



OB32 West, OB28 and OB33

Targeted Vertebrate Fauna Surveys

BHP Western Australia Iron Ore

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Executive summary

BHP Western Australia Iron Ore (BHP WAIO) commissioned GHD Pty Ltd (GHD) to undertake a single season targeted vertebrate fauna survey covering the OB32 West, OB28 and OB33 Part IV survey area (hereafter referred to as the survey area). The survey area extends approximately 14 kilometres (km) west and 24 km east of Newman and covers an area of 6,535.8 hectares. The field survey was completed over six days by four experienced ecologists/zoologists from 8 April – 13 April 2021. The purpose of the survey was to identify key significant vertebrate fauna species present and map broad fauna habitat types describing relevance and values to significant fauna occurring or likely to occur within the survey area.

This report will be used to inform future environmental assessment across the area but the report does not assess any specific development proposed by BHP WAIO. This report is subject to, and must be read in conjunction with, the limitations set out in Section 1.4 and the assumptions and qualifications contained throughout the report.

The survey area was traversed by vehicle and on foot over the course of the survey to identify and describe the dominant fauna habitat types present and their condition, assess habitat for significant species, assess habitat connectivity, and identify and record fauna species within the survey area. Habitat assessment was conducted in accordance with the BHP WAIO fauna survey guidelines.

A total of 18 remote cameras were set across the survey area for 28-32 nights per camera giving a total of 566 camera trap nights. Five bat ultrasonic recorders were set for a total of 19 nights, and five bird acoustic recorders were set for 19 nights of Night Parrot (*Pezoporus occidentalis*) acoustic assessment. Additional survey effort consisted of 555 minutes of nocturnal searches, and 2982 minutes of target search transects.

The desktop assessment identified the potential presence of 34 significant fauna species occurring within or in proximity of the survey area, including: 24 birds, eight mammals and two reptiles.

The fauna habitat evaluation considered the significant species that are known (present) and also those species likely to occur. Seven broad fauna habitat types were described and mapped during the field survey. They comprise Breakaway/ Cliff, Gorge/ Gully, Sandplain, Hillcrest/ Hillslope, Mulga Woodland, Major Drainage Line and Claypan. Of these, three habitat types are considered as high value as they are likely to provide shelter or roosting habitat for several significant species identified as present or likely to be present. Breakaway/ Cliff and Gorge/ Gully are regionally significant for Pilbara Leaf-nosed Bat (*Rhinonictis aurantia*), Ghost Bat (*Macroderma gigas*) and Pilbara Olive Python (*Liasis olivaceus barroni*). All other fauna habitat types are considered moderate value based on the presence and extent of foraging and shelter habitat for a diverse range of common, locally occurring native fauna species, with these habitats being locally significant.

GHD undertook cave assessments at five caves within the survey area (CCAT-01, CCAT-06, CCAT-13, CCAT-17 and CCAT-19). Of the assessed caves by GHD one cave (CCAT-13) was a previously known cave (Biologic 2014). The remaining four caves that were assessed are new caves not previously known (CCAT-01, CCAT-06, CCAT-17 and CCAT-19). There were five other previously known caves; CCAT-08 (Biologic 2021), CCAT-11 (ENV 2009), CCAT-14 (Biologic 2016) and CCAT-07 and CCAT-16 (Biologic 2014) that were not assessed due to track accessibility and time constraint limitations that did not allow for detailed searches of some portions of the survey area. Three (CCAT-19, CCAT-17, and CCAT-01) of the five caves were assessed as potential day roosts for the Pilbara Leaf-nosed Bat. The remaining two caves were assessed as potential Ghost Bat roosts (CCAT-06 and CCAT-13), equating to two potential day roosts for Ghost Bat.

The field survey recorded 96 vertebrate fauna species within the survey area, mostly comprising non-significant species.

Five significant species were recorded within the survey area during the field survey, including two Vulnerable (VU) listed under the *Environment Protection and Biodiversity Conservation Act 1999* and *Biodiversity Conservation Act 2016*, two Department of Biodiversity and Conservation and Attractions listed Priority (P) 4 and one Other Specially Protected (OS) fauna species listed under the *Biodiversity Conservation Act 2016*:

- Pilbara Leaf-nosed Bat – (VU; VU)
- Grey Falcon (*Falco hypoleucos*) – (VU; VU)
- Brush-tailed Mulgara (*Dasyclercus blythi*) – (P4)

- Western Pebble-mound Mouse (*Pseudomys chapmani*) – (P4)
- Peregrine Falcon (*Falco peregrinus*) – (OS)

Call recordings of an active Pilbara Leaf-nosed Bat were detected in Gorge/ Gully habitat. The Grey Falcon and Peregrine Falcon were recorded flying overhead within the survey area in the Hillcrest/ Hillslope and Breakaway/ Cliff habitat-types, respectively. Evidence of the Brush-tailed Mulgara was recorded in the form of one active, and eight inactive burrows, and one individual detected on remote camera in the Sandplain habitat-type.

A total of six active mounds and nine inactive mounds were recorded for the Western Pebble-mound Mouse in the Hillcrest/ Hillslope habitat type.

A further five significant fauna taxa are considered likely to occur based on local records and habitats present. These include: Ghost Bat (VU; VU), Pilbara Olive Python (VU; VU), *Anilius ganei* (Gane's Blind Snake (Pilbara)) (P1), Long-tailed Dunnart (*Sminthopsis longicaudata*) (P4) and Glossy Ibis (*Plegadis falcinellus*) (Migratory (MI)).

The Breakaway/ Cliff and Gorge/ Gully habitat-types are likely to support suitable roost-caves for the Pilbara Leaf-nosed Bat and Ghost Bat. Ultrasonic recordings of the species identified during the survey, and known records of the species in the area, confirm the likely presence of the species in the survey area. Track accessibility and time constraint limitations did not allow for detailed searches of some portions of the survey area. Further targeted assessment of Gorge/ Gully and Breakaway/ Cliff for potential roost caves in the northern portion of the survey area would provide thorough coverage for Pilbara Leaf-nosed Bat and Ghost Bat.

The Pilbara Olive Python is also likely to be present within the Gorge/ Gully and Major Drainage Line habitat in the survey area as it provides shelter and foraging opportunity.

No evidence of the Northern Quoll (*Dasyurus hallucatus*) Endangered (EN) was recorded during the survey. Suitable habitat is present within the survey area in Breakaway/ Cliff, Gorge/ Gully, Hillcrest/ Hillslope and Major Drainage Line habitats. However, it is considered unlikely that the species would occur in the survey area, with a lack of records within the eastern Hamersley Range, which is considered marginal at best, and beyond the known range of the species.

No evidence of the Night Parrot was recorded during the survey. The survey area has a paucity of old growth *Triodia* (preferred roosting and breeding habitat) and lacks chenopod shrublands which are preferred foraging habitat. The survey area also does not include the species requirement for long unburned *Triodia* with proximity to foraging areas (Murphy 2016). It is considered unlikely that the survey area supports resident birds of this species, with any possible use being irregular or opportunistic.

The survey was conducted successfully with no significant limitations impacting the completeness of the biological assessment to the required standards. Some minor constraints relating to access were encountered in the south-eastern corner of the survey area due to the presence of the rail corridor.

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1. Introduction

1.1 Project background and purpose of this report

BHP Western Australia Iron Ore (BHP WAIO) have commissioned GHD Pty Ltd (GHD) to undertake a single season targeted vertebrate fauna survey covering the OB32 West, OB28 and OB33 Part IV survey area (hereafter referred to as the survey area).

The single season targeted vertebrate fauna survey will be used to inform future environmental assessment across the area. This survey report has not assessed a specific development proposed by BHP WAIO and therefore only presents the terrestrial vertebrate fauna values of the survey area.

1.2 Project location

The survey area is located approximately 14 kilometres (km) west to 24 km east of Newman, in the Shire of East Pilbara, in the Pilbara bioregion of Western Australia (WA). The survey area location and extent is presented in Figure 1, Appendix A. The survey area is 6,535.8 hectares (ha) in size.

The survey also includes a study area which refers to a 40 km radius around the survey area, for the purpose of the desktop assessment.

1.3 Scope of works

The scope of works included:

- Conduct a comprehensive vertebrate fauna database (with a 40 km radius) and literature review for the study area as detailed in Section 3.3 of BHP WAIO guidance document SPR-IEN-EMS-012, to determine the presence, or likely presence, of significant species
- Undertake a targeted vertebrate fauna survey as detailed in Sections 3.6-3.8 of guidance document SPR-IEN-EMS-012
- Produce a technical report (this document) including the survey results as detailed in Section 3.9 of guidance document SPR-IEN-EMS-012
- Submit all data in accordance with BHP WAIO guidance document SPR-IEN-EMS-015.

1.4 Scope and limitations

This report has been prepared by GHD for BHP WAIO and may only be used and relied on by BHP WAIO for the purpose agreed between GHD and BHP WAIO as set out in Section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than BHP WAIO arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by BHP WAIO and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Site conditions may change after the date of this report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

This report has assessed desktop environmental aspects and biological factors in the field for the survey area. Should these areas change or be refined, further assessment may be required.

2. Methodology

2.1 BHP requirements

BHP WAIO requirements applied to this survey are set out in Guidance for Vertebrate Fauna Surveys in the Pilbara (SPR-IEN-EMS-012 v6). This document outlines BHP WAIO expectations for survey components including the level of survey, desktop assessment, survey design and intensity, timing, fauna and habitat assessment, and reporting requirements. Biological survey spatial data requirements (SPR-IEN-EMS-015 v11) set out all biodiversity data requirements to a standard and consistent format. These standards enable analysis of survey data and comparison between surveys spatially and temporally.

2.2 Relevant legislation and background information

In WA some fauna species are protected under both Federal and/or State government legislation. In addition, regulatory authorities also provide a range of guidance and information on expected standards and protocols for environmental surveys. The legislation relevant to the survey has been summarised in Table 1 below.

Table 1 Key environmental legislation relevant to the project

Legislation	Responsible agency	Aspect
Commonwealth legislation		
<i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act)	Department of Agriculture, Water and the Environment (DAWE)	Matters of National Environmental Significance (MNES) including threatened fauna
State legislation		
<i>Biodiversity Conservation Act 2016</i> (BC Act)	Department of Biodiversity, Conservation and Attractions (DBCA)	Conservation and protection of biodiversity components in Western Australia (WA)
<i>Biosecurity and Agricultural Management Act 2007</i> (BAM Act)	Department of Primary Industries and Regional Development (DPIRD)	Weeds and feral animals
<i>Conservation and Land Management Act 1984</i>	DBCA	Use, protection and management of public lands and waters and its flora and fauna
<i>Environmental Protection Act 1986</i>	Environmental Protection Authority (EPA) (Part IV) Department of Water and Environmental Regulation (DWER) (Part V)	Environmental impact assessment and management
<i>Environmental Protection (Clearing of Native Vegetation) Regulations 2004</i>	DWER	Clearing of native vegetation
<i>Rights in Water and Irrigation Act 1914</i>	DWER	Access to and use of water resources; protection and management of river flows and drainage
<i>Soil and Land Conservation Act 1945</i>	DPIRD	Protection of soil and prevention/management of soil erosion

An overview of key legislation and guidelines, conservation codes and background information relevant to this survey is provided in Appendix B.

2.3 Desktop assessment

The desktop assessment was conducted in the survey area which included an additional 40 km search radius area (the desktop study area), to identify existing records of significant fauna and habitat. Spatial data was obtained from files largely sourced from BHP WAIO and Government of Western Australia (GoWA) (2021a). Other data sets were collated from publicly available, government managed databases. The information sources utilised in this

assessment are presented in Table 2. Environmental values identified through the desktop assessment with associated spatial data are presented in Figure 2, Appendix A.

Results of the desktop assessment provide information for a fauna likelihood of occurrence assessment (Appendix D). For the fauna likelihood of occurrence assessment, marine and pelagic fauna species identified under the EPBC protected matters search were excluded from the likelihood of occurrence assessment as they are not expected to occur within the survey area. The complete likelihood of occurrence assessment is presented in Appendix D.

Table 2 Information sources

Aspect	Information source
Climate	Bureau of Meteorology (BoM) Climate Data Online (BoM 2021)
Geology, landforms and soil	1:500 000 State linear structures layer (Department of Mines Industry Regulation and Safety (DMIRS)-015) Soil Landscape Mapping-Systems (DPIRD-064)
Environmentally Sensitive Areas (ESAs)	Clearing Regulations – ESAs (DWER-046)
Conservation reserves and areas	Department of Biodiversity Conservation and Attractions (DBCA) – Legislated Land and Waters (DBCA-011) DBCA-Lands of interest (DBCA-012)
Vegetation	Pre-European Vegetation (DPIRD-006) Native Vegetation Extent (DPIRD-005) Statewide Vegetation Statistics (GoWA 2021b)
Significant fauna	– Department of Agriculture, Water and the Environment (DAWE) Protected Matters Search Tool (PMST) to identify fauna species listed under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act) potentially occurring within the study area (DAWE 2021a) (Appendix C). – The DBCA Threatened and Priority Fauna database for the study area (DBCA 2021b). – The International Union for Conservation of Nature and Natural Resources (IUCN) Red List to identify species listed as Critically Endangered, Endangered, Vulnerable or Near Threatened that potentially occur within the study area (IUCN 2021) – The DBCA <i>NatureMap</i> database for fauna species previously recorded within the study area (Appendix C) (DBCA 2007–). This database comprises the following composite datasets: • Atlas of Australian birds • Pilbara Threatened Fauna • Bird data -Birdlife Australia • Fauna Survey Returns Database (New) • Pilbara Biological Survey (mammals, birds, reptiles) • Waterbirds or Pilbara Threatened Fauna • Western Australian Museum (WAM) databases (mammals, birds, reptiles)
Matters of National Environmental Significance	EPBC Act Protected Matters Search Tool (PMST) (DAWE 2021b)

2.4 Field survey

2.4.1 Survey timing and personnel

The single season targeted vertebrate fauna survey was undertaken between 8 – 13 April 2021 by Senior Zoologists Robert Browne-Cooper and Brad Maryan and Ecologists Sarah Flemington and Grace Formentin.

2.4.2 Guiding documentation

In addition to the BHP WAIO requirements listed in Section 2.1, the survey methodology and data collection GHD employed was consistent with:

- Environmental Protection Authority (EPA) Technical Guidance - Terrestrial vertebrate fauna surveys for environmental impact assessment (EPA 2020)
- EPA Factor Guideline – Terrestrial Fauna (EPA 2016)
- Department of the Environment, Water, Heritage and the Arts (DEWHA) (2010a) Survey Guidelines for Australia's Threatened Bats
- DEWHA (2010b) Survey Guidelines for Australia's Threatened Mammals
- DEWHA (2010c) Survey Guidelines for Australia's Threatened Reptiles
- DBCA Guidelines for surveys to detect the presence of bilbies, and assess the importance of habitat in Western Australia (DBCA 2017a)
- Verifying Greater Bilby presence and the systematic sampling of wild populations using sign-based protocols – with notes on aerial and ground-based techniques and asserting absence (Southgate et al 2018)
- DAWE (2016) EPBC Act referral guideline for the endangered northern quoll (*Dasyurus hallucatus*)
- DBCA (2017) Interim guideline for preliminary surveys of night parrot (*Pezoporus occidentalis*) in Western Australia.

2.4.3 Data collection and storage

Field data collection for the targeted vertebrate fauna survey was undertaken using Global Positioning System enabled Samsung tablets using electronic forms in Collector and tailored to BHP WAIO spatial data requirements (SPR-IEN-EMS-015). Data was synced to the cloud at the conclusion of each field day. Field photographs were stored and where applicable have been provided as part of the project deliverables.

2.4.4 Vertebrate fauna

The survey area was traversed by vehicle and on foot over the course of the survey to identify and describe the dominant fauna habitat types present and their condition, assess habitat for significant species, assess habitat connectivity, and identify and record fauna species within the survey area. An assessment of the likelihood of significant fauna and their habitats occurring within the survey area was also undertaken. Survey sample points and tracks, and fauna observation are detailed in Appendix D.

Habitat assessment

The habitat assessment was conducted in accordance with the BHP WAIO fauna survey guidelines as outlined in section 2.1. Habitat assessments were undertaken during the survey at all vertebrate fauna sample sites. Field data was collected via the ArcGis online platform on hand-held Samsung Tablets, as required to enable delineation and mapping of major fauna habitat types throughout the survey area. Vegetation associations mapped by GHD as part of a detailed flora and vegetation survey conducted in May 2021 (GHD 2021), were used to delineate the habitat types.

Broad habitat types within the survey area were identified, mapped and described based on the following:

- Location within survey area
- Landscape position
- Geomorphology, topography and substrate
- Photos of representative habitat types
- Values relevant to significant species (e.g. refuge, foraging, shelter)
- Disturbances (weeds, fire, ground disturbance)
- Comparison between broad habitat types
- Evaluation of the likelihood of occurrence of significant fauna within the environments present (based on presence of suitable habitats and species recorded)
- GHD (2021) flora survey vegetation association mapping.

A total of 43 fauna habitat assessments were undertaken throughout the survey area with the locations of each presented in Figure 3, Appendix A.

Remote camera

Remote sensor cameras (Reconyx-Hyperfire ® and Scoutguard ®) were deployed from the 9 April 2021. Cameras were used primarily to target Northern Quoll (*Dasyurus hallucatus*) and Brush-tailed Mulgara (*Dasycercus blythi*). Cameras were baited with sardines and/or universal animal bait to attract fauna species. A total of 18 remote cameras were set across the survey area for 28-32 nights per camera giving a total of 566 camera trap nights. The cameras were retrieved between the 8 and 13 April. The remote camera locations are presented in Figure 3, Appendix A. Data from the cameras were downloaded and analysed for the presence of animals following the field survey. Fauna images were identified to species level by a senior zoologist.

Bat ultrasonic recorder

Five bat ultrasound call detectors including SM2, SM4 (Wildlife Acoustics ®) and Swift (Anabat ®) were deployed targeting a range of micro bats, but with focus on the Ghost Bat (*Macroderma gigas*) and Pilbara Leaf-nosed Bat (*Rhinonicteris aurantia*). All three detector types used have full spectrum capability and are highly suitable for detection of both target bat species. Each bat detector was set for three to four nights at one location. The bat detectors were set where bats were likely to be present during night activity (i.e. rocky gully flyways, steep rocky areas, and water bodies). The bat detectors were programmed to record from 25 minutes pre-dusk to 25 minutes post-dawn. The bat detectors were set for a total of 19 nights. The bat detector locations are presented in Figure 3, Appendix A.

Data from the bat detectors were downloaded and analysed following the field survey. The analysis and identification of the bat ultrasonic call recordings was completed by Craig Grabham (GHD). Data was processed and analysed using a combination of manual review and automated processes using Kaleidoscope Pro (Wildlife Acoustic, version 5.1.9) and Anabat Insight (Titley Scientific, version 1.9.1). The full report is provided in Appendix D. All incidental (non-target) bat call recordings were identified and included in the species inventory.

Bird acoustic recorders

Four bird acoustic recorders (SM4 SongMeter ®) were set primarily for detecting the Night Parrot (*Pezoporus occidentalis*) in line with DBCA (2017d). The acoustic recorders were deployed in areas of *Triodia* and grassland plain and water bodies, which Night Parrot may utilise for roosting and foraging. The detectors were set for a maximum of six nights and programmed to record from 25 minutes pre-dusk to 25 minutes post-dawn. Three of the recorders were left in the same location for up to six nights, and one recorder was re-deployed to a second location, which was set for five nights only, to target other birds of the survey area and increase the species inventory. The bird acoustic recorders were set for a total of 19 nights. No adverse weather conditions (cyclonic or storms) occurred during the survey evenings. Some light drizzle was experienced during days, but this would not have impacted the call recordings. The bird acoustic detector locations are presented in Figure 3, Appendix A. Data from the recorders was downloaded and analysed by Nigel Jakkett, a Senior Zoologist having specialist experience in the analysis and identification of Night Parrot acoustic data. Appendix D contains the Bird Acoustic Analysis Report conducted by Nigel. Non-target bird call recordings were identified and included in the species inventory, also provided in Appendix D.

Nocturnal searches

Nocturnal searches were undertaken over two consecutive nights using head torches or hand-held spotlights. Each search involved two personnel walking along search transects in selected habitat including minor/major drainage lines, rocky outcrop areas, sandplain and along waterbodies. Searches were primarily targeting the Pilbara Olive Python. Opportunistic nocturnal driving surveys were undertaken in vehicle along tracks at slow speeds whilst moving between designated nocturnal search areas. All searches were recorded as a logged trail using field tablet. Total nocturnal search effort equated to 555 minutes. The nocturnal transects undertaken during the survey are recorded within the data as vertebrate fauna search transects, and presented in Figure 3, Appendix A.

Target search transects

Diurnal target search transects were undertaken across the survey area in accessible locations over a range of habitats to detect significant species including Western Pebble-mound Mouse (*Pseudomys chapmani*), Pilbara Olive Python (*Liasis olivaceus barroni*) and Brush-tailed Mulgara. The transects were undertaken concurrently with

the searches for potential bat caves in suitable habitat. Searches were recorded as a logged walk transect using field tablet and recorded within the data as vertebrate fauna targeted search transect. Total target search transect effort equated to 2982 minutes. The targeted search transects are presented in Figure 3, Appendix A.

Opportunistic observations

Opportunistic observations involve the recording of fauna taxa (physical presence and/or signs of presence) across the survey area. Opportunistic observations include physical observations (sighting or hearing fauna), and indirect evidence (scats, tracks, diggings, nests, feathers, skeletal remains, pellets) which indicate the current or recent activity of a species. Wherever possible, the number of individuals, microhabitat use, and other relevant information was recorded. Opportunistic observations were recorded when driving, traversing the survey area on foot and when conducting habitat assessments). These observations account for a substantial proportion of the total fauna species recorded (54 recordings, 44% of total fauna observations) including significant species.

Targeted bat cave assessments

Targeted bat cave assessments were carried out for accessible caves located during target search transects in selected Gorge/Gully, Breakaway/Cliff/ and Hillcrest/Hillslope habitats. Where a new cave was located, an assessment was conducted to identify roost and/or maternity suitability for the Ghost Bat or Pilbara Leaf-nosed Bat, which included recording any signs of activity (e.g. scats and foraging residue), and the cave characteristics including: cave architecture (angle, type, number of chambers, depth, height), and cave conditions (approximate ambient temperature, humidity, airflow, night level) of the cave itself. Roost suitability will be classified according to the Threatened Species Scientific Committee (TSSC) Ghost Bat and Pilbara Leaf-nosed Bat standard categories: permanent diurnal roost, non-permanent breeding roosts, transitory diurnal roosts and nocturnal refuge (TSSC 2016a, 2016b). If possible, bat ultrasonic recorders and/or cameras were set within or at the mouth of caves to collect further evidence of cave use. Where potential roost sites were located, a visual inspection for signs of use by Ghost Bat, Pilbara Leaf-nosed Bat and other microchiropteran bat species was undertaken including:

- Evidence of current or historical occupation (e.g. bat species within the cave; presence, age, type, and amount of scat; presence of Ghost Bat feeding)
- Preliminary assessment of cave structure and microclimate characteristics
- Evidence of other species occupying the site.

Roost categorisation

Unlike the Pilbara Leaf-nosed Bat, the roost habitats of the Ghost Bat are not yet formally categorised in current published guidance. The categorisation approach used here for Ghost Bat roost habitats is consistent with surveys undertaken to date by GHD for other mining projects in the Pilbara and considers the roosting requirements of the Ghost Bat as documented in Threatened Species Scientific Committee (2016b). Potential roost records also follow a similar nomenclature, however, cannot be definitively categorised due to the absence of some information (e.g. the roost structure appears to be suitable, however Ghost Bat are yet to be recorded in the roost).

Roost categories include:

- Breeding roost — evidence of occupation from early September through to mid-February by more than a few individuals. The roost may or may not be occupied all year round. Pregnancy in the Pilbara has been recorded in August and births occurred after late October (Douglas 1967 cited in Armstrong 2000). A study of the Ghost Bat in the Pilbara noted pregnant bats in September 1998 and young attached to the teat in November and December 1998 (Armstrong and Anstee 2000). Parturition occurs over a month commencing in mid-October and juvenile bats commence flying at seven weeks with young capable of flight by the end of January (Toop 1985). Considered as critical habitat for both the daily and long-term survival of the Ghost Bat.
- Diurnal roost with ongoing use — evidence of occupation during different times of the year by one or more individuals however structure of roost unlikely to support breeding habitat requirements. Considered as critical habitat for both the daily and long-term survival of the Ghost Bat.

- Diurnal roost with occasional use — roost occasionally used at different times of the year for a few individuals. Structure of roost small and does not support breeding or large colony habitat requirements. Roost could facilitate dispersal in the region. Considered as important habitat for both the daily and long-term survival of the Ghost Bat. In addition to the structural aspect of the roost, an assessment of usage including evidence for feeding, scat deposits and/or presence of Ghost Bat should be used to categorise this roost type. Information including acoustic and visual data may also be required to understand ongoing usage.
- Diurnal roost probably occasional use — the structure (e.g. shape and size) may support diurnal roosting for a few individuals, however, insufficient evidence to provide definitive categorisation or cave could not be assessed due to presence of Ghost Bat individual. Further survey and monitoring is recommended to determine the type of diurnal roost.
- Nocturnal/feeding refuge — occupied or entered at night for resting, feeding or other purposes. Not considered critical habitat but are important for persistence in a local area. Nocturnal refuge sites may also be shallow caves, or deeper overhangs that do not offer diurnal roosting opportunities.

Survey effort

Survey effort is described as the amount of survey that is undertaken during an assessment. The total survey effort consisted of 566 camera trap nights, 555 minutes of nocturnal searches, 2982 minutes of target search transects, 19 nights of bat detection, and 19 nights of Night Parrot acoustic assessment.

Species identification and nomenclature

Fauna species were identified during the field survey and office (remote camera, bat call and bird acoustic analysis) using reference books, field guides and electronic guides (Table 3). Species not discernible in the bat call analysis or on remote camera were identified to genus level only.

Nomenclature used in this report follows that used by WAM (2021) as reported on *NatureMap*. This nomenclature is deemed the most up to date species information for WA fauna.

Table 3 Fauna references

Fauna group	Field guide
Mammals	Menkhorst & Knight (2011), Van Dyck & Strahan (2008), Pizzey & Knight (2012)
Bats	Churchill (2008), Menkhorst & Knight (2011), Pizzey & Knight (2012), Van Dyck et al. (2013)
Birds	Morcombe (2004)
Reptiles	Wilson & Swan (2017), Storr et al. (1999), Storr et al. (2002)
Amphibians	Tyler & Doughty (2009)

2.5 Survey limitations

2.5.1 Desktop limitations

The EPBC Act PMST is based on bioclimatic modelling for the potential presence of species. As such, this does not represent actual records of fauna species within the area. The records from the DBCA searches of Threatened and Priority fauna provide more accurate information for the general area and local occurrence. However, some collection records cannot be dated and often misrepresent the current range of Threatened and Priority species. Some species also have outdated taxonomy, if the records are older, and can also misrepresent the current range for certain species.

2.5.2 Survey limitations

The EPA (2020) states that fauna survey reports for environmental impact assessment in WA should contain a section describing the limitations of the survey methods used. The limitations and constraints associated with this field survey are discussed in Table 4.

Table 4 Vertebrate fauna survey limitations

Aspect	Constraints	Comment
Sources of information and availability of contextual information	Nil	Adequate information is available for the survey area. Broad scale (1:250,000) mapping by Beard (1975) and digitised by Shepherd et al. (2002) and Regional biogeography (Van Vreeswyk et al. 2004). In addition, relevant BHP WAIO fauna habitat mapping and vertebrate fauna records were provided. The checklist for WA fauna (Western Australian Museum 2021) provides information on any changes in the taxonomy of species. The survey results were not limited by lack of information, as no fauna occurring in the area have incurred a recent taxonomic change or have outstanding taxonomic revision. The checklist provided the necessary information to confirm this.
Scope (what life forms were sampled etc.)	Nil	Terrestrial vertebrate fauna was surveyed using targeted approaches relevant to the species known to occur locally and regionally. Marine, subterranean, aquatic or targeting Short Range Endemic invertebrates were not part of the scope.
Proportion of fauna collected and identified (based on sampling, timing and intensity)	Nil	The targeted vertebrate fauna survey was undertaken 8 – 13 April 2021. The fauna assessment sampled those species that can be effectively detected via current in-situ search methods and remote detection devices. All fauna species recorded during the survey were identified to species level. The fauna assessment was aimed at identifying habitat types and terrestrial vertebrate fauna utilizing the survey area.
Completeness and further work which might be needed (e.g. was the relevant area fully surveyed)	Minor	The survey area was generally accessible by vehicle and foot. Some minor portions of the survey area were not able to be surveyed, including the south-eastern corner, due to the presence of the rail corridor. Due to the substantial size of the survey area, and reduced accessibility in the northern portion due to heavy track erosion, time constraints impacted survey effort and areas targeted. All major habitat types were targeted. Some areas in the north were not accessible on foot, however all major Gorge/ Gully habitats were assessed to the extent possible. Some caves were inaccessible due to either excessively steep terrain or where caves were reached on foot, unable to accessed due to restrictively narrow cave opening. Adequate time was available to complete the biological survey to the required standard for this level of assessment.
Mapping reliability	Minor	The fauna habitat (and vegetation associations for the GHD 2021 survey) was mapped using high-resolution ESRI aerial imagery obtained from Landgate, topographical features, previous broad scale mapping (Beard 1975) and field data. Data was recorded in the field using hand-held GPS tools (e.g. Samsung tablet and Garmin GPS). Certain atmospheric factors and other sources of error can affect the accuracy of GPS receivers. The Garmin GPS units used for this survey are accurate to within ± 5 m on average. Therefore the coordinates recorded from the GPS may contain minor inaccuracies.
Timing/weather/season cycle	Nil	The field survey was conducted in April 2021. In the six months prior to the survey (October 2021 to April 2021) the Newman Aerodrome (No.007176) recorded a total of 287.6 mm of rainfall (BoM 2021), which is higher than the long-term average for the same period (257.9 mm). The weather conditions recorded during the survey were considered unlikely to have impacted the survey results. Some light rain was experienced during the day and the

Aspect	Constraints	Comment
		winds were not strong. The survey timings were considered appropriate for the vertebrate fauna survey.
Disturbances (e.g. fire, flood, accidental human intervention)	Nil	Some of the survey area has been subject to previous disturbances, including clearing for vehicle tracks, stock fences, stock infrastructure and stock grazing. These disturbances did not limit the survey and improved access in most instances.
Resources	Nil	Adequate resources were employed during the field survey. Twenty-four person days were spent undertaking the survey using dedicated zoologists/ecologists.
Access restrictions	Minor	Most of the survey area was accessible on foot where there was moderate proximity to exploration vehicle tracks. Some tracks in the north-eastern portion of the survey area had heavy erosion and therefore restricted vehicle access and was not traversed on foot.
Experience levels	Nil	The zoologists/ecologists who executed the survey were practitioners suitably qualified in their respective fields. Senior Zoologist Robert Browne-Cooper has over 17 years' experience undertaking fauna surveys (Detailed, Basic and Targeted) within the Pilbara bioregion and other regions within WA, including targeted surveys for bilby. Senior Zoologist Brad Maryan, and Ecologists Sarah Flemington and Grace Formentin have over 17, 4 and 2 years' experience respectively undertaking ecological surveys in the Pilbara region, including experience in targeted significant fauna surveys for BHP WAIO in the Jimblebar area and other arid regions in WA.

3. Desktop assessment

3.1.1 Climate

The survey area is located in the Pilbara region of WA and experiences a semi-arid climate. The region is characterised by hot summers and warm to mild winter temperatures, with typically low to sporadic rainfall falling mostly in the late summer and autumn months due to the influence of tropical cyclones and monsoon. The closest BoM weather station with sufficient historical data is Newman Aerodrome (No. 007176), approximately 11 km southeast of the survey area. Climate data from this station indicates the mean maximum temperature ranges from 39.2°C in December to 23.1°C in July. The mean minimum temperature ranges from 25.1°C in January to 6.5°C in July. The mean annual rainfall is 325.1mm (BoM 2021). In the six months prior to the survey (October 2020 to April 2021) the Newman Aerodrome (No. 007176) station recorded a total of 287.6 mm of rainfall, which is slightly higher (29.7 mm / 10.3%) than the long-term average of 257.9 mm.

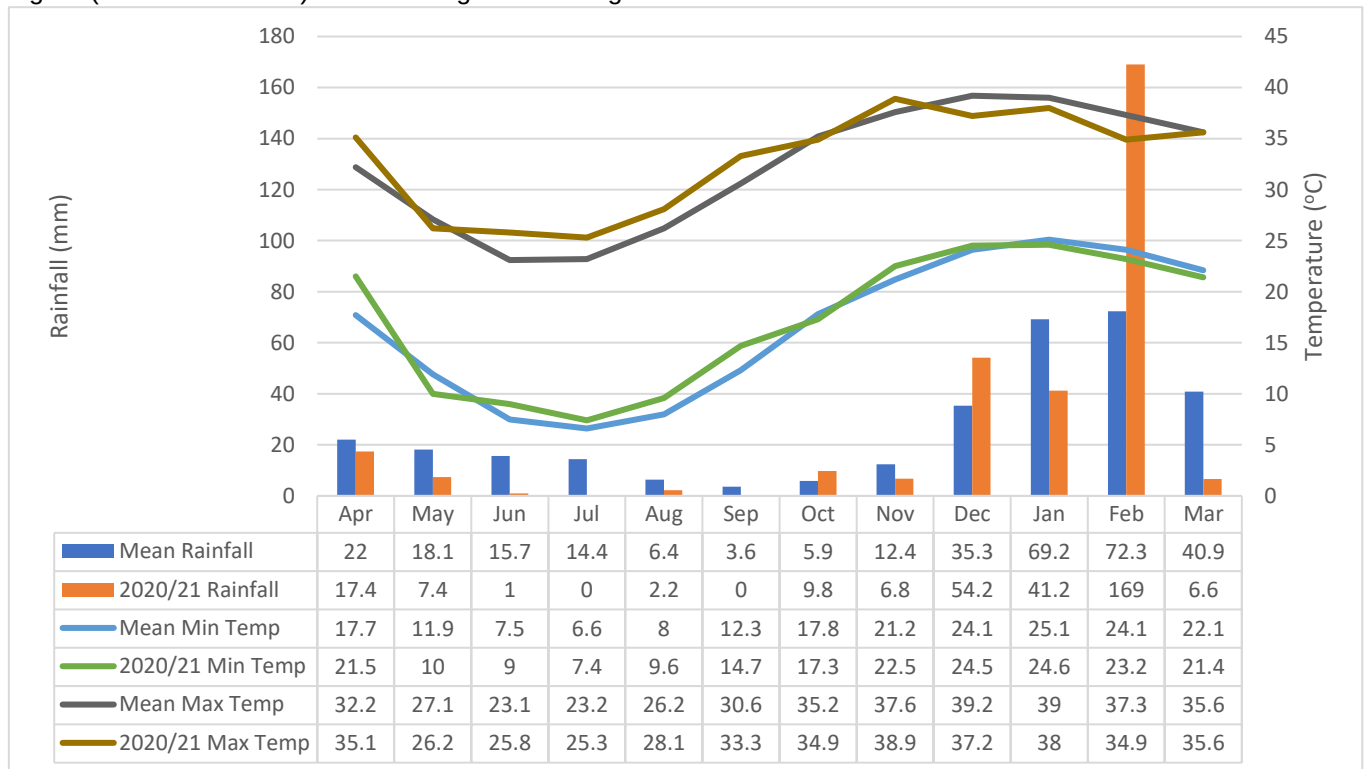


Plate 1 Newman Aero (007176) rainfall and temperature (BoM 2021)

3.1.2 Land systems, landforms and soils

The DPIRD (2021) provide soil landscape mapping for pastoral areas of Western Australia at scales between 1:20,000 and 1:3,000,000. The descriptions of the land systems were sourced from Vreeswyk et al. (2004). This database was used to assess the possible land systems which lie within the survey area. A total of seven land systems occur within the survey area, these are described and the total area calculated in the study area and the associated percentage that occurs in the survey area provided in Table 5 and presented in Figure 2, Appendix A.

Table 5 Land systems of the study area

Land System ¹	Description	Total ha within study area (40 km)	Total ha and % within survey area
Boolgeeda System	Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands or mulga shrublands.	30298 ha	246.7 ha (0.8 %)

Land System ¹	Description	Total ha within study area (40 km)	Total ha and % within survey area
Elimunna System	Stony plains on basalt supporting sparse acacia and cassia shrublands and patchy tussock grasslands.	19099 ha	932.7 ha (4.8 %)
McKay System	Hills, ridges, plateau remnants and breakaways of meta sedimentary and sedimentary rocks supporting hard spinifex grasslands with acacias and occasional eucalypts.	4946 ha	811.5 ha (16.4 %)
Newman System	Rugged jaspilite plateau, ridges and mountains supporting hard spinifex grasslands.	147150 ha	2864.1 ha (1.9 %)
River System	Narrow, seasonally active flood plains and major river channels supporting moderately close, tall shrublands or woodlands of acacias and fringing communities of eucalypts sometimes with tussock grasses or spinifex.	20715 ha	427.7 ha (2.0 %)
Rocklea System	Basalt hills, plateau, lower slopes and minor stony plains supporting hard spinifex and occasionally soft spinifex grasslands with scattered shrubs.	57049 ha	1018.8 ha (1.7 %)
Wannamunna System	Hardpan plains and internal drainage tracts supporting mulga shrublands and woodlands and occasionally eucalypt woodlands.	11462 ha	233.8 ha (2.0 %)

¹ The land systems may occur outside of the study area, but for the purpose of the desktop study, these values have been used. The percentage calculated for the survey area is therefor only for the total occurrences of the land systems in the study area not in the entire region.

3.2 Hydrology

Desktop searches of the GoWA (2021a) data layers identified the water resource aspects present in the study area. These are detailed in Table 6.

