woodland communities, riparian vegetation and watercourses, and unique features such as sandstone formations.

Lowland woodland vegetation communities within the study area were generally very open and provided few unique habitat features for fauna. Leaf litter and small, isolated occurrences of large woody debris were found in these habitats along with the occasional tree hollow for fauna species to occupy. Shrubs were generally sparse, however provide some shelter values for local fauna where they did occur. Flowering and fruiting eucalypts in these areas are also likely to provide resources for local fauna at certain times of the year. Overall, these open woodland communities generally provide a variety of habitat features for small to moderate sized reptiles and mammals, moderate to large sized grazing animals, and birds. However, habitat features for fauna within these areas are well represented within the surrounding region and the study area does not support any unique habitat features within the ground-truthed open woodland communities. Woodland communities on hillslopes and crests generally provide more shelter locations for small mammals and reptiles as loose rocks and woody debris was more abundant. However, other habitat values to local fauna were generally similar to those observed within the low open vegetation communities.

Riparian vegetation and ephemeral watercourses within the study area provide a variety of habitat features for local fauna. Locally unique features that are not present within other areas of the study area generally include the temporal presence of water and occasionally denser vegetation for fauna to shelter within. These areas also provide valuable connectivity corridors for fauna throughout the local landscape.

Sandstone formations within the study area form part of the broader Gregory Range, where several endemic and/or habitat-restricted species are known to occur. Two of these species, the Gilbert ground gecko and Silver-eyed velvet gecko were identified to occur on sandstone within the study area. Other unique features present within sandstone formations include weathered underhangs, crevices, and boulder piles which provides a variety of shelter options for a range of fauna. Additionally, areas of dense leaf litter and piles of large woody debris were also observed within these formations, providing additional shelter and resources for local fauna.

The presence of highly mobile fauna species (i.e. birds, bats and some arboreal mammals) is likely to be influenced by seasonal characteristics such as rainfall as many of these species disperse to areas where trees are flowering or fruiting. Resultantly, habitat features and suitability for many of these species may vary seasonally, causing species diversity to fluctuate as species seek out resources within the region.

5.2 Fauna species

Numerous fauna species were identified within the study area over the survey period using both active and passive survey techniques. A full list of fauna species identified during field assessments is included in Appendix G. The following sections provide a brief discussion of the species observed for each taxonomic group.

5.2.1 Birds

A total of 49 bird species were observed within the study area during field assessments (Appendix G). All the identified species are generally common in similar habitats throughout the region. No NC Act or EPBC Act EVNT or migratory species were identified to occur on site. Birds were abundant in all parts of the study area; however, were most frequently observed within the vicinity of standing water and/or flowering trees.

5.2.2 Mammals

A total of 22 mammal species were positively identified within the study area during field assessments (Appendix G). Evidence of two non-native (pest) species—Cattle (**Bos taurus*) and European rabbits (**Oryctolagus cuniculus*)—were identified during the survey. Pest species are discussed further in Section 5.2.5 of this report.

Microbats were the most species-rich mammal group detected during the survey. The survey effort resulted in identification of 14 microbat species within the study area. All these are listed as least concern under the NC Act and are not listed under the EPBC Act. The Microbat Call Interpretation Reports from the surveys are included in Appendix H. All of the identified mammal species are generally common in similar habitats throughout the region.

5.2.3 Reptiles

A total of 18 reptile species were identified within the study area during field assessments (Appendix G), however geckos (Gekkonidae) and skinks (Scincidae) were the most species-rich reptile families observed within the study area. Most of the identified species are generally common in similar habitats throughout the region, however one non-native and two recently described gecko species were identified within the study area. These species include the Asian house gecko (**Hemidactylus frenatus*), Gilbert ground gecko (*Lucasium iris*) and Silver-eyed velvet gecko (*Oedura argentea*), respectively. Non-native pest species are discussed further in Section 5.2.5 of this report.

The Gilbert ground gecko, which was described in early November 2020 and is not currently evaluated under the NC Act and EPBC Act, was found within the study area. This species has a restricted range that was previously only known to occur within the vicinity of Gilberton Station. However, the detection of this species within the study area represents an ~20km range extension for this poorly known and recently described species (Vanderduys *et al.*, 2020). Similarly, the Silver-eyed velvet gecko was also found within the study area. This species was described in late 2018 and is only known to occur in sandstone habitats from the Gregory Range and nearby sandstone outcropping at Bulleringa National Park (Hoskin *et al.*, 2018). Overall, both species show close affiliations with sandstone habitats, are poorly known and have restricted distributions.

5.2.4 Amphibians

Four amphibian species, including the invasive Cane toad (**Rhinella marina*), were identified within the study area (Appendix F). The remaining three amphibian species were the Bumpy rocket frog (*Litoria inermis*), Naked tree frog (*Litoria rubella*), and Ornate burrowing frog (*Platyplectrum ornatum*), all of which are common within the local area and surrounding region. Non-native pest species are discussed further in Section 5.2.5 of this report.

5.2.5 Pest fauna species

Evidence of four pest fauna species was identified during field assessments, which included:

- Asian house gecko
- Cane toad,
- Cattle, and
- European rabbit

These non-native species are common within the local area and surrounding region. Cane toads were observed during active nocturnal searches in moderate abundances within the vicinity of standing water during the May survey and were less frequently observed during the December survey. Cattle were observed to be concentrated around water sources throughout the study area during both surveys and consequently cattle impacts were greatest around these areas. These impacts included deep tracks in muddy soil, scats, worn tracks and grazing impacts to vegetation communities. European Rabbits were incidentally observed throughout the study area and Asian House Gecko's were incidentally heard around the mining camp.

6 Significant Environmental Matters

The following sections detail the relevant MSES and MNES ground-truthed within the study area.

6.1 Regulated vegetation

6.1.1 Regional ecosystems

Six remnant vegetation communities were ground-truthed as present in the study area, distinguished primarily by differences in key canopy species and land-zone. These communities are RE 2.10.5a, 9.3.13, 9.3.26, 9.5.10a, 9.11.16 and 9.12.11. All these communities have a 'least concern' VM Act status and a 'no concern at present' biodiversity status, except for REs 9.3.13 and 9.3.26, which have an 'of concern' biodiversity status. No vegetation communities ground-truthed within the study area equate to a MSES under the Queensland environmental offsets framework.

6.1.2 Remnant vegetation associated with a watercourse

Remnant vegetation associated with a watercourse shown on the VM Act watercourse and drainage feature map is classified as a MSES under the Queensland environmental offsets framework. There are several VM Act State mapped watercourse and drainage features within the study area (QLD Globe, 2020) (Appendix A). The extent to which the remnant vegetation associated with these watercourses is considered a protected matter is determined by the bioregional context and stream order of the watercourse or drainage feature. The structural category of the vegetation community is used to determine significant impact thresholds.

All vegetation communities within the study area are classified as remnant vegetation. Therefore, the extent of vegetation communities within the defined distance of the banks of the State mapped watercourse/drainage features is a MSES. The study area is located within a non-coastal bioregion and the relevant defining distance for REs associated with a watercourse are shown in **Table 12**.

Table 12 Defined distance for REs associated with a watercourse (non-coastal bioregions) as shown in the Queensland Environmental Offsets Policy V1.8

Watercourse stream order	Distance from defining bank (m)
1 or 2	25
3 or 4	50

Clearing of vegetation within the defined distance of the State mapped watercourse or drainage features should be avoided where possible. Where impacts are unavoidable, the following criteria are used to determine whether the impacts are significant, therefore triggering environmental offset liability:

- Clearing occurs within 5m of the defining bank of the feature, AND
- The following area thresholds are exceeded¹:

¹ Clearing area and width thresholds are dependent on the structural category of the RE as defined in the REDD. All relevant REs mapped and ground-truthed within the study area have a 'sparse', very sparse' or grassland structural category and therefore only the relevant thresholds for these communities are presented here.

- o Greater than 25m wide for linear infrastructure (grassland, RE 9.3.26)
- o Greater than 20m wide for linear infrastructure (all other mapped REs)
- o Greater than 5ha for non-linear infrastructure (grassland, RE 9.3.26)
- o Greater than 2ha for non-linear infrastructure (all other mapped REs).

Any clearing of remnant vegetation within 5m of the defining banks of these mapped watercourse or drainage features that is also in excess of the relevant clearing thresholds may be classified as a significant residual impact. In such case, the provision of an environmental offset may be required under the Queensland environmental offsets framework.

6.2 Connectivity areas

The study area occurs within a broad area of remnant vegetation that is typically comprised of open woodland communities and riparian vegetation dominated by River red gums and *Melaleuca* species. Additionally, the Rungulla NP protected area is located to the southwest of the study area, which provides important values to flora and fauna within the local region. Most open woodland habitats within the study area are similar to those within the surrounding region and provide fewer fine scale fauna connectivity values compared to riparian vegetation and sandstone formations within the study area. Riparian vegetation along watercourses provide important connectivity corridors for a variety of fauna and flora species, which facilitate these species in occupying the local landscape by providing shelter and other resources. Additionally, sandstone formations within the study area form part of the broader Gregory Range and provide important connectivity corridors for a variety of fauna and flora. These formations are particularly important for species endemic to these formations, including the Gilbert ground gecko and Silver-eyed velvet gecko. As the study area occurs to the north east of the Rungulla NP, these sandstone formations and riparian areas also provide connectivity values for the dispersal of fauna in and out of this protected area.

The landscape fragmentation and connectivity (LFC) tool is a decision support tool to assist in identifying and quantifying a significant impact on connectivity for an individual impact area. This GIS tool measures the extent and arrangement of the current regulated vegetation against the extent that would remain if a prescribed activity were to occur. As no proposed disturbance footprint for any future development of the study area is available, this tool can not be utilised. However, to avoid potential impacts to local endemic or habitat restricted species, it is recommended that future development of the study area avoids impacts to sandstone formations. This will minimise impacts to regionally unique habitat for flora and fauna within the study area.

6.3 Watercourse habitat and wetlands

The study area does not contain any wetland protection areas or wetlands of high ecological significance as shown on the map of referable wetlands (DES, 2020c). The watercourses present within the study area are not 'high ecological value waters' as identified under the Environmental Protection (Water) Policy 2009. Additionally, no wetlands of international importance (Ramsar wetlands) are located within the study area. Disturbance to watercourse features present within the study area should be avoided where possible to minimise impacts to local environmental values.

6.4 Protected areas and ESAs

Several protected areas and ESAs were identified to occur to the south west of the study area during desktop and ground-truthing assessments. These areas are described below with project related considerations highlighted for each.

Protected areas

Protected areas are MSES under the Environmental offsets framework. Protected areas State mapped to the south west of the study area include the Rungulla NP and Rungulla RR (Appendix A). As these protected areas do not occur within the study area they are unlikely to be significantly impacted by project activities within the study area.

ESAs

Two protected areas that equate to ESAs under the EP Regulation (2008) were State mapped to occur to the south west of the study area. These areas include the Rungulla NP and Rungulla RR, which equate to a Category A and Category C ESA, respectively (Appendix A). An assessment of the proposed action within the ML in relation to ESAs is limited to new development and activity buffers and considerations for these ESAs are outlined within condition A13 of the *Eligibility criteria and standard conditions for mining lease activities – Version 1.1* (As applicable to ML 100030) and are described in **Table 13**. No other ESAs relevant to the Agate Creek mine were ground-truthed within the study area.

Table 13 EP Regulation (2008) ESAs and activity buffers and considerations

Feature	EP Regulation (2008) ESA category	ESA buffers and considerations
		Mining lease activities ¹
Rungulla National Park	National Parks are classified as a Category A ESAs	Activities must not be carried out within 2km of a Category A ESA
Rungulla Resources Reserve	Resource Reserves are classified as a Category C ESA ²	N/A ²

1 Buffers and relevant other considerations were sourced from condition A13 of the *'Eligibility criteria and standard conditions for mining lease activities – Version 2'*.

2 In order to carry out exploration activities within a Category C ESA, the relevant administering authorities (and the Environmental Protection Agency¹) need to be consulted prior to activities taking place. If it is determined through consultation that additional conditions are necessary, the holder must comply with those conditions^{1,2}.

6.5 Protected wildlife and essential habitat

No areas of protected wildlife (vulnerable or endangered) habitat or essential habitat are State mapped to occur within the study area (QLD Globe, 2020) (Appendix A) and none was located during field assessments. Therefore, it is unlikely that any areas of protected wildlife (vulnerable or endangered) habitat or essential habitat will be significantly impacted by development within the study area.

6.6 Conservation significant species

6.6.1 Conservation significant flora species

Desktop searches revealed seven conservation significant flora species with the potential to occur within 20km of the study area, of which none were detected within the study area during field assessments. However, likelihood of occurrence assessments determined that six of these species had a moderate to high likelihood of occurring within the study area. Potential impacts to, and management strategies for, these species are described below.

Pluchea punctata

Pluchea punctata is listed as endangered under the NC Act and is not listed under the EPBC Act. Wildnet searches revealed two local records of this species within a 20km buffer of the study area (DES, 2020b), which are located along Rungulla Rd. within the Rungulla National Park, ~6km to the south of the study area. This species was considered to have a moderate likelihood of occurring within the study area based on key assessment criteria in **Table 1**. However, despite the moderate likelihood of occurrence, this species was not detected during field assessments.

This species is endemic to Queensland and is known from a single locality near Forsayth in north Queensland. Little information is available on habitat preferences for this species, however it has been documented to occur on hill slopes with Gilbert river box and *Triodia spp.* (FoA, 2015). Hill slopes within the study area are generally dominated by Narrow-leaved ironbark and not Gilbert river box, which occurs as a dominant species within the low, broad flood plains within the study area. Spinifex (*Triodia spp.*) were dominant within the ground layer in small patches throughout the study area, but these patches occurred in Narrow-leaved ironbark dominated areas that were generally on hill crests. Overall, this species was not identified to occur within the study area and it is considered that suitable habitat for this species is not present within the study area. Therefore, it is unlikely that significant impacts will occur to this species as a result of mining activity within the study area.

Labichea brassii

Labichea brassii is listed as near threatened under the NC Act and is not listed under the EPBC Act. Wildnet searches revealed seven local records of this species within a 20km buffer of the study area (DES, 2020b), which are located ~4km to the south of the study area within Rungulla National Park. This species was considered to have a high likelihood of occurring within the study area based on key assessment criteria in **Table 1**. However, despite the high likelihood of occurrence, this species was not detected during field assessments.

This poorly known species is confined to northern Queensland and is known from Mt Mulligan in the north and extending south west to Agate Creek. Preferred habitat for this species includes vegetation along creeks and in riverbeds, however locally it has also been recorded to occur on sparse woodland on sandstone plateaus in RE 2.10.2x1 (FoA, 1998; Ford 2010). Sandstone plateaus and scarps were found to occur within and near to the north and north western portions of the study area, which equate to potentially suitable habitat for this species in addition to the Agate Creek watercourse. No information is available on the flowering times of this species; however, it is considered to be readily distinguishable from other species in the study area based on information provided within FoA (1998). Overall, field assessments did not identify this species to be present within the study area despite extensive surveys in potentially suitable habitat, particularly within potential watercourse habitat. As this species was not detected during baseline assessments, it is considered unlikely that this species will be significantly impacted by activities within suitable habitat within the study area.

Leptospermum pallidum

Leptospermum pallidum is listed as near threatened under the NC Act and is not listed under the EPBC Act. This species was not identified within the study area during baseline assessments, however Wildnet searches revealed two local records of this species within a 20km buffer of the study area (DES, 2020b), which are located ~7 and 15km to the south of the study area within Rungulla National Park. This species was considered to have a high likelihood of occurring within the study area based on key assessment criteria in **Table 1**. However, despite the high likelihood of occurrence, this species was not detected during field assessments.

This distinctive species has a restricted distribution within northern Queensland, with most records occurring around the Greenvale area, however this species has also been recorded to occur at Porcupine Gorge, north of Hughenden, within the Cobbold Gorge Nature Refuge and within the Rungulla National Park (Bean, 1992; Ford, 2010). Locally, this species has been observed on a low sandstone hill among large boulders with a metamorphic substrate within RE 2.10.5x1 (Ford, 2010). RE 2.10.5a is the dominant community on sandstone scarps and plateaus within the study area, which comprises a similar floristic structure to RE 2.10.5x1. *L. pallidum* is considered to be readily recognisable from other species identified within the study area during baseline assessments. However, despite extensive surveys in potentially suitable habitat, it was not detected during baseline assessments. As this species was not detected during baseline assessments, it is considered unlikely that this species will be significantly impacted by activities within suitable habitat within the study area.

Bluegrass

Bluegrass (*Dichanthium setosum*) is listed as least concern under the NC Act and as vulnerable under the EPBC Act. Wildnet searches revealed no local records of this species within a 20km buffer of the study area (DES, 2020b) and the nearest records of this species are ~100km to the south east (ALA, 2020). However, the study area is on the north western edge of the modelled distribution for this species (DES, 2020e). Additionally, potentially suitable, but degraded, habitat for this species was considered to occur within the study area. Overall, it is considered that this species has a moderate likelihood of occurring within the study area based on key assessment criteria in **Table 1**. However, despite the moderate likelihood of occurrence, this species was not detected during field assessments.

This species is identified to occur on heavy soils (predominantly cracking clays or alluvium, often in Gilgai's) in woodland or open woodland usually dominated by Brigalow (*Acacia spp.*) and/or *Eucalyptus* species. The climatic range of this species includes tropical to subtropical areas that are markedly seasonal, with suitable habitat drying out for part of the year (DES, 2020e and references therein). Potentially suitable habitat for this species within the study area includes lowland flood plains dominated by Gilbert river box (RE 9.5.10a) and the Agate Creek overflow area, which has a high proportion of black soil and is dominated by RE 9.3.26. All these potentially suitable habitats for this species within the study area are heavily impacted by cattle grazing, which is one of the key threats to this species (DES, 2020e and references therein) and results in habitat for this species being degraded within the study area. Other threats to this species include habitat loss through clearing for pasture improvement and cropping, frequent fires, invasive flora species, and demographic effects from small population size (DES, 2020e and references therein).

This species was not detected within the study area during baseline assessments, despite the study area occurring within the modelled distribution for this species and potentially suitable habitat for this species occurring within the study area.

Drummondita calida

Drummondita calida is listed as vulnerable under the NC Act and is not listed under the EPBC Act. Wildnet searches revealed the presence of one local record of this species within a 20km buffer of the study area (DES, 2020b), which is located ~4km to the south west of the study area within Rungulla National Park. This species was considered to have a high likelihood of occurring within the study area based on key assessment criteria in **Table 1**. However, despite the high likelihood of occurrence, this species was not detected during field assessments.

Within Queensland, this species is found between Bulleringa National park to the southern end of the Gregory Range. Locally, this species has been located on very exposed and sparse low shrubland on bare sandstone plateaus to low open woodland on sandstone with large boulders. This species has a very conspicuous corky fissured stem, however the overall appearance of the plant is primarily driven by habitat, with taller individuals in woodland and shorter plants in more open and exposed situations (Ford, 2010). Within the local area, this species is noted to be locally common and has been observed in REs 2.10.2x1, 2.10.2, 2.10.5x2 and 2.7.2 (Ford, 2010). RE 2.10.5a is the dominant community on sandstone scarps and plateaus within the study area, therefore the study area affords potentially suitable local habitat for this species based on ground-truthing results.

As this species was not detected during baseline assessments, it is considered unlikely that this species will be significantly impacted by activities within suitable habitat within the study area. Although this species is unlikely to be significantly impacted by development of the study area it is recommended that development within potentially suitable habitat for this species (i.e., areas ground-truthed as RE 2.10.5a) is avoided.

Solanum carduiforme

Solanum carduiforme is listed as vulnerable under the NC Act and not listed under the EPBC Act. Wildnet searches revealed the presence of two local records of this species within a 20km buffer of the study area (DES, 2020b), which are located ~5km to the south west of the study area. This species was considered to have a high likelihood of occurring within the study area based on key assessment criteria in **Table 1**. However, despite the high likelihood of occurrence, this species was not detected during field assessments.

