Sanjiv Ridge Project
Consolidated Desktop Vertebrate Fauna Assessment – Significant Species

Report to Atlas Iron Pty Ltd

12 September 2024

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Executive Summary

Atlas Iron Pty Ltd (Atlas) commissioned Biologic Environmental Survey Pty Ltd (Biologic) to undertake a desktop review of significant vertebrate fauna species, with particular focus on species classified as Matters of National Environmental Significance (MNES) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act); significant species listed under the *Biodiversity Conservation Act 2016* (BC Act) and Priority species listed by the Department of Biodiversity, Conservation and Attractions (DBCA) within the Sanjiv Ridge Project (Study Area). The Study Area is located 33 kilometres (km) south of Marble Bar and covers approximately 18,845 hectares (ha).

The objective of the review was to consolidate data on the significant species recorded (or likely to occur) within the Study Area and identify broad fauna habitats present to determine the importance of the Study Area to these species. A total of 78 survey reports were reviewed, including 22 that occurred within or overlapped the Study Area and 56 reports within 43 km of the Study Area. Sampling effort for significant species within the Study Area included diurnal and nocturnal searches, hand searching, avifauna censuses, cave and habitat assessments, trapping (camera, harp, mist, pitfall, funnel, Elliot and cage), ultrasonic and acoustic recorders, scat monitoring, cave microclimate monitoring, hormone analysis, annual monitoring, and opportunistic observations. There were no substantial limitations or constraints documented during these surveys.

Eleven broad fauna habitat types have previously been mapped in the Study Area, comprising Stony Rise (41%, 7,303 ha), Rocky Foothill (24%, 4,458 ha), Spinifex Stony Plain (10%, 1,876 ha), Rocky Ridge and Gorge (9%, 1,766 ha), Ironstone Ridgetop (8%, 1, 543 ha), Drainage Line (3%, 502 ha), Granite Upland (1%, 238 ha), Calcrete (1%, 235 ha), Spinifex Sandplain (1%, 195 ha), Riverine (1%, 167 ha) and Granite Outcrop 1%, 163 ha). All 11 habitats and several features (including caves and water features) within the Study Area are considered significant for the persistence of one or more significant species at a local scale, as they provide critical or important roosting, breeding, nesting, foraging and/or dispersal habitat. One habitat, Rocky Ridge and Gorge, is considered of regional significance, as although widespread through the Pilbara, the habitat is of high quality and value and provides critical or important breeding and shelter habitat for several significant species, including MNES. Forty-three caves and 40 water features have been previously recorded within the Study Area, of which 11 caves provide critical roosting habitat for Pilbara leaf-nosed bat and/or ghost bat.

Thirty-one significant species identified as potentially occurring within the Study Area were assessed for their likelihood of occurrence. Eight have previously been recorded and confirmed within the Study Area: ghost bat (*Macroderma gigas*) – Vulnerable (EPBC Act/BC Act), greater bilby (*Macrotis lagotis*) – Vulnerable (EPBC/BC Act), northern quoll (*Dasyurus hallucatus*) -

Endangered (EPBC Act/BC Act), peregrine falcon (*Falco peregrinus*) – Specially Protected (BC Act), Pilbara leaf-nosed bat (*Rhinonicteris aurantia*) – Vulnerable (EPBC Act/BC Act), Pilbara olive python (*Liasis olivaceus barroni*) – Vulnerable (EPBC/BC Act), spectacled hare-wallaby (*Lagorchestes conspicillatus Leichardti*) - Priority 4 (DBCA) and western pebble-mound mouse (*Pseudomys chapmani*) – Priority 4 (DBCA).

Three significant species are considered likely to occur; brush-tailed mulgara (*Dasycercus blythi*) – Priority 4 (DBCA), long-tailed dunnart (*Antechinomys longicaudatus*) – Priority 4 (DBCA) and spotted Ctenotus (*Ctenotus uber johnstonei*) – Priority 2 (DBCA). Five significant species are considered possible to occur in the Study Area; fork-tailed swift (*Apus pacificus*) – Migratory (EPBC/BC Act), grey falcon (*Falco hypoleucos*) – Vulnerable (EPBC/BC Act), northern short-tailed mouse (*Leggadina lakedownensis*) – Priority 4 (DBCA), oriental plover (*Charadrius veredus*) – Migratory (EPBC/BC Act) and Pilbara flat-headed blind-snake (*Anilios ganei*) – Priority 1 (DBCA). The remaining 15 species were considered unlikely (one species) and highly unlikely (14 species) to occur in the Study Area.

Of the 16 significant species identified as confirmed, likely or possible to occur in the Study Area, three species previously recorded in the Study Area (ghost bat, northern quoll and Pilbara leaf-nosed bat) and one species considered possible to occur (Pilbara flat-headed blind-snake), may represent important populations in the Pilbara bioregion. The latter species is included due to the scarcity of information on the ecology of the species and therefore any records of the species, and the habitat they are recorded in, are considered important, until further information is obtained. The remaining five species previously recorded within the Study Area (greater bilby, peregrine falcon, Pilbara olive python, spectacled hare-wallaby and western pebble mound mouse) and the seven species considered likely or possible, should they be recorded within the Study Area, are unlikely to represent an important population in the Pilbara based on the distribution and ecology of these species.

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1 Introduction

1.1 Background and Objectives

Atlas Iron Pty Ltd (Atlas) is currently considering the expansion of mining operations at the Sanjiv Ridge Project (the Project, formerly known as Corunna Downs Project), an iron ore project located in the Pilbara region of Western Australia, 33 kilometres (km) south of Marble Bar (Figure 1.1). The Sanjiv Ridge Project area, hereafter referred to as the Study Area, covers approximately 18,845 hectares (ha).

Atlas commissioned Biologic Environmental Survey Pty Ltd (Biologic) to undertake a desktop review of significant vertebrate fauna species, with particular focus on species classified as Matters of National Environmental Significance (MNES) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), significant species listed under the *Biodiversity Conservation Act 2016* (BC Act) and Priority species listed by the Department of Biodiversity, Conservation and Attractions (DBCA), within the Study Area.

The objective of the review is to consolidate data on the significant species recorded (or likely to occur) within the Study Area and identify broad fauna habitats present to determine the importance of the Study Area to these species. Based on the results of the review, the potential impact of future mining operations on significant species within the Sanjiv Ridge Project area can be assessed.

1.2 Background to the Protection of Terrestrial Vertebrate Fauna

Terrestrial fauna may be significant for a range of reasons, including:

- being identified as a threatened or priority species
- being a species with restricted distribution
- enduring a degree of historical impact from threatening processes, or
- providing an important function required to maintain the ecological integrity of a significant ecosystem (EPA, 2016).

All native fauna in Western Australia (WA) are protected at a state level under the BC Act and at a national level under the EPBC Act. Any action that has the potential to impact native fauna needs to be approved by relevant state and/ or federal departments in accordance with the WA *Environmental Protection Act 1986* (EP Act) and the federal EPBC Act. While all native fauna is protected under these Acts, some species are afforded extra protection. These include species that are considered Threatened under the EPBC Act and/or BC Act, or; migratory bird species that are protected under international agreements and subsequently listed as Migratory under the EPBC Act and/ or BC Act (Table 1.1). Furthermore, any species that may be threatened but for which there is insufficient information available to allocate a

threatened status under the EPBC Act and/or BC Act, can also be listed as Priority species by the WA DBCA (Table 1.1). For the purposes of this assessment, species considered to be of conservation significance (herein significant species), are those that are afforded protection under the EPBC Act, BC Act and/or listed as Priority species by DBCA (Table 1.1).

Table 1.1: Definitions and terms for significant species.

Act, Agreement or List	Status Code
Federal	
EPBC Act In Australia, native fauna is protected under the EPBC Act. This Act makes provisions for an independent committee (the Threatened Species Scientific Committee [TSSC]), which is charged with maintaining a list of threatened species. Threatened species are listed under one of six categories, depending on their specific conservation status. Additionally, migratory bird species are those listed under international agreements and protected under the EPBC Act as a MNES. Relevant international agreements include the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), China-Australia Migratory Bird Agreement (CAMBA), Japan-Australia Migratory Bird Agreement (JAMBA), and Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA).	Extinct: • EX – Extinct • EW – Extinct in the Wild Threatened: • CR – Critically Endangered • EN – Endangered • VU – Vulnerable • CD – Conservation Dependent Other: • MI – Migratory
State	
BC Act In WA, native fauna is protected under the BC Act. Species in special need of protection are listed as being Extinct, Threatened or Specially Protected. Within these groups, species are listed under one of eight categories, depending on their specific conservation status. Migratory bird species are those listed under the Bonn Convention and/ or CAMBA, JAMBA and ROKAMBA agreements.	Extinct: • EX – Extinct • EW – Extinct in the Wild Threatened: • CR – Critically Endangered • EN – Endangered • VU – Vulnerable Specially Protected: • MI – Migratory • CD – Conservation Dependent • OS – Other specially protected fauna
DBCA Priority List The DBCA maintains a list of Priority species that are considered to be possibly threatened but have not been assigned statutory protection under the BC Act, as not enough information is available for an accurate determination of conservation status. These species are generally in urgent need of survey to determine their distribution and abundance.	Poorly Known: • P1 – Priority 1 • P2 – Priority 2 • P3 – Priority 3 Rare, Near Threatened and other • P4 – Priority

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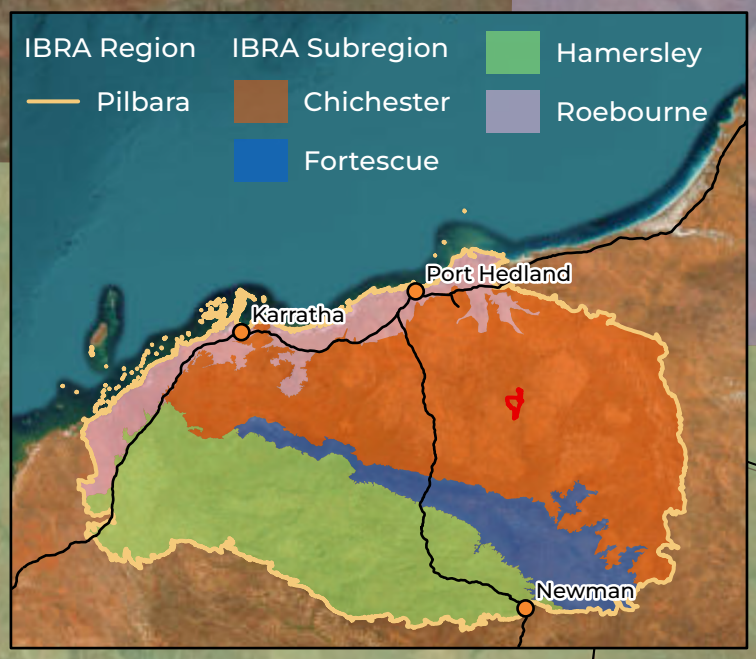


Eginbah Station
- Also Known As
Limestone Station

Hillside - Marble Bar Rd

Panorama
Station

Corunna
Downs
Station

LEGEND

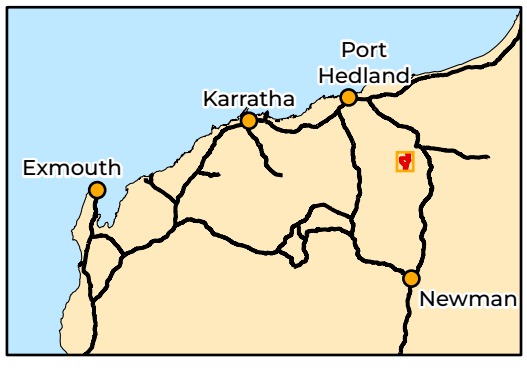
- Study Area
- Local Road

Pastoral Lease

- Corunna Downs Station
- Eginbah Station - Also Known As Limestone Station
- Panorama Station

Scale 1:110,000
0 2 4 Km

Coordinate System: GDA 1994 MGA Zone 50
Transverse Mercator Created: 05/08/2024



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Consolidated Significant Species Vertebrate Fauna Assessment

Figure 1.1: Study Area and regional context

2 Existing Environment

2.1 Biogeography

The Interim Biogeographic Regionalisation for Australia (IBRA) is a bioregional framework that divides Australia into 85 bioregions and 419 subregions on the basis of climate, geology, landforms, vegetation and fauna (Thackway & Cresswell, 1995). The Study Area is located within the Pilbara bioregion (Figure 1.1).

The Pilbara bioregion is characterised by vast coastal plains and inland mountain ranges with cliffs and deep gorges (Thackway & Cresswell, 1995). Vegetation is predominantly mulga low woodlands or snappy gum over bunch and hummock grasses (Bastin, 2008). Within the Pilbara bioregion there are four subregions: Hamersley, Chichester, Roebourne and Fortescue Plains.

The Study Area lies wholly within the Chichester subregion which comprises the northern section of the Pilbara Craton (Kendrick & McKenzie, 2003). Undulating Archaean granite and basalt plains include significant areas of basaltic ranges. The basalt plains host a shrub steppe characterised by *Acacia inaequilatera* over *Triodia* spp. hummock grasslands, while *Eucalyptus leucophloia* tree steppes occur on ranges. The Chichester subregion drains to the north via numerous rivers (e.g. De Grey, Oakover, Nullagine, Shaw, Yule, Sherlock) (Kendrick & McKenzie, 2003).

2.2 Climate

The Pilbara region has a semi-desert to tropical climate with highly variable, mostly summer rainfall (Leighton, 2004; McKenzie *et al.*, 2003). The average annual rainfall over the broader Pilbara area ranges from about 200–350 millimetres (mm) (predominantly in January, February and March), although rainfall may vary widely from year to year (van Etten, 2009). The Pilbara climate is heavily influenced by tropical cyclones that develop over the Indian Ocean in the north of Australia (Leighton, 2004). These sometimes cross the northwest coastline, bringing heavy rainfall to inland regions of the Pilbara (Leighton, 2004). The Bureau of Meteorology (BoM) weather station at Marble Bar, located approximately 25 km south-west of the Study Area, is the closest to the Study Area and expected to provide the most accurate dataset for historic and current climatic conditions experienced within the Study Area.

2.3 Geology

The Chichester Province has a long geological history, broadly comprising Archaean and Proterozoic metamorphic and sedimentary rocks with much younger (Tertiary) sedimentary deposits. At a scale of 1:500,000, the Study Area occurs across 16 geological units, with Mount Ada Basalt formation being the dominant geology within the Study Area (3,481.13 ha, 18.50%) and Coolyia Creek Granodiorite formation the least common (58.04 ha, 0.31%) (Table 2.1; Figure 2.1).

Table 2.1: Geology units within the Study Area

Geological unit	Code	Description	Extent in Study Area	
			Ha	%
Mount Ada Basalt	A-WAm-b	Mafic volcanic rock; local ultramafic rock; metamorphosed	3,481.13	18.50
Duffer Formation	A-WAd-f	Felsic volcanic rock; local basalt, chert, and felsic schist; metamorphosed	3,013.15	15.99
Cleaverville Formation	A-GCe-ca	Banded iron-formation, ferruginous chert, sandstone, siltstone and shale; minor grey-white chert and felsic volcaniclastic rock; metamorphosed	2,123.20	11.27
Euro Basalt	A-KEe-b	Basalt, komatiitic basalt, serpentinized peridotite; local dolerite and gabbro sills; minor felsic volcaniclastic rocks and chert; metamorphosed	2,058.74	10.92
Hardey Formation	A-FOh-xs-f	Sedimentary and felsic volcanic rocks; local intrusive rocks	1,612.67	8.56
North Star Basalt	A-WAn-b	Mafic volcanic rocks; minor ultramafic rocks and chert; metamorphosed	1,463.24	7.76
Mount Roe Basalt	A-FOr-b	Basaltic volcanic rock; local volcaniclastic and siliciclastic rocks	1,438.96	7.64
Panorama Formation	A-WAp-f	Felsic volcanic rock; local sedimentary rock; metamorphosed	773.87	4.11
Wyman Formation	A-KEw-xf-s	Felsic volcanic and volcaniclastic rocks; local clastic sedimentary rocks, chert and basalt; metamorphosed	624.29	3.31
Kylena Formation	A-FOk-b	Massive, amygdaloidal, and vesicular basalt and basaltic andesite; local komatiitic basalt, dacite, and rhyolite	523.11	2.78
Lalla Rookh Sandstone	A-CDl-st	Sandstone with beds of conglomerate, and minor siltstone and shale; metamorphosed	499.00	2.65
Dalton Suite	A-DA-xo-a	Mafic and ultramafic intrusive rocks; metamorphosed	432.58	2.30

Geological unit	Code	Description	Extent in Study Area	
			Ha	%
Cooglegong Monzogranite	A-SRcg-gm	Monzogranite, coarse grained and commonly porphyritic; locally fine grained or pegmatitic; local igneous layering; metamorphosed	351.73	1.87
McPhee Formation	A-WAh-xu-s	Ultramafic volcanic rock, siliciclastic sedimentary rock, basalt, and chert; local felsic volcanic rock; metamorphosed	196.20	1.04
Strelley Pool Formation	A-PIs-xs-c	Silicified carbonate rocks, sandstone, conglomerate, chert and dolomite; stromatolitic; metamorphosed	195.30	1.04
Coolyia Creek Granodiorite	A-CLco-mgg	Metagranodiorite to metatonalite; clotty hornblende texture; strongly foliated	58.04	0.31
Total			**18,845.21**	**100**

760000 770000 780000

7640000 7630000 7620000

Bedrock Geology

- A-CDl-st; Lalla Rookh Sandstone
- A-CLco-mgg; Coolyia Creek Granodiorite
- A-DA-xo-a; Dalton Suite
- A-EMca-gmp; Carbana Monzogranite
- A-EMna-gge; Nandingarra Granodiorite
- A-FOe-xs-b; Pear Creek Formation
- A-FOh-xs-f; Hardey Formation
- A-FOk-b; Kylena Formation
- A-FOr-b; Mount Roe Basalt
- A-GC-xci-s; Gorge Creek Group
- A-GCe-ca; Cleaverville Formation
- A-KEe-b; Euro Basalt
- A-KEw-xf-s; Wyman Formation
- A-PIs-xs-c; Strelley Pool Formation
- A-SRcg-gm; Cooglegong Monzogranite
- A-TA-mg; Tambina Supersuite
- A-TAbo-mgt; Bookargemoona Tonalite
- A-WAa-b; Apex Basalt
- A-WAd-f; Duffer Formation
- A-WAh-xu-s; McPhee Formation
- A-WAm-b; Mount Ada Basalt
- A-WAn-b; North Star Basalt
- A-WAp-f; Panorama Formation
- A-bg-od; Black Range Dolerite

Hillside - Marble Bar Rd

LEGEND

- Study Area
- Local Road

Scale 1:110,000

0 2 4 Km

Coordinate System: GDA 1994 MGA Zone 50
Transverse Mercator Created: 05/08/2024

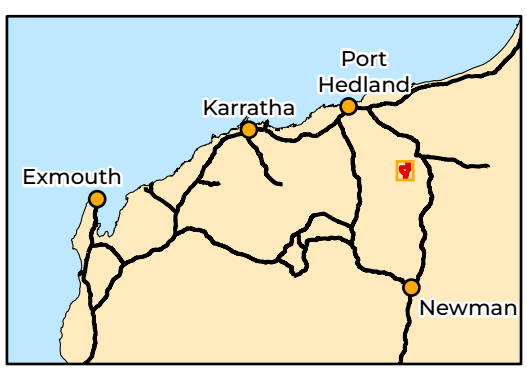

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Figure 2.1: Broad geology of the Study Area

2.4 Land Systems

Van Vreeswyk *et al.* (2004) classified and mapped the land systems of the Pilbara according to similarities in landform, soil, vegetation, geology and geomorphology. An assessment of land systems provides an indication of the diversity and distribution of fauna habitats present. The Study Area occurs within eight land systems, with Capricorn and Rocklea dominating the area, defined by rocky ridges and undulating hills, respectively (Table 2.2; Figure 2.2).

Table 2.2: Land systems within the Study Area

Land System	Description	Extent in Study Area	
		Ha	%
Rocklea	Basalt hills, plateaux, lower slopes and minor stony plains supporting hard (and occasionally soft spinifex) grasslands	11,125.00	59.0
Capricorn	Hills and ridges of sandstone and dolomite supporting shrubby hard and soft spinifex grasslands	4,057.90	21.50
Talga	Hills and ridges of greenstone and chert and stony plains supporting hard and soft spinifex grasslands	2,190.50	11.60
Boolgeeda	Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands or mulga shrublands	481.62	2.56
Satirist	Stony plains and low rises supporting hard spinifex grasslands, and gilgai plains supporting tussock grasslands	339.47	1.80
Granitic	Rugged granitic hills supporting shrubby hard and soft spinifex grasslands	294.57	1.56
River	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	291.70	1.55
Macroy	Sandy/Stony plains and occasional tor fields based on granite supporting hard and soft spinifex shrubby grasslands	64.79	0.34
Total		**18,845.21**	**100**

760000
770000
780000
7640000
7630000
7620000
Hillside - Marble Bar Rd

LEGEND

Study Area
Local Road

Land System
Black System
Boolgeeda System
Calcrete System
Capricorn System
Granitic System
Macroy System
River System
Rocklea System
Satirist System
Talga System
Taylor System

Scale 1:110,000
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Coordinate System: GDA 1994 MGA Zone 50
Transverse Mercator Created: 05/08/2024

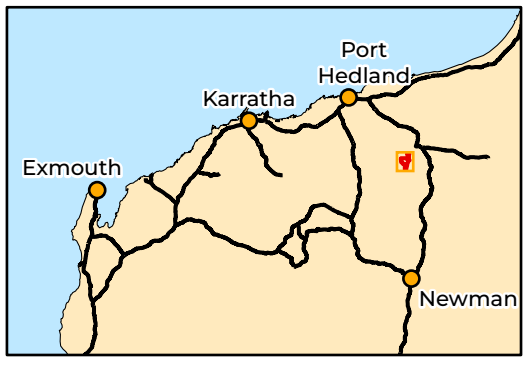

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Figure 2.2: Land systems of the Study Area

2.5 Surface Hydrology

The ephemeral Coongan River headwaters emerge below the Chichester Range and flows in a northerly direction past Marble Bar and to the east of the Study Area (Ruprecht & Ivanescu, 2000) (Figure 2.3). The river flows through the Gorge Range before discharging into the larger ephemeral De Grey River. The Coongan River has eight tributaries, including Boobin Creek, Talga River, Triberlar Creek, Emu Creek and Budjen Creek. There are many ephemeral drainage lines within the Study Area that flow in direct response to rainfall, with streamflow mainly occurring during the summer months of December to March. Streamflow in the smaller flow channels is typically short in duration and ceases soon after the rainfall event. In the larger river channels, which drain the larger catchments, runoff can persist for several weeks and possibly months following major rainfall events (Ruprecht & Ivanescu, 2000).

2.6 Pre-European Vegetation

Beard (1975) broadly (1:1,000,000) mapped the major structural vegetation types of Western Australia. Shepherd *et al.* (2002) reinterpreted and updated the vegetation association mapping to reflect the National Vegetation Information System (NVIS) standards (ESCAVI, 2003). This update also accounts for extensive clearing since Beard (1975) mapping. Some of Beard's vegetation associations have been separated to remove mosaic vegetation associations; however, some mosaics still occur.