Table 6 *Hydrology aspects within the study area*

Aspect	Details	Results
Groundwater Areas	Groundwater areas proclaimed under the <i>Rights in Water and Irrigation Act</i> (RIWI Act)	Pilbara Groundwater Area
Surface Water Areas	Surface water areas proclaimed under the RIWI Act	Pilbara Surface Water Area
Irrigation District	Irrigation districts proclaimed under the RIWI Act	Pilbara Surface Water Area
Rivers	Rivers proclaimed under the RIWI Act	None present
Public Drinking Water Source Areas (PDWSA)	PDWSA is a collective term used for the description of Water Reserves, Catchment Areas and Underground Pollution Control Areas declared (gazette) under the provisions of the <i>Country Area Water Supply Act 1947</i>	Newman Water Reserve
Waterways Management Areas	Areas proclaimed under the <i>Waterway Conservation Act 1976</i>	None present

3.2.1 Surface water and drainage

The survey area is located within the Fortescue Marsh and Ophthalmia sub-catchments of the Upper Fortescue River catchment within the Fortescue River basin (Department of Water and Environmental Regulation (DWER))

2018). Surface water in the broader area is largely reliant on weather, and surface water in waterways is generally only present or flowing for parts of the year, often in response to larger cyclonic, rainfall events.

3.2.2 Wetlands

No wetlands of International Importance (Ramsar) or nationally important wetlands are located within 40 km of the survey area (DBCA 2017c, DBCA 2018). The closest wetlands of national importance are Fortescue Marshes and Lake Disappointment (Savory Creek) System located approximately 70 km northwest and 47 km southeast of the survey area respectively.

3.3 Land use

3.3.1 Conservation reserves and areas

No DBCA managed area intersect the survey area. The nearest DBCA managed area; Collier Range National Park (R 35104), is located approximately 138 km from the survey area (DBCA 2021c).

3.3.2 Environmentally sensitive areas

One ESA (6937) intersects the southeast corner of the survey area. This corresponds to the State-listed Endangered Threatened Ecological Community (Ethel Gorge aquifer stygobiont community) (DBCA 2021a), as presented in Figure 2, Appendix A. The next nearest ESA is located approximately 6 km from the survey area, the Newman Training Depot (Defense) (DBCA 2021a).

3.4 Vegetation and flora

3.4.1 Regional biogeography

The survey area is situated in the Fortescue Province, within the Pilbara bioregion and the Hamersley sub-region (PIL03) as described by the Interim Biogeographic Regionalisation of Australia (IBRA 2020).

The Pilbara bioregion is characterised by vast coastal plains and inland mountain ranges with cliffs and deep gorges. Vegetation is predominantly mulga low woodlands or snappy gum over bunch and hummock grasses. Tenure comprises Aboriginal land, leasehold (for grazing cattle) and conservation reserves. The bioregion provides the majority of WA's exports in petroleum, natural gas and iron ore. Major population centres are Karratha, Port Hedland, Newman and Tom Price.

The Hamersley sub-region is characterised by hills and dissected plateau with some stony plains and hardpan wash plains on sedimentary and volcanic rocks of the Hamersley Basin. Stony soils are common with red shallow loams and some red/brown non-cracking clays and red loamy earth (Tille 2006). Vegetation encompasses mulga low woodland over bunch grasses on fine textured soils in valley floors, and *Eucalyptus leucophloia* over *Triodia brizoides* on skeletal soils of the ranges (Kendrick 2001).

3.4.2 Broad vegetation associations

Broad scale (1:250,000) pre-European vegetation mapping of the study area has been completed by Beard (1975) at an association level. The mapping indicates the survey areas intersects two vegetation associations:

- Hummock grassland with scattered bloodwoods and snappy gum *Triodia* spp., *Corymbia dichromophloia* and *Eucalyptus leucophloia* (association 82)
- Low woodland, open low woodland or sparse woodland; mulga, *Acacia aneura* and associated species (association 18).

3.4.3 Flora and vegetation survey

GHD was commissioned by BHP WAIO to undertake a single-season Detailed flora and vegetation survey of the survey area. The field surveys were conducted in May 2021 (GHD 2021). Nine vegetation types aligning with broad landforms were identified and described in the survey area, not including cleared tracks:

- VT01 (Major Drainage Line) *Eucalyptus victrix*, *Corymbia candida* and *Corymbia hamersleyana* woodland to open woodland on red/brown sandy loam on major drainage lines
- VT02 (Minor Drainage Line) *Eucalyptus gamophylla* and *Corymbia hamersleyana* isolated trees on red/brown sandy loam with some rocky areas on minor drainage lines
- VT03 (Sand Plain), *Eucalyptus gamophylla*, *Eucalyptus xerothermica* and *Corymbia hamersleyana* isolated trees on red loamy sand on sand plains
- VT04 (Hillslope) *Eucalyptus leucophloia* subsp. *leucophloia* and *Corymbia deserticola* isolated trees on rocky hillslopes, low rocky rises and hills
- VT05 (Breakaway) *Eucalyptus leucophloia* subsp. *leucophloia* and *Eucalyptus gamophylla* isolated trees on brown sandy loam on shale breakaway ridgeline
- VT06 (Sandy/ Stony Plain) *Acacia pteraneura* open woodland with occasional *Corymbia candida* and *Eucalyptus gamophylla* isolated trees on red/brown sandy loam sandy/stony plains
- VT07 (Claypan) *Acacia aneura* isolated trees on red/brown loamy clay on claypan
- VT08 (Hillslope) *Eucalyptus leucophloia* subsp. *leucophloia* isolated trees on rocky hillslopes, low rocky rises and hills
- VT09 (Hillslope) *Eucalyptus gamophylla*, *Eucalyptus xerothermica* and *Eucalyptus socialis* isolated mallee trees on red/brown sandy loam with rocky low hillslopes.

The condition of the vegetation within the survey area ranged from Excellent to Completely Degraded. Areas mapped as Poor to Completely Degraded were areas of previous mining activities resulting in vegetation clearing. There are numerous tracks throughout the survey area, particularly in the central and southern areas. Established tracks are associated with mining activity and powerline corridors that occur within the survey area. The northern half of the survey was mapped as Excellent to Very Good with limited previous disturbance (GHD 2021).

3.5 Fauna

3.5.1 Fauna diversity

The *NatureMap* database identified 348 vertebrate fauna species previously recorded within 40 km of the survey area (DBCA 2007-). This total comprised 198 bird, 42 mammal, 99 reptile, seven amphibian, and two fish species. Of the fauna species previously recorded, 342 were native species and six were introduced species.

The database search results have been provided in Appendix D.

3.5.2 Significant fauna

The EPBC Act PMST, *NatureMap* and DBCA databases identified the presence/potential presence of 34 significant fauna species occurring within or in proximity of the survey area (Appendix C). The species listed included 24 birds, eight mammals and two reptiles. These species comprise:

- One Critically Endangered species
- Three Endangered species
- Six Vulnerable species
- One Priority 1 species
- Four Priority 4 species
- 18 Migratory species
- One Other Specially protected species.

3.5.3 Previous records of significant fauna

3.5.3.1 Greater Bilby

Biologic (2018) recorded a single inactive Greater Bilby (*Macrotis lagotis*) burrow within the eastern portion of the BHP WAIO Caramulla exploration mining lease (Exploration Leases E52/18 and E52/172), approximately 50 km east of the survey area. Records of this species in the vicinity of the survey area are sparse and historical. The closest known population is in the vicinity of Jigalong to the east of Jimblebar, approximately 105 km east of Newman, where very extensive areas on sandplain occur. Most of the survey area and surrounding land is predominantly rocky and lacks extensive sandplain and habitat connectivity required for the Bilby.

3.5.3.2 Brush-tailed Mulgara

Evidence of Brush-tailed Mulgara has previously been recorded by:

- Biologic (2018) within the eastern portion of the BHP WAIO Caramulla exploration mining lease (Exploration Leases E52/18 and E52/172), approximately 50km east of the survey area. The Brush-tailed Mulgara was recorded 16 times within a sand plain habitat, identified via 11 active burrows, three inactive burrows, one digging, and one recently deceased individual
- Biologic (2013a) within the BHP WAIO Orebody 19 tenement (BHP Mineral Lease AML7000244), approximately three kilometres east of the survey area. Seven burrows; five old and inactive, and two possibly active were recorded
- Biologic (2013b) within the BHP WAIO Orebody 31 mining tenement (BHP Mineral Lease AML7000244), approximately 40 km east of the survey area. Five individuals were recorded via trapping, including a female with a litter of six, and from secondary evidence (burrows, scats, diggings).

3.5.3.3 Western Pebble-mound Mouse

Evidence of Western Pebble-mound Mouse has previously been recorded by:

- Outback Ecology (2009) within the BHP WAIO Jimblebar Iron Ore lease (BHP Mining Lease M266SA), approximately 40 km east of the survey area. Four mounds, two inactive and two active were recorded
- Biologic (2013a) within the BHP WAIO Orebody 19 tenement (BHP Mineral Lease AML7000244), approximately three kilometres east of the survey area. Five mounds were recorded, four inactive and one active, and thirteen individuals were identified via trapping
- ENV Australia (2011) within the BHP WAIO Orebody 31 mining tenement (BHP Mineral Lease AML7000244), approximately 40 km east of the survey area. Two recently inactive mounds were recorded.

3.5.3.4 Pilbara Olive Python

Biologic (2013a) recorded a total of four individuals within the BHP Orebody 19 tenement (BHP Mineral Lease AML7000244), approximately three kilometres east of the survey area. Individuals were recorded in a gorge/gully habitat, either in or close to water pools/holes and secondary evidence (scats and shed skin) was also recorded among boulders close to minor drainage habitat.

3.5.3.5 Ghost Bat

Evidence of the Ghost Bat has previously been recorded by:

- Biologic (2013a) within the BHP WAIO Orebody 19 tenement (BHP Mineral Lease AML7000244), approximately 3 km east of the survey area. Very old scats were present in one cave, however due to the decayed nature it is likely the cave has been used historically only
- Ecologia (2006) within the BHP WAIO Hashimoto Project Area within the Mineral Lease M266SA, approximately 50 km east of the survey area. Multiple individuals were recorded at a likely important roost site for Pilbara Leaf-nosed Bat, as well as a single individual recorded hunting a few kilometres from the roost.

3.5.3.6 Pilbara Leaf-nosed Bat

Ecologia (2006) recorded Pilbara Leaf-nosed Bats within the Hashimoto Project Area (BHP Mineral Lease M266SA), approximately 50 km east of the survey area. Multiple individuals were recorded and is considered to be a likely important roost site for this species and is a notable site as it is the south-easternmost roost in the Pilbara and a significant range extension for this species.

3.5.4 Literature review

As part of the desktop assessment previous fauna survey reports of spatial relevance to the survey area were provided by BHP WAIO. Following a review of the reports the findings were collated and are summarised in Table 7.

Table 7 *Summary of previous fauna studies*

Name of survey	OB31 Jimblebar Access Track VCP Level 1 Flora & Vegetation Survey and Vertebrate Fauna Assessment 2015	Jimblebar Iron Ore Project: Bat Survey and Assessment 2009	Jimblebar Iron Ore Project: Terrestrial Vertebrate Fauna Assessment 2009	Orebody 19 Level 2 Vertebrate Fauna Survey 2013	Orebody 31 Fauna Assessment 2011	Orebody 31 Vertebrate Fauna Survey 2013	Wheellarra Hill North Fauna Assessment
Consultant	Onshore Environmental	Specialised Zoological	Outback Ecology	Biologic	ENV Australia	Biologic	ENV Australia
Level of experience of consultant	One Principal Zoologist	Two Field Biologists	One Zoologist and two Biologists	Two Principal Zoologists and four Senior Zoologists	One Senior Zoologist and one Zoologist	Four Senior Zoologists and one Zoologist	One Principal Zoologist, two Senior Zoologists, two Zoologists, one Biologist, two Field Assistants
Location of survey in relation to this survey	~40km SE of survey eastern border	~40km SE of survey eastern border	~40km SE of survey eastern border	In the immediate vicinity of the survey area (~3km E of survey eastern border)	~36km E of survey eastern border	~40km E of survey eastern border	~40km E of survey eastern border
Dates of survey	15 Jul – 16 Jul 2015	6 May-11 May 2008	4 Jun-15 Jun 2008, 27 Sep-3 Oct 2008.	24 May-6 Jun 2013, 27 Aug-6 Sep 2013, 3 and 5 Dec 2013	28 Feb-2 Mar 2011, 29 Mar-1 Apr 2011	2 Oct-11 Oct 2013, 2 Dec-6 Dec 2013	7 Apr-18 Apr 2011, 4 Oct-13 Oct 2011
Seasonal conditions during and in the six months prior to the survey	399 mm of rainfall preceding the survey. Average maximum temperature: low 20s, minimum temperature: below 10°C.	207.8 mm of rainfall preceding the survey. Average maximum temperature: high 30s, minimum temperature: below 20°C.	411.2 mm of rainfall preceding June survey, 77.4 preceding Sep/Oct survey, 41.4 mm of rainfall between 10 Jun-15 Jun. Maximum temperature: between 14.9°C - 24.7°C for June survey, 25°C to 35.8°C for Sep/Oct survey. Minimum temperature: between 8°C - 15.4°C for June	247.8 mm of rainfall preceding May/Jun survey, 155.4 mm preceding Aug/Sep survey. Average maximum temperature: mid-low 30's for May/Jun survey, mid-high 30s for Aug/Sep survey. Average minimum temperature: below 10°C for May/June survey, between 5°C and 10°C for	250.6 mm of rainfall preceding the survey. Day temperature between 26.2°C - 34.7°C for Feb/Mar survey and low 20s for Mar/Apr survey. Night temperature: between 17.7°C - 24.6°C for Feb/Mar survey and between 15.8°C - 21.9°C for Mar/Apr survey.	91.8 mm of rainfall preceding the Oct survey and 89.6 mm preceding the Dec survey. Average maximum temperature: mid-high 30s for Oct survey and high 30's for Dec survey. Average minimum temperature: between 10°C - 20°C for Oct survey and mid-high 20s for Dec	230 mm of rainfall preceding the Apr survey and 32.4 mm preceding the Oct survey. Average maximum temperature: low 30s for Apr survey and mid 30's for Oct survey. Average minimum daily temperature: 18°C for Apr survey and 18.7°C for Oct survey.

Name of survey	OB31 Jimblebar Access Track VCP Level 1 Flora & Vegetation Survey and Vertebrate Fauna Assessment 2015	Jimblebar Iron Ore Project: Bat Survey and Assessment 2009	Jimblebar Iron Ore Project: Terrestrial Vertebrate Fauna Assessment 2009	Orebody 19 Level 2 Vertebrate Fauna Survey 2013	Orebody 31 Fauna Assessment 2011	Orebody 31 Vertebrate Fauna Survey 2013	Wheelarra Hill North Fauna Assessment
			survey, 2°C - 23.5°C for Sep/Oct survey.	Aug/Sep survey.		survey.	
Summary of survey techniques and survey effort	Level 1 (Basic) survey: Targeted transects at eight sites including fauna habitat mapping (two person days). Opportunistic vertebrate fauna observations recorded.	Level 1 (Basic) survey: Baseline survey including targeted daytime traverses (eight total), cave occupancy assessments (Anabat SD1), active acoustic monitoring (Anabat SD1) (three hours over two nights), passive acoustic monitoring (total 14 Anabat SD1 units) and harp trapping (four nights).	Two-phase Level 2 (Detailed) survey: Nine trapping sites, between six and eight trap nights per site. Total trapping effort equal to 2028 trap nights including 250 Pit traps, 1330 Elliot traps, 126 Cage traps and 322 Funnel trap nights. Additionally, 22 hours hand-searching (two and half hours per site), 19 hours of fixed-time bird census (two hours per site, 18.75 hours of nocturnal searches (two hours per site). Targeted searches survey effort included 38.5 hours and opportunistic fauna observations recorded.	Two-phase Level 2 (Detailed) survey: Six trapping sites, 52 traps per site. Total trapping effort equal to 4368 trap nights including 840 Pit traps, 1680 Elliot traps, 168 Cage traps, and 1680 Funnel trap nights. Additionally, 11 hours of fixed-time bird census (20 minutes per site) and 48 bat recording nights (576 hours across 26 locations) (SM2BAT+). Non-systematic survey effort included over 500 hours of diurnal searching, 80 hours of nocturnal searching (two night surveys) searching and 1248 hours of motion camera surveys.	Level 1 (Basic) survey: Targeted habitat assessments at 11 sites. Opportunistic fauna observations only.	Single season Level 2 (Detailed) survey: Five trapping sites, 52 traps per site. Total trapping effort equal to 1820 trap nights including 350 Pit trap, 700 Elliot trap, 70 cage traps and 700 funnel trap nights. Additionally, 9.3 hours of fixed-time bird census (four 20 minute surveys at seven sites) and 28 bat recording nights (336 hours) (SM2BAT+). Non-systematic survey effort included over 900 hours of diurnal searching, 80 hours of nocturnal searching and 84 nights of motion camera surveys.	Two-phase Level 2 (Detailed) survey: Seven trapping sites. Total trapping effort equal to 2452 trap nights including 490 pitfall trap, 14 Cage trap, 140 Elliot trap and 980 Funnel trap nights. Additionally, 49 hours of fixed-time bird census (three and half hours per site), 19 hours of nocturnal searching (half an hour per site) and two bat recording nights at five locations (AnaBat SD1 and SM2). Additional trapping conducted at a small Gorge for four nights during both surveys (total of 120 cage trap and 36 Elliot trap nights). Non-systematic survey effort: 60 hours diurnal opportunistic searching.
Species	Sixteen vertebrate	Six vertebrate	Ninety two	136 vertebrate	Fifty vertebrate	One hundred and	One hundred and

Name of survey	OB31 Jimblebar Access Track VCP Level 1 Flora & Vegetation Survey and Vertebrate Fauna Assessment 2015	Jimblebar Iron Ore Project: Bat Survey and Assessment 2009	Jimblebar Iron Ore Project: Terrestrial Vertebrate Fauna Assessment 2009	Orebody 19 Level 2 Vertebrate Fauna Survey 2013	Orebody 31 Fauna Assessment 2011	Orebody 31 Vertebrate Fauna Survey 2013	Wheelarra Hill North Fauna Assessment
richness within survey area (species recorded)	fauna species comprising four mammals (four introduced), 11 birds and one reptile.	fauna species comprising six mammals(all common bat species)	vertebrate fauna species comprising 16 mammals (six introduced), 47 birds, 27 reptiles and two amphibians.	fauna species comprising 25 mammals (two introduced), 62 birds, 48 reptiles and one amphibian.	fauna species comprising seven mammals (two introduced), 42 birds, nine reptiles and one amphibian.	three vertebrate fauna species comprising of 22 mammals (five introduced), 39 birds and 42 reptiles.	thirty-nine vertebrate fauna species comprising of 23 mammals (two introduced), 59 birds, 55 reptiles and two amphibians.
Significant species recorded and relevant significant caves	<i>Ardeotis australis</i> Australian Bustard (P4) <i>Merops ornatus</i> Rainbow Bee-eater (S3/M)	None	<i>Pseudomys chapmani</i> Western Pebble-mound Mouse (P4) <i>Ardeotis australis</i> Australian Bustard (P4) <i>Burhinus grallarius</i> Bush Stone-curlew (P4) <i>Merops ornatus</i> Rainbow Bee-eater (S3/M)	<i>Dasyercus blythi</i> Brush-tailed Mulgara (P4) <i>Pseudomys chapmani</i> Western Pebble-mound Mouse (P4) <i>Macroderma gigas</i> Ghost Bat (P4) <i>Ramphotyphlops ganei</i> Pilbara Flat-headed Blind Snake (P1) <i>Liasis olivaceus barroni</i> Pilbara Olive Python (VU/S1) <i>Merops ornatus</i> Rainbow Bee-eater (S3/M)	<i>Pseudomys chapmani</i> Western Pebble-mound Mouse (P4) <i>Ardeotis australis</i> Australian Bustard (P4) <i>Apus pacificus</i> Fork-tailed Swift (M)	<i>Dasyercus blythi</i> Brush-tailed Mulgara (P4) <i>Ardeotis australis</i> Australian Bustard (P4) <i>Merops ornatus</i> Rainbow Bee-eater (S3/M)	<i>Pseudomys chapmani</i> Western Pebble-mound Mouse (P4) <i>Ardeotis australis</i> Australian Bustard (P4) <i>Merops ornatus</i> Rainbow Bee-eater (S3/M)

Name of survey	OB31 Jimblebar Access Track VCP Level 1 Flora & Vegetation Survey and Vertebrate Fauna Assessment 2015	Jimblebar Iron Ore Project: Bat Survey and Assessment 2009	Jimblebar Iron Ore Project: Terrestrial Vertebrate Fauna Assessment 2009	Orebody 19 Level 2 Vertebrate Fauna Survey 2013	Orebody 31 Fauna Assessment 2011	Orebody 31 Vertebrate Fauna Survey 2013	Wheellarra Hill North Fauna Assessment
Taxonomic changes for conservation significant species*	Australian Bustard ¹ and Rainbow Bee-eater ² have been de-listed	None	Rainbow Bee-eater and Bush Stone-curlew ³ have been de-listed	Rainbow Bee-eater has been de-listed. Ghost Bat ⁴ status upgraded from P4 to (VU)	Australian Bustard has been de-listed	Australian Bustard and Rainbow Bee-eater have been de-listed	Australian Bustard and Rainbow Bee-eater have been de-listed
Survey limitations	Unlikely for all vertebrate fauna species to have been detected as a result of the single survey using non-systematic sampling methodology; Onshore Environmental indicated that seasonal conditions (significantly cold conditions) during the survey may have reduced herpetofauna detection.	Unlikely for all bat species to have been detected as a result of baseline single-survey methodology; Specialised Zoological indicated that cave assessments were limited to the most prospective structures in relation to limitations on accessibility, timeframe and vast survey area.	Outback Ecology indicated that seasonal conditions (rainfall and low temperatures) during the June survey may have reduced diurnal and nocturnal reptile and nocturnal mammal species activity. Also the lack of flowering plants during the Sep/Oct survey may have contributed to low bird species recorded compared to previous surveys.	Biologic indicated that due to identical call characteristics of some bat species within a genus, it was not possible to use calls to differentiate all species. Additionally, due to spatial and temporal changes in distribution a proportion of species would not have been detected likely including additional conservation significant species.	Unlikely for all vertebrate fauna species to have been detected as a result of non-systematic sampling methodology.	Biologic indicated that sampling was prevented between 12:00-18:00 on 6 Dec due to heavy rainfall, which may have impacted the outcomes of the survey, however, did not affect intended night surveys. Additionally, due to spatial and temporal changes in the distribution a proportion of species would not have been detected likely including additional conservation significant species.	ENV Australia indicated that the typical weather conditions experienced may have limited fauna activity.

¹ Australian Bustard (*Ardeotis australis*) state listing status previously Priority 4 (P4), have since been de-listed at the state level. Classified as Least Concern (IUCN 2021).

² Rainbow Bee-eater (*Merops ornatus*) state listing status previously Schedule 3 (S3), have since been de-listed at the state level. Classified as Least Concern (IUCN 2021)..

³ Bush Stone-curlew (*Burhinus grallarius*) state listing status previously Priority 4 (P4), have been de-listed at the state level. Classified as Least Concern (IUCN 2021).

⁴ Ghost Bat (*Macroderma gigas*) state listing status previously Priority 4 (P4), changed to Vulnerable (VU) as of September 2018 (DAWE 2021a). Classified as Vulnerable since 2019 (IUCN 2021).

Name of survey	Ore Body 24 Targeted Vertebrate Fauna Survey 2014	Newman to Yandi Transmission Line Terrestrial Vertebrate Fauna Assessment 2009	Cathedral Gorge Level 1 and Targeted Vertebrate Fauna Survey 2016
Consultant	Biologic	ENV Australia Pty Ltd	Biologic
Level of experience of consultant	Three Senior Zoologists (including the Project Manager) and two Zoologists	One Senior Zoologist and one Zoologist.	One Principal Zoologist and one Senior Zoologist
Location of survey in relation to this survey	7.6 km northeast of Newman	From Newman to Yandi, 90 km to the northwest of Newman	10 km north of Newman
Dates of survey	3 May -10 May 2013	7 May -16 May 2009	30 September – 5 October 2015
Seasonal conditions during and in the six months prior to the survey	0.2 mm of rainfall was recorded during the survey on 9 May 2013. Daily maximum temperatures ranged from 28 to 35°C, and daily minimum temperatures ranged from 12 to 23°C during the survey, which is generally consistent with long-term May averages for the area. The extent of climatic data in the six months prior to the survey was only presented from December to February 2013, which was also consistent with long-term averages.	131 mm of rainfall in the three months proceeding the survey. Daily maximum temperatures of 21 to 26°C (mean 27.7°C), overnight temperatures from 7 - 6°C (mean 11.4°C).	Dry, warmer than average
Summary of survey techniques and survey effort	Targeted transects (approximately 25 km of meandering transects), bat surveys (SM2BAT+ detectors), motion sensitive cameras (five cameras at 12 locations, across 32 nights), trapping (five sites with 10 Elliot traps and 10 cage traps, spaced linearly 50-100 m apart for five nights), and incidental records (indirect records and incidental sightings).	Level 1 (Basic) survey: Fauna habitat assessment, diurnal fauna searches (targeted to each major habitat), nocturnal searches (foot-based and car-based), ornithological census (targeted), bat echolocation detection (Anabat, two-nights) and opportunistic observations	Level 1 (Basic) survey: map and describe the fauna habitats present and undertake targeted surveys for fauna of conservation significance.
Species richness within survey area (species recorded)	165 vertebrate fauna species, comprising 30 mammal (four introduced) species, 85 bird species, 51 reptile species and three amphibian species.	76 terrestrial species, comprising nine reptile species, 59 bird species and eight mammal species.	A total of 72 vertebrate fauna species, comprising 16 mammal species, 46 bird species, and 10 reptile species were recorded.

Name of survey	Ore Body 24 Targeted Vertebrate Fauna Survey 2014	Newman to Yandi Transmission Line Terrestrial Vertebrate Fauna Assessment 2009	Cathedral Gorge Level 1 and Targeted Vertebrate Fauna Survey 2016
Significant species recorded and relevant significant caves	<i>Dasyercus sp.</i> Mulgara (P4) <i>Rhinonictis aurantia</i> Pilbara Leaf-nosed Bat (VU) <i>Macroderma gigas</i> Ghost Bat (P4) <i>Pseudomys chapmani</i> Western Pebble-mound Mouse (P4) <i>Ardeotis australis</i> Australian Bustard (P4) <i>Merops ornatus</i> Rainbow Bee-eater (MI) <i>Falco peregrinus</i> Peregrine Falcon (VU/OS) <i>Liasis olivaceus barroni</i> Pilbara olive Python (VU) Significant caves – CCAT-07, CCAT-13, CCAT-16	<i>Merops ornatus</i> Rainbow Bee-eater (MI) <i>Ardeotis australis</i> Australian Bustard (P4) Significant cave – CCAT-11	Ghost Bat (VU) Pilbara Leaf-nosed Bat (VU) Western Pebble-mound Mouse (P4) Rainbow Bee-eater (MI) Pilbara olive Python (VU) Significant caves – CCAT-08, CCAT-14
Taxonomic changes for conservation significant species*	Rainbow Bee-eater and the Australian Bustard have been de-listed. Ghost Bat has been changed to VU.	Rainbow Bee-eater and the Australian Bustard have been de-listed.	-
Survey limitations	No nocturnal work was undertaken, reducing the likelihood of opportunistic sightings of nocturnal fauna. Some bats could not be differentiated to species level, based on calls alone.	Restricted by Level 1 survey effort.	No nocturnal work was undertaken

4. Field Survey Results

4.1 Fauna

4.1.1 Habitat assessment

Seven broad habitat types were described and mapped during the field survey as described in Table 8 and shown in Figure 3 in Appendix A. These comprise:

- Breakaway/ Cliff
- Gorge/ Gully
- Sandplain
- Hillcrest/ Hillslope
- Mulga Woodland
- Major Drainage Line
- Claypan.

Cleared areas include roads, easements and infrastructure, and account for approximately 62.57 ha of the survey area.

Table 8 Fauna habitats of the survey area

Broad fauna habitat types	Mapped extent (ha)	Representative photograph
Breakaway/ Cliff This habitat includes steep and highly eroded ironstone scree formations usually at the edge of mesas and other elevated landforms with some vertical geomorphology. This habitat is extensive within the northern portion of the survey area. Substrates are generally skeletal or poorly formed and characterised by outcropping and eroded rocky areas that support <i>Triodia</i> (spinifex), and sparse <i>Corymbia candida</i> over mixed low sparse <i>Acacia</i>. The habitat has an abundance of rocky refuge sites such as crevices and overhangs for saxicoline vertebrates and has potential bat roost caves. Several species of birds and bats would utilise this habitat type. Mammals such as the Rothschild's Rock Wallaby (<i>Petrogale rothschildi</i>), Euro (<i>Osphranter erubescens</i>), rodents and dasyurids and many rock-dwelling reptiles (snakes, varanids, skinks, geckos) all utilise this habitat. Existing disturbances are limited to ground disturbance, associated with exploration drilling pads and tracks. Significant fauna Significant fauna that will utilise this habitat for foraging, roosting and breeding include the Pilbara Olive Python, Ghost Bat, Pilbara Leaf-nosed Bat, Gane's Blind Snake (Pilbara) (<i>Anilius ganei</i>), Long-tailed Dunnart (<i>Sminthopsis longicaudata</i>) and Peregrine Falcon (<i>Falco peregrinus</i>). The Peregrine Falcon will find a ledge on high cliffs to nest, and will forage in the air across this habitat, seeking out other birds as their prey. They will roost on cliff ledges too. The Long-tailed Dunnart is a rock-dwelling specialist and will forage for invertebrates in this habitat-type. It can also breed in deep rock crevices. The Pilbara Olive Python will roost in deep cracks during the heat of the day, and will forage on the breakaways for macropods, bats and birds in the evening. The species will breed in caves or other appropriate shelter. The Ghost Bat and Pilbara Leaf-nosed Bat will utilise this habitat for foraging and roosting, and where suitable, for breeding in cave systems. The Gane's Blind Snake will utilise the area for foraging and traversing through to reach other habitat. Habitat value: High	34.66	

Broad fauna habitat types	Mapped extent (ha)	Representative photograph
Gorge/ Gully This habitat type contains moderately to deeply bisected drainage channel and is present within the northern section of the survey area where it is associated with extensive Hillcrest/ Hillslope and Breakaway/ Cliff habitats. Soils tend to be shallow and alluvial where present. The drainage channel associated with the Gorge/ Gully supports open <i>Eucalyptus victrix</i>, <i>Corymbia candida</i> and <i>Corymbia hamersleyana</i>. The habitat is characterised by greater topographic features including deep gorges and gullies with cliffs, breakaways, rocky outcropping, scree slopes and an abundance of overhangs, crevices and caves. The habitat contained several water features (rockpools) in the gullies with exposed ironstone and are mostly temporary but persistent into dry season. Disturbance includes cattle and indirect weed presence, particularly Buffel grass (<i>*Cenchrus ciliaris</i>) spread via cattle. Several species of amphibian, birds and bats would utilise this habitat type. Mammals such as the Rothschild's Rock Wallaby, Euro, rodents and dasyurids and several rock-dwelling reptiles (snakes, varanids, geckos, and skinks) would all utilise this habitat. Significant fauna Ghost Bat and Pilbara Leaf-nosed Bat, Gane's Blind Snake (Pilbara), Long-tailed Dunnart, and Peregrine Falcon and Grey Falcon (<i>Falco hypoleucos</i>) are likely to utilise this habitat type. The Pilbara Olive Python will roost in deep cracks of the gorge during the heat of the day. It will utilise the water bodies in this habitat-type, particularly in the northwest area of the survey boundary. Water features associated with gorges are preferred hunting sites, where birds and mammals tend to be concentrated, particularly as surface water becomes limited in the dry season. The species will breed in caves and overhangs in the gorges. The Peregrine Falcon will find a ledge on high cliffs of the gorge to nest, or tree hollows that may be present in the tree-lined gully. The species will forage in the air across this habitat, seeking out other birds as their prey. The Grey Falcon will nest in the abandoned stick-nests formed by other birds of prey in the tallest trees in the landscape, usually along watercourses/gullies. Like the Peregrine Falcon, this species will forage overhead in this habitat, seeking out prey below. The Long-tailed Dunnart is a rock-dwelling specialist and will forage for invertebrates in this habitat-type. It can also breed in deep rock crevices that occur in the gorges.	407.36	

Broad fauna habitat types	Mapped extent (ha)	Representative photograph
The Ghost Bat and Pilbara Leaf-nosed Bat will utilise this habitat for foraging and roosting, and where suitable, for breeding in cave systems formed in the gorges. The water pools present in the gully provide excellent foraging potential for these species. The Gane's Blind Snake is thought to be associated with moist gorges and gullies (Wilson & Swan 2017). It will utilise the area for foraging and traversing through to reach other habitat. It will particularly utilise the soft soils of the gully for shelter. Habitat value: High		
Sandplain Sandplain habitat is characterised by orange red sandy clay loam with varying and patchy amounts of gravel. These substrates tend to be at low elevation and moderately deep and can be either aeolian or alluvial in origin. Sandplain supports isolated trees of <i>Eucalyptus gamophylla</i>, <i>Eucalyptus xerothermica</i> and <i>Corymbia hamersleyana</i> over patchy open to sparse mixed Acacia over an understory dominated by Triodia hummock grasslands. The Sandplain habitat makes up a small proportion of the survey area, concentrated particularly in the central and southern areas and appears to be relatively isolated, surrounded by extensive stony hillslopes and hillcrests instead of a large patch or corridor of sandplain. This poor connectivity with extensive regional sandplain, limits the use of some species that won't traverse hillslopes or hillcrests. This does not seem to be the case for the Brush-tailed Mulgara, which was recorded in this habitat in the survey area. Disturbances in the Sandplain habitat of the survey area included weeds in the alluvial areas and along tracks. A diverse range of burrowing reptile species are known to occur particularly small reptiles including snakes, skinks, geckos, pygopodids and agamids. Burrowing rodents and small dasyurid marsupials also utilise this habitat for foraging and shelter. Evidence of goanna diggings were prevalent over the entirety of the site, as well as small mammal (Spinifex Hopping Mouse (<i>Notomys alexis</i>) and Military Dragon (<i>Ctenophorus isolepis</i>)) and introduced mammal tracks, including dog and cat. Significant fauna The Sandplain habitat supports Brush-tailed Mulgara. This species was recorded via remote camera, and secondary evidence (scats and burrows) of mulgara were found in this habitat type, in the north-east portion of the survey area.	197.34	

Broad fauna habitat types	Mapped extent (ha)	Representative photograph
Habitat value: Moderate Hillcrest/ Hillslope This habitat type includes stony hills and rises with open low <i>Triodia</i> and low <i>Acacia</i>. There are scattered trees of <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> and occasional <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i>, and <i>Corymbia deserticola</i>. In some parts, there were low rises of red/brown sandy loam soils giving rise to scattered mallees; <i>Eucalyptus gamophylla</i>, <i>Eucalyptus xerothermica</i> and <i>Eucalyptus socialis</i>. Certain species of reptiles adapted to rocky substrates will utilise this habitat-type, including <i>Lucasium wombeyi</i> and <i>Ctenotus rutilans</i>. Small rodents and mammals will also utilise this habitat as a foraging and dispersal area. No disturbances were recorded in this habitat. Significant fauna The habitat supports the Gane's Blind Snake (Pilbara), Long-tailed Dunnart, Western Pebble-mound Mouse and Peregrine Falcon and Grey Falcon. The Grey Falcon would particularly forage in this habitat as it supports a lot of ground-dwelling birds, which comprises majority of its diet (Threatened Species Scientific Committee 2020). The Peregrine Falcon may also utilise these areas for foraging. The Long-tailed Dunnart may traverse along this habitat for foraging and use it as connectivity to the Breakaway/ Cliff habitat. The hummock grasses should provide necessary cover for this species and they are known to utilise stony soils as well as exposed rock (Western Australian Museum Collections 2021; Pavey 2006a). The Western Pebble-Mound Mouse will utilise this habitat type for building its mounds and intricate burrow systems underground. Active mounds were recorded in this habitat-type in the western and central portions of the survey area. The Gane's Blind Snake is most often recorded in rocky or stony areas and would utilise this habitat for foraging and traversing through to reach other habitats. Habitat value: Moderate, however where fine scale habitat features exist such as Gorge/ Gully and Breakaway/ Cliff habitats forming localised habitat, the value is high.	4450.88	

Broad fauna habitat types	Mapped extent (ha)	Representative photograph
Mulga Woodland This habitat has similar topography to Sandplain but heavier clay soils that support low open woodland of <i>Acacia aptaneura</i> and <i>Acacia paraneura</i> over <i>Eremophila spp.</i>, <i>Senna spp.</i>, shrubland over <i>Triodia epactia</i> very open to scattered hummock grassland. There were several large patches of Mulga Woodland habitat across the whole of the site, and sections that corresponded to drainage zones. This habitat represents a relatively small proportion of the survey area. Disturbance includes vehicle tracks, cattle grazing and weed presence, particularly Buffel grass spread via cattle. It provides habitat for several arid adapted frogs (<i>Cyclorana</i> and <i>Platyplectrum</i> species) and a range of common woodland birds. The understory provides litter and debris as microhabitats suitable for fossorial reptiles. Significant fauna This habitat provides foraging potential for the Gane's Blind Snake (Pilbara). The Long-tailed Dunnart may frequent this habitat as they are known to utilise spinifex hummocks under mulga in rocky landscapes. Where this habitat connects with the Hillcrest/ Hillslope this species may be present. The Grey Falcon will utilise this habitat for foraging. Given the sandy-clay substrate in some areas of this habitat, there is potential for the Brush-tailed Mulgara to utilise the softer substrate for digging its burrows. Habitat value: Moderate	864.37	

Broad fauna habitat types	Mapped extent (ha)	Representative photograph
Major Drainage Line This habitat is characterised by linear open woodland corridors of <i>Eucalyptus camaldulensis</i> subsp. <i>refulgens</i>, <i>Eucalyptus gamophylla</i> and <i>Corymbia hamerselyana</i> over open mixed shrubland over open tussock grassland on alluvial sandy loam substrate with some rocky areas associated with the drainage line. Landform tends to be low elevation plains. This habitat would support water features in the correct season. These were mostly dry during the survey but support large <i>Eucalyptus</i> and <i>Corymbia</i> trees throughout the year. Disturbances include cattle tracks causing erosion of the gully walls, and the spread of weeds, particularly Buffel grass. Several species of amphibian, birds and bats would utilise this habitat type. Mammals such as Euro, rodents and dasyurids and a range of reptiles (snakes, varanids, geckos, and skinks) would all utilise this habitat. Significant fauna The Grey Falcon would utilise this habitat type for breeding where there are large <i>Eucalyptus/Corymbia</i> trees. The species may also forage here, where birds come to loaf throughout the day. The Pilbara Olive Python would utilise the habitat as a corridor for movement through habitats and it provides foraging potential, particularly around large eucalypts and build up areas of woody debris (from flood events). The Ghost Bat and Pilbara-leaf nose Bat may utilise this habitat for foraging or utilisation as a water source when there is water present in the right season. They may use the habitat as a flyway (corridor). Ghost Bat may also utilise the large eucalypts as vantage points during hunting or feeding locations once prey is captured. Habitat value: High	481.74	

Broad fauna habitat types	Mapped extent (ha)	Representative photograph
Claypan This habitat is characterised as low elevation, poorly drained areas of heavy clay soil. This habitat will experience occasional / highly infrequent flooding following prolonged heavy rainfall. Vegetation community comprises <i>Acacia aneura</i> isolated trees over sparse <i>Senna spp.</i> isolated shrubs over mixed native grass open tussock grassland over open forbs forbland on red/brown loamy clay soils. Disturbances included cattle grazing and the spread of weeds, particularly Buffel grass, via cattle and development in the area. There was some infrastructure present in the area and cleared areas for access tracks. Provides foraging habitat for a diverse range of native bird and reptile species and is breeding habitat for several arid-adapted frog species (<i>Cyclorana</i>, <i>Platyplecturm</i>, <i>Neobatrachus species</i>). Significant fauna Potentially this habitat will flood on an infrequent/episodic basis and may provide temporary foraging habitat for several shorebirds (Glossy Ibis (<i>Plegadis falcinellus</i>), Sharp-tailed Sandpiper (<i>Calidris acuminata</i>), Gull-billed Tern (<i>Gelochelidon nilotica</i>) and Common Greenshank (<i>Tringa nebularia</i>)), known to occur locally. Habitat value: Moderate	36.88	
Cleared This includes areas devoid of all vegetation. This includes areas previously cleared for vehicle tracks, laydown areas and recently burnt areas. This does not comprise a habitat type but is included to represent the total size of the survey area.	62.57	Photo not available.
Total	6535.80	

4.1.2 Cave assessments

GHD undertook cave assessments at five caves within the survey area (CCAT-01, CCAT-06, CCAT-13, CCAT-17 and CCAT-19). Of the assessed caves by GHD one cave (CCAT-13) was a previously known cave (Biologic 2014). The remaining four caves that were assessed are new caves not previously known (CCAT-01, CCAT-06, CCAT-17 and CCAT-19). There were five other previously known caves; CCAT-08 (Biologic 2016, 2021), CCAT-11 (ENV 2009), CCAT-14 (Biologic 2016) and CCAT-07 and CCAT-16 (Biologic 2014) that were not assessed due to track accessibility and time constraint limitations that did not allow for detailed searches of some portions of the survey area.