This species is documented as being extremely rare, inadequately known and was previously only known to occur in the Lawn Hill area. However, it has recently been recorded from the Bungle Bungle region and Prince Regent River area of WA and there are records of this species from the Cobbold Gorge Nature Refuge and Rungulla National Park. This species is an erect, clonal herb or subshrub to 50 cm with densely pubescent leaves with stellate hairs and prickles (to 8 mm long) on all parts of the leaf. Leaves are concolorous with deep, oblong to broadly triangular lobes. Prickles are also present on all parts of the plant (FoA, 1982; Ford, 2010). Broadly, this species is documented to grow on conglomerate rock formations (FoA, 1982; Ford, 2010). However, to the south of the study area, this species is noted to grow on sandstone areas either with minimal soil on pavements or amongst spinifex on deep sandy soil. Local REs that this species has been associated with include REs 2.10.5x2 and 2.10.2x1 (Ford, 2010). RE 2.10.5a is the dominant community on sandstone scarps and plateaus within the study area, therefore the study area affords potentially suitable local habitat for this species based on ground-truthing results.

Several small Potato bush (*Solanum ellipticum*) individuals were found within the study area; however, these individuals lacked the deep, oblong to broadly triangular lobes that are consistent with the description of *S. carduiforme*. As this species was not detected during baseline assessments, it is considered unlikely that this species will be significantly impacted by activities within unsuitable habitat within the study area.

6.6.2 Conservation significant fauna species

Desktop searches revealed 21 conservation significant fauna species or their habitat to potentially occur within 20km of the study area, of which none were detected within the study area during field assessments. However, likelihood of occurrence assessments determined that three of these species had a moderate to high likelihood of occurring within the study area. Potential impacts to, and management strategies for, these species are described below.

The conservation status of the Gilbert Ground Gecko has not yet been evaluated under the NC Act or EPBC Act due to the recency of this species being described. Therefore, the potential for significant impacts to this species from development of the study area is discussed below. This will support future approvals if the Gilbert Ground Gecko is subsequently assessed as being an EVNT species under the NC Act or EPBC Act.

Ghost Bat

The Ghost bat (*Macroderma gigas*) is listed as endangered under the NC Act and as vulnerable under the EPBC Act. Wildnet searches did not reveal the presence of local records of this species within a 20km buffer of the study area (DES, 2020b). However, this species was considered to have a moderate likelihood of occurring within the study area based on key assessment criteria in **Table 1**. Despite the moderate likelihood of occurrence, this species was not detected during field assessments.

Ghost bats are sparsely distributed across northern Australia, with disjunct strongholds (often associated with a single maternity roost) on the central Queensland coast, Top End in the Northern Territory, and the Pilbara and Kimberley regions in Western Australia. Population trends among known roosts are poorly understood, with counts rare and by varying methods. Population estimates are approximately 7,000 to 9,000 individuals (McKenzie & Hall, 2008), with certain individual roosts making up over 5% of that figure.

Ghost bats utilise various sites as roosts depending on the purpose. Night roosts are temporary and used during foraging spells at night—these can include rock crevices and shallow overhangs or mine adits. Day roosts are in limestone or sandstone caves, large granite boulder scree or mine adits and are usually deep and entirely dark through the day (generally by having small openings), holding stable temperatures and relatively high humidity (TSSC, 2016b). When breeding, Ghost bats coalesce, sometimes forming large colonies (generally 30–200 individuals). The entire regional population of Ghost bats can be represented at a single roost during breeding. However, males disperse widely during the wet season, occurring in pairs or small groups, and occupy a variety of dark higher humidity roost sites (TSSC, 2016b). Information from Churchill (2008) is similar to observations made by Pettigrew *et al.* (1986) in regard to the Ghost Bat's breeding season. Both state that mating occurs in May with pups born in late July and early August.

Ghost bats forage in various, generally open, habitats such as tropical savannah woodlands, but may also forage in more dense habitats such as rainforests. This species is carnivorous, with a broad diet comprised of small mammals including other bats, birds, reptiles, frogs and large insects. This species has a variety of foraging strategies, including perching in vegetation to ambush passing prey and gleaning surfaces such as the ground while in flight (Hourigan, 2011).

Populations in parts of northern Australia have declined significantly in the last couple of decades. The main threatening processes effecting Ghost bat populations are thought to be cave disturbance, habitat loss (destruction of natural caves or collapse/reworking of old mine adits), collision with barbed-wire fences, contamination by mine residue and disease (Woinarski *et al*, 2014). Recently, Cane Toads have been strongly implicated in the observed decline of Ghost bats at Riversleigh (QLD) and from other sites in the Northern Territory since their arrival in 2001, with declines of over 90% recorded from sites in Kakadu, including the loss of major breeding sites (TSSC 2016b). Unlike their Asian relative *Megaderma lyra*, Ghost bats lack resistance to the bufonid toxin (Shine *et al.*, 2016) and a deceased individual found in Kakadu cave with a Cane Toad in its oesophagus confirmed predation on the invasive species (White *et al.*, 2016).

Ground-truthing assessments did not reveal the presence of suitable roosting habitat within the study area. Large sandstone escarpments occur outside the northern portions of the study area, which may provide suitable roosting habitat for this species. However, ground-truthing assessments determined that suitable roost habitat for this species does not occur within the study area. Conversely, the study area supports suitable foraging habitat for this species, particularly as this species utilised a wide variety of habitats for foraging. However, suitable foraging habitat within the study area is widely represented within the broader region and no echolocation calls were recorded from this species during either survey. Overall, it is considered that development of the study area is unlikely to significantly impact any populations of Ghost bat as no suitable day-roost habitat was present within the study area.

Koala

The Koala (*Phascolarctos cinereus*) is listed as vulnerable under both the NC Act and EPBC Act. Wildnet searches revealed the presence of three local records of this species within a 20km buffer of the study area (DES, 2020b) and this species was considered to have a moderate likelihood of occurring within the study area based on key assessment criteria in **Table 1**. Despite the moderate likelihood of occurrence, this species was not detected during field assessments.

The study area is mapped to occur on the western boundary of the modelled distribution of the Koala and is within an “inland” habitat context for the Koala within the *EPBC Act Referral Guidelines for the vulnerable Koala* (2014). Koala habitat can be broadly defined as any forest or woodland containing species that are known food trees. The diet of the Koala is mainly restricted to foliage of certain *Eucalyptus* spp.; however, it may also consume foliage of related genera, including *Corymbia* spp., *Angophora* spp. and *Lophostemon* spp. (DAWE, 2020b). As most of the study area is dominated by potential food trees for the Koala, it is broadly considered that most of the study area is habitat for this species. However, reliable soil moisture and fertility are also important factors in determining Koala habitat (DoE, 2014). Most of the study area is dominated by plains and slopes that do not retain soil moisture for extended periods throughout the year. Additionally, sandstone formations within the study area typically comprise nutrient poor soils and are therefore not overly fertile. Vegetation communities along Agate Creek within the study area represents the most suitable habitat for the Koala. However, this riparian vegetation is marginal, and Agate Creek itself is a highly ephemeral watercourse. The broader area supports larger watercourses with denser riparian vegetation, which likely provide more suitable habitat for local Koala populations. Local records of this species are all located from 16 to 20kms to the east and northeast of the study area in open woodland communities similar to those ground-truthed within the study area.

As this species was considered as having a moderate likelihood of occurring within the study area a habitat assessment was conducted in accordance with the *EPBC Act Referral Guidelines for the vulnerable Koala (2014)*. The outcome of this assessment was that, while there are no local records of this species that are of significant relevance to the study area, the site contains habitat that may be suitable to the Koala (**Table 14**). Key outcomes from the habitat assessment tool were:

- There is no evidence of any Koalas within 2km of the edge of the impact area within the last 10 years.
- Emergent trees of at least two species that are known as Koala food trees are present.
- The study area is part of a contiguous landscape.
- The study area has some degree of dog or vehicle threat present.
- Habitat within the study area is unlikely to be important for achieving the interim recovery objective.

Table 14 Koala habitat assessment

Attribute	Score	Habitat assessment	
Koala occurrence	0	Desktop studies	DAWE (2020x) states that the Koala, or Koala habitat, is likely to occur within a 20km buffer from the study area. Additionally, DES (2020b) identified three local records of the Koala within 20km of the study area. However, a review of these records (QLD Globe, 2020) identified that these occurrences were all pre 2000.
		Field studies	Searches throughout the study area revealed no evidence of Koalas during baseline assessments.
Vegetation structure and composition	2	Ground-truthing assessments revealed that the study area is mostly dominated by Eucalypt woodlands of varying structural complexity. Throughout these woodlands, a variety of known food trees for the Koala were identified, which were dominated by the Gilbert river box, River red gum, and Narrow-leaved ironbark.	
Habitat connectivity	2	A combination of desktop and field studies revealed that the study area is part of a contiguous landscape above 1000ha in size.	
Key existing threats	1	There is potential for a low to moderate level of traffic within the study area during project operations. No wild dogs or Dingoes were identified within the study area during baseline assessments, however there is the potential for Dingoes to occur. Key existing threats has been scored as 1 (medium) as there is at least some threat from vehicle strike and dog attack present.	

Attribute	Score	Habitat assessment
Recovery value	0	The interim recovery objectives for koalas within the project area include: - Protect and conserve the quality and extent of habitat refuges for the persistence of the species during droughts and periods of extreme heat, especially in riparian environments and other areas with reliable soils moisture and fertility. - Maintain the quality, extent and connectivity of large areas of koala habitat surrounding habitat refuges. The study area is mostly dominated by open woodland communities on plains and slopes where soil moisture and fertility is not reliable. Riparian habitat dominated by River red gum within the study area occurs along highly ephemeral watercourses where soil moisture may persist for longer periods. However, riparian habitat within the study area is marginal with few very large trees. Larger watercourses with more dense riparian vegetation are present within the surrounding region, which likely provide greater value to koala recovery objectives within inland areas. Overall, it is considered that potential Koala habitat within the study area is unlikely to be important for achieving the interim recovery objectives for Koalas in inland areas.
Total score	5	Decision: Habitat potentially critical to the survival of the Koala – an assessment of significance is required.

While the study area supports potentially suitable habitat for the Koala, given the absence of any evidence of this species occurring within the study area, it is important to consider the following characteristics for the assessment of significance of the study area to this species:

- A habitat score of five represents a moderate habitat value and, in this case, the score is based entirely on habitat suitability as local records of this species are within 16 to 20km of the study area and are all >20 years old.
- The scale of disturbance within the study area is low compared to the size of the surrounding area of remnant vegetation. Any clearing within the study area is not likely to impact broader connectivity values for this species.

On this basis, it is unlikely that development the study area will result in a significant impact to any local individuals or populations of Koala that may occur in the area.

Due to the lack of any evidence of this species occurring within the study area during field assessments, no recent local records, and a relatively minor loss of potentially suitable habitat for this species within the study area, it is unlikely that development of the study area will:

- Lead to a long-term decrease in the size of any local populations of Koala;
- Reduce the area of occupancy of any local populations;
- Fragment any population into multiple populations;
- Adversely affect habitat critical to the survival of the Koala;
- Disrupt the breeding cycle of an important population;

- Modify, destroy, remove or isolate, or decrease the availability or quality of habitat to the extent that the Koala is likely to decline;
- Result in invasive species that are harmful to Koalas becoming established in Koala habitat;
- Introduce disease that may cause the species to decline; or
- Interfere substantially with the recovery of the species.

Overall, it is considered unlikely that there will be any significant impacts to local populations of Koala within the study area.

Large-eared Horseshoe Bat

The Large-eared horseshoe bat (*Rhinolophus robertsi*) is listed as endangered under the NC Act and as vulnerable under the EPBC Act. Wildnet searches did not reveal the presence of local records of this species within a 20km buffer of the study area (DES, 2020b). However, this species was considered to have a moderate likelihood of occurring within the study area based on key assessment criteria in **Table 1**. Despite the moderate likelihood of occurrence, this species was not detected during field assessments.

This species is restricted to northern Queensland, ranging from Iron Range National Park south to Townsville and west to the karst regions of Chillagoe (TSSC, 2016a and references therein). The distribution of this species is considered to be continuous on a broad scale. However, fine scale connectedness between populations may be low due to land clearing and it is suggested to occur in low densities even within core habitats. Across its occurrence, this species is found in lowland rainforest, forest-lined creeks within open eucalypt forest, *Melaleuca* forest with rainforest understorey, open savannah woodland and tall riparian woodland of *Melaleuca* spp., *Eucalyptus tereticornis* and *Corymbia tessellaris*. Within these habitats, this species prefers to forage within relatively dense stands of vegetation, however it has been identified to infrequently forage in woodland and in open, cleared areas (TSSC, 2016a and references therein).

It is thought that this species mainly roosts in tree hollows and vegetation, or in open habitats such as under creek banks and road culverts, in rockpiles, and relatively shallow caves in drier times. However, it is also an opportunistic cave and mine-dweller, taking advantage of disused underground mines. Although, it is not an obligate cave- or mine-dwelling species (TSSC, 2016a and references therein).

The study area may provide potentially suitable foraging and roosting habitat for this species, particularly in sheltered areas where vegetation is thicker. However, in general, vegetation within the study area is comprised of open woodland communities, which may not be preferable habitat to individuals of this species. These habitats are similar to those represented within the broader region, therefore no unique habitat values for this species are present within the study area. Baseline assessments did not detect the calls of this species despite eight detector nights in various habitats throughout the study area. Therefore, as evidence of this species was not detected during baseline assessments and no unique or generally preferable habitat for this species occurs within the study area it is considered unlikely that this species will be significantly impacted by development within the study area.

Gilbert Ground Gecko

The status of the Gilbert ground gecko (*Lucasium iris*) is not currently evaluated under the NC Act and EPBC Act due to the recency of the scientific paper describing this species being published in November 2020 (Vanderduys *et al.*, 2020). As a precautionary measure, an assessment of significant impacts to this species within the study area are discussed below with reference to information published within Vanderduys *et al.* (2020).

This species is endemic to the western Einasleigh Uplands bioregion in a localised area of the Gregory Range on Gilberton Station. This is the most range restricted of any *Lucasium* species within Australia and is the only Endemic *Lucasium* species to Queensland. The occurrence of this species within the study area represents a range extension (~20km) of the previously known extent of occurrence of this species. Although small, this range extension provides valuable insight into the occurrence of this species within the local area, particularly as the study area is just outside of the modelled area of occupancy (AOO) for this species. Within its known distribution, this species is known to occur on low rocky hills with many small escarpments, talus slopes and washout areas. Specifically, this species has been identified to occur within REs 2.10.5, 9.11.28, and 9.11.16. Current data does not suggest that this species fits any IUCN threatened category.

One individual of this species was identified within the central western portion of the study area on sandstone formations. The vegetation community that this individual was located within (RE 2.10.5a) supports habitat preferences for this species published within Vanderduys *et al.* (2020). RE 9.11.16, which is noted to be a community that this species occurs within in Vanderduys *et al.* (2020) was also ground-truthed within the study area, however no individuals of this species were identified within this ground-truthed community within the study area. Although this species is not currently listed, development within the study area is unlikely to significantly impact this species.

6.7 Pest species

Four non-native fauna species were identified within the study area during field assessments: Cane toad, Asian house gecko, European rabbit and domesticated Cattle. Various introduced flora species were also identified during the survey. These included a variety of species generally considered environmental weeds as well as pasture improvement species and a restricted invasive species (Rubber Vine) according to the *Biosecurity Act* (2014).

Cane toads occurred at low densities in proximity to standing water during spotlighting surveys. The Cane toad is common in a variety of habitat types throughout Queensland, including arid regions where populations disperse during the wet season and contract to permanent water sources such as cattle dams as ephemeral systems dry out (Letnic *et al.*, 2014). Management of toad populations in arid regions may therefore rely on restricting Cane toad access to artificial water sources. The spread of Cane toads across tropical Australia has been implicated in population declines of many large vertebrate predator species (Burnett, 1997), including the Ghost bat (TSSC, 2016c), which may occur in the study area.

Asian house geckos were incidentally detected at the mine camp during the surveys, however, were not found outside of this area. This species is widespread in urban areas within northern Australia, however, has the potential to establish within natural environments (Barnett, 2017). The most important factors facilitating the expansion of this species into natural woodland environments is propagule pressure (i.e., relative abundance of this species at the urban edge) and the number of years since this species established in the urban area (Barnett, 2017). As this species was detected in low abundances within areas of infrastructure within the study area it is unlikely that the presence of this species will have a notable impact on natural environments in the near future.

European rabbits were incidentally observed within open woodland communities within the study area. This species is a major agricultural and environmental pest in Australia, incurring environmental and economic impacts by eating pasture and crops, competing with native animals, causing soil erosion and preventing the regeneration of native vegetation. Although widespread and abundant throughout much of Australia, it is recommended that rabbit populations within the study area are managed to reduce impacts to local landholders and the environment (DAF, 2020).

The current land use for the local area is cattle grazing and cattle were identified within the study area. Excessive stocking of cattle may result in a variety of environmental impacts, particularly around watering points within the study area, where minor to moderate cattle impacts are already evident.

One Category 3 restricted invasive flora species under the *Biosecurity Act 2014* was identified within the study area during field assessments (Rubber Vine), which occurs broadly within the surrounding region.

The *Biosecurity Act 2014* outlines a general biosecurity obligation (GBO). The GBO identifies that everyone is responsible for managing biosecurity risks that are:

- Under their control; and
- That they know, or should reasonably know, about.

Under the GBO, individuals and organisations whose activities pose a biosecurity risk must:

- Take all reasonable and practical steps to prevent or minimise each biosecurity risk;
- Minimise the likelihood or causing a 'biosecurity event', and limit the consequences if such an event is caused; and
- Prevent or minimise the harmful effects a risk could have, and not do anything that might make any harmful effects worse.

Overall, it is recommended that all reasonable and practical steps to manage pest flora and fauna species identified within the study area are taken.

7 Conclusions and Recommendations

7.1 Local biodiversity and values

A total of 93 fauna species (49 birds, 22 mammals, 18 reptiles, and four amphibians) and 147 flora species (from 51 families) were identified within the study area during field assessments. Therefore, the study area contains moderate to high biodiversity for the local area and provides an array of values to local flora and fauna.

Most of the study area is comprised of open woodlands dominated by Gilbert river box and Narrow-leaved ironbark with a sparse shrub and grass understory. These open woodlands primarily provide habitat features for reptiles, small to large mammals and birds. While slopes dominated by Narrow-leaved ironbark and Lancewood provide similar habitat features to these open woodlands, these areas are often more floristically and structurally complex, providing greater amounts of refugia for reptiles and small mammals and a variety of microhabitats for flora to occupy. RE 2.10.5a woodland communities provide the most unique habitat, which two species identified during baseline assessments are endemic to; the Gilbert ground gecko and Silver-eyed velvet gecko. Additionally, several flora species within the local area are also heavily reliant on these sandstone-based woodlands. Sandstone features within areas of RE 2.10.5a also provide topographical complexity and an abundance of habitats, such as weathered overhangs, dense leaf litter, crevices, and areas of large, strewn boulders, for a variety of species. Ephemeral watercourses within the study area, particularly Agate Creek, also provide unique values within the study area. Although similar watercourses are present within the surrounding region, these features provide connectivity values and valuable resources to local fauna and flora.

The variety of landscape features provided diverse habitat features across the study area. These are influenced by vegetation community type, landform characteristics and land use practices. Most local biodiversity and ecological values within the study area are likely to be widely present or available within the broader region. However, several features, such as water availability during the dry season and sandstone features within areas of RE 2.10.5a, are likely to provide high ecological value to the study area. It is recommended that development within these areas is avoided, where possible, to reduce impacts to local biodiversity values.

7.2 Significant environmental matters and ESAs

Below is an overview of significant environmental matters and ESAs ground-truthed within the study area. Project considerations associated with these matters and areas are described below.

7.2.1 Regulated vegetation

Remnant vegetation associated with a watercourse

Most of the study area is dominated by remnant vegetation, with the exception of a few small areas of previous disturbance. There are several first to fourth order watercourses that traverse through the study area. Remnant vegetation associated with these watercourses within the relevant defined distances (see section 6.1.2) is a MSES. The clearing of vegetation within these defined distances can result in offset requirements under the Queensland environmental offsets framework. Therefore, it is recommended that any development of the study area avoids the clearing of this vegetation type, where possible, and the clearing thresholds identified in Section 6.1.2 are considered where clearing is unavoidable.

7.2.2 Protected areas and ESAs

Several protected areas and ESAs were identified to occur adjacent to the study area during desktop and ground-truthing assessments. These areas are described below with project related considerations provided for each.