Two vegetation associations occurs within the Study Area (Table 2.3; Figure 2.4). The Study Area is dominated by vegetation association George Ranges 82, characterised by hummock grasslands, low tree steppe and snappy gum over *Triodia* spp. (Table 2.3; Figure 2.4)

Table 2.3: Vegetation associations within the Study Area

Vegetation association	System code	Description	Extent in Study Area	
			Area (ha)	%
George Ranges	82	Hummock grassland with scattered bloodwoods & snappy gum *Triodia* spp., *Corymbia dichromophloia, Eucalyptus leucophloia*	14,238.00	75.55
	587	Mosaic: Hummock grasslands, open low tree-steppe; snappy gum over *Triodia wiseana* / Hummock grasslands, shrubsteppe; kanji over *Triodia pungens*	3,275.69	17.38
	619	Medium woodland; river gum (*Eucalyptus camaldulensis*)	304.29	1.61
Abydos Plain	93	Hummock grassland with scattered shrubs or mallee *Triodia* spp. *Acacia* spp., *Grevillea* spp. *Eucalyptus* spp	1,027.23	5.45
Total			**18,845.21**	**100**

760000
770000
780000
7640000
7630000
7620000
Callina Creek
Glen Herring Creek
Camel Creek
Hillside - Marble Bar Rd
Coolyia Creek
Split Rock Creek
Coongan River
Coongan River
Emu Creek
Hartigan Creek
Boobina Creek

LEGEND

Study Area

Local Road

Surface Hydrology

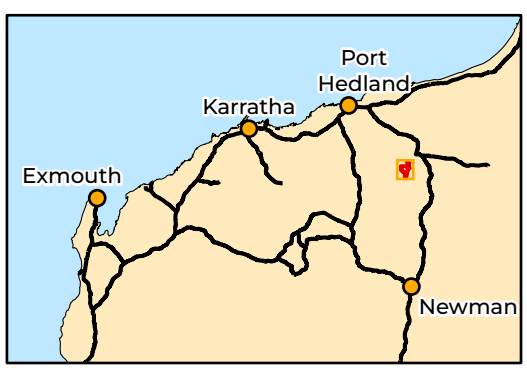
Minor

Major

Scale 1:107,933

0 2 4 Km

Coordinate System: GDA 1994 MGA Zone 50
Transverse Mercator Created: 05/08/2024



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Consolidated Significant Species Vertebrate Fauna Assessment

Figure 2.3: Surface hydrology of the Study Area

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7630000
7620000
Hillside - Marble Bar Rd

LEGEND

Study Area
Local Road

Vegetation Association

Abydos Plain - Chichester 93
Abydos Plain 93
Abydos Plain 619
George Ranges 82
George Ranges 587
George Ranges 619

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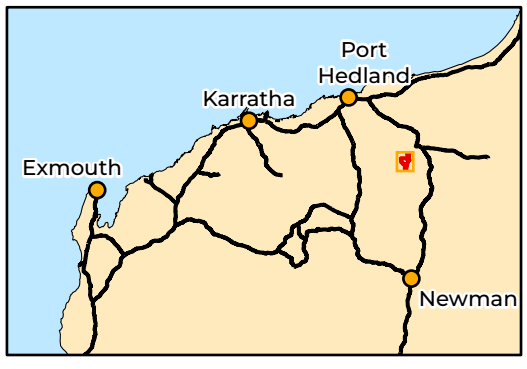

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Figure 2.4: Vegetation associations of the Study Area

3 Desktop Assessment

3.1 Methods

The desktop assessment reviewed relevant literature sources and databases, including all available data and reports of vertebrate fauna surveys previously undertaken within the vicinity of the Study Area (approximately 50 km). The review primarily focusses on MNES species listed under the EPBC Act; however, it also includes significant species listed under the BC Act and on the DBCA Threatened and Priority fauna list. The desktop assessment does not include collation of broader species assemblages of species not listed under or by the aforementioned EPBC Act, BC Act and/or DBCA.

A species inventory was produced for all significant vertebrate fauna species recorded within the Study Area, as well as a list of significant species that may occur in the Study Area due to having been recorded within the vicinity. Records of significant species were assigned a likelihood of occurrence within the Study Area based on details such as the habitat the record was located within, likely and known habitats of the Study Area, age and relevancy of the record, validity and confidence of the records, and general attributes of the species themselves.

Additionally, fauna habitats previously identified and mapped on a local and regional scale were reviewed and consolidated to assess their importance to significant species that occur or have the potential to occur in the Study Area. For significant species listed as Priority by DBCA, where species' abundance and distribution is poorly known (and therefore conservation status under the EPBC/BC Act cannot be determined), the preferred habitat of each species, or habitat where species have previously been recorded are considered important habitat, until such time that further information becomes available.

The latest checklist of mammal, reptile and amphibian names published by the WAM (2024) was used as a guide to the current taxonomy and nomenclature of these groups. For birds, the current checklist of Australian birds maintained by Birdlife Australia (based on Christidis & Boles, 2008) was used in conjunction with the WAM (2024) species list.

3.1.1 Database Searches

Five databases were searched for significant vertebrate fauna records within and surrounding the Study Area (Table 3.1).

Table 3.1: Details of database searches conducted.

Database	Data Access/ Receival Date	Area Searched
BirdLife Australia (2024) Birdata	09/07/2024	Centre point of Study Area (-21.4221°S, 119.6405°E) with a ~40 km buffer
DBCA (2024a) NatureMap	10/07/2024	Centre point of Study Area (-21.4221°S, 119.6405°E) with a 50 km buffer
DBCA (2024b) Threatened and Priority Ecological Communities	09/07/2024	
DBCA (2024c) Threatened and Priority Fauna	17/07/2024	
DCCEEW (2024) EPBC Protected Matters Tool	09/07/2024	

3.1.2 Literature Review

The literature review comprised of surveys that had previously been completed within the vicinity of the Study Area and which are publicly available or were made available by Atlas (Appendix A). Publicly available reports within the vicinity of the Study Area were sourced through the Index of Biodiversity Surveys for Assessments (DWER, 2024) and Biologic's private database. A list of fauna habitats and vertebrate fauna species that occur or have the potential to occur within the Study Area were compiled from the literature review. A total of 78 assessments were reviewed, comprising 48 monitoring surveys, 17 targeted, five detailed, four detailed/ baseline, one targeted/ baseline and three baseline/monitoring surveys (Appendix A). Twenty-two surveys were conducted within (or overlapping) the Study Area, with the remaining 56 surveys within 43 km of the Study Area and included other Atlas projects: Mt Webber, M^{c}Phee Creek and Miralga Creek; along with other projects nearby (i.e. Calidus Resources Warrawoona Gold Project).

3.1.3 Assessment of Occurrence

Significant species identified by the desktop review were assessed for their likelihood of occurring in the Study Area using a decision matrix which considers the presence and suitability of habitat within the Study Area, and the proximity of previous records (Table 3.2). Based on this decision matrix, each species was assigned to one of six categories of likelihood: confirmed, highly likely, likely, possible, unlikely, or highly unlikely.

The decision matrix is intended to be an indicative guide only, and the way in which it is interpreted may vary between species, depending on a given species' habitat preferences and ability to disperse, as well as the reliability and availability of contextual information. For example, considering species which have been previously recorded close to the Study Area, a species with a limited dispersal capability will have a reduced likelihood of occurring in the Study Area compared with a species with greater dispersal capability. It is also recognised that a lack of records in the vicinity of the Study Area may indicate limited sampling effort

rather than species' absence, and that previous records may include historic or presumed erroneous information which may misrepresent a species' current distribution. Where the determination of a species' likelihood of occurrence within the Study Area deviates from the decision matrix, detailed justification for any variation will be presented.

Table 3.2: Species likelihood of occurrence decision matrix

		Habitat suitability of Study Area			
		Breeding habitat present	Foraging and dispersal habitat present	Marginally suitable habitat[2] present	No suitable habitat present
Species Records[1]	Recorded in Study Area	Confirmed	Confirmed	Confirmed	Confirmed
	Recorded within 10 km of Study Area	Highly Likely	Likely	Possible	Possible
	Recorded within 10-50 km of Study Area	Likely	Possible	Possible	Unlikely
	Recorded within 50–100 km of Study Area	Possible	Possible	Unlikely	Unlikely
	Recorded >100 km of Study Area	Possible	Unlikely	Unlikely	Highly Unlikely
	Species considered locally/regionally extinct	Unlikely	Unlikely	Highly Unlikely	Highly Unlikely

[1] Only records within the previous 50 years are considered.

[2] Marginally suitable habitat is habitat which is possibly utilised by a species but is unlikely to be depended upon; for example, it may be used only when in proximity to core breeding, foraging or dispersal habitat.

3.2 Results

The literature review and database searches identified a total of 114 vertebrate fauna species and subspecies which have previously been recorded and/or have the potential to occur within the vicinity of the Study Area. This comprised 19 mammals, 82 birds and 13 reptiles (Appendix A).

A total of 31 significant species were identified as having been previously recorded and/or have the potential to occur within the Study Area (Figure 3.1; Table 3.3; Appendix A). Overall, of the 31 significant vertebrate fauna species identified in the desktop assessment, there were nine mammals, 18 birds, and four reptiles. Eight of these species have previously been recorded within the Study Area:

- greater bilby (*Macrotis lagotis*) – Vulnerable (EPBC/BC Act)
- ghost bat (*Macroderma gigas*) – Vulnerable (EPBC Act/BC Act)

- northern quoll (*Dasyurus hallucatus*) - Endangered (EPBC Act/BC Act)
- Pilbara leaf-nosed bat (*Rhinonicteris aurantia*) – Vulnerable (EPBC Act/BC Act)
- spectacled hare-wallaby (*Lagorchestes conspicillatus* subsp. *Leichardti)* - Priority 4 (DBCA)
- western pebble-mound mouse (*Pseudomys chapmani*) – Priority 4 (DBCA)
- peregrine falcon (*Falco peregrinus*) – Specially Protected (BC Act)
- Pilbara olive python (*Liasis olivaceus barroni*) – Vulnerable (EPBC/BC Act).

The remaining 23 species have modelled distributions encompassing the Study Area or have previously been recorded within a 40 km radius of the Study Area. Two species, brush-tailed mulgara (*Dasycercus blythi*) and spotted Ctenotus (*Ctenotus uber johnstonei*) have previously been recorded within 20 km of the Study Area and three species have been recorded between 20-45 km, including the long-tailed dunnart (*Antechinomys longicaudatus*) , grey falcon (*Falco hypoleucos)* and Pilbara flat-headed blind-snake (*Anilios ganei*) (Table 3.3).

Based on the proximity of previous records and the occurrence of habitats likely to be utilised by the species', three species are considered likely to occur; brush-tailed mulgara, long-tailed dunnart and spotted Ctenotus. Five species are considered possible to occur; northern short-tailed mouse (*Leggadina lakedownensis*), fork-tailed swift (*Apus pacificus*), grey falcon, oriental plover (*Charadrius veredus*) and Pilbara flat-headed blind-snake. (Table 5.2). The remaining 15 species were deemed unlikely (n = 1, osprey (*Pandion haliaetus*) and highly unlikely (n = 14) to occur within the Study Area, primarily due to the absence of any critical and/or supporting habitats likely to be used by the species.

Due to the size of the desktop assessment search area, and likelihood of encompassing habitats which may not occur in the Study Area, results of the desktop review are likely to include species which may not occur in the Study Area. Additionally, many species tend to be patchily distributed even where appropriate habitats are present, and numerous species of birds can occur as regular migrants, occasional visitors or vagrants.

Table 3.3: Significant species identified in the desktop assessment

Scientific Name	Common Name	Conservation Status			Recorded within Study Area	Recorded within 50 km of Study Area
		EPBC Act	BC Act	DBCA		
Mammals						
Dasyuridae						
Antechinomys longicaudatus	long-tailed dunnart			P4		•
Dasycercus blythi	brush-tailed mulgara			P4		•
Dasyurus hallucatus	northern quoll	EN	EN		•	•
Macropodidae						
Lagorchestes conspicillatus leichardti	spectacled hare-wallaby			P4	•	•
Megadermatidae						
Macroderma gigas	ghost bat	VU	VU		•	•
Muridae						
Leggadina lakedownensis	northern short-tailed mouse			P4		•
Pseudomys chapmani	western pebble-mound mouse			P4	•	•
Rhinonycteridae						
Rhinonicteris aurantia 'Pilbara form'	Pilbara leaf-nosed bat	VU	VU		•	•
Thylacomydae						
Macrotis lagotis	greater bilby	VU	VU		•	•
Birds						
Accipitridae						
Erythrotriorchis radiatus	red goshawk	EN	VU			
Apodidae						
Apus pacificus	fork-tailed swift	MI	MI			
Charadriidae						
Charadrius veredus	oriental plover	MI	MI			•
Falconidae						
Falco hypoleucos	grey falcon	VU	VU			
Falco peregrinus	peregrine falcon		OS		•	•
Glareolidae						
Glareola maldivarum	oriental pratincole	MI	MI			
Hirundinidae						
Hirundo rustica	barn swallow	MI	MI			

Scientific Name	Common Name	Conservation Status			Recorded within Study Area	Recorded within 50 km of Study Area
		EPBC Act	BC Act	DBCA		
Motacillidae						
Motacilla cinerea	grey wagtail	MI	MI			
Psittacidae						
Polytelis alexandrae	princess parrot	VU		P4		
Pandionidae						
Pandion haliaetus	osprey	MI	MI			
Pezoporus occidentalis	night parrot	EN	CR			
Rostratulidae						
Rostratula australis	Australian painted snipe	EN	EN			
Scolopacidae						
Actitis hypoleucos	common sandpiper	MI	MI			•
Calidris acuminata	sharp-tailed sandpiper	MI	MI			•
Calidris ferruginea	curlew sandpiper	MI / CR	CR			
Calidris melanotos	pectoral sandpiper	MI	MI			
Tringa glareola	wood sandpiper	MI	MI			•
Tringa nebularia	common greenshank	MI	MI			•
Reptiles						
Pythonidae						
Liasis olivaceus barroni	Pilbara olive python	VU	VU		•	•
Scincidae						
Ctenotus uber johnstonei	spotted ctenotus			P2		•
Liopholis kintorei	great desert skink	VU	VU			
Typhlopidae						
Anilios ganei	Pilbara flat-headed blind-snake			P1		•

740000
770000
800000
830000
7690000
7660000
7630000
7600000
Lalla Rookh Rd
North Pole Rd
Marble Bar Rd
Goldsworthy Rd
Hillside - Marble Bar Rd
Marble Bar
Coruna Downs Rd
Ripon Hills Rd
Hillside - Marble Bar Rd
Marble Bar - Woodstock Rd
Hillside - Woodstock Rd
Bonney Downs - Hillside Rd

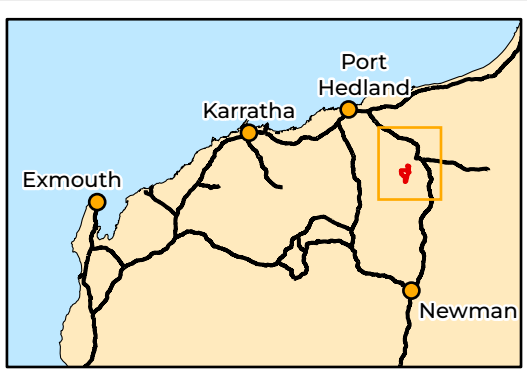
LEGEND

- Study Area
- Local Road
- State Road

Scale 1:420,000

0 5 10 15 Km

Coordinate System: GDA 1994 MGA Zone 50
Transverse Mercator Created: 11/09/2024



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Consolidated Significant Species Vertebrate Fauna Assessment

Figure 3.1: Significant vertebrate fauna species recorded in the vicinity of the Study Area

DBCA (2024)

Bird

- Common greenshank - MI
- Common sandpiper - MI
- Oriental plover - MI
- Sharp-tailed sandpiper - MI
- Wood sandpiper - MI
- Peregrine falcon - OS

Mammal

- Northern quoll - EN
- Pilbara leaf-nosed bat - VU
- Greater bilby - VU
- Ghost bat - VU
- Brush-tailed mulgara - P4
- Long-tailed dunnart - P4
- Northern short-tailed mouse - P4
- Spectacled hare-wallaby - P4 Western
- pebble-mound mouse - P4

Reptile

- Pilbara olive python - VU

Biologic (2021m)

- Pilbara olive python - VU

Biologic (2021f)

- Pilbara olive python - VU

Biologic (2021e)

- Pilbara olive python - VU

Biologic (2021d)

- Pilbara olive python - VU

Biologic (2020d)

- Grey falcon - VU
- Peregrine falcon - OS

Biologic (2019e)

- Pilbara olive python - VU
- Brush-tailed mulgara - P4

Biologic (2019b)

- Peregrine falcon - OS

Biologic (2019a)

- Pilbara olive python - VU

MWH (2018b); MWH (2016a)

- Pilbara olive python - VU

MWH (2016b)

- Spectacled hare-wallaby - P4
- Western pebble-mound mouse - P4
- Peregrine falcon - OS

MWH (2014e)

- Peregrine falcon - OS

MWH (2014a)

- Greater bilby - VU

Outback Ecology (2014b)

- Pilbara flat-headed blind-snake - P1
- Spotted Ctenotus - P2
- Brush-tailed mulgara - P4
- Peregrine falcon - OS

Outback Ecology (2014a)

- Pilbara olive python - VU
- Spectacled hare-wallaby - P4
- Western pebble-mound mouse - P4

Outback Ecology (2013c)

- Pilbara olive python - VU
- Pilbara flat-headed blind-snake - P1

Outback Ecology (2013a)

- Greater bilby - VU

Outback Ecology (2012b)

- Long-tailed dunnart - P4

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Consolidated Significant Species Vertebrate Fauna Assessment

Figure 3.1 LEGEND

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4 Assessment of Significance

4.1 Fauna Habitats

Habitat units were categorised as providing critical and supporting (EPBC/BC Act listed species), important (DBCA priority species), or nil habitat for significant species confirmed or likely to occur. The categorisation of critical, important and supporting habitat followed that of conservation advice, recovery plans and guidance outlined by DCCEEW and DBCA for MNES and Priority species under the EPBC Act and/or BC Act. Due to differing habitat preferences of significant species (including habitat features and/or microhabitats), habitat significance was assessed on a species-by-species basis.

It should be noted that assessment of habitat significance applies only to habitat occurring within the Study Area, and therefore may not be representative of significance applied to the same habitat in other areas outside the Study Area. For example, a habitat within the Study Area may be deemed unsuitable due to the absence of certain habitat features and/or suitable connecting habitat (e.g. wildlife movement corridors) which are required for the species persistence, despite the same habitat occurring outside the Study Area being considered of greater significance. The significance of habitats within the Study Area may also be influenced by other habitats occurring within the Study Area and more broadly, including areas adjacent to the Study Area, particularly if representative of critical habitat.

4.1.1 Critical/ Important Habitat

4.1.1.1 Confirmed Species

Northern quoll

Habitat critical to the survival of the northern quoll is defined by DoE (2016) as:

- habitat within the species modelled distribution, which provides shelter for breeding, refuge from fire or predation and potential poisoning from cane toads
- foraging habitat associated with or connecting populations important for the long-term survival of the northern quoll.

This includes areas of rocky habitats such as ranges, escarpments, mesas, gorges, breakaways, boulder fields, major drainage lines or treed creek lines.

Ghost bat

Critical habitat for ghost bat was classified following definitions by Bat Call (2021a), summarised in Table 4.1 and includes category 1, 2 and 3 (where relevant) roost caves. Available data which provide for an assessment of the relative importance of roost sites to ghost bat include site structure, timing of calls and signs of use:

- *Site structure*. Ghost bats appear to prefer deep, complex caves with narrow entrances that open into domed chambers in which warm temperatures and moderate/ high levels of humidity level are maintained (Armstrong & Anstee, 2000). These caves are more likely to be used as diurnal roosts and maternity roosts than smaller, simpler caves.
- *Timing of calls*. The timing of calls recorded at a given site may reveal whether individuals used the site as a nocturnal roost or a diurnal roost. Calls recorded immediately after sunset (i.e. when ghost bats typically depart roosts to commence foraging) are presumed to be by individuals who roosted in the site during the day, while calls recorded soon before sunrise are presumed to be by individuals returning to the roost after a night of foraging.
- *Signs of use*. High levels of use of a given site, as evidenced by high volumes of scats observed on initial visits to a site, and/or high rates of scat deposition across a period of monitoring, suggest that the site is being occupied for longer periods than nocturnal visitations would allow, thereby suggesting that it is being used as a diurnal roost or possibly as a maternity roost.

Critical foraging habitat for ghost bats is classified as occurring within 12 km radius of critical roost caves (Bat Call, 2021a) and supporting habitat within 12 km radius of non-critical caves (or 1,200 ha of habitat surrounding each of these caves). The habitat includes:

- productive plain areas with thin mature woodland over patchy or clumped tussock or hummock grass (*Triodia* spp.) on sand or stony ground
- isolated trees and trees on the edge of thin thickets on the plains
- trees along the edges of watercourse woodlands
- gully or gorge system that opens onto a plain or riparian line.

Table 4.1: Roost categories for ghost bat

Category	Description	Typical features	Importance to ghost bat
Category 1	Maternity/ diurnal roost sites with year-round occupancy	Deep, dark caves with at least one roosting chamber behind a narrow entrance or in-cave constriction, a ceiling over 1.5 m in height, steady microclimate, and substantial evidence of previous occupation by ghost bat (e.g. extensive scat pile).	Critical habitat important for the ongoing presence of ghost bat in an area.
Category 2	Maternity/ diurnal roost sites with regular occupancy	These sites are similar to category 1 sites but are usually less complex (e.g. may only contain a single chamber) and/or located in less productive areas which may only periodically attract ghost bats.	Critical habitat important for the ongoing presence of ghost bat in an area.
Category 3	Diurnal roost sites with occasional occupancy	Simple caves where one to a few ghost bats roost occasionally, or rarely. Roosting locations are not necessarily dark.	Category 3 caves which are located adjacent to category 1 or 2 caves are considered critical habitat important for the ongoing presence of ghost bats in the area. While

Category	Description	Typical features	Importance to ghost bat
			isolated category 3 caves are not considered critical habitat, such caves may play an important role in facilitating genetic exchange between neighbouring colonies by enabling the long-distance movement of individuals.
Category 4	Nocturnal roost sites with opportunistic usage	Shallow caves and deep overhangs which may be visited during the night during foraging activity, but are unlikely to support diurnal roosting (e.g. roosting locations are exposed)	Not considered critical habitat for ghost bat.

Adapted from information presented by Bat Call (2021a)

Pilbara leaf-nosed bat

The importance of a roost site to Pilbara leaf-nosed bat can be categorised according to its potential nature of use by the species, as defined by Bat Call (2021b). Most roost types (category 1, 2 and 3) are considered critical habitat essential for the long-term survival of the species (Table 4.2). Foraging sites surrounding known or suspected roosts can be critical to the survival of the species as the species forages within the vicinity of roost caves and more broadly along waterbodies with suitable fringing vegetation supporting prey species (TSSC, 2016b). The species is predicted to travel up to 20 km from roost caves during nightly foraging (Cramer *et al.*, 2016a) in the dry season and up to 50 km during the wet season (Bullen, 2013). The importance of potential foraging habitat can be categorised following a classification system defined by Bat Call (2021a), however, all foraging habitat within 20 km of a critical roost site are considered critical habitat for the species (Table 4.3).