The descriptions of the re-assessed and new caves have been presented as vertebrate fauna sample sites in Appendix D. The location of the five caves assessed in this survey and the locations of the six other known caves are shown in Figure 4, Appendix A.

The five caves that were assessed during the field survey have the potential to be suitable for the Ghost Bat and Pilbara Leaf-nose Bat. Four bat recording units were placed in suitable habitat: three in Gorge/ Gully, one in Major Drainage Line and one unit placed in close proximity to a cave in Gorge/ Gully habitat.

The three new caves assessed during the survey, namely CCAT-01, CCAT-06 and CCAT-17 were detected during vertebrate fauna search transects and are considered to be potential permanent or transitory diurnal roost for the Pilbara Leaf-nosed bat or Ghost Bat based on cave conditions and architecture. No secondary signs of activity (scats, feeding evidence) for either species were recorded in the assessed caves during the field survey.

Three (CCAT-19, CCAT-17, and CCAT-01) of the five caves were assessed as potential day roosts for the Pilbara Leaf-nosed Bat, with caves CCAT-17 and CCAT-01 noted as having a narrow inaccessible (to human) shaft potentially leading to a suitable roost chamber. The remaining two caves were assessed as potential Ghost Bat roosts (CCAT-06 and CCAT-13), equating to two potential day roosts for Ghost Bat. CCAT-13 contained a tarpaulin from a previous survey and evidence of *Taphozous* bats present.

Further targeted assessment of Gorge/ Gully and Breakaway/ Cliff for potential day roost caves in the northern portion of the survey area would provide thorough coverage for Pilbara Leaf-nosed Bat and Ghost Bat.

4.1.3 Fauna diversity

The field survey recorded 96 vertebrate fauna species within the survey area. The number of species by fauna group are presented in Table 9. These comprise two amphibia from one family, 59 birds from 28 different families, 16 reptiles from six different families, and 19 mammals from eight different families.

The most specious families of birds were Artamidae (5), Columbidae (5), Accipitridae (4), Falconidae (4) and Meliphagidae (4). The most speciose family of reptiles was Gekkonidae (4), Scincidae (4), and Varanidae (4). The most specious family of mammals was Vespertilionidae (3).

The complete table of all vertebrate fauna observations is presented in Appendix D.

Table 9 Fauna groups recorded during the survey

Fauna group	Number of species
Amphibians	2
Birds (native, not significant)	57
Birds (significant)	2
Mammals (native, not significant)	13
Mammals (significant)	3
Mammals (introduced)	3
Reptiles	16
Total	96

4.1.4 Introduced fauna

Mammals comprised the only group in which introduced fauna were recorded. Only one species was recorded during the field survey via remote camera detection:

- Dog (*Canis familiaris familiaris*).

4.1.5 Significant fauna

Five significant fauna species were recorded during the survey, they include:

- Pilbara Leaf-nosed bat (*Rhynonictus aurantia*) – (VU; VU)
- Grey Falcon (*Falco hypoleucos*) – (VU; VU)
- Brush-tailed Mulgara (*Dasycercus blythi*) - (P4)
- Western Pebble-mound Mouse (*Pseudomys chapmani*) - (P4)
- Peregrine Falcon (*Falco peregrinus*) – (OS)

The location of significant fauna observations or evidence are presented in Figure 4, Appendix A.

Likelihood of occurrence assessment

A likelihood of occurrence assessment was completed (Appendix D) for significant fauna taxa identified in the desktop assessment and following the analysis of the field survey. This assessment is based on species' biology, habitat requirements, the quality and availability of suitable habitat as determined during the field survey and records of the species in the survey area and locality. Species-specific searches of the DBCA *NatureMap* database with a buffer of 40 km were also conducted in order to gather information about the broader regional occurrence of species to further inform the likelihood of occurrence assessment. Some species identified in the Protected Matters Search tool are not realistically considered to occur in the survey area or are not terrestrial vertebrate species and have been excluded from the assessment.

34 significant fauna were identified within the study area, including:

- 24 birds
- eight mammals
- two reptiles

Of the 34 identified significant fauna taxa within the study area, five are known to occur and an additional five significant fauna taxa are considered likely to occur based on local records and habitats present. Likely fauna include:

- Pilbara Olive Python (*Liasis olivaceus barroni*) (VU/VU)
- Ghost Bat (*Macrotis lagotis*) (VU/VU)
- Gane's Blind Snake (Pilbara) *Anilius ganei* (P1)
- Long-tailed Dunnart (*Sminthopsis longicaudata*) (P4)
- Glossy Ibis (*Plegadis falcinellus*) (IA)

Table 10 summarises the species of significance (10 species) that are either known to occur or considered likely to occur in the survey area. A brief description of these species and their associated habitat types within the survey area are described below. The parameters of assessment for this likelihood of occurrence assessment and the full likelihood of occurrence assessment are provided in Appendix D. Out of the remaining 24 identified significant fauna taxa, 21 are considered unlikely to occur, and three are considered highly unlikely to occur within the study area.

Table 10 Summary of likelihood of occurrence assessment for conservation significant fauna species deemed known or likely to occur

Species	BC Act / DBCA	EPBC Act	Assessment outcome	Source
Birds				
Peregrine Falcon (<i>Falco peregrinus</i>)	OS		Known: The species is known from the region and was recorded during the survey opportunistically. Suitable habitat is present in Breakaway/ Cliff and Hillcrest/ Hillslope, Gorge/Gully habitat for nesting.	DBCA, NM
Grey Falcon (<i>Falco hypoleucos</i>)	VU	VU	Known: The species is known from the region and was recorded during the survey in the southern part of the survey area in the Hillcrest/ Hillslope habitat. Suitable habitat is also present in Mulga Woodland, Major Drainage Line, Hillcrest/ Hillslope and Gorge/ Gully habitat.	PMST
Glossy Ibis (<i>Plegadis falcinellus</i>)	IA	Mi	Likely: The species is known from the region with records present within the survey area and immediately adjacent. No specimens were recorded during the field survey however likely to visit, at least as vagrant on an occasional basis when adequate rainfall provides suitable extensive shallow water for foraging.	DBCA, NM
Mammals				
Ghost Bat (<i>Macroderma gigas</i>)	VU	VU	Likely: Unconfirmed calls were tentatively recorded with six calls detected during the nights of the 10 – 11 April 2021 (Swift 2). There was insufficient information to allocate a confident identification, therefore this species was not positively identified during the survey.	DBCA, PMST
Pilbara Leaf-nosed Bat (<i>Rhinonictis aurantia</i>)	VU	VU	Known: Confirmed calls were recorded at 9:33 pm on the night of the 10 April 2021 (Swift 2). This was three hours and 40 minutes after the end of civil twilight. The two recorded calls were of foraging bats, recorded near a cave within the Gorge/ Gully habitat. Suitable foraging habitat is present and two potential roosting caves were identified within the survey area.	DBCA, PMST
Brush-tailed Mulgara (<i>Dasycercus blythi</i>)	P4		Known: The species is known from the region and was recorded during the survey via remote camera detection in addition to active and inactive burrows in Sandplain habitat. Suitable habitat is restricted to the Sandplain and Mulga Woodland habitats.	DBCA
Long-tailed Dunnart (<i>Sminthopsis longicauda</i>)	P4		Likely: The species has been recorded in a wide variety of habitat types such as open shrubland sandplains and rocky habitat. The closest record is approximately 51 km east of the survey area. No specimens were recorded during the field survey however the survey area is within the known range and suitable habitat is present in Hillcrest/ Hillslope and Long-tailed Dunnart habitat. Breakaway/ Cliff, Gorge/ Gully, Hillcrest/ Hillslope and Mulga Woodland habitats.	DBCA
Western Pebble-mound Mouse (<i>Pseudomys chapmani</i>)	P4		Known: The species was recorded during the field survey via their pebble mound structures in the Hillcrest/ Hillslope habitat. Mounds were assessed as both active and non-active.	DBCA
Reptiles				
Pilbara Olive Python (<i>Liasis olivaceus barroni</i>)	VU	VU	Likely. The species is known from the region with records present within the survey area. No specimens were recorded during the field survey however some habitat is present along Major Drainage Line and Gorge/ Gully and Breakaway/ Cliff habitats. Two water features were located within the survey area and identified as potential foraging habitat.	DBCA, PMST
Gane's Blind Snake (Pilbara) (<i>Anilius ganei</i>)	P1		Likely: The species is known from the region with records present within the survey area, and west and northwest of the survey area. No specimens were recorded during the field survey however some habitat is present in Hillcrest/ Hillslope, Mulga Woodlands and Gorge/ Gully habitat.	DBCA

Key – (OS): Other Specially Protected Fauna under BC Act, (VU): Vulnerable under the EPBC Act and/ or BC Act, (P1): Priority 1 under DBCA, (P4): Priority 4 under DBCA. For breakdown of code meaning see Appendix B.

Significant fauna species recorded or formerly recorded in the survey area

Peregrine Falcon (*Falco peregrinus*)

The Peregrine Falcon is listed as Other Specially Protected Fauna under the BC Act.

The Peregrine Falcon is a large falcon species, which is predominantly preys aerially on medium sized birds such as pigeon, galah, and ducks. The species prefers areas with deep gorges or large cliff faces with riparian or plain habitat surrounding. The Peregrine Falcon nests primarily on ledges of cliffs, shallow tree hollows, and ledges of buildings in cities (Morcombe 2004). The Peregrine Falcon is wide ranging, mobile and aerial in nature, and therefore is likely to utilise all habitats within the survey area to varying degrees.

Breakaway/ Cliff, Hillcrest/ Hillslope and Gorge/ Gully habitat is present within the survey area. During the field survey a pair of Peregrine Falcons was observed and heard calling from Cliff/ Breakaway habitat within the northern portion of the survey area. No nest sites were recorded in the survey area; however, these habitats provide suitable nesting areas. The species likely utilises the survey area for nesting and foraging.

Grey Falcon (*Falco hypoleucos*)

The Grey Falcon is listed as Vulnerable under the EPBC Act and BC Act.

The Grey Falcon inhabits lightly timbered country, especially stony plains, and lightly timbered acacia scrubland. This species is considered scarce to rare and is usually found singularly or sometimes in pairs (Morcombe 2004). In Northern Pilbara/Southern Kimberley WA, the Grey Falcon is very rare. The distribution of the Grey Falcon is typically centred on inland drainage systems, where it frequents timbered lowland plains, particularly acacia shrublands intersected by tree-lined watercourses to forage. It also hunts in treeless areas and frequents tussock grassland and open woodland, especially in winter, and generally avoids deserts.

Grey Falcons are known from the region, all be it in low numbers. A pair of Grey Falcons were observed and heard calling from a low stony hill in the Hillcrest/ Hillslope habitat within the southern portion of the survey area. No nest sites were recorded in the survey area. The Mulga Woodland and Gorge/ Gully habitat provides suitable foraging habitat, and the Major Drainage Line habitat provides suitable nesting habitat for this species.

Pilbara Leaf-nosed Bat (*Rhinonictis aurantia*)

The Pilbara Leaf-nosed Bat is listed as Vulnerable under the EPBC Act and BC Act.

The Pilbara Leaf-nosed Bat populations are scattered and localised in the Pilbara region of WA. There are a few known populations of this species in the western Pilbara, roosting in caves formed in gorges that dissect massive siliceous sedimentary geology. It is more often observed in flight over waterhole sin gorges (Van Dyck and Strahan 2008). During the dry season the species roosts in deep, warm, humid caves or mines and forages nearby; in the wet season it is more widespread and may not require caves for roosting (Menkhorst and Knight 2011).

Optimal roosts are thought to occur in caves that form between ascending tock layers, where humidity is maintained from seeping groundwater (Van Dyck and Strahan 2008). Roosts are commonly located over pools of water, or areas deep within the mine of cave structure which provides elevated temperature and humidity. The species forages in open habitats, including Triodia hummock grasslands covering low rolling hills and shallow gullies and breakaways, with *Eucalyptus camaldulensis* along creeks and other drainage lines, over small watercourses throughout granite boulder terrain, over pools and low shrubs in ironstone gorges and in and around gravelly watercourses with *Melaleuca sp* (Van Dyck and Strahan 2008).

The Pilbara Leaf-nosed Bat was identified from two calls at 9:33 pm 10 April 2021 (Swift 2). This location was near a cave within Gorge Gully habitat. No calls were identified during the emergence period for this species. The two calls recorded were of foraging bats. The Major Drainage Line provides suitable foraging habitat, and the Breakaway/ Cliff and Gorge/ Gully habitats provide both suitable foraging and roosting habitat for this species. A bat call analysis report for this survey is presented in Appendix D.

Brush-tailed Mulgara (*Dasycercus blythi*)

The Brush-tailed Mulgara is listed as Priority 4 under the DBCA Priority Fauna listing.

The Brush-tailed Mulgara is primarily nocturnal, shelters in burrows and feeds on insects, other arthropods and small vertebrates. This species inhabits spinifex grasslands and, in central Australia, lives in burrows that it digs on the flats (sandplain) or between or on low sand dunes (Van Dyck and Strahan 2008). The Mulgara is a solitary

species exhibiting high site fidelity and a low propensity for dispersal once a home range has been established (Masters and Crowther 2003). Males and females maintain home ranges of 1.4 to 14 ha (Masters and Crowther 2003) which on average, overlap by less than 20% (Masters and Crowther 2003). The species is known to occur locally and has been previously recorded in the immediate vicinity (approximately three kilometres east of) of the survey area (Biologic 2014). The Sandplain habitat of the survey area represents suitable and typical habitat for the species.

Evidence of the Brush-tailed Mulgara was recorded in the form of one active, and eight inactive burrows, and one individual detected on remote camera in the Sandplain habitat. Camera images were captured from eight separate nights (15, 16, 18, 21, 24 April 2021 and 3, 4, 10 May 2021), and the images appear to all be of the same individual based on features. It is likely this animal was occupying one of the burrows identified during the survey. Table 11 below shows some of the evidence recorded and is also presented on Figure 4, Appendix A.

Table 11 *Brush-tailed Mulgara evidence recorded in the survey area*

Site ID	Evidence	Status	Latitude	Longitude	Habitat
CAM-15	Individual	-	-23.2862	119.6590	Sandplain
FAU-37	Burrow	Inactive	-23.2861	119.6589	Sandplain
FAU-35	Burrow	Active	-23.2859	119.6589	Sandplain
FAU-29	Burrow	Inactive	-23.2861	119.6594	Sandplain
FAU-27	Burrow	Inactive	-23.2861	119.6594	Sandplain
FAU-31	Burrow	Inactive	-23.2862	119.6592	Sandplain
FAU-33	Burrow	Inactive	-23.2858	119.6590	Sandplain
FAU-39	Burrow	Inactive	-23.28646	119.6590	Sandplain
FAU-41	Burrow	Inactive	-23.2864	119.6591	Sandplain
FAU-43	Burrow	Inactive	-23.2934	119.6716	Sandplain

Western Pebble-mound Mouse (*Pseudomys chapmani*)

The Western Pebble-mound Mouse is listed as Priority 4 under DBCA Priority Fauna listing.

The Western Pebble-mound Mouse is restricted to the Pilbara region where it is recognised as an endemic species. Habitat for the species can be found on stony hills or hillsides with hummock grasslands. The species constructs large mounds of pebbles on stony hills which cover an area of 0.5 – 9.0 square metres. 'Active' mounds are characterised by volcano-like cones capped by 'craters' that mark occluded entrances to subterranean burrow systems in which the mice live, often gregariously (Van Dyck and Strahan 2008). Additionally, an active mound has pebbles that do not or are not settled, meaning that the mound is being worked and pebbles continuously manipulated.

The species is known to occur locally and has been previously recorded in the immediate vicinity (approximately 3 km east of) of the survey area (Biologic 2014). *NatureMap* records (DBCA 2007-) indicate that this species is widespread in the eastern Pilbara region. However, this species is known to be sensitive to external impacts and populations are known to decline in areas where disturbance has occurred.

Evidence of Western Pebble-mound Mouse was recorded in 15 locations within the survey area: a total of six active and nine inactive mounds with a majority being within the Hillcrest/ Hillslope habitat type. Table 12 shows the evidence recorded and is presented in Figure 4, Appendix A.

Table 12 Western Pebble-mound Mouse mounds recorded in the survey area

Site ID	Evidence	Status	Latitude	Longitude	Habitat
FAU-02	Mound	inactive	-23.275846	119.674374	Stony Plain
FAU-03	Mound	inactive	-23.283614	119.669003	Hillcrest/ Hillslope
FAU-04	Mound	active	-23.270123	119.680197	Hillcrest/ Hillslope
FAU-05	Mound	inactive	-23.327444	119.703656	Stony Plain
FAU-06	Mound	inactive	-23.276299	119.677391	Hillcrest/ Hillslope
FAU-08	Mound	inactive	-23.284012	119.710518	Hillcrest/ Hillslope
FAU-07	Mound	inactive	-23.286206	119.691715	Breakaway/ Cliff
FAU-09	Mound	inactive	-23.286925	119.691331	Gorge/ Gully
FAU-11	Mound	active	-23.289566	119.755545	Hillcrest/ Hillslope
FAU-13	Mound	active	-23.302958	119.658671	Hillcrest/ Hillslope
FAU-17	Mound	active	-23.302392	119.688355	Hillcrest/ Hillslope
FAU-19	Mound	active	-23.302441	119.695845	Hillcrest/ Hillslope
FAU-21	Mound	active	-23.305918	119.698878	Hillcrest/ Hillslope
FAU-23	Mound	inactive	-23.305552	119.698903	Hillcrest/ Hillslope
FAU-45	Mound	inactive	-23.288482	119.694841	Hillcrest/ Hillslope

Significant fauna species likely to occur in the survey area

Glossy Ibis (*Plegadis falcinellus*)

The Glossy Ibis is listed as Migratory under the EPBC Act and BC Act.

The Glossy Ibis utilises freshwater marshes at the edges of lakes and rivers, lagoons, floodplains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation. The species is occasionally found in coastal locations such as estuaries, deltas, saltmarshes and coastal lagoons. Within Australia, the largest contiguous area of prime habitat is inland and norther floodplains (Marchant & Higgins 1990).

The species has previously been recorded nearby the survey area. No records were recorded during the survey. The closest and most recent recorded individuals was in 2010, approximately 12.5 km east of the survey area at Ophthalmia Dam. Given the limited availability of suitable habitat in the survey area, and the Glossy Ibis being a vagrant, it is likely the species will utilise Clay Pan and Major Drainage Line habitat on the survey area when adequate rainfall provides suitable extensive shallow water for foraging. The survey area is unlikely to be significant to the survival of the Glossy Ibis at either the local or regional levels.

Ghost Bat (*Macroderma gigas*)

The Ghost Bat is listed as Vulnerable under the EPBC Act and BC Act.

The Ghost Bat occurs in a wide range of habitats (foraging), and requires an undisturbed cave, deep fissure or disused mine shaft in which to roost (roosting and breeding). It is patchily distributed across Australia with an isolated population persisting in the Pilbara region and is sensitive to disturbance (Van Dyck and Strahan 2008).

The Ghost Bat has previously been recorded in the region, with the closest record approximately 3 km east of the survey area (Biologic 2014) and approximately 50 km east of the survey area (ecologia 2006). No records of Ghost Bat were recorded during the survey. Of the areas searched Gorge/ Gully habitat provided the most potential landform available to support large cave systems within the survey area. Two locations were identified as potential day roost caves for Ghost Bats. Unconfirmed calls were tentatively recorded with six calls detected during the nights of the 10 – 11 April 2021 (Swift 2).

Studies undertaken on Ghost Bat foraging found that the species will travel up to 2 km from a roost cave utilising large trees as vantage points to hunt (Churchill 1998). The survey area is within the species range, with suitable foraging habitat for Ghost Bats occurring as Major Drainage Line, Gorge/ Gully and Breakaway/ Cliff habitat types.

Long-tailed Dunnart (*Sminthopsis longicaudata*)

The Long-tailed Dunnart is listed as Priority 4 under DBCA Priority Fauna listing.

The Long-tailed Dunnart is a unique species of Dunnart as it's the only species which tail is double the length of its body with a terminal tuft (Menkhorst and Knight 2004). The longer tail enables the species to negotiate and move rapidly within rocky challenging environments. The species utilises rocky ranges, outcrops and breakaway environments within the Pilbara, Gascoyne, Murchison and northern Goldfields (Van Dyck et al. 2013). The records of the Long-tailed Dunnart come from widely scattered localities in the arid zone where it inhabits rugged, rocky areas including scree slopes, boulder and stony plateaus, and adjacent stony plains with shrubs over spinifex grasslands (Van Dyck et al. 2013). The scattered records are possibly an artefact of the environment which it utilises and difficulty in surveying these areas. However, the species may be locally common at times and numerous records are represented from some localities. The species is known to feed on arthropods, including mainly beetles and ants, but also spiders, cockroaches, centipedes, grasshoppers, flies, and various larvae (Van Dyck et al. 2013).

No records of the Long-tailed Dunnart were recorded during the survey. This species has been recorded in a wide variety of habitat types such as open shrubland, sandplains and rocky habitat. The species has previously been recorded in the region and general area, with the closest record approximately 51 km east of the survey area in 2006. The survey area is within this species range, with Hillcrest/ Hillslope, Breakaway/ Cliff, Mulga Woodlands and Gorge/ Gully habitat considered suitable.

Pilbara Olive Python (*Liasis olivaceus barroni*)

The Pilbara Olive Python is listed as Vulnerable under the EPBC Act and the BC Act.

The Pilbara Olive Python's range is restricted to the Pilbara region, north Western Australia, and the Dampier Archipelago. Habitat consists of rocky escarpments, gorges and waterholes. The preferred microhabitats for this species are under rock piles, on top of rocks, and under spinifex as well as in man-made features such as overburden heaps, railway embankments and sewerage treatment ponds. The species breeding season occurs from June to August, with males travelling large distances in search of breeding females (Wilson and Swan 2017.).

The species has previously been recorded in the region and within the survey area (Biologic 2014). No records of the Pilbara Olive Python were recorded during the survey. Within the survey area, the Gorge/ Gully, Breakaway/ Cliff and Major Drainage Line (and associated riparian vegetation) are considered critical habitat for this species.

Gane's Blind Snake (Pilbara) (*Anilius ganei*)

The Gane's Blind Snake (Pilbara) is listed as Priority 1 under DBCA Priority Fauna listing.

The Gane's Blind Snake (Pilbara) is an endemic species to the Pilbara found only between Newman and Pannawonica. The species is moderately robust with greyish/ brown above and cream below. An irregular junction is present between the darker lateral and paler underside areas (Wilson and Swan 2017). This species has a cryptic fossorial habit and is rarely encountered during surveys. Little is known of this species' ecology but like most other blind snakes, it is insectivorous, feeding on termites and their eggs, and larvae and pupae of ants

(Wilson and Swan 2017). This species of blind snake is known from widely separated areas. The habitat preferences of this species are not well understood however it appears to be mostly associated with moist gorges and gullies, and other rocky or stony habitats (Wilson and Swan 2017).

No records were recorded during the survey. The species has previously been recorded within the region and survey area in 1998, approximately three kilometres east of the survey area (approximately 14.5 km east of the survey area in 2009 and approximately 10 km south southwest of the survey area in 2010 (ALA, 2021). Within the survey area, Hillcrest/ Hillslopes, Gorge/ Gully, Breakaway/ Cliff, Mulga Woodland and Major Drainage Line are considered suitable habitats.

Other significant fauna species

Night Parrot (*Pezoporus occidentalis*)

The Night Parrot is listed as Endangered under the EPBC Act and Critically Endangered under the BC Act.

The Night Parrot inhabits arid and semi-arid areas that are characterised by having dense, low vegetation. Based on accepted records, the habitat of the Night Parrot consists of *Triodia* grasslands in stony or sandy environments and samphire and chenopod shrublands, including genera *Atriplex*, *Bassia* and *Maireana*, on floodplains and claypans, and on the margins of salt lakes, creeks or other sources of water (Parker 1980).

No evidence of the Night Parrot was recorded during the survey. The survey area has a paucity of old growth *Triodia* (preferred roosting and breeding habitat) and lacks chenopod shrublands which are preferred foraging habitat. The survey area also does not include the species requirement for long unburned *Triodia* with proximity to foraging areas (Murphy 2016). It is considered unlikely that the survey area supports resident birds of this species, with any possible use being irregular or opportunistic.

Northern Quoll (*Dasyurus hallucatus*)

The Northern Quoll is listed as Endangered under the EPBC Act and BC Act.

The Northern Quoll once occurred across the majority of northern Australia, but its range has significantly contracted. The species occurs in the Pilbara region but in disjunct populations. The Northern Quoll inhabits a range of vegetation associations, however, is especially abundant on dissected rocky escarpment and eucalypt woodland within 200 km of the coast (Van Dyck and Strahan 2008). The species is known to den in rock crevices and rock piles, favouring rocky areas.

The species is predominantly nocturnal, but are occasionally active during the day, particularly during mating season and are known to have a large home range (Van Dyck and Strahan 2008). No evidence of the Northern Quoll was recorded during the survey. There is a recognised lack of records within the eastern Hamersley Range which is an area considered to be marginal at best, and beyond the known range of the species. It is considered unlikely that the species would occur in the survey area.

5. Discussion and conclusion

The fauna habitat evaluation considered the significant species known or likely to occur, habitat extent and suitability, and specialised habitat requirements of significant species. In total, seven broad fauna habitat types were described and mapped during the field survey. Three of these, namely Breakaway/ Cliff, Gorge/ Gully and Major Drainage Line are considered high value as they are likely to provide specialised shelter, roosting and foraging habitat for several significant species identified and are regionally significant. All other fauna habitat types are considered moderate value based on the presence and extent of foraging and shelter habitat for a diverse range of common, locally occurring native fauna species, with these habitats being locally significant.

No roost caves were confirmed for Pilbara Leaf-nosed Bat or Ghost Bat based during the survey. It is likely that Gorge/ Gully and Breakaway/ Cliff habitats within the survey area that were not assessed have potential caves suitable for both or either species. Hillcrest/ Hillslope generally does not contain suitable habitat for caves, except where small areas of Gorge/ Gully and Cliff/ Breakaways are present. During the survey the Pilbara Leaf-nosed Bat was recorded via ultrasonic recording confirming presence and activity within the survey area. No records of the Ghost Bat were recorded during the survey. Both species have previously been recorded in the vicinity of the survey area, therefore known both locally and regionally. Pilbara Leaf-nosed Bat have been recorded both east and north of the survey area (within approximately 10 km) and Ghost Bat surrounding the survey area with numerous records west, north and east of the survey area within 10 km.

Ghost Bats are known to roost in caves and then venture out to forage, typically 1.9 km from the daytime roost with average foraging area spanning 61 hectares (Tidemann et al. 1985). Foraging habitat consists of all habitat types but typically those that provide structure and resources (i.e. shrublands or plains near to Major Drainage Lines). Based on local and regional records of the species and caves within the broader Hamersley Range, Ghost Bats are likely to utilise Breakaway/ Cliff, Gorge/ Gully and Major Drainage Line habitats for foraging within the survey area. The Gorge/ Gully habitat type potentially provides a higher foraging value as water pools present in gully's provide excellent foraging potential for this species.

The Pilbara Olive Python is known to occur throughout the Hamersley Range in extensive Gorge/ Gully habitat and has previously been recorded within survey area. No records of this species were recorded during the survey. The Pilbara Olive Python is considered likely to occur as it is known from the region, with Gorge/ Gully, Breakaway/ Cliff and Major Drainage Line (and associated riparian vegetation) habitat types considered critical habitat for this species, providing suitable shelter and hunting/ foraging habitat within the survey area.

The survey area has extensive foraging habitat that is potentially suitable for the Grey Falcon, as well as potential nesting habitat locally and throughout the region. The species distribution is widespread throughout the Pilbara region, however considered elusive and sedentary. This species was recorded in the survey area in the Hillcrest/ Hillslope habitat type. No nest sites were recorded. The Grey Falcon typically utilises shrublands for foraging, such as the Mulga Woodland habitat type and nests in woodlands, however the species is likely to opportunistically utilise all habitat types in the survey area.

The Peregrine Falcon is widespread in the Pilbara region with previous records extending through the Hamersley Range. The species prefers areas with deep gorges or large cliff faces with riparian or plain habitat surrounding. This species was recorded in the Cliff/ Breakaway habitat within the northern portion of the survey area. No nest sites were recorded. The Breakaway/ Cliff and Gorge/ Gully habitat types in the survey area provide suitable nesting and foraging habitat, and the species is likely to opportunistically utilise the Hillcrest/ Hillslope habitat that is associated with these critical habitat types for foraging.

The Brush-tailed Mulgara is known to occur locally although patchily due to paucity of suitable sandplain habitat within the local Newman area. Previous records of mulgara have been recorded approximately 3 km east of the survey area and evidence of this species was recorded on the Sandplain habitat type during the survey. The Sandplain habitat type within the survey area is locally significant as it provides suitable but limited localised habitat for a small resident population of mulgara. Suitable sandplain habitat becomes more extensive regionally to the south and east of Newman where this species is known to occur.

The Western Pebble-mound Mouse was recorded on stony hillslopes within the Hillcrest/ Hillslope habitat type from both active and inactive burrows. This species is known from the region and has been recorded regularly

within the local area and regionally on suitable extensive stony areas within the Newman Area, the southeast Hamersley Range and wider Pilbara area.

The Gane's Blind Snake (Pilbara) and Long-tailed Dunnart were not recorded during the survey. Both species prefer rocky habitats, however the Gane's Blind Snake is also associated with areas that capture water flow (i.e. drainage lines). Both species are found throughout the Pilbara and are relatively widespread but considered to have patchy distributions and cryptic in nature. The Gane's Blind Snake is known from the region with records present within the survey area, west and northwest of the survey area and is considered likely to occur. The Long-tailed Dunnart is also considered likely to occur as the survey area is within the known range and suitable habitat is present in Hillcrest/ Hillslope, Breakaway/ Cliff, Mulga Woodland and Gorge/ Gully habitat.

The Night Parrot was assessed via 19 nights of acoustic recording throughout the survey area. No calls of the species were recorded. Some potential roosting and foraging habitat is present within the survey area primarily as old growth *Triodia* within the Sandplain habitat type. The survey area lacks chenopod shrublands known to be preferred Night Parrot foraging habitat. The species is not known from the area with the closest known record is present along the Fortescue Marsh approximately 90 km north of the survey area. It is considered unlikely that the survey area supports resident birds of this species, with any possible use being irregular or opportunistic.

No evidence of Northern Quoll was recorded during the survey. Suitable habitat is present in the survey area in Breakaway/ Cliff, Gorge/ Gully, Hillcrest/ Hillslope and Major Drainage Line habitat types. The species has previously been recorded in low numbers in such habitats adjoining the survey area. Previous surveys of the eastern Hamersley Ranges show few Northern Quoll records, indicative of its classification as marginal for the species. It is possible the species occurs in the region, however in very low numbers being beyond the known range of the species. It is considered unlikely that the species would occur in the survey area.

The survey successfully identified key significant vertebrate fauna species present and mapped broad fauna habitat types with relevance to significant fauna occurring and deemed likely to occur within the survey area.