Protected areas are MSES under the Environmental offsets framework. Protected areas mapped within close proximity to the study area include the Rungulla NP and Rungulla RR, which occur to the south and west of the study area (Appendix A). ML 100030 does not directly overlap with either of these two protected areas, however the 2km Category A ESA buffer for the Rungulla NP overlaps the southern portion of the ML. An Environmental Authority variation application may be required for any activities that cannot meet the eligibility criteria and comply with the standard conditions relating to the Category A ESA buffer.

7.2.3 Threatened species

No threatened species were identified to occur within the study area during desktop and ground-truthing assessments. However, several threatened flora and fauna species were determined to have a moderate or high likelihood of occurring within the study area. These species include those that are restricted to, or have high local affiliations with sandstone outcrops. Although extensive survey effort during optimal times of detection did not identify these species within the study area during baseline assessments, it is recommended that disturbance to these sandstone outcrops be avoided.

7.3 Pest management

Several pest flora and fauna species were identified to occur within the study during field assessments (see Sections 4.2.1 and 5.2.5). The pest species identified are common throughout the local and broader region, all have the potential to impact biodiversity values within the study area. Therefore, where reasonable and practical, it is recommended that the pest flora and fauna species are managed in accordance with obligations under the Biosecurity Act (2014) to reduce impact of pest species to threatened flora and fauna species and their habitats.

Additionally, several introduced pasture improving flora species identified within the study area are considered as environmental weeds. It is recommended that pasture improving flora species are not encouraged to establish within the study area.

8 References

Atlas of Living Australia. (2020). Retrieved from <http://www.ala.org.au>.

Aumann, T. & Baker-Gabb, D. (1991). RAOU Report 75. *A management plan for the Red Goshawk*. RAOU. Melbourne: Royal Australasian Ornithologists Union.

Barnett, L.K. (2017). Understanding range expansion of Asian house geckos (*Hemidactylus frenatus*) in natural environments. PhD thesis, James Cook University.

Bean, A.R. (1992). The genus *Leptospermum* Forst. Et Forst.f. (Myrtaceae) in Northern Australia and Malesia. *Austrobaileya* 3(4), 643-659.

Bureau of Meteorology (BoM). (2020). Available from: <http://www.bom.gov.au/climate/data/stations/>.

Burnett, S. (1997). Colonizing Cane Toads cause population declines in native predators: reliable anecdotal information and management implications. *Pacific Conservation Biology* 3(1), 65–72.

Brown, G.K. & Bostock, P.D. (2019). Census of the Queensland Flora 2019. Queensland Department of Environment and Science: Brisbane.

Churchill, S. K. (2008). *Australian bats*. Sydney: Allen and Unwin.

Department of Agriculture and Fisheries (DAF). (2020). Rabbit (*Oryctolagus cuniculus*). The State of Queensland, Department of Agriculture and Fisheries.

Department of Environment and Heritage Protection (EHP). (2013). Code of Environmental Compliance for Mining Lease Projects Version 1.1.

Department of Environment and Science (DES). (2020a). Flora survey guidelines—protected plants. State of Queensland, 2020.

Department of Environment and Science (DES). (2020b). Queensland Government wildlife online.

Department of Environment and Science (DES). (2020c). Map of referable wetlands.

Department of Environment and Science (DES). (2020d). Environmentally sensitive areas map. Department of Environment and Science, Brisbane. Retrieved from: http://www.ehp.qld.gov.au/licences-permits/maps_of_environmentally_sensitive_areas.php.

Department of Environment and Science (DES). (2020e). Species Profiles. Available from: <https://apps.des.qld.gov.au/species-search/>.

Department of the Environment (DoE). (2014) EPBC Act referral guidelines for the vulnerable Koala. Commonwealth of Australia.

Department of Natural Resources and Mines (DNRME). (2020). Vegetation management report. The State of Queensland. Available from: <https://www.dnrm.qld.gov.au/qld/environment/land/vegetation/vegetation-map-request-form>

Department of Agriculture, Water and the Environment (DAWE). (2020a). EPBC Act protected matters report.

Department of Agriculture, Water and the Environment (DAWE) (2020b). Species profile and threats database, Department of the Environment and Energy, Canberra. Retrieved from <http://www.environment.gov.au/sprat>.

Eyre, T.J., Ferguson, D.J., Hourigan, C.L., Smith, G.C., Mathieson, M.T., Kelly, A.L., Venz, M.F. & Hogan, L.D. (2018). *Terrestrial vertebrate fauna survey assessment guidelines for Queensland*. Brisbane: Department of Science, Information Technology, Innovation and the Arts, Queensland Government.

Flora of Australia (FoA). (1982). Flora of Australia, Volume 29, Solanaceae. Australian Government Publishing Service, Canberra.

Flora of Australia (FoA). (1998). Flora of Australia, Volume 12, Mimosaceae (excl. Acacia), Caesalpiniaceae. Australian Government Publishing Service, Canberra.

Flora of Australia (FoA). (2015). Flora of Australia, Volume 37, Asteraceae 1. Australian Government Publishing Service, Canberra.

Ford, A.J. (2010). Preliminary Assessment of the Floristic and Vegetation Values of “Gilbert River” and “Rungulla” Stations. CSIRO.

Gill, F. & Donsker, D. (2015). IOC World Bird List version 5.4. Available from: <http://www.worldbirdnames.org/>.

Higgins, P.J. (ed.) (1999). *Handbook of Australian, New Zealand and Antarctic Birds. Volume Four - Parrots to Dollarbird*. Oxford University Press, Melbourne.

Hill, K.D. (1992) *Cycas platyphylla*. Telopea. 5(1): 193-194.

Hourigan, C. (2011) Ghost bat, *Macroderma gigas*. Targeted species survey guidelines. Queensland Herbarium, Department of Science, Information Technology and Innovation, Brisbane.

Letnic, M., Webb, J. K., Jessop, T. S., Florance, D. & Dempster, T. (2014). Artificial water points facilitate the spread of an invasive vertebrate in arid Australia. *Journal of Applied Ecology* 51(3), 795–803.

McKenzie, N. & Hall, L. (2008). *Macroderma gigas*. In: IUCN 2010. IUCN Red List of Threatened Species. Version 2010.4.

Menkhorst, P. & Knight, F. (2011). *A field guide to the mammals of Australia* Third Edition. Oxford University Press.

Menkhorst, P., Rogers, D., Clarke, R., Davies, J., Marsack, P. & Franklin, K. (2017). *The Australian Bird Guide*. CSIRO.

Morcombe, M. (2003). *Field guide to Australian birds*. Steve Parish Publishing Pty Ltd.

Neldner, V.J., Wilson, B.A., Dillewaard, H.A., Ryan, T.S., Butler, D.W., McDonald, W.J.F, Addicott, E.P. and Appelman, C.N. (2020) *Methodology for survey and mapping of regional ecosystems and vegetation communities in Queensland*. Version 5.1. Updated March 2020. Queensland Herbarium, Queensland Department of Environment and Science, Brisbane.

Pettigrew, J., Baker, G.B., Baker-Gabb, D., Baverstock, G., Coles, R., Conole, L., Churchill, S., Fitzherbert, K., Guppy, A., Hall, L., Helman, P., Nelson, J., Priddel, D., Pulsford, I., Richards, G., Schulz, M. and Tidemann, C.R. (1986). The Australian Ghost bat, *Macroderma gigas*, at Pine Creek, Northern Territory. *Macroderma* 2: 8-19.

Queensland Globe (QLD Globe) (2020). Available from: <https://qldglobe.information.qld.gov.au/>

Queensland Herbarium. (2019). Regional ecosystem description database. Version 11.1 (April 2019). Brisbane: Queensland Department of Science, Information Technology, Innovation and the Arts.

Reardon, T.B., Armstrong, K.N. & Jackson, S.M. (2015). *A current taxonomic list of Australian Chiroptera*. Australasian Bat Society. Retrieved from: <http://ausbats.org.au/taxonomic-list/4589345107>.

Shine R., Wang S., Madani G., Armstrong K.N., Zhang L., Li Y. (2016). Using genetic data to predict the vulnerability of a native predator to a toxic invader. *Endangered Species Research* 31: 13-17.

Timmick (1883).

Threatened Species Scientific Committee (TSSC). (2016a). Conservation Advice for *Rhinolophus robersti* (greater large-eared horseshoe bat). Canberra: Department of the Environment and Energy.

Threatened Species Scientific Committee (TSSC). (2016b). Approved Conservation Advice for *Macroderma gigas* (Ghost Bat). Canberra: Department of the Environment (now Department of Agriculture, Water and Environment).

Van Dyck, S., Gynther, I., & Baker, A. (2013). *Field companion to the mammals of Australia*. Sydney: New Holland Publishers.

Vanderduys, E. (2012). *Field guide to the frogs of Queensland*. Collingwood, Victoria: CSIRO Publishing.

Vanderduys, E., Hoskin, C.J., Kutt, A.S., Wright, J.M. and Zozaya, S.M. (2020). Beauty in the eye of the beholder: a new species of gecko (Diplodactylidae: *Lucasium*) from inland north Queensland, Australia. *Zootaxa*. 4877(2): 291-310.

White A.W., Morris I., Madani, G., Archer, M. (2016). Are Cane Toads *Rhinella marina* impacting Ghost Bats *Macroderma gigas* in Northern Australia? *Australian Zoologist* 38(2): 183-191.

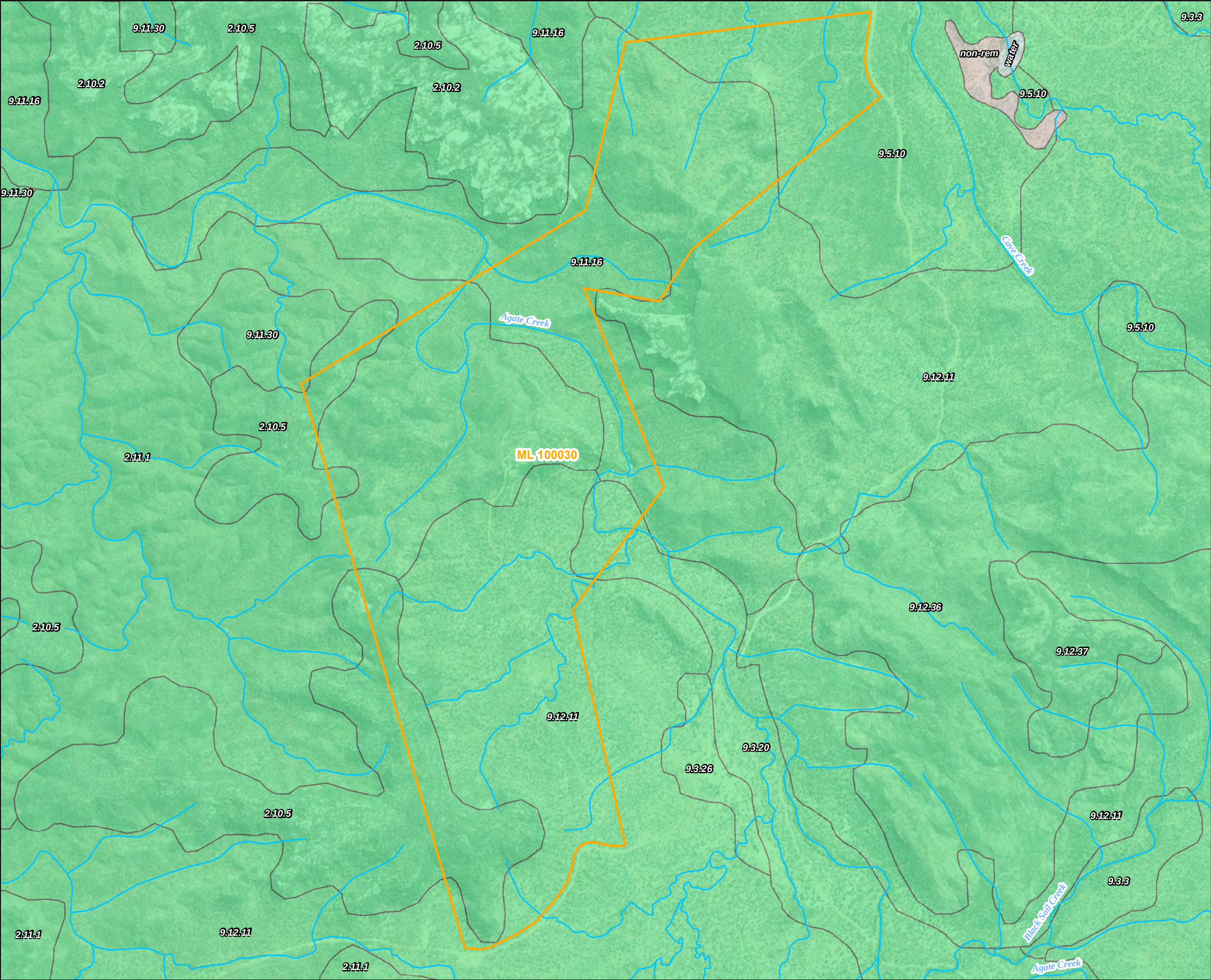
Wilson, P. R. & Taylor, P. M. (2012). *Land zones of Queensland*. Brisbane: Queensland Herbarium, Queensland Department of Science, Information Technology, Innovation and the Arts.

Wilson, S. & Swan, G. (2017). *A Complete Field guide to the reptiles of Australia*. Sydney: New Holland Publishers.

Woinarski J.C.Z., Burbidge A.A., Harrison P.L. (2014) The action plan for Australian mammals 2012. CSIRO Publishing, Collingwood, Vic

APPENDIX A

Maps



LANEWAY
RESOURCES

AGATE CREEK

STATE-MAPPED
REGIONAL
ECOSYSTEMS

LEGEND

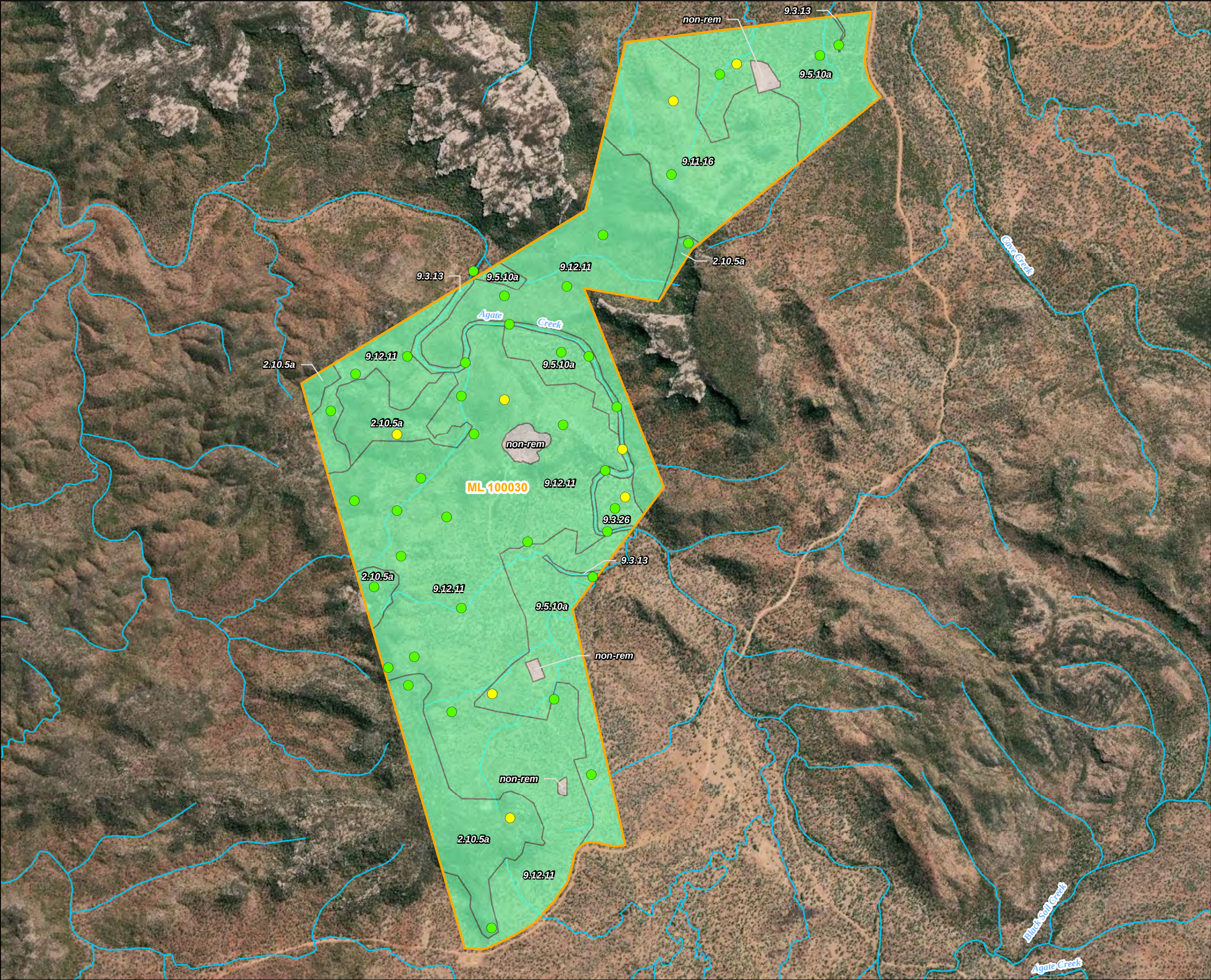
- Watercourse
- Mining Lease (ML 100030)
- Category A or B area that is least concern
- Category X area that is non-remnant
- Water



Coordinate System:	GDA 1994 MGA Zone 54
Scale:	1:20,000 at A3
Project Number:	623.20155
Date:	14-Jan-2021
Drawn by:	AJ
Reviewed by:	SH

Data Sources:
Vegetation Management Watercourse and Drainage Feature Map (1:100000 and 1:250000) – Queensland except South East Queensland Version 4.0, and Vegetation Management Regional Ecosystem Map - Version 11.0, and Mining Lease (ML 100030 only) datasets: © State of Queensland (Department of Natural Resources, Mines, and Energy) 2021.
Imagery Sources: 50cm resolution Maxar GE01 Australia 2018 Satellite Imagery Service: © ESRI, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community.