Table 4.2: Roost categories for Pilbara leaf-nosed bat

Category	Description	Typical features	Importance to Pilbara leaf-nosed bat
Category 1	Maternity roost sites with year-round occupancy (proven presence of young).	Deep, dark caves with at least one roosting chamber behind a narrow entrance or in-cave constriction, a ceiling over 1.5 m in height, steady microclimate and high humidity, within flying range of a permanent water source.	Critical habitat essential for the long-term survival of the species.
Category 2	Diurnal roost sites with regular occupancy (no proven presence of young).	These sites are similar to category 1 sites but are usually less complex (e.g. may only contain a single chamber), have a more variable microclimate, and/or are located in less productive areas which may only periodically attract Pilbara leaf-nosed bats.	Critical habitat essential for the long-term survival of the species.

Category	Description	Typical features	Importance to Pilbara leaf-nosed bat
Category 3	Diurnal roost sites with occasional occupancy.	These sites are similar to category 1 and 2 sites but are usually less complex (e.g. may only contain a single chamber), have a more variable microclimate, and/or are located in less productive areas which may only periodically attract Pilbara leaf-nosed bats.	Critical habitat essential for the long-term survival of the species.
Category 4	Nocturnal roost sites with opportunistic usage.	Caves and deep overhangs which may be visited during the night during foraging activity, but are unlikely to support diurnal roosting (e.g. roosting locations are exposed or exhibit low levels of humidity)	Not considered critical habitat for Pilbara leaf-nosed bat, but still important for the persistence of the species within a local area.

Adapted from information presented by Bat Call (2021b)

Table 4.3: Foraging habitat categories for Pilbara leaf-nosed bat

Habitat rating	Description	Typical features
0 Poor	Unlikely to be used by the species.	Open ground with no vegetation cover.
1 Low	Unlikely to be used for foraging but may be traversed during dispersal.	Open plains and low hills with simple vegetation structure (e.g. one or two-layer with no trees); or minor ridgelines, gullies and mesas with minimal caves and overhangs and sparse vegetation cover.
2 Moderate	May be used occasionally for foraging.	Plains and low hills with simple vegetation structure (e.g. one or two-layer with no trees) and at least one ephemeral water source nearby; or ridgelines, gullies and mesas with caves and overhangs and at least one ephemeral water source nearby.
3 High	Likely to be used for foraging if located within flying range of a diurnal roost.	Plains and low hills with complex vegetation structure (e.g. three-layer) and at least one ephemeral water source nearby; or ridgelines, gullies, mesas and gorges with complex vegetation structure, caves and overhangs and at least one ephemeral water source nearby.
4 Very high	Very likely to be used for foraging and/or as a source of drinking water, if located within flying range of a diurnal roost.	Plains and low hills with complex vegetation structure (e.g. three-layer) and semi-permanent or permanent surface water; or ridgelines, gullies, mesas and gorges with complex vegetation structure, caves and overhangs, and semi-permanent or permanent surface water.
5 Outside diurnal roost	Areas outside permanently occupied roosts where Pilbara leaf-nosed bats are present nightly.	N/A

Adapted from information presented by Bat Call (2021b)

Greater bilby

As habitat varies across the greater bilby distribution range, habitat critical to the species survival is difficult to define, and has not been formally described (DCCEEW, 2023b). In the interim, in accordance with DCCEEW (2023b), habitat critical to the survival of the greater bilby can be considered to include:

- any area where the species is known or likely to occur
- any location outside the known or likely distribution where bilbies are found to occur
- any area, between the areas noted above, that may be periodically occupied by bilbies
- any area which bilbies may naturally colonise or may feasibly be reintroduced.

Spectacled hare-wallaby

Habitat important to the survival of spectacled hare-wallaby has not been formally defined but is likely to include habitat where large *Triodia* spp. spinifex hummocks or grass tussocks are present, to provide adequate shelter from high temperatures and predators (Ingleby & Westoby, 1992).

Western pebble-mound mouse

While important habitat for the western pebble-mound mouse has not been formally defined, the species preferred habitat includes gently sloping hills of rocky ranges, with stony substrate (van Dyck & Strahan, 2008). These stony plains and hills are vegetated by spinifex and may have a sparse overstorey of eucalypts and scattered *Acacia* and *Ptilotus* spp. shrubs.

Peregrine falcon

The peregrine falcon is a habitat generalist, however important (although undefined) habitat could be considered those that provide protected nest sites and abundant prey resources, with the species preferring cliffs or open woodlands near permanent water sources (Johnstone & Storr, 1998; Olsen & Olsen, 1989).

Pilbara olive python

For the purposes of this assessment, the definition of critical habitat for Pilbara olive python followed that of DoE (2013b), being areas necessary for activities such as foraging, breeding, roosting, or dispersal. This includes rocky habitats such as gorges, gullies, major drainage lines and associated waterbodies (particularly those that are persistent or semi-persistent).

4.1.1.2 Species Likely to Occur

Brush-tailed mulgara

While important habitat has not been defined for the brush-tailed mulgara, they prefer habitat dominated by *Triodia* spp. spinifex. grasslands on sandy or stony plains where suitable burrowing substrate is present (Pavey *et al.*, 2012; Woolley, 2006). Mature spinifex

hummocks appear to be important for protection from introduced predators (Körtner *et al.*, 2007).

Long-tailed dunnart

Important habitat has not been defined for the long-tailed dunnart, however the species are typically recorded on plateaus near breakaways and scree slopes, and on rugged boulder-strewn scree slopes (Burbidge *et al.*, 2008).

Spotted Ctenotus

Likely due to the scarcity of records of the spotted Ctenotus, there is no clearly defined important habitat for the species. Within the Pilbara, the taxon is known from *Triodia* spp. on hillslopes, *Acacia xiphophylla* over chenopods, and *Acacia xiphophylla* scattered tall shrubs to high open shrubland (Cogger, 2014).

4.1.2 Supporting Habitat

For the purpose of this assessment, supporting habitat is categorised for each MNES species as habitat that is not necessary for foraging, breeding, roosting or dispersal but supports such activities and is often found adjacent to critical or important habitat. With regards to Priority listed species', supporting habitat is not discussed, as preferred habitat and habitat where species' have been previously recorded are considered important to the survival of the species. Further information on the abundance and distribution of each species through future survey effort will assist to refine the significance of habitats.

4.1.3 Significant Habitat Features

Caves can be significant features within a landscape, particularly in arid zone systems, often providing stable microclimates, shelter and protection (Medellin *et al.*, 2017). As described in Section 4.1.1.1, caves provide critical habitat for Pilbara leaf-nosed bat and ghost bat, as they provide important refuges for maternity and/or diurnal roosting by bat species (category 1, 2 and 3) (Table 4.1; Table 4.2). Diurnal ghost bat roost caves (category 3) situated adjacent to critical roost habitat can also be considered critical habitat, with Pilbara leaf-nosed bat nocturnal refuges (category 4) considered supporting habitat for the persistence of the species (Table 4.1; Table 4.2).

Water sources are a limiting factor for many ecosystems (James *et al.*, 1995), particularly within arid-zone ecosystems such as the Pilbara (Burbidge *et al.*, 2010; Doughty *et al.*, 2011) and often represent areas of comparatively high ecological productivity (Murray *et al.*, 2003). Mammals and birds have endothermic metabolisms and therefore require relatively continuous sources of food and moisture, while water for amphibians provides opportunities to forage (i.e. suitably wet periods) and breed (i.e. when water pools for long enough for them

to complete the life cycle) (James *et al.*, 1995). These features are highlighted because they may provide important sources of food and water for significant species.

4.2 Significant Species Occurrence

For each significant species identified in the desktop database and literature review, an assessment was made on the significance of their occurrence based on the most relevant and prescriptive guidance documents relative to each species.

For species listed as Critically Endangered and Endangered under the EPBC Act (including night parrot, red goshawk, Australian painted snipe, common greenshank and curlew sandpiper), the significance of occurrence was based on the definitions of the DoE (2013a), specifically the presence of a 'population'. A 'population of a species' is defined under the EPBC Act as an occurrence of the species in a particular area, including, but are not limited to:

- a geographically distinct regional population, or collection of local populations, or
- a population, or collection of local populations, that occurs within a particular bioregion.

For the Endangered northern quoll, the significance of occurrence was based on definitions of the DoE (2016), specifically whether the individuals present in the Study Area were representative of a 'populations important for the long-term survival of the northern quoll'. These are populations that are (DoE, 2016):

- high density quoll populations, which occur in refuge-rich habitat critical to the survival of the species, including where cane toads are present
- occurring in habitat that is free of cane toads and unlikely to support cane toads upon arrival i.e. granite habitats in WA, populations surrounded by desert and without permanent water, and/or
- subject to ongoing conservation or research actions i.e. populations being monitored by government agencies or universities or subject to reintroductions or translocation.

For those species listed as Vulnerable under the EPBC Act, but with no specific criteria to assess significance of occurrence (ghost bat, Pilbara leaf-nosed bat, greater bilby, grey falcon, princess parrot, sharp-tailed sandpiper, great desert skink and Pilbara olive python), the significance of occurrence was based on criteria defined by DoE (2013a). Specifically, whether their occurrence in the Study Area represented an 'important population'. An 'important population' is a population that is necessary for a species' long-term survival and recovery - this may include populations identified as such in recovery plans, and/or that are (DoE, 2013a):

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

For the Pilbara leaf-nosed bat and ghost bat, the entire Pilbara is suggested to represent an 'important population' (Bat Call, 2021a, 2021b; TSSC, 2016b). Thus, the significance of occurrence was based on the presence of critical roosting and foraging habitat. For the greater bilby, the species is considered a single population, with a largely fragmented distribution (DCCEEW, 2023b). Therefore the concept of 'important population' is not relevant to the overall conservation of the species, as the species is being treated as a metapopulation, due to the local cultural significance of each occurrence and the lack of information on the species population structure (DCCEEW, 2023b). Due to the species fragmented distribution and ability to travel across vast distances for foraging and dispersal purposes, the significance of occurrence for the species is based on the presence of the species within the vicinity of the Study Area. Particular populations of greater bilby may be considered more important for the purposes of meeting specific conservation objectives, however these are not identified or discussed further as they are beyond the scope of the report.

For the remaining species listed as Vulnerable under the EPBC Act, no 'important populations' relevant to the overall conservation of each species have been identified within the vicinity of the Study Area.

For Migratory species listed under the EPBC Act (including barn swallow, common sandpiper, osprey, fork-tailed swift, grey wagtail, oriental plover, oriental pratincole, pectoral sandpiper and wood sandpiper), the significance of occurrence was based on the definitions of the DoE (2013a), specifically the presence of a 'population'. A 'population of a migratory species' is defined under the EPBC Act as the entire population or any geographically separate part of the population of any species or lower taxon of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries, including Australia (DoE, 2013a).

Species otherwise in need of special protection listed under the BC Act (peregrine falcon) and significant species listed on the DBCA Priority fauna list (including Priority 1 species: Pilbara flat-headed blind-snake, Priority 2 species: spotted Ctenotus, and Priority 4 species: long-tailed dunnart, brush-tailed mulgara, spectacled hare wallaby, northern short-tailed mouse and western pebble-mound mouse) do not have species specific criteria to determine their significance of occurrence within the Study Area. Therefore, determination of the significance of their occurrence was made on the definitions outlined in DoE (2013a), specifically whether their occurrence in the Study Area represented an 'important population' (as detailed above for species listed as Vulnerable under the EPBC Act).

5 Results and Discussion

5.1 Fauna Habitats of the Study Area

Eleven broad vertebrate fauna habitat types have previously been identified across the Study Area (MWH, 2016a) (Figure 5.1), comprising, in decreasing order of extent:

- Stony Rise (7,303 ha, 41%)
- Rocky Foothill (4,458 ha, 24%)
- Spinifex Stony Plain (1,876 ha, 10%)
- Rocky Ridge and Gorge (1,766 ha, 9%)
- Ironstone Ridgetop (1,543 ha, 8%)
- Drainage Line (502 ha, 3%)
- Granite Upland (238 ha, 1%)
- Calcrete (235 ha, 1%)
- Spinifex Sandplain (195 ha, 1%)
- Riverine (167 ha, 1%)
- Granite Outcrop (163 ha, 1%).

Stony Rise (41%) and Rocky Foothill (24%) were the dominant broad fauna habitats within the Study Area, with Granite Upland, Calcrete, Spinifex Sandplain, Riverine and Granite Outcrop making up 1% each of the total Study Area (Table 5.1).

All 11 habitats are considered locally significant as they provide critical or important roosting, breeding, foraging and/or dispersal habitat for several significant species and have the potential to support permanent, semi-permanent or seasonally inundated water sources. Taking into consideration the occurrence of critical roosting habitat and proximal foraging habitat surrounding critical roost sites, the number of locally significant habitats within the Study Area has increased from those previously identified (Rocky Ridge and Gorge, Drainage Line, Riverine and Granite Outcrop) in earlier studies (MWH, 2018b) to include all habitats. Similar to MWH (2018b), one habitat, Rocky Ridge and Gorge is considered of regional significance, due to the quality of the habitat within the Study Area and presence of habitat features such as caves and water features critical to the survival of several significant species. Caves within the Study Area classified category 1, 2 and 3 (where applicable) Pilbara leaf-nosed bat and/or ghost bat roosts, are also considered regionally significant as they provide critical roosting habitat for the two species' Pilbara population, and are discussed in further detail in Section 5.1.1.1.

Table 5.1: Broad fauna habitats occurring within the Study Area adapted from MWH (2018b), Biologic (2021n) and Atlas Iron (2019)

Habitat	Distinguishing habitat characteristics	Extent of habitat	Habitat for significant species	Representative photo
Stony Rise 7,303 ha (41%)	Scattered *Corymbia hamersleyana* trees over scattered-open shrubland dominated by *Grevillea wickhamii, Acacia inaequilatera* and/or *Hakea lorea* over open to dense hummock grassland on skeletal soils of brown clay-loam.	Widespread throughout the Pilbara bioregion. Most common habitat present within the Study Area, providing transitionary habitat between Spinifex Stony Plain and Rocky Foothill habitats. Significant habitat within Study Area. Not regionally significant.	Critical habitat for: • **ghost bat** – foraging and dispersal where proximal (<12 km) to critical roosting habitat • **Pilbara leaf-nosed bat** – foraging and dispersal where proximal (<20 km) to critical roosting habitat Important habitat for: • **peregrine falcon** – foraging and dispersal • **spectacled hare wallaby** – breeding, foraging and dispersal (where long unburnt) • **spotted Ctenotus** – breeding and foraging • **western pebble mound mouse** – breeding, foraging and dispersal Supporting habitat for: • **fork-tailed swift** – foraging and dispersal • **northern quoll** – foraging and dispersal	
Rocky Foothill 4, 458 ha (24%)	Scattered *Corymbia hamersleyana* trees over scattered- open shrubland dominated by *Grevillea wickhamii* and/or *Acacia inaequilatera* over hard spinifex on stony red clay loam.	Widespread throughout the Pilbara bioregion. Commonly occurs in the Study Area as transitionary habitat between Stony Rises and Rocky Ridge and Gorge habitats. Significant habitat within Study Area. Not regionally significant.	Critical habitat for: • **ghost bat** – roosting, along with foraging and dispersal where proximal (<12 km) to critical roosting habitat • **northern quoll** – breeding (where outcropping occurs), foraging and dispersal • **Pilbara leaf-nosed bat** – foraging and dispersal where proximal (<20 km) to critical roosting habitat Important habitat for: • **long-tailed dunnart** – breeding, foraging and dispersal • **peregrine falcon** – foraging and dispersal • **Pilbara flat-headed blind-snake** – breeding and foraging • **spectacled hare wallaby** – breeding, foraging and dispersal (where long unburnt) • **spotted Ctenotus** – breeding and foraging • **western pebble mound mouse** – breeding, foraging and dispersal Supporting habitat for: • **fork-tailed swift** – foraging and dispersal • **Pilbara olive python** – foraging and dispersal	
Spinifex Stony Plain 1,876 ha (10%)	Sparse woodland of *Corymbia hamersleyana* over mixed open shrubland dominated by *Acacia pyrifolia*, *Acacia inaequilatera, Senna* spp, and *Grevillia wickhamii* over dense hummock grassland of *Triodia* spp. and herbs on reddish brown sandy loam.	Widespread throughout the Pilbara bioregion. Relatively common within the Study Area, predominantly in the eastern section of Study Area and isolated sections along the western boundary. Significant habitat within Study Area. Not regionally significant.	Critical habitat for: • **ghost bat** – foraging and dispersal habitat where proximal (<12 km) to critical roosting habitat • **Pilbara leaf-nosed bat** – foraging and dispersal where proximal (<20 km) to critical roosting habitat Important habitat for: • **brush-tailed mulgara** – breeding, foraging and dispersal • **spectacled hare wallaby** – foraging and dispersal (where long unburnt) • **spotted Ctenotus** – breeding and foraging • **western pebble mound mouse** – breeding, foraging and dispersal Supporting habitat for: • **fork-tailed swift** – foraging and dispersal • **grey falcon** – foraging and dispersal	

Habitat	Distinguishing habitat characteristics	Extent of habitat	Habitat for significant species	Representative photo
Rocky Ridge and Gorge 1,766 ha (9%)	Gorges dominated by *Eucalyptus camaldulensis* and/or *Melaleuca argentea* with scattered *Ficus* spp. over mixed *Acacia* spp. shrubland and *Triodia* and *Eriachne* grasses. Ridges with scattered *Eucalyptus leucophloia* and *Ficus* spp. with scattered *Acacia* spp. over *Triodia* spp. hummock grassland. Contain significant microhabitats including permanent and semi-permanent water sources, outcropping ironstone, gorges, caves, crevices and fallen boulders.	Widespread throughout the Pilbara bioregion. Similar habitat of similar value not common within the Chichester subregion. Relatively common within the Study Area, often in association with Ironstone Ridgetop habitat. Significant habitat within Study Area. Regionally significant due to habitat quality.	Critical habitat for: • **ghost bat** – roosting, along with dispersal where proximal (<12 km) to critical roosting habitat • **northern quoll** – breeding, foraging and dispersal • **Pilbara leaf-nosed bat** – roosting, along with foraging and dispersal where proximal (<20 km) to critical roosting habitat • **Pilbara olive python** – breeding, foraging and dispersal Important habitat for: • **long-tailed dunnart** – breeding, foraging and dispersal • **peregrine falcon** – nesting, foraging and dispersal Supporting habitat for: • **fork-tailed swift** - foraging and dispersal • **Pilbara flat-headed blind-snake** – breeding and foraging	
Ironstone Ridgetop 1, 543 ha (8%)	Sparse woodland and mallee woodland of *Eucalyptus leucophloia* scattered trees, over shrubland dominated by *Grevillea wickhamii, Acacia orthocarpa* and mixed *Acacia* spp. over open dense *Triodia* spp. hummock grassland on red brown skeletal soils.	Widespread throughout the Pilbara bioregion. Relatively common in the Study Area, primarily found in the central/ eastern section of the Study Area and represents the most elevated habitat within the Study Area. Significant habitat within Study Area. Not regionally significant.	Critical habitat for: • **ghost bat** – roosting • **northern quoll** – breeding, foraging and dispersal • **Pilbara leaf-nosed bat** – roosting, along with foraging and dispersal where proximal (<20 km) to critical roosting habitat Important habitat for: • **long-tailed dunnart** – breeding, foraging and dispersal • **western pebble mound mouse** – breeding, foraging and dispersal Supporting habitat for: • **fork-tailed swift** - foraging and dispersal • **Pilbara olive python** – foraging and dispersal	
Drainage Line 502 ha (3%)	Open woodland dominated by *Eucalyptus victrix* and/or *E. camaldulensis*, over open-dense shrubland of *Acacia tumida* and/or *Melaleuca glomerata* with scattered/clumps of tussock grasses, *Cenchrus ciliaris, Eriachne* spp. and *Triodia* hummock grasses on river sand and alluvial loam. Many microhabitats occur in this habitat including permanent to semi-permanent water sources, large trees and hollows, suitable burrowing substrate and an accumulation of leaf litter.	Widespread, yet uncommon in the Pilbara bioregion, as they occur as linear corridors (small in overall area) that wind through the landscape connecting multiple habitat types. Widespread distribution, yet uncommon throughout the Study Area. Significant habitat within Study Area. Not regionally significant.	Critical habitat for: • **ghost bat –** foraging and dispersal where proximal (<12 km) to critical roosting habitat • **grey falcon** – nesting, foraging and dispersal • **northern quoll** – foraging and dispersal where proximal (<1 km) to critical denning habitat • **Pilbara leaf-nosed bat** – foraging and dispersal where proximal (<20 km) to critical roosting habitat Important habitat for: • **northern short-tailed mouse** – breeding, foraging and dispersal • **peregrine falcon** – nesting, foraging and dispersal • **Pilbara flat-headed blind-snake** – breeding and foraging • **spotted Ctenotus** – breeding and foraging Supporting habitat for: • **fork-tailed swift** - foraging and dispersal • **greater bilby** – foraging and dispersal • **migratory waterbirds** – foraging and dispersal (following significant rainfall events) • **Pilbara olive python** – foraging and dispersal	

Habitat	Distinguishing habitat characteristics	Extent of habitat	Habitat for significant species	Representative photo
Granite Upland 238 ha (1%)	Very open shrubland of slender *Acacia* spp. over *Triodia* spp. on shallow sandy soils over sheets and outcropping of granite stones and boulders.	Limited extent throughout the Pilbara bioregion. Limited occurrence within the Study Area, restricted to small areas in the western and north-east sections of the Study Area. Significant habitat within Study Area. Not regionally significant.	Critical habitat for: • **Pilbara leaf-nosed bat** – foraging and dispersal where proximal (<20 km) to critical roosting habitat Supporting habitat for: • **fork-tailed swift** - foraging and dispersal	
Calcrete 235 ha (1%)	Scattered *Corymbia hamersleyana* over scattered *Acacia inaequilatera* shrubland over low hard hummock grassland of *Triodia* spp. on clay-loam with calcrete.	Limited extent throughout the Pilbara bioregion. Limited to small areas in the western and central sections of the Study Area. Significant habitat within Study Area. Not regionally significant.	Critical habitat for: • **ghost bat** – foraging where proximal (<12 km) to critical roosting habitat • **Pilbara leaf-nosed bat** – foraging and dispersal where proximal (<20 km) to critical roosting habitat Important habitat for: • **spectacled hare wallaby** – foraging and dispersal (where long unburnt) Supporting habitat for: • **fork-tailed swift** - foraging and dispersal	
Spinifex Sandplain 195 ha (1%)	Low dense *Acacia* spp. shrubland over dense soft *Triodia* spp. hummock grassland on shallow red/orange sand with underlying hardpan.	Limited extent throughout the Pilbara bioregion. Limited occurrence within the Study Area, restricted to the north-east section. Significant habitat within Study Area. Not regionally significant.	Critical habitat for: • **ghost bat** – foraging and dispersal where proximal (<12 km) to critical roosting habitat • **greater bilby** – breeding, foraging and dispersal • **Pilbara leaf-nosed bat** – foraging and dispersal where proximal (<20 km) to critical roosting habitat Important habitat: • **brush-tailed mulgara** – breeding, foraging and dispersal • **peregrine falcon** – foraging and dispersal • **spectacled hare wallaby** – foraging and dispersal (where long unburnt) Supporting habitat for: • **fork-tailed swift** - foraging and dispersal • **grey falcon** – foraging and dispersal	
Riverine 167 ha (1 %)	Woodland of *Eucalyptus victrix, E. camaldulensis* and/or *Melaleuca argentea* over shrubland of *Hakea lorea*, *Melaleuca glomerata* and/or *Grevillea pyramidalis* with pockets of *Triodia* spp. hummock grassland and *Cenchrus ciliaris* tussock grassland on brown sandy river sands and brown sandy loam. Contains significant microhabitats to support vertebrate fauna assemblages including permanent and semi-permanent water sources, large trees and hollows, suitable burrowing substrate and accumulation of leaf litter.	Limited extent throughout the Pilbara bioregion. Limited occurrence within the Study Area, isolated to the north-east and eastern margins. Significant habitat within Study Area. Not regionally significant.	Critical habitat for: • **ghost bat** – foraging and dispersal where proximal (<12 km) to critical roosting habitat • **grey falcon** – nesting, foraging and dispersal • **northern quoll** – foraging and dispersal where proximal (<1 km) to critical denning habitat • **Pilbara leaf-nosed bat** – foraging and dispersal where proximal (<20 km) to critical roosting habitat Important habitat for: • **peregrine falcon** – foraging and dispersal • **Pilbara flat-headed blind-snake** – breeding and foraging	