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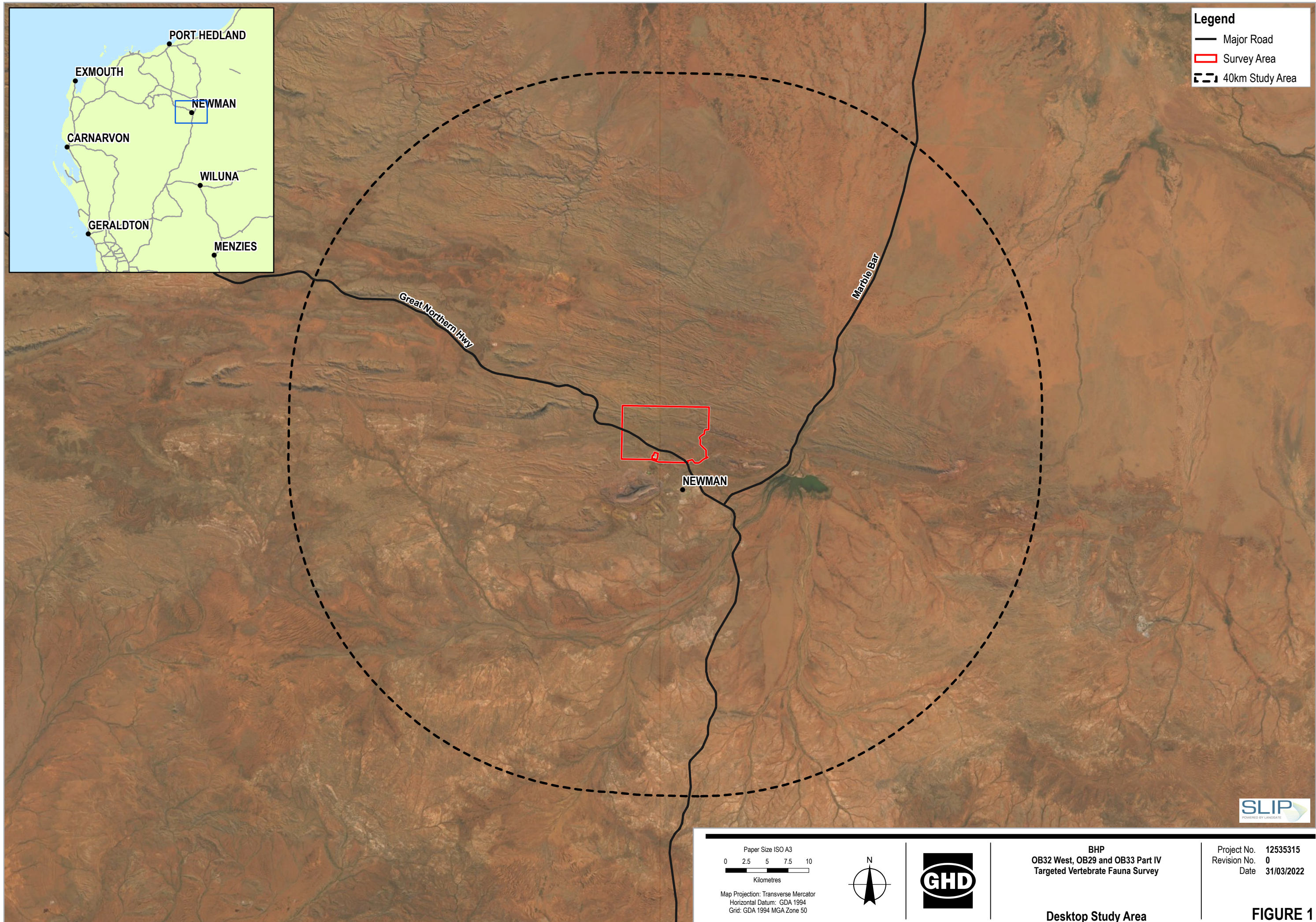
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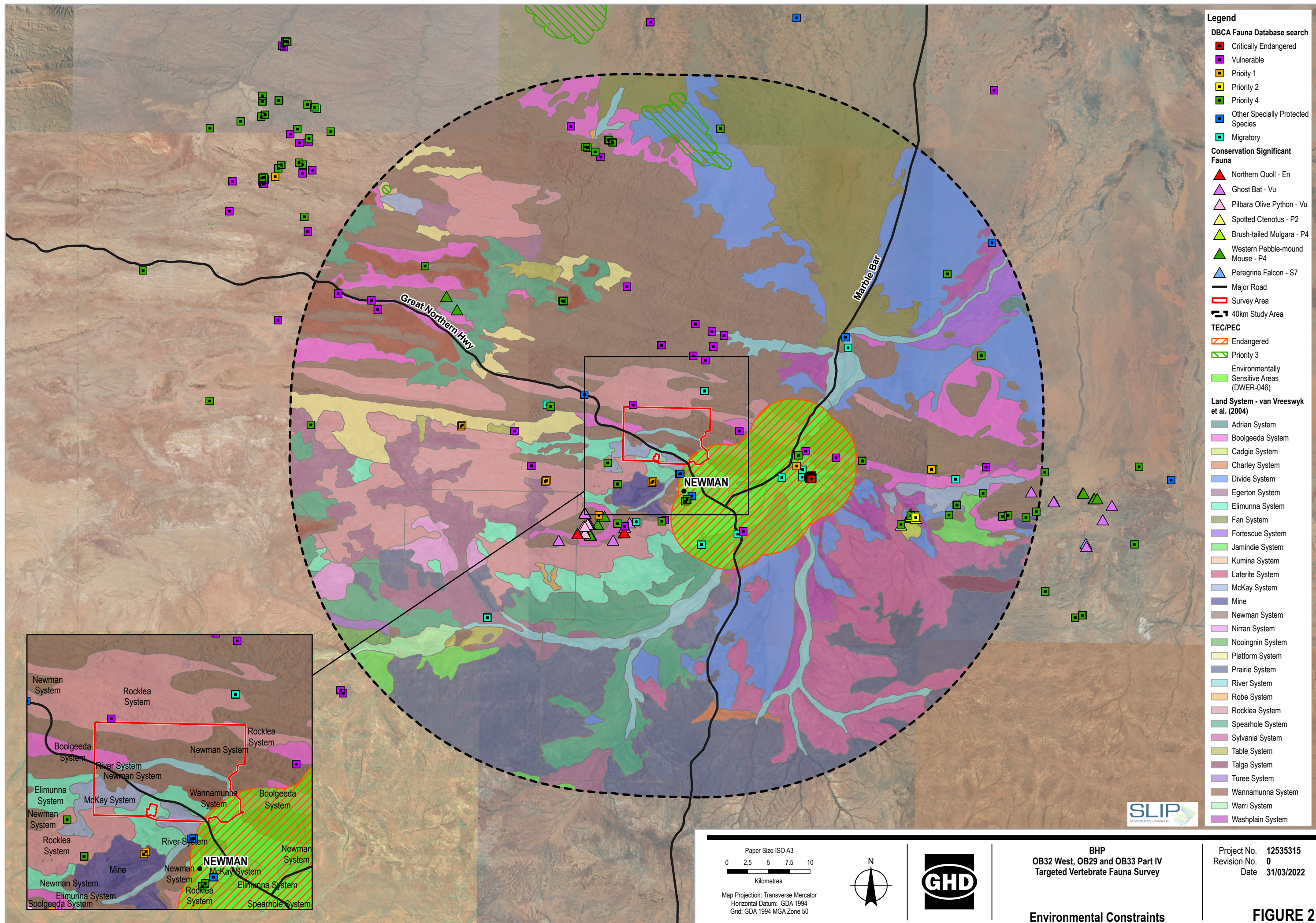
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Appendices

Appendix A

Figures





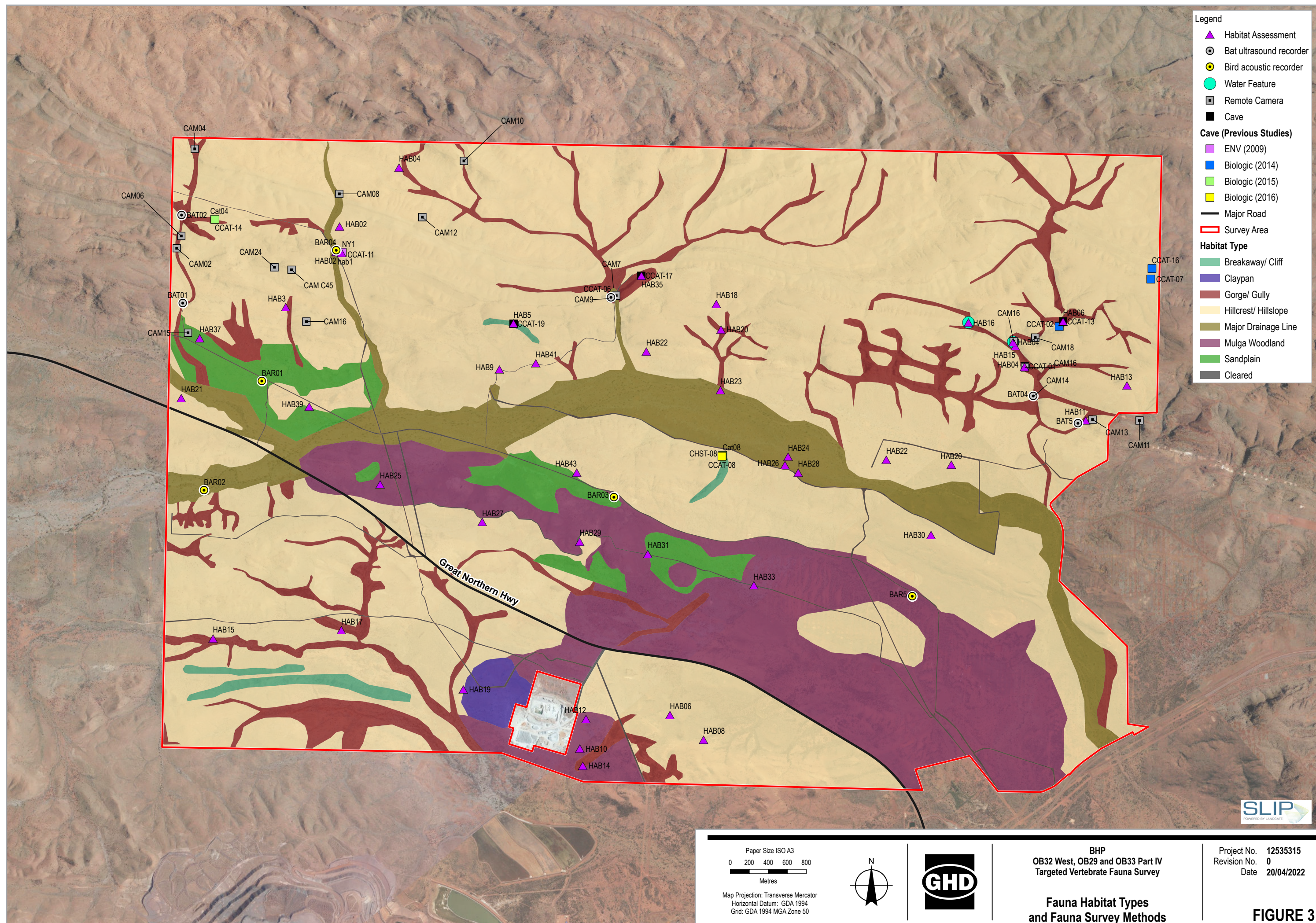
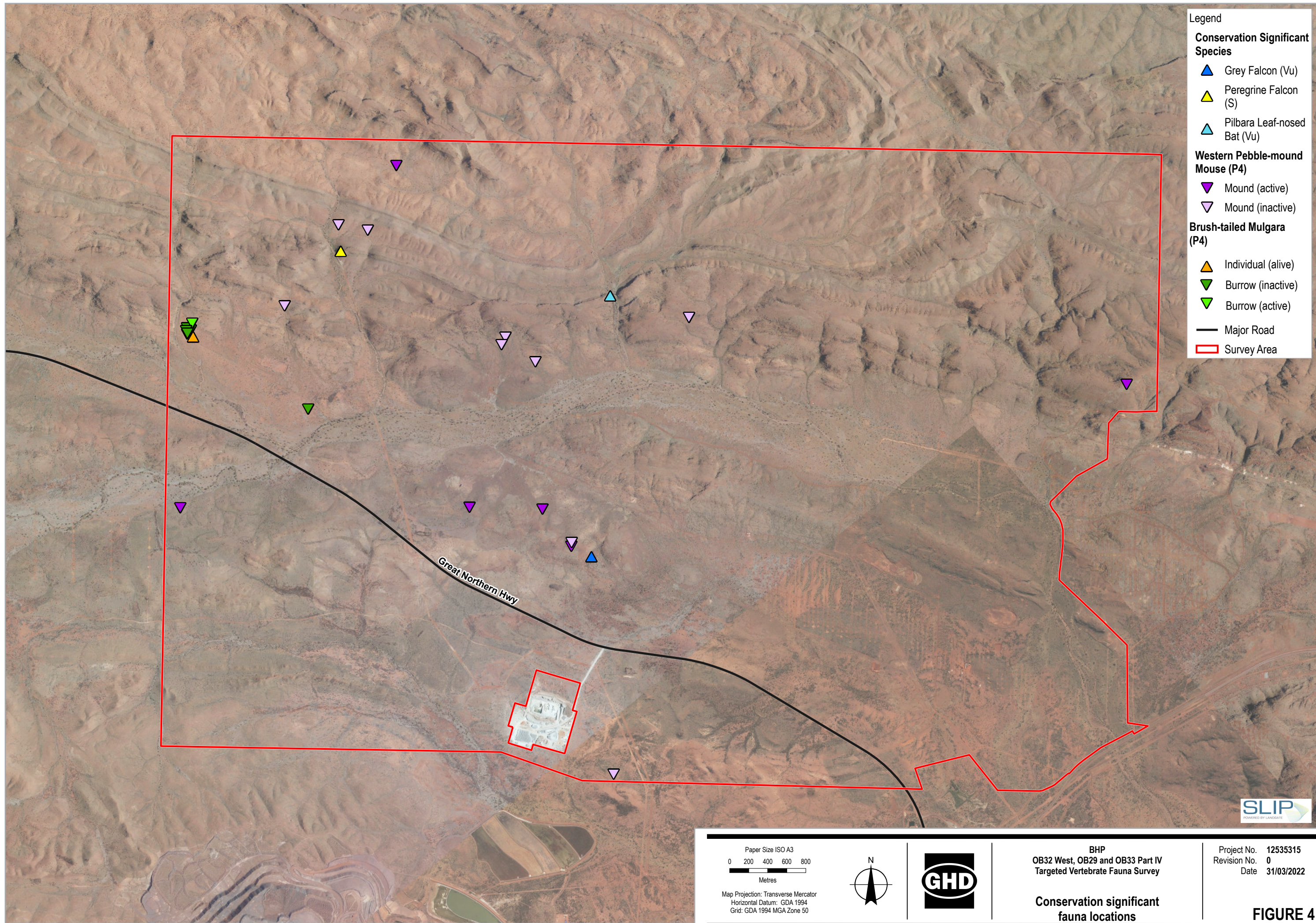


FIGURE 3



Appendix B

**Relevant legislation, background
information and conservation codes**

Relevant legislation

Federal *Environment Protection and Biodiversity Conservation Act 1999*

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the Federal Government's central piece of environmental legislation. It 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 Matters of National Environmental Significance (MNES).

The biological aspects listed as MNES include:

- Nationally threatened flora and fauna species and ecological communities
- Migratory species

A person must not undertake an action that has, will have, or is likely to have a significant impact (direct or indirect) on MNES, without approval from the Federal Minister for the Environment.

The EPBC Act is administered by the Department of the Environment and Energy (DEE).

State *Environment Protection Act 1986*

The *Environmental Protection Act 1986* (EP Act) is the primary legislative Act dealing with the protection of the environment in Western Australia. The Act allows the Environmental Protection Authority (EPA), to prevent, control and abate pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with the foregoing. Part IV of the EP Act is administered by the EPA and makes provisions for the EPA to undertake environmental impact assessment of significant proposals, strategic proposals and land use planning schemes.

The Department of Water and Environment Regulation (DWER) is responsible for administering the clearing provisions of the EP Act (Part V). Clearing of native vegetation in Western Australia requires a permit from the DWER, unless exemptions apply. Applications for clearing permits are assessed by the Department and decisions are made to grant or refuse the application in accordance with the Act. When making a decision the assessment considers clearing against the ten clearing principles as specified in Schedule 5 of the EP Act:

1. Native vegetation should not be cleared if it comprises a high level of biodiversity.
2. Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a significance habitat for fauna indigenous to Western Australia.
3. Native vegetation should not be cleared if it includes, or is necessary, for the continued existence of rare flora.
4. Native vegetation should not be cleared if it comprises the whole or part of native vegetation in an area that has been extensively cleared.
5. Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.
6. Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.
7. Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.
8. Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.
9. Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.
10. Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.

Exemptions for clearing include clearing that is a requirement of a written law or authorised under certain statutory processes (listed in Schedule 6 of the EP Act) and exemptions for prescribed low impact day-to-day activities (prescribed in the Environmental Protection (Clearing of Native Vegetation) Regulations 2004); these exemptions do not apply in environmentally sensitive areas (ESAs).

State Biodiversity and Conservation Act 2016

The *Biodiversity Conservation Act 2016* (BC Act) provides for the conservation and protection of biodiversity and biodiversity components, as well as the promotion of the ecologically sustainable use of biodiversity components in Western Australia. The BC Act replaces both the repealed *Wildlife Conservation Act 1950* (WC Act) and the *Sandalwood Act 1929* (Sandalwood Act), as well as their associated regulations. To attain the objectives of the BC Act, principles of ecological sustainable development have been established:

- Decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations
- If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation
- The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations
- The conservation of biodiversity and ecological integrity should be a fundamental consideration in decision-making
- Improved valuation, pricing and incentive mechanisms should be promoted.

The BC Act is administered by the Department of Biodiversity Conservation and Attractions (DBCA).

State Biosecurity and Agriculture Management Act 2007

The *Biosecurity and Agriculture Management Act 2007* (BAM Act) and associated regulations are administered by the Department of Primary Industries and Regional Development (DPIRD) and replace the repealed *Agriculture and Related Resources Protection Act 1976*. The main purposes of the BAM Act and its regulations are to:

- Prevent new animal and plant pests (vermin and weeds) and diseases from entering WA
- Manage the impact and spread of those pests already present in the state
- Safely manage the use of agricultural and veterinary chemicals
- Increased control over the sale of agricultural products that contain violative chemical residues.

The Western Australian Organism List (WAOL) provides the status of organisms which have been categorised under the BAM Act. A Declared Pest is a prohibited organism or an organism for which a declaration under Section 22(2) of the Act is in force. Declared Pests may be assigned a control category including: C1 (exclusion), C2 (eradication) and C3 (management). The category may apply to the whole of the State, LGAs, districts, individual properties or even paddocks, and all landholders are obliged to comply with the specific category of control. Categories of control are defined below.

DPIRD Categories for Declared Pests under the BAM Act

Control class code	Description
C1 (Exclusion)	Pests will be assigned to this category if they are not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.
C2 (Eradication)	Pests will be assigned to this category if they are present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.
C3 (Management)	Pests will be assigned to this category if they are established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which is currently free of that pest.

Fauna Conservation codes

Conservation significant fauna

The Federal conservation level of fauna species and their significance status is assessed under the EPBC Act. The significance levels for fauna used in the EPBC Act align with the International Union for Conservation of Nature (IUCN) Red List criteria, which are internationally recognised as providing best practice for assigning the conservation status of species. The EPBC Act also protects land and migratory species that are listed under International Agreements. The list of migratory species established under section 209 of the EPBC Act comprises:

- Migratory species which are native to Australia and are included in the appendices to the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals Appendices I and II)
- Migratory species included in annexes established under the Japan-Australia Migratory Bird Agreement (JAMBA) and the China–Australia Migratory Bird Agreement (CAMBA)
- Native, migratory species identified in a list established under, or an instrument made under, an international agreement approved by the Minister, such as the republic of Korea–Australia Migratory Bird Agreement (ROKAMBA)

The State conservation level of fauna species and their significance status also follows the IUCN Red List criteria. Under the BC Act fauna can be listed as Threatened, Extinct and as Specially Protected species.

Threatened species are those are species which have been adequately searched for and are deemed to be, in the wild, either rare, under identifiable threat of extinction, or otherwise in need of special protection, and have been gazetted as such. The assessment of the conservation status of Threatened species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria. Specially protected species meet one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection. Species that are listed as Threatened or Extinct species under the BC Act cannot also be listed as Specially Protected species.

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna List under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened flora or fauna.

Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.

Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.

For the purposes of this assessment, all species listed under the EPBC Act, BC Act and DBCA Priority species are considered conservation significant.

Conservation categories and definitions for EPBC Act and BC Act listed fauna species

Conservation category	Definition
Threatened species	
Critically Endangered (CR)	Threatened species considered to be “facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines”. Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with criteria set out in section 20 and the ministerial guidelines.
Endangered (EN)	Threatened species considered to be “facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines”. Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines.

Conservation category	Definition
Vulnerable (VU)	Threatened species considered to be “facing a high risk of extinction in the wild in the medium term future as determined in accordance with criteria set out in the ministerial guidelines”. Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines.
Extinct species	
Extinct (EX)	Species where “there is no reasonable doubt that the last member of the species has died”, and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).
Extinct in the Wild (EW)	Species that “is known only to survive in cultivation, in captivity or as a naturalized population well outside its past range, and it has not been recorded in its known habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its lifecycle and form”, and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).
Specially protected species	
Migratory (MI)	Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act). Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species.
Species of special conservation interest (conservation dependent fauna) (CD)	Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened.
Other specially protected fauna (OS)	Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act).

Conservation codes for DBCA listed Priority fauna

Priority category	Definition
Priority 1	Poorly-known taxa Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
Priority 2	Poorly-known taxa Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
Priority 3	Poorly-known taxa Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and

Priority category	Definition
	known threatening processes exist that could affect them. Such species are in need of further survey.
Priority 4	Rare, Near Threatened and other taxa in need of monitoring – Rare: Taxa that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands. – Near Threatened. Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. – Taxa that have been removed from the list of threatened taxa during the past five years for reasons other than taxonomy.

Other significant fauna

Fauna species may be significant for a range of reasons other than those protected by international agreement or treaty, Specially Protected or Priority Fauna. Significant fauna may include short-range endemic species, species that have declining populations or declining distributions, species at the extremes of their range, or isolated outlying populations, or species which may be undescribed (EPA 2010).

Appendix C

Desktop searches



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.

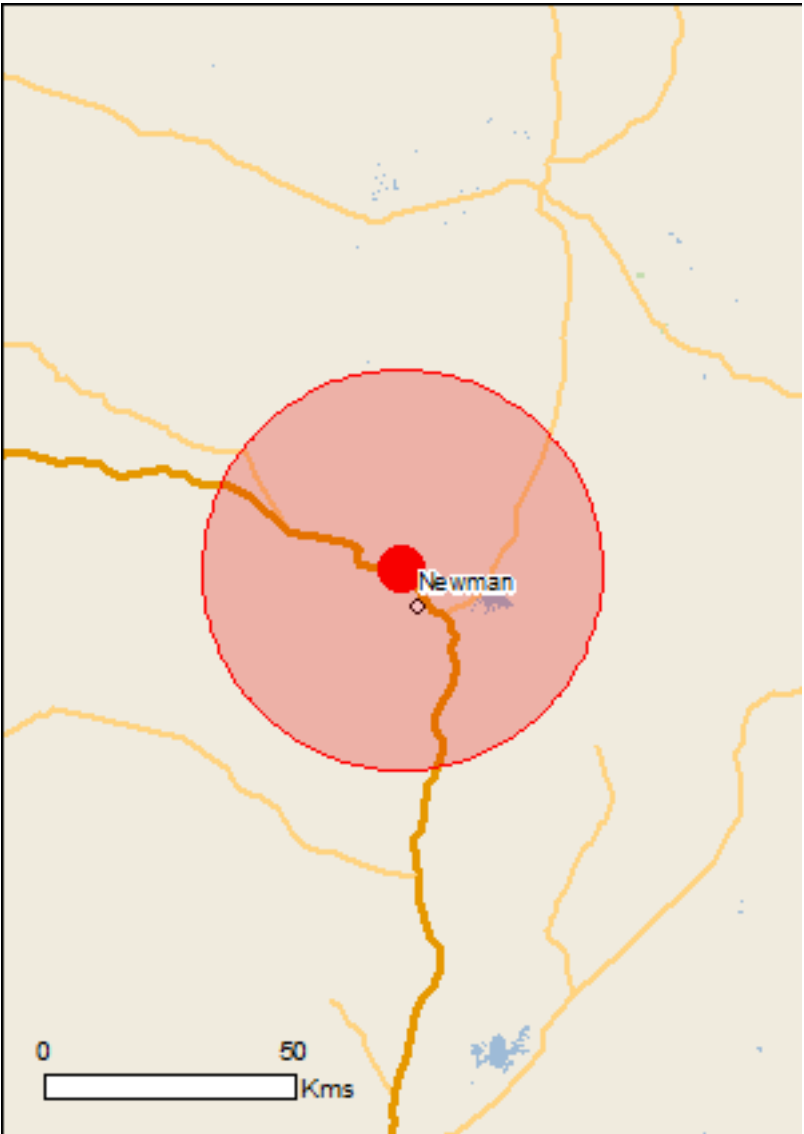
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

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

Report created: 17/06/21 09:58:42

- [Summary](#)
- [Details](#)

[Matters of NES](#)[Other Matters Protected by the EPBC Act](#)[Extra Information](#)
- [Caveat](#)
- [Acknowledgements](#)



This map may contain data which are
©Commonwealth of Australia
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[Coordinates](#)

Buffer: 40.0Km



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:	11
Listed Migratory Species:	9

Other Matters Protected by the EPBC Act

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

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <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:	2
Commonwealth Heritage Places:	None
Listed Marine Species:	13
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:	None
Regional Forest Agreements:	None
Invasive Species:	10
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 known to occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat likely to occur within area
Polytelis alexandrae Princess Parrot, Alexandra's Parrot [758]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	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 likely to occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
Macrotis lagotis Greater Bilby [282]	Vulnerable	Species or species habitat likely to occur within area
Rhinonictoris aurantia (Pilbara form) Pilbara Leaf-nosed Bat [82790]	Vulnerable	Species or species habitat known to occur within area
Plants		
Pityrodia augustensis Mt Augustus Foxglove [4962]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Liasis olivaceus barroni Olive Python (Pilbara subspecies) [66699]	Vulnerable	Species or species habitat known 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		
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 known to 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 known to occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Charadrius veredus		
Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land

[\[Resource Information \]](#)

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name	Threatened	Type of Presence
Commonwealth Land - Defence - NEWMAN TRAINING DEPOT		
Listed Marine Species		
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name		
Threatened		
Type of Presence		
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area
Apus pacificus		
Fork-tailed Swift [678]		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

Name	Threatened	Type of Presence
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat known to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]	Endangered*	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
Rostratula benghalensis (sensu lato) Painted Snipe [889]		Species or species habitat may occur within area

Extra Information

Invasive Species	[Resource Information]
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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
Mammals		
Camelus dromedarius Dromedary, Camel [7]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Equus asinus Donkey, Ass [4]		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
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		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

-23.29694 119.70307

Acknowledgements

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

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

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

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

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NatureMap Species Report

Created By Guest user on 17/06/2021

Kingdom Animalia
Current Names Only Yes
Core Datasets Only Yes
Method 'By Circle'
Centre 119° 42' 11" E, 23° 17' 49" S
Buffer 40km
Group By Species Group

Species Group	Species	Records
Amphibian	7	2076
Bird	198	8087
Fish	2	127
Invertebrate	353	1321
Mammal	42	1292
Reptile	99	1469
TOTAL	701	14372

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
Amphibian				
1.	25375 <i>Cyclorana maini</i> (Sheep Frog)			
2.	25392 <i>Litoria rubella</i> (Little Red Tree Frog)			
3.	25425 <i>Neobatrachus kunapalari</i> (Kunapalari Frog)			
4.	42306 <i>Platyplectrum spenceri</i> (Centralian Burrowing Frog)			
5.	25432 <i>Pseudophryne douglasi</i> (Gorge Toadlet)			
6.	25445 <i>Uperoleia russelli</i> (Northwest Toadlet)			
7.	41428 <i>Uperoleia saxatilis</i> (Pilbara Toadlet)			
Bird				
8.	24559 <i>Acanthagenys rufogularis</i> (Spiny-cheeked Honeyeater)			
9.	24260 <i>Acanthiza apicalis</i> (Broad-tailed Thornbill, Inland Thornbill)			
10.	24261 <i>Acanthiza chrysorrhoa</i> (Yellow-rumped Thornbill)			
11.	24264 <i>Acanthiza robustirostris</i> (Slaty-backed Thornbill)			
12.	24265 <i>Acanthiza uropygialis</i> (Chestnut-rumped Thornbill)			
13.	25535 <i>Accipiter cirrocephalus</i> (Collared Sparrowhawk)			
14.	25536 <i>Accipiter fasciatus</i> (Brown Goshawk)			
15.	25755 <i>Acrocephalus australis</i> (Australian Reed Warbler)			
16.	24831 <i>Acrocephalus australis</i> subsp. <i>gouldi</i> (Australian Reed Warbler)			
17.	41323 <i>Actitis hypoleucos</i> (Common Sandpiper)		IA	
18.	25544 <i>Aegotheles cristatus</i> (Australian Owllet-nightjar)			
19.	25647 <i>Amytornis striatus</i> (Striated Grasswren)			
20.	24540 <i>Amytornis striatus</i> subsp. <i>whitei</i> (Rufous Grasswren)			
21.	24312 <i>Anas gracilis</i> (Grey Teal)			
22.	24315 <i>Anas rhynchotis</i> (Australasian Shoveler)			
23.	24316 <i>Anas superciliosa</i> (Pacific Black Duck)			
24.	47414 <i>Anhinga novaehollandiae</i> (Australasian Darter)			
25.	24317 <i>Anseranas semipalmata</i> (Maggie Goose, Pied Goose)			
26.	25670 <i>Anthus australis</i> (Australian Pipit)			
27.	24285 <i>Aquila audax</i> (Wedge-tailed Eagle)			
28.	25558 <i>Ardea ibis</i> (Cattle Egret)			
29.	25559 <i>Ardea intermedia</i> (Intermediate Egret)			
30.	41324 <i>Ardea modesta</i> (great egret, white egret)			
31.	24340 <i>Ardea novaehollandiae</i> (White-faced Heron)			
32.	24341 <i>Ardea pacifica</i> (White-necked Heron)			
33.	24610 <i>Ardeotis australis</i> (Australian Bustard)			
34.	25566 <i>Artamus cinereus</i> (Black-faced Woodswallow)			
35.	24353 <i>Artamus cyanopterus</i> (Dusky Woodswallow)			
36.	24355 <i>Artamus minor</i> (Little Woodswallow)			
37.	24356 <i>Artamus personatus</i> (Masked Woodswallow)			
38.	24357 <i>Artamus superciliosus</i> (White-browed Woodswallow)			
39.	24318 <i>Aythya australis</i> (Hardhead)			

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
40.		<i>Barnardius zonarius</i>			
41.	24319	<i>Biziura lobata</i> (Musk Duck)			
42.	24359	<i>Burhinus grallarius</i> (Bush Stone-curlew)			
43.	25715	<i>Cacatua roseicapilla</i> (Galah)			
44.	24725	<i>Cacatua roseicapilla</i> subsp. <i>assimilis</i> (Galah)			
45.	25716	<i>Cacatua sanguinea</i> (Little Corella)			
46.	42307	<i>Cacomantis pallidus</i> (Pallid Cuckoo)			
47.	24779	<i>Calidris acuminata</i> (Sharp-tailed Sandpiper)		IA	
48.	24784	<i>Calidris ferruginea</i> (Curlew Sandpiper)		T	
49.	24786	<i>Calidris melanotos</i> (Pectoral Sandpiper)		IA	
50.	24788	<i>Calidris ruficollis</i> (Red-necked Stint)		IA	
51.	24789	<i>Calidris subminuta</i> (Long-toed Stint)		IA	
52.	25600	<i>Centropus phasianinus</i> (Pheasant Coucal)			
53.	24564	<i>Certhionyx variegatus</i> (Pied Honeyeater)			
54.	24377	<i>Charadrius ruficapillus</i> (Red-capped Plover)			
55.	24321	<i>Chenonetta jubata</i> (Australian Wood Duck, Wood Duck)			
56.	47909	<i>Cheramoeca leucosterna</i> (White-backed Swallow)			
57.		<i>Chroicocephalus novaehollandiae</i>			
58.	24431	<i>Chrysococcyx basalis</i> (Horsfield's Bronze Cuckoo)			
59.	24434	<i>Chrysococcyx osculans</i> (Black-eared Cuckoo)			
60.	24288	<i>Circus approximans</i> (Swamp Harrier)			
61.	24289	<i>Circus assimilis</i> (Spotted Harrier)			
62.	24774	<i>Cladorhynchus leucocephalus</i> (Banded Stilt)			
63.	25675	<i>Colluricincla harmonica</i> (Grey Shrike-thrush)			
64.	24613	<i>Colluricincla harmonica</i> subsp. <i>rufiventris</i> (Grey Shrike-thrush)			
65.	24361	<i>Coracina maxima</i> (Ground Cuckoo-shrike)			
66.	25568	<i>Coracina novaehollandiae</i> (Black-faced Cuckoo-shrike)			
67.	24363	<i>Coracina novaehollandiae</i> subsp. <i>subpallida</i> (Black-faced Cuckoo-shrike)			
68.	24416	<i>Corvus bennetti</i> (Little Crow)			
69.	25593	<i>Corvus orru</i> (Torresian Crow)			
70.	24671	<i>Coturnix pectoralis</i> (Stubble Quail)			
71.	25701	<i>Coturnix ypsilophora</i> (Brown Quail)			
72.	24420	<i>Cracticus nigrogularis</i> (Pied Butcherbird)			
73.	25595	<i>Cracticus tibicen</i> (Australian Magpie)			
74.	25596	<i>Cracticus torquatus</i> (Grey Butcherbird)			
75.	24322	<i>Cygnus atratus</i> (Black Swan)			
76.	25547	<i>Dacelo leachii</i> (Blue-winged Kookaburra)			
77.	24324	<i>Dendrocygna arcuata</i> (Wandering Whistling Duck, Chestnut Whistling Duck)			
78.	24325	<i>Dendrocygna eytoni</i> (Plumed Whistling Duck)			
79.	25607	<i>Dicaeum hirundinaceum</i> (Mistletoebird)			
80.	24470	<i>Dromaius novaehollandiae</i> (Emu)			
81.		<i>Egretta garzetta</i>			
82.		<i>Egretta novaehollandiae</i>			
83.		<i>Elanus axillaris</i>			
84.	25540	<i>Elanus caeruleus</i> (Black-shouldered Kite)			
85.	47937	<i>Elseya melanops</i> (Black-fronted Dotterel)			
86.	24631	<i>Emblema pictum</i> (Painted Finch)			
87.		<i>Eolophus roseicapillus</i>			
88.	25578	<i>Ephippiorhynchus asiaticus</i> (Black-necked Stork)			
89.	24568	<i>Epthianura aurifrons</i> (Orange Chat)			
90.	24570	<i>Epthianura tricolor</i> (Crimson Chat)			
91.	24837	<i>Eremiornis carteri</i> (Spinifex-bird)			
92.	24368	<i>Eurostopodus argus</i> (Spotted Nightjar)			
93.	25621	<i>Falco berigora</i> (Brown Falcon)			
94.	24471	<i>Falco berigora</i> subsp. <i>berigora</i> (Brown Falcon)			
95.	25622	<i>Falco cenchroides</i> (Australian Kestrel, Nankeen Kestrel)			
96.	24472	<i>Falco cenchroides</i> subsp. <i>cenchrus</i> (Australian Kestrel, Nankeen Kestrel)			
97.	25623	<i>Falco longipennis</i> (Australian Hobby)			
98.	24474	<i>Falco longipennis</i> subsp. <i>longipennis</i> (Australian Hobby)			
99.	25624	<i>Falco peregrinus</i> (Peregrine Falcon)		S	
100.	25727	<i>Fulica atra</i> (Eurasian Coot)			
101.	25730	<i>Gallirallus philippensis</i> (Buff-banded Rail)			
102.	47954	<i>Gelochelidon nilotica</i> (Gull-billed Tern)		IA	
103.	24401	<i>Geopelia cuneata</i> (Diamond Dove)			
104.	24402	<i>Geopelia humeralis</i> (Bar-shouldered Dove)			
105.	25585	<i>Geopelia striata</i> (Zebra Dove)			
106.	24404	<i>Geophaps plumifera</i> (Spinifex Pigeon)			
107.	25530	<i>Gerygone fusca</i> (Western Gerygone)			
108.	47959	<i>Gerygone fusca</i> subsp. <i>munyi</i> (Desert Gerygone)			
109.	24443	<i>Grallina cyanoleuca</i> (Magpie-lark)			

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
110.	24293	<i>Haliaeetus leucogaster</i> (White-bellied Sea-Eagle)			
111.	24295	<i>Haliastur spheonurus</i> (Whistling Kite)			
112.	24297	<i>Hamirostra melanosternon</i> (Black-breasted Buzzard)			
113.	47965	<i>Hieraaetus morphnoides</i> (Little Eagle)			
114.	25734	<i>Himantopus himantopus</i> (Black-winged Stilt)			
115.	24491	<i>Hirundo neoxena</i> (Welcome Swallow)			
116.	48587	<i>Hydroprogne caspia</i> (Caspian Tern)		IA	
117.	24572	<i>Lacustroica whitei</i> (Grey Honeyeater)			
118.	24367	<i>Lalage tricolor</i> (White-winged Triller)			
119.	24511	<i>Larus novaehollandiae</i> subsp. <i>novaehollandiae</i> (Silver Gull)			
120.	25661	<i>Lichmera indistincta</i> (Brown Honeyeater)			
121.		<i>Lophoictinia isura</i>			
122.	24326	<i>Malacorhynchus membranaceus</i> (Pink-eared Duck)			
123.	25651	<i>Malurus lamberti</i> (Variegated Fairy-wren)			
124.	24544	<i>Malurus lamberti</i> subsp. <i>assimilis</i> (Variegated Fairy-wren)			
125.	25652	<i>Malurus leucopterus</i> (White-winged Fairy-wren)			
126.	25654	<i>Malurus splendens</i> (Splendid Fairy-wren)			
127.	24583	<i>Manorina flavigula</i> (Yellow-throated Miner)			
128.	25758	<i>Megalurus gramineus</i> (Little Grassbird)			
129.	24838	<i>Megalurus gramineus</i> subsp. <i>gramineus</i> (Little Grassbird)			
130.	47997	<i>Melanodryas cucullata</i> (Hooded Robin)			
131.	25665	<i>Melithreptus gularis</i> (Black-chinned Honeyeater)			
132.	24589	<i>Melithreptus gularis</i> subsp. <i>laetior</i> (Black-chinned Honeyeater)			
133.	24736	<i>Melopsittacus undulatus</i> (Budgerigar)			
134.	24598	<i>Merops ornatus</i> (Rainbow Bee-eater)			
135.		<i>Microcarbo melanoleucos</i>			
136.	25542	<i>Milvus migrans</i> (Black Kite)			
137.	25545	<i>Mirafra javanica</i> (Horsfield's Bushlark, Singing Bushlark)			
138.	25685	<i>Neochmia ruficauda</i> (Star Finch)			
139.	24639	<i>Neochmia ruficauda</i> subsp. <i>clarescens</i> (Star Finch)			
140.	24737	<i>Neophema bourkii</i> (Bourke's Parrot)			
141.	25747	<i>Ninox connivens</i> (Barking Owl)			
142.	25564	<i>Nycticorax caledonicus</i> (Rufous Night Heron)			
143.	24742	<i>Nymphicus hollandicus</i> (Cockatiel)			
144.	24407	<i>Ocyphaps lophotes</i> (Crested Pigeon)			
145.	24618	<i>Oreoica gutturalis</i> (Crested Bellbird)			
146.	34012	<i>Oreoica gutturalis</i> subsp. <i>pallascens</i> (Crested Bellbird, central)			
147.	25680	<i>Pachycephala rufiventris</i> (Rufous Whistler)			
148.	24627	<i>Pardalotus rubricatus</i> (Red-browed Pardalote)			
149.	25682	<i>Pardalotus striatus</i> (Striated Pardalote)			
150.	24628	<i>Pardalotus striatus</i> subsp. <i>murchisoni</i> (Striated Pardalote)			
151.	24648	<i>Pelecanus conspicillatus</i> (Australian Pelican)			
152.	48060	<i>Petrochelidon ariel</i> (Fairy Martin)			
153.	48061	<i>Petrochelidon nigricans</i> (Tree Martin)			
154.	24659	<i>Petroica goodenovii</i> (Red-capped Robin)			
155.	25697	<i>Phalacrocorax carbo</i> (Great Cormorant)			
156.	25698	<i>Phalacrocorax melanoleucos</i> (Little Pied Cormorant)			
157.	24667	<i>Phalacrocorax sulcirostris</i> (Little Black Cormorant)			
158.	25699	<i>Phalacrocorax varius</i> (Pied Cormorant)			
159.	24409	<i>Phaps chalcoptera</i> (Common Bronzewing)			
160.	24841	<i>Platalea flavipes</i> (Yellow-billed Spoonbill)			
161.	24842	<i>Platalea regia</i> (Royal Spoonbill)			
162.	24748	<i>Platycercus varius</i> (Mulga Parrot)			
163.	25721	<i>Platycercus zonarius</i> (Australian Ringneck, Ring-necked Parrot)			
164.	24751	<i>Platycercus zonarius</i> subsp. <i>zonarius</i> (Port Lincoln Parrot)			
165.	24843	<i>Plegadis falcinellus</i> (Glossy Ibis)		IA	
166.	25703	<i>Podargus strigoides</i> (Tawny Frogmouth)			
167.	25704	<i>Podiceps cristatus</i> (Great Crested Grebe)			
168.	24681	<i>Poliiocephalus poliocephalus</i> (Hoary-headed Grebe)			
169.	24752	<i>Polytelis alexandrae</i> (Princess Parrot)		P4	
170.	24683	<i>Pomatostomus superciliosus</i> (White-browed Babbler)			
171.	25706	<i>Pomatostomus temporalis</i> (Grey-crowned Babbler)			
172.	25731	<i>Porphyrio porphyrio</i> (Purple Swamphen)			
173.	25732	<i>Porzana pusilla</i> (Baillon's Crake)			
174.	24771	<i>Porzana tabuensis</i> (Spotless Crake)			
175.	24390	<i>Psophodes occidentalis</i> (Western Wedgebill, Chiming Wedgebill)			
176.		<i>Ptilonorhynchus guttatus</i>			
177.	25724	<i>Ptilonorhynchus maculatus</i> (Spotted Bowerbird)			
178.	24757	<i>Ptilonorhynchus maculatus</i> subsp. <i>guttatus</i> (Western Bowerbird)			
179.	42323	<i>Ptilotula keartlandi</i> (Grey-headed Honeyeater)			