LANEWAY
RESOURCES

AGATE CREEK

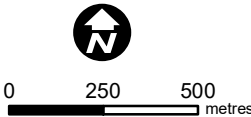
GROUND-TRUTHED
REGIONAL
ECOSYSTEMS

LEGEND

- Secondary Site
- Quaternary Site
- Watercourse
- Mining Lease (ML 100030)

Ground-Truthed
Regional Ecosystems

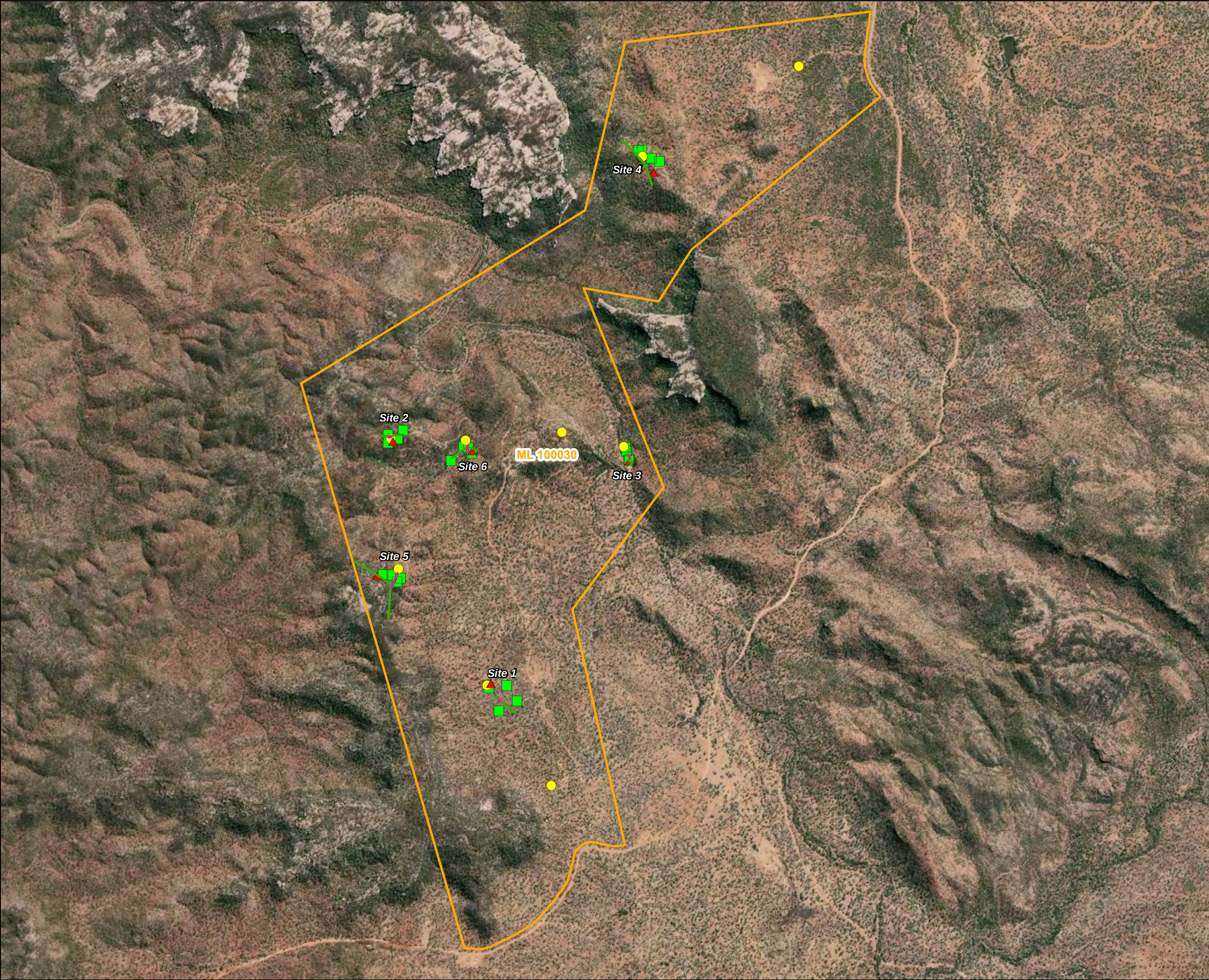
- Least Concern
- Non-remnant



Coordinate System:	GDA 1994 MGA Zone 54
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Date:	18-Jan-2021
Drawn by:	AJ
Reviewed by:	SH

Data Sources:
Vegetation Management Watercourse and Drainage
Feature Map (1:100000 and 1:250000) –
Queensland except South East Queensland Version
4.0, and Mining Lease (ML 100030 only) datasets: ©
State of Queensland (Department of Natural
Resources, Mines, and Energy) 2021; Secondary
Site, Quaternary Site, and Ground-Truthed Regional
Ecosystems datasets: derived from Ecological Field
Survey data - SLR Consulting (2020).
Imagery Sources: 50cm resolution Maxar GE01
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DigitalGlobe, GeoEye, Earthstar Geographics,
CNES/Airbus DS, USDA, USGS, AeroGRID, IGN,
and the GIS User Community.





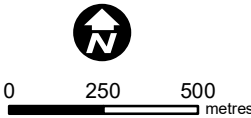
LANEWAY
RESOURCES

AGATE CREEK

FAUNA
SURVEY

LEGEND

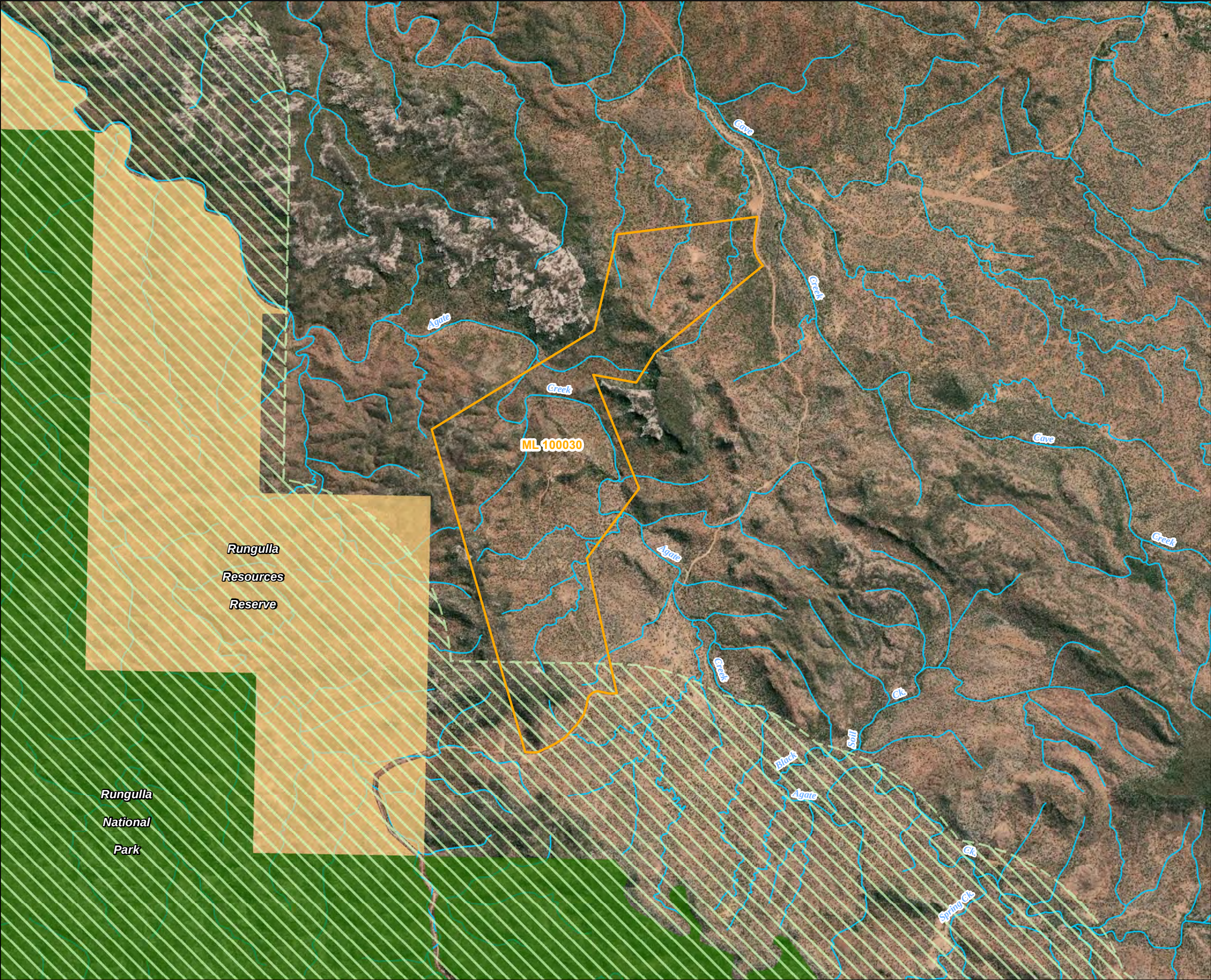
- IR Camera
- Bat Detector
- Cage Trap
- Drift Line
- Elliot Line
- Mining Lease (ML 100030)



Coordinate System:	GDA 1994 MGA Zone 54
Scale:	1:20,000 at A3
Project Number:	623.20155
Date:	14-Jan-2021
Drawn by:	AJ
Reviewed by:	SH

Data Sources:
Mining Lease (ML 100030 only) dataset: © State of Queensland (Department of Natural Resources, Mines, and Energy) 2021; IR Camera, Bat Detector, Cage Trap, Drift Line, Elliot Line, and Watercourse datasets: SLR Consulting (2020).
Imagery Sources: 50cm resolution Maxar GE01 Australia 2018 Satellite Imagery Service: © ESRI, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community.





LANEWAY
RESOURCES

AGATE CREEK

ENVIRONMENTALLY
SENSITIVE AREAS

LEGEND

- Watercourse
- Mining Lease (ML 100030)
- 2km Buffer from National Park
- National Park (Cat. A ESA)
- Resources Reserve (Cat. C ESA)



0 500 1,000 metres

Coordinate System:	GDA 1994 MGA Zone 54
Scale:	1:35,000 at A3
Project Number:	623.20155
Date:	15-Jan-2021
Drawn by:	AJ
Reviewed by:	SH

Data Sources:
Vegetation Management Watercourse and Drainage Feature Map (1:100000 and 1:250000) – Queensland except South East Queensland Version 4.0, 2km Buffer from National Park, National Park (Cat. A ESA), Resources Reserve (Cat. C ESA), and Mining Lease (ML 100030 only) datasets: © State of Queensland (Department of Natural Resources, Mines, and Energy) 2021.
Imagery Sources: 50cm resolution Maxar GE01 Australia 2018 Satellite Imagery Service: © ESRI, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community.



APPENDIX B

EPBC Act Protected Matters Report



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: 14/02/20 12:01:34

[Summary](#)

[Details](#)

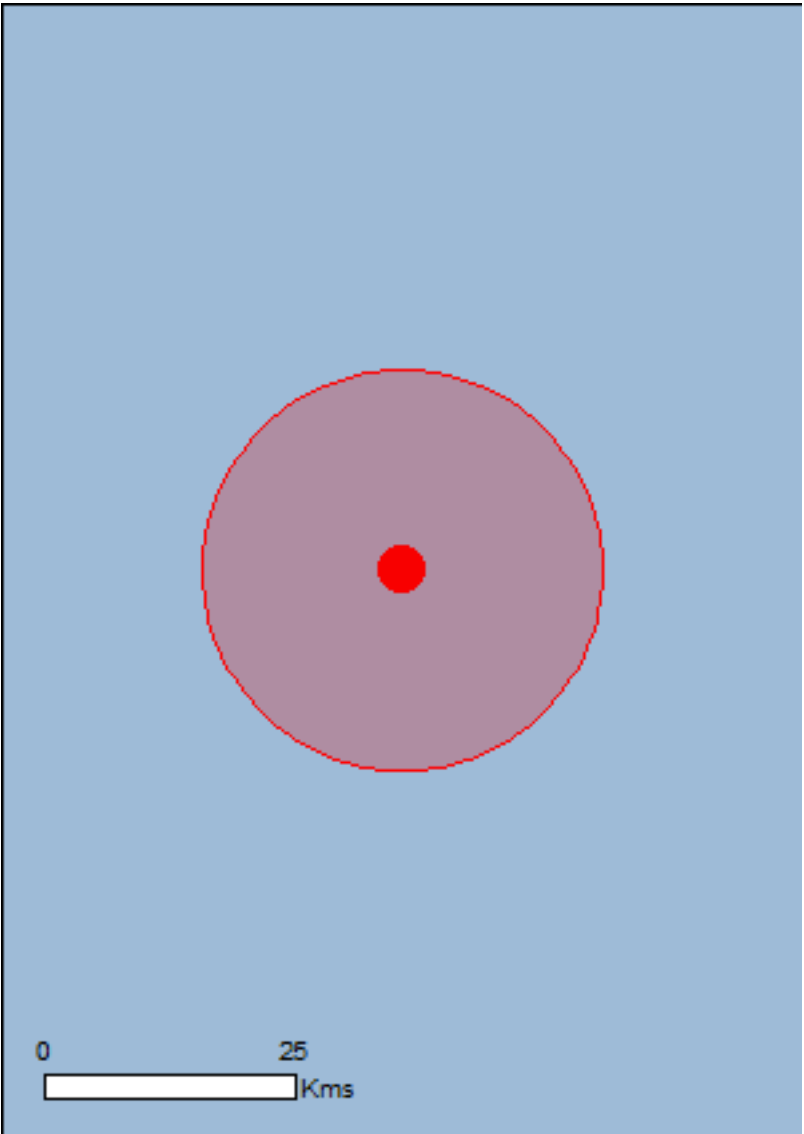
[Matters of NES](#)

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

[Extra Information](#)

[Caveat](#)

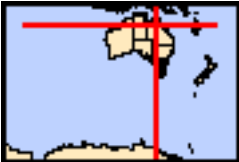
[Acknowledgements](#)



This map may contain data which are
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[Coordinates](#)

Buffer: 20.0Km



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:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	12
Listed Migratory Species:	11

Other Matters Protected by the EPBC Act

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

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <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:	18
Whales and Other Cetaceans:	None
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:	14
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Erythrura gouldiae Gouldian Finch [413]	Endangered	Species or species habitat known to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Tyto novaehollandiae kimberli Masked Owl (northern) [26048]	Vulnerable	Species or species habitat may occur within area
Mammals		
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat may occur within area
Macroderma gigas Ghost Bat [174]	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 may occur within area
Rhinolophus robertsi Large-eared Horseshoe Bat, Greater Large-eared Horseshoe Bat [87639]	Vulnerable	Species or species habitat may occur within area
Saccolaimus saccolaimus nudicluniatus Bare-rumped Sheath-tailed Bat, Bare-rumped Sheathtail Bat [66889]	Vulnerable	Species or species habitat may occur within area
Plants		
Cycas platyphylla a cycad [55796]	Vulnerable	Species or species habitat may occur within area
Dichanthium setosum bluegrass [14159]	Vulnerable	Species or species habitat likely to 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		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus		
Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundo rustica		
Barn Swallow [662]		Species or species habitat may occur within area
Motacilla cinerea		
Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Pandion haliaetus		
Osprey [952]		Species or species habitat likely to 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 may 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

Name	Threatened	Type of Presence
		within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely 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 may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		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 may occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area
Reptiles		
Crocodylus johnstoni Freshwater Crocodile, Johnston's Crocodile, Johnston's River Crocodile [1773]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Cobbold Gorge	QLD
Rungulla	QLD
Rungulla	QLD
Stuarts Spring	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 Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		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
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
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		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
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
Parkinsonia aculeata Parkinsonia, Jerusalem Thorn, Jelly Bean Tree,		Species or species

Name	Status	Type of Presence
Horse Bean [12301]		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

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

-18.9972 143.5455

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.

APPENDIX C

Wildlife Online Database Extract



Queensland Government

Wildlife Online Extract

Search Criteria: Species List for a Specified Point
Species: All
Type: Native
Status: Rare and threatened species
Records: All
Date: All
Latitude: -18.9972
Longitude: 143.5455
Distance: 20
Email: sharte@slrconsulting.com
Date submitted: Friday 14 Feb 2020 11:00:15
Date extracted: Friday 14 Feb 2020 11:10:06

The number of records retrieved = 6

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.

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	mammals	Phascolarctidae	<i>Phascolarctos cinereus</i>	koala		V	V	3
plants	land plants	Asteraceae	<i>Pluchea punctata</i>			E		2/2
plants	land plants	Caesalpinaceae	<i>Labichea brassii</i>			NT		7/7
plants	land plants	Myrtaceae	<i>Leptospermum pallidum</i>			NT		2/2
plants	land plants	Rutaceae	<i>Drummondita calida</i>			V		1/1
plants	land plants	Solanaceae	<i>Solanum carduiforme</i>			V		2/2

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.

APPENDIX D

Potential Occurrence of EVNT Species

Table D1 Likelihood of occurrence assessments for EVNT flora identified in Protected Matters Search Tool and Queensland Government Wildlife Online searches in a 20km radius from the study area

Status ¹		Family	Scientific name	Common name	Source ²	WO records	Ecology	Potential to occur in the study area
NCA	EPBC							
E	-	Asteraceae	<i>Pluchea punctata</i>	-	WO	2	This species is endemic to Queensland and is known from a single locality near Forsyth in north Queensland. Little information is available on habitat preferences for this species, however it has been documented to occur on hill slopes with Gilbert River Box and <i>Triodia spp.</i> (FoA, 2015).	Moderate -There are two records of this species occurring within 20km of the study area (DES, 2020b) and ground-truthed vegetation communities were similar to those that this species is described to occur within. Overall, it is considered that this species has a moderate likelihood of occurring within the study area due to the presence of local records and potential habitat for this species.
V	V	Cycadaceae	<i>Cycas platyphylla</i>	-	PM	0	Cycads are a distinct family of plants that, in some species, have a very localised distribution. This species is known from the Petford district on the north-western Atherton Tableland, and a disjunct population about 250km to the south of Wandovale station. In both localities, it occurs in open grassy ironbark-dominated woodland on shallow loamy soils on stony slopes over acid to intermediate volcanics (Hill, 1992).	Low – There are no local records of this species occurring within 20km of the study area (DES, 2020b). As there are no local records of this species and the study area occurs outside of the modelled distribution of this species, it is considered that this species has a low likelihood of occurring within the study area. Additionally, no individuals of this distinctive family of plants were identified within the study area.
NT	-	Leguminosae	<i>Labichea brassii</i>	-	WO	7	This poorly known species is confined to northern Queensland and is known from Mt Mulligan in the north and extends south west to Agate Creek (FoA, 1998). Preferred habitat for this species includes vegetation along creeks and in riverbeds, however locally it has also been recorded to occur on sparse woodland on sandstone plateaus in RE 2.10.2x1 (FoA, 1998; Ford 2010).	High – There are seven records of this species occurring within 20km of the study area (DES, 2020b). Due to the presence of local records and potential habitat within the study area (RE 2.10.5a) it is considered that this species has a high likelihood of occurring within suitable habitat within the study area.
NT	-	Myrtaceae	<i>Leptospermum pallidum</i>	-	WO	2	This species has a restricted distribution within northern Queensland, with most records occurring around the Greenvale area, however this species has also been recorded to occur at Porcupine Gorge, north of Hughenden, within the Cobbold Gorge Nature Refuge and within the Rungulla National Park (Bean, 1992; Ford, 2010). Locally, this species has been observed on low sandstone hills among large boulders with a metamorphic substrate within RE 2.10.5x1 (Ford, 2010).	High – There are two records of this species occurring within 20km of the study area (DES, 2020b). Due to the presence of local records and ground-truthed regional ecosystems (RE 2.10.5a) within the study area equating to known local habitat for this species it is considered that this species has a high likelihood of occurring within suitable habitat within the study area.
LC	V	Poaceae	<i>Dichanthium setosum</i>	-	PM	0	This species occurs in inland QLD and NSW, with Queensland populations in the southern and central Brigalow Belt, the Central Queensland Highlands and the Einasleigh Uplands between Charters Towers and Georgetown. Other scattered records occur in the Cape York Peninsula and Northwest Highlands. It is found in moderately disturbed areas such as cleared woodland and grassy roadside remnants. It is typically associated with heavy black soils and red-brown loams with clay subsoil (DES, 2020e and references therein).	Moderate - The nearest local record of this species is ~100km to the south east of the study area, which is the northernmost available record of this species (ALA, 2020). The study area is on the north-western boundary of the modelled distribution of this species (DES, 2020e) and potentially suitable habitat for this species is present within the study area. Overall, it is considered that this species has a moderate likelihood of occurring within the study area.
V	-	Rutaceae	<i>Drummondita calida</i>	-	WO	1	Within Queensland, this species is found between Bulleringa National park to the southern end of the Gregory Range. Locally, this species has been located on very exposed and sparse low shrubland on bare sandstone plateaux to low open woodland on sandstone with large boulders. This species has a very conspicuous corky fissured stem, however the overall appearance of the plant is primarily driven by habitat, with taller individuals in woodland and shorter plants in more open and exposed situations (Ford, 2010). Within the local area, this species is noted to be locally common and has been observed in REs 2.10.2x1, 2.10.2, 2.10.5x2 and 2.7.2 (Ford, 2010).	High – There is one record of this species occurring within 20km of the study area (DES, 2020b). Due to the presence of a local record and ground-truthed regional ecosystems (RE 2.10.5a) within the study area equating to known local habitat for this species it is considered that this species has a high likelihood of occurring within suitable habitat within the study area.

Status ¹		Family	Scientific name	Common name	Source ²	WO records	Ecology	Potential to occur in the study area
NCA	EPBC							
V	-	Solanaceae	<i>Solanum carduiforme</i>	-	WO	6	An extremely rare, inadequately known species previously only known to occur in the Lawn Hill area of north-western QLD. However, it has recently been recorded from the Bungle Bungle region and Prince Regent River area of WA and is also recorded from the Cobbold Gorge Nature Refuge and Rungulla National Park. This species grows on conglomerate rock formations. This species is an erect, clonal herb or subshrub to 50 cm with densely pubescent leaves with stellate hairs and prickles (to 8 mm long) on all parts of the leaf. Leaves are concolorous with deep, oblong to broadly triangular lobes. Prickles are also present on all parts of the plant (FoA, 1982; Ford, 2010). Within the Gilbert River and Rungulla Stations this species is noted to grow on sandstone areas either with minimal soil on pavements or amongst spinifex on deep sandy soil. Local REs that this species has been associated with include RE 2.10.5x2 and 2.10.2x1 (Ford, 2010).	High – There are six records of this species occurring within 20km of the study area (DES, 2020b). Due to the presence of local records and ground-truthed regional ecosystems (RE 2.10.5a) within the study area equating to known local habitat for this species it is considered that this species has a high likelihood of occurring within suitable habitat within the study area.