Habitat	Distinguishing habitat characteristics	Extent of habitat	Habitat for significant species	Representative photo
			• **northern short-tailed mouse** – breeding, foraging and dispersal • **spotted Ctenotus** –breeding and foraging Supporting habitat for: • **fork-tailed swift** - foraging and dispersal • **greater bilby** – breeding, foraging and dispersal • **migratory waterbirds** – foraging and dispersal (following significant rainfall events) • **Pilbara olive python** – foraging and dispersal (following significant rainfall events, where proximal to Drainage Line or Rocky Ridge and Gorge habitats)	
Granite Outcrop 163 ha (1%)	Very sparse *Acacia* spp. woodland over shrubland of *Acacia* spp. and *Triodia* spp. hummock grassland on stony red sand, interspersed with substantial granite boulder piles. Contains significant microhabitats including crevices, cracks and boulders.	Limited extent throughout the Pilbara bioregion. Limited occurrence within the Study Area, isolated to the southern section. Significant habitat within Study Area. Not regionally significant.	Critical habitat for: • **northern quoll** – breeding, foraging and dispersal habitat • **Pilbara leaf-nosed bat** – foraging and dispersal where proximal (<20 km) to critical roosting habitat Important habitat: • **peregrine falcon** – nesting, foraging and dispersal Supporting habitat for: • **fork-tailed swift** - foraging and dispersal • **Pilbara olive python** – foraging and dispersal (following significant rainfall events, where proximal to Drainage Line or Rocky Ridge and Gorge habitats)	

760000
770000
780000
7640000
7630000
7620000
Hillside - Marble Bar Rd

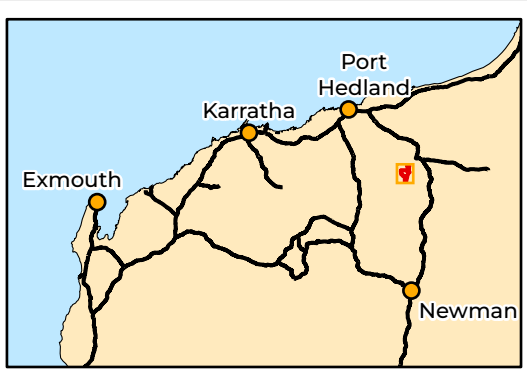
LEGEND

Study Area
Local Road

Fauna Habitat

Calcrete
Drainage Line
Granite Outcrop
Granitic Upland
Ironstone Ridgetop
Riverine
Rocky Foothill
Rocky Ridge and Gorge
Spinifex Sandplain
Spinifex Stony Plain
Stony Rise

Scale 1:110,000
0 2 4 Km
Coordinate System: GDA 1994 MGA Zone 50 Transverse Mercator
Created: 11/09/2024



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Consolidated Significant Species Vertebrate Fauna Assessment

Figure 5.1: Fauna habitats in the Study Area

5.1.1 Habitat Features of the Study Area

5.1.1.1 Caves

Forty-three caves with the potential to provide roosting habitat for ghost bats and/or Pilbara leaf-nosed bats are known within the Study Area to date (Figure 5.2; Appendix B). An additional four caves are present within 12 km of the Study Area. Rock shelters that may provide some protection for ghost bat and Pilbara leaf-nosed bats within the Study Area have not been included as they are unlikely to provide critical or important roosting habitat for the species. Additional caves are known to occur within the broader Pilbara bioregion that provide critical and supporting habitat for the ghost bat population and further information regarding these caves and ghost bat usage can be found from surveys detailed in Appendix A.

Of the total 43 caves known to occur within the Study Area, 11 are currently subject to long-term monitoring for ghost bat and/or Pilbara leaf-nosed bat activity as part of the Sanjiv Ridge ghost bat and Pilbara leaf-nosed bat monitoring program (Atlas Iron, 2023). An additional three caves (CO-CA-18, Lalla Rookh and Mt Webber) are located outside the Study Area and are included as control caves for the annual monitoring program (Atlas Iron, 2023). Of the 43 caves within the Study Area, 26 occur within Rocky Ridge and Gorge habitat, nine within Rocky Foothill, seven in Ironstone Ridgetop and one in Stony Rise habitat. Previous cave searching survey effort focussed mostly on the areas of Rocky Ridge and Gorge and Ironstone Ridgetop habitats most likely to have the highest quality caves, therefore it is possible that not all caves have been located within the Study Area and additional caves may be present.

Caves and roosts used by Pilbara leaf-nosed bat were classified by Bat Call (2021b) into four categories (see Section 4.1.1), of which category 1–3 caves are classified as critical habitat for the species. Of the 43 caves in the Study Area, one is classified as category 1 (permanent diurnal roost, CO-CA-01) and one classified as category 2 (non-permanent breeding roost, CO-CA-03) for Pilbara leaf-nosed bats, both located in Rocky Ridge and Gorge habitat. Two category 3 (transitory diurnal roost) caves (CO-CA-04 and CO-CA-05, located in Rocky Ridge and Gorge habitat). These four caves are considered critical roosting habitat and are locally and regionally significant for the survival of the Pilbara leaf-nosed bat. The remaining 16 caves recorded within the Study Area are classified as category 4 nocturnal refuges and provide supporting roosting habitat for the species (Appendix B).

Caves and roosts used by ghost bats can be classified into four categories (Bat Call, 2021a) (see Section 4.1.1), of which category 1–2, and 3 (when found in an apartment block with category 2 caves) caves are classified as critical habitat for the species. Nine of the caves occurring in the Study Area are category 2 diurnal roosts, and four of these are considered

potential maternity roosts (CO-CA-24, CO-CA-33, CO-CA-35 and CO-CA-42) due to cave usage and scat hormone analysis. Five of the category 2 roosts are within Rocky Ridge and Gorge, three roosts within Rocky Foothill and one within Ironstone Ridgetop habitat. These nine caves are considered critical roosting habitat for the ghost bat, and as such, are both locally and regionally significant for the survival of the species. Six caves within the Study Area are category 3 ghost bat diurnal roosts, with 15 caves classified as category 4 ghost bat nocturnal roosts. Of these 15 nocturnal roosts, four caves (CO-CA-23, CO-CA-25, CO-CA-29 and CO-CA-34) are potentially category 3 diurnal roosts, based on previously recorded bat activity. None of the category 3 caves occur as part of an apartment block with any category 2 caves, therefore, are not considered critical ghost bat roosting habitat.

There are also a number of regionally significant caves/roosts for Pilbara leaf-nosed bat and/or ghost bat recorded in the vicinity of the Study Area. These include Comet Mine (20 km north), Klondyke Queen Mine (25 km north-east), Mt Webber (45 km north-west) and Lalla Rookh (54 km west). These provide critical roosting habitat for the Pilbara leaf-nosed bat and ghost bat populations in the broader Pilbara region.

5.1.1.2 Water Features

Forty water features are known within the Study Area (Atlas Iron, 2019; Biologic, 2021l; MWH, 2018b; Stantec, 2018a), including eight permanent, four potentially permanent, nine semi-permanent, 17 likely semi-permanent, one temporary and one unknown (Figure 5.3; Appendix C). Of these, 19 occur within Rocky Ridge and Gorge habitat, seven within Drainage Line, six in Rocky Foothill, five within Stony Rise and three are located in Ironstone Ridgetop habitat. It is possible that other temporary water features occur within the Study Area, particularly within the Drainage Line and Riverine habitats, where inundation following significant rainfall events may occur. Five water features are currently being monitored in accordance with the Sanjiv Ridge Significant Species Management Plan (SSMP) and Monitoring Strategy, including CO-WS-01, CO-WS-03, CO-WS-08, CO-WS-13 and CO-WS-14 (Atlas Iron, 2023; Biologic, 2020a). An additional eight water features are known to occur within 5 km of the Study Area, including one semi-permanent, two potentially permanent and five likely semi-permanent (Figure 5.3; Appendix C).

Water features are typically considered to provide critical or supporting habitat for significant species. For ghost bat and Pilbara leaf-nosed bat, they can provide significant drinking and foraging sources when located within 12 and 20 km, respectively, of a critical roost site. For Pilbara olive python, water features can often act as primary foraging locations and for that reason the species is more often than not associated with such features, both natural and artificial (Pearson, 1993). Additionally, water features may also provide foraging habitat for migratory waterbirds on occasions of inundation following periods of significant rainfall events. This occurrence is likely to be seasonal and irregular.

760000 770000 780000

7640000 7630000 7620000

CO-CA-18
CO-CA-46 CO-CA-45
CO-CA-49 CO-CA-48
CO-CA-43 CO-CA-06
CO-CA-36
CO-CA-37
CO-CA-22 CO-CA-31
CO-CA-25 CO-CA-29
CO-CA-20
CO-CA-30
CO-CA-19
CO-CA-32 CO-CA-38
CO-CA-21 CO-CA-17
CO-CA-07
CO-CA-01
CO-CA-15
CO-CA-39
CO-CA-35 CO-CA-05
CO-CA-40 CO-CA-16
CO-CA-42
CO-CA-12
CO-CA-02 CO-CA-13
CO-CA-03
CO-CA-04
CO-CA-47
CO-CA-11
CO-CA-41
CO-CA-33

Hillside - Marble Bar Rd

Lalla Rookh
Marble Bar
Mt Webber

LEGEND

Study Area
Local Road

Cave Category

Ghost Bat
- Category 2
- Category 3
- Category 4
- Potential Category 4
- Not classified

Pilbara Leaf-nosed Bat
- Category 1
- Category 2
- Category 3
- Category 4
- Potential Category 4
- Not classified

Scale 1:110,000
0 2 4 Km

Coordinate System: GDA 1994 MGA Zone 50
Transverse Mercator Created: 11/09/2024

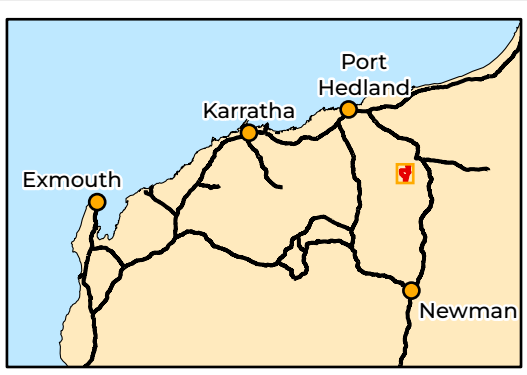

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Figure 5.2: Known caves recorded in the Study Area

760000 770000 780000

7650000 7640000 7630000 7620000

CO-WS-21
CO-WS-22
CO-WS-23
CO-WS-24
CO-WS-25
CO-WS-26
CO-WS-27
CO-WS-28
CO-WS-44
CO-WS-29
CO-WS-45
CO-WS-03
CO-WS-43
CO-WS-20
CO-WS-04
CO-WS-15
CO-WS-40
CO-WS-30
CO-WS-46
CO-WS-38
CO-WS-47
CO-WS-37
CO-WS-06
CO-WS-36
CO-WS-32
CO-WS-48
CO-WS-35
CO-WS-01
CO-WS-18
CO-WS-10
CO-WS-33
CO-WS-12
CO-WS-34
CO-WS-11
CO-WS-08
CO-WS-05
CO-WS-13
CO-WS-14
CO-WS-09
CO-WS-07
CO-WS-02
Hillside - Marble Bar Rd

CO-WS-29
CO-WS-03
CO-WS-42
CO-WS-43
CO-WS-41
CO-WS-19
CO-WS-04
CO-WS-16
CO-WS-20
CO-WS-40
CO-WS-30
CO-WS-15
CO-WS-39
CO-WS-38
CO-WS-46
CO-WS-47
CO-WS-37
CO-WS-36
CO-WS-06
CO-WS-48
CO-WS-35
CO-WS-31
CO-WS-32
CO-WS-01
CO-WS-10
CO-WS-18
CO-WS-12
CO-WS-17
CO-WS-33
CO-WS-34

LEGEND

Study Area
Local Road

Water Feature
- Permanent
- Potentially Permanent
- Semi-permanent
- Likely Semi-permanent
- Temporary
- Unknown

Scale 1:125,000
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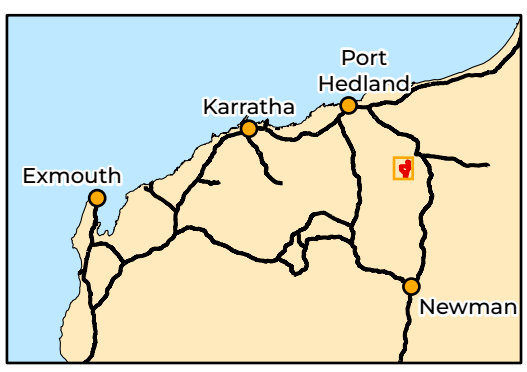
Coordinate System: GDA 1994 MGA Zone 50
Transverse Mercator Created: 11/09/2024



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Sanjiv Ridge Project
Consolidated Significant Species Vertebrate Fauna Assessment

Figure 5.3: Known water features recorded in the Study Area

5.2 Significant Species

Of the 31 significant species identified during the desktop assessment, eight have been confirmed in the Study Area (ghost bat, greater bilby, northern quoll, peregrine falcon, Pilbara leaf-nosed bat, Pilbara olive python, spectacled hare-wallaby and western pebble-mound mouse). Based on known species' distribution, previous records and the habitats present, three significant species are considered likely to occur (brush-tailed mulgara, long-tailed dunnart and spotted Ctenotus), five considered possible (fork-tailed swift, grey falcon, northern short-tailed mouse, oriental plover and Pilbara flat-headed blind-snake), one considered unlikely and the remaining 14 are considered highly unlikely to occur within the Study Area (Table 5.2).

Those species confirmed to occur within the Study Area, along with those considered highly likely or likely to occur have been discussed in greater detail below. For the remaining species considered possible, unlikely and highly unlikely, the Study Area and habitats within are unlikely to be solely relied upon by any of these species for their long-term persistence at a local and/or regional scale, there is an absence of suitable habitat and/or the Study Area occurs outside the known distribution for the species (Table 5.2). The species considered unlikely or highly unlikely to occur have not been discussed further in the report.

Table 5.2: Significant vertebrate fauna species likelihood assessment

Species	Conservation Status			Preferred Broad Habitats	Nearest Records to the Study Area	Potential Habitat within the Survey Area										Likelihood of Occurrence	Occurrence	Comments
	EPBC Act	BC Act	DBCA			Stony Rise	Rocky Foothill	Spinifex Stony Plain	Rocky Ridge and Gorge	Ironstone Ridgetop	Drainage Line	Granite Upland	Calcrete	Spinifex Sandplain	Riverine	Granite Outcrop			
MAMMALS																		
Dasyuridae																		
brush-tailed mulgara (*Dasycercus blythi*)			P4	Can occur in a range of habitats across the Australian arid zone, often dominated by spinifex *Triodia* spp. grasslands on sandy or stony plains where suitable burrowing substrate is present (Pavey *et al.*, 2012; Woolley, 2006). Mature spinifex hummocks appear to be important for protection from introduced predators (Körtner *et al.*, 2007).	~14 km E (2019) (Biologic, 2019f)			I						I			Likely	Resident	The species has previously been recorded in Spinifex Sandplain habitat in the vicinity of the Study Area (~14 km), with the most recent records in 2019.
long-tailed dunnart (*Antechinomys longicaudatus*)			P4	Typically occurs on plateaus near breakaways and scree slopes, and on rugged boulder-strewn scree slopes (Burbidge *et al.*, 2008). Once considered rare but now shown to be relatively common and widespread in rocky habitats (Burbidge *et al.*, 2008).	~37 km W (2003) (DBCA, 2024c)		I		I	I							Likely	Resident	The species has not commonly been recorded within the vicinity of the Study Area and there are no records within the Study Area. The species has been recorded twice in the previous 50 years, 37 km and 49 km east of the Study Area.
northern quoll (*Dasyurus hallucatus*)	EN	EN		The species tends to inhabit rocky habitats which offer protection from predators and are generally more productive in terms of availability of resources (Braithwaite & Griffiths, 1994) (Oakwood, 2000). Other Microhabitat features important to the species include rock cover, proximity to permanent water and time-since last fire (Woinarski *et al.*, 2008).	Within (2023) (DBCA, 2024c	C	C		C	C	C				C	C	Confirmed	Resident	Northern quoll has commonly been recorded in the Study Area and surrounding region. Commonly recorded within the Study Area in six habitats, including Stony Rise, Spinifex Stony Plain, Rocky Ridge and Gorge, Drainage Line, Riverine and Ironstone Ridgetop habitats. Rocky Ridge and Gorge, Rocky Foothill, Ironstone Ridgetop and Granite Outcrop provide critical shelter and denning habitat, while Drainage Line and Riverine provide critical foraging and dispersal habitat, where proximal to critical denning habitat.
Macropodidae																		

Species	Conservation Status			Preferred Broad Habitats	Nearest Records to the Study Area	Potential Habitat within the Survey Area										Likelihood of Occurrence	Occurrence	Comments
	EPBC Act	BC Act	DBCA			Stony Rise	Rocky Foothill	Spinifex Stony Plain	Rocky Ridge and Gorge	Ironstone Ridgetop	Drainage Line	Granite Upland	Calcrete	Spinifex Sandplain	Riverine	Granite Outcrop			
spectacled hare-wallaby (*Lagorchestes conspicillatus leichardti*)			P4	Inhabits spinifex hummock grasslands and Acacia shrublands (van Dyck & Strahan, 2008; Woinarski *et al.*, 2014a).	Within (2014) Outback Ecology (2014a)	I	I	I					I	I			Confirmed	Resident	Records of the species in the vicinity of the Study Area are uncommon, but the spectacled hare-wallaby has previously been recorded in Stony Rise habitat in the Study Area on five occasions in 2014 and once approximately 16 km from the Study Area.
Megadermatidae																		
ghost bat (*Macroderma gigas*)	VU	VU		Ghost bats roost in deep, complex caves beneath bluffs of low, rounded hills, granite rock piles and abandoned mines (Armstrong & Anstee, 2000). These features often occur within habitats including gorge/gully, hill crest/ hill slope and low hills (Armstrong & Anstee, 2000). Forages broadly across habitats, particularly woodland and open woodland habitats, including eucalypt and Mulga woodlands (Biologic, 2020c; Richards *et al.*, 2008; Tidemann *et al.*, 1985; TSSC, 2016a)	Within (2023) (DBCA, 2024c)	C	C	C	C	C	C		C	C	C		Confirmed	Resident	Commonly recorded within the Study Area. The species has been recorded at 28 caves within the Study Area, including nine category 2, six category 3 and 13 category 4 caves. The species has also been recorded at two category 2 caves outside the Study Area (CO-CA-46 and Lalla Rookh, 140 m and 54 km, respectively). The nine category 2 caves represent critical roosting habitat, and occur within Rocky Ridge and Gorge, Ironstone Ridgetop and Rocky Foothill habitat. The remaining habitats, with the exception of Granite Upland and Granite Outcrop are critical foraging and dispersal habitats where proximal to critical roost sites.
Muridae																		
northern short-tailed mouse (*Leggadina lakedownensis*)			P4	The species occupies a diverse range of habitats from the monsoon tropical coast to semiarid climates, including spinifex and tussock grasslands, samphire and sedgelands, *Acacia* shrublands, tropical eucalypt and Melaleuca woodlands and stony ranges; however, the species is usually found in seasonally inundated habitats on red or white sandy-clay soils (Moro & Kutt, 2008).	~20 km WNW (2005) (DBCA, 2024c)						I			I			Possible	Visitor	The species has rarely been recorded in the vicinity of the Study Area, with two records in 2005, approximately 20 km from the Study Area. Cracking clays providing important habitat to the species are absent from the Study Area but it's possible the species will visit the Study Area when seasonally inundated following significant rainfall events.
western pebble-mound mouse			P4	This species occurs on the gentler slopes of rocky ranges where the ground is covered with a stony mantle	Within (2016)	I	I	I		I							Confirmed	Resident	There are 19 records of the species in the Study Area between 2014 and 2016 and a further 10 records

Species	Conservation Status			Preferred Broad Habitats	Nearest Records to the Study Area	Potential Habitat within the Survey Area										Likelihood of Occurrence	Occurrence	Comments
	EPBC Act	BC Act	DBCA			Stony Rise	Rocky Foothill	Spinifex Stony Plain	Rocky Ridge and Gorge	Ironstone Ridgetop	Drainage Line	Granite Upland	Calcrete	Spinifex Sandplain	Riverine	Granite Outcrop			
(*Pseudomys chapmani*)				and vegetated by hard spinifex, often with a sparse overstorey of eucalypts and scattered shrubs (Anstee, 1996; Start *et al.*, 2000).	(DBCA, 2024c)													in the vicinity. These include records of an individual along with active and inactive mounds. The species was recorded within Ironstone Ridgetop, Spinifex Stony Plain and Stony Rise habitat in the Study Area.
Rhinonycteridae																		
Pilbara leaf-nosed bat (*Rhinonicteris aurantia* 'Pilbara form')	VU	VU		Species roosts within caves and abandoned mines with high humidity (95%) and temperature (32°C) (Armstrong, 2001). Species forages in caves and along waterbodies with fringing vegetation (TSSC, 2016b).	Within (2023) (DBCA, 2024c	C	C	C	C	C	C	C	C	C	C	C	Confirmed	Resident	Commonly recorded within the Study Area. The species has been recorded at 20 caves and one water feature within the Study Area, including one category 1, one category 2, two category 3 and 16 category 4 caves. The species has also been recorded at two category 1 caves outside the Study Area (Mt Webber and Lalla Rookh, 45 km and 54 km, respectively). The four category 1, 2 and 3 caves represent critical habitat, and occur within Rocky Ridge and Gorge, Ironstone Ridgetop and Rocky Foothill habitat within the Study Area. The remaining habitats are critical foraging and dispersal habitats where proximal to critical roost sites.
Thylacomydae																		
greater bilby (*Macrotis lagotis*)	VU	VU		Variety of habitats including spinifex hummock grassland and *Acacia* shrubland, on soft soils (Burrows *et al.*, 2012). In the Pilbara often associated with major drainage line sandy terraces (How *et al.*, 1991).	Within (2021) (DBCA, 2024c)						S			C	S		Confirmed	Resident	The species has commonly been recorded in the vicinity of the Study Area for over 50 years. One record exists within the Study Area, a dead individual observed on an access road within Spinifex Sandplain habitat in the Study Area in 2021.
BIRDS																		
Accipitridae																		

Species	Conservation Status			Preferred Broad Habitats	Nearest Records to the Study Area	Potential Habitat within the Survey Area											Likelihood of Occurrence	Occurrence	Comments
	EPBC Act	BC Act	DBCA			Stony Rise	Rocky Foothill	Spinifex Stony Plain	Rocky Ridge and Gorge	Ironstone Ridgetop	Drainage Line	Granite Upland	Calcrete	Spinifex Sandplain	Riverine	Granite Outcrop			
red goshawk (*Erythrotriorchis radiatus*)	VU	VU		Inhabits tall open forests and woodlands, often in association with drainage lines and fertile soils (Garnett *et al.*, 2011; Menkhorst *et al.*, 2017). Nests in trees taller than 20 m within 1 km of watercourse or wetland habitats (Garnett *et al.*, 2011). Forages in a broad range of habitats within a home range of up to 200 km^2 (Garnett *et al.*, 2011).	>100 km (DBCA, 2024c)												Highly Unlikely	N/A	Suitable habitat not present in the Study Area. May possibly visit following significant rainfall events.
Apodidae																			
fork-tailed swift (*Apus pacificus*)	MI	MI		Inhabits dry/open habitats, inclusive of riparian woodlands and tea-tree swamps, low scrub, heathland or saltmarsh, as well as treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes (Johnstone & Storr, 1998). Aerial species, which forages high above the tree canopy and rarely lower (Johnstone & Storr, 1998).	>70 km NW (2011) (DBCA, 2024c)	S	S	S	S	S	S	S	S	S	S	S	Possible	Occasional visitor	Suitable habitat not present in the Study Area and no records of the species within approximately 70 km of the Study Area. May occasionally visit within the airspace above the Study Area but unlikely to nest or land within the Study Area.
Charadriidae																			
oriental plover (*Charadrius veredus)*	MI	MI		Variety of habitats, including coastal habitats, such as estuarine mudflats and sandbanks, on sandy or rocky ocean beaches as well as open inland environments such as, semi-arid or arid grasslands, where the grass is short and sparse (Johnstone & Storr, 2004).	~25 km NE (2005) (DBCA, 2024c)						S				S		Possible	Occasional visitor	Suitable habitat not present in the Study Area. May possibly visit following significant rainfall events.
Falconidae																			
grey falcon (*Falco hypoleucos*)	VU	VU		Timbered lowlands, particularly *Acacia* shrubland and along inland drainage systems. Also frequents spinifex and tussock grassland habitats to forage (Burbidge *et al.*, 2010; Olsen & Olsen, 1986). The species commonly nests in timbered areas, particularly tall trees along watercourses, or tall infrastructure (e.g. powerline towers) and forages in open or more sparsely vegetated habitats (Garnett *et al.*, 2011).	~43 km NW (2019) (Biologic, 2020f)			S			C			S	C		Possible	Occasional visitor	There are three records of the species 43-47 km from the Study Area, and no records within. The species may occasionally visit the Study Area for foraging purposes. Potential nesting habitat exists within the Riverine and Drainage Line habitats of the Study Area.