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
180.	42344	<i>Purnella albifrons</i> (White-fronted Honeyeater)			
181.	24278	<i>Pyrrholaemus brunneus</i> (Redthroat)			
182.	24776	<i>Recurvirostra novaehollandiae</i> (Red-necked Avocet)			
183.		<i>Rhipidura albicauda</i>			
184.	48096	<i>Rhipidura albiscapa</i> (Grey Fantail)			
185.	25614	<i>Rhipidura leucophrys</i> (Willie Wagtail)			
186.	24454	<i>Rhipidura leucophrys</i> subsp. <i>leucophrys</i> (Willie Wagtail)			
187.	30948	<i>Smicromis brevirostris</i> (Weebill)			
188.	24329	<i>Stictonetta naevosa</i> (Freckled Duck)			
189.	24482	<i>Stiltia isabella</i> (Australian Pratincole)			
190.	25656	<i>Stipiturus ruficeps</i> (Rufous-crowned Emu-wren)			
191.	25705	<i>Tachybaptus novaehollandiae</i> (Australasian Grebe, Black-throated Grebe)			
192.	24331	<i>Tadorna tadornoides</i> (Australian Shelduck, Mountain Duck)			
193.	30870	<i>Taeniopygia guttata</i> (Zebra Finch)			
194.	30871	<i>Taeniopygia guttata</i> subsp. <i>castanotis</i> (Zebra Finch)			
195.	24845	<i>Threskiornis spinicollis</i> (Straw-necked Ibis)			
196.	42351	<i>Todiramphus pyrrhopygius</i> (Red-backed Kingfisher)			
197.	25549	<i>Todiramphus sanctus</i> (Sacred Kingfisher)			
198.	48141	<i>Tribonyx ventralis</i> (Black-tailed Native-hen)			
199.	24806	<i>Tringa glareola</i> (Wood Sandpiper)		IA	
200.	24808	<i>Tringa nebularia</i> (Common Greenshank, greenshank)		IA	
201.	24809	<i>Tringa stagnatilis</i> (Marsh Sandpiper, little greenshank)		IA	
202.	24810	<i>Tringa totanus</i> (Common Redshank, redshank)		IA	
203.	24851	<i>Turnix velox</i> (Little Button-quail)			
204.	24852	<i>Tyto alba</i> subsp. <i>delicatula</i> (Barn Owl)			
205.	24386	<i>Vanellus tricolor</i> (Banded Lapwing)			

Fish

206.	<i>Leiopotherapon unicolor</i>
207.	<i>Melanotaenia australis</i>

Invertebrate

208.	'Maarka etheli'	Y
209.	<i>Acariformes</i> sp.	
210.	<i>Achnanthes exigua</i> Grun.	
211.	<i>Achnanthes exilis</i> Kütz.	
212.	<i>Aeolosoma</i> sp. 1 (PSS)	
213.	<i>Agraptocorixa parvipunctata</i>	
214.	<i>Ainudrilus</i> sp. WA27 (PSS)	Y
215.	<i>Allodessus bistrigatus</i>	
216.	<i>Allonais pectinata</i>	
217.	<i>Alona</i> cf. <i>verrucosa</i>	
218.	<i>Alona clathrata</i>	
219.	<i>Alona rigidicaudis</i>	
220.	<i>Amphipoda</i> sp.	
221.	<i>Amphora ovalis</i> (Kütz.) Kütz.	
222.	<i>Ampullacypris</i> sp.	Y
223.	<i>Aname mellosa</i>	
224.	<i>Anax papuensis</i>	
225.	<i>Anisops hackeri</i>	
226.	<i>Anisops nasutus</i>	
227.	<i>Anisops stali</i>	
228.	<i>Anopheles annulipes</i> s.l.	
229.	<i>Antiporus bakewelli</i>	
230.	<i>Antiporus</i> sp.	
231.	<i>Arcella</i> sp.	
232.	<i>Archinitocrella newmanensis</i>	Y
233.	<i>Areacandona</i> cf. 'iuo' (PSS)	
234.	<i>Areacandona</i> sp.	
235.	<i>Areacandona</i> sp. 7' (PSS)	Y
236.	<i>Argiocnemis rubescens</i>	
237.	<i>Armatalona macrocopa</i>	
238.	<i>Arrenurus</i> (Arrenurus) <i>ensifer</i>	
239.	<i>Asplanchna brightwelli</i>	
240.	<i>Australiobates queenslandensis</i>	
241.	<i>Australospilus elongatus</i>	
242.	<i>Austroagrimon pindrina</i> /Ischnura <i>heterosticta</i>	
243.	<i>Austrodytes insularis</i>	
244.	<i>Austroepigomphus</i> (Xerogomphus) <i>gordoni</i>	
245.	<i>Austrolestes aridus</i>	
246.	<i>Austrolimnius</i> WA sp. 2 (= adult sp WA 2) (PSW)	

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
247.	<i>Austropeplea lessoni</i>			
248.	<i>Austrostrophus stictopygus</i>			
249.	<i>Axonopsella nr truza</i> (PSW)			
250.	<i>Axonopsella</i> sp. P2 (PSW)			
251.	<i>Baetidae</i> sp.			
252.	<i>Bathynella</i> sp.			
253.	<i>Bdelloidea</i> sp. 2:2			
254.	<i>Bennelongia barangaroo</i> lineage			
255.	<i>Bennelongia nimala</i>			
256.	<i>Berosus dallasae</i>			
257.	<i>Berosus pulchellus</i>			
258.	<i>Bidessodes denticulatus</i>			
259.	<i>Boeckella triarticulata</i>			
260.	<i>Brachionus angularis</i>			
261.	<i>Brachionus bidentatus</i>			
262.	<i>Brachionus dichotomus</i>			
263.	<i>Brachionus falcatus</i>			
264.	<i>Brachionus quadridentatus</i>			
265.	<i>Branchinella halsei</i>			
266.	<i>Buddelundia</i> sp.			
267.	<i>Calamoecia baylyi</i> (Cue form) (ex nr <i>lucasi</i> CB)			
268.	<i>Caloneis silicula</i> (Ehr.) Cl.			
269.	<i>Carabidae</i> sp.			
270.	<i>Cephalodella biungulata</i>			
271.	<i>Cephalodella gibba</i>			
272.	<i>Cephalodella nr misgurnus</i> (PSW)			
273.	<i>Ceratopogonidae</i> sp.			
274.	<i>Cercyon</i> sp.			
275.	<i>Ceriodaphnia cornuta</i>			
276.	<i>Chironominae</i> sp.			
277.	<i>Chironomus aff. alternans</i> (V24) (CB)			
278.	<i>Chironomus tepperi</i>			
279.	<i>Chydaekata</i> sp.			
280.	<i>Cladopelma curtivalva</i>			
281.	<i>Cloeon</i> sp.			
282.	<i>Corduliidae</i> sp.			
283.	<i>Corixidae</i> sp.			
284.	<i>Cryptochironomus griseidorsum</i>			
285.	<i>Culex</i> (<i>Culex</i>) <i>annulirostris</i>			
286.	<i>Culex crinicauda</i>			
287.	<i>Culex palpalis</i>			
288.	<i>Culicidae</i> sp.			
289.	<i>Culicoides</i> sp.			
290.	<i>Cybister tripunctatus</i>			
291.	<i>Cylotella menghiniana</i> Kütz.			
292.	<i>Cylotella stelligera</i> Cl. & Grun.			
293.	<i>Cymbella affinis</i> Kütz.			
294.	<i>Cymbella aspera</i> (Ehr.) Cl.			
295.	<i>Cymbella delicatula</i> Kütz.			
296.	<i>Cypretta 'reticulata'</i> (PSW)			
297.	<i>Cypretta</i> ? <i>lutea</i>			
298.	<i>Cypricerus</i> sp. 422 (CB)			
299.	<i>Dasyheleinae</i> sp. P1 (PSW)			
300.	<i>Decapauropus tenuis</i>			Y
301.	<i>Dero nivea</i>			
302.	<i>Diacyclops cockingi</i>			
303.	<i>Diacyclops humphreysi humphreysi</i>			
304.	<i>Diacyclops scanloni</i>			
305.	<i>Diacyclops sobeprolatus</i>			
306.	<i>Diaphanosoma excisum</i>			
307.	<i>Diaphanosoma unguiculatum</i>			
308.	<i>Dicrotendipes jobetus</i>			
309.	<i>Diffugia</i> sp. P1			
310.	<i>Dineutus australis</i>			
311.	<i>Diplacodes bipunctata</i>			
312.	<i>Diplacodes haematodes</i>			
313.	<i>Diploneis ovalis</i> (Hilse) Cl.			
314.	<i>Dolichopodidae</i> sp.			
315.	<i>Draculoides neoanthropus</i>			Y
316.	<i>Dytiscidae</i> sp.			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
317.	<i>Ecnomus pilbarensis</i>			
318.	<i>Enchytraeidae</i> sp.			
319.	<i>Enchytraeus Pilbara</i> sp. 1 (PSS)			
320.	<i>Entomoneis paludosa</i> (W. Sm.) Reimer			
321.	<i>Eodiaptomus lumholtzi</i>			
322.	<i>Eosphora najas</i>			
323.	<i>Ephemeroporus barroisi</i> s.l.			
324.	<i>Ephydriidae</i> sp.			
325.	<i>Ephydriidae</i> sp. 6 (SAP)			
326.	<i>Epistylis</i> sp			
327.	<i>Epithemia adnata</i> (Kütz.) Bréb.			
328.	<i>Epithemia smithii</i> Carruthers			
329.	<i>Eretes australis</i>			
330.	<i>Ethmostigmus curtipes</i>			
331.	<i>Ethmostigmus rubripes</i>			
332.	<i>Euchlanis dilatata</i>			
333.	<i>Euchlanis oropha</i>			
334.	<i>Eucyclops australiensis</i>			
335.	<i>Euglypha</i> sp.			
336.	<i>Eurysticta coolawanyah</i>			
337.	<i>Fragilaria nanana</i> Lange-Bertalot			Y
338.	<i>Fragilaria ulna</i> (Nitz.) Lange Bertalot			
339.	<i>Gastrotricha</i> sp.			
340.	<i>Gomphodella 'hirsuta'</i> (PSS)			
341.	<i>Grayenulla waldockae</i>			
342.	<i>Guineaxonopsis</i> sp. S1 (PSS)			
343.	<i>Gyraulius hesperus</i>			
344.	<i>Haliphus pinderi</i>			
345.	<i>Hantzschia amphioxys</i> (Ehr.) Grun.			
346.	<i>Harpacticoida</i> sp			
347.	<i>Hellyethira</i> sp.			
348.	<i>Helochares/E mastersi</i> larvae			
349.	<i>Hemicordulia tau</i>			
350.	<i>Hemicypris megalops</i>			
351.	<i>Heteroceridae</i> sp.			
352.	<i>Hexarthra cf brandorffi</i> (PSW)			
353.	<i>Hexarthra intermedia</i>			
354.	<i>Hexarthra mira</i>			
355.	<i>Hoggicosa castanea</i>			
356.	<i>Holconia nigrigularis</i>			
357.	<i>Hydaticus consanguineus</i>			
358.	<i>Hydaticus daemeli</i>			
359.	<i>Hydra</i> sp.			
360.	<i>Hydrachna</i> sp.			
361.	<i>Hydrachna</i> sp. 4/5 (PSW)			
362.	<i>Hydraena barbipes</i>			
363.	<i>Hydraena cf. rudallensis</i> (PSW)			
364.	<i>Hydraenidae</i> sp.			
365.	<i>Hydrochus eurypleuron</i>			
366.	<i>Hydrochus</i> group 3 "black" (PSW)			
367.	<i>Hydrochus interioris</i>			
368.	<i>Hydrochus obscuraeus</i>			
369.	<i>Hydrodroma</i> sp.			
370.	<i>Hydroglyphus grammopterus (=trilineatus)</i>			
371.	<i>Hydroglyphus leai</i>			
372.	<i>Hydroglyphus orthogrammus</i>			
373.	<i>Hydrophilidae</i> sp.			
374.	<i>Hydrophilus brevispina</i>			
375.	<i>Hydrovatus weiri</i>			
376.	<i>Hyphydrus elegans</i>			
377.	<i>Hyphydrus lyratus</i>			
378.	<i>Ictinogomphus dobsoni</i>			
379.	<i>Indolpium</i> sp.			
380.	<i>Ischnura aurora aurora</i>			
381.	<i>Isopoda</i> sp.			Y
382.	<i>Itura deridderae</i>			
383.	<i>Keratella procurva</i>			
384.	<i>Keratella tropica</i>			
385.	<i>Laccophilus clarki</i>			
386.	<i>Laccophilus sharpi</i>			

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387.	<i>Lampona whaleback</i>			
388.	<i>Lanatomyia sp.</i>			
389.	<i>Larsia albiceps</i>			
390.	<i>Lecane batillifer</i>			
391.	<i>Lecane bulla</i>			
392.	<i>Lecane cf. crepida (PSW)</i>			
393.	<i>Lecane crepida</i>			
394.	<i>Lecane curvicornis</i>			
395.	<i>Lecane grandis</i>			
396.	<i>Lecane hornemanni</i>			
397.	<i>Lecane luna</i>			
398.	<i>Lecane papuana</i>			
399.	<i>Lepadella (H.) ehrenbergii</i>			
400.	<i>Lepadella (H.) heterostyla</i>			
401.	<i>Lepadella patella</i>			
402.	<i>Lepadella triptera</i>			
403.	<i>Leptocerus sp. AV2 (atsou?) (PSW)</i>			
404.	<i>Lesquereusia spiralis</i>			
405.	<i>Libellulidae sp.</i>			
406.	<i>Limbodessus compactus</i>			
407.	<i>Limnadopsis tatei</i>			
408.	<i>Limnebius sp.</i>			
409.	<i>Limnesia sp. 4 (PSW)</i>			
410.	<i>Limnichidae sp. P1</i>			
411.	<i>Limnichidae sp. P4</i>			
412.	<i>Limnocythere stationis</i>			
413.	<i>Longrita whaleback</i>			Y
414.	<i>Lophocharis n. sp. (psw079)</i>			
415.	<i>Macrochaetus altamirai</i>			
416.	<i>Mastogloia elliptica (Ag.) Cl.</i>			
417.	<i>Mastogloia smithii Thwaites</i>			
418.	<i>Melitidae sp.</i>			
419.	<i>Meridiescandona cf. facies (PSS)</i>			
420.	<i>Meridiescandona lucerna (PSS)</i>			Y
421.	<i>Meridiescandona sp. 3' (PSS)</i>			
422.	<i>Mesocyclops brooksi</i>			
423.	<i>Mesocyclops darwini</i>			
424.	<i>Mesovelgia hungerfordi</i>			
425.	<i>Mesovelgia sp.</i>			
426.	<i>Microcerberidae sp.</i>			
427.	<i>Microchironomus 'K1' (PSW)</i>			
428.	<i>Microcyclops varicans</i>			
429.	<i>Micronecta adelaidae</i>			
430.	<i>Micronecta micra</i>			
431.	<i>Micronecta n. sp. P1 (PSW)</i>			
432.	<i>Micronecta n. sp. P3 (PSW)</i>			
433.	<i>Microvelia (Austromicrovelia) peramoena</i>			
434.	<i>Missulena occatoria</i>			
435.	<i>Moina micrura s.l.</i>			
436.	<i>Mytilina ventralis macracantha</i>			
437.	<i>Nais variabilis</i>			
438.	<i>Navicula cryptocephala Kütz.</i>			
439.	<i>Navicula duerrenbergiana Hust.</i>			
440.	<i>Navicula radiosa Kütz.</i>			
441.	<i>Navicula rhynchocephala Kütz.</i>			
442.	<i>Navicula subrhynchocephala Hust.</i>			
443.	<i>Necterosoma regulare</i>			
444.	<i>Nematoda sp.</i>			
445.	<i>Nematoda sp. P2/P4 (PSW)</i>			
446.	<i>Nematoda sp. P6 (PSW)</i>			
447.	<i>Nematoda sp. P8 (PSW)</i>			
448.	<i>Nitocrella sp. 1 (PSS)</i>			Y
449.	<i>Nitzschia acicularis (Kütz.) W. Sm.</i>			
450.	<i>Nitzschia amphibia Grun.</i>			
451.	<i>Nitzschia angustata Grun.</i>			
452.	<i>Nitzschia frustulum (Kütz.) Grun.</i>			
453.	<i>Nitzschia gracilis Hantz.</i>			
454.	<i>Nitzschia microcephala Grun.</i>			
455.	<i>Nitzschia obtusa W. Sm</i>			
456.	<i>Nitzschia palea (Kütz.) W. Sm.</i>			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
457.	No invertebrates			
458.	Notobathynella sp.			
459.	Notonectidae sp.			
460.	Ochthebius sp. P1 (PSW)			
461.	Oecetis sp. Pilbara 2 (PSW)			
462.	Oecetis sp. Pilbara 4 (PSW)			
463.	Oecetis sp. Pilbara 5 (PSW)			
464.	Oligochaeta sp.			
465.	Onychohydus atratus			
466.	Oribatida group 5 (PSS)			
467.	Origocandona gratia			
468.	Origocandona inanitas			
469.	Orthetrum caledonicum			
470.	Ostracoda (unident.)			
471.	Oxus orientalis			
472.	Ozestheria packardi			
473.	Pantala flavescens			
474.	Paracyclops intermedius			
475.	Paracyclops sp. 8 (PSW)			
476.	Paracymus spenceri			
477.	Paramelitidae cf. sp. 2 (PSS)			
478.	Paramelitidae sp.			
479.	Paramelitidae sp. 2 (PSS)			
480.	Paramerina sp. D (PSW)			
481.	Paranacaena horni			
482.	Paranyctiophylax sp AV5 (KIM-UWA)			
483.	Parastenocarididae sp.			
484.	Parastenocaris jane			
485.	Paratanytarsus sp. P1 (PSW)			
486.	Paratanytarsus sp. P2 (PSW)			
487.	Paratanytarsus sp. P3 (PSW)			
488.	Paratendipes sp. 'K1' (PSW)			
489.	Pescecyclus sp. P1			
490.	Phreodrilid with dissimilar ventral chaetae			
491.	Phreodrilid with similar ventral chaetae			
492.	Phryssonotus novaehollandiae			
493.	Pilbaracandona 'kosmos' (PSS)			Y
494.	Pilbaracandona 'temporaria' (PSS)			
495.	Pilbaracandona colonia			
496.	Pilbaracandona eberhardi			
497.	Pilbarus millsii			
498.	Pinnularia subrostrata (A. Cl.) Cl.-Euler			
499.	Piona cumberlandensis			
500.	Platyias quadricornis			
501.	Platynectes decempunctatus var decempunctatus			
502.	Pleurosigma elongatum W. Sm.			
503.	Polyarthra dolichoptera			
504.	Polypedilum leei			
505.	Polypedilum nr vespertinus (M2) (SAP)			
506.	Polypedilum nubifer			
507.	Prethopalpus boltoni			Y
508.	Procladius paludicola			
509.	Pseudocloeon hypodelum (ex Baetid genus3 WA sp. 2) (PSW)			
510.	Pseudohydryphantes sp. P1 (PSW)			
511.	Psychodidae sp.			
512.	Ptygura sp.			
513.	Pygolabis humphreysi			Y
514.	Pygolabis sp.			
515.	Ranatra diminuta			
516.	Recifella sp.			
517.	Regimbartia attenuata			
518.	Rhantaticus congestus			
519.	Rheotanytarsus trivittatus			
520.	Rhopalodia gibba (Ehr.) O. Mull.)			
521.	Sciomyzidae sp.			
522.	Scirtidae sp.			
523.	Scolopendra morsitans			
524.	Sinantherina semibullata			
525.	Skusella subvittata			
526.	Spinasteron knowlesi			

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527.	<i>Spongillidae</i> sp.			
528.	<i>Staphylinidae</i> sp.			
529.	<i>Sternolophus australis</i>			
530.	<i>Sternolophus immarginatus</i>			
531.	<i>Sternolophus marginicollis</i>			
532.	<i>Sternopriscus multimaculatus</i>			
533.	<i>Sternopriscus pilbarensis</i>			
534.	<i>Stilobezzia</i> sp.			Y
535.	<i>Stratiomyidae</i> sp.			
536.	<i>Syncarida</i> sp.			
537.	<i>Tabanidae</i> sp.			
538.	<i>Tanypodinae</i> sp.			
539.	<i>Tanytarsus fuscithorax/semibarbitarsus</i>			
540.	<i>Tanytarsus</i> nr sp. P9 (PSW)			
541.	<i>Tanytarsus</i> sp. P12 (PSW)			
542.	<i>Tasmanocoenis arcuata</i>			
543.	<i>Testudinella amphora</i>			
544.	<i>Testudinella patina</i>			
545.	<i>Thereuopoda lesueurii</i>			
546.	<i>Thermocyclops decipiens</i>			
547.	<i>Tiporus tambreyi</i>			
548.	<i>Tipulidae</i> sp.			
549.	<i>Trachyspina mundaring</i>			
550.	<i>Trichocerca</i> cf. <i>bicristata</i>			
551.	<i>Trichocerca pusilla</i>			
552.	<i>Trichocerca similis</i>			
553.	<i>Triops australiensis australiensis</i>			
554.	<i>Triplectides australis</i>			
555.	<i>Tubificidae</i> stygo type 1A			Y
556.	<i>Turbellaria</i> sp.			
557.	<i>Tyrannochthonius aridus</i>			
558.	<i>Unixenus mjoebergi</i>			
559.	<i>Urodacus hoplurus</i>			
560.	<i>Vestalenula marmonieri</i>			

Mammal

561.	24251	<i>Bos taurus</i> (European Cattle)	Y	
562.	24254	<i>Camelus dromedarius</i> (Dromedary, Camel)	Y	
563.	24181	<i>Chaerephon jobensis</i> (Greater Northern Freetail-bat, Northern Mastiff Bat)		
564.	24186	<i>Chalinolobus gouldii</i> (Gould's Wattled Bat)		
565.	30903	<i>Dasymercus blythi</i> (Brush-tailed Mulgara, Ampurta)		P4
566.	24091	<i>Dasykaluta rosamondae</i> (Little Red Kaluta)		
567.	24257	<i>Equus asinus</i> (Donkey)	Y	
568.	24041	<i>Felis catus</i> (Cat)	Y	
569.	24180	<i>Macroderma gigas</i> (Ghost Bat)		T
570.	25489	<i>Macropus robustus</i> (Euro, Biggada)		
571.	24135	<i>Macropus robustus</i> subsp. <i>erubescens</i> (Euro, Biggada)		
572.	24136	<i>Macropus rufus</i> (Red Kangaroo, Marlu)		
573.	24168	<i>Macrotis lagotis</i> (Bilby, Dalgyte, Ninu)		T
574.	24223	<i>Mus musculus</i> (House Mouse)	Y	
575.	24095	<i>Ningau timealeyi</i> (Pilbara Ningau)		
576.	24224	<i>Notomys alexis</i> (Spinifex Hopping-mouse)		
577.	24194	<i>Nyctophilus geoffroyi</i> (Lesser Long-eared Bat)		
578.	24085	<i>Oryctolagus cuniculus</i> (Rabbit)	Y	
579.	24142	<i>Petrogale lateralis</i> subsp. <i>lateralis</i> (Black-flanked Rock-wallaby, Black-footed Rock-wallaby)		T
580.	24144	<i>Petrogale rothschildi</i> (Rothschild's Rock-wallaby)		
581.	48401	<i>Petrogale</i> sp. (rock wallaby)		T
582.	24102	<i>Planigale maculata</i> (Common Planigale)		
583.	24105	<i>Pseudantechinus roryi</i> (Rory's Pseudantechinus)		
584.	24106	<i>Pseudantechinus woolleyae</i> (Woolley's Pseudantechinus)		
585.	24233	<i>Pseudomys chapmani</i> (Western Pebble-mound Mouse, Ngadjij)		P4
586.	24235	<i>Pseudomys desertor</i> (Desert Mouse)		
587.	24237	<i>Pseudomys hermannsburgensis</i> (Sandy Inland Mouse)		
588.	43368	<i>Rhinonicteris aurantia</i> (Orange Leaf-nosed bat)		P4
589.	48095	<i>Rhinonicteris aurantia</i> (Pilbara) (Pilbara leaf-nosed bat)		T
590.	24174	<i>Saccolaimus flaviventris</i> (Yellow-bellied Sheath-tailed Bat)		
591.	24199	<i>Scotorepens balstoni</i> (Inland Broad-nosed Bat)		
592.	24200	<i>Scotorepens greyii</i> (Little Broad-nosed Bat)		
593.	24108	<i>Sminthopsis crassicaudata</i> (Fat-tailed Dunnart)		
594.	24115	<i>Sminthopsis longicaudata</i> (Long-tailed Dunnart)		

	Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
				P4	
595.	24116	<i>Sminthopsis macroura</i> (Stripe-faced Dunnart)			
596.	24117	<i>Sminthopsis ooldea</i> (Ooldea Dunnart)			
597.	24120	<i>Sminthopsis youngsoni</i> (Lesser Hairy-footed Dunnart)			
598.	24207	<i>Tachyglossus aculeatus</i> (Short-beaked Echidna)			
599.	24175	<i>Taphozous georgianus</i> (Common Sheath-tailed Bat)			
600.	24176	<i>Taphozous hilli</i> (Hill's Sheath-tail-bat)			
601.	24205	<i>Vespadelus finlaysoni</i> (Finlayson's Cave Bat)			
602.	24248	<i>Zyomys argurus</i> (Common Rock-rat)			

Reptile

603.	25332	<i>Acanthopis wellsi</i> (Pilbara Death Adder)			
604.	30833	<i>Amphibolurus longirostris</i> (Long-nosed Dragon)			
605.	44634	<i>Anilius ganei</i> (Gane's blind snake (Pilbara))		P1	
606.	25318	<i>Antaresia perthensis</i> (Pygmy Python)			
607.	25448	<i>Antaresia stimsoni</i> (Stimson's Python)			
608.	25241	<i>Antaresia stimsoni</i> subsp. <i>stimsoni</i> (Stimson's Python)			
609.	25320	<i>Aspidites melanocephalus</i> (Black-headed Python)			
610.	25331	<i>Brachyuropsis approximans</i> (North-western Shovel-nosed Snake)			
611.	25015	<i>Carlia munda</i> (Shaded-litter Rainbow Skink)			
612.	25017	<i>Carlia triacantha</i> (Desert Rainbow Skink)			
613.	25339	<i>Chelodina steindachneri</i> (Flat-shelled Turtle)			
614.	30893	<i>Cryptoblepharus buchananii</i>			
615.	30892	<i>Cryptoblepharus ustulatus</i>			
616.	25458	<i>Ctenophorus caudicinctus</i> (Ring-tailed Dragon)			
617.	24865	<i>Ctenophorus caudicinctus</i> subsp. <i>caudicinctus</i> (Ring-tailed Dragon)			
618.	25459	<i>Ctenophorus isolepis</i> (Crested Dragon, Military Dragon)			
619.	24876	<i>Ctenophorus isolepis</i> subsp. <i>isolepis</i> (Crested Dragon, Military Dragon)			
620.	25460	<i>Ctenophorus maculatus</i> (Spotted Military Dragon)			
621.	24882	<i>Ctenophorus nuchalis</i> (Central Netted Dragon)			
622.	24886	<i>Ctenophorus reticulatus</i> (Western Netted Dragon)			
623.	25025	<i>Ctenotus ariadnae</i>			
624.	25036	<i>Ctenotus duricola</i>			
625.	25462	<i>Ctenotus grandis</i>			
626.	25045	<i>Ctenotus helenae</i>			
627.	25052	<i>Ctenotus leonhardii</i>			
628.	25463	<i>Ctenotus pantherinus</i> (Leopard Ctenotus)			
629.	25064	<i>Ctenotus pantherinus</i> subsp. <i>ocellifer</i> (Leopard Ctenotus)			
630.	25072	<i>Ctenotus rubicundus</i>			
631.	25071	<i>Ctenotus rutilans</i>			
632.	25073	<i>Ctenotus saxatilis</i> (Rock Ctenotus)			
633.	25465	<i>Ctenotus uber</i> (Spotted Ctenotus)			
634.	25081	<i>Ctenotus uber</i> subsp. <i>johnstonei</i> (Spotted Ctenotus (northeast), Spotted Skink (Balgo, NE WA))		P2	
635.	25466	<i>Cyclodomorphus melanops</i> (Slender Blue-tongue)			
636.	25090	<i>Cyclodomorphus melanops</i> subsp. <i>melanops</i> (Slender Blue-tongue)			
637.	24997	<i>Delma butleri</i>			
638.	24998	<i>Delma elegans</i>			
639.	25000	<i>Delma haroldi</i>			
640.	25001	<i>Delma nasuta</i>			
641.	25002	<i>Delma pax</i>			
642.	25468	<i>Demansia psammophis</i> (Yellow-faced Whipsnake)			
643.	25295	<i>Demansia psammophis</i> subsp. <i>cupreiceps</i> (Yellow-faced Whipsnake)			
644.	25297	<i>Demansia rufescens</i> (Rufous Whipsnake)			
645.	24926	<i>Diplodactylus conspicillatus</i> (Fat-tailed Gecko)			
646.	24937	<i>Diplodactylus mitchelli</i>			
647.	24944	<i>Diplodactylus savagei</i> (Southern Pilbara Beak-faced Gecko)			
648.	30909	<i>Diporiphora amphiboluroides</i> (Mulga Dragon)			
649.	41406	<i>Egernia cygnitos</i> (Western Pilbara Spiny-tailed Skink)			
650.	25092	<i>Egernia depressa</i> (Southern Pygmy Spiny-tailed Skink)			
651.	25094	<i>Egernia formosa</i>			
652.	25109	<i>Eremiascincus richardsonii</i> (Broad-banded Sand Swimmer)			
653.	25301	<i>Furina ornata</i> (Moon Snake)			
654.	24956	<i>Gehyra pilbara</i>			
655.	24958	<i>Gehyra punctata</i>			
656.	24959	<i>Gehyra variegata</i>			
657.	24961	<i>Heteronotia binoei</i> (Bynoe's Gecko)			
658.	24963	<i>Heteronotia planiceps</i>			
659.	24962	<i>Heteronotia spelea</i> (Desert Cave Gecko, Pilbara Cave Gecko)			
660.	25125	<i>Lerista bipes</i>			
661.	25150	<i>Lerista macropisthopus</i> subsp. <i>remota</i> (unpatterned robust slider (Robertson Range),			

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
	<i>skink</i>)		P2	
662.	25155 <i>Lerista muelleri</i>			
663.	25156 <i>Lerista neander</i>			
664.	25183 <i>Lerista zietzi</i>			
665.	25005 <i>Lialis burtonis</i>			
666.	25238 <i>Liasis olivaceus</i> subsp. <i>barroni</i> (Pilbara Olive Python)		T	
667.	30933 <i>Lucasium stenodactylum</i>			
668.	30934 <i>Lucasium wombeyi</i>			
669.	25184 <i>Menetia greyii</i>			
670.	25187 <i>Menetia surda</i> subsp. <i>surda</i>			
671.	25495 <i>Morethia ruficauda</i>			
672.	25193 <i>Morethia ruficauda</i> subsp. <i>exquisita</i>			
673.	24972 <i>Nephurus wheeleri</i> subsp. <i>cinctus</i>			
674.	24976 <i>Oedura marmorata</i> (Marbled Velvet Gecko)			
675.	25254 <i>Parasuta monachus</i>			
676.	25510 <i>Pogona minor</i> (Dwarf Bearded Dragon)			
677.	24907 <i>Pogona minor</i> subsp. <i>minor</i> (Dwarf Bearded Dragon)			
678.	25261 <i>Pseudechis australis</i> (Mulga Snake)			
679.	42416 <i>Pseudonaja mengdeni</i> (Western Brown Snake)			
680.	25263 <i>Pseudonaja modesta</i> (Ringed Brown Snake)			
681.	25264 <i>Pseudonaja nuchalis</i> (Gwardar, Northern Brown Snake)			
682.	25009 <i>Pygopus nigriceps</i>			
683.	24982 <i>Rhynchoedura ornata</i> (Western Beaked Gecko)			
684.	24927 <i>Strophurus elderi</i>			
685.	24949 <i>Strophurus wellingtonae</i>			
686.	25269 <i>Suta fasciata</i> (Rosen's Snake)			
687.	25307 <i>Suta punctata</i> (Spotted Snake)			
688.	25202 <i>Tiliqua multifasciata</i> (Central Blue-tongue)			
689.	30814 <i>Tympanocryptis cephalus</i> (Pebble Dragon)			
690.	25209 <i>Varanus acanthurus</i> (Spiny-tailed Monitor)			
691.	25210 <i>Varanus breviceauda</i> (Short-tailed Pygmy Monitor)			
692.	30825 <i>Varanus bushi</i> (Pilbara Mulga Monitor)			
693.	25211 <i>Varanus caudolineatus</i>			
694.	25216 <i>Varanus giganteus</i> (Perentie)			
695.	25218 <i>Varanus gouldii</i> (Bungarra or Sand Monitor)			
696.	25524 <i>Varanus panoptes</i> (Yellow-spotted Monitor)			
697.	25223 <i>Varanus panoptes</i> subsp. <i>rubidus</i>			
698.	25224 <i>Varanus pilbarensis</i> (Pilbara Rock Monitor, Northern Pilbara Rock Goanna)			
699.	25526 <i>Varanus tristis</i> (Racehorse Monitor)			
700.	25227 <i>Varanus tristis</i> subsp. <i>tristis</i> (Racehorse Monitor)			
701.	25311 <i>Vermicella snelli</i>			

Conservation Codes

T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

¹ For NatureMap's purposes, species flagged as endemic are those whose records are wholly contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

Appendix D

Fauna data and Likelihood Assessment

Habitat Assessment Sites

Site ID	Start date	End date	Habitat type	Landform	Aspect	Slope	Soil type	Soil availability	Outcrop	Rock type	Rock size	Veg litter	Hollow count	Last fire (yr)	Disturbance	Longitude	Latitude
BAR-01	08/04/2021	13/04/2021	Stony Plain	Stony Plain	Flat	Flat	Loamy Sand	Many Large Patches	Limited Outcropping	BIF	Small Rocks (11-20cm)	Few Small Patches	0	Old (6+ yr)	Road/ Access Track	119.666 70128	- 23.2906 7183
BAR-02	08/04/2021	10/04/2021	Medium Drainage Line	Major Drainage Line	North	Low	Clay Loam Sandy	Evenly Spread	Limited Outcropping	BIF	Small Rocks (11-20cm)	Few Small Patches	0	Moderate (3 to 5 yr)	Mining Exploration	119.660 96273	- 23.3011 2207
BAR-03	08/04/2021	13/04/2021	Stony Plain	Major Drainage Line	Flat	Flat	Loamy Sand	Many Small Patches	Negligible	BIF	Pebbles (5-10cm)	Many Small Patches	0	Old (6+ yr)	Road/ Access Track	119.703 09057	- 23.3010 4942
BAR-04	09/04/2021	13/04/2021	Gorge/ Gully	Major Drainage Line	South / East	Moderate	Loamy Sand	Few Small Patches	moderate Outcropping	BIF	Large Rocks (21-60cm)	Few Small Patches	0	Old (6+ yr)Road/ A	Mining Exploration	119.674 09213	- 23.2781 1941
BAR-05	10/04/2021	13/04/2021	Sandplain	Sandplain	Flat	Flat	Clayey Sand	Few Large Patches	Negligible	None Discernible	Negligible	Few Large Patches	0	Old (6+ yr)	Road/ Access Track	119.733 92107	- 23.3099 5352
BAT-01	08/04/2021	12/04/2021	Gorge/ Gully	Ironstone Outcrops	South	Low	Loamy Sand	Scarce	Extensive Outcropping	BIF	Large Rocks (21-60cm)	Scarce	0	Old (6+ yr)	Road/ Access Track	119.658 42978	- 23.2834 1012
BAT-02	09/04/2021	12/04/2021	Medium Drainage Line	Gully	Flat	Flat	Clay Loam	Few Large Patches	Moderate Outcropping	BIF	Large Rocks (21-60cm)	Evenly Spread	0	Old (6+ yr)	Mining Exploration	119.658 13547	- 23.2750 5092
BAT-03	09/04/2021	13/04/2021	Cave	Gorge	East	Very Steep	Heavy Clay	Scarce	Major Outcropping	BIF	Boulders (>61cm)	Scarce	0	Moderate (3 to 5 yr)	Mining Exploration	119.702 39365	- 23.2821 0304
BAT-04	10/04/2021	13/04/2021	Gorge/ Gully	Gorge	East	Moderate	Clay Loam	Scarce	Major Outcropping	BIF	Boulders (>61cm)	Few Large Patches	0	Old (6+ yr)	Mining Exploration	119.745 95920	- 23.2907 2013
BAT-05	10/04/2021	13/04/2021	Gorge/ Gully	Gully	South / West	Moderate	Heavy Clay	Few Small Patches	Moderate Outcropping	BIF	Pebbles (5-10cm)	Few Small Patches	0	Old (6+ yr)	Road/ Access Track	119.750 60637	- 23.2931 9968
CAM-02	09/04/2021	11/05/2021	Medium Drainage Line	Gorge	West	Moderate	Clay Loam	Many Small Patches	Major Outcropping	BIF	Large Rocks (21+AK1 2-60cm)	Many Small Patches	0	Old (6+ yr)	Mining Exploration	119.657 69638	- 23.2782 0182
CAM-04	09/04/2021	11/05/2021	Medium Drainage	Gully	East	Low	Clay Loam	Few Small	Moderate Outcrop	BIF	Boulders (>61cm)	Many Small	0	Old (6+ yr)	Mining Explorati	119.659 36027	- 23.2687