1. Status: LC = Least Concern, NT = Neat Threatened, V = Vulnerable, E = Endangered

2. Source: WO = Queensland Government Wildlife Online Database Extract (20km radius search area), PM = EPBC Act Protected Matters Report

Table D2 Likelihood of occurrence assessments for EVNT fauna identified in Protected Matters Search Tool and Queensland Government Wildlife Online searches in a 20km radius from the study area

Status ¹		Family	Scientific name	Common name	Source ²	WO records	Ecology	Potential to occur in the study area
NCA	EPBC							
BIRDS								
E	V	Accipitridae	<i>Erythrotriorchis radiatus</i>	Red Goshawk	PM	0	This species prefers open forests and woodland with a mosaic of vegetation types, particularly near riverine systems and permanent water where there is an abundance of prey species (DAWE, 2020b and reference therein). The home range in northern Australia has been reported up to 200km ² , with indications it may be even larger (Aumann & Baker-Gabb, 1991).	Low — There are no local records of this species within 20km of the study area (DES, 2020b) and the study area does not occur within the core distribution of this species (Menkhorst <i>et al.</i> , 2017). Additionally, habitat within the study area is suggested as being of low quality to this species due to the absence of permanent water. Overall, it is considered that this species has a low likelihood of occurring within the study area.
E	E	Estrilidae	<i>Erythrura gouldiae</i>	Gouldian Finch	PM	0	Sparsely distributed across northern Australia from the Kimberley region to central north Queensland. This species inhabits tropical open woodlands dominated by <i>Eucalyptus</i> trees with ground cover of tall native grasses, such as Sorghum (Morcombe, 2003). Gouldian Finch also occur in thickets of vegetation along streams and gorges and the margins of mangroves. This species requires daily access to fresh water and becomes restricted to rock outcrops with permanent pools during the dry season (Menkhorst <i>et al.</i> , 2017).	Low – There are no local records of this species within 20km of the study area (DES, 2020b) and the study area occurs to the south of the modelled distribution of this species within north eastern Queensland (Menkhorst <i>et al.</i> , 2017). Overall, it is considered that this species has a low likelihood of occurring within the study area based on desktop results. Additionally, field observations identified no permanent water on site and that local watercourses are highly ephemeral.
E	E	Rostratulidae	<i>Rostratula australis</i>	Australian Painted Snipe	PM	0	This species has been recorded at wetland sites throughout much of Australia but is most common in the eastern states. The Australian Painted Snipe is a distinct species but can be hard to detect due to its cryptic and crepuscular behaviour. This species typically occurs in shallow freshwater wetlands and other permanently or temporarily inundated areas, particularly where rank tussocks of grasses, sedges, rushes or reeds are present (DAWE, 2020b; Morcombe, 2003).	Low – There are no local records of this species within 20km of the study area (DES, 2020b) and the study area does not contain and suitable habitat (wetlands). Overall, it is considered that this species has a low likelihood of occurring within the study area.
E	CE, M, Ma	Scolopacidae	<i>Calidris ferruginea</i>	Curlew Sandpiper	PM	0	This species occurs around the coasts of Australia from Cairns south. It is also quite widespread inland, with scattered records occurring in the Gulf of Carpentaria. This species mainly occurs on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets, lagoons and also around non-tidal swamps, lakes, and lagoons near the coast, foraging on mudflats and nearby shallow water (DAWE, 2020b and references therein).	Low – There are no local records of this species within 20km of the study area (DES, 2020b). The study area is inland and does not contain the coastal and aquatic habitats required for this species. Overall, it is considered that this species has a low likelihood of occurring within the study area.
V	V	Tytonidae	<i>Tyto novaehollandiae kimberli</i>	Masked Owl (northern)	PM	0	In Queensland, the northern subspecies of the Masked Owl occurs along the southern rim of the Gulf of Carpentaria, Cape York Peninsula and south at least as far as the Atherton Tablelands (DAWE, 2020b and references therein). The species has been recorded in a variety of habitats including riverside forests, rainforest, open forest and paperbark swamps and is known to occupy home-ranges of over 1,000ha in the non-breeding season.	Low – There are no local records of this species within 20km of the study area (DES, 2020b) and the study area does not occur within the modelled distribution of this sub-species of the Masked Owl (Menkhorst <i>et al.</i> , 2017). Overall, it is considered that this sub-species has a low likelihood of occurring within the study area.
MAMMALS								
LC	E	Dasyuridae	<i>Dasyurus hallucatus</i>	Northern Quoll	PM	0	Across its range the Northern Quoll utilises a wide variety of habitats; in Queensland it favours high-relief areas with shallow soils, high boulder cover and low fire frequency close to permanent water (DAWE, 2020b and references therein).	Low – There are no local records of this species within 20km of the study area (DES, 2020b) and the nearest other records of this species are ~150km to the north east and ~230km to the south east of the study area (ALA, 2020). Additionally, the study area does not occur within the core distribution of this species (Van Dyck, 2013) and there is no permanent water within or near the study area. Overall, it is considered that this species has a low likelihood of occurring within the study area.
E	V	Emballonuridae	<i>Saccolaimus saccolaimus nudicluniatus</i>	Bare-rumped Sheathtail Bat	PM	0	This species is known to occupy tropical woodland and tall open forests in lowland areas, preferably coastal eucalypt forests with high rainfall, along the northeast coast of Queensland (Churchill, 2008). Roosts have been recorded in tree hollows (DAWE, 2020b and references therein).	Low – There are no local records of this species within 20km of the study area (DES, 2020b) and the study area is outside of the modelled distribution of this species (Van Dyck, 2013). Overall, it is considered that this species has a low likelihood of occurring within the study area.

Status ¹		Family	Scientific name	Common name	Source ²	WO records	Ecology	Potential to occur in the study area
NCA	EPBC							
E	V	Megadermatidae	<i>Macroderma gigas</i>	Ghost Bat	PM	0	The distribution of this species is discontinuous across Australia with two ranges in Queensland: coastal and near-coastal eastern Queensland, from Cape York to near Rockhampton, and western Queensland (DAWE, 2020b and references therein). It has been recorded hunting in rainforest, deciduous vine thicket, open woodland, spinifex, black soil and grassland habitats. Ghost Bats roost in caves, boulder piles, shallow escarpments and mines, and have very specific roosting requirements with respect to temperature and humidity (TSSC, 2016b).	Moderate – There are no local records of this species within 20km of the study area (DES, 2020b), however the study area occurs within the modelled distribution for this species (Van Dyck, 2013). Sandstone escarpments within close proximity to the study area may afford suitable roosting habitat for this species. Therefore, there is the potential that this species may utilise the study area for foraging. Overall, it is considered that this species has a moderate likelihood of occurring within the study area.
V	V	Phascolarctidae	<i>Phascolarctos cinereus</i>	Koala	WO/PM	3	This species range includes the eastern half of Queensland in sclerophyll forest and woodland (Menkhorst & Knight, 2011). While being widespread, suitable feed species and leaf moisture are the primary determinants of habitat suitability and populations are in decline due to a wide range of threats (DAWE, 2020b and references therein).	Moderate - There are three local records of this species within 20km of the study area (DES, 2020b) and the study area occurs within the modelled distribution for this species (Van Dyck, 2013). The study area is mostly dominated by <i>Eucalyptus</i> species, which may comprise suitable food resources for this species, particularly River Red Gums along the Agate Creek watercourse. Overall, it is considered that this species has a moderate likelihood of occurring within the study area. This is due to local records being >20yrs old and northern populations of the Koala occurring sparsely in suitable habitat throughout their range. Additionally, despite Eucalyptus species being abundant throughout the study area, favoured species such as River red gum are only found along watercourses with leaf moisture likely being low in other areas due to the dry and hilly terrain.
E	V	Rhinolophidae	<i>Rhinolophus robersti</i>	Large-eared Horseshoe Bat	PM	0	This species is restricted to northern Queensland, ranging from Iron Range National Park south to Townsville and west to the karst regions of Chillagoe (TSSC, 2016 and references therein). This species is found in lowland rainforest, forest-lined creeks within open eucalypt forest, <i>Melaleuca</i> forest with rainforest understorey, open savannah woodland and tall riparian woodland of <i>Melaleuca</i> spp., <i>Eucalyptus tereticornis</i> and <i>Corymbia tessellaris</i> . The species is an opportunistic cave and mine-dweller and takes advantage of disused underground mines but also roosts in trees and other vegetation (TSSC, 2016a and references therein).	Moderate - There are no local records of this species within 20km of the study area (DES, 2020b). However, the study area occurs on the western boundary of the modelled distribution for this species and potentially suitable habitat for this species is located within the study area. Overall, it is considered that this species has a moderate likelihood of occurring within the study area.

1. Status: LC – Least Concern, V = Vulnerable, E = Endangered, CE = Critically Endangered, M = Migratory, Ma = Marine

2. Source: WO = Queensland Government Wildlife Online Database Extract (20km radius search area), PM = EPBC Act Protected Matters Report

Table D3 Likelihood of occurrence assessments for migratory fauna identified in the Protected Matters Search Tool and Queensland Government Wildlife Online searches in a 20km radius of the study area.

Status ¹		Family	Scientific name	Common name	Source ²	WO records	Ecology	Potential to occur in the study area
NCA	EPBC							
BIRDS								
SLC	M, Ma	Apodidae	<i>Apus pacificus</i>	Fork-tailed Swift	PM	0	The Fork-tailed Swift is a non-breeding visitor to all States and territories of Australia. This species is known to utilise cliffs and beaches and to hunt above various habitat types including rainforest and open forests ahead of storm fronts (Higgins, 1999). Swifts are hardly ever seen to land except at nests, and when they do they cling to vertical surfaces rather than perching upright like swallows (Menkhorst <i>et al.</i> , 2017). This species has been noted to forage in high-flying flocks 100s of meters above the ground or canopy (Menkhorst <i>et al.</i> , 2017).	Low – There are no local records of this species within 20km of the study area. The occurrence of this species within the vicinity of the study area is likely to correspond with the presence of storm fronts travelling across the landscape. During these instances, it is likely that this species will only occupy the air space above the study area for short periods of time as this species rarely lands except to nest, which does not occur within Australia. Overall, it is considered that terrestrial habitats relevant to the study area and proposed disturbance constitute unsuitable habitat for this species.
SLC	M, Ma	Cuculidae	<i>Cuculus optatus</i>	Oriental Cuckoo	PM	0	This species is widespread in the northern and eastern parts of Australia, inhabiting rainforest margins, monsoon forest, vine scrubs, riverine thickets, wetter, densely canopied eucalypt forests, paperbark swamps and mangroves (Morcombe, 2003).	Low – There are no local records of this species within 20km of the study area and preferred habitat for this species is not present within the study area. Overall, it is considered that this species has a low likelihood of occurring within the study area.
SLC	M, Ma	Hirundinidae	<i>Hirundo rustica</i>	Barn Swallow	PM	0	This species is typically found patchily along the north coast of the mainland, typically found open country in coastal lowland utilising a wide variety of habitats (DES, 2021 and references therein).	Low – There are no local records of this species within 20km of the study area and the study area is outside of the modelled distribution of this species within Australia. Therefore, it is considered that this species has a low likelihood of occurring within the study area.
SLC	M, Ma	Motacillidae	<i>Motacilla cinerea</i>	Grey Wagtail	PM	0	A scarce but regular visitor to Australia (October to April), this species is infrequently recorded in the Northern Territory and Queensland. It prefers montane forests and forested areas close to water, with a preference for fast flowing rocky watercourses and waterfalls. However, this species may also occur at beaches and rock pools during migration (Menkhorst <i>et al.</i> , 2017).	Low – There are no local records of this species within 20km of the study area and preferred habitat for this species is not present within the study area. Overall, it is considered that this species has a low likelihood of occurring within the study area.
SLC	M, Ma	Motacillidae	<i>Motacilla flava</i>	Yellow Wagtail	PM	0	This species is a rare but regular migrant to coastal areas within Australia. It typically inhabits open habitats, often near water and occasionally on drier inland plains and edges of mangroves (Morcombe, 2003).	Low – There are no local records of this species within 20km of the study area. It is considered that habitat for this species within the study area is degraded or absent as water bodies are scarce within the study area and inland plains within the study area support no unique features for this species. Overall, it is considered that this species has a low likelihood of occurring within the study area.
SLC	M, Ma	Pandionidae	<i>Pandion haliaetus</i>	Osprey	PM	0	Found on the coasts, interior and many offshore islands of Australia, this species occurs in coastal habitats and terrestrial wetlands of tropical and temperate Australia. This species may travel inland along major rivers in its northern distribution (DAWE, 2021b and references therein).	Low – There are no local records of this species within 20km of the study area and preferred habitat for this species is not present within the study area. Overall, it is considered that this species has a low likelihood of occurring within the study area.
SLC	M, Ma	Scolopacidae	<i>Actitis hypoleucos</i>	Common Sandpiper	PM	0	Widespread but patchy distribution along all coastlines of Australia. Found in coastal wetlands and inland wetlands with varying levels of salinity (DAWE, 2021b and references therein). Most commonly found in muddy or rocky shores of estuaries, deltas of streams, banks upstream, lakes, pools, billabongs, reservoirs, and dams.	Low – There are no local records of this species within 20km of the study area and preferred habitat for this species is not present within the study area. Overall, it is considered that this species has a low likelihood of occurring within the study area.
SLC	M, Ma	Scolopacidae	<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	PM	0	This species occurs around the entire coast of Australia outside its breeding season, where it is found in a broad range of permanent or ephemeral water bodies, primarily brackish (DAWE, 2021b and references therein). It prefers muddy edges of shallow fresh or brackish wetlands, and use flooded paddocks, sedge lands and other ephemeral wetlands.	Low – There are no local records of this species within 20km of the study area and preferred habitat for this species is not present within the study area. Overall, it is considered that this species has a low likelihood of occurring within the study area.
E	CE, M, Ma	Scolopacidae	<i>Calidris ferruginea</i>	Curlew Sandpiper	PM	0	This species occurs around the coasts of Australia and is quite widespread inland, with scattered records occurring in the Gulf of Carpentaria, with wide-spread records along the coast south of Cairns. This species mainly occurs on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets, lagoons and also around non-tidal swamps, lakes, and lagoons near the coast, foraging on mudflats and nearby shallow water (DAWE, 2021b and references therein).	Low – There are no local records of this species within 20km of the study area and preferred habitat for this species is not present within the study area. Overall, it is considered that this species has a low likelihood of occurring within the study area.

Status ¹		Family	Scientific name	Common name	Source ²	WO records	Ecology	Potential to occur in the study area
NCA	EPBC							
SLC	M, Ma	Scolopacidae	<i>Calidris melanotos</i>	Pectoral Sandpiper	PM	0	This species occurs around the coasts of Australia and is quite widespread inland, with scattered records occurring in the Gulf of Carpentaria and wide-spread records along the coast south of Cairns. This species mainly occurs on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets, lagoons and also around non-tidal swamps, lakes, and lagoons near the coast, foraging on mudflats and nearby shallow water (DAWE, 2021b and references therein).	Low – There are no local records of this species within 20km of the study area and preferred habitat for this species is not present within the study area. Overall, it is considered that this species has a low likelihood of occurring within the study area.
SLC	M, Ma	Scolopacidae	<i>Gallinago hardwickii</i>	Latham’s Snipe	PM	0	This species is distributed along the east coast of Australia from Cape York Peninsula south to south eastern Australia. It occurs in permanent and ephemeral wetlands with low to dense vegetation up to 2000m above sea level (DAWE, 2020b and references therein). This species is known to occur close to humans and human activity (i.e., near roads, railways, airfields, commercial or industrial complexes) (DAWE, 2020b and references therein). Though it is described as utilising areas of permanent or temporary inundation, including streams in a wide range of habitat types, literature and records indicate that it does not occur in dense, closed-canopy rainforest and vine forest (DAWE, 2020b and references therein).	Low – There are no local records of this species within 20km of the study area and preferred habitat for this species is not present within the study area. Overall, it is considered that this species has a low likelihood of occurring within the study area.

1. Status: SLC – Special Least Concern, E = Endangered, CE = Critically Endangered, M = Migratory, Ma = Marine
2. Source: WO = Queensland Government Wildlife Online Database Extract (20km radius search area), PM = EPBC Act Protected Matters Report

APPENDIX E

Ground-truthed Vegetation Communities

Table E1 Floristic composition and structure of ground-truthed REs within the study area with a short REDD (Regional Ecosystem Description Database) provided

Description and status	Ground-truthed floristic composition and structure	Representative photograph
RE 2.10.5a VMA Status: Least concern Biodiversity Status: No concern at present REDD short description: <i>Acacia shirleyi</i> woodland and <i>Triodia pungens</i> hummock grassland on scarps and stony ledges.	T1: Sparse 7 – 10m <i>Eucalyptus chartaboma</i> (CD-A), <i>Acacia julifera</i> ssp. <i>julifera</i> (CD-A), <i>Acacia shirleyi</i> (CD-A), <i>Callitris intratropica</i> (A), <i>Alphitonia excelsa</i> (A). T2: Sparse 4 – 6m <i>A. julifera</i> ssp. <i>julifera</i> (D), <i>Acacia leptostachya</i> (SD-A), <i>C. intratropica</i> (A), <i>Grevillea glauca</i> (A), <i>Petalostigma banksia</i> (A), <i>Alphitonia excelsa</i> (A). S1: Sparse to Mid-dense 0.5 – 2.5m <i>A. leptostachya</i> (D), <i>Grevillea decora</i> (A), <i>Terminalia aridicola</i> (A), <i>P. banksii</i> (A), <i>A. excelsa</i> (A), <i>Pandorea pandorana</i> (A), <i>Premna tomentosa</i> (A), <i>Persoonia falcata</i> (A), <i>Grevillea mimosoides</i> (A). G: Very sparse to Sparse 0 - 0.5m <i>Schizachyrium fragile</i> (CD), <i>Eriachne ciliata</i> (CD-A), <i>Aristida</i> sp. (CD-A), <i>Gomphrena flaccida</i> (A), <i>Polycarpaea corymbosa</i> (A), <i>Triodia</i> sp. (A), <i>Cheilanthes</i> spp. (A), <i>Bidens bipinnata</i> (A).	
RE 9.3.13 VMA Status: Least concern Biodiversity Status: Of concern REDD short description: <i>Melaleuca</i> spp., <i>Eucalyptus camaldulensis</i> and <i>Casuarina cunninghamiana</i> fringing open forest on streams and channels.	T1: Sparse to Mid-dense 10 - 15m <i>Eucalyptus camaldulensis</i> (CD-SD), <i>Melaleuca fluviatilis</i> (CD-SD), <i>Lophostemon grandiflorus</i> (A). T2: Sparse to Mid-dense 5 – 9m <i>M. fluviatilis</i> (CD-A), <i>Melaleuca bracteata</i> (CD-A), <i>L. grandiflorus</i> (A), <i>E. camaldulensis</i> (A), <i>Ficus opposita</i> (A). S1: Sparse 0.5 – 2.5m <i>M. fluviatilis</i> (CD-A), <i>M. bracteata</i> (CD-A) **<i>Cryptostegia grandiflorus</i> (A), <i>F. opposita</i> (A), <i>Exocarpus latifolius</i> (A). G: Mid-dense to Dense 0 - 0.5m *<i>Megathyrsus maximus</i> (D), <i>Crotalaria novae-hollandiae</i> (A) <i>Crotalaris verrucosa</i> (A), <i>Crotalaria medicaginea</i> (A), <i>Bothriochloa</i> spp. (A), *<i>Themeda quadrivalvis</i> (A), <i>Dichanthium sericum</i> (A), <i>Ammannia multiflora</i> (A), <i>B. bipinnata</i> (A).	