Species	Conservation Status			Preferred Broad Habitats	Nearest Records to the Study Area	Potential Habitat within the Survey Area										Likelihood of Occurrence	Occurrence	Comments
	EPBC Act	BC Act	DBCA			Stony Rise	Rocky Foothill	Spinifex Stony Plain	Rocky Ridge and Gorge	Ironstone Ridgetop	Drainage Line	Granite Upland	Calcrete	Spinifex Sandplain	Riverine	Granite Outcrop			
peregrine falcon (*Falco peregrinus*)		OS		Arid areas and is most often encountered along cliffs above rivers, ranges and wooded watercourses where it hunts birds (Johnstone & Storr, 1998). It typically nests on rocky ledges occurring on tall, vertical cliff faces between 25 m and 50 m high (Olsen *et al.*, 2004; Olsen & Olsen, 1989). In general it nests on cliffs, granite outcrops, quarries and in the wheatbelt, old Raven and Whistling Kite nests (Johnstone & Storr, 1998).	Within (2019) (Biologic, 2019c)	I	I		I		I			I	I	I	Confirmed	Possible resident	The species has been recorded seven times in the vicinity of the Study Area, including three records within Spinifex Stony Plain and Rocky Ridge and Gorge habitats.
Glareolidae																		
oriental pratincole (*Glareola maldivarum*)	MI	MI		Prefers open plains, floodplains or short grasslands, often with extensive bare areas. They often occur near terrestrial wetlands (such as billabongs, lakes or creeks), and artificial wetlands (such as reservoirs, saltworks and sewage farms) (Johnstone & Storr, 1998).	>120 km NW (2012) (DBCA, 2024c)												Highly Unlikely	Occasional visitor	Suitable habitat not present in the Study Area. May visit following significant rainfall events.
Hirundinidae																		
barn swallow (*Hirundo rustica*)	MI	MI		Non-breeding summer visitor to the Pilbara. It favors areas near water (Johnstone *et al.*, 2013) (Menkhorst *et al.*, 2017).	>150 km NW (2005) (DBCA, 2024c)												Highly Unlikely	Occasional Visitor	Suitable habitat not present in the Study Area. May visit following significant rainfall events.
Motacillidae																		
grey wagtail (*Motacilla cinerea*)	MI	MI		A rare vagrant to Western Australia where it has been recorded within various habitats with open waterbodies (Johnstone & Storr, 2004).	>100 km SW (2012) (DBCA, 2024c)												Highly Unlikely	N/A	Suitable habitat not present in the Study Area.
Psittacidae																		

Species	Conservation Status			Preferred Broad Habitats	Nearest Records to the Study Area	Potential Habitat within the Survey Area										Likelihood of Occurrence	Occurrence	Comments
	EPBC Act	BC Act	DBCA			Stony Rise	Rocky Foothill	Spinifex Stony Plain	Rocky Ridge and Gorge	Ironstone Ridgetop	Drainage Line	Granite Upland	Calcrete	Spinifex Sandplain	Riverine	Granite Outcrop			
princess parrot (*Polytelis alexandrae*)	VU		P4	Inhabits low open eucalypt woodlands and savannah shrublands in arid deserts, usually with *Triodia* grasses, mixed shrubs and *Casuarina, Allocasuarina* or *Eucalyptus* tree species (DEWHA, 2008; Pavey et al., 2014). It feeds on a range of grass and shrub seeds, and primarily nests in hollows formed in marble gum (Eucalyptus species) (Pavey et al., 2014). Occurrence and abundance of the species often influenced by rainfall (Pavey et al., 2014).	>100 km (DBCA, 2024c)												Highly Unlikely	N/A	Suitable habitat not present in the Study Area.
Pandionidae																		
osprey (*Pandion haliaetus*)	MI	MI		Often occurs along coasts and inshore waters and tidal zones (Menkhorst *et al.*, 2017). Occasionally occurs further inland, particularly following cyclonic activity along the coast, where it's regularly associated with large permanent or long-standing waterbodies, often occurring along rivers and lakes. Found mainly in sheltered seas around islands, tidal creeks, estuaries and saltwork ponds, also large river pools (Johnstone & Storr, 1998).	>80 km WSW (2013) (DBCA, 2024c)												Unlikely	Occasional visitor	Suitable habitat not present in the Study Area. May visit following significant rainfall events.
night parrot (*Pezoporus occidentalis*)	EN	CR		The night parrot prefers sandy/stony plain habitat with old-growth spinifex for roosting and nesting in conjunction with native grasses and herbs for foraging (DPaW, 2017).	>110 km SW (2005) (DBCA, 2024c)												Highly Unlikely	N/A	Suitable habitat not present in the Study Area.
Rostratulidae																		
Australian painted snipe (*Rostratula australis*)	EN	EN		Favours recently flooded areas in shallow lowland freshwater temporary or permanent wetlands. This includes swamps, marshes, reedbeds, overgrown rice fields, inundated grassland and saltmarsh, margins of pools, freshwater lakes, sewage pools, reservoirs and mudflats (BirdLife International, 2016).	>100 km S (2012) (DBCA, 2024c)												Highly Unlikely	Occasional visitor	Suitable habitat not present in the Study Area. May visit following significant rainfall events.
Scolopacidae																		

Species	Conservation Status			Preferred Broad Habitats	Nearest Records to the Study Area	Potential Habitat within the Survey Area										Likelihood of Occurrence	Occurrence	Comments
	EPBC Act	BC Act	DBCA			Stony Rise	Rocky Foothill	Spinifex Stony Plain	Rocky Ridge and Gorge	Ironstone Ridgetop	Drainage Line	Granite Upland	Calcrete	Spinifex Sandplain	Riverine	Granite Outcrop			
common greenshank (*Tringa nebularia*)	MI	MI		Species occurs as a non-breeding summer migrant which occurs throughout the region. Occurs mainly in tidal mudflats, mangrove creeks, flooded samphire flats, beaches, river pools, and saltwork and sewage ponds (Johnstone *et al.*, 2013).	~24 km NE (2005) DBCA, 2024c)											Highly Unlikely	N/A	Suitable habitat not present in the Study Area.
common sandpiper (*Actitis hypoleucos*)	MI	MI		Estuaries and deltas of streams, as well as banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans (Johnstone & Storr, 1998).	~12 km NNE (2005) (DBCA, 2024c)											Highly Unlikely	Occasional visitor	Suitable habitat not present in the Study Area. May visit following significant rainfall events.
curlew sandpiper (*Calidris ferruginea*)	CR/ MI	CR /MI		Inhabits intertidal mudflats in sheltered coastal areas (i.e. estuaries, bays, inlets and lagoons) (Geering *et al.*, 2007). This rare species generally roosts on bare dry shingle, shell or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands (Geering *et al.*, 2007).	>130 km NNE (1981) (DBCA, 2024c)											Highly Unlikely	N/A	Suitable habitat not present in the Study Area.
pectoral sandpiper (*Calidris melanotos*)	MI	MI		Coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands (Johnstone & Storr, 2004; Johnstone *et al.*, 2013). It prefers wetlands with open fringing mudflats and low, emergent or fringing vegetation (Geering *et al.*, 2007).	>140 km NW (1998) (DBCA, 2024c)											Highly Unlikely	Occasional visitor	Suitable habitat not present in the Study Area. May visit following significant rainfall events.
sharp-tailed sandpiper (*Calidris acuminata*)	MI	MI		Coastal and inland areas saline and freshwater but prefers non-tidal fresh or brackish wetlands (Geering *et al.*, 2007). Favors flooded samphire flats and grasslands, mangrove creeks mudflats, beaches, river pools, saltwork ponds, sewage ponds and freshwater soaks (Johnstone *et al.*, 2013).	~24 km NE (2005) (DBCA, 2024c)											Highly Unlikely	Occasional visitor	Suitable habitat not present in the Study Area. May visit following significant rainfall events.

Species	Conservation Status			Preferred Broad Habitats	Nearest Records to the Study Area	Potential Habitat within the Survey Area											Likelihood of Occurrence	Occurrence	Comments
	EPBC Act	BC Act	DBCA			Stony Rise	Rocky Foothill	Spinifex Stony Plain	Rocky Ridge and Gorge	Ironstone Ridgetop	Drainage Line	Granite Upland	Calcrete	Spinifex Sandplain	Riverine	Granite Outcrop			
wood sandpiper (*Tringa glareola*)	MI	MI		Species occurs as a non-breeding summer migrant which occurs throughout the region. Occurs mainly in river pools, sewage ponds, flooded claypans, freshwater lagoons and bore overflows (Johnstone *et al.*, 2013). Freshwater wetlands and occasional brackish intertidal mudflats (Geering *et al.*, 2007).	~25 km NE (2005) (DBCA, 2024c)												Highly Unlikely	Occasional visitor	Suitable habitat not present in the Study Area. May visit following significant rainfall events.
REPTILES																			
Pythonidae																			
Pilbara olive python (*Liasis olivaceus barroni*)	VU	VU		Associated with drainage systems, including areas with localised drainage and watercourses (Pearson, 1993). In the inland Pilbara the species is most often encountered near permanent waterholes in rocky ranges or among riverine vegetation (Pearson, 1993).	Within (2023) (DBCA, 2024c)		S		C	S	S				S	S	Confirmed	Resident	The species has previously been recorded on 14 occasions in Rocky Foothill, Rocky Ridge and Gorge, Ironstone Ridgetop, Spinifex Stony Plain, and cave CO-CA- 43 (Biologic, 2021m, 2021o; MWH, 2016a) in the Study Area, as well as eight records 19-60 km from the Study Area. Rocky Ridge and Gorge provide critical breeding, foraging and dispersal habitat, with Ironstone Ridgetop, Drainage Line, Rocky Foothill, Riverine and Granite Outcrop habitats providing supporting foraging and dispersal habitat (the latter two following significant rainfall events only).
Scincidae																			

Species	Conservation Status			Preferred Broad Habitats	Nearest Records to the Study Area	Potential Habitat within the Survey Area										Likelihood of Occurrence	Occurrence	Comments
	EPBC Act	BC Act	DBCA			Stony Rise	Rocky Foothill	Spinifex Stony Plain	Rocky Ridge and Gorge	Ironstone Ridgetop	Drainage Line	Granite Upland	Calcrete	Spinifex Sandplain	Riverine	Granite Outcrop			
great desert skink (*Liopholis kintorei*)	VU	VU		Endemic to the Australian arid zone in the western deserts region, occurs on sand plain and sand dune habitats, often comprising vegetation dominated by hummock grassland (*Triodia basedowii* and *T. schnizii*) and open shrubland (*Eremophila leucophylla* and *Acacia* species) on red sands, occasionally on gravelly undulating plain in some areas (Pearson *et al.*, 2001). Preferred habitat appears to comprise at least 50% bare ground. prefers a mosaic landscape comprising different aged post-fire vegetation regeneration and inhabits sites that have been burnt in the previous three to fifteen years (DoEE, 2018). Regenerating areas are considered to potentially provide ample food while unburnt patches provide shelter (Pearson *et al.*, 2001).	>100 km (DBCA, 2024c)										Highly Unlikely	N/A	Suitable habitat not present in the Study Area.
spotted Ctenotus (*Ctenotus uber johnstonei*)			P2	Within the Pilbara, the taxon is known from *Triodia* on hillslopes, *Acacia xiphophylla* over chenopods, and *Acacia xiphophylla* scattered tall shrubs to high open shrubland (Cogger, 2014).	~13 km S (2014) (Outback Ecology, 2014b)	I	I	I			I				I		Likely	Resident	There are no records of the species in the Study Area, however three records of the spotted Ctenotus have been recorded in in Spinifex Stony Plain and Riverine habitat 13-21 km from the Study Area.
Typhlopidae																		
Pilbara flat-headed blind-snake (*Anilios ganei*)			P1	Little is known of the species' ecology, but it is often associated with moist soils and leaf litter within gorges and gullies (Wilson and Swan 2014), and potentially within a wide range of other stony habitats. The species has been recorded from numerous habitats but is most likely to be present in rocky terrain and along drainage lines (DBCA, 2019).	~32 km SW (Outback Ecology, 2013c)		I		S		I				I		Possible	Resident	The species has been recorded in Spinifex Sandplain habitat approximately 32-42 km from the Study Area, with no records within the Study Area.

5.2.1 Confirmed

5.2.1.1 Ghost bat (*Macroderma gigas*) – Vulnerable (EPBC Act/ BC Act)

Species Profile

The ghost bat occurs in disjunct colonies across northern Australia (TSSC, 2016a). In the Pilbara region, the species occurs in all four subregions. The Pilbara population is estimated to comprise between 1,300 and 2,000 individuals (TSSC, 2016a). The largest population occurs within the Chichester subregion (estimated at approximately 1,500 individuals) where known populations are largely restricted to disused mines (TSSC, 2016a).

The distribution of ghost bats in the Pilbara is determined by the presence of suitable roosting sites. Natural roosts generally comprise deep, complex caves beneath bluffs or low rounded hills (Armstrong & Anstee, 2000). Centralised breeding sites in the Pilbara are largely restricted to abandoned mines in the Chichester Ranges; however, there are also a number of smaller maternity roosts in the Chichester and Hamersley Ranges (Armstrong & Anstee, 2000). Based on available data, breeding has been documented in natural caves at Mining Area C, Mt Brockman and West Angeles in the Hamersley subregion, and at Callawa and Tambrey Station in the Chichester subregion (Armstrong & Anstee, 2000). Ghost bats are known to move between a number of caves seasonally, or as dictated by weather conditions, and require a range of cave sites (Hutson *et al.*, 2001). Outside the breeding season, male bats are known to disperse widely, most likely during the wet season when conditions would allow bats to use caves that would otherwise not be suitable (Worthington-Wilmer *et al.*, 1994). Genetic studies indicate that females are likely to stay close to the maternity roosts (Worthington-Wilmer *et al.*, 1994).

Historically, ghost bats were documented to have a short-range foraging strategy of up to 3 km (average 1.9 km), with vantage points changing approximately every 15 minutes, and average foraging areas of 61 ha having been recorded in the Northern Territory (Tidemann *et al.*, 1985). However, recent studies using VHF tracking and GPS/satellite tracking technologies show that ghost bats, both male and female, forage over much larger areas up to 12 km from their diurnal roost (Augusteyn *et al.*, 2018; Bat Call, 2021a). It also appears that bats generally return to the same area each night (Tidemann *et al.*, 1985), although it has been suggested that ghost bats in the arid zone are semi-transient through most areas and will readily travel large distances (>4 km) (Biologic, 2020c).

Ghost bats have a 'sit and inspect' foraging strategy; whereby they hang on a perch and visually inspect their surroundings for movement. Once their prey is detected it may be captured in the air, gleaned (i.e. taken from the surface of a substrate by a flying bat) from the ground or vegetation, or dropped on from a perch (Boles, 1999). Recent studies at BHP WAIO's South Flank mine have observed a ghost bat exiting a cave and moving immediately

towards broad drainage plains, comprising of Mulga Woodland and Major Drainage Line (Biologic, 2020c). Such areas are often highly productive and comprise an abundance of foraging structures (Biologic, 2020c).

Survey Effort

Ghost bat has been targeted in 12 surveys across the Study Area since 2013 and within the vicinity of the Study Area since 2010 in a further 31 surveys (Appendix A). Sampling effort has included targeted searches for direct or secondary evidence in suitable habitat, annual monitoring, camera traps, ultrasonic recorders, cave and habitat assessments, cave microclimate recording, scat monitoring, hormone analysis, mist and harp trapping, VHF tagging, DNA collection and opportunistic observations.

Previous Records

Ghost bats have been commonly recorded within the vicinity of the Study Area since 2014, with the species first detected in the Study Area in 1955 (Biologic, 2019a, 2021a, 2021b, 2021m, 2022d, 2023j; DBCA, 2024c; MWH, 2018a, 2018b) (Table 5.3; Figure 3.1; Appendix A). The species has been subject to annual monitoring at 18 caves within the Study Area and one cave (Lalla Rookh) outside the Study Area since 2017, in accordance with Atlas' SSMP (Atlas Iron, 2017, 2023).

Of the 43 known caves within the Study Area, the species have been recorded at 28 caves in Rocky Ridge and Gorge, Ironstone Ridgetop, Rocky Foothill and Stony Rise habitat (Appendix A; Figure 3.1) The species has also been recorded at caves within 54 km of the Study Area, primarily during surveys and monitoring programs relating to mining operations (including Atlas' Miralga Creek, M^{c}Phee Creek and Mt Webber Projects and Calidus Resources' Warrawoona Gold Project) unrelated to the Sanjiv Ridge Project (Appendix A).

Table 5.3: Summary of ghost bat records within the Study Area

Author/ Custodian	Survey Title	Record
Biologic (2019a)	Corunna Downs Project: Pilbara leaf-nosed bat and ghost bat monitoring survey 2018	Detected via direct observation and/or secondary evidence (ultrasonic recording, scats) at one cave
Biologic (2021a)	Corunna Downs Project: Pilbara leaf-nosed bat and ghost bat monitoring survey 2019	Detected via direct observation and/or secondary evidence (ultrasonic recording, scats) at four caves
Biologic (2021b)	Corunna Downs Project: Pilbara leaf-nosed bat and ghost bat monitoring survey 2020	Detected via direct observation and/or secondary evidence (ultrasonic recording, scats) at three caves
Biologic (2021l)	Sanjiv Ridge Stage 2 Development Area: consolidated terrestrial fauna report	Detected via direct observation and/or secondary evidence (ultrasonic recording, scats) at eight caves

Author/ Custodian	Survey Title	Record
Biologic (2021m)	Sanjiv Ridge Stage 2: ghost bat and Pilbara leaf-nosed bat monitoring and regional survey	Detected via direct observation and/or secondary evidence (ultrasonic recording, scats) at 14 caves
Biologic (2022f)	Sanjiv Ridge Project: long term ghost bat monitoring survey 2021-2022	Detected via direct observation and/or secondary evidence (ultrasonic recording, scats) at seven caves
Biologic (2022f)	Sanjiv Ridge Project: Pilbara leaf-nosed bat monitoring 2021-2022	Detected via secondary evidence (ultrasonic recording) at one cave (CO-CA-01)
DBCA (2024c)	DBCA threatened and priority fauna database	First detected in 1955. Within the past 50 years there have been 580 records via direct observation and/or secondary evidence (ultrasonic recording, scats) in numerous caves
MWH (2018a)	Corunna Downs Project: Pilbara leaf-nosed bat and ghost bat baseline monitoring survey	Detected via direct observation and/or secondary evidence (ultrasonic recording, scats) at four caves
Outback Ecology (2014a)	Corunna Downs Project: terrestrial vertebrate fauna baseline assessment.	Detected via direct observation at one cave
Biologic (2023k)	Sanjiv Ridge 2022 ghost bat monitoring survey	Detected via direct observation and/or secondary evidence (ultrasonic recording, scats) at 12 caves
Biologic (2023h)	Sanjiv Ridge 2022 Pilbara leaf-nosed bat monitoring survey	Detected via secondary evidence (scat) at two caves
Biologic (2024b)	Sanjiv Ridge and McPhee Creek regional ghost bat survey	Detected via direct observation at one cave
MWH (2016a), MWH (2018b)	Corunna Downs Project: terrestrial vertebrate fauna survey	Detected via direct observation and/or secondary evidence (ultrasonic recording, scats) at six caves and opportunistically.

Discussion

Overall, the combined results from the baseline, targeted, detailed and monitoring surveys confirm the ghost bat, and its roosts, are regularly recorded both within and outside the Study Area. The colony of ghost bat using caves and habitats within the Study Area contributes to the larger Pilbara species population (Appendix A).

Critical habitat for the ghost bat includes category 1, 2 and 3 caves (where adjacent to category 1 and 2 caves), as well as suitable foraging and dispersal habitat within 12 km of critical roost caves. Of the 43 caves known within the Study Area, 40 have been classified as category 2-4 ghost bat roosts, with no category 1 roosts present (Appendix A; Appendix B). A recent regional ghost bat survey of Sanjiv Ridge and nearby M^{c}Phee Creek was undertaken that describes recent categorisation and usage of caves in greater detail (Biologic, 2024b).