Site ID	Start date	End date	Habitat type	Landform	Aspect	Slope	Soil type	Soil availability	Outcrop	Rock type	Rock size	Veg litter	Hollow count	Last fire (yr)	Disturbance	Longitude	Latitude
			e Line					Patches	ping			Patches			on		4450
CAM-06	09/04/2021	11/05/2021	Medium Drainage Line	Gully	Flat	Flat	Clay Loam	Scarce	Limited Outcropping	BIF	Large Rocks (21-60cm)	Scarce	0	Old (6+ yr)	Mining Exploration	119.658 14287	- 23.2770 3008
CAM-07	09/04/2021	11/05/2021	Medium Drainage Line	Gully	Flat	Flat	Clay Loam	Scarce	Limited Outcropping	BIF	Large Rocks (21-60cm)	Scarce	0	Old (6+ yr)	Mining Exploration	119.702 38578	- 23.2821 0713
CAM-08	09/04/2021	11/05/2021	Minor Drainage Line	Gully	West	Low	Clay Loam	Few Large Patches	Moderate Outcropping	BIF	Boulders (>61cm)	Few Large Patches	0	Old (6+ yr)	Mining Exploration	119.674 29673	- 23.2727 6000
CAM-09	09/04/2021	11/05/2021	Cave	Gorge	West	Very Steep	Heavy Clay	Scarce	Major Outcropping	BIF	Boulders (>61cm)	Scarce	0	Moderate (3 to 5 yr)	Mining Exploration	119.702 92657	- 23.2819 3137
CAM-10	09/04/2021	11/05/2021	Gorge/ Gully	Gully	West	Moderate	Clay Loam	Few Small Patches	Extensive Outcropping	BIF	Boulders (>61cm)	Evenly Spread	0	Old (6+ yr)	Mining Exploration	119.687 02785	- 23.2694 1235
CAM-11	10/04/2021	11/05/2021	Gorge/ Gully	Major Drainage Line	South / East	Very Steep	Heavy Clay	Scarce	Major Outcropping	BIF	Large Rocks (21-60cm)	Scarce	1	Old (6+ yr)	Road/ Access Track	119.756 92080	- 23.2928 4585
CAM-12	09/04/2021	11/05/2021	Minor Drainage Line	Minor Drainage Line	South	Low	Clay Loam	Scarce	Moderate Outcropping	BIF	Large Rocks (21-60cm)	Many Small Patches	0	Old (6+ yr)	Mining Exploration	119.682 86548	- 23.2748 2318
CAM-13	10/04/2021	11/05/2021	Breakaway/ Cliff	Breakaway	North	Very Steep	Heavy Clay	Scarce	Moderate Outcropping	BIF	Large Rocks (21-60cm)	Scarce	1	Moderate (3 to 5 yr)	Mining Exploration	119.752 09223	- 23.2928 4083
CAM-14	10/04/2021	11/05/2021	Gorge/ Gully	Gorge	East	Moderate	Clay Loam	Evenly Spread	Major Outcropping	BIF	Boulders (>61cm)	Scarce	0	Old (6+ yr)	Mining Exploration	119.746 04148	- 23.2907 0512
CAM-15	13/04/2021	11/05/2021	Sandplain	Sandplain	Flat	Flat	Sandy Loam	Evenly Spread	negligible	None Discernible	Negligible	Few Small Patches	0	Moderate (3 to 5 yr)	Road/ Access Track	119.659 01672	- 23.2862 0918
CAM-16	09/04/2021	11/05/2021	Hillcrest/ Hillslope	Breakaway	South	Steep	Heavy Clay	Scarce	Extensive Outcropping	BIF	Pebbles (5-10cm)	Scarce	0	Old (6+ yr)	None Discernible	119.671 15692	- 23.2849 3642
CAM-17	10/04/2021	11/05/2021	Gorge/ Gully	Major Drainage	South / East	Moderate	Loamy Sand	Few Small	moderate Outcrop	BIF	Large Rocks (21-	Few Small	0	Old (6+ yr)Road/	Mining Explorati	119.743 83755	- 23.2855

Site ID	Start date	End date	Habitat type	Landform	Aspect	Slope	Soil type	Soil availability	Outcrop	Rock type	Rock size	Veg litter	Hollow count	Last fire (yr)	Disturbance	Longitude	Latitude
				Line				Patches	ping		60cm)	Patches		A	on		5710
CAM-18	10/04/2021	11/05/2021	Gorge/Gully	Gully	South	Low	Clay Loam	Few Large Patches	Extensive Outcropping	BIF	Small Rocks (11-20cm)	Scarce	0	Old (6+ yr)	Mining Exploration	119.74604693	- 23.28516575
CAM-19	10/04/2021	11/05/2021	Gorge/Gully	Gorge	East	Steep	Clay Loam	Scarce	Major Outcropping	BIF	Boulders (>61cm)	Scarce	0	Old (6+ yr)	Mining Exploration	119.74504765	- 23.28801380
CAM-24	09/04/2021	11/05/2021	Breakaway/ Cliff	Breakaway	South / East	Steep	Heavy Clay	None Discernible	Moderate Outcropping	BIF	Large Rocks (21-60cm)	Scarce	1	Recent (0 to 2 yr)	Frequent Fire	119.66777258	- 23.27983570
CAM-25	09/04/2021	11/05/2021	Breakaway/ Cliff	Breakaway	South / West	Steep	Heavy Clay	None Discernible	Moderate Outcropping	BIF	Large Rocks (21-60cm)	Scarce	1	Recent (0 to 2 yr)	Frequent Fire	119.66952935	- 23.28005113
HAB-01	09/04/2021	09/04/2021	Breakaway/ Cliff	Breakaway	West	Cliff	Clay Loam	Evenly Spread	Extensive Outcropping	BIF	Boulders (>61cm)	Evenly Spread	0	Old (6+ yr)	Road/ Access Track	119.67409482	- 23.27825356
HAB-02	09/04/2021	09/04/2021	Hillcrest/ Hillslope	Stony Plain	West	Low	Clay Loam	Scarce	Minor	BIF	Small Rocks (11-20cm)	Evenly Spread	0	Moderate (3 to 5 yr)	Road/ Access Track	119.67438657	- 23.27585712
HAB-03	09/04/2021	09/04/2021	Hillcrest/ Hillslope	Stony Plain	East	Low	Clay Loam	Scarce	Minor Outcropping	BIF	Small Rocks (11-20cm)	Evenly Spread	0	Old (6+ yr)	Mining Exploration	119.68038303	- 23.27015685
HAB-04	10/04/2021	10/04/2021	Gorge/Gully	Gorge	East	Steep	Clay Loam	Evenly Spread	Major Outcropping	BIF	Boulders (>61cm)	Few Small Patches	0	Old (6+ yr)	Mining Exploration	119.74500863	- 23.28794619
HAB-05	10/04/2021	10/04/2021	Waterhole	Gully	East	Flat	Clay Loam	Scarce	Minor Outcropping	BIF	Pebbles (5-10cm)	Scarce	0	Old (6+ yr)	Mining Exploration	119.74378738	- 23.28565505
HAB-06	10/04/2021	10/04/2021	Gorge/Gully	Gorge	North	Steep	Clay Loam	Scarce	Extensive Outcropping	BIF	Boulders (>61cm)	Scarce	0	Old (6+ yr)	Mining Exploration	119.74888497	- 23.28357914
HAB-07	11/04/2021	11/04/2021	Hillcrest/ Hillslope	Hillcrest/ Upper Hillslope	North	Moderate	Clay Loam	Scarce	Moderate Outcropping	BIF	Large Rocks (21-60cm)	Evenly Spread	0	Moderate (3 to 5 yr)	Road/ Access Track	119.70925873	- 23.32163400
HAB-08	11/04/2021	11/04/2021	Stony Plain	Major Drainage	Flat	Flat	Clay Loam	Scarce	Limited Outcrop	Quartz	Pebbles (5-	Scarce	0	Recent (0 to 2	Road/ Access	119.71275443	- 23.3239

Site ID	Start date	End date	Habitat type	Landform	Aspect	Slope	Soil type	Soil availability	Outcrop	Rock type	Rock size	Veg litter	Hollow count	Last fire (yr)	Disturbance	Longitude	Latitude
				Line					ping		10cm)			yr)	Track		2843
HAB-09	09/04/2021	09/04/2021	Breakaway/ Cliff	Cliff	South	Very Steep	Heavy Clay	None Discernible	Extensive Outcropping	BIF	Boulders (>61cm)	None Discernible	0	Moderate (3 to 5 yr)	Other	119.674 65235	- 23.2783 5294
HAB-10	11/04/2021	11/04/2021	Claypan	Claypan	Flat	Flat	Light Medium Clay	Many Large Patches	Negligible	Quartz	Negligible	Many Large Patches	0	Old (6+ yr)	Cattle Grazing	119.700 06057	- 23.3249 9144
HAB-11	10/04/2021	10/04/2021	Breakaway/ Cliff	Breakaway	South / West	Steep	Medium Clay	Scarce	Extensive Outcropping	Conglomerate	Large Rocks (21-60cm)	Scarce	0	Old (6+ yr)	Road/ Access Track	119.751 40105	- 23.2929 3618
HAB-12	11/04/2021	11/04/2021	Stony Plain	Stony Plain	Flat	Flat	Clay Loam	Scarce	Negligible	BIF	Pebbles (5-10cm)	Many Small Patches	0	Old (6+ yr)	Cattle Grazing	119.700 63518	- 23.3221 5448
HAB-13	10/04/2021	10/04/2021	Hillcrest/ Hillslope	Hillcrest/ Upper Hillslope	South / West	Low	Heavy Clay	Scarce	Moderate Outcropping	BIF	Gravel (1-4cm)	Scarce	2	Recent (0 to 2 yr)	Road/ Access Track	119.755 55837	- 23.2895 4938
HAB-14	11/04/2021	11/04/2021	Mulga Woodland	Claypan	Flat	Low	Clay Loam	Many Small Patches	Negligible	None Discernible	Pebbles (5-10cm)	Many Large Patches	0	Recent (0 to 2 yr)	Cattle Grazing	119.700 40112	- 23.3266 1022
HAB-15	11/04/2021	11/04/2021	Gorge/ Gully	Gully	South / East	Low	Sand	Few Large Patches	Moderate Outcropping	BIF	Boulders (>61cm)	Few Small Patches	2	Moderate (3 to 5 yr)	None Discernible	119.744 01964	- 23.2860 2020
HAB-16	12/04/2021	12/04/2021	Gorge/ Gully	Gully	South	Low	Clay Loam	Scarce	Major Outcropping	BIF	Large Rocks (21-60cm)	Scarce	0	Old (6+ yr)	Mining Exploration	119.739 16340	- 23.2838 6563
HAB-17	11/04/2021	11/04/2021	Mulga Woodland	Stony Plain	Flat	Low	Clay Loam	Many Small Patches	Negligible	None Discernible	Gravel (1-4cm)	Few Small Patches	0	Moderate (3 to 5 yr)	Mining Exploration	119.675 33510	- 23.3141 7478
HAB-18	12/04/2021	12/04/2021	Hillcrest/ Hillslope	Hillcrest/ Upper Hillslope	South / East	Moderate	Clay Loam	Scarce	Major Outcropping	BIF	Pebbles (5-10cm)	Evenly Spread	0	Moderate (3 to 5 yr)	Mining Exploration	119.713 22191	- 23.2825 4442
HAB-19	11/04/2021	11/04/2021	Sandplain	Stony Plain	Flat	Flat	Clay Loam Sandy	Many Small Patches	Negligible	None Discernible	Gravel (1-4cm)	Few Small Patches	0	Recent (0 to 2 yr)	Frequent Fire	119.687 98205	- 23.3195 8080
HAB-20	13/04/2021	13/04/2021	Sandplain	Sandplain	Flat	Flat	Sandy Clay Loam	Many Small Patches	Negligible	None Discernible	Pebbles (5-10cm)	Many Large Patches	0	Old (6+ yr)	Cattle Grazing	119.737 68093	- 23.2973 8437
HAB-21	11/04/2021	11/04/2021	Sandplain	Sandplain	Flat	Flat	Sandy Loam	Many Small	Negligible	None Discernible	Gravel (1-4cm)	Few Small	2	Moderate (3 to 5 yr)	Road/ Access	119.658 44990	- 23.2924

Site ID	Start date	End date	Habitat type	Landform	Aspect	Slope	Soil type	Soil availability	Outcrop	Rock type	Rock size	Veg litter	Hollow count	Last fire (yr)	Disturbance	Longitude	Latitude
								Patches		ble		Patches		yr)	Track		0782
HAB-22	12/04/2021	12/04/2021	Minor Drainage Line	Minor Drainage Line	South / East	Low	Clay Loam Sandy	Many Large Patches	Limited Outcropping	BIF	Large Rocks (21-60cm)	Few Small Patches	0	Old (6+ yr)	Mining Exploration	119.706 13093	- 23.2871 8218
HAB-23	11/04/2021	11/04/2021	Major Drainage Line	Major Drainage Line	Flat	Flat	Loamy Sand	Many Large Patches	Minor Outcropping	Conglomerate	Gravel (1-4cm)	Few Large Patches	3	Moderate (3 to 5 yr)	Weed Invasion	119.713 81755	- 23.2907 1083
HAB-24	13/04/2021	13/04/2021	Major Drainage Line	Claypan	Flat	Flat	Clay Loam	Many Small Patches	Negligible	BIF	Negligible	Many Large Patches	0	Old (6+ yr)	Mining Exploration	119.720 89612	- 23.2968 9561
HAB-25	12/04/2021	12/04/2021	Hillcrest/Hillslope	Hillcrest	North	Moderate	Light Medium Clay	Few Small Patches	Minor Outcropping	BIF	Gravel (1-4cm)	None Discernible	0	Recent (0 to 2 yr)	Road/ Access Track	119.679 03568	- 23.3002 6223
HAB-26	13/04/2021	13/04/2021	Sandplain	Sandplain	Flat	Flat	Sandy Clay Loam	Many Large Patches	Negligible	None Discernible	Pebbles (5-10cm)	Many Large Patches	0	Old (6+ yr)	Mining Exploration	119.720 58834	- 23.2977 3057
HAB-27	12/04/2021	12/04/2021	Hillcrest/Hillslope	Hillslope	North / West	Moderate	Heavy Clay	Scarce	Minor Outcropping	BIF	Gravel (1-4cm)	Scarce	0	Old (6+ yr)	Mining Exploration	119.689 60717	- 23.3036 5510
HAB-28	13/04/2021	13/04/2021	Sandy/ Stony Plain	Stony Plain	Flat	Flat	Clay Loam	Scarce	Limited Outcropping	None Discernible	Pebbles (5-10cm)	Many Large Patches	0	Old (6+ yr)	Mining Exploration	119.721 96040	- 23.2984 0898
HAB-29	12/04/2021	12/04/2021	Hillcrest/Hillslope	Hillcrest/Hillslope	North / West	Moderate	Heavy Clay	Scarce	Minor Outcropping	BIF	Gravel (1-4cm)	None Discernible	0	Recent (0 to 2 yr)	Mining Exploration	119.699 65190	- 23.3053 5396
HAB-30	13/04/2021	13/04/2021	Gorge/ Gully	Gorge	North	Steep	Clay Loam	Scarce	Major Outcropping	BIF	Boulders (>61cm)	Scarce	0	Old (6+ yr)	Mining Exploration	119.735 73307	- 23.3040 8496
HAB-31	12/04/2021	12/04/2021	Stony Plain	Stony Plain	Flat	Flat	Light Medium Clay	Few Small Patches	Limited Outcropping	BIF	Gravel (1-4cm)	Few Small Patches	0	Moderate (3 to 5 yr)	Mining Exploration	119.706 67034	- 23.3064 0416
HAB-32	09/04/2021	09/04/2021	Gorge/ Gully	Breakaway	South	Very Steep	Heavy Clay	Scarce	Major Outcropping	BIF	Large Rocks (21-60cm)	Scarce	0	Moderate (3 to 5 yr)	Mining Exploration	119.692 43992	- 23.2847 5652
HAB-33	12/04/2021	12/04/2021	Sandy/ Stony Plain	Sandy/ Stony Plain	Flat	Flat	Clay Loam	Many Large Patches		None Discernible	Gravel (1-4cm)	Few Small Patches	0	Moderate (3 to 5 yr)	Mining Exploration	119.717 62372	- 23.3091 8840
HAB-34	09/04/2021	09/04/2021	Gorge/ Gully	Boulders/ Rockpiles	South	Moderate	Heavy Clay	Scarce	Moderate Outcropping	BIF	Pebbles (5-10cm)	Scarce	0	Moderate (3 to 5 yr)	Mining Exploration	119.691 08102	- 23.2891 4817

Site ID	Start date	End date	Habitat type	Landform	Aspect	Slope	Soil type	Soil availability	Outcrop	Rock type	Rock size	Veg litter	Hollow count	Last fire (yr)	Disturbance	Longitude	Latitude
HAB-35	12/04/2021	12/04/2021	Breakaway/ Cliff	Breakaway	North / West	Steep	Heavy Clay	None Discernible	Major Outcropping	BIF	Large Rocks (21-60cm)	Scarce	0	Moderate (3 to 5 yr)	Road/ Access Track	119.70548767	- 23.28000303
HAB-36	11/04/2021	11/04/2021	Major Drainage Line	Sandy/ Stony Plain	South	Low	Silty Clay Loam	Many Large Patches	Minor Outcropping	Other	Gravel (1-4cm)	Few Small Patches	0	Recent (0 to 2 yr)	Road/ Access Track	119.66216771	- 23.31518921
HAB-37	13/04/2021	13/04/2021	Sandplain	Sandplain	Flat	Flat	Sandy Loam	Many Small Patches	Negligible	None Discernible	Gravel (1-4cm)	Few Small Patches	0	Old (6+ yr)	Road/ Access Track	119.66022603	- 23.28672273
HAB-38	12/04/2021	12/04/2021	Gorge/ Gully	Gully	South / East	Moderate	Clay Loam Sandy	Many Small Patches	Moderate Outcropping	BIF	Large Rocks (21-60cm)	Many Small Patches	0	Old (6+ yr)	Mining Exploration	119.71375486	- 23.28495986
HAB-39	13/04/2021	13/04/2021	Sandplain	Sandplain	Flat	Flat	Sandy Loam	Many Small Patches	Negligible	None Discernible	Gravel (1-4cm)	Few Small Patches	0	Old (6+ yr)	Road/ Access Track	119.67160216	- 23.29300211
HAB-40	13/04/2021	13/04/2021	Sandy/ Stony Plain	Sandplain	Flat	Flat	Sandy Clay Loam	Many Small Patches	Negligible	None Discernible	Small Rocks (11-20cm)	Many Large Patches	0	Moderate (3 to 5 yr)	Cattle Grazing	119.73099092	- 23.29700991
HAB-41	13/04/2021	13/04/2021	Hillcrest/ Hillslope	Hillslope	South / East	Low	Heavy Clay	None Discernible	Minor Outcropping	BIF	Gravel (1-4cm)	Few Small Patches	0	Recent (0 to 2 yr)	Road/ Access Track	119.69480237	- 23.28849107
HAB-42	09/04/2021	09/04/2021	Hillcrest/ Hillslope	Stony Plain	South	Low	Heavy Clay	Scarce	Negligible	BIF	Gravel (1-4cm)	None Discernible	1	Moderate (3 to 5 yr)	None Discernible	119.66900247	- 23.28361408
HAB-43	13/04/2021	13/04/2021	Hillcrest/ Hillslope	Hillslope	South	Low	Heavy Clay	Scarce	Minor Outcropping	BIF	Gravel (1-4cm)	Scarce	0	Recent (0 to 2 yr)	Road/ Access Track	119.69921691	- 23.29880287

Vertebrate Fauna Sample Sites

Sample site description	Site ID	Start date	End date	Trap nights	Habitat type	Comments	Longitude	Latitude
Bird Acoustic Recorder	BAR-01	08/04/2021	13/04/2021	5	Stony Plain	SM4 AC2	119.66670128	-23.29067183
Bird Acoustic Recorder	BAR-02	08/04/2021	10/04/2021	2	Medium Drainage Line	SM4 AC1	119.66096273	-23.30112207
Bird Acoustic Recorder	BAR-03	08/04/2021	13/04/2021	5	Stony Plain	SM4 AC3	119.70309057	-23.30104942
Bird Acoustic Recorder	BAR-04	09/04/2021	13/04/2021	4	Gorge/ Gully	SM4AO4	119.67409213	-23.27811941
Bird Acoustic Recorder	BAR-05	10/04/2021	13/04/2021	3	Sandplain	SM4-AC1	119.73392107	-23.30995352
Bat Ultrasound Recorder	BAT-01	08/04/2021	12/04/2021	5	Gorge/ Gully	SM4 - 4	119.65842978	-23.28341012
Bat Ultrasound Recorder	BAT-02	09/04/2021	12/04/2021	4	Medium Drainage Line	swift1	119.65813547	-23.27505092
Bat Ultrasound Recorder	BAT-03	09/04/2021	13/04/2021	4	Cave	Swift2	119.70239365	-23.28210304
Bat Ultrasound Recorder	BAT-04	10/04/2021	13/04/2021	3	Gorge/ Gully	SM2 3	119.74595920	-23.29072013
Bat Ultrasound Recorder	BAT-05	10/04/2021	13/04/2021	3	Gorge/ Gully	SM2-2	119.75060637	-23.29319968
Remote Camera	CAM-02	09/04/2021	11/05/2021	32	Medium Drainage Line	camera	119.65769638	-23.27820182
Remote Camera	CAM-04	09/04/2021	11/05/2021	32	Medium Drainage Line	CAM 115	119.65936027	-23.26874450
Remote Camera	CAM-06	09/04/2021	11/05/2021	32	Medium Drainage Line	cam 29	119.65814287	-23.27703008
Remote Camera	CAM-07	09/04/2021	11/05/2021	32	Medium Drainage Line	Camera 19	119.70238578	-23.28210713
Remote Camera	CAM-08	09/04/2021	11/05/2021	32	Minor Drainage Line	camera	119.67429673	-23.27276000
Remote Camera	CAM-09	09/04/2021	11/05/2021	32	Cave	camera 166	119.70292657	-23.28193137
Remote Camera	CAM-10	09/04/2021	11/05/2021	32	Gorge/ Gully	camera	119.68702785	-23.26941235
Remote Camera	CAM-11	10/04/2021	11/05/2021	31	Gorge/ Gully	camera R41	119.75692080	-23.29284585
Remote Camera	CAM-12	09/04/2021	11/05/2021	32	Minor Drainage Line	camera	119.68286548	-23.27482318
Remote Camera	CAM-13	10/04/2021	11/05/2021	31	Breakaway/ Cliff	camera B1	119.75209223	-23.29284083
Remote Camera	CAM-14	10/04/2021	11/05/2021	31	Gorge/ Gully	camera C43	119.74604148	-23.29070512
Remote Camera	CAM-15	13/04/2021	11/05/2021	28	Sandplain	Camera 8	119.65901672	-23.28620918
Remote Camera	CAM-16	09/04/2021	11/05/2021	32	Hillcrest/ Hillslope	camera	119.67115692	-23.28493642

Sample site description	Site ID	Start date	End date	Trap nights	Habitat type	Comments	Longitude	Latitude
Remote Camera	CAM-17	10/04/2021	11/05/2021	31	Gorge/ Gully	camera	119.74383755	-23.28555710
Remote Camera	CAM-18	10/04/2021	11/05/2021	31	Gorge/ Gully	camera	119.74604693	-23.28516575
Remote Camera	CAM-19	10/04/2021	11/05/2021	31	Gorge/ Gully	camera	119.74504765	-23.28801380
Remote Camera	CAM-24	09/04/2021	11/05/2021	32	Breakaway/ Cliff	camera	119.66777258	-23.27983570
Remote Camera	CAM-25	09/04/2021	11/05/2021	32	Breakaway/ Cliff	camera	119.66952935	-23.28005113
Opportunistic observation	HAB-01	09/04/2021	09/04/2021	n.a.	Breakaway/ Cliff	opportunistic fauna obs	119.67409482	-23.27825356
Opportunistic observation	HAB-02	09/04/2021	09/04/2021	n.a.	Hillcrest/ Hillslope	opportunistic fauna obs	119.67438657	-23.27585712
Opportunistic observation	HAB-03	09/04/2021	09/04/2021	n.a.	Hillcrest/ Hillslope	opportunistic fauna obs	119.68038303	-23.27015685
Opportunistic observation	HAB-04	10/04/2021	10/04/2021	n.a.	Gorge/ Gully	opportunistic fauna obs	119.74500863	-23.28794619
Opportunistic observation	HAB-05	10/04/2021	10/04/2021	n.a.	Waterhole	opportunistic fauna obs	119.74378738	-23.28565505
Opportunistic observation	HAB-06	10/04/2021	10/04/2021	n.a.	Gorge/ Gully	opportunistic fauna obs	119.74888497	-23.28357914
Opportunistic observation	HAB-07	11/04/2021	11/04/2021	n.a.	Hillcrest/ Hillslope	opportunistic fauna obs	119.70925873	-23.32163400
Opportunistic observation	HAB-08	11/04/2021	11/04/2021	n.a.	Stony Plain	opportunistic fauna obs	119.71275443	-23.32392843
Opportunistic observation	HAB-09	09/04/2021	09/04/2021	n.a.	Breakaway/ Cliff	opportunistic fauna obs	119.67465235	-23.27835294
Opportunistic observation	HAB-10	11/04/2021	11/04/2021	n.a.	Claypan	opportunistic fauna obs	119.70006057	-23.32499144
Opportunistic observation	HAB-11	10/04/2021	10/04/2021	n.a.	Breakaway/ Cliff	opportunistic fauna obs	119.75140105	-23.29293618
Opportunistic observation	HAB-12	11/04/2021	11/04/2021	n.a.	Stony Plain	opportunistic fauna obs	119.70063518	-23.32215448
Opportunistic observation	HAB-13	10/04/2021	10/04/2021	n.a.	Hillcrest/ Hillslope	opportunistic fauna obs	119.75555837	-23.28954938
Opportunistic observation	HAB-14	11/04/2021	11/04/2021	n.a.	Mulga Woodland	opportunistic fauna obs	119.70040112	-23.32661022
Opportunistic observation	HAB-15	11/04/2021	11/04/2021	n.a.	Gorge/ Gully	opportunistic fauna obs	119.74401964	-23.28602020
Opportunistic observation	HAB-16	12/04/2021	12/04/2021	n.a.	Gorge/ Gully	opportunistic fauna obs	119.73916340	-23.28386563
Opportunistic observation	HAB-17	11/04/2021	11/04/2021	n.a.	Mulga Woodland	opportunistic fauna obs	119.67533510	-23.31417478
Opportunistic	HAB-18	12/04/2021	12/04/2021	n.a.	Hillcrest/ Hillslope	opportunistic fauna	119.71322191	-23.28254442

Sample site description	Site ID	Start date	End date	Trap nights	Habitat type	Comments	Longitude	Latitude
observation						obs		
Opportunistic observation	HAB-19	11/04/2021	11/04/2021	n.a.	Sandplain	opportunistic fauna obs	119.68798205	-23.31958080
Opportunistic observation	HAB-20	13/04/2021	13/04/2021	n.a.	Sandplain	opportunistic fauna obs	119.73768093	-23.29738437
Opportunistic observation	HAB-21	11/04/2021	11/04/2021	n.a.	Sandplain	opportunistic fauna obs	119.65844990	-23.29240782
Opportunistic observation	HAB-22	12/04/2021	12/04/2021	n.a.	Minor Drainage Line	opportunistic fauna obs	119.70613093	-23.28718218
Opportunistic observation	HAB-23	11/04/2021	11/04/2021	n.a.	Major Drainage Line	opportunistic fauna obs	119.71381755	-23.29071083
Opportunistic observation	HAB-24	13/04/2021	13/04/2021	n.a.	Major Drainage Line	opportunistic fauna obs	119.72089612	-23.29689561
Opportunistic observation	HAB-25	12/04/2021	12/04/2021	n.a.	Hillcrest/ Hillslope	opportunistic fauna obs	119.67903568	-23.30026223
Opportunistic observation	HAB-26	13/04/2021	13/04/2021	n.a.	Sandplain	opportunistic fauna obs	119.72058834	-23.29773057
Opportunistic observation	HAB-27	12/04/2021	12/04/2021	n.a.	Hillcrest/Hillslope	opportunistic fauna obs	119.68960717	-23.30365510
Opportunistic observation	HAB-28	13/04/2021	13/04/2021	n.a.	Sandy/ Stony Plain	opportunistic fauna obs	119.72196040	-23.29840898
Opportunistic observation	HAB-29	12/04/2021	12/04/2021	n.a.	Hillcrest/Hillslope	opportunistic fauna obs	119.69965190	-23.30535396
Opportunistic observation	HAB-30	13/04/2021	13/04/2021	n.a.	Gorge/ Gully	opportunistic fauna obs	119.73573307	-23.30408496
Opportunistic observation	HAB-31	12/04/2021	12/04/2021	n.a.	Stony Plain	opportunistic fauna obs	119.70667034	-23.30640416
Opportunistic observation	HAB-32	09/04/2021	09/04/2021	n.a.	Gorge/ Gully	opportunistic fauna obs	119.69243992	-23.28475652
Opportunistic observation	HAB-33	12/04/2021	12/04/2021	n.a.	Sandy/ Stony Plain	opportunistic fauna obs	119.71762372	-23.30918840
Opportunistic observation	HAB-34	09/04/2021	09/04/2021	n.a.	Gorge/ Gully	opportunistic fauna obs	119.69108102	-23.28914817
Opportunistic observation	HAB-35	12/04/2021	12/04/2021	n.a.	Breakaway/ Cliff	opportunistic fauna obs	119.70548767	-23.28000303
Opportunistic observation	HAB-36	11/04/2021	11/04/2021	n.a.	Major Drainage Line	opportunistic fauna obs	119.66216771	-23.31518921
Opportunistic observation	HAB-37	13/04/2021	13/04/2021	n.a.	Sandplain	opportunistic fauna obs	119.66022603	-23.28672273
Opportunistic observation	HAB-38	12/04/2021	12/04/2021	n.a.	Gorge/ Gully	opportunistic fauna obs	119.71375486	-23.28495986

Sample site description	Site ID	Start date	End date	Trap nights	Habitat type	Comments	Longitude	Latitude
Opportunistic observation	HAB-39	13/04/2021	13/04/2021	n.a.	Sandplain	opportunistic fauna obs	119.67160216	-23.29300211
Opportunistic observation	HAB-40	13/04/2021	13/04/2021	n.a.	Sandy/ Stony Plain	opportunistic fauna obs	119.73099092	-23.29700991
Opportunistic observation	HAB-41	13/04/2021	13/04/2021	n.a.	Hillcrest/ Hillslope	opportunistic fauna obs	119.69480237	-23.28849107
Opportunistic observation	HAB-42	09/04/2021	09/04/2021	n.a.	Hillcrest/ Hillslope	opportunistic fauna obs	119.66900247	-23.28361408
Opportunistic observation	HAB-43	13/04/2021	13/04/2021	n.a.	Hillcrest/ Hillslope	opportunistic fauna obs	119.69921691	-23.29880287

Vertebrate Transects

Transect description	Transect I.D.	Date	Start time	End time	Person hours	Habitat targeted	Species targeted	Comments
Nocturnal search	NOC-01	10/04/2021	18:00	18:30	1	Sandplain, Hillcrest/ Hillslope, Major Drainage Line	Pilbara Olive Python	Opportunistic fauna recorded
Nocturnal search	NOC-02	10/04/2021	18:30	19:00	1	Gorge Gully	Pilbara Olive Python, Northern Quoll	Opportunistic fauna recorded
Nocturnal search	NOC-03	10/04/2021	18:45	19:15	1	Gorge/ Gully, Major Drainage Line	Pilbara Olive Python, Northern Quoll	Opportunistic fauna recorded
Nocturnal search	NOC-04	10/04/2021	20:00	20:30	1	Hillcrest/ Hillslope	Pilbara Olive Python, Northern Quoll	Opportunistic fauna recorded
Nocturnal search	NOC-05	10/04/2021	19:30	20:00	1	Sandplain, Hillcrest/ Hillslope, Major Drainage Line	Pilbara Olive Python	Opportunistic fauna recorded
Nocturnal search	NOC-06	11/04/2021	17:55	19:00	2.25	Hillcrest/ Hillslope	Pilbara Olive Python	Opportunistic fauna recorded
Nocturnal search	NOC-08	11/04/2021	19:00	20:00	2	Gorge/ Gully	Pilbara Olive Python, Northern Quoll	Opportunistic fauna recorded
Target search	TRA-01	08/04/2021	16:30	17:00	1	Hillcrest/Hillslope	Western pebble mound mouse	Opportunistic fauna recorded
Target search	TRA-02	08/04/2021	09:02	09:32	1	Mulga Plain	Western pebble mound mouse	Opportunistic fauna recorded
Target search	TRA-03	08/04/2021	11:00	11:30	1	Breakaway/ Cliff	Pilbara Leaf-Nosed Bat, Ghost Bat	Opportunistic fauna recorded
Target search	TRA-04	09/04/2021	8:00	8:30	1	Gorge/ Gully, Major Drainage Line	Pilbara Olive Python, Northern Quoll	Opportunistic fauna recorded
Target search	TRA-05	08/04/2021	9:17	9:47	1	Hillcrest/ Hillslope	Western pebble mound mouse	Opportunistic fauna recorded
Target search	TRA-06	09/04/2021	12:00	12:50	1.6	Gorge/ Gully, Hillcrest/ Hillslope	Northern Quoll, Western pebble mound mouse	Opportunistic fauna recorded
Target search	TRA-07	09/04/2021	13:18	13:38	0.6	Hillcrest/ Hillslope	Western pebble mound mouse	Opportunistic fauna recorded
Target search	TRA-08	10/04/2021	11:50	12:20	1	Gorge/ Gully	Northern Quoll, Pilbara Olive Python	Opportunistic fauna recorded
Target search	TRA-09	09/04/2021	9:30	9:47	0.5	Hillcrest/ Hillslope	Northern Quoll	Opportunistic fauna recorded
Target search	TRA-10	10/04/2021	14:20	15:30	2.5	Mulga Woodland, Sandplain	Western pebble mound mouse, Mulgara, Bilby	Opportunistic fauna recorded
Target search	TRA-11	09/04/2021	14:09	14:39	1	Breakaway/ Cliff	Pilbara Leaf-Nosed Bat, Ghost Bat	Opportunistic fauna recorded
Target search	TRA-12	12/04/2021	9:50	10:50	2	Gorge/ Gully	Pilbara Olive Python,	Opportunistic fauna

Transect description	Transect I.D.	Date	Start time	End time	Person hours	Habitat targeted	Species targeted	Comments
							Northern Quoll	recorded
Target search	TRA-13	09/04/2021	15:07	15:37	1	Hillcrest/ Hillslope	Western pebble mound mouse	Opportunistic fauna recorded
Target search	TRA-14	12/04/2021	12:50	15:00	4.25	Major Drainage Line, Gorge/ Gully, Hillcrest/ Hillslope	Northern Quoll	Opportunistic fauna recorded
Target search	TRA-15	09/04/2021	15:40	16:10	1	Hillcrest/ Hillslope	Western pebble mound mouse	Opportunistic fauna recorded
Target search	TRA-16	12/04/2021	11:05	11:35	1	Sand Plain	Mulgara	Opportunistic fauna recorded
Target search	TRA-17	09/04/2021	6:06	7:06	2	Hillcrest/ Hillslope	Western pebble mound mouse	Opportunistic fauna recorded
Target search	TRA-18	13/04/2021	15:36	16:06	1	Sand Plain	Mulgara, Bilby	Opportunistic fauna recorded
Target search	TRA-19	10/04/2021	6:51	7:21	1	Gorge/ Gully, Hillcrest/ Hillslope	Pilbara Olive Python, Northern Quoll, Pilbara Leaf-Nosed Bat	Opportunistic fauna recorded
Target search	TRA-20	12/04/2021	15:30	16:20	1.5	Gorge/ Gully	Pilbara Olive Python, Pilbara Leaf-Nosed Bat	Opportunistic fauna recorded
Target search	TRA-21	10/04/2021	5:49	6:19	1	Breakaway/ Cliff	Ghost Bat, Pilbara Leaf-Nosed Bat	Opportunistic fauna recorded
Target search	TRA-22	13/04/2021	13:26	13:56	1	Sand Plain	Pilbara Leaf-Nosed Bat, Ghost Bat	Opportunistic fauna recorded
Target search	TRA-23	10/04/2021	6:20	6:50	1	Hillcrest/ Hillslope	Mulgara, Bilby	Opportunistic fauna recorded
Target search	TRA-24	13/04/2021	14:09	14:39	1	Sand Plain	Western pebble mound mouse	Opportunistic fauna recorded
Target search	TRA-25	12/04/2021	7:32	8:02	0.75	Sandy/ Stony Plain, Major Drainage Line	Mulgara, Bilby	Opportunistic fauna recorded
Target search	TRA-26	11/04/2021	12:50	14:05	2.5	Hillcrest hillslope, Major Drainage Line, Stony Plain	Bilby, Mulgara	Opportunistic fauna recorded
Target search	TRA-27	11/04/2021	9:45	10:15	1	Mulga Woodland	Western pebble mound mouse, Mulgara, Bilby	Opportunistic fauna recorded
Target search	TRA-29	11/04/2021	8:11	8:41	1	Sand Plain	Mulgara, Bilby	Opportunistic fauna recorded
Target search	TRA-31	11/04/2021	7:30	8:00	1	Hillcrest/ Hillslope	Western pebble mound mouse	Opportunistic fauna recorded
Target search	TRA-33	11/04/2021	9:00	9:30	1	Sand Plain	Western pebble mound mouse	Opportunistic fauna recorded

Transect description	Transect I.D.	Date	Start time	End time	Person hours	Habitat targeted	Species targeted	Comments
Target search	TRA-35	11/04/2021	18:00	19:30	3	Hillcrest/ Hillslope	Mulgara, Bilby	Opportunistic fauna recorded
Target search	TRA-37	11/04/2021	10:30	11:00	1	Major Drainage Line	Pilbara Olive Python	Opportunistic fauna recorded
Target search	TRA-39	13/04/2021	7:50	8:20	1	Hillcrest/ Hillslope	Pilbara Olive Python	Opportunistic fauna recorded
Target search	TRA-41	12/04/2021	9:38	10:08	1	Hillcrest/ Hillslope	Pilbara Olive Python	Opportunistic fauna recorded
Target search	TRA-43	12/04/2021	6:11	6:41	0.75	Hillcrest/ Hillslope	Pilbara Olive Python, Northern Quoll	Opportunistic fauna recorded
Target search	TRA-45	12/04/2021	6:52	7:22	0.75	Hillcrest/ Hillslope	Western pebble mound mouse	Opportunistic fauna recorded
Target search	TRA-47	13/04/2021	13:24	14:24	2	Sand Plain	Mulgara, Bilby	Opportunistic fauna recorded
Target search	TRA-49	13/04/2021	13:54	14:24	1	Sand Plain	Mulgara, Bilby	Opportunistic fauna recorded
Target search	TRA-51	13/04/2021	15:19	15:49	1	Hillcrest/ Hillslope	Western pebble mound mouse	Opportunistic fauna recorded