Description and status	Ground-truthed floristic composition and structure	Representative photograph
RE 9.3.26 VMA Status: Least concern Biodiversity Status: Of concern REDD short description: Mixed grassland to open grassland including <i>Eragrostis sp.</i>, <i>Aristida sp.</i>, <i>Enneapogon sp.</i>, <i>Iseilema sp.</i>, <i>Chloris sp.</i>, or <i>Dichanthium sp.</i> on non-basalt derived alluvial deposits.	T1: Very sparse 10.6 –11.8m <i>Eucalyptus microneura</i> (D). T2: Very sparse 5 – 7m <i>E. microneura</i> (D). S1: Very sparse to Sparse 0.5 – 2.4m <i>Tephrosia sp.</i> (D), <i>Carissa lanceolata</i> (A), <i>Denhamia cunninghamii</i> (A), <i>Capparis mitchelli</i> (A), <i>Erythroxylum australe</i> (A), <i>Melhania oblongifolia</i> (A). G: Sparse – Mid-dense 0 - 0.5m <i>D. sericeum</i> (D), <i>Aristida sp.</i> (SD), <i>Grewia savannicola</i> (A), <i>C. verrucosa</i> (A), <i>Glycine sp.</i> (A), <i>Heteropogon contortus</i> (A).	
RE 9.5.10a VMA Status: Least concern Biodiversity Status: No concern at present REDD short description: <i>Eucalyptus microneura</i> +/- <i>Terminalia spp.</i> low woodland on sand sheets.	T1: Sparse 10.5 – 14m <i>E. microneura</i> (D). T2: Very sparse 5-9m <i>E. microneura</i> (CD-SD), <i>Melaleuca citrolens</i> (CD-A), <i>Diospyros humilis</i> (A), <i>Vachellia bidwillii</i> (A), <i>D. cunninghamii</i> (A). S1: Very sparse to Sparse 0.5 – 3m <i>E. australe</i> (CD-A), <i>C. lanceolata</i> (CD-SD), <i>Alphitonia excelsa</i> (A), <i>V. bidwillii</i> (A), <i>Petalostigma pubescens</i> (A), <i>Atalaya hemiglauca</i> (A). G: Sparse 0 - 0.5m <i>D. sericeum</i> (CD-A), <i>Aristida sp.</i> (CD-SD) <i>Themeda triandra</i> (A), <i>Heteropogon contortus</i> (A), <i>C. lanceolata</i> (A).	

Description and status	Ground-truthed floristic composition and structure	Representative photograph
RE 9.11.16 VMA Status: Least concern Biodiversity Status: No concern at present REDD short description: <i>Eucalyptus crebra</i> +/- <i>Corymbia erythrophloia</i> or <i>Corymbia pocillum</i> woodland on steep to rolling hills.	T1: Sparse 12 – 15m <i>Eucalyptus crebra</i> (D). T2: Very sparse 4 – 7m <i>E. crebra</i> (CD), <i>A. leptostachya</i> (CD-A), <i>Terminalia aridicola</i> (SD), <i>A. excelsa</i> (A), <i>D. cunninghamii</i> (A). S1: Very sparse 0.5 – 3m <i>Petalostigma banksii</i> (D), <i>V. bidwillii</i> (A), <i>A. excelsa</i> (A), <i>Indigofera</i> sp. (A), <i>G. mimosoides</i> (A). G: Sparse 0 - 0.5m <i>Aristida</i> sp. (D), <i>*Stylosanthes scabra</i> (A), <i>P. banksii</i> (A), <i>Enneapogon lindleyanus</i> (A), <i>H. contortus</i> (A), <i>Glycine</i> sp. (A).	
RE 9.12.11 VMA Status: Least concern Biodiversity Status: No concern at present REDD short description: <i>E. crebra</i> and/or <i>Eucalyptus whitei</i> +/- <i>C. erythrophloia</i> open woodland on steep to rolling hills on igneous rocks.	T1: Very sparse to Mid-dense 7 – 10m <i>E. crebra</i> (D, SD, or A), <i>A. shrileyi</i> (D, SD, or A), <i>Corymbia erythrophloia</i> (A), <i>Erythrophleum chlorostachys</i> (A). T2: Very sparse to Sparse 2.5 – 5m <i>P. banksia</i> (CD-A), <i>A. excelsa</i> (SD-A), <i>T. aridicola</i> (A), <i>A. excelsa</i> (A), <i>G. parallela</i> (A), <i>G. glauca</i> (A), <i>G. mimosoides</i> (A). S1: Very sparse to Sparse 0.5 – 2m <i>P. banksii</i> (CD), <i>A. excelsa</i> (A), <i>C. lanceolata</i> (CD-A), <i>E. australe</i> (A), <i>A. leptostachya</i> (A), <i>Acacia disparrima</i> (A), <i>Acacia gonoclada</i> (A). G: Sparse – Mid-dense 0 - 0.5m <i>A. contortus</i> (D), <i>Cymbopogon bombycinus</i> (A), <i>Themeda triandra</i> (A), <i>S. fragile</i> (A), <i>Zornia sterlingii</i> (A) <i>Brunoniella acaulis</i> (A), <i>Aristida</i> sp. (A), <i>B. bipinnata</i> (A).	

APPENDIX F

Flora Species List

Table F1 Flora species recorded within the study area

Status		Family	Scientific name	Common name	Regional Ecosystem					
NCA	EPBC				2.10.5a	9.3.13	9.3.26	9.5.10a	9.11.16	9.12.11
LC	-	Acanthaceae	<i>Brunoniella acaulis</i>	Blue trumpet						X
LC	-	Acanthaceae	<i>Rostellularia adscendens</i>	Pink tongues					X	X
LC	-	Amaranthaceae	<i>Achyranthes aspera</i>	Chaff weed					X	X
LC	-	Amaranthaceae	<i>Gomphrena flaccida</i>	Bunched Gomphrena	X					
*	-	Amaranthaceae	<i>Gomphrena celosioides</i>	Gomphrena weed		X				
LC	-	Apocynaceae	<i>Carissa lanceolata</i>	Konkerberry				X		X
**	-	Apocynaceae	<i>Cryptostegia grandiflora</i>	Rubber Vine		X				
LC	-	Araliaceae	<i>Trachymene glaucifolia</i>	Wild parsnip	X					
*	-	Asteraceae	<i>Bidens bipinnata</i>	Bidens	X			X	X	X
*	-	Asteraceae	<i>Emilia sonchifolia</i>	Lilac tasselflower						X
LC	-	Asteraceae	<i>Pterocaulon sphacelatum</i>	Fruit-salad plant					X	X
*	-	Asteraceae	<i>Xanthium occidentale</i>	Noogoora burr		X				
LC	-	Bignoniaceae	<i>Dolichandrone heterophylla</i>	Lemonwood				X		X
LC	-	Bignoniaceae	<i>Pandorana pandorana</i>	Wonga vine	X					
LC	-	Boraginaceae	<i>Trichodesma zeylanicum</i>	Camel bush		X				
LC	-	Burseraceae	<i>Canarium australasicum</i>	Mango bark						X
LC	-	Byttneriaceae	<i>Waltheria indica</i>	Sleepy morning				X		X
LC	-	Capparaceae	<i>Capparis mitchellii</i>	Native Orange	X				X	
LC	-	Caryophyllaceae	<i>Polycarpaea corymbosa</i>	Oldman's cap	X					
LC	-	Celastraceae	<i>Denhamia cunninghamii</i>	Yellowberry bush				X	X	X

Status		Family	Scientific name	Common name	Regional Ecosystem					
NCA	EPBC				2.10.5a	9.3.13	9.3.26	9.5.10a	9.11.16	9.12.11
LC	-	Cleomaceae	<i>Cleome viscosa</i>	Tickweed	X	X	X	X	X	X
LC	-	Combretaceae	<i>Terminalia aridicola</i>	Arid peach	X			X	X	X
LC	-	Convolvulaceae	<i>Evolvulus alsinoides</i>	Dwarf Ipomoea	X			X	X	X
LC	-	Convolvulaceae	<i>Ipomoea sp.</i>	Morning glory	X					
LC	-	Convolvulaceae	<i>Xenostegia tridentata</i>	Arrow-leaf morning glory					X	X
LC	-	Cucurbitaceae	<i>Cucumis sp.</i>	Melon						X
LC	-	Cupressacaceae	<i>Callitris intratropica</i>	Coast cypress pine	X					
LC	-	Ebenaceae	<i>Diospyros humilis</i>	Queensland ebony				X		X
LC	-	Erythroxylaceae	<i>Erythroxylum australe</i>	Cocaine bush	X			X	X	X
LC	-	Erythroxylaceae	<i>Erythroxylum ellipticum</i>	Brown plum	X			X	X	X
LC	-	Euphorbiaceae	<i>Croton arnhemicus</i>	Hard cascarilla						X
*	-	Euphorbiaceae	<i>Euphorbia hirta</i>	Asthma plant					X	X
LC	-	Euphorbiaceae	<i>Euphorbia sp.</i>	Spurge				X		
LC	-	Lamiaceae	<i>Clerodendrum floribundum</i>	Lolly bush				X		
*	-	Lamiaceae	<i>Mesosphaerum suaveolens</i>	Hyptis	X	X	X	X	X	X
LC	-	Lamiaceae	<i>Premna tomentosa</i>	Teak					X	X
LC	-	Lauraceae	<i>Cassytha sp.</i>	Devils twine					X	
LC	-	Laxmanniaceae	<i>Lomandra multiflora</i>	Many-flowered mat-rush						X
LC	-	Lecythidaceae	<i>Planchonia careya</i>	Cocky apple						X
LC	-	Leguminosae (Fabaceae)	<i>Abrus precatorius</i>	Crab's eye						X
LC	-	Leguminosae (Mimosaceae)	<i>Acacia disparrima</i>	Southern salwood					X	X
LC	-	Leguminosae (Mimosaceae)	<i>Acacia galioides</i>	-					X	X

Status		Family	Scientific name	Common name	Regional Ecosystem					
NCA	EPBC				2.10.5a	9.3.13	9.3.26	9.5.10a	9.11.16	9.12.11
LC	-	Leguminosae (Mimosaceae)	<i>Acacia gonoclada</i>	Ganambureng						X
LC	-	Leguminosae (Mimosaceae)	<i>Acacia julifera ssp. julifera</i>	Catkin wattle	X					
LC	-	Leguminosae (Mimosaceae)	<i>Acacia leptostachya</i>	Showy wattle	X				X	X
LC	-	Leguminosae (Mimosaceae)	<i>Acacia orthocarpa</i>	Pilbara weeping wattle					X	X
LC	-	Leguminosae (Mimosaceae)	<i>Acacia shirleyi</i>	Lancewood	X					
LC	-	Leguminosae (Fabaceae)	<i>Aeschynomene sp.</i>	-						X
LC	-	Leguminosae (Caesalpiniaceae)	<i>Chamaecrista absus</i>	Four-leafed cassia	X					
*	-	Leguminosae (Fabaceae)	<i>Clitoria ternatea</i>	Blue butterfly pea						X
LC	-	Leguminosae (Fabaceae)	<i>Crotalaria medicaginea</i>	Trefoil rattlepod		X	X			
LC	-	Leguminosae (Fabaceae)	<i>Crotalaria novae-hollandiae</i>	New Holland rattlepod		X	X			
LC	-	Leguminosae (Fabaceae)	<i>Crotalaria verrucosa</i>	Blue-flowered rattlepod		X	X			
LC	-	Leguminosae (Caesalpiniaceae)	<i>Erythrophleum chlorostachys</i>	Cooktown ironwood	X			X	X	X
LC	-	Leguminosae (Fabaceae)	<i>Hovea longipes</i>	Brush Hovea	X					
LC	-	Leguminosae (Fabaceae)	<i>Indigofera hirsuta</i>	Hairy indigo	X				X	X
LC	-	Leguminosae (Fabaceae)	<i>Indigofera linifolia</i>	Narrow-leafed indigo				X		
LC	-	Leguminosae (Fabaceae)	<i>Indigofera linnaei</i>	Birdsville indigo				X		
LC	-	Leguminosae (Fabaceae)	<i>Indigofera pratensis</i>	Forest indigo	X				X	X
LC	-	Leguminosae (Fabaceae)	<i>sp.</i>	-	X				X	X
LC	-	Leguminosae (Caesalpiniaceae)	<i>Lysiphyllum cunninghamii</i>	Kimberly bauhinia		X				
LC	-	Leguminosae (Fabaceae)	<i>Rhynchosia minima</i>	Least snout-bean				x	X	X
LC	-	Leguminosae (Fabaceae)	<i>Sesbania cannabina</i>	Yellow pea bush						X
*	-	Leguminosae (Fabaceae)	<i>Stylosanthes scabra</i>	Stylo	X			X	X	X

Status		Family	Scientific name	Common name	Regional Ecosystem					
NCA	EPBC				2.10.5a	9.3.13	9.3.26	9.5.10a	9.11.16	9.12.11
LC	-	Leguminosae (Mimosaceae)	<i>Tephrosia sp.</i>	-			X	X		
LC	-	Leguminosae (Fabaceae)	<i>Uraria lagopodioides</i>	Velcro pea	X				X	X
LC	-	Leguminosae (Mimosaceae)	<i>Vachellia bidwillii</i>	Corkwood wattle				X		X
LC	-	Leguminosae (Mimosaceae)	<i>Zornia sp.</i>	-						X
LC	-	Leguminosae (Fabaceae)	<i>Zornia stirlingii</i>	-						X
LC	-	Lythraceae	<i>Ammannia multiflora</i>	Jerry-jerry		X				
LC	-	Malvaceae	<i>Abutilon sp.</i>	Mallow						X
LC	-	Malvaceae	<i>Hibiscus meraukensis</i>	Merauke Hibiscus	X			X	X	X
*	-	Malvaceae	<i>Malvastrum americanum</i>	Spiked Malvastrum						X
LC	-	Menispermaceae	<i>Tinospora smilacina</i>	Snake vine	X			X	X	X
LC	-	Moraceae	<i>Ficus opposita</i>	Sandpaper fig		X				
LC	-	Myrtaceae	<i>Corymbia confertiflora</i>	-			X	X		
LC	-	Myrtaceae	<i>Corymbia dallachiana</i>	Dallachy's ghost gum				X	X	X
LC	-	Myrtaceae	<i>Corymbia tessellaris</i>	Moreton Bay ash		X				
LC	-	Myrtaceae	<i>Eucalyptus camaldulensis</i>	River red gum		X				
LC	-	Myrtaceae	<i>Eucalyptus chartaboma</i>	Paperbark gum	X					
LC	-	Myrtaceae	<i>Eucalyptus crebra</i>	Narrow-leaved ironbark				X	X	X
LC	-	Myrtaceae	<i>Eucalyptus microneura</i>	Gilbert River box				X	X	X
LC	-	Myrtaceae	<i>Lophostemon grandiflorus</i>	Swamp box		X				
LC	-	Myrtaceae	<i>Melaleuca bracteata</i>	Black tea-tree		X				
LC	-	Myrtaceae	<i>Melaleuca citrolens</i>	Gularn		X				
LC	-	Myrtaceae	<i>Melaleuca fluviatilis</i>	Weeping tea-tree		X				

Status		Family	Scientific name	Common name	Regional Ecosystem					
NCA	EPBC				2.10.5a	9.3.13	9.3.26	9.5.10a	9.11.16	9.12.11
LC	-	Myrtaceae	<i>Melaleuca nervosa</i>	Fibrebark				X		
LC	-	Orchidaceae	<i>Cymbidium canaliculatum</i>	Black orchid		X	X	X	X	X
LC	-	Orobanchaceae	<i>Buchnera linearis</i>	Blackrod						X
*	-	Passifloraceae	<i>Passiflora foetida</i>	Stinking passionflower	X					
LC	-	Pentapetaceae	<i>Melhania oblongifolia</i>	Melhania	X			X	X	X
LC	-	Phyllanthaceae	<i>Breynia oblongifolia</i>	Coffee bush						X
LC	-	Phyllanthaceae	<i>Flueggea virosa</i>	Common bushweed		X				X
LC	-	Picrodendraceae	<i>Petalostigma banksii</i>	Quinine bush	X			X	X	X
LC	-	Picrodendraceae	<i>Petalostigma pubescens</i>	Quinine				X		
LC	-	Pittosporaceae	<i>Bursaria incana</i>	Prickly pine	X					X
LC	-	Poaceae	<i>Aristida sp.</i>	-				X	X	X
LC	-	Poaceae	<i>Aristida calycina</i>	Dark wire grass					X	X
LC	-	Poaceae	<i>Arundinella nepalensis</i>	River grass	X				X	X
LC	-	Poaceae	<i>Bothriochloa bladhii</i>	Bluestem		X				
LC	-	Poaceae	<i>Bothriochloa decipiens</i>	Pitted bluegrass		X				
*	-	Poaceae	<i>Bothriochloa pertusa</i>	Indian bluegrass		X				
LC	-	Poaceae	<i>Chrysopogon fallax</i>	Golden-beard grass				X		
LC	-	Poaceae	<i>Cymbopogon bombycinus</i>	Lemon-scented grass	X				X	X
LC	-	Poaceae	<i>Dichanthium sericeum</i>	Queensland bluegrass		X				
LC	-	Poaceae	<i>Enneapogon lindleyanus</i>	Lindley nineawn					X	X
LC	-	Poaceae	<i>Enneapogon polyphyllus</i>	Leafy nineawn	X					
LC	-	Poaceae	<i>Eriachne ciliata</i>	Wanderrie grass	X				X	X

Status		Family	Scientific name	Common name	Regional Ecosystem					
NCA	EPBC				2.10.5a	9.3.13	9.3.26	9.5.10a	9.11.16	9.12.11
LC	-	Poaceae	<i>Heteropogon contortus</i>	Black speargrass				X	X	X
LC	-	Poaceae	<i>Heteropogon triticeus</i>	Giant speargrass					X	X
*	-	Poaceae	<i>Megathyrsus maximus</i>	Guinea grass		X				
*	-	Poaceae	<i>Melinis repens</i>	Red Natal grass						X
LC	-	Poaceae	<i>Panicum sp.</i>	Panic grass		X				
LC	-	Poaceae	<i>Schizachyrium fragile</i>	Fire grass	X			X	X	X
LC	-	Poaceae	<i>Setaria surgens</i>	Pigeon grass		X				
LC	-	Poaceae	<i>Sporobolus caroli</i>	Fairy grass		X				
*	-	Poaceae	<i>Themeda quadrivalvis</i>	Grader grass		X				
LC	-	Poaceae	<i>Themeda triandra</i>	Kangaroo grass				X	X	X
LC	-	Poaceae	<i>Triodia sp.</i>	Spinifex					X	X
LC	-	Portulacaceae	<i>Calandrinia uniflora</i>	-				X		
*	-	Portulacaceae	<i>Portulaca oleracea</i>	Common purslane				X		
LC	-	Proteaceae	<i>Grevillea decora</i>	-	X					
LC	-	Proteaceae	<i>Grevillea glauca</i>	Bushman's clothes peg						X
LC	-	Proteaceae	<i>Grevillea mimosoides</i>	Tar Grevillea					x	X
LC	-	Proteaceae	<i>Grevillea parallela</i>	Silver oak	X			X	X	X
LC	-	Proteaceae	<i>Grevillea striata</i>	Beefwood				X	X	X
LC	-	Proteaceae	<i>Hakea arborescens</i>	Common Hakea					X	X
LC	-	Proteaceae	<i>Hakea lorea</i>	Bootlace oak				X		
LC	-	Proteaceae	<i>Persoonia falcata</i>	Wild pear	X					
LC	-	Pteridaceae	<i>Cheilanthes brownii</i>	Rock fern	X					

Status		Family	Scientific name	Common name	Regional Ecosystem					
NCA	EPBC				2.10.5a	9.3.13	9.3.26	9.5.10a	9.11.16	9.12.11
LC	-	Pteridaceae	<i>Cheilanthes nitida</i>	Rock fern	X					
LC	-	Pteridaceae	<i>Cheilanthes sieberi</i>	Rock fern	X					
LC	-	Santalaceae	<i>Exocarpos latifolius</i>	Native cherry		X				
LC	-	Santalaceae	<i>Santalum lanceolatum</i>	Northern sandalwood	X					
LC	-	Sapindaceae	<i>Atalaya hemiglauca</i>	Whitewood				X		
LC	-	Sapindaceae	<i>Dodonaea physocarpa</i>	-					X	X
LC	-	Sapotaceae	<i>Sersalisia sericea</i>	Mongo						X
*	-	Solanaceae	<i>Datura ferox</i>	Long-spined thorn-apple		X				
LC	-	Solanaceae	<i>Solanum ellipticum</i>	Potato bush					X	X
LC	-	Sparrmanniaceae	<i>Grewia savannicola</i>	Dog's balls				X	X	X
LC	-	Rhamnaceae	<i>Alphitonia excelsa</i>	Soap tree	X			X	X	X
LC	-	Rubiaceae	<i>Coelospermum reticulatum</i>	Medicine bush	X					
LC	-	Rubiaceae	<i>Larsenaikia ochreatea</i>	Native gardenia	X				X	X
LC	-	Rubiaceae	<i>Pavetta granitica</i>	-					X	
LC	-	Taccaceae	<i>Tacca leontopetaloides</i>	Polynesian arrowroot						X
LC	-	Violaceae	<i>Afrohybanthus enneaspermus</i>	Lady's slipper						X
LC	-	Vitaceae	<i>Cayratia trifolia</i>	Bush grape		X	X			

Status: LC = Least Concern, * = non-native to Australia, ** = species that is a restricted invasive plant in Queensland.