All nine of the category 2 roosts present in the Study Area and category 2 roosts in the vicinity of the Study Area, have consistently recorded ghost bat activity over time (Figure 3.1). Of

these, four caves within the Study Area are considered potential maternity roosts due to the presence of pregnant females, indicated from hormone scat analysis (Biologic, 2021m) (Appendix B). All category 2 caves are described as critical to the persistence of the regional population, considered an 'important population' in accordance with relevant guidance (Bat Call, 2021a; DoE, 2013a). The habitats that these critical caves are located within (and up to 12 km surrounding the caves) are also considered critical foraging and dispersal habitat for the species, and include Rocky Ridge and Gorge, Ironstone Ridgetop and Rocky Foothill habitat. Six additional habitats, Stony Rise, Spinifex Stony Plain, Drainage Line, Spinifex Sandplain, Riverine and Calcrete provide critical dispersal and/or foraging habitat for the species, where located within 12 km from critical roosting habitat (Table 5.1; Table 5.2). Granite Outcrop and Granite Upland do not provide suitable roosting, foraging or dispersal habitat for the species.

The remaining 34 caves located within Rocky Ridge and Gorge, Ironstone Ridgetop, Rocky Foothill and Stony Rise habitat within the Study Area are not considered critical roosting habitat. Twenty-one of these caves provide supporting roosting habitat and include six category 3 diurnal roosts (not critical as not nearby category 1 and 2 caves) and 15 category 4 nocturnal roosts (of which five are potential diurnal roosts due to cave characteristics and usage). An additional 10 caves are considered to potentially provide supporting roosting habitat as potential category 4 roosts, while the remaining three caves are without a roost classification and therefore provide neither critical nor supporting ghost bat roosting habitat.

Rocky Ridge and Gorge, Ironstone Ridgetop, Rocky Foothill and Stony Rise habitat within the Study Area provide supporting roosting habitat for the ghost bat. All habitats, with the exception of Granite Upland and Granite Outcrop habitats, provide supporting dispersal and/or foraging habitat, where located within 12 km of supporting roosting habitat. The prevalence of caves suitable for roosting by ghost bats, along with suitable foraging habitat in the Study Area and extending into the surrounding region, allows for the movement of the species through the landscape.

The species occurrence within the Study Area represents part of an important population and the species is likely to be reliant upon critical roosting, foraging and dispersal habitat within the Study Area for the long-term persistence of the species at a local and regional scale.

5.2.1.2 Pilbara leaf-nosed bat (*Rhinonicteris aurantius* 'Pilbara form') – Vulnerable (EPBC Act/ BC Act)

Species Profile

Within the Pilbara, the Pilbara leaf-nosed bat is recognised as a geographically isolated population (or form) of the orange leaf-nosed bat, distributed across northern Australia and separated from the Pilbara population by approximately 400 km of the Great Sandy Desert

(Armstrong, 2001). The Pilbara population is regarded as representing a single interbreeding population comprising multiple colonies (TSSC, 2016b; Umbrello *et al.*, 2022). Currently, there are 48 confirmed permanent diurnal categories 1 and 2 roost sites (17 of known location and 31 yet to be found) throughout the Pilbara region (Bat Call, 2021b).

Pilbara leaf-nosed bats typically roost in undisturbed caves, deep fissures or abandoned mine shafts (Armstrong, 2000, 2001). The species' limited ability to conserve heat and water (Baudinette *et al.*, 2000) means they require warm (28–32°C) and very humid (85–100%) roost sites to persist in arid and semi-arid climates (Armstrong, 2001; Churchill, 1991). Roost sites with such attributes are relatively uncommon in the Pilbara and the limiting factor of the species' distribution (Armstrong, 2001). During the dry season (June to November), individuals are believed to aggregate in roosts that provide a suitably warm, humid microclimate (Armstrong, 2000, 2001; Bullen & McKenzie, 2011). While in the wet season (December to May), when conditions are generally wetter and more humid, individuals typically disperse roosting in seasonally suitable features (Armstrong, 2000, 2001; Bullen & McKenzie, 2011).

Foraging sites surrounding known or suspected roosts can be critical to the survival of the species as the species forages within the vicinity of roost caves and more broadly along waterbodies with suitable fringing vegetation supporting prey species (TSSC, 2016b). The species is predicted to travel up to 20 km from roost caves during nightly foraging (Cramer *et al.*, 2016a) in the dry season and up to 50 km during the wet season (Bullen, 2013).

Survey Effort

Pilbara leaf-nosed bat has been targeted in 14 surveys across the Study Area since 2013 and within the vicinity of the Study Area since 2010 in 29 surveys (Appendix A). Sampling effort has included targeted searches for direct or secondary evidence in suitable habitat, annual monitoring, camera traps, ultrasonic recorders, cave and habitat assessments, cave microclimate recording, mist and harp trapping, VHF tagging, DNA collection and opportunistic observations.

Previous Records

Pilbara leaf-nosed bats have commonly been recorded within the vicinity of the Study Area since 2014 (Biologic, 2019a, 2021a, 2021b, 2021m, 2022d, 2023j; DBCA, 2024c; MWH, 2018a, 2018b) (Table 5.4; Figure 3.1; Appendix A). The species has been subject to annual monitoring at eight sites (caves and water features) within the Study Area and three sites (Lalla Rookh, Mt Webber and CO-CA-18) outside the Study Area since 2017, in accordance with Atlas' SSMP (Atlas Iron, 2017, 2023). Of the known 43 caves and 40 water features within the Study Area, the species have previously been recorded at 20 caves and 10 water features in Rocky Ridge and Gorge, Ironstone Ridgetop, Rocky Foothill and Drainage Line habitats (Figure 3.1;

Appendix B; Appendix C). The species has been recorded outside the Study Area, primarily as part of survey and monitoring programs for mining operations (including Altas' Miralga Creek, M^{c}Phee Creek and Mt Webber Projects and Calidus Resources' Warrawoona Gold Project) unrelated to the Sanjiv Ridge Project (Figure 3.1; Appendix A).

Table 5.4: Summary of Pilbara leaf-nosed bat records within the Study Area

Author/ Custodian	Survey Title	Record
Bat Call (2018)	Corunna Downs cave CO-CA-03 Pilbara leaf-nosed bat roost census, November 2017	Detected via secondary evidence (ultrasonic recording) at one cave
Biologic (2020b)	Corunna Downs Project: Pilbara leaf-nosed bat roost analysis	Detected via secondary evidence (ultrasonic recording) at CO-CA-01 and CO-CA-03
Biologic (2019a)	Corunna Downs Project: Pilbara leaf-nosed bat and ghost bat monitoring survey 2018	Detected via secondary evidence (ultrasonic recording) at eight monitoring sites, including four caves and four water features
Biologic (2021a)	Corunna Downs Project: Pilbara leaf-nosed bat and ghost bat monitoring survey 2019	Detected via secondary evidence (ultrasonic recording) at eight monitoring sites, including four caves and four water features
Biologic (2021b)	Corunna Downs Project: Pilbara leaf-nosed bat and ghost bat monitoring survey 2020	Detected via secondary evidence (ultrasonic recording) at eight monitoring sites, including four caves and four water features
Biologic (2021l)	Sanjiv Ridge Stage 2 Development Area: consolidated terrestrial fauna report	Detected via secondary evidence (ultrasonic recording) at seven sites, including five caves, one general foraging habitat site and one water feature
Biologic (2021m)	Sanjiv Ridge Stage 2: ghost bat and Pilbara leaf-nosed bat monitoring and regional survey	Detected via secondary evidence (ultrasonic recording) at 13 caves
Biologic (2022f)	Sanjiv Ridge Project: Pilbara leaf-nosed bat monitoring 2021-2022	Detected via secondary evidence (ultrasonic recording) at two caves
Biologic (2023k)	Sanjiv Ridge 2022 ghost bat monitoring survey	Detected via direct observation and/or secondary evidence (ultrasonic recording, scats) at seven caves
Biologic (2023h)	Sanjiv Ridge 2022 Pilbara leaf-nosed bat monitoring survey	Detected via secondary evidence (ultrasonic recording) at eight monitoring sites, including four caves and four water features
DBCA (2024c)	DBCA threatened and priority fauna database	Within the past 50 years there have been 903 records via direct observation and/or secondary evidence (ultrasonic recording, scats) in numerous caves, water features and sampling sites
MWH (2018a)	Corunna Downs Project: Pilbara leaf-nosed bat and ghost bat baseline monitoring survey	Detected via direct observation and/or secondary evidence (ultrasonic recording, scats) at eight monitoring sites including four caves and four water features
MWH (2016a), MWH (2018b)	Corunna Downs Project: terrestrial vertebrate fauna survey	Detected via direct observation and/or secondary evidence (ultrasonic recording, scats) at 15 caves, seven water features and 13 other sites

Author/ Custodian	Survey Title	Record
Outback Ecology (2014a)	Corunna Downs Project: terrestrial vertebrate fauna baseline assessment	Detected via direct observation and/or secondary evidence (ultrasonic recording, scats) at six caves

Discussion

Overall, the combined results from the baseline, targeted, detailed and monitoring surveys confirm the presence of Pilbara leaf-nosed bats and its roosts within the Study Area. The species are regularly observed within the Study Area at caves and water features. Individuals that utilise the habitats within the Study Area and immediate surrounds contribute to the larger regional Pilbara 'important' population of Pilbara leaf-nosed bats (Figure 3.1; Appendix A).

Habitat critical to the survival of the Pilbara leaf-nosed bat include category 1, 2 and 3 caves, as well as suitable foraging and dispersal habitat proximal (within 20 km) to critical roost caves. Of the 43 caves within the Study Area, 30 have been classified as category 1-4 Pilbara leaf-nosed roosts, including one category 1 (CO-CA-01), one category 2 (CO-CA-03) and two category 3 (CO-CA-04 and CO-CA-05) caves in Rocky Ridge and Gorge, Ironstone Ridgetop and Rocky Foothill habitats. All habitats in the Study Area where within 20 km of these critical roosts provide critical foraging and dispersal habitat for the species. Critical roosting habitat is also located within the vicinity of the Study Area, with regular records of the species at two category 1 caves, 45 km and 54 km from the Study Area (Mt Webber and Lalla Rookh, respectively).

Sixteen category 4 caves and nine potential category 4 caves are located in Rocky Ridge and Gorge, Ironstone Ridgetop, Rocky Foothill and Stony Rise habitats within the Study Area (Bat Call, 2021b) and these provide supporting roosting habitat for the Pilbara leaf-nosed bat..

Water features are often considered critical habitat for the species as they provide suitable foraging habitat and allow for dispersal, particularly along drainage lines. Pilbara leaf-nosed bats have been regularly recorded at up to 10 water features (ranging from permanent to temporarily persisting) within the Study Area, demonstrating they provide critical or supporting habitat for the species, where proximal to roosting caves.

The species occurrence within the Study Area represents part of an important population (wider Pilbara population) and the species is likely to be reliant upon roosting, foraging and dispersal habitat within the Study Area for the long-term persistence of the species at a local and regional scale.

5.2.1.3 Northern quoll (*Dasyurus hallucatus*) – Endangered (EPBC/ BC Act)

Species Profile

The northern quoll was once widely distributed across northern Australia, however, it is now restricted to three isolated populations; the Pilbara, the Kimberley and Northern Territory, and Queensland (DoE, 2016). Northern quolls are opportunistic omnivores, consuming a wide range of invertebrates and small vertebrates also in addition to fruit, nectar, carrion and human refuse (Dunlop *et al.*, 2017).

As a result of facultative die-off, the abundance of the species is cyclical, and the annual reproduction is highly synchronised (Oakwood *et al.*, 2001). In the Pilbara, abundance is lowest toward the end of winter into early spring after the mating season, as a significant proportion of adult males die off and young have not yet begun to forage independently (Braithwaite & Griffiths, 1994; Oakwood, 2000). Conversely, the population density is thought to be highest in the summer months, prior to the mating season and when juveniles have begun foraging independently (Oakwood, 2000). Schmitt *et al.* (1989) reported relatively small home ranges in rugged habitat in the Kimberley (i.e. 2.3 ha for females and 1.8 ha for males), whereas in the western Pilbara, minimum activity areas (often used as an estimator of home range) are 75–443 ha for females and 5–1,109 ha for males (King, 1989). It should be noted here though that the method used to calculate minimum activity areas in this latter study can potentially overestimate home ranges (Burgman & Fox, 2003).

The northern quoll is both arboreal and terrestrial, inhabiting ironstone and sandstone ridges, scree slopes, granite boulders and outcrops, drainage lines, riverine habitats (Braithwaite & Griffiths, 1994; Oakwood, 2002), dissected rocky escarpments, open forest of lowland savannah and woodland (Oakwood, 2002, 2008). Rocky habitats tend to support higher densities, as they offer protection from predators and are generally more productive in terms of availability of resources (Braithwaite & Griffiths, 1994; Oakwood, 2000). Other microhabitat features important to the species include rock cover, proximity to permanent water, and time-since last fire (Woinarski *et al.*, 2008). Dens occur in a wide range of habitat features, including rock overhangs, tree hollows, hollow logs, termite mounds, goanna burrows and human dwellings/infrastructure, where individuals usually den alone (Oakwood, 2002; Woinarski *et al.*, 2008). At present, northern quolls are relatively common in the northern Pilbara region (generally within 150 km of the coast) but are much less common in southern and south-eastern parts of the region (Cramer *et al.*, 2016b).

The species has experienced a precipitous decline in much of its former range in northern Queensland and the Northern Territory in direct association with the spread of the cane toad, *Rinella marina* (Braithwaite & Griffiths, 1994; Fitzsimons *et al.*, 2010). Other threats include predation from feral predators such as foxes and cats, inappropriate fire regimes, disease, habitat degradation through grazing and weed invasion, habitat destruction through

mining and agriculture (Woinarski *et al.*, 2011). The potential invasion of the Pilbara by the cane toad is regarded as the most significant future threat to the northern quoll in the Pilbara; however, there is little knowledge of the relative impact of the other key threats, and their interactive effects, currently and in the future (Cramer *et al.*, 2016b).

Survey Effort

Northern quoll has been targeted in 10 surveys across the Study Area since 2013 and within the vicinity of the Study Area since 2010 in 29 surveys (Appendix A). Sampling effort has included targeted searches for direct or secondary evidence in suitable habitat, annual monitoring, camera traps, habitat assessments and opportunistic observations.

Previous Records

Northern quoll has been regularly recorded within the vicinity of the Study Area (within 42 km) since 2014 (Biologic, 2019b, 2019c, 2021c, 2021d, 2021o, 2023i, 2024c; DBCA, 2024c) (Table 5.5; Figure 3.1; Appendix A). As part of the Sanjiv Ridge Project, the species has been subject to annual monitoring at up to nine sites (including two water features CO-WS-01 and CO-WS-08) within the Study Area since 2017, in accordance with Atlas' SSMP (Atlas Iron, 2017, 2023). The species has been recorded within Stony Rise, Spinifex Stony Plain, Rocky Ridge and Gorge, Drainage Line, Ironstone Ridgetop and Riverine habitats in the Study Area. This also includes four caves (CO-CA-24, CO-CA-30, CO-CA-33 and CO-CA-38) and three water features (two permanent [CO-WS-01 and CO-WS-16] and one semi-permanent [CO-WS-08]) (Appendix B; Appendix C).

The northern quoll has commonly been recorded outside the Study Area, through targeted surveys and monitoring programs for mining operations (including Altas' Miralga Creek, M^{c}Phee Creek and Mt Webber Projects and Calidus Resources' Warrawoona Gold Project) unrelated to the Sanjiv Ridge Project (Figure 3.1; Appendix A).

Table 5.5: Summary of northern quoll records within the Study Area

Author/ Custodian	Survey Title	Record
Biologic (2021d)	Corunna Downs Project northern quoll monitoring 2021	44 individuals detected via camera trap at seven of the eight monitoring sites in Rocky Ridge and Gorge, Drainage Line and Rocky Foothill habitat
Biologic (2021l)	Sanjiv Ridge Stage 2 Development Area: consolidated terrestrial fauna report	Detected at one location via secondary evidence (scat) within Rocky Ridge and Gorge habitats
Biologic (2021m)	Sanjiv Ridge Stage 2: ghost bat and Pilbara leaf-nosed bat monitoring and regional survey	Detected at four locations via secondary evidence (scat)
Outback Ecology (2014a)	Corunna Downs Project: terrestrial vertebrate fauna baseline assessment	Four records via direct observation and/or secondary (scats) in Rocky Ridge

Author/ Custodian	Survey Title	Record
		and Gorge and Ironstone Ridgetop habitats
Biologic (2019b)	Corunna Downs Project northern quoll monitoring 2018	14-19 individuals detected via camera trap at seven of the eight monitoring sites in Rocky Ridge and Gorge, Drainage Line and Rocky Foothill habitats
Biologic (2019c)	Corunna Downs Project northern quoll monitoring 2019	41 individuals detected via camera trap and secondary evidence (scats and tracks) at all eight monitoring sites in Rocky Ridge and Gorge, Drainage Line, Riverine and Rocky Foothill habitats
Biologic (2021c)	Corunna Downs Project northern quoll monitoring 2020	39-42 individuals detected via camera trap and secondary evidence (scats) at seven of the eight monitoring sites in Rocky Ridge and Gorge, Drainage Line and Rocky Foothill habitats
Biologic (2023i)	Sanjiv Ridge 2022 northern quoll monitoring survey	34 individuals detected via camera trap and secondary evidence (scats) at eight of the nine monitoring sites in Rocky Ridge and Gorge, Riverine, Drainage Line and Rocky Foothill habitats
DBCA (2024c)	DBCA threatened and priority fauna database	Within the past 50 years there have been 297 records via direct observation and/or secondary evidence (scats) in numerous caves, water features, sampling sites and opportunistically
MWH (2016a), MWH (2018b)	Corunna Downs Project: terrestrial vertebrate fauna survey	38 records via direct observation and secondary evidence (scats) in Ironstone Ridgetop, Ricky Ridge and Gorge, Rocky Foothill, Spinifex Stony Plain, Riverine and Drainage Line habitats

Discussion

The ongoing presence of northern quoll within the Study Area is confirmed from the combined results from previous baseline, targeted, detailed and monitoring surveys (Figure 3.1; Appendix A). Rocky Ridge and Gorge, Rocky Foothill, Ironstone Ridgetop, Drainage Line, Riverine and Granite Outcrop habitats are considered critical habitat for northern quoll, as they provide necessary habitat for breeding, denning, and/or foraging and dispersal.

Critical foraging and dispersal habitat is defined as vegetated land occurring adjacent to (within 1 km) and connecting nearby important breeding and denning habitat (DoE, 2016). Drainage Line and Riverine habitats are likely to provide critical foraging and dispersal habitat, but only where located within 1 km of critical denning habitat. The species has previously been recorded within each of these six habitats, confirming their importance in

the Study Area and that the northern quoll utilises a variety of habitats to forage and reach critical shelter and denning habitat across the Study Area. It is likely that other habitats within the Study Area (e.g. species has also been previously recorded in Spinifex Stony Plain habitat) provide supporting foraging and/or dispersal habitat for the species. Northern quoll are known to have relatively larger home ranges in the Pilbara than other regions (King, 1989), presumably related to the limited availability of suitable shelter, denning and foraging resources.

Occurrence of the northern quoll within the Study Area represents a population that is important for the long-term survival of the species, as defined in DoE (2016). The species is likely to be reliant upon the refuge rich habitats within the Study Area, particularly Rocky Ridge and Gorge (although widespread through the region, it is of high quality in the Study Area), Rocky Foothill and Granite Outcrop habitats. These critical habitats, along with critical foraging and dispersal habitat within 1 km, are required for the long-term persistence of the species at a local and regional scale.

5.2.1.4 Greater bilby (*Macrotis lagotis*) – Vulnerable EPBC Act & BC Act

Species Profile

The greater bilby is semi-fossorial and nocturnal, remaining in their burrows during the day and intermittently during the night for rest and refuge. Greater bilby populations naturally occur as scattered solitary individuals or small groups (Smythe & Philpott, 1968; Southgate, 1990a). They are regarded as having low site fidelity and high mobility (Southgate et al., 2007); males regularly move 3-5 km between burrows on consecutive days and have been recorded moving up to 15 km in a few weeks (Southgate & Possingham, 1995). This high mobility, together with low population density, ensures that the area of occupancy is often far less than the extent of occurrence. As greater bilbies are solitary in nature, lack territoriality and have large home ranges, it is likely that males adopt a roving strategy to find receptive females, consistent with an overlapping promiscuous mating system (Miller et al., 2010), and may move in response to foraging potential (Southgate, 1990a; Southgate *et al.*, 2019).

Populations of greater bilby exist in the Pilbara bioregion (particularly within the Chichester subregion, along the Fortescue River and north-east to Goldsworthy and Shay Gap), in the Dampier bioregion (along 80 Mile Beach north to Beagle Bay) and in the Central Kimberley and Ord-Victoria Plains bioregions south of the Fitzroy and Margaret Rivers (Southgate, 1990a). The species' distribution within the Pilbara region is highly fragmented (Cramer et al., 2017).

Greater bilbies occupy 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 (Southgate, 1990b). Laterite and rock feature substrates are an

important part of their habitat as they support shrub species, such as *Acacia kempeana*, *A. hilliana* and *A. rhodophylla*, which have root-dwelling larvae prone that support a constant food source (Dziminski & Carpenter, 2017; Southgate et al., 2007). These habitats also contain spinifex hummocks, which are quite uniform and discrete, providing runways between hummocks and enabling easier movement and foraging (Southgate et al., 2007). Minimal ground cover is a common feature in greater bilby habitats, as it allows easy foraging (Dawson et al., 2018). Habitat within the Pilbara bioregion seems to consist mostly of spinifex sand plain associated with major drainage line sandy terraces. In general, the distribution of greater bilbies can be limited by the availability of suitable burrowing habitat, such as dunes where burrow excavation is easier (Moseby & O'Donnell, 2003), and are not found in predominantly rocky areas or mountains where they would be unable to dig suitable burrow systems or dig for food.

Greater bilby can forage broadly across habitats and can be highly mobile in response to resource availability, particularly in response to fire and post-fire regeneration (Southgate *et al.*, 2007). Fire has been identified as an important process in the species ecology and occurrence, particularly due to many plant species that make up the species' diet or host prey species are fire-germinated species (Southgate, 1990b; Southgate & Carthew, 2007; Southgate & Carthew, 2006; Southgate *et al.*, 2007). As such, the species is known to utilise mosaic habitats comprising unburnt areas and areas at various stages of post-fire regeneration, often primarily utilising unburnt areas but venturing into burnt areas during foraging and dispersal movements (Southgate & Carthew, 2007; Southgate & Carthew, 2006; Southgate *et al.*, 2007). The utilisation of burnt areas however is often associated with post-fire regeneration of vegetation, which is heavily dependent on rainfall events to occur successfully (Southgate & Carthew, 2007). As rainfall throughout a large portion of the species distribution is relatively inconsistent and often associated with cyclonic activity to the north and northwest, the occurrence of rainfall, and therefore timeframes during which habitat utilisation is likely to occur on a regular basis, can be difficult to ascertain.

Survey Effort

Greater bilby has been targeted in five baseline and detailed surveys across the Study Area since 2013 and 11 targeted, baseline and detailed surveys within the vicinity of the Study Area since 2010 (Appendix A). Sampling effort has included targeted searches for direct or secondary evidence in suitable habitat, camera traps, habitat assessments and opportunistic observations.

Previous Records

The greater bilby has commonly been recorded within the vicinity of the Study Area on at least 169 occasions within 50 km in the previous 50 years (DBCA, 2024c; MWH, 2014a, 2014b;

Outback Ecology, 2013a, 2013c, 2014b)(Table 5.6; Figure 3.1; Appendix A). There is one record within the Study Area, a dead individual observed on the Camp Access road in 2021 (DBCA, 2024c) (Table 5.6). Three records of the species occur within 15 km (1984-1985), 135 records between 15-30 km (1977-2022) and at least 34 records between 30-42 km (1984-2023) of the Study Area.