Water Features

Site ID	Date	Length (m)	Width (m)	Water Present	Days since last rain	Last rain (mm)	Groundwater vegetation present	Emergent macrophytes present	Fauna species present	Longitude	Latitude
WTR-05	11/04/2021	10	4	Yes	29	6.6	Yes	No	Yes. Perch	119.7437934	-23.28565353
WTR-04	11/04/2021	8	8	Yes	29	6.6	Yes	No	Yes. Flat-shelled turtle.	119.7391664	-23.28385952

Target Bat Cave survey

Site ID	Cave ID	Date	Roost type	Cave position	Floor slope	Cave aspect	Cave exposure	Entrance type	Entrance shape	Entrance width (m)	Entrance height (m)	cave depth (m)	Number of chambers	Chamber height (m)	Water in cave	Water outside	Scat count	Comment	Longitude	Latitude	
CAV-01	CCAT-19	2021-04-09	No usage for Ghost Bat	Upper Slope	Flat	South	Semi Exposed	Cavity	Horizontal	1.2	0.4	10	2	0.5	None	None	0	Potential day roost for Pilbara Leaf-nosed Bat	119.6924244	- 23.2847900	
CAV-03	CCAT-06	2021-04-09	Potential Day Roost for Ghost Bat	Mid Slope	Incline	East	Sheltered	Overhang	Round/Oval	1.8	0.8	20	2	3	None	None	0	No usage for Pilbara Leaf-nosed Bat. No signs of Ghost Bat	119.7023926	- 23.2820960	
CAV-04	CCAT-13	2021-04-10	Potential Day Roost for Ghost Bat	Lower Slope	Flat	North	Semi Exposed	Cavern	Round/Oval	2.5	3	15			None	None	0	No usage for Pilbara Leaf-nosed Bat. Taphozous present	119.7488845	- 23.2835939	photo not available
CAV-06	CCAT-01	2021-04-10	No usage for Ghost Bat	Mid Slope	Flat	East	Sheltered	Cavity	Horizontal	2.5	2	20	1	2	None	None	0	Potential day roost for Pilbara Leaf-nosed Bat, deep and narrow shaft	119.7450068	- 23.2879135	photo not available
CAV-05	CCAT-17	2021-04-12	No usage for Ghost Bat	Upper Slope	Incline	North/ West	Exposed	Cavern	Round/Oval	4	1.5	15	1	4	None	None	0	Potential day roost for Pilbara Leaf-nosed Bat, no evidence	119.7054818	- 23.2799821	photo not available

Vertebrate Fauna Observations

Site ID.	Sample method	Date	Record type	Common name	Genus	species	Subspecies	Conservation status	Number of individuals	Habitat type	Longitude	latitude
FAU-95	Opportunistic	11/04/2021	Individual (alive)	Australian Hobby	Falco	longipennis		Native	1	Sandplain	119.658450	- 23.292408
FAU-96	Opportunistic	11/04/2021	Individual (alive)	Australian Magpie	Cracticus	tibicen		Native	1	Sandplain	119.658450	- 23.292408
FAU-68	Nocturnal Search	11/04/2021	Individual (alive)	Australian Owlet Nightjar	Aegotheles	cristatus		Native	1	Gorge/ Gully	119.744020	- 23.286020
FAU-46	Opportunistic	9/04/2021	Individual (alive)	Australasian Pipit	Anthus	australis	australis	Native	1	Sandplain	119.659017	- 23.286209
FAU-49	Opportunistic	9/04/2021	Individual (alive)	Black Kite	Milvus	migrans		Native	1	Sandplain	119.659017	- 23.286209
FAU-47	Opportunistic	9/04/2021	Individual (alive)	Black-faced Cuckoo-shrike	Coracina	novaehollandiae	subpallida	Native	1	Sandplain	119.659017	- 23.286209
FAU-48	Opportunistic	9/04/2021	Individual (alive)	Black-faced Woodswallow	Artamus	cinereus		Native	1	Sandplain	119.659017	- 23.286209
FAU-50	Nocturnal Search	11/04/2021	Individual (alive)	Boobook Owl	Ninox	boobook		Native	1	Gorge/ Gully	119.744020	- 23.286020
FAU-51	Opportunistic	11/04/2021	Individual (alive)	Brown Falcon	Falco	berigora		Native	1	Sandplain	119.687982	- 23.319581
CAM-16	Camera	9/04/2021	Individual (alive)	Brown Goshawk	Accipiter	fasciatus		Native	1	Hillcrest/ Hillslope	119.671157	- 23.284936
FAU-52	Opportunistic	11/04/2021	Individual (alive)	Brown Honeyeater	Lichmera	indistincta		Native	1	Sandplain	119.687982	- 23.319581
FAU-27	Targeted Search	13/04/2021	Burrow (inactive)	Brush-tailed Mulgara	Dasycercus	blythi		Priority 4 – BC Act	1	Sandplain	119.659406	- 23.286105
FAU-29	Targeted Search	13/04/2021	Burrow (inactive)	Brush-tailed Mulgara	Dasycercus	blythi		Priority 4 – BC Act	1	Sandplain	119.659406	- 23.286071
FAU-31	Targeted Search	13/04/2021	Burrow (inactive)	Brush-tailed Mulgara	Dasycercus	blythi		Priority 4 – BC Act	1	Sandplain	119.659190	- 23.286173
FAU-33	Targeted Search	12/04/2021	Burrow (inactive)	Brush-tailed Mulgara	Dasycercus	blythi		Priority 4 – BC Act	1	Sandplain	119.659028	- 23.285864
FAU-35	Targeted Search	13/04/2021	Mound (active)	Brush-tailed Mulgara	Dasycercus	blythi		Priority 4 – BC Act	1	Sandplain	119.658923	- 23.285991
FAU-37	Targeted Search	12/04/2021	Burrow (inactive)	Brush-tailed Mulgara	Dasycercus	blythi		Priority 4 – BC Act	1	Sandplain	119.658942	- 23.286134
FAU-39	Targeted Search	12/04/2021	Burrow (inactive)	Brush-tailed Mulgara	Dasycercus	blythi		Priority 4 – BC Act	1	Sandplain	119.659044	- 23.286465
FAU-41	Targeted Search	12/04/2021	Burrow (inactive)	Brush-tailed Mulgara	Dasycercus	blythi		Priority 4 – BC Act	1	Sandplain	119.659081	- 23.286376

Site ID.	Sample method	Date	Record type	Common name	Genus	species	Subspecies	Conservation status	Number of individuals	Habitat type	Longitude	latitude
FAU-43	Targeted Search	12/04/2021	Burrow (inactive)	Brush-tailed Mulgara	Dasyercus	blythi		Priority 4 – BC Act	1	Sandplain	119.671610	- 23.293376
CAM-15	Camera	15/04/2021	Individual (alive)	Brush-tailed Mulgara	Dasyercus	blythi		Priority 4 – BC Act	1	Sandplain	119.659017	- 23.286209
CAM-16	Camera	9/04/2021	Individual (alive)	Budgerigar	Melopsittacus	undulatus		Native	1	Hillcrest/ Hillslope	119.671157	- 23.284936
FAU-53	Opportunistic	11/04/2021	Individual (alive)	Bynoe's Gecko	Heteronotia	binoei		Native	1	Sandplain	119.687982	- 23.319581
BAT-04	Bat detector	13/04/2021	Individual (alive)	Chocolate Wattled Bat	Chalinolobus	morio		Native	1	Gorge/ Gully	119.745959	- 23.290720
FAU-83	Opportunistic	9/04/2021	Individual (alive)	Cockatiel	Nymphicus	hollandicus		Native	1	Major Drainage Line	119.660963	- 23.301122
CAM-18	Camera	10/04/2021	Individual (alive)	Common Bronzewing	Phaps	chalcoptera		Native	1	Gorge/ Gully	119.746047	- 23.285166
CAM-08	Camera	9/04/2021	Individual (alive)	Common Rock Rat	Zyzomys	argurus		Native	1	Major Drainage Line	119.674297	- 23.272760
BAT-05	Bat detector	11/04/2021	Individual (alive)	Common Sheath-tailed Bat	Taphozous	georgianus		Native	1	Gorge/ Gully	119.750606	- 23.293200
FAU-88	Opportunistic	9/04/2021	Individual (alive)	Common Sheath-tailed Bat	Taphozous	georgianus		Native	3	Breakaway/ Cliff	119.674095	- 23.278254
FAU-98	Opportunistic	11/04/2021	Track	Cow	Bos	taurus		Introduced	1	Claypan	119.700061	- 23.324991
FAU-54	Opportunistic	11/04/2021	Individual (alive)	Crested Pigeon	Ocyphaps	lophotes		Native	1	Sandplain	119.687982	- 23.319581
FAU-91	Nocturnal Search	11/04/2021	Individual (alive)	Desert Cave Gecko	Heteronotia	spelea		Native	1	Gorge/ Gully	119.744020	- 23.286020
CAM-18	Camera	10/04/2021	Individual (alive)	Desert Tree Frog	Litoria	rubella		Native	1	Gorge/ Gully	119.746047	- 23.285166
CAM-18	Camera	10/04/2021	Individual (alive)	Diamond Dove	Geopelia	cuneata		Native	1	Gorge/ Gully	119.746047	- 23.285166
CAM-16	Camera	9/04/2021	Individual (alive)	Dog	Canis	familiaris		Introduced	1	Hillcrest/ Hillslope	119.671157	- 23.284936
FAU-94	Opportunistic	11/04/2021	Track	Domestic Cat	Felis	catus		Introduced	1	Sandplain	119.658450	- 23.292408
CAM-16	Camera	9/04/2021	Individual (alive)	Euro	Osphranter	robustus	erubescens	Native	1	Hillcrest/ Hillslope	119.671157	- 23.284936
FAU-55	Opportunistic	11/04/2021	Individual (alive)	Fairy Martin	Petrochelidon	ariel		Native	1	Sandplain	119.687982	- 23.319581
BAT-05	Bat detector	12/04/2021	Individual (alive)	Finlayson's Cave Bat	Vespadelus	finlaysoni		Native	1	Gorge/ Gully	119.750606	- 23.293200

Site ID.	Sample method	Date	Record type	Common name	Genus	species	Subspecies	Conservation status	Number of individuals	Habitat type	Longitude	latitude
FAU-76	Opportunistic	12/04/2021	Individual (alive)	Flat-shelled Turtle	Chelodina	steindachneri		Native	1	Gorge/ Gully	119.739166	- 23.283860
CAM-16	Camera	9/04/2021	Individual (alive)	Galah	Cacatua	roseicapilla		Native	1	Hillcrest/ Hillslope	119.671157	- 23.284936
BAT-04	Bat detector	11/04/2021	Individual (alive)	Gould's Wattled Bat	Chalinolobus	gouldii		Native	1	Gorge/ Gully	119.745959	- 23.290720
BAT-05	Bat detector	11/04/2021	Individual (alive)	Greater Northern Free-tailed Bat	Chaerephon	jobensis	colonicus	Native	1	Gorge/ Gully	119.750606	- 23.293200
FAU-25	Opportunistic	12/04/2021	Individual (alive)	Grey Falcon	Falco	hypoleucos		Vulnerable EPBC/BC Act	2	Hillcrest/ Hillslope	119.700963	- 23.306882
FAU-57	Opportunistic	11/04/2021	Individual (alive)	Grey Shrike-thrush	Colluricincla	harmonica	rufiventris	Native	1	Sandplain	119.687982	- 23.319581
FAU-56	Opportunistic	11/04/2021	Individual (alive)	Grey-crowned babbler	Pomatostomus	temporalis	rubeculus	Native	1	Sandplain	119.687982	- 23.319581
CAM-18	Camera	10/04/2021	Individual (alive)	Grey-headed Honeyeater	Ptilotula	keartlandi		Native	1	Gorge/ Gully	119.746047	- 23.285166
CAM-15	Camera	13/04/2021	Individual (alive)	Leopard Skink	Ctenotus	pantherinus	occellifer	Native	1	Sandplain	119.659017	- 23.286209
FAU-93	Opportunistic	11/04/2021	Individual (alive)	Leopard Skink	Ctenotus	pantherinus	occellifer	Native	1	Sandplain	119.658450	- 23.292408
BAT-05	Bat detector	12/04/2021	Individual (alive)	Little Broad-nosed Bat	Scotorepens	greyii		Native	1	Gorge/ Gully	119.750606	- 23.293200
FAU-58	Opportunistic	11/04/2021	Individual (alive)	Little Button Quail	Turnix	velox		Native	1	Sandplain	119.687982	- 23.319581
FAU-59	Opportunistic	11/04/2021	Individual (alive)	Little Corella	Cacatua	sanguinea		Native	1	Sandplain	119.687982	- 23.319581
FAU-60	Opportunistic	11/04/2021	Individual (alive)	Little Crow	Corvus	bennetti		Native	1	Sandplain	119.687982	- 23.319581
FAU-84	Opportunistic	9/04/2021	Individual (alive)	Little Eagle	Hieraetus	morphnoides		Native	1	Major Drainage Line	119.660963	- 23.301122
FAU-61	Opportunistic	11/04/2021	Individual (alive)	Little Woodswallow	Artamus	minor		Native	1	Sandplain	119.687982	- 23.319581
FAU-62	Opportunistic	11/04/2021	Individual (alive)	Long-nosed Dragon	Gowidon	longirostris		Native	1	Sandplain	119.687982	- 23.319581
FAU-63	Opportunistic	11/04/2021	Individual (alive)	Magpie-lark	Grallina	cyanoleuca		Native	1	Sandplain	119.687982	- 23.319581
FAU-64	Opportunistic	11/04/2021	Individual (alive)	Masked Woodswallow	Artamus	personatus		Native	1	Sandplain	119.687982	- 23.319581
FAU-65	Opportunistic	11/04/2021	Individual (alive)	Military Dragon	Ctenophorus	isolepis	isolepis	Native	1	Sandplain	119.687982	- 23.319581
FAU-	Opportunistic	11/04/2021	Individual (alive)	Nankeen Kestrel	Falco	cenchroides		Native	1	Sandplain	119.687982	-

Site ID.	Sample method	Date	Record type	Common name	Genus	species	Subspecies	Conservation status	Number of individuals	Habitat type	Longitude	latitude
66												23.319581
BAT-02	Bat detector	13/04/2021	Individual (alive)	Northern Free-tailed Bat	Ozimops	lumsdenae		Native	1	Major Drainage Line	119.658135	- 23.275051
CAM-18	Camera	10/04/2021	Individual (alive)	Painted Finch	Emblema	pictum		Native	1	Gorge/ Gully	119.746047	- 23.285166
FAU-89	Opportunistic	10/04/2021	Individual (alive)	Painted Finch	Emblema	pictum		Native	1	Gorge/ Gully	119.743787	- 23.285655
FAU-69	Opportunistic	13/04/2021	Individual (alive)	Peaceful Dove	Geopelia	striata	placida	Native	1	Sandplain	119.737681	- 23.297384
FAU-01	Opportunistic	9/04/2021	Individual (alive)	Peregrine Falcon	Falco	peregrinus		Specially protected BC Act	2	Breakaway/ Cliff	119.674650	- 23.278342
CAM-24	Camera	9/04/2021	Individual (alive)	Perentie	Varanus	giganteus		Native	1	Breakaway/ Cliff	119.667773	- 23.279836
FAU-70	Opportunistic	13/04/2021	Individual (alive)	Pied Butcherbird	Cracticus	nigrogularis		Native	1	Sandplain	119.737681	- 23.297384
BAT-03	Bat detector	11/04/2021	Individual (alive)	Pilbara Leaf-nosed Bat	Rhinonicteris	aurantia		Vulnerable EPBC & BC Act	1	Cave	119.702394	- 23.282103
CAM-14	Camera	10/04/2021	Individual (alive)	Pilbara Rock Monitor	Varanus	pilbarensis		Native	1	Gorge/ Gully	119.746041	- 23.290705
FAU-85	Opportunistic	9/04/2021	Individual (alive)	Port Lincoln Parrot	Platycercus	zonarius	zonarius	Native	1	Major Drainage Line	119.659360	- 23.268744
FAU-87	Opportunistic	10/04/2021	Individual (alive)	Ring-tailed Dragon	Ctenophorus	caudicinctus	caudicinctus	Native	1	Gorge/ Gully	119.750606	- 23.293200
CAM-14	Camera	10/04/2021	Individual (alive)	Rothschild's Rock Wallaby	Petrogale	rothschildi		Native	1	Gorge/ Gully	119.746041	- 23.290705
FAU-86	Opportunistic	10/04/2021	Individual (alive)	Russet Snake-eyed Skink	Cryptoblepharus	ustulatus		Native	1	Gorge/ Gully	119.750606	- 23.293200
FAU-72	Opportunistic	13/04/2021	Individual (alive)	Sacred Kingfisher	Todiramphus	sanctus		Native	1	Sandplain	119.737681	- 23.297384
FAU-92	Nocturnal Search	11/04/2021	Individual (alive)	Sheep Frog	Cyclorana	maini		Native	1	Gorge/ Gully	119.744020	- 23.286020
FAU-73	Opportunistic	13/04/2021	Individual (alive)	Singing Honeyeater	Gavicalis	virescens		Native	1	Sandplain	119.737681	- 23.297384
FAU-71	Opportunistic	13/04/2021	Individual (alive)	Skink	Ctenotus	inornatus		Native	1	Sandplain	119.737681	- 23.297384
FAU-74	Opportunistic	13/04/2021	Individual (alive)	Spinifex Bird	Eremiornis	carteri		Native	1	Sandplain	119.737681	- 23.297384
FAU-97	Opportunistic	11/04/2021	Track	Spinifex Hopping Mouse	Notomys	alexis		Native	1	Sandplain	119.658450	- 23.292408

Site ID.	Sample method	Date	Record type	Common name	Genus	species	Subspecies	Conservation status	Number of individuals	Habitat type	Longitude	latitude
CAM-18	Camera	10/04/2021	Individual (alive)	Spinifex Pigeon	Geophaps	plumifera	ferruginea	Native	1	Gorge/ Gully	119.746047	- 23.285166
FAU-90	Opportunistic	10/04/2021	Individual (alive)	Spiny-tailed Monitor	Varanus	acanthurus		Native	1	Breakaway/ Cliff	119.751401	- 23.292936
CAM-13	Camera	10/04/2021	Individual (alive)	Spotted Dtella	Gehyra	punctata		Native	1	Breakaway/ Cliff	119.752092	- 23.292841
FAU-82	Opportunistic	9/04/2021	Individual (alive)	Spotted Harrier	Circus	assimilis		Native	1	Major Drainage Line	119.660963	- 23.301122
FAU-75	Nocturnal Search	11/04/2021	Individual (alive)	Spotted Nightjar	Eurostopodus	argus		Native	1	Gorge/ Gully	119.744020	- 23.286020
CAM-08	Camera	9/04/2021	Individual (alive)	Stripe-faced Dunnart	Sminthopsis	macroura		Native	1	Major Drainage Line	119.674297	- 23.272760
FAU-67	Opportunistic	11/04/2021	Individual (alive)	Two-toed Skink	Lerista	bipes		Native	1	Sandplain	119.687982	- 23.319581
FAU-78	Opportunistic	9/04/2021	Individual (alive)	Variegated Fairywren	Malurus	lamberti	assimilis	Native	1	Hillcrest/ Hillslope	119.671157	- 23.284936
CAM-16	Camera	9/04/2021	Individual (alive)	Wedge-tailed Eagle	Aquila	audax		Native	1	Hillcrest/ Hillslope	119.671157	- 23.284936
FAU-79	Opportunistic	9/04/2021	Individual (alive)	Weebill	Smicromis	brevirostris		Native	1	Hillcrest/ Hillslope	119.671157	- 23.284936
CAM-18	Camera	10/04/2021	Individual (alive)	Western Bowerbird	Ptilonorhynchus	guttatus	guttatus	Native	1	Gorge/ Gully	119.746047	- 23.285166
FAU-77	Nocturnal Search	11/04/2021	Individual (alive)	Western Marbled Velvet Gecko	Oedura	fimbria		Native	1	Gorge/ Gully	119.744020	- 23.286020
FAU-02	Opportunistic	9/04/2021	Mound (recently inactive)	Western Pebble-mound Mouse	Pseudomys	chapmani		Priority 4 BC Act	1	Stony Plain	119.674374	- 23.275846
FAU-03	Targeted Search	9/04/2021	Mound (inactive)	Western Pebble-mound Mouse	Pseudomys	chapmani		Priority 4 BC Act	1	Hillcrest/ Hillslope	119.669003	- 23.283614
FAU-04	Opportunistic	9/04/2021	Mound (active)	Western Pebble-mound Mouse	Pseudomys	chapmani		Priority 4 BC Act	1	Hillcrest/ Hillslope	119.680197	- 23.270123
FAU-05	Opportunistic	11/04/2021	Mound (inactive)	Western Pebble-mound Mouse	Pseudomys	chapmani		Priority 4 BC Act	1	Stony Plain	119.703656	- 23.327444
FAU-06	Opportunistic	9/04/2021	Mound (recently inactive)	Western Pebble-mound Mouse	Pseudomys	chapmani		Priority 4 BC Act	1	Hillcrest/ Hillslope	119.677391	- 23.276299
FAU-08	Opportunistic	12/04/2021	Mound (inactive)	Western Pebble-mound Mouse	Pseudomys	chapmani		Priority 4 BC Act	1	Hillcrest/ Hillslope	119.710518	- 23.284012
FAU-07	Targeted Search	9/04/2021	Mound (inactive)	Western Pebble-mound Mouse	Pseudomys	chapmani		Priority 4 BC Act	1	Breakaway/ Cliff	119.691715	- 23.286206
FAU-09	Targeted Search	9/04/2021	Mound (inactive)	Western Pebble-mound Mouse	Pseudomys	chapmani		Priority 4 BC Act	1	Gorge/ Gully	119.691331	- 23.286925

Site ID.	Sample method	Date	Record type	Common name	Genus	species	Subspecies	Conservation status	Number of individuals	Habitat type	Longitude	latitude
FAU-11	Targeted Search	10/04/2021	Mound (active)	Western Pebble-mound Mouse	Pseudomys	chapmani		Priority 4 BC Act	1	Hillcrest/ Hillslope	119.755545	- 23.289566
FAU-13	Targeted Search	10/04/2021	Mound (active)	Western Pebble-mound Mouse	Pseudomys	chapmani		Priority 4 BC Act	1	Hillcrest/ Hillslope	119.658671	- 23.302958
FAU-17	Targeted Search	12/04/2021	Mound (active)	Western Pebble-mound Mouse	Pseudomys	chapmani		Priority 4 BC Act	1	Hillcrest/ Hillslope	119.688355	- 23.302392
FAU-19	Targeted Search	12/04/2021	Mound (active)	Western Pebble-mound Mouse	Pseudomys	chapmani		Priority 4 BC Act	1	Hillcrest/ Hillslope	119.695845	- 23.302441
FAU-21	Targeted Search	12/04/2021	Mound (active)	Western Pebble-mound Mouse	Pseudomys	chapmani		Priority 4 BC Act	1	Hillcrest/ Hillslope	119.698878	- 23.305918
FAU-23	Targeted Search	12/04/2021	Mound (inactive)	Western Pebble-mound Mouse	Pseudomys	chapmani		Priority 4 BC Act	1	Hillcrest/ Hillslope	119.698903	- 23.305552
FAU-45	Opportunistic	13/04/2021	Mound (inactive)	Western Pebble-mound Mouse	Pseudomys	chapmani		Priority 4 BC Act	1	Hillcrest/ Hillslope	119.694841	- 23.288482
FAU-80	Opportunistic	9/04/2021	Individual (alive)	Whistling Kite	Haliastur	sphenurus		Native	1	Hillcrest/ Hillslope	119.671157	- 23.284936
CAM-16	Camera	9/04/2021	Individual (alive)	Willie Wagtail	Rhipidura	leucophrys	leucophrys	Native	1	Hillcrest/ Hillslope	119.671157	- 23.284936
BAT-05	Bat detector	11/04/2021	Individual (alive)	Yellow Bellied Sheath-tail Bat	Saccolaimus	flaviventris		Native	1	Gorge/ Gully	119.750606	- 23.293200
CAM-06	Camera	9/04/2021	Individual (alive)	Yellow Spotted Monitor	Varanus	panoptes		Native	1	Major Drainage Line	119.658143	- 23.277030
FAU-81	Opportunistic	9/04/2021	Individual (alive)	Yellow-throated Miner	Manorina	flavigula		Native	1	Major Drainage Line	119.660963	- 23.301122
CAM-18	Camera	10/04/2021	Individual (alive)	Zebra Finch	Taeniopygia	guttata	castanotis	Native	1	Gorge/ Gully	119.746047	- 23.285166
BAR-02	Microphone	10/04/2021	Individual (alive)	Horsfield's Bronze Cuckoo	Chrysococcyx	basalis		Native	1	Major Drainage Line	119.660963	- 23.301122
BAR-01	Microphone	10/04/2021	Individual (alive)	White-winged Fairywren	Malurus	leucopterus	leuconotus	Native	1	Stony Plain	119.666701	- 23.290672
BAR-01	Microphone	10/04/2021	Individual (alive)	Ground Cuckoo-shrike	Coracina	maxima		Native	1	Stony Plain	119.666701	- 23.290672
BAR-03	Microphone	10/04/2021	Individual (alive)	Blue-winged Kookaburra	Dacelo	leachii	leachii	Native	1	Stony Plain	119.703091	- 23.301049
BAR-04	Microphone	10/04/2021	Individual (alive)	Black-eared Cuckoo	Chrysococcyx	osculans		Native	1	Gorge/ Gully	119.674092	- 23.278119
BAR-04	Microphone	10/04/2021	Individual (alive)	Pallid Cuckoo	Cacomantis	pallidus		Native	1	Gorge/ Gully	119.674092	- 23.278119
BAR-04	Microphone	10/04/2021	Individual (alive)	Grey Teal	Anas	gracilis		Native	1	Gorge/ Gully	119.674092	- 23.278119

Site ID.	Sample method	Date	Record type	Common name	Genus	species	Subspecies	Conservation status	Number of individuals	Habitat type	Longitude	latitude
BAR-04	Microphone	10/04/2021	Individual (alive)	Brown Quail	Coturnix	ypsilophora		Native	1	Gorge/Gully	119.674092	-23.278119
BAR-04	Microphone	10/04/2021	Individual (alive)	Rufous Whistler	Pachycephala	rufiventris	rufiventris	Native	1	Gorge/Gully	119.674092	-23.278119
BAR-04	Microphone	10/04/2021	Individual (alive)	Red-backed Kingfisher	Todiramphus	pyrrhopygius		Native	1	Gorge/Gully	119.674092	-23.278119

Cave assessments

Site ID:	CCAT-19	
Date:	9/04/2021	Described by: Robert Browne-Cooper
Co-ordinates:	119.6924244	-23.28479005
Roost type:	Potential day roost for Pilbara Leaf-nosed Bat.	
Cave position and floor slope:	Upper slope, flat	
Aspect:	South	
Cave exposure:	Semi exposed	
Entrance type and shape:	Cavity, horizontal	
Entrance width and height (m):	1.2	0.4
Cave depth (unit):	10	
Number of chambers:	2	
Height of highest chamber (m):	0.5	
Temperature entrance (degrees):	28	
Water present:	None	
Scat count and age:	0	



Site ID:	CCAT-06	
Date:	9/04/2021	Described by: Robert Browne-Cooper
Co-ordinates:	119.7023926	-23.28209607
Roost type:	Potential day roost for Ghost Bat	
Cave position and floor slope:	Mid slope, incline	
Aspect:	East	
Cave exposure:	Sheltered	
Entrance type and shape:	Overhang, round / oval	
Entrance width and height (m):	1.8	0.8
Cave depth (unit):	20	
Number of chambers:	2	
Height of highest chamber (m):	3	
Temperature entrance (degrees):		
Water present:	None	
Scat count and age:	0	



Site ID:	CCAT-13	
Date:	9/04/2021	Described by:
Co-ordinates:	119.7488845	-23.28359394
Roost type:	Potential day roost for Ghost Bat	
Cave position and floor slope:	Lower slope, flat	
Aspect:	North	
Cave exposure:	Semi exposed	
Entrance type and shape:	Cavern, round / oval	
Entrance width and height (m):	2.5	3
Cave depth (unit):	15	
Number of chambers:		
Height of highest chamber (m):		
Temperature entrance (degrees):		
Water present:		
Scat count and age:		

Site ID:	CCAT-17	
Date:	9/04/2021	Described by:
Co-ordinates:	119.7054818	-23.2799821
Roost type:	Potential day roost for Pilbara Leaf-nosed Bat	
Cave position and floor slope:	Upper slope, incline	
Aspect:	North / west	
Cave exposure:	Semi exposed	
Entrance type and shape:	Cavern, round / oval	
Entrance width and height (m):	4	1.5
Cave depth (unit):	15	
Number of chambers:	1	
Height of highest chamber (m):	4	
Temperature entrance (degrees):		
Water present:	None	
Scat count and age:	0	

Site ID:	CCAT-01	
Date:	9/04/2021	Described by:
Co-ordinates:	119.7450068	-23.2879135
Roost type:	Potential day roost for Pilbara Leaf-nosed Bat	
Cave position and floor slope:	Mid slope, flat	
Aspect:	East	
Cave exposure:	Sheltered	
Entrance type and shape:	Cavity, horizontal	
Entrance width and height (m):	2.5	2
Cave depth (unit):	20	
Number of chambers:	1	
Height of highest chamber (m):	2	
Temperature entrance (degrees):		
Water present:	None	
Scat count and age:		

1. Bat call survey and analysis

1.1 Call analysis process

Bat calls were recorded during field surveys using in situ (stationary) full spectrum Song Meter (SM4 bat) detectors (Wildlife Acoustics) or Anabat Swift detectors (Titley Electronics). Detectors were set for 17 nights at 5 location and programmed to record from 30 minutes pre-sunset to 30 minutes post-sunrise. For each detector the time and date deployed and recovered, and the GPS coordinates were recorded.

Data from the bat detectors were downloaded to a computer and analysed for the presence of bat calls following the field survey by Craig Grabham (GHD). Data was processed and analysed using a combination of manual review and automated techniques using Kaleidoscope Pro (Wildlife Acoustic, version 5.4) and Anabat Insight (Titley Scientific, version 1.9.9). The analysis process consisted of the following steps:

1. Files were downloaded from the units and saved to external hard drive (back up copy) following the survey for later processing and analysis
2. Using the batch and signal parameter processing features in Kaleidoscope Pro compressed WAV files collected using the Song Meter units were split into 1 second standard WAV files for manual analysis
3. For each night, data was manually reviewed for bat calls using Kaleidoscope Pro viewer from sunset onwards for 45 mins by visually comparing the time-frequency graph (spectrogram) and call characteristics (e.g. peak frequency, characteristic frequency and call shape) with species call descriptions from published guidelines (e.g. Armstrong and Cole 2007; McKenzie and Bullen 2009; Guppy et al. 1985; Hourigan 2011)
4. Data was then processed using the cluster analysis feature in Kaleidoscope Pro to automatically scan and sort the recorded bat calls into groups of similar calls (clusters). Clusters were then manually reviewed and identified to species or species group
5. For comparison a portion of the data was also processed using customised filters in Anabat Insight for the Pilbara Leaf-nosed Bat and Ghost Bat. Further manual review of some data was completed for validation purposes to accurately identify species.

Call identification was assisted by consulting distribution information for potential species (Armstrong 2011 and McKenzie et al various dates; Churchill 2008; Van Dyck et al. 2013) and records from Atlas of Living Australia (August 2021) and DBCA 2007–2021).

A call (pass) was defined as a sequence of three or more consecutive pulses of similar frequency and shape with the exception of the Pilbara Leaf-nosed Bat where at least two clear pulses was acceptable. Calls with less than three defined consecutive pulses of similar frequency and shape were not unambiguously identified to a species but may be used as part of the bat activity count for the project area. Due to variability in the quality of calls and the difficulty in distinguishing some species the identification of each call was assigned a confidence rating (see Mills et al. 1996 & Duffy et al. 2000) as summarised in **Table 1.**

Table 1 Confidence ratings applied to calls

Identification	Description
D - Definite	Species identification not in doubt.
PR - Probable	Call most likely to represent a particular species, but there exists a low probability of confusion with species of similar call type or call lacks sufficient detail.
SG - Species Group	Call made by one of two or more species. Call characteristics overlap, particularly poor quality calls or mixed species calls making it difficult to distinguish between species e.g. <i>Chaerophen jobensis</i> / <i>Saccolaimus flaviventris</i> <i>Taphozous georgianus</i> / <i>Taphozous hilli</i> <i>Nyctophilus</i> sp. The calls of <i>Nyctophilus geoffroyi</i> / <i>daedalus</i> / <i>arnhemensis</i> .

The semi-automated analysis process does not always capture all 'softer' Pilbara Leaf-nosed Bat (those calls with a lower amplitude) and Ghost Bat calls and sometimes calls with few pulses. Noting these limitations the manual review of all files during step 3 of the analysis process for each night ensured no emergence or early calls were missed. It is also important to note that both the Pilbara Leaf-nosed Bat and Ghost Bat need to be in close proximity to the bat detector to be recorded. The Ghost Bat call in particular is of low intensity making it difficult to detect with a bat detector therefore ultrasonic surveys should not be the primary means of surveying for this species.

1.2 Bat call analysis results

Nine species were positively identified (Definite) of the 15 or so species that are known to occur from the locality of the study area (see Tables 2,3,4).

One threatened species including the threatened species – Pilbara Leaf-nosed Bat *Rhinonictis aurantia* was identified from two calls at 9:33 pm 10/4/2021 (Swift 2). No calls were identified during the emergence period for this species. Plate 1 provides an example spectrogram call of the Pilbara Leaf-nosed Bat identified from call analysis from site.

The threatened Ghost Bat *Macroderma gigas* was also tentatively recorded from six calls during the nights of the 10th and 11th of April 2021 (Swift 2). No definitive calls were identified during the emergence period for this species. The call sequences consisted of some pulse that were consistent with the shape and frequency of the various harmonic components produced by the species, however some pulses were irregular and not characteristic of the species. There was insufficient information to allocate a confident identification. Furthermore, calls of the Common Sheath-tailed Bat *Taphozous georgianus* were regularly recorded for this site.

Table 2 Summary results – all sites

Species/Species Groups	All sites combined
<i>Chaerephon jobensis</i>	D
<i>Saccolaimus flaviventris</i>	D
<i>Taphozous georgianus</i>	D
<i>Ozimops lumsdenae</i>	D
<i>Chalinolobus gouldii</i>	D
<i>Scotorepens greyii</i>	D
<i>Chalinolobus morio</i>	PR
<i>Macroderma gigas/T. georgianus</i>	SG
<i>Nyctophilus geoffroyi/daedalus</i>	SG
<i>Vespadelus finlaysoni</i>	D
<i>Rhinonictis aurantia</i>	D
<i>C.jobensis/S.flaviventris</i>	SG
<i>C.gouldii/O.lumsdenae</i>	SG
<i>S.flaviventris/T.georgianus</i>	SG

Table 3 Summary of call analysis results

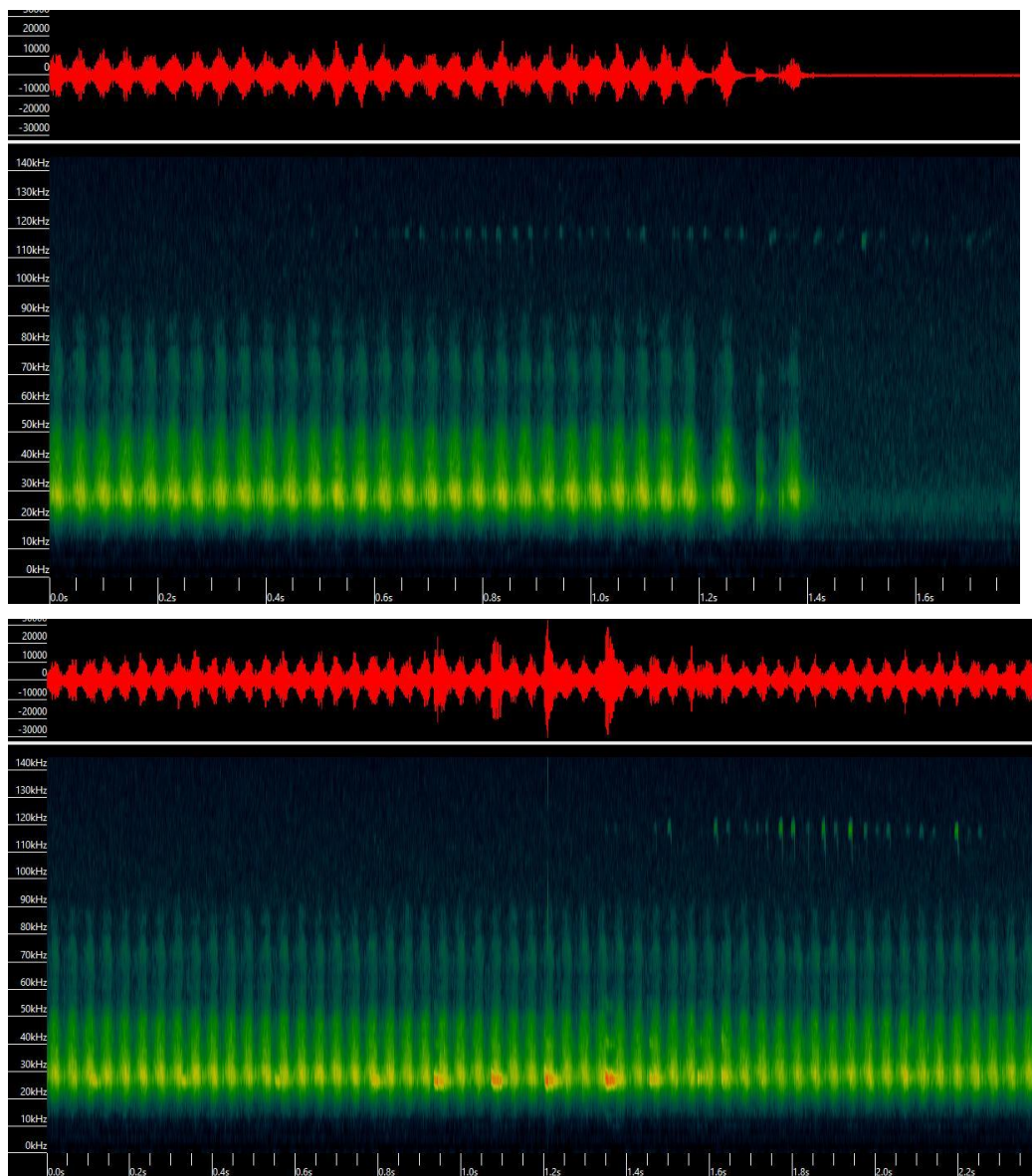
	SM2_2	SM2_2	SM2_2	SM2_3	SM2_3	SM2_3	SM4_4	SM4_4	SM4_4
Species/Species Groups	10-11/4/21	11-12/4/21	12-13/4/21	10-11/4/21	11-12/4/21	12-13/4/21	10-11/4/21	11-12/4/21	12-13/4/21
<i>Chaerephon jobensis</i>		D		D	D				
<i>Saccolaimus flaviventris</i>		D	D	D	D	D		D	D
<i>Taphozous georgianus</i>	D	D			D	D		D	
<i>Ozimops lumsdenae</i>									
<i>Chalinolobus gouldii</i>	D			D	D	D			
<i>Scotorepens greyii</i>	D	D	D	D	D	D		D	
<i>Chalinolobus morio</i>					PR			PR	
<i>Nyctophilus geoffroyi/daedalus</i>									
<i>Vespadelus finlaysoni</i>	D	D	D	D	D	D		D	D
<i>Rhinonictis aurantia</i>									
<i>C.jobensis/S.flaviventris</i>		SG	SG	SG				SG	SG
<i>C.gouldii/O.lumsdenae</i>		SG		SG	SG	SG			
<i>S.flaviventris/T.georgianus</i>	SG	SG							

Table 4 Summary of call analysis results

	Swift_1	Swift_1	Swift_1	Swift_1	Swift_2	Swift_2	Swift_2	Swift_2
Species/Species Groups	9-10/4/21	10-11/4/21	11-12/4/21	12-13/4/21	9-10/4/21	10-11/4/21	11-12/4/21	12-13/4/21
<i>Chaerephon jobensis</i>						D	D	
<i>Saccolaimus flaviventris</i>					D		D	D
<i>Taphozous georgianus</i>				D	D	D	D	D
<i>Ozimops lumsdenae</i>				D			D	D
<i>Chalinolobus gouldii</i>						D	D	D

<i>Scotorepens greyii</i>						D	D	D
<i>Chalinolobus morio</i>					PR		PR	PR
<i>Macroderma gigas/T. georgianus</i>							SG	SG
<i>Nyctophilus geoffroyi/daedalus</i>						SG	SG	
<i>Vespadelus finlaysoni</i>	D		D	D	D	D	D	D
<i>Rhinonictoris aurantia</i>						D (1)		
<i>C.jobensis/S.flaviventris</i>							SG	SG
<i>C.gouldii/O.lumsdenae</i>			SG	SG	SG	SG	SG	SG
<i>S.flaviventris/T.georgianus</i>				SG		SG	SG	

Plate 1 Example spectrogram for echolocation call of a Pilbara Leaf-nosed Bat identified as a result of call analysis (not compressed)



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Results of acoustic surveys conducted for the Night Parrot (*Pezoporus occidentalis*) near Newman – April 2021

Report to:

GHD

Prepared by:

Nigel Jackett

Adaptive NRM

27th May 2021



1. Summary

During April 2021, autonomous recording units (ARUs) were deployed approximately 4km north of Newman, Western Australia, to survey for Night Parrots (*Pezoporus occidentalis*). Resulting acoustic data was analysed using signal parameters optimised for detecting Night Parrot calls. No Night Parrot calls were detected during the analysis.