NCA = Nature Conservation Act 1992, EPBC = Environment Protection and Biodiversity Conservation Act 1999

APPENDIX G

Fauna Species List

Table G1 Fauna species recorded within the study area

Status		Family	Scientific name	Common name	Survey site						
NCA	EPBC				1	2	3	4	5	6	Incidental
BIRDS											
LC	-	Anatidae	<i>Anas superciliosa</i>	Pacific black duck							X
LC	-	Podicipidae	<i>Tachybaptus novaehollandiae</i>	Australasian grebe							X
LC	-	Columbidae	<i>Geophaps scripta</i>	Squatter Pigeon							X
LC	-	Columbidae	<i>Ocyphaps lophotes</i>	Crested pigeon	X						X
LC	-	Columbidae	<i>Geopelia striata</i>	Peaceful dove	X		X	X			X
LC	-	Columbidae	<i>Phaps chalcoptera</i>	Common bronzewing	X	X					X
LC	-	Podargidae	<i>Podargus strigoides</i>	Tawny frogmouth	X						X
LC	-	Eurostopodidae	<i>Eurostopodus argus</i>	Spotted nightjar							X
LC	-	Accipitridae	<i>Aquila audax</i>	Wedge-tailed eagle							X
LC	-	Accipitridae	<i>Accipiter fasciatus</i>	Brown goshawk			X	X			X
LC	-	Accipitridae	<i>Haliastur sphenurus</i>	Whistling kite							X
LC	-	Accipitridae	<i>Milvus migrans</i>	Black kite							X
LC	-	Falconidae	<i>Falco berigora</i>	Brown falcon		X					X
LC	-	Gruidae	<i>Grus rubicunda</i>	Brolga							X
LC	-	Otididae	<i>Ardeotis australis</i>	Australian bustard				X			
LC	-	Cacatuidae	<i>Calyptorhynchus banksii</i>	Red-tailed black-cockatoo	X						X
LC	-	Cacatuidae	<i>Cacatua galerita</i>	Sulphur-crested cockatoo							X
LC	-	Cacatuidae	<i>Eolophus roseicapillus</i>	Galah							X
LC	-	Cuculidae	<i>Centropus phasianinus</i>	Pheasant coucal				X			
LC	-	Cuculidae	<i>Scythrops novaehollandiae</i>	Channel-billed cuckoo				X			
LC	-	Strigidae	<i>Ninox novaeseelandiae</i>	Southern boobook				X	X		X
LC	-	Psittacidae	<i>Platycercus adscitus</i>	Pale-headed rosella	X	X	X	X		X	X
LC	-	Psittacidae	<i>Aprosmictus erythropterus</i>	Red winged parrot				X			
LC	-	Psittacidae	<i>Trichoglossus haematodus moluccanus</i>	Rainbow lorikeet	X	X					X
LC	-	Halcyonidae	<i>Dacelo leachii</i>	Blue-winged kookaburra	X	X					X
LC	-	Halcyonidae	<i>Dacelo novaeguineae</i>	Laughing kookaburra			X				X
LC	-	Ptilonorhynchidae	<i>Ptilonorhynchus nuchalis</i>	Great bowerbird							X
LC	-	Acanthizidae	<i>Gerygone albogularis</i>	White-throated gerygone							X
LC	-	Acanthizidae	<i>Smicrornis brevirostris</i>	Weebill	X						X
LC	-	Pardalotidae	<i>Pardalotus striatus</i>	Striated pardalote	X		X				X
LC	-	Meliphagidae	<i>Entomyzon cyanotis</i>	Blue-faced honeyeater	X						X
LC	-	Meliphagidae	<i>Manorina flavigula</i>	Yellow-throated miner	X		X				X
LC	-	Meliphagidae	<i>Melithreptus albogularis</i>	White-throated honeyeater	X		X	X			
LC	-	Meliphagidae	<i>Philemon corniculatus</i>	Noisy Friarbird	X	X		X	X	X	X
LC	-	Meliphagidae	<i>Philemon citreogularis</i>	Little friarbird		X					
LC	-	Campephagidae	<i>Coracina novaehollandiae</i>	Black-faced cuckoo-shrike	X		X	X			X
LC	-	Oriolidae	<i>Oriolus sagittatus</i>	Olive-backed oriole			X				

Status		Family	Scientific name	Common name	Survey site						
NCA	EPBC				1	2	3	4	5	6	Incidental
LC	-	Artamidae	<i>Artamus minor</i>	Little woodswallow		X	X				X
LC	-	Corcoracidae	<i>Struthidea cinerea</i>	Apostlebird							X
LC	-	Artamidae	<i>Cracticus nigrogularis</i>	Pied butcherbird	X		X	X		X	X
LC	-	Artamidae	<i>Cracticus torquatus</i>	Grey butcherbird		X	X				X
LC	-	Artamidae	<i>Strepera graculina graculina</i>	Pied currawong	X	X	X		X	X	X
LC	-	Artamidae	<i>Cracticus tibicen</i>	Australian magpie	X		X	X			X
LC	-	Rhipiduridae	<i>Rhipidura leucophrys</i>	Willie wagtail	X						X
LC	-	Rhipiduridae	<i>Rhipidura albiscapa</i>	Grey Fantail		X					
LC	-	Corvidae	<i>Corvus orru</i>	Toressian Crow	X	X	X	X			X
LC	-	Monarchidae	<i>Grallina cyanoleuca</i>	Magpie lark							X
LC	-	Nectariniidae	<i>Dicaeum hirundinaceum</i>	Mistletoebird	X		X	X			X
LC	-	Estrildidae	<i>Taeniopygia bichenovii</i>	Double-barred finch			X				
MAMMALS											
*	-	Bovidae	<i>Bos taurus</i>	European cattle			X	X			X
LC	-	Emballonuridae	<i>Saccolaimus flaviventris</i>	Yellow-bellied sheathtail bat				X	X	X	X
LC	-	Emballonuridae	<i>Taphozous troughtoni</i>	Troughton’s sheathtail bat				X	X	X	X
LC	-	Potoroidae	<i>Aepyprymnus rufescens</i>	Rufous bettong	X						X
*	-	Leporidae	<i>Oryctolagus cuniculus</i>	European rabbit							X
LC	-	Macropodidae	<i>Macropus robustus</i>	Common wallaroo				X		X	X
LC	-	Macropodidae	<i>Macropus giganteus</i>	Eastern grey kangaroo							X
LC	-	Miniopteridae	<i>Miniopterus australis</i>	Little bent-wing bat			X				
LC	-	Miniopteridae	<i>Miniopterus orianae</i>	Eastern bent-wing bat				X	X	X	X
LC	-	Molossidae	<i>Chaerephon jobensis</i>	Greater northern freetail bat		X	X	X	X	X	X
LC	-	Molossidae	<i>Ozimops lumsdenae</i>	Northern freetail bat			X	X	X		X
LC	-	Molossidae	<i>Ozimops ridei</i>	Ride’s freetail bat							X
LC	-	Rhinolophidae	<i>Rhinolophus megaphyllus</i>	Eastern Horseshoe Bat	X						X
LC	-	Vespertilionidae	<i>Chalinolobus nigrogriseus</i>	Hoary wattled bat				X	X	X	X
LC	-	Vespertilionidae	<i>Nyctophilus sp.</i>	Long-eared bat			X				
LC	-	Vespertilionidae	<i>Scotorepens balstoni</i>	Inland broad-nosed bat	X						X
LC	-	Vespertilionidae	<i>Scotorepens greyii</i>	Little broad-nosed bat	X	X	X	X	X		X
LC	-	Vespertilionidae	<i>Scotorepens sanborni</i>	Northern broad-nosed bat			X	X			X
LC	-	Vespertilionidae	<i>Vespadelus troughtoni</i>	Eastern cave bat	X		X	X	X	X	X
LC	-	Vespertilionidae / Molossidae	<i>Chalinolobus nigrogriseus</i> / <i>Ozimops ridei</i>	Hoary wattled bat / Ride’s freetail bat							X
LC	-	Vespertilionidae	<i>Chalinolobus nigrogriseus</i> / <i>Scotorepens greyii</i>	Hoary wattled bat / Little broad-nosed bat				X		X	X
LC	-	Vespertilionidae	<i>Scotorepens greyii</i> / <i>Scotorepens sanborni</i>	Little broad-nosed bat / Northern broad-nosed bat				X	X		X
REPTILES											
LC	-	Elapidae	<i>Acanthophis antarcticus</i>	Common death adder							X
LC	-	Elapidae	<i>Demansia papuanensis</i>	Greater black whip snake							X
LC	-	Diplodactylidae	<i>Amalosia rhombifer</i>	Zigzag velvet gecko		X		X		X	

Status		Family	Scientific name	Common name	Survey site						
NCA	EPBC				1	2	3	4	5	6	Incidental
LC	-	Scincidae	<i>Ctenotus sp.</i>	-	X						
LC	-	Diplodactylidae	<i>Diplodactylus platyurus</i>	Eastern fat-tailed gecko						X	
LC	-	Gekkonidae	<i>Gehyra dubia</i>	Dubious dtella				X			X
LC	-	Gekkonidae	<i>Gehyra einasleighensis</i>	Einasleigh rock dtella				X	X		
LC	-	Gekkonidae	<i>Heteronotia binoei</i>	Bynoe's gecko				X	X	X	X
*	-	Gekkonidae	<i>Hemidactylus frenatus</i>	Asian house gecko							X
LC	-	Gekkonidae	<i>Oedura argentea</i>	Silver-eyed velvet gecko					X		X
NE	NE	Diplodactylidae	<i>Lucasium iris</i>	Gilbert ground gecko					X		
LC	-	Diplodactylidae	<i>Oedura castelnaui</i>	Northern velvet gecko		X				X	
LC	-	Pygopodidae	<i>Lialis burtonis</i>	Burton's legless lizard				X			
LC	-	Scincidae	<i>Carlia munda</i>	Shaded-litter rainbow skink	X	X					
LC	-	Scincidae	<i>Carlia schmeltzii</i>	Robust rainbow skink			X				
LC	-	Scincidae	<i>Cryptoblepharus sp.</i>	-						X	
LC	-	Scincidae	<i>Morethia taeniopleura</i>	Fire-tailed skink			X				X
LC	-	Varanidae	<i>Varanus tristis</i>	Black-headed monitor				X			X
AMPHIBIANS											
*	-	Bufonidae	<i>Rhinella marina</i>	Cane toad			X		X		X
LC	-	Hylidae	<i>Litoria inermis</i>	Bumpy rocket frog							X
LC	-	Hylidae	<i>Litoria rubella</i>	Desert tree frog							X
LC	-	Limnodynastidae	<i>Platyplectrum ornatum</i>	Ornate burrowing frog			X				

Status: NE = Not Evaluated, LC = Least Concern , * = non-native to Australia

NCA = Nature Conservation Act 1992, EPBC = Environment Protection and Biodiversity Conservation Act 1999

APPENDIX H

Microbat Call Interpretation Reports



Microbat Call Identification Report

Prepared for (“Client”):	SLR Consulting
Survey location/project name:	Agate Creek (Forsayth area)
Survey dates:	25-29 May 2020
Client project reference:	623-20155-0002
Job no.:	SLR-2005
Report date:	31 July 2020

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Methods

Data received

Balance! Environmental received 4314 full-spectrum audio files (WAV files), recorded over five consecutive nights (25th – 29th May 2020) using an Anabat Swift detector (Titley Scientific, Brisbane). GPS coordinates saved in the metadata for each recording indicate the detector was deployed at a new site each night.

Bat-call analysis

The data were processed in three steps using *Anabat Insight* (Version 1.9.4; Titley Scientific, Brisbane):

1. All WAV files were scanned with a 'noise' filter to separate files containing only non-bat background noise from those with potentially identifiable calls.
2. WAV files that passed the 'noise' filter (*i.e.* contained bat calls) were then processed through a Decision Tree analysis to group calls with similar pulse characteristics (e.g. characteristic frequency, slope, duration) and apply tentative species labels.
3. Each "species" group was reviewed manually to verify and/or correct species labels by comparing call spectrograms and derived metrics with those of regionally relevant reference calls and published call descriptions (e.g. Reinhold *et al.* 2001; Milne 2002). For expediency of processing, for groups where calls were recorded in large quantity, once the constituent species of the group were identified for each night, the rest of the calls were left assigned only to the group label.

Species identification was also guided by considering probability of occurrence based on published distributional information (Churchill 2008; van Dyck *et al.* 2013) and/or records held in Atlas of Living Australia (<http://www.ala.org.au>).

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 noise filtration process excluded 3085 WAV files from further analysis. Some 1307 bat calls were identified in the remaining 1233 WAV files. More than 90% (1186) of the calls were recorded on the final night of deployment (29th May; see **Table 1**); and over half of those calls were from a single difficult-to-differentiate species group (*Chalinolobus nigrogriseus* / *Scotorepens greyii* / *S. sanborni*).

Twelve species were reliably identified from 549 (42%) of the recorded calls (**Table 1**, top section). The other 758 calls were assigned to three undifferentiated species-groups, all of which represented species that were otherwise positively identified (see lower portion of **Table 1**).

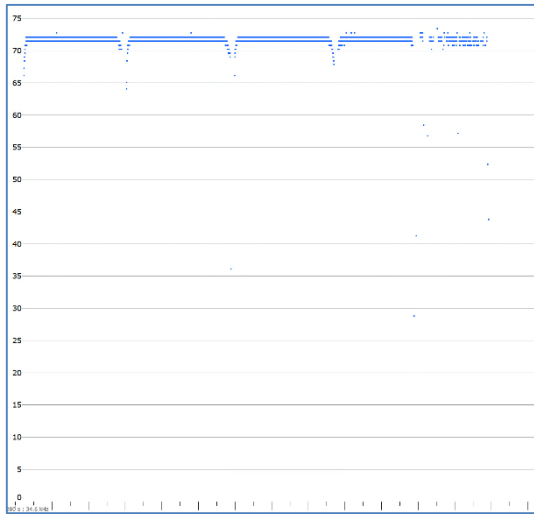
Table 1 Microbat species recorded during the Agate Creek survey, 25-29 May 2020.
Number of calls allocated per night to each species or “unresolved” species group

Night of:	25/5	26/5	27/5	28/5	29/5	Species Total
Positively identified calls						
<i>Rhinolophus megaphyllus</i>	2					2
<i>Chalinolobus nigrogriseus</i>				16	163	179
<i>Nyctophilus</i> sp.			1			1
<i>Scotorepens balstoni</i>	1				4	5
<i>Scotorepens greyii</i>	2	1	68	3	27	101
<i>Scotorepens sanborni</i>			2		9	11
<i>Vespadelus trougtoni</i>	2		2	1	26	31
<i>Miniopterus australis</i>			4			4
<i>Miniopterus orianae</i>					3	3
<i>Chaerephon jobensis</i>		3	3	5	175	186
<i>Ozimops lumsdenae</i>			1		8	9
<i>Ozimops ridei</i>					17	17
Unresolved calls						
<i>C. nigrogriseus</i> / <i>S. greyii</i>				4	631	635
<i>C. nigrogriseus</i> / <i>O. ridei</i>					117	117
<i>S. greyii</i> / <i>S. sanborni</i>					6	6
Detector-night Total	7	4	81	29	1186	1307

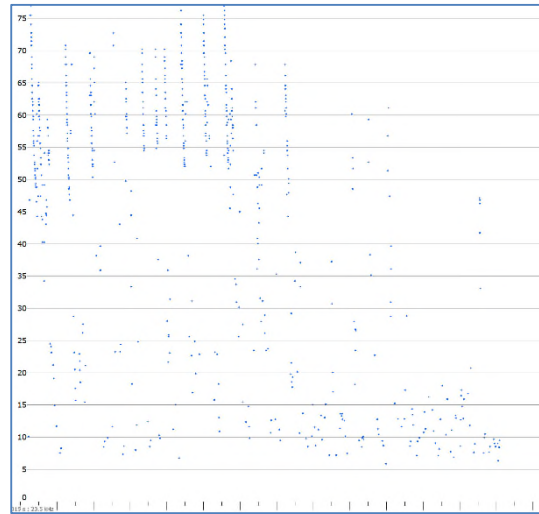
References

- Churchill, S. (2008). *Australian Bats*. Jacana Books, Allen & Unwin; Sydney.
- Jackson, S. and Groves, C. (2015). *Taxonomy of Australian Mammals*. CSIRO Publishing, Melbourne.
- Milne, D.J. (2002). *Key to the Bat Calls of the Top End of the Northern Territory*. Technical Report No. 71, Parks and Wildlife Commission of the Northern Territory, Darwin.
- Reardon, T. (2003). Standards in bat detector based surveys. *Australasian Bat Society Newsletter* 20, 41-43.
- Reinhold, L., Law, B., Ford, G. and Pennay, M. (2001). *Key to the bat calls of south-east Queensland and north-east New South Wales*. Department of Natural Resources and Mines, Brisbane.
- van Dyck, S., Gynther, I. and Baker, A. (ed.) (2013). *Field Companion to the Mammals of Australia*. New Holland; Sydney.

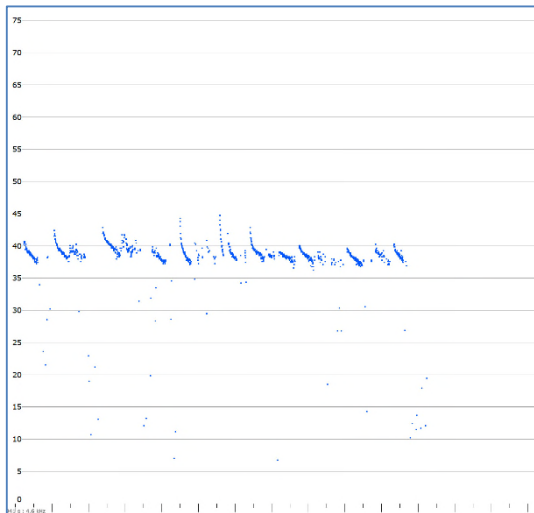
Appendix 1 Representative call sequences recorded at Agate Creek, 25-29 May 2020.
x-axis = 10 ms per tick-mark; time between pulses removed (i.e. compressed view)



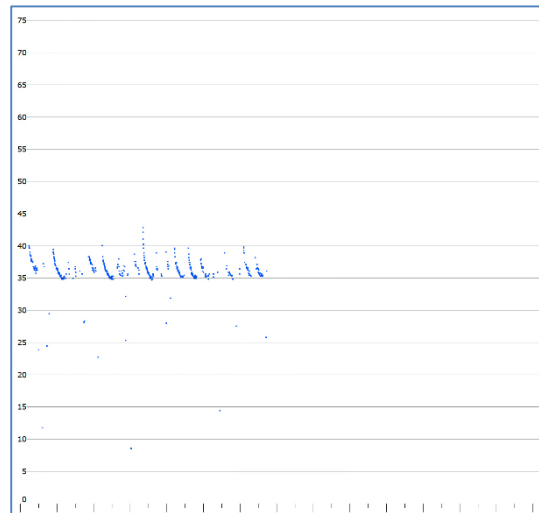
Rhinolophus megaphyllus



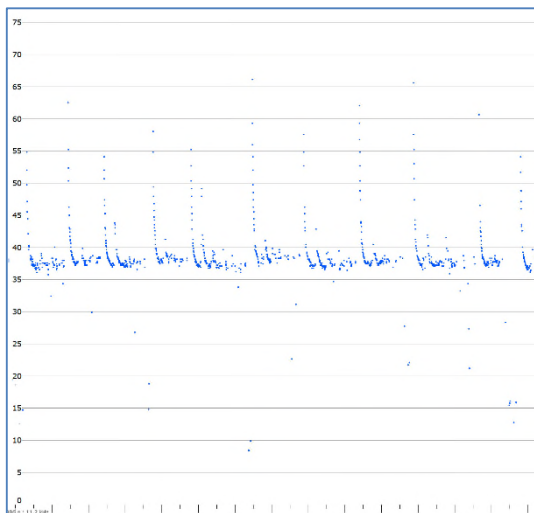
Nyctophilus sp.