Table 5.6: Summary of greater bilby records within the Study Area

Author/ Custodian	Survey Title	Record
DBCA (2024c)	DBCA threatened and priority fauna database	One dead individual recorded in 2021 on Camp Access Rd in Spinifex Sandplain habitat

Discussion

The single greater bilby record within the Study Area was observed in Spinifex Sandplain habitat, which represents critical breeding, foraging and dispersal habitat for the species (Table 5.1; Table 5.2). Riverine and Drainage Line habitats within the Study Area provide supporting breeding, foraging and dispersal habitat for the species.

The low number of greater bilby records within the Study Area indicates the species is likely present in low numbers in the Study Area. This is due to the limited availability of suitable burrowing habitat such as that present within Spinifex Sandplain, Riverine and Drainage Line habitats. However, the low number of records within the Study Area may also be in response to the lack of targeted sampling effort for the greater bilby within the Study Area. DBCA (2017) recommend linear (transect) searches and/or 2 ha plots be undertaken in order to confidently detect the species, which have not been undertaken within the Study Area. Therefore, it is possible the species occurs with greater frequency than indicated by previous surveys in the Study Area.

The species is known to forage across vast distances in response to environmental conditions and the species has also been recorded in Spinifex Sandplain habitat in the vicinity of the Study Area. This includes 11 records of the species via secondary evidence (i.e. scats, tracks and burrows) recorded by Outback Ecology (2014b) ~42 km to the southeast of the Study Area. As the species is known to be rare in its distribution (van Dyck & Strahan, 2008), it is not unexpected that there be low numbers of individuals in the greater bilby population in the Pilbara.

Based on previous records and the ecology of the greater bilby, the species occurrence within the Study Area is unlikely to represent an important population. The species is not likely to be reliant upon the Study Area, or habitat within, for the long-term persistence of the species at a local or regional scale.

5.2.1.5 Pilbara olive python (*Liasis olivaceus barroni*) – Vulnerable (EPBC/ BC Act)

Species Profile

The Pilbara olive python is Western Australia's largest snake, averaging 2.5 metres (m), with records up to 4.5 m (Bush & Maryan, 2011; Cogger, 2014). The species has a dull olive-brown upper surface and is pale cream below (Burbidge, 2004; Cogger, 2014). This species is endemic to the Pilbara and northern parts of the Gascoyne bioregions, distributed from Burrup Peninsula, Ord Ranges and Meentheena south to Nanutarra and Newman in the Pilbara, with an isolated population occurring at Mt Augustus in the Gascoyne region (Bush & Maryan, 2011; Storr *et al.*, 2002).

This species is primarily nocturnal and tends to shelter amongst rocky habitats, in small caves or under vegetation during the day. During summer months they will emerge from daytime shelters soon after dark and continue to move until the early hours of the morning (DSEWPaC, 2011). In the winter months, the species is primarily nocturnal, although adult pythons can sometimes be found basking in the morning sun (DSEWPaC, 2011). The breeding season of the Pilbara olive python takes place in the cooler months, which extends from June to August and males will travel up three kilometres in search of a mate (DSEWPaC, 2011). The species is a well-adapted opportunistic ambush predator and common prey items include rock-wallabies, small euros, fruit bats, waterbirds, doves/pigeons and is also likely to include instances of northern quoll and other small mammals (Ellis, 2013; Ellis & Johnstone, 2016; Pearson, 2007; Pearson, 2003; TSSC, 2008).

The species commonly inhabits moist areas such as gorges, rivers, pools and surrounding hills, but can be found in a range of habitats (Burbidge, 2004; DSEWPaC, 2011). In the Hamersley region, the Pilbara olive python is most often encountered in the vicinity of permanent waterholes in rocky ranges or among riverine vegetation (DSEWPaC, 2011; Pearson, 1993). The species is likely to be attracted to these areas due to the productivity and abundance of suitably-sized prey (Pearson, 2003).

Survey Effort

Pilbara olive python has been targeted in five baseline and detailed surveys across the Study Area since 2013 and nine targeted, baseline and detailed surveys within the vicinity of the Study Area since 2010 (Appendix A). Sampling effort has included targeted nocturnal and diurnal searches for direct or secondary evidence in suitable habitat, camera traps, habitat assessments and opportunistic observations.

Previous Records

The Pilbara olive python has been previously recorded on 22 occasions within the vicinity of the Study Area, in a variety of habitats including caves and water features (Biologic, 2019b, 2019f, 2021d, 2021e, 2021f, 2021m; DBCA, 2024c; MWH, 2016a, 2018b; Outback Ecology, 2013c,

2013d, 2014a, 2014b) (Table 5.7; Figure 3.1; Appendix A). This includes 14 records in Drainage Line, Rocky Foothill, Rocky Ridge and Gorge, Ironstone Ridgetop and Spinifex Stony Plain habitats within the Study Area. There are eight records outside the Study Area, with one record within a cave immediately adjacent to the Study Area (75 m west) (Biologic, 2021m) and the remaining seven records occurring between 19-60 km from the Study Area.

Table 5.7: Summary of Pilbara olive python records within the Study Area

Author/ Custodian	Survey Title	Record
Biologic (2021d)	Corunna Downs Project northern quoll monitoring 2021	One record via direct observation within Rocky Ridge and Gorge habitat
Biologic (2021m)	Sanjiv Ridge Stage 2: ghost bat and Pilbara leaf-nosed bat monitoring and regional survey	One record via direct observation within cave CO-CA-43
Biologic (2019b)	Corunna Downs Project northern quoll monitoring 2018	Two records via direct observation at one cave and one water feature
Biologic (2021c)	Corunna Downs Project northern quoll monitoring 2020	One record via direct observation within Rocky Ridge and Gorge
DBCA (2024c)	DBCA threatened and priority fauna database	Five records via direct observation (dead and live individuals) between 2010-2023
MWH (2016a), MWH (2018b)	Corunna Downs Project: terrestrial vertebrate fauna survey	Four records via direct observation and/or secondary evidence (skin slough) in Rocky Ridge and Gorge, Ironstone Ridgetop and Drainage Line habitats
Outback Ecology (2014a)	Corunna Downs Project: terrestrial vertebrate fauna baseline assessment	Two records via direct observation in Rocky Ridge and Gorge and Ironstone Ridgetop habitats

Discussion

Overall, the combined results from the baseline, targeted, detailed and monitoring surveys confirm the presence of Pilbara olive python within the Study Area. The species have been recorded in the critical breeding, foraging and dispersal Rocky Ridge and Gorge habitat, along with supporting foraging and dispersal Rocky Foothill, Ironstone Ridgetop and Drainage Line habitats, often in association with caves and water features. Granite Outcrop and Riverine habitats also provide supporting foraging and dispersal habitat following significant rainfall events. Where the species has been recorded within other habitats in the Study Area (e.g. Spinifex Stony Plain), they are likely utilising this habitat to disperse to critical or supporting breeding, foraging and dispersal habitat within the Study Area. The species occurrence within the Study Area is unlikely to represent an important population, however the species is likely to be reliant upon critical habitat present within the Study Area, particularly the high quality Rocky Ridge and Gorge habitat, for the long-term persistence of the species at a local, but not regional, scale.

5.2.1.6 Peregrine falcon (*Falco peregrinus*) – Specially Protected (BC Act)

Species Profile

The peregrine falcon is a medium-sized raptor found throughout Australia. It preys almost entirely on birds, but will occasionally take small reptiles, mammals (Olsen et al., 2008) or insects (BirdLife Australia, 2012). Suitable habitat includes cliffs, gorges, and timbered watercourses or in association with rivers, wetlands, plains, open woodlands, pylons, spires and buildings (Pizzey & Knight, 2007). Preferred nesting sites are on tall cliffs, although they may occasionally use tall trees along drainage lines and abandoned nests of other large bird species (Olsen & Olsen, 1989).

Survey Effort

Peregrine falcon has been targeted in five baseline and detailed surveys across the Study Area since 2013 and six baseline and detailed surveys within the vicinity of the Study Area since 2010 (Appendix A). Sampling effort has included avifauna census for direct or secondary evidence in suitable habitat, habitat assessments and opportunistic observations.

Previous Records

The peregrine falcon has been recorded previously on seven occasions in the vicinity of the Study Area between 2001 and 2020, including three records in Rocky Ridge and Gorge and Spinifex Stony Plain habitats within the Study Area (Biologic, 2019c, 2020f; DBCA, 2024c; MWH, 2014e, 2016a, 2018b; Outback Ecology, 2014a) (Table 5.8; Figure 3.1; Appendix A). The remaining records occur between 5-43 km from the Study Area.

Table 5.8: Summary of peregrine falcon records within the Study Area

Author/ Custodian	Survey Title	Record
Biologic (2019c)	Corunna Downs Project northern quoll monitoring 2019	One record via direct observation in Spinifex Stony Plain habitat
MWH (2016a), MWH (2018b)	Corunna Downs Project: terrestrial vertebrate fauna Survey	One record via direct observation in Rocky Ridge and Gorge habitat
Outback Ecology (2014a)	Corunna Downs Project: terrestrial vertebrate fauna baseline assessment.	One record via direct observation in Rocky Ridge and Gorge habitat

Discussion

The species has been recorded on three separate occasions in Rocky Ridge and Gorge and Spinifex Stony Plain habitats within the Study Area. The Rocky Ridge and Gorge, Granite Outcrop and Drainage Line habitats provide potentially important nesting, foraging and dispersal habitat for the species, where tall cliffs or large trees are present, and particularly areas in association with major watercourses.

Most other habitat types within the Study Area are also likely to be important for foraging and dispersal to varying extents, particularly Stony Rise, Rocky Foothill, Spinifex Sandplain and Riverine habitats; however, the species' presence is likely to be dependent upon the availability of nesting sites. While nesting habitat is present within the Study Area, the species has not been confirmed. Although it is likely the Study Area doesn't support an important population of peregrine falcon, it may still provide important nesting habitat to the species at a local, but not regional scale, and the species is likely to occur within the Study Area in low densities.

5.2.1.7 Western pebble-mound mouse (*Pseudomys chapmani*) – Priority 4 (DBCA)

Species Profile

The western pebble-mound mouse has experienced a significant decline in their range through the Gascoyne and Murchison and is now considered endemic to the Pilbara (Start *et al.*, 2000). This species almost exclusively occurs on the gentler slopes of rocky ranges and low undulating hills where the ground is covered with a stony mantle and vegetated by hard spinifex, often with a sparse overstorey of eucalypts and scattered shrubs (Anstee & Armstrong, 2001).

Survey Effort

Western pebble-mound mouse has been targeted in five baseline and detailed surveys across the Study Area since 2013 and six baseline and detailed surveys within the vicinity of the Study Area since 2010 (Appendix A). Sampling effort has included targeted searches for direct or secondary evidence in suitable habitat, trapping (pitfall, funnel), camera traps, habitat assessments and opportunistic observations.

Previous Records

The western pebble-mound mouse was recorded via primary (i.e. direct observation) and secondary (i.e. active and inactive mounds) evidence on 29 occasions within the vicinity of the Study Area from 1993 to 2016 (DBCA, 2024c; MWH, 2016a; Outback Ecology, 2014a) (Table 5.9; Figure 3.1; Appendix A). This includes 19 records within the Study Area in Spinifex Stony Plain, Ironstone Ridgetop and Stony Rise habitats. Three records were within 15 km of the Study Area, four records within 30 km and the remaining three records of the species occurred within 43 km of the Study Area.

Table 5.9: Summary of western pebble-mound mouse records within the Study Area

Author/ Custodian	Survey Title	Record
DBCA (2024c)	DBCA threatened and priority fauna database	Seven records (unknown whether direct observation or secondary evidence) between 2014-2016

Author/ Custodian	Survey Title	Record
MWH (2016a), MWH (2018b)	Corunna Downs Project: terrestrial vertebrate fauna survey	Thirteen records via direct observation and/or secondary evidence (active and inactive mounds) in Stony Rise, Ironstone Ridgetop and Spinifex Stony Plain habitats
Outback Ecology (2014a)	Corunna Downs Project: terrestrial vertebrate fauna baseline assessment	Six records via secondary evidence (inactive mounds) in Stony Rise, Ironstone Ridgetop and Spinifex Stony Plain habitats

Discussion

The western pebble-mound mouse has been confirmed as a resident from the combined results of previous baseline and targeted surveys in the Study Area, including within Spinifex Stony Plain, Ironstone Ridgetop and Stony Rise habitats. The presence of small stones required for mound building (Anstee 1996) within these habitats (and Rocky Foothill) make them important to the survival of the species. However, these four habitats are generally widespread throughout the Pilbara bioregion and common within the Study Area. The number of records in the surrounding area and extent of the preferred habitats outside the Study Area suggests it is unlikely the Study Area supports an important population of the western pebble-mound mouse nor are habitats within required for the species local or regional persistence.

5.2.1.8 Spectacled hare-wallaby (*Lagorchestes conspicillatus leichardti*) – Priority 4

Species Profile

The spectacled hare wallaby occupies *Triodia* spp. hummock grasslands, tussock grasslands and *Acacia* shrublands (van Dyck & Strahan, 2008). This species is nocturnal, often solitary and breeding continuously through the year, with peaks in March and September (Burbidge & Johnson, 1995).

Survey Effort

Spectacled hare-wallaby has been targeted in five baseline and detailed surveys across the Study Area since 2013 and six baseline and detailed surveys within the vicinity of the Study Area since 2010 (Appendix A). Sampling effort has included targeted diurnal searches for direct or secondary evidence in suitable habitat, camera traps, habitat assessments and opportunistic observations.

Previous Records

The spectacled hare-wallaby has been recorded on six occasions within the vicinity of the Study Area (DBCA, 2024c; MWH, 2018b; Outback Ecology, 2014b) (Table 5.10; Figure 3.1; Appendix A). These include five records (scats, shelter and individuals) in 2014 within Stony

Rise habitat in the Study Area, and one record of the species 16 km west-south-west of the Study Area in 1986.

Table 5.10: Summary of spectacled hare-wallaby records within the Study Area

Author/ Custodian	Survey Title	Record
DBCA (2024c)	DBCA threatened and priority fauna database	Three records via direct observation (and unknown) in 2014
MWH (2016a), MWH (2018b)	Corunna Downs Project: terrestrial vertebrate fauna survey	One record via secondary evidence (scat) in Stony Rise habitat
Outback Ecology (2014a)	Corunna Downs Project: terrestrial vertebrate fauna baseline assessment.	One record via secondary evidence (scat) in Stony Rise habitat

Discussion

Previous records of the species within Stony Rise habitat indicate this habitat is important breeding, foraging and dispersal habitat within the Study Area. Although there are no records of the species in Rocky Foothill, Spinifex Stony Plain, Spinifex Sandplain and Calcrete habitats, these also provide potentially important habitat for the species, particularly where proximal to breeding habitat. MWH (2018b) recorded the species in a small patch of long unburnt hummock grasses, surrounded by large expanses of habitat burnt in 2013. It is likely that these important breeding and/or foraging and dispersal habitats provide suitable habitat for the spectacled hare-wallaby in areas, primarily where the spinifex is long unburnt. Based on previous records and ecology of the spectacled hare-wallaby, the species occurrence within the Study Area is unlikely to represent an important population. The species is not likely to be reliant upon the Study Area, or habitat within, for the long-term persistence of the species at a local or regional scale.

5.2.2 Likely to Occur

5.2.2.1 Brush-tailed mulgara (*Dasycercus blythi*) – Priority 4 (DBCA)

The brush-tailed mulgara is a small carnivorous marsupial occurring from southwestern Queensland across the Simpson, Tanami, and Great Sandy Deserts and central Western Australia, including parts of the Pilbara (Woinarski *et al.*, 2014b). The species is found in sand ridge habitat, *Triodia* spp. sand plain and gibber plain (Pavey *et al.*, 2012), and on the gentler slopes of rocky ranges where the ground is covered with a stony mantle and vegetated by hard spinifex, often with a sparse overstorey of eucalypts and scattered shrubs. Mature spinifex hummocks appear to be important for protection from introduced predators (Körtner *et al.*, 2007). Mulgara are renowned for using multiple burrow systems within a home-range and changing these frequently (Thompson & Thompson, 2007).

Survey Effort

Brush-tailed mulgara has been targeted in five baseline and detailed surveys across the Study Area since 2013 and six baseline and detailed surveys within the vicinity of the Study Area since 2010 (Appendix A). Sampling effort has included targeted searches for direct or secondary evidence in suitable habitat, trapping (pitfall, funnel, Elliot), camera traps, habitat assessments and opportunistic observations.

Previous Records

The brush-tailed mulgara has been recorded 13 times in the vicinity of the Study Area, with no records within the Study Area itself (Biologic, 2019f; DBCA, 2024c; Outback Ecology, 2014b) (Figure 3.1; Appendix A). The most recent records are individuals captured on camera traps on eight occasions in Spinifex Sandplain habitat approximately 14 km to the east in 2019 (Biologic, 2019f). Additional records include three records of burrows in Spinifex Sandplain habitat in 2014, approximately 17-21 km to the south-east of the Study Area (Outback Ecology, 2014b). Historically, the species was recorded on two occasions in the vicinity of the Study Area 16 km to the east in 1985.

Discussion

Although the species have not previously been recorded within the Study Area, two habitats provide important habitat for the brush-tailed mulgara; Spinifex Stony Plain and Spinifex Sandplain. Therefore, despite the lack of desktop records within the Study Area, the brush-tailed mulgara is considered likely to occur due to the number of recent records in close proximity to the Study Area and suitable habitat being present.

If the species does occur in the Study Area, it is unlikely to represent an important population and the species is not likely to be solely reliant upon the Study Area, or habitat within for the long-term persistence of the species at a local or regional scale.

5.2.2.2 Long-tailed dunnart (*Antechinomys longicaudatus*) – Priority 4 (DBCA)

Species Profile

The long-tailed dunnart has a widespread distribution in the Pilbara, but is sparsely distributed and locally uncommon, occurring in rugged rocky areas, scree slopes or stony plains and plateaus dominated by open shrubland and *Triodia* spp. grassland vegetation (van Dyck et al., 2013).

Survey Effort

Long-tailed dunnart has been targeted in five baseline and detailed surveys across the Study Area since 2013 and six baseline and detailed surveys within the vicinity of the Study Area since 2010 (Appendix A). Sampling effort has included targeted searches for direct or

secondary evidence in suitable habitat, trapping (pitfall, funnel, Elliot), camera traps, habitat assessments and opportunistic observations.

Previous Records

The species has not previously been recorded within the Study Area, although there are two records of the long-tailed dunnart 37km to the east in 2003 and 49 km to the south-east in 2011 in Channel Iron Deposit habitat, not present within the Study Area (DBCA, 2024c; Outback Ecology, 2012b) (Figure 3.1; Appendix A).

Discussion

Important breeding, foraging and dispersal habitat for the species includes Rocky Foothill, Rocky Ridge and Gorge and Ironstone Ridgetop habitats, all of which occur within the Study Area and the vicinity of the Study Area. Therefore, despite the lack of desktop records within the Study Area, the long-tailed dunnart is considered likely to occur due to records of the species within the vicinity of the Study Area and suitable habitat being present.

If the species does occur in the Study Area, it is unlikely to represent an important population and the species is not likely to be solely reliant upon the Study Area, or habitat within, for the long-term persistence of the species at a local or regional scale.

5.2.2.3 Spotted Ctenotus (*Ctenotus uber johnstonei*) – Priority 2 (DBCA)

Species Profile

Habitat preferences of the spotted Ctenotus are poorly understood, however are known to occur in reddish soils in inland Western Australia. Within the Pilbara, the taxon is known from *Triodia* spp. on hillslopes, *Acacia xiphophylla* over chenopods, and *Acacia xiphophylla* scattered tall shrubs to high open shrubland (Cogger, 2014).

Survey Effort

Spotted Ctenotus has been targeted in five baseline and detailed surveys across the Study Area since 2013 and six baseline and detailed surveys within the vicinity of the Study Area since 2010 (Appendix A). Sampling effort has included targeted searches for direct or secondary evidence in suitable habitat, trapping (pitfall, funnel), hand searching, habitat assessments and opportunistic observations.

Previous Records

The species has been recorded on three occasions in the vicinity of the Study Area, between 13-21 km south of the Study Area, in Spinifex Stony Plain and Riverine habitats (Outback Ecology, 2014b) (Figure 3.1; Appendix A). There are no previous records of the spotted Ctenotus within the Study Area.

Discussion

While the species has not been previously recorded within the Study Area, important breeding and foraging habitat occurs and includes Rocky Foothill, Stony Rise, Drainage Line, Spinifex Stony Plain and Riverine habitats. The species has been recorded in the latter two habitats outside the Study Area, supporting their importance to the species. Based on the presence of the species in close proximity to the Study Area and suitable important habitat present, it is considered likely that the species will occur within the Study Area.

If the species does occur in the Study Area, it is unlikely to represent an important population and the species is not likely to be reliant upon the Study Area, or habitat within, for the long-term persistence of the species at a local or regional scale.

5.2.3 Possible to Occur

5.2.3.1 Northern short-tailed mouse

The northern short-tailed mouse is endemic to northern Australia, where it has a discontinuous distribution from Cape York to the Pilbara (Moro & Kutt, 2008). It is a nocturnal species found in areas of open tussock and hummock grassland, *Acacia* shrubland, and savanna woodland, on alluvial clay or sandy soils (Lee, 1995; Moro & Kutt, 2008). Within the Pilbara, it is generally restricted to cracking clays (Gibson & McKenzie, 2009). The species has not previously been recorded within the Study Area, however two records were recorded 20 km to the west, in 2005 (DBCA, 2024c) (Figure 3.1).

Drainage Line and Riverine habitats potentially provide important breeding, foraging and dispersal habitat within the Study Area, however no cracking clays are present. Therefore, the northern short-tailed mouse may only occur sporadically in the Study Area following large rainfall events when resources are likely to be most abundant. If the species does occur within the Study Area, it likely doesn't support an important population, but the Study Area may still provide important habitat for the species.

5.2.3.2 Fork-tailed swift (*Apus pacificus*) – Migratory (EPBC/ BC Act)

The fork-tailed swift is a wide ranging but sparsely distributed species that occurs in a wide range of dry and/or open habitats (Johnstone & Storr, 1998). It does not breed in Australia, migrating from breeding grounds in the northern hemisphere. In Australia, it is almost exclusively aerial, foraging and possibly roosting aerially (DCCEEW, 2023a). There are no previous records of the fork-tailed swift within the vicinity of the Study Area, with the closest record greater than 70 km north-west of the Study Area in 2011 (DBCA, 2024c).

The species has the potential to be an infrequent visitor to the airspace above the Study Area, with all habitats considered supporting foraging and dispersal and therefore, the species is possible to occur. While the species may occasionally forage within the Study Area, it is

unlikely to land or nest due to its aerial nature and is unlikely to be reliant on habitat occurring within the Study Area. The species' occurrence within the Study Area is unlikely to represent an important population.

5.2.3.3 Grey falcon (*Falco hypoleucos*) – Vulnerable (EPBC/ BC Act)

The grey falcon is widely distributed over the northern parts of Australia's arid and semi-arid zone (Mullin *et al.*, 2020). Recent studies suggest the grey falcon comprises a single, widely distributed interbreeding population (although there may be weak population structure between breeding grounds in the east and west of Australia) with around 1,415 females (Mullin *et al.*, 2020). The Pilbara is thought to potentially be a stronghold (Sutton, 2010). Grey falcons do not appear to be associated with particular vegetation types (Schoenjahn *et al.*, 2019); they often sit motionless in the canopies of trees or dead branches of eucalypts (Falkenberg, 2010). It tends to prefer sparsely-treed, open plains, and creek lines for hunting (Olsen & Olsen, 1986).