2. Survey effort

Research in western Queensland has demonstrated Night Parrots occupy long-term stable roost sites for periods of up to several years. These long-term stable roost sites support both roosting and breeding. The birds also have predictable year-round calling periods at dusk and dawn (Murphy *et al.* 2017a; Leseberg *et al.* 2019). This ensures that if Night Parrots are roosting at a particular site, the likelihood of detecting them using ARUs is very high, provided the ARU is placed for a minimum of four nights in calm weather, and the recorder is set to record during the peak calling periods. During breeding, and following large rain events, calling is more frequent, extends throughout the night (Murphy *et al.* 2017a), and the likelihood of detection is increased. Preliminary results from research in central Western Australia suggest patterns of behaviour in that region are similar (Jackett *et al.* 2017).

Night Parrots are also known to call during the night at feeding and drinking sites (S. Murphy, N. Leseberg, N. Jackett unpubl. data). Anecdotal evidence suggests they may call when moving between these sites (N. Leseberg, N. Jackett, S. Murphy unpubl. data). However, the detection of birds away from roosting sites is likely to be a chance event given the large area over which birds range at night (Murphy *et al.* 2017b). Night Parrots are known to drink, and modelling suggests they may be reliant on free-standing water (or succulent food containing >55% water) during hot weather (Kearney *et al.* 2016). Birds have been detected in the Great Sandy Desert by focusing survey effort at water sources (J. Brown pers. comm.). It is likely this technique will be most effective during periods of water scarcity, when survey effort can focus on just a few possible locations.

The likelihood of detection is also influenced by the type of ARU being used. In calm conditions, Song Meter 4s are known to be capable of reliably detecting 95% of Night Parrot calls out to a range of around 205 m (Leseberg *et al.* in-prep).

GHD conducted sampling for the Night Parrot (*Pezoporus occidentalis*) in April 2021. Four Song Meter 4 (Wildlife Acoustics, MA, USA) bioacoustic recording units were deployed across 4 sites and recorded a combined total of 20 nights of data (Table 1). The analysed dataset comprised 440 sound files (wav format) totalling 72.0 GB. Each unit recorded continuously from sunset until sunrise (approx. 12 hours).

Table 1. Bioacoustic recordings analysed from the April 2021 survey

Site name	Recording start date (PM)	Recording end date (AM)	Total recording nights	Nights with calm conditions
SM4-AC1	08/04/21	13/04/21	5	5
SM4-AC2	08/04/21	13/04/21	5	5
SM4-AC3	08/04/21	13/04/21	5	5
SM4-AC4	08/04/21	13/04/21	5	5
		Total	20	20

3. Data analysis

The analysis was undertaken using the software Kaleidoscope Pro v5.2.1, targeting the frequency range of 1000 – 4000 Hz for which all known calls of the Night Parrot are distributed within (Leseberg *et al.* 2019). Searching for calls over a large frequency range such as this is likely to produce a high number of false-positive results due to many other bird species calling at similar frequencies but is a necessary procedure in order to capture the potential repertoire of Night Parrot.

Potential Night Parrot calls detected during the analysis were compared to a reference library comprising 897 Night Parrot calls from Western Australia. This library consists of calls recorded at sites where Night Parrots have been confirmed using visual means and is therefore considered of high reliability. The library also comprises multiple examples of all known call types from Western Australia (Leseberg *et al.* 2019).

Kaleidoscope Pro search parameters were optimised using a random selection of 250 Night Parrot call examples manually detected from both Great Sandy Desert and East Murchison datasets, of which 205 (82.0%) were automatically detected. Calls not detected were typically extremely faint. The probability of non-detection of a true-positive call was 18.0%; two true-positive calls was 3.2%; three true-positive calls was 0.6%; etc. Of the data tested, the median number of consecutive (spaced at <5 minutes apart) calls in a sequence when Night Parrots were recorded was 5 (1–34, n=29). The probability of at least one call being detected within a

sequence of median length, assuming there was variation in the location of the source of the call, was >99.9%.

4. Survey results

A total of 8,018 Kaleidoscope detections were manually assessed for Night Parrot vocalisations. No calls attributable to Night Parrots were detected during the analysis.

A total of 23 non-target species were detected during the analysis and are shown for each site in Appendix 1.

5. Conclusion

It is very unlikely a long-term stable Night Parrot roost exists within two hundred metres of any of the surveyed points where four or more non-windy recording nights were made. Additionally, it is unlikely that Night Parrots were foraging in proximity to these surveyed points during the survey. It is important to note that these results pertain specifically to that area immediately surrounding the survey points, and do not necessarily support conclusions about the presence or absence of Night Parrots in the wider landscape.

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Appendix 1 – Species detected during the analysis

Species	SM4-AC1	SM4-AC2	SM4-AC3	SM4-AC4
Brown Quail				•
Grey Teal	•			
Horsfield's Bronze-Cuckoo			•	•
Black-eared Cuckoo				•
Pallid Cuckoo	•	•	•	•
Australian Owlet-nightjar	•	•	•	•
Little Button-quail			•	
Southern Boobook	•			
Blue-winged Kookaburra		•	•	
Red-backed Kingfisher	•		•	•
Galah	•	•		
Australian Ringneck	•	•	•	
White-winged Fairy-wren		•		
Yellow-throated Miner	•			•
Singing Honeyeater	•	•	•	
Grey-headed Honeyeater	•		•	
Weebill		•		•
Australian Magpie		•		
Pied Butcherbird		•		•
Ground Cuckoo-shrike		•		
Grey Shrike-thrush		•		•
Rufous Whistler				•
Zebra Finch		•	•	
Total	10	13	10	11

Likelihood of occurrence assessment - Parameters

Assessment outcome	Description
Known	The species was recorded or has been recorded recently by reputable observers.
Likely	Species are likely to occur in the project area where there is suitable habitat within the project area and there are recent records of occurrence of the species in close proximity to the project area. OR Species known distribution overlaps with the project area and there is suitable habitat within the project area.
Unlikely	Species assessed as unlikely include those species previously recorded within 5km of the project area however: -There is limited (i.e. the type, quality and quantity of the habitat is generally poor or restricted) habitat in the project area. -The suitable habitat within the project area is isolated from other areas of suitable habitat and the species has no capacity to migrate into the project area. OR Those species that have a known distribution overlapping with the project area however: -There is limited habitat in the project area (i.e. the type, quality and quantity of the habitat is generally poor or restricted). -The suitable habitat within the project area is isolated from other areas of suitable habitat and the species has no capacity to migrate into the project area.
Highly unlikely	Species that are considered highly unlikely to occur in the project area include: -Those species that have no suitable habitat within the project area. -Those species that have become locally extinct, or are not known to have ever been present in the region of the project area.

Source information – desktop searches

PMST – DAWE PMST to identify fauna listed under the EPBC Act potentially occurring within the project area

DBCA – DBCA 2021b. WA Government, DBCA Threatened and Priority fauna rankings

NM – DBCA NatureMap (accessed June 2021)

Fauna likelihood of occurrence assessment term definitions

Term	Description
Survey area	The area subject to the current survey
Study area	A 40 km buffer area around the survey area
CR	Critically endangered
EN	Endangered
VU	Vulnerable
IA	International Agreement – listed as a migratory species
Mi	Migratory
CD	Conservation dependent
OS	Other specially protected fauna
P1 – P4	Priority 1 – Priority 4. Threatened and Priority fauna ranking
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
BC Act	Biodiversity Conservation Act 2016
DBCA	Department of Biodiversity, Conservation and Attractions

Fauna likelihood of occurrence assessment of significant fauna identified in the desktop assessment as potentially occurring within the OB32 West, OB28 and OB33 study area

Taxa	Common Name	Status		Description and habitat requirements	Likelihood of occurrence within the survey area	Source
		BC Act / DBCA	EPBC Act			
Birds						
<i>Actitis hypoleucos</i>	Common Sandpiper	IA	Mi	The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. The Common Sandpiper has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. The muddy margins utilised by the species are often narrow, and may be steep. The species is often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags (Geering et al. 2007; Higgins & Davies 1996). Generally the species forages in shallow water and on bare soft mud at the edges of wetlands; often where obstacles project from substrate, e.g. rocks or mangrove roots. Birds sometimes venture into grassy areas adjoining wetlands (Higgins & Davies 1996).	Unlikely. The closest record is approximately 0.35 km south of the survey area. No suitable habitats such as tidal shores, shallow floodplains are present in the survey area, however suitable habitat immediately adjacent to the survey area.	DBCA, PMST, NM
<i>Apus pacificus</i>	Fork-tailed Swift	IA	Mi	In WA there are sparsely scattered records along the south coast, ranging from the Eyre Bird Observatory and west to Denmark. They are widespread in coastal and sub-coastal areas between Augusta and Carnarvon, including some on nearshore and offshore islands. This species is almost exclusively aerial, flying less than 1 m to at least 300 m above ground. This species is considered rare in the south-west region (DAWE 2021a). Breeding occurs in the Northern Hemisphere.	Unlikely. This species breeds in the Northern Hemisphere. It has been recorded locally during its non-breeding season but is unlikely to occur as it feeds aerially.	DBCA, PMST
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	IA	Mi	In Australasia, the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, salt pans and hypersaline salt lakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgeland and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered	Unlikely, closest record is approximately 0.4 km south of the survey area. No suitable habitat present in the survey area, however suitable	DBCA, PMST, NM

Taxa	Common Name	Status		Description and habitat requirements	Likelihood of occurrence within the survey area	Source
		BC Act / DBCA	EPBC Act			
				bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves. They tend to occupy coastal mudflats mainly after ephemeral terrestrial wetlands have dried out, moving back during the wet season. They may be attracted to mats of algae and water weed either floating or washed up around terrestrial wetlands, and coastal areas with much beachcast seaweed. Sometimes they occur on rocky shores and rarely on exposed reefs (Higgins & Davies 1996).	habitat immediately adjacent to the survey area.	
<i>Calidris ferruginea</i>	Curlew Sandpiper	IA	Mi	Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters (Higgins & Davies 1996). Curlew Sandpipers forage on mudflats and nearby shallow water. In non-tidal wetlands, they usually wade, mostly in water 15–30 mm, but up to 60 mm, deep. They forage at the edges of shallow pools and drains of intertidal mudflats and sandy shores. At high tide, they forage among low sparse emergent vegetation, such as saltmarsh, and sometimes forage in flooded paddocks or inundated saltflats. Occasionally they forage on wet mats of algae or waterweed, or on banks of beach cast seagrass or seaweed. They rarely forage on exposed reefs (Higgins & Davies 1996). In Roebuck Bay, northern Western Australia, they are also said to feed on part of the mudflats that have been exposed for a longer period, foraging in small groups (Tulp & de Goeij 1994). Curlew Sandpipers generally roost on bare dry shingle, shell or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands, occasionally roosting in dunes during very high tides and sometimes in saltmarsh (Higgins & Davies 1996).	Unlikely, closest record is approximately 0.7 km south of the survey area. No suitable habitat present in the survey area, however suitable habitat immediately adjacent to the survey area.	DBCA, PMST, NM
<i>Calidris melanotos</i>	Pectoral Sandpiper	IA	Mi	In Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. The species is usually found in coastal or near	Highly Unlikely, this species is known to occur locally within tidal coastline areas, however the	DBCA, PMST, NM

Taxa	Common Name	Status		Description and habitat requirements	Likelihood of occurrence within the survey area	Source
		BC Act / DBCA	EPBC Act			
				coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. The species has also been recorded in swamp overgrown with lignum. They forage in shallow water or soft mud at the edge of wetlands (Higgins & Davies 1996).	study area lacks suitable habitat (lagoons, wetlands, shorelines)	
<i>Calidris ruficollis</i>	Red-necked Stint	IA	Mi	In Australasia, the Red-necked Stint is mostly found in coastal areas, including in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats, often near spits, islets and banks and, sometimes, on protected sandy or coralline shores. Occasionally they have been recorded on exposed or ocean beaches, and sometimes on stony or rocky shores, reefs or shoals. They also occur in saltworks and sewage farms; saltmarsh; ephemeral or permanent shallow wetlands near the coast or inland, including lagoons, lakes, swamps, riverbanks, waterholes, bore drains, dams, soaks and pools in saltflats. They sometimes use flooded paddocks or damp grasslands. They have occasionally been recorded on dry gibber plains, with little or no perennial vegetation (Higgins & Davies 1996).	Unlikely, closest record is approximately 0.38 km south of the survey area. Alluvial drainage zones represent marginal habitat at best.	DBCA, NM
<i>Calidris subminuta</i>	Long-toed Stint	IA	Mi	In Australia, the Long-toed Stint occurs in a variety of terrestrial wetlands. They prefer shallow freshwater or brackish wetlands including lakes, swamps, river floodplains, streams, lagoons and sewage ponds. The species is also fond of areas of muddy shoreline, growths of short grass, weeds, sedges, low or floating aquatic vegetation, reeds, rushes and occasionally stunted samphire. It has also been observed at open, less vegetated shores of larger lakes and ponds and is common on muddy fringes of drying ephemeral lakes and swamps. The Long-toed Stint also frequents permanent wetlands such as reservoirs and artificial lakes. They are uncommon, but not unknown, at tidal estuaries, saline lakes, saltponds and bore swamps (Higgins & Davies 1996). The Long-toed Stint forages on wet mud or in shallow water, often among short grass, weeds and other vegetation on islets or around the edges of wetlands. They occasionally feed on open water, well away from the shore; this is more common in drying ephemeral wetlands. They roost or loaf in sparse vegetation at the edges of wetlands and on damp mud near shallow water. It also roosts in small depressions in the mud (Higgins & Davies 1996).	Unlikely, closest record is approximately 0.4 km south of the survey area. No suitable habitat present in the survey area, however suitable habitat immediately adjacent to the survey area.	DBCA, NM

Taxa	Common Name	Status		Description and habitat requirements	Likelihood of occurrence within the survey area	Source
		BC Act / DBCA	EPBC Act			
<i>Charadrius veredus</i>	Oriental Plover	IA	Mi	Immediately after arriving in non-breeding grounds in northern Australia, Oriental Plovers spend a few weeks in coastal habitats such as estuarine mudflats and sandbanks, on sandy or rocky ocean beaches or nearby reefs, or in near-coastal grasslands, before dispersing further inland. Thereafter they usually inhabit flat, open, semi-arid or arid grasslands, where the grass is short and sparse, and interspersed with hard, bare ground, such as claypans, dry paddocks, playing fields, lawns and cattle camps or open areas that have been recently burnt (Storr, 1980).	Unlikely, closest record is approximately 7.1 km south of the survey area. Limited suitable habitat is present in the survey area, and immediately adjacent.	DBCA, PMST
<i>Falco hypoleucos</i>	Grey Falcon		VU	The Grey Falcon is a sleek, grey falcon of the interior plains, commonly patrolling low over groundcover below treetop level. It is usually found in lightly timbered country, particularly stony plains and, lightly timbered acacia scrublands (Morcombe 2004).	Known, species was recorded within the survey area in the Hillcrest/Hillslope habitat.	PMST
<i>Falco peregrinus</i>	Peregrine Falcon	OS		The Peregrine Falcon is uncommon but wide-ranging across Australia. Habitat is extremely diverse, from rainforest to arid scrub, from coastal heath to alpine. The Peregrine Falcon nests primarily on ledges of cliffs, shallow tree hollows, and ledges of building in cities (Morcombe 2004).	Known, species was recorded within the survey area in a breakaway/cliff habitat.	DBCA, NM
<i>Gelochelidon nilotica</i>	Gull-billed Tern	IA	Mi	The Gull-billed Tern is nomadic or migratory species in Australia. Gull-billed Terns are found in freshwater swamps, brackish and salt lakes, beaches and estuarine mudflats, floodwaters, sewage farms, irrigated croplands and grasslands, where resources are favourable. They are only rarely found over the ocean. Although essentially an inland species, outside breeding season it shows a distinct preference for saltmarshes and lagoons near the coast. Movements are not fully understood but it is common and widespread in Australia (Morcombe 2004).	Unlikely, closest record is approximately 0.33 km south of the survey area. No suitable habitat present in the survey area, however suitable habitat immediately adjacent to the survey area.	DBCA, NM
<i>Hirundo rustica</i>	Barn Swallow	IA	Mi	In Australia, the Barn Swallow is recorded in open country in coastal lowlands, often near water, towns and cities. Birds are often sighted perched on overhead wires, and also in or over freshwater wetlands, paperbark Melaleuca woodland,	Unlikely, this species is a rare vagrant to Australia and any use is	PMST

Taxa	Common Name	Status		Description and habitat requirements	Likelihood of occurrence within the survey area	Source
		BC Act / DBCA	EPBC Act			
				mesophyll shrub thickets and tussock grassland (DAWE 2021a).	irregular and opportunistic	
<i>Hydroprogne caspia</i>	Caspian Tern	IA	Mi	The Caspian Tern is mostly found in sheltered coastal embayments (harbours, lagoons, inlets, bays, estuaries and river deltas) and those with sandy or muddy margins are preferred. They also occur on near-coastal or inland terrestrial wetlands that are either fresh or saline, especially lakes (including ephemeral lakes), waterholes, reservoirs, rivers and creeks. They also use artificial wetlands, including reservoirs, sewage ponds and saltworks. In offshore areas the species prefers sheltered situations, particularly near islands, and is rarely seen beyond reefs (DAWE 2021a).	Unlikely, closest record is approximately 0.37 km south of the survey area. Limited suitable habitat is present in the survey area, and immediately adjacent.	DBCA, NM
<i>Motacilla cinerea</i>	Grey Wagtail	IA	Mi	The Grey Wagtail is an opportunistic migrant to Australia. The species typically migrates to Indonesia occasionally landing in Australia. Most records for the species are from Northern Australia and South Australia (Morcombe 2004). The non-breeding habitat only of the Grey Wagtail has a strong association with water, particularly rocky substrates along water courses but also lakes and marshes (DAWE 2021a). It can be found mainly in banks and rocks in fast-running freshwater habitats: rivers, creeks, streams, and around waterfalls, both in forest and open country; but occurs almost anywhere during migration (Johnstone & Storr 2004).	Unlikely, this species is a rare vagrant to Australia and any use is irregular and opportunistic	PMST
<i>Motacilla flava</i>	Yellow Wagtail	IA	Mi	The Yellow Wagtail occupies a range of damp or wet habitats with low vegetation, from damp meadows, marshes, waterside pastures, sewage farms and bogs to damp steppe and grassy tundra (IUCN Redlist 2021). In Australia, the Yellow Wagtail is a very uncommon except in the Broome region. They can often be found in northern towns wherever there are well watered grass areas (DAWE 2021a).	Unlikely, this species is a rare vagrant to Australia and any use is irregular and opportunistic	PMST
<i>Pezoporus occidentalis</i>	Night Parrot	CR	EN	The Night Parrot inhabits arid and semi-arid areas that are characterised by having dense, low vegetation. Based on accepted records, the habitat of the Night Parrot consists of Triodia grasslands in stony or sandy environments and of samphire and chenopod shrublands, including genera such as Atriplex, Bassia and Maireana, on floodplains and claypans, and on the margins of saltlakes, creeks or other sources of water (Parker, 1980). It has also been observed to enter dense Muehlenbecki growth when flushed from a more typical habitat	Unlikely, the survey area has a paucity of old growth Triodia (preferred roosting and breeding habitat), and the survey area lacks chenopod	PMST

Taxa	Common Name	Status		Description and habitat requirements	Likelihood of occurrence within the survey area	Source
		BC Act / DBCA	EPBC Act			
				(Boles et al. 1994).	shrublands which are preferred foraging habitat. Species requirement for long unburnt <i>Triodia</i> within proximity to foraging areas (Murphy 2016). Unlikely that the survey area currently supports resident birds of this species.	
<i>Plegadis falcinellus</i>	Glossy Ibis	IA	Mi	The Glossy Ibis' preferred habitat for foraging and breeding are freshwater marshes at the edges of lakes and rivers, lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation. The species is occasionally found in coastal locations such as estuaries, deltas, saltmarshes and coastal lagoons. Within Australia, the largest contiguous areas of prime habitat is inland and northern floodplains (Marchant & Higgins 1990).	Likely, species previously recorded in the survey area and immediately adjacent. Likely to visit, at least as vagrant on an occasional basis when adequate rainfall provides suitable extensive shallow water for foraging.	DBCA, NM
<i>Polytelis alexandrae</i>	Princess Parrot	P4	VU	The Princess Parrot inhabits sand dunes and sand flats in the arid zone of western and central Australia. It occurs in open savanna woodlands and shrublands that usually consist of scattered stands of Eucalyptus (including <i>E. gongylocarpa</i> , <i>E. chippendalei</i> and mallee species), Casuarina or Allocasuarina trees; an understorey of shrubs such as Acacia (especially <i>A. aneura</i>), Cassia, Eremophila, Grevillea, Hakea and Senna; and a ground cover dominated by <i>Triodia</i> species (Allen 1987; Baxter & Henderson 2000).	Unlikely, closest record is approximately 83 km east of the survey area. Habitat is available to this species and it may opportunistically occur however this species is nomadic	DBCA, PMST, NM

Taxa	Common Name	Status		Description and habitat requirements	Likelihood of occurrence within the survey area	Source
		BC Act / DBCA	EPBC Act			
					and resource dependant, with resident populations occurring in Northern Territory, South Australia and the eastern arid region of Western Australia.	
<i>Rostratula australis</i>	Australian Painted Snipe	EN	EN	The Australian Painted Snipe is rarely seen as it is extremely secretive, keeping to dense vegetation of swamps, emerging only in subdued light of dawn and dusk. The preferred habitat of this species includes surrounds and shallows of wetlands that are well vegetated with dense low cover (Morcombe 2004).	Highly Unlikely, the study area lacks suitable habitat (tidal wetlands)	PMST
<i>Rostratula benghalensis (sensu lato)</i>	Painted Snipe		EN	The Painted Snipe is extremely secretive, keeping to dense vegetation of swamps, emerging only in subdued light of dawn and dusk. It is commonly found in the surrounds and shallows of wetlands that are well vegetated with dense low cover (Morcombe 2004).	Highly Unlikely, the study area lacks suitable habitat (tidal wetlands)	PMST
<i>Tringa glareola</i>	Wood Sandpiper	IA	Mi	The Wood Sandpiper uses well-vegetated, shallow, freshwater wetlands, such as swamps, billabongs, lakes, pools and waterholes. They are typically associated with emergent, aquatic plants or grass, and dominated by taller fringing vegetation, such as dense stands of rushes or reeds, shrubs, or dead or live trees, especially Melaleuca and River Red Gums Eucalyptus camaldulensis and often with fallen timber. They also frequent inundated grasslands, short herbage or wooded floodplains, where floodwaters are temporary or receding, and irrigated crops. They are also found at some small wetlands only when they are drying. They are rarely found using brackish wetlands, or dry stunted saltmarsh. Typically they do not use coastal flats, but are occasionally recorded in stony wetlands. This species uses artificial wetlands, including open sewage ponds, reservoirs, large farm dams, and bore drains (Higgins & Davies 1996). In Western Australia, within wetlands, birds often occur within a few metres of one another and are concentrated at a few sites in a wetland (Higgins & Davies 1996).	Unlikely, closest record is approximately 0.46 km south of the survey area. No suitable habitat is present in the survey area, however suitable habitat is available immediately adjacent to the survey area.	DBCA, NM

Taxa	Common Name	Status		Description and habitat requirements	Likelihood of occurrence within the survey area	Source
		BC Act / DBCA	EPBC Act			
<i>Tringa nebularia</i>	Common Greenshank	IA	Mi	The Common Greenshank is found in a wide variety of inland wetlands and sheltered coastal habitats of varying salinity. It occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass. Habitats include embayments, harbours, river estuaries, deltas and lagoons and are recorded less often in round tidal pools, rock-flats and rock platforms. The species uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and saltflats. It will also use artificial wetlands, including sewage farms and saltworks dams, inundated rice crops and bores. The edges of the wetlands used are generally of mud or clay, occasionally of sand, and may be bare or with emergent or fringing vegetation, including short sedges and saltmarsh, mangroves, thickets of rushes, and dead or live trees. It was once recorded with Black-winged Stilts (<i>Himantopus himantopus</i>) in pasture, but are generally not found in dry grassland (Higgins & Davies 1996).	Unlikely, closest record is approximately 0.39 km south of the survey area. No suitable habitat is present in the survey area, however suitable habitat is available immediately adjacent to the survey area.	DBCA, NM
<i>Tringa stagnatilis</i>	Marsh Sandpiper	IA	Mi	The Marsh Sandpiper lives in permanent or ephemeral wetlands of varying salinity, including swamps, lagoons, billabongs, salt pans, saltmarshes, estuaries, pools on inundated floodplains, and intertidal mudflats and also regularly at sewage farms and saltworks. They are recorded less often at reservoirs, waterholes, soaks, bore-drain swamps and flooded inland lakes. In north Australia they prefer intertidal mudflats (Higgins & Davies 1996), although surveys in Kakadu National Park recorded more birds around shallow freshwater lakes than in areas influenced by tide (Bamford 1988). At the Top End they often use ephemeral pools on inundated freshwater and tidal floodplains (Higgins & Davies 1996). Three of the five sites with highest recorded numbers are saltwater habitats (Hunter Estuary, NSW; Port Hedland Saltworks, Western Australia; Tullakool Evaporation Ponds, NSW) (Watkins 1993). In the south-east Gulf of Carpentaria they have been recorded round both saline and fresh waters (Garnett 1989). Elsewhere they said to avoid, or rarely occur in, tidal habitats, and rarely occur on beaches. In Western Australia they prefer freshwater to marine environments. In south-east Australia they prefer inland saline lakes and coastal saltworks. They are found infrequently around mangroves (Higgins & Davies 1996).	Unlikely, closest record is approximately 0.38 km south of the survey area. No suitable habitat is present in the survey area, however suitable habitat is available immediately adjacent to the survey area.	DBCA, NM

Taxa	Common Name	Status		Description and habitat requirements	Likelihood of occurrence within the survey area	Source
		BC Act / DBCA	EPBC Act			
<i>Tringa totanus</i>	Common Redshank	IA	Mi	The Common Redshank is found at sheltered coastal wetlands such as bays, river estuaries, lagoons, inlets and saltmarsh (with bare open flats and banks of mud or sand). They are also found around saltlakes, freshwater lagoons, artificial wetlands and saltworks and sewage farms (Higgins & Davies 1996). The Common Redshank has been observed feeding in shallow water, on wet bare mud or sand, or on algal deposits, round the edges of wetlands, near rocks or samphire (Higgins & Davies 1996). They have been recorded roosting on small elevated areas such as estuarine sandbars and muddy islets surrounded by water (Higgins & Davies 1996).	Unlikely, the study area lacks suitable habitat (wetlands, dams, shorelines)	DBCA, NM
Reptiles						
<i>Anilius ganei</i>	Gane's Blind Snake (Pilbara)	P1		The Gane's Blind Snake is known from widely separated areas between Newman and Pannawonica, WA. It is possibly associated with most gorge and gully habitat types (Wilson & Swan, 2013).	Likely, species previously recorded within the survey area and west and northwest of the survey area.	DBCA
<i>Liasis olivaceus barroni</i>	Pilbara Olive Python	VU	VU	The Olive Python is commonly found in escarpments, gorges and water holes in the ranges of the Pilbara region (Pearson 1993; Wilson & Swan 2003). Radio-telemetry has shown that individuals are commonly in close proximity to water and rock outcrops that attract suitable sized prey species (Pearson 2003).	Likely, species previously recorded within the survey area. Suitable habitat is present within the survey area (major drainage line, gorge-gully habitats)	DBCA, PMST
Mammals						
<i>Dasycercus blythi</i>	Brush-tailed Mulgara	P4		The Brush-tailed Mulgara is primarily nocturnal, shelters in burrows and feeds on insects, other arthropods and small vertebrates. This species inhabits spinifex grasslands and, in central Australia, lives in burrows that it digs on the flats between low sand dunes (Van Dyck and Strahan 2008). The Mulgara is a solitary species exhibiting high site fidelity and a low propensity for dispersal once a home range has been established (Masters <i>et al.</i> 2003). Males and females maintain home ranges of 1.4 to 14 hectares (Masters <i>et al.</i> 2003) which	Known, recorded via remote camera and burrows recorded. area on sandplain habitat.	DBCA

Taxa	Common Name	Status		Description and habitat requirements	Likelihood of occurrence within the survey area	Source
		BC Act / DBCA	EPBC Act			
				on average, overlap by less than 20% (Masters <i>et al.</i> 2003).		
<i>Dasyurus hallucatus</i>	Northern Quoll	EN	EN	The Northern Quoll once occurred across the majority of northern Australia but its range has significantly contracted. It occurs in the Pilbara region but in disjunct populations. The Northern Quoll inhabits a range of vegetation associations but is especially abundant on dissected rocky escarpment and eucalypt woodland within 200 km of the coast. It is known to den in rock crevices and rock piles and favours rocky areas. They are predominantly nocturnal but are occasionally active during the day, particularly during the mating season and are known to have a large home range (Van Dyck and Strahan 2008).	Unlikely, There is a recognised paucity of record within the south eastern Hamersley Range which is an area considered to be marginal at best, and beyond the known range.	PMST
<i>Lagorchestes conspicillatus leichardti</i>	Spectacled Hare-wallaby (mainland)	P4		This subspecies was formerly distributed on Barrow Island and on Hermite Island in the Montebello Group, Western Australia. It is now restricted to Barrow Island and Boomerang Island, which is joined to Barrow at low tide. As the species occurs only on Barrow and Boomerang Islands, the extent of occurrence can be calculated to be approximately 233 km ² , the size of Barrow Island (DAWE 2021a).	Unlikely, closest record is approximately 29.5 km south-east of the survey area. The survey area lacks extensive areas of sandplain supporting old growth (long un-burnt) Triodia.	DBCA
<i>Macroderma gigas</i>	Ghost Bat	VU	VU	The Ghost Bat occurs in a wide range of habitats, and requires an undisturbed cave, deep fissure or disused mine shaft in which to roost. It is patchily distributed across Australia, and is sensitive to disturbance (Van Dyck and Strahan 2008).	Likely, closest record is approximately 3 km east of the survey area. Potential roosting caves (cliffs, breakaway, gully), and foraging habitat is present (minor drainage lines/areas) for the species.	DBCA, PMST
<i>Macrotis lagotis</i>	Greater Bilby	VU	VU	The Greater Bilby distribution in Western Australia is restricted to the north, including the Pilbara, Sandy and Gibson Deserts. The Greater Bilby usually spends the daytime in burrows, often built against termite mounds, spinifex hummock or shrubs (Van	Unlikely, Historical records for this species are known locally, however	DBCA, PMST

Taxa	Common Name	Status		Description and habitat requirements	Likelihood of occurrence within the survey area	Source
		BC Act / DBCA	EPBC Act			
				Dyck and Strahan 2008). Extant population of the Greater Bilby occur in a variety of habitats, usually on landforms with level to low slope topography and light to medium soils. It occupies three major vegetation types; open tussock grassland on uplands and hills, mulga woodland/shrubland growing on ridges and rises, and hummock grassland in plains and alluvial areas. Laterite and rock feature substrates are an important part of Greater Bilby habitat. These habitat support shrub species, such as <i>Acacia kempeana</i> , <i>A. hilliana</i> and <i>A. rhodophylla</i> , which have root-dwelling larvae that provide a constant food source for the Greater Bilby. After dark they leave their burrows to feed and populations are known to move long distances when current habitat ranges become unsuitable. Bilbies are largely solitary, widely dispersed and found in low numbers. The current occurrence of the Greater Bilby is strongly associated with higher rainfall and temperatures, which promote areas of higher plant and food production. The Greater Bilby may also prefer these conditions as higher rainfall and temperatures are not well tolerated by foxes (Pavey 2006b).	the survey area lacks extensive areas of suitable sandplain habitat. the large areas the species is known to utilise for foraging and habitat as resources become available. Populations are known from the region.	
<i>Pseudomys chapmani</i>	Western Pebble-mound Mouse	P4		The Western Pebble-mound Mouse is restricted to the Pilbara region where it is recognised as an endemic species. Habitat for the Western Pebble-mound Mouse can be found on stony hillsides with hummocky grasslands and little or no soil. It constructs large mounds of pebbles on stony slopes which cover an area of 0.5-9.0 square metres. 'Active' mounds are characterized by volcano-like cones capped by 'craters' that mark occluded entrances to subterranean burrow systems in which the mice live, often gregariously (Van Dyck and Strahan 2008).	Known, evidence of this species was recorded (active and inactive burrows) within the survey area on hillcrest/hillslope habitat.	DBCA
<i>Rhinonictis aurantia</i> (Pilbara)	Pilbara Leaf-nosed Bat	VU	VU	The Pilbara Leaf-nosed Bat roosts in deep caves or mines in the wet season and forages nearby. This species occurs in the Pilbara region where its populations are scattered and localised. There are a few known populations of this species in the western Pilbara, roosting in caves formed in gorges that dissect massive siliceous sedimentary geology. It is most often observed in flight over waterholes in gorges (Van Dyck and Strahan 2008). Optimal roosts are thought to occur in caves that form between ascending rock layers, where humidity is maintained from seeping groundwater (Van Dyck and Strahan 2008). Roosts are commonly located over pools of water, or	Known. Recorded via ultrasound call recording within gorge/ gully habitat. Foraging habitat and potential roosting caves present.	DBCA, PMST

Taxa	Common Name	Status		Description and habitat requirements	Likelihood of occurrence within the survey area	Source
		BC Act / DBCA	EPBC Act			
				areas deep within the mine or cave structure which provides elevated temperature and humidity. Foraging habitat includes: Triodia hummock grasslands covering low rolling hills and shallow gullies, with <i>Eucalyptus camaldulensis</i> along the creeks; over small watercourses throughout granite boulder terrain; over pools and low shrubs in ironstone gorges; and in and around gravelly watercourses with <i>Melaleuca leucodendron</i> .		
<i>Sminthopsis longicaudata</i>	Long-tailed Dunnart	P4		The Long-tailed Dunnart occurs throughout the Gibson Desert, Murchison, southern Carnarvon Basin and the Pilbara in Western Australia. Its habitat includes rugged, rocky areas with hummock grasses, shrubs and tall open shrublands and woodlands. In the Young Range in the Gibson Desert, the Long-tailed Dunnart has been found to be associated with plateaus, composed of boulders and stones, with some fine red soils, and sparsely vegetated Mulga (<i>Acacia aneura</i>) and Miniritchie (<i>A. grasbyi</i>) shrubs over spinifex (Van Dyck and Strahan 2008).	Likely, closest record is 51 km east of the survey area. This species has been recorded in a wide variety of habitat types such as open shrubland sandplains and rocky habitats. The survey area is within the range and suitable habit occurs.	DBCA



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