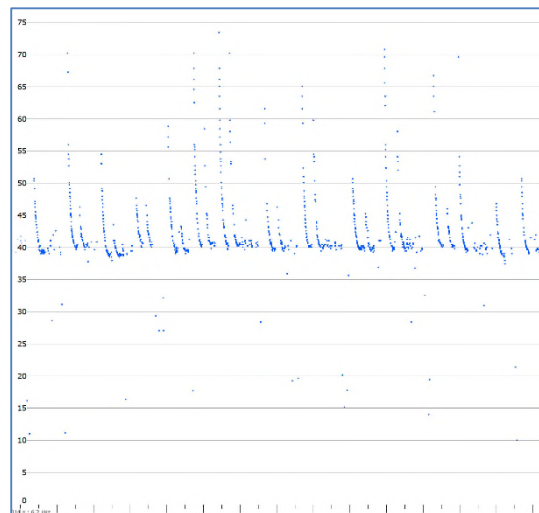
Chalinolobus nigrogriseus



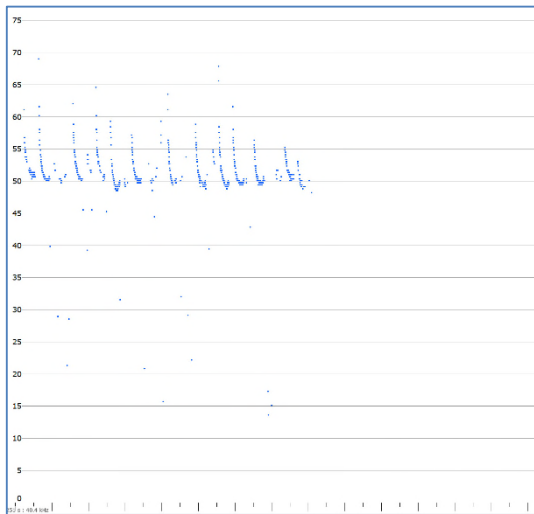
Scotorepens balstoni



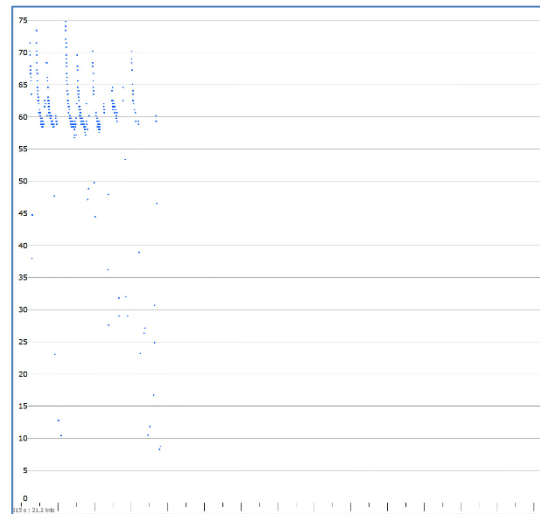
Scotorepens greyii



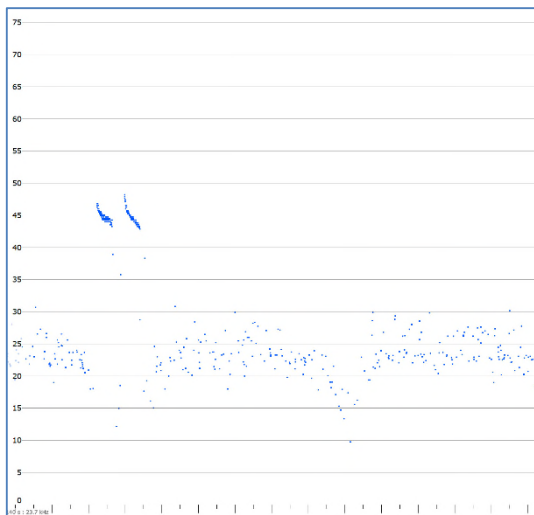
Scotorepens sanborni



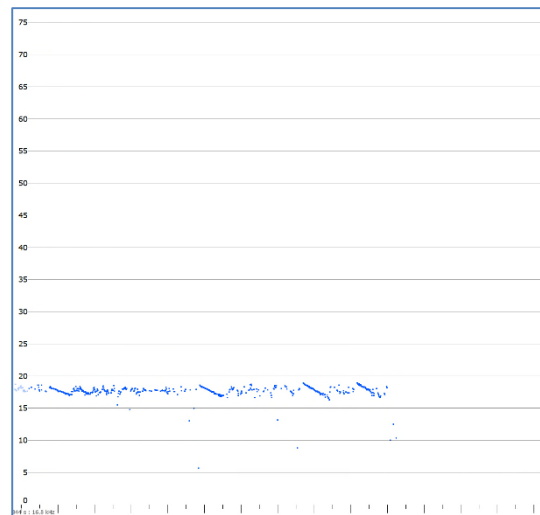
Vespardelus troughtoni



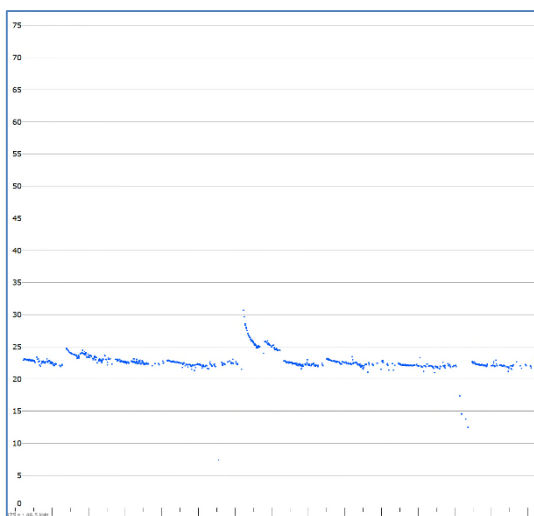
Miniopterus australis



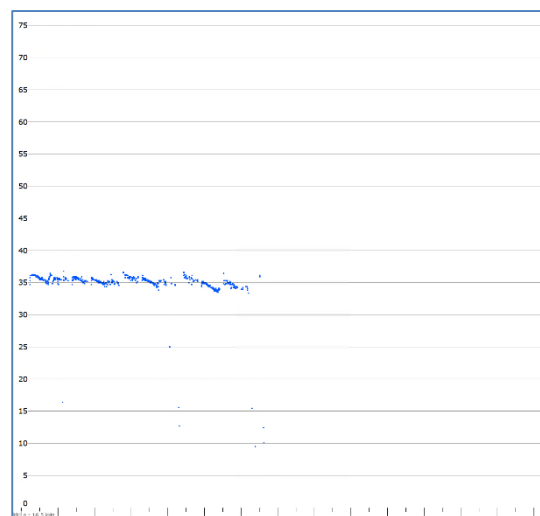
Miniopterus orianae



Chaerephon jobensis



Ozimops lumsdenae



Ozimops ridei



Microbat Call Identification Report

Prepared for ("Client"):	SLR Consulting
Survey location/project name:	Agate Creek (Forsayth area)
Survey dates:	30 November – 3 December 2020
Client project reference:	
Job no.:	SLR-2008
Report date:	7 January 2021

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Methods

Data received

Balance! Environmental received 4080 full-spectrum audio files (WAV files), recorded over four consecutive nights (30th November – 3rd December 2020) using a Song Meter SM4BAT-FS detector (Wildlife Acoustics, Maynard MA, USA).

Bat-call analysis

The data were processed in three steps using *Anabat Insight* (Version 1.9.7; Titley Scientific, Brisbane):

1. All WAV files were scanned with a 'noise' filter to separate files containing only non-bat background noise from those with potentially identifiable calls.
2. WAV files that passed the 'noise' filter (*i.e.* contained bat calls) were then processed through a Decision Tree analysis to group calls with similar pulse characteristics (e.g. characteristic frequency, slope, duration) and apply tentative species labels.
3. Each "species" group was reviewed manually to verify and/or correct species labels by comparing call spectrograms and derived metrics with those of regionally relevant reference calls and published call descriptions (e.g. Reinhold *et al.* 2001; Milne 2002).

Species identification was also guided by considering probability of occurrence based on published distributional information (Churchill 2008; van Dyck *et al.* 2013) and/or records held in Atlas of Living Australia (<http://www.ala.org.au>).

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 noise filtration process excluded 2384 WAV files from further analysis. Some 1781 bat calls were identified in the remaining 1696 WAV files.

More than 96% (1718) of the calls were positively identified to one of ten unique species (see upper section of **Table 1**). The other 63 "unresolved" calls each had characteristics that were potentially attributable to two or more species. These calls were allocated to two multi-species groups (see bottom section of **Table 1**), representing three species that were otherwise reliably identified from calls with more definitive features.

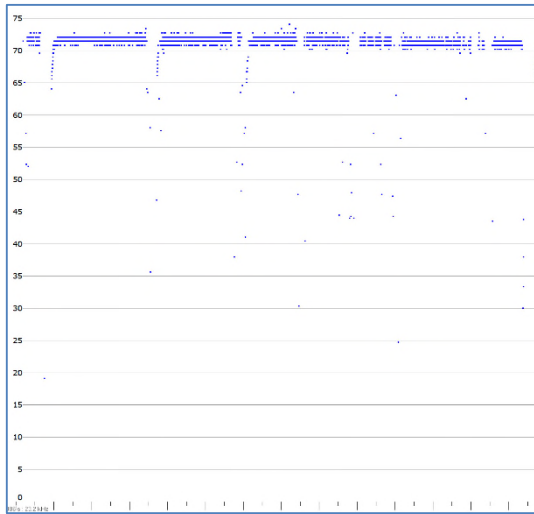
Table 1 Microbat species recorded during the Agate Creek survey, November-December 2020.
Number of calls allocated per night to each species or “unresolved” species group

Night:	30/11/2020	1/12/2020	2/12/2020	3/12/2020	Species Total
Positively identified calls					
<i>Rhinolophus megaphyllus</i>				1	1
<i>Chalinolobus nigrogriseus</i>	20	6	9	62	97
<i>Scotorepens greyii</i>	4	1		10	15
<i>Scotorepens sanborni</i>	2			9	11
<i>Vespadelus trougtoni</i>	6	129	5	39	179
<i>Miniopterus orianae</i>	1	2	3	3	9
<i>Chaerephon jobensis</i>	59	160	380	78	677
<i>Ozimops lumsdenae</i>	4	1		5	10
<i>Saccolaimus flaviventris</i>	10	5	5	5	25
<i>Taphozous trougtoni</i>	24	381	281	8	694
Unresolved calls					
<i>C. nigrogriseus</i> or <i>S. greyii</i>	15		3	33	51
<i>S. greyii</i> or <i>S. sanborni</i>	3	1		8	12
Detector-night Total	148	686	686	261	1781

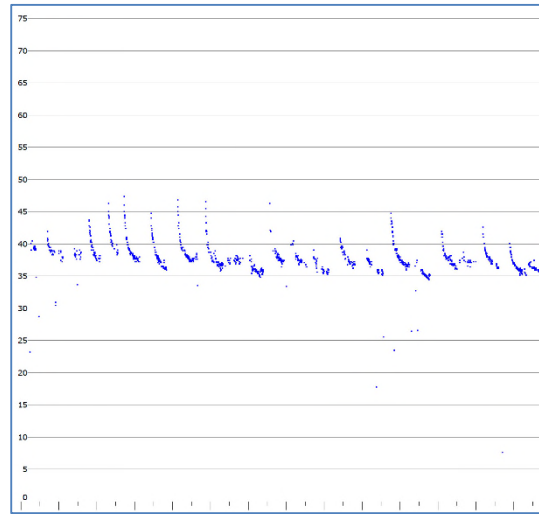
References

- Churchill, S. (2008). *Australian Bats*. Jacana Books, Allen & Unwin; Sydney.
- Jackson, S. and Groves, C. (2015). *Taxonomy of Australian Mammals*. CSIRO Publishing, Melbourne.
- Milne, D.J. (2002). *Key to the Bat Calls of the Top End of the Northern Territory*. Technical Report No. 71, Parks and Wildlife Commission of the Northern Territory, Darwin.
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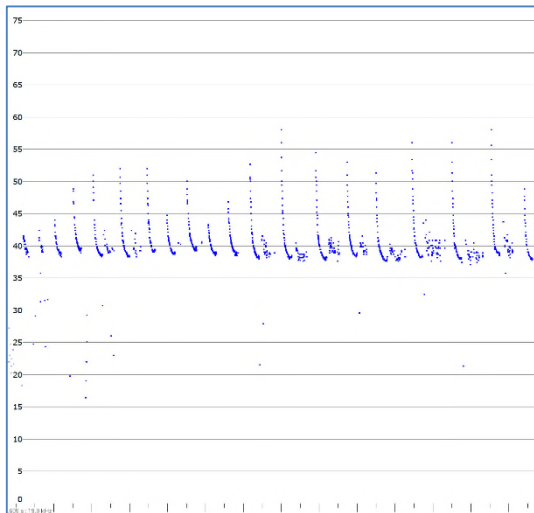
Appendix 1 Representative call sequences recorded at Agate Creek, November-December 2020.
x-axis = 10 ms per tick-mark; time between pulses removed (i.e. compressed view)



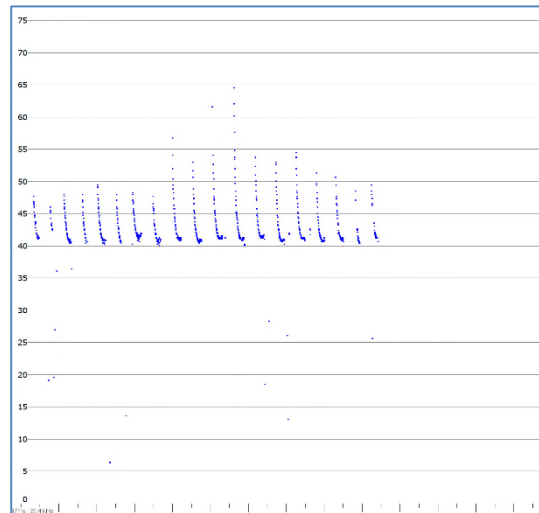
Rhinolophus megaphyllus



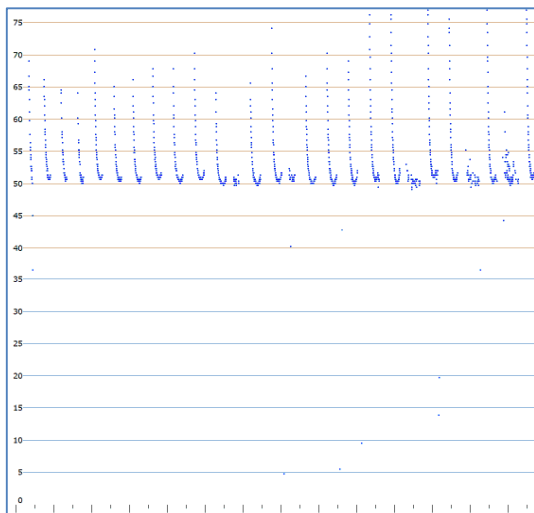
Chalinolobus nigrogriseus



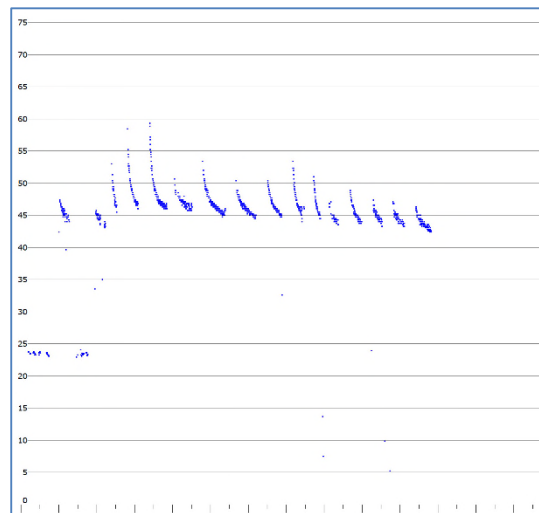
Scotorepens greyii



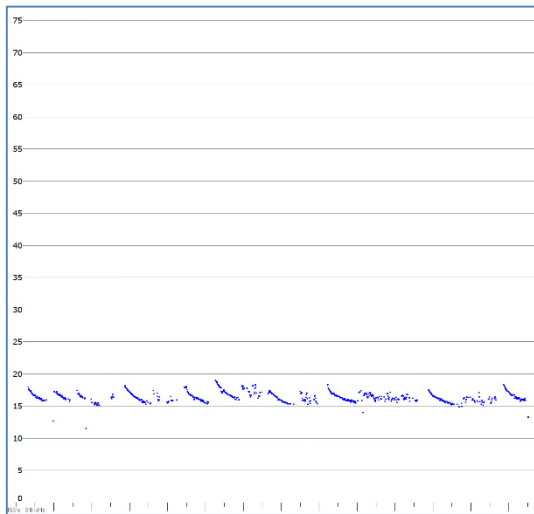
Scotorepens sanborni



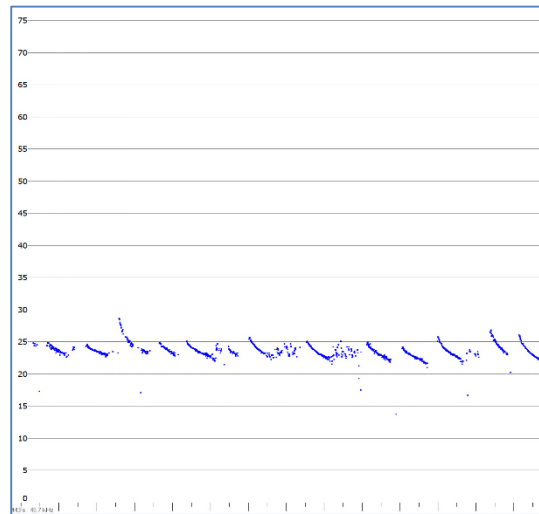
Vespadelus trougtoni



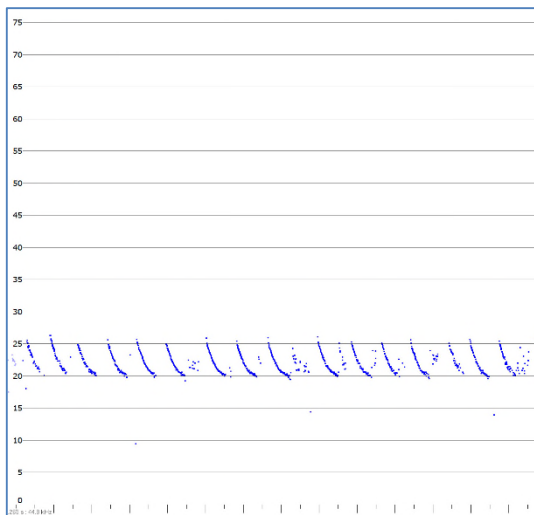
Miniopterus orianae



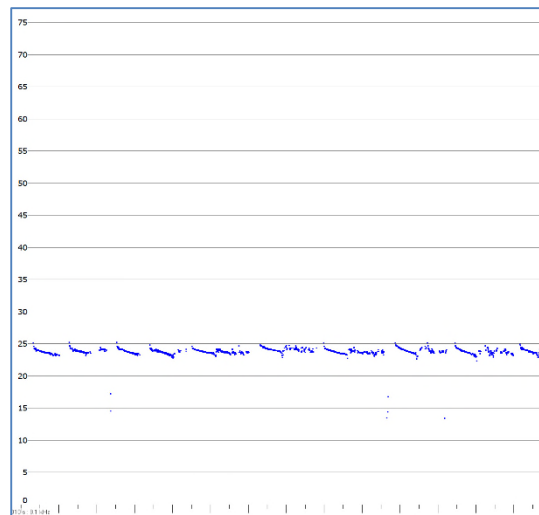
Chaerephon jobensis



Ozimops lumsdenae



Saccolaimus flaviventris



Taphozous troughoni

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