The grey falcon has been recorded on three occasions in 2020, 43-47 km north-west of the Study Area, with no records within the Study Area (Biologic, 2020f) (Figure 3.1; Appendix A). The grey falcon may occur in the Study Area as an occasional visitor, with Drainage Line and Riverine habitats potentially providing important nesting habitat, and Spinifex Stony Plain and Spinifex Sandplain habitats providing potential supporting foraging and dispersal habitat. It is unlikely these habitats are relied upon by the species for their long-term persistence at a local and/or regional scale, unless nesting occurs.

5.2.3.4 Oriental plover (*Charadrius veredus*) – Migratory (EPBC/ BC Act)

The oriental plover prefers a range of habitats, including estuarine mudflats and sandbanks, sandy or rocky ocean beaches as well as open inland environments such as, semi-arid or arid grasslands, where the grass is short and sparse (Johnstone & Storr, 2004). The oriental plover has been recorded on two occasions in 2005, 25 km north-east of the Study Area, with no records within the Study Area (DBCA, 2024c) (Figure 3.1; Appendix A). The species possibly occurs in the Study Area, in Drainage Line and Riverine habitat. However, these habitats are only likely to be used following inundation from significant rainfall events and are unlikely to be relied upon for the oriental plover's long-term persistence at a local or regional scale.

5.2.3.5 Pilbara flat-headed blind-snake (*Anilios ganei*) – Priority 1 (DBCA)

Little is known about the Pilbara flat-headed blind-snake, however, it is assumed to have similar ecology to other blind snake species (Cogger, 2014). It is a fossorial species, and therefore rarely encountered. Records are often associated with moist gorges and gullies (Wilson & Swan, 2021).

The Pilbara leaf-nosed blind-snake has previously been recorded on three occasions within the vicinity of the Study Area, in Spinifex Sandplain and Rocky Ridge and Gorge habitats ranging 32-42 km from the Study Area (Outback Ecology, 2013c) (Outback Ecology, 2014b) (Figure 3.1; Appendix A). The species is considered possible to occur as a resident in the Study Area, with Riverine, Drainage Line, Rocky Foothill and Rocky Ridge and Gorge habitats potentially providing important breeding and foraging habitat, particularly in areas where leaf litter accumulates, and moisture is retained in leaf litter and substrates. As very little is known about the species, any record of the species in the Study Area may be considered to contribute to an important population and significant for the long-term persistence at a local and/or regional scale, until demonstrated otherwise.

6 Conclusion

Within the vicinity of the Study Area, there has been considerable survey effort since 2014, with 22 vertebrate fauna surveys within, or overlapping the Study Area, and a further 56 within approximately 43 km. As a result, the fauna habitats, their value to significant species and the presence of significant species within the Study Area have been well documented. Six of the 11 fauna habitats documented within the Study Area; Stony Rise, Rocky Foothill, Spinifex Stony Plain, Rocky Ridge and Gorge, Ironstone Ridgetop and Drainage Line have a widespread distribution across the Pilbara bioregion and are therefore likely to support typical fauna assemblages and species of the region. Five of these habitats are also common or relatively common within the Study Area, with the exception of Drainage Line habitat, which is limited, occurring linearly through the Study Area and surrounding region. Rocky Ridge and Gorge habitat within the Study Area is considered to be of high quality and value when compared to habitat in the surrounding region.

Thirty-one significant species were identified as potentially occurring within the Study Area, of which eight were confirmed through previous surveys. These included the ghost bat, greater bilby, northern quoll, peregrine falcon, Pilbara leaf-nosed bat, Pilbara olive python, spectacled hare-wallaby and western pebble-mound mouse. Based on known species' distribution, previous records and the habitats present, three significant species are considered likely to occur; brush-tailed mulgara, long-tailed dunnart and spotted Ctenotus; and five are considered possible to occur; fork-tailed swift, grey falcon, northern short-tailed mouse, oriental plover and Pilbara flat-headed blind-snake. The remaining 15 species were considered unlikely (one species) and highly unlikely (14 species) to occur in the Study Area.

Three species recorded within the Study Area; ghost bat, northern quoll and Pilbara leaf-nosed bat, represent important populations in the Pilbara bioregion. A fourth species, the Pilbara flat-headed blind-snake, has not been previously recorded in the Study Area and is considered possible to occur. If recorded in the Study Area, they may represent part of an important population for the species due to the paucity of information on the ecology of the species. Any records of the species, and the habitat they are recorded in, are considered important, until further information is obtained. The remaining five species previously recorded within the Study Area, greater bilby, peregrine falcon, Pilbara olive python, spectacled hare-wallaby and western pebble mound mouse, along with the seven species considered likely or possible (should they be recorded within the Study Area), are unlikely to represent an important population in the Pilbara, based on the distribution and ecology of these species.

All 11 habitats provide critical or important roosting, breeding, nesting, foraging and/or dispersal habitat for one or more significant species and all habitats within the Study Area

are considered locally significant for the persistence of one or more of these species. Due to its high quality and value in the Study Area compared to the surrounding region, Rocky Ridge and Gorge habitat is considered of regional significance as it provides critical or important breeding and shelter habitat for several significant species including ghost bat, Pilbara leaf-nosed bat, northern quoll, peregrine falcon and Pilbara olive python. Forty-three caves and 40 water features have been previously recorded within the Study Area, of which 11 caves provide critical roosting habitat for Pilbara leaf-nosed bat and/or ghost bat. Habitats proximal to these critical roost sites also provide critical foraging habitat for the Pilbara leaf-nosed bat and ghost bat.

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Appendix A: Summary of Literature Review

Reference Number	Reference	Survey details	Proximity to Study Area	Survey methods	Significant species habitat	Vertebrate fauna assemblage found (summary of species richness)	Significant species	Survey limitations/ notes
1	Bat Call (2018)	Project: Corunna Downs cave CO-CA-03 Pilbara leaf-nosed bat roost census , November 2017 Client: Atlas Survey date: 23 November 2017 Survey type: Targeted survey Experience: Species specialist	Within Study Area	Bat echolocation recording Video recording	Cave/ roost site	1 vertebrate species 1 native mammal	Threatened: Pilbara leaf-nosed bat (*Rhinonicteris aurantia*)	
2	Biologic (2020b)	Project: Corunna Downs Project: Pilbara leaf-nosed bat roost analysis Client: Atlas Survey date: 17 April 2019 -25 April 2020 Survey type: Monitoring of cave and water feature over period to determine quality and use by target species Experience:	Within Study Area	Microclimate monitoring Targeted searches Bat echolocation recording Opportunistic observations Secondary evidence Water quality monitoring	Caves and water feature	1 vertebrate species 1 native mammal	Threatened: Pilbara leaf-nosed bat (*Rhinonicteris aurantia*)	
3	Biologic (2019a)	Project: Corunna Downs Project: Pilbara leaf-nosed bat and ghost bat monitoring survey 2018 Client: Atlas Survey date: 9-19 July 2018 Survey type: Targeted Pilbara leaf-nosed bat and ghost bat monitoring survey Experience: Senior Zoologist x 2	Within Study Area	Microclimate monitoring Targeted searches Bat echolocation recording Scat sheets Opportunistic observations Secondary evidence	Caves/ roost sites	2 vertebrate species 2 native mammals	Threatened: Ghost bat (*Macroderma gigas*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*)	
4	Biologic (2021a)	Project: Corunna Downs Project: Pilbara leaf-nosed bat and ghost bat monitoring survey 2019 Client: Atlas Survey date: 19-30 July 2019 Survey type: Targeted Pilbara leaf-nosed bat and ghost bat monitoring survey Experience: Senior Zoologist x 2	Within Study Area	Microclimate monitoring Targeted searches Bat echolocation recording Scat sheets Opportunistic observations Secondary evidence	Caves/ roost sites	2 vertebrate species 2 native mammals	Threatened: Ghost bat (*Macroderma gigas*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*)	
5	Biologic (2021b)	Project: Corunna Downs Project: Pilbara leaf-nosed bat and ghost bat monitoring survey 2020. Client: Atlas Survey date: 18-30 June 2020 Survey type: Targeted Pilbara leaf-nosed bat and ghost bat monitoring survey Experience:	Within Study Area	Microclimate monitoring Targeted searches Bat echolocation recording Scat sheets Opportunistic observations Secondary evidence	Caves/ roost sites	2 vertebrate species 2 native mammals	Threatened: Ghost bat (*Macroderma gigas*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*)	

Reference Number	Reference	Survey details	Proximity to Study Area	Survey methods	Significant species habitat	Vertebrate fauna assemblage found (summary of species richness)	Significant species	Survey limitations/ notes
		Senior Zoologist x 2						
6	Biologic (2021d)	Project: Corunna Downs Project Northern Quoll Monitoring 2021 Client: Atlas Survey date: 5-16 July 2021 Survey type: Northern Quoll Monitoring Survey Experience: Senior Zoologist x 2	Within Study Area	Motion sensitive cameras Targeted searches Opportunistic observations Secondary evidence	Rocky Ridge and Gorge Drainage Line Riverine Rocky Foothill	17 vertebrate species 5 native mammals 1 introduced mammal 5 birds 6 reptiles	Threatened: Northern quoll (*Dasyurus hallucatus*) Pilbara olive python (*Liasis olivaceus* subsp. *barroni*)	
7	Biologic (2021l)	Project: Sanjiv Ridge Stage 2 Development Area: Consolidated Terrestrial Fauna Report Client: Atlas Survey date: 14-19 May 2020 Survey type: Targeted Experience: Senior Invertebrate Zoologist Zoologist	Within Study Area	Targeted searches Opportunistic observations Secondary evidence Acoustic recorders Ultrasonic recorders Cave and habitat assessments	Rocky Ridge and Gorge	23 vertebrate species 9 native mammals 12 birds 2 amphibians	Threatened: Ghost bat (*Macroderma gigas*) Northern quoll (*Dasyurus hallucatus*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*)	
8	Biologic (2021m)	Project: Sanjiv Ridge Stage 2: Ghost bat and Pilbara leaf-nosed bat monitoring and regional survey Client: Atlas Survey date: 14-29 January 2021 Survey type: Regional survey and annual monitoring survey Experience: Senior Zoologist Zoologist	Within Study Area	Cave microclimate monitoring Ultrasonic recording Cave assessments Scat monitoring and hormone analysis Motion sensitive cameras Targeted searches Opportunistic observations Secondary evidence	Rocky Ridge and Gorge	4 vertebrate species 3 native mammals 1 reptile	Threatened: Ghost bat (*Macroderma gigas*) Northern quoll (*Dasyurus hallucatus*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*) Pilbara olive python (*Liasis olivaceus* subsp. *barroni*)	
9	Biologic (2022f)	Project: Sanjiv Ridge Project: Pilbara leaf-nosed bat monitoring 2021-2022 Client: Atlas Survey date: 25 April 2020 – 19 January 2022 Survey type: Targeted long term monitoring Pilbara leaf-nosed bat Experience: Zoologists x 4	Within Study Area	Bat echolocation recording Cave microclimate recording Opportunistic observations Secondary evidence	Caves in Rocky Ridge and Gorge habitat	2 vertebrate species 2 native mammals	Threatened: Ghost bat (*Macroderma gigas*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*)	
10	(Biologic, 2022e)	Project: Sanjiv Ridge Project: Long-term ghost bat monitoring survey 2021-2022 Client: Atlas Survey date: 14 January 2021 – 21 January 2022 Survey type: Targeted long term monitoring ghost bat Experience:	Within Study Area	Bat echolocation recording Cave microclimate recording Opportunistic observations Secondary evidence	Caves in Rocky Ridge and Gorge habitat	1 vertebrate species 1 native mammal	Threatened: Ghost bat (*Macroderma gigas*)	

Reference Number	Reference	Survey details	Proximity to Study Area	Survey methods	Significant species habitat	Vertebrate fauna assemblage found (summary of species richness)	Significant species	Survey limitations/ notes
		Zoologists x 4						
11	MWH (2018a)	Project: Corunna Downs Project: Pilbara leaf-nosed bat and ghost bat baseline monitoring survey. Client: Atlas Survey date: July 2017 Survey type: Baseline survey Pilbara leaf-nosed bat and ghost bat Experience: Zoologists x 3	Within Study Area	Bat echolocation recording Cave microclimate recording Opportunistic observations Secondary evidence Dusk census for ghost bat	Caves in Rocky Ridge and Gorge habitat	2 vertebrate species 2 native mammals	Threatened: Ghost bat (*Macroderma gigas*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*)	
12	Outback Ecology (2014a)	Project: Corunna Downs project: Terrestrial vertebrate fauna baseline assessment. Client: Atlas Survey date: 24 February to 7 March 2014 Survey type: Detailed vertebrate fauna survey Experience: Environmental Scientists x 6	Within Study Area	Habitat assessment/ mapping Systematic sampling Active searching Targeted trapping – pitfall, funnel, Elliott, cage Motion sensitive cameras Bat echolocation recording Nocturnal surveys Avifauna census Opportunistic observations Secondary evidence	Rocky Ridge and Gorge Drainage Line Granite Outcrop	154 vertebrate species 21 native mammals 5 introduced mammals 61 birds 62 reptiles 5 amphibians	Threatened: Northern quoll (*Dasyurus hallucatus*) Ghost bat (*Macroderma gigas*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*) Pilbara olive python (*Liasis olivaceus* subsp. *barroni*) Priority: Western pebble-mound mouse (*Pseudomys chapmani*) Spectacled hare-wallaby (*Lagorchestes conspicillatus leichardti*) Other significant: Peregrine falcon (*Falco peregrinus*)	
13	Biologic (2019b)	Project: Corunna Downs Project Northern Quoll Monitoring 2018 Client: Atlas Survey date: 9-19 July 2018 Survey type: Northern Quoll Monitoring Survey Experience: Principal Zoologist Zoologist	Overlapping	Motion cameras Habitat assessments Opportunistic observations Secondary Evidence	Rocky Ridge and Gorge Drainage Line Riverine Rocky Foothill	20 vertebrate species 6 native mammals 2 introduced mammals 8 birds 3 reptiles 0 amphibians	Threatened: Northern quoll (*Dasyurus hallucatus*) Pilbara olive python (*Liasis olivaceus* subsp. *barroni*)	
14	Biologic (2019c)	Project: Corunna Downs Project Northern Quoll Monitoring 2019 Client: Atlas Survey date: 19-30 July 2019 Survey type: Northern Quoll Monitoring Survey Experience: Zoologist x 2	Overlapping	Motion cameras Habitat assessments Opportunistic observations Secondary Evidence	Rocky Ridge and Gorge Drainage Line Riverine Rocky Foothill	21 vertebrate species 4 native mammals 3 introduced mammals 8 birds 6 reptiles 0 amphibians	Threatened: Northern quoll (*Dasyurus hallucatus*) Other specially protected: Peregrine falcon (*Falco peregrinus*)	
15	Biologic (2021c)	Project: Corunna Downs Project Northern Quoll Monitoring 2020 Client:	Overlapping	Motion cameras Habitat assessments Opportunistic observations	Rocky Ridge and Gorge Drainage Line Riverine	15 vertebrate species 5 native mammals 1 introduced mammals	Threatened: Northern quoll (*Dasyurus hallucatus*)	

Reference Number	Reference	Survey details	Proximity to Study Area	Survey methods	Significant species habitat	Vertebrate fauna assemblage found (summary of species richness)	Significant species	Survey limitations/ notes
		Atlas Survey date: 18-30 June 2020 Survey type: Northern Quoll Monitoring Survey Experience: Senior Zoologist x 2		Secondary Evidence	Rocky Foothill	8 birds 1 reptile 0 amphibians	Pilbara olive python (*Liasis olivaceus* subsp. *barroni*)	
16	Biologic (2023i)	Project: Sanjiv Ridge 2022 Northern Quoll Monitoring Survey Client: Atlas Survey date: 19-26 July 2022 Survey type: Monitoring survey for northern quoll. Experience: Senior Zoologist Zoologist	Overlapping	Habitat assessments/ photo monitoring Targeted northern quoll camera transects Targeted searching Opportunistic observations	Rocky Ridge and Gorge Riverine Drainage Line Rocky Foothill Water feature	1 vertebrate species 1 native mammal	Threatened: Northern quoll (*Dasyurus hallucatus*)	
17	Biologic (2023k)	Project: Sanjiv Ridge 2022 ghost bat monitoring survey Client: Atlas Survey date: Annual: 29 August to 8 September 2022 Long term: 1 January to 31 December 2022 Survey type: Annual and long term monitoring survey for ghost bats. Experience: Senior Zoologist Zoologist x 4	Overlapping	Site Assessments/ photo monitoring Ultrasonic recorders Opportunistic observations Secondary evidence Micro climate recording Camera trap Scat sheets	Caves in Rocky Ridge and Gorge habitat	1 vertebrate species 1 native mammal	Threatened: Ghost bat (*Macroderma gigas*)	Partial loss of data due to technical issues (temperature recordings) and fire in December 2022 affecting site access and equipment.
18	Biologic (2023h)	Project: Sanjiv Ridge 2022 Pilbara leaf-nosed bat monitoring survey Client: Atlas Survey date: Annual: 29 August to 8 September 2022 Long term: 1 January to 31 December 2022 Survey type: Annual and long term monitoring survey for Pilbara leaf-nosed bats. Experience: Principal Zoologist Senior Zoologist x 3 Zoologist x 4	Overlapping	Site Assessments/ photo monitoring Ultrasonic recorders Opportunistic observations Secondary evidence Micro climate recording	Rocky Ridge and Gorge Abandoned mine adit	3 vertebrate species 3 native mammals	Threatened: Ghost bat (*Macroderma gigas*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*) Northern quoll (*Dasyurus hallucatus*)	Partial loss of data due to technical issues (temperature recordings) and fire in December 2022 damaged EWS unit at CO-CA-01 leading to no data capture 16-31 December for that cave.
19	Biologic (2024b)	Project: Sanjiv Ridge and McPhee Creek Regional Ghost Bat Survey Client: Atlas Survey date: 19-23 April 2023 Survey type: Targeted survey for ghost bat. Experience: Principal Zoologist	Overlapping	Targeted searches Cave assessments	Caves in Rocky Ridge and Gorge habitat	1 vertebrate species 1 native mammal	Threatened: Ghost bat (*Macroderma gigas*)	

Reference Number	Reference	Survey details	Proximity to Study Area	Survey methods	Significant species habitat	Vertebrate fauna assemblage found (summary of species richness)	Significant species	Survey limitations/ notes
		Field Technician						
20	MWH (2016a)	Project: Corunna Downs Project: Terrestrial Vertebrate Fauna Survey Client: Atlas Survey date: Reconnaissance survey: 19 and 21 November 2013 Phase 1: 24 February to 7 March 2014 Phase 2: 22 September – 5 October 2016 Bat monitoring: 15 May – 27 August 2014, 22-30 July 2015 and 1-8 July 2016 Survey type: Two phase Detailed fauna survey Experience: Principal Zoologist Principal Ecologist Senior Zoologist x 3 Zoologists Ecologists	Overlapping	Habitat assessment/ mapping Systematic sampling Active searching Targeted trapping – pitfall, funnel, Elliott, cage Motion sensitive cameras Bat echolocation recording Nocturnal surveys Avifauna census Opportunistic observations Secondary evidence	Rocky Ridge and Gorge Drainage Line Riverine Granite Outcrop	172 vertebrate species 26 native mammals 5 introduced mammals 71 birds 66 reptiles 4 amphibians	Threatened: Ghost bat (*Macroderma gigas*) Northern quoll (*Dasyurus hallucatus*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*) Pilbara olive python (*Liasis olivaceus* subsp. *barroni*) Priority: Western pebble-mound mouse (*Pseudomys chapmani*) Other significant: Peregrine falcon (*Falco peregrinus*)	
21	MWH (2018b)	Final version of the above report – change to species recorded – includes additional priority species – spectacle-haired wallaby	Overlapping	Habitat assessment/ mapping Systematic sampling Active searching Targeted trapping – pitfall, funnel, Elliott, cage Motion sensitive cameras Bat echolocation recording Nocturnal surveys Avifauna census Opportunistic observations Secondary evidence	Rocky Ridge and Gorge Drainage Line Riverine Granite Outcrop	175 vertebrate species 28 native mammals 5 introduced mammals 72 birds 66 reptiles 4 amphibians	Threatened: Ghost bat (*Macroderma gigas*) Northern quoll (*Dasyurus hallucatus*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*) Pilbara olive python (*Liasis olivaceus* subsp. *barroni*) Priority: Western pebble-mound mouse (*Pseudomys chapmani*) Spectacle-haired wallaby (*Lagorchestes conspicillatus leichardti*) Other significant: Peregrine falcon (*Falco peregrinus*)	
22	Outback Ecology (2013a)	Project: East West Rail Spur Project: Terrestrial Vertebrate Fauna Baseline Survey Client: Atlas Survey date: 26 June to 9 July 2013 Survey type: Level 2 Baseline Experience: Principal Environmental Scientist Senior Environmental Scientists x 2 Environmental Scientist x 5	Overlapping	Active searching Targeted trapping – pitfall, funnel, Elliott, cage Bat echolocation recording Avifauna census Nocturnal survey / spotlighting Camera traps Opportunistic observations Secondary evidence	Spinifex Sandplain Drainage Line Riverine Granite Outcrop Rocky Ridge and Gorge	163 vertebrate species 27 native mammals 6 non-native mammals 84 birds 42 reptiles 4 amphibians	Threatened: Ghost bat (*Macroderma gigas*) Northern quoll (*Dasyurus hallucatus*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*) Bilby (*Macrotis lagotis*)	
23	Biologic (2017)	Project: Warrawoona targeted bat assessment: September 2017 Client: Calidus Resources Survey date: 20-24 September 2017 Survey type: Targeted assessment for Pilbara leaf-nosed bat and ghost bat.	4.3km E	Habitat assessment Bat echolocation recorders Video recording Visual counts (census)	Cave in Rocky Ridge and Gorge habitat Disused mine adits	2 vertebrate species 2 native mammals	Threatened: Ghost bat (*Macroderma gigas*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*)	

Reference Number	Reference	Survey details	Proximity to Study Area	Survey methods	Significant species habitat	Vertebrate fauna assemblage found (summary of species richness)	Significant species	Survey limitations/ notes
		Experience: Principal Zoologists x 2 Bat Ecologist						
24	Biologic (2019f)	Project: Warrawoona Gold Project: 2019 significant species survey. Client: Calidus Resources Survey date: 5-10 April 2019 (Biologic) 31 May to 11 June (Calidus placement of acoustic recorders and cameras) Survey type: Targeted vertebrate fauna survey for northern quoll, night parrot, bilby. Experience: Principal Zoologist Bat Ecologist	4.3km E	Acoustic recordings Motion cameras Opportunistic observations Secondary evidence Habitat assessment/ mapping	Rocky Breakaway Major Drainage Line Hillcrest/ Hillslope Minor Drainage Line Sandplain Rounded hills Stony Plain	3 vertebrate species 3 native mammals	Threatened: Northern quoll (*Dasyurus hallucatus*) Pilbara olive python (*Liasis olivaceus* subsp. *barroni*) Priority: Brush-tailed mulgara	Entirety of suitable habitat for night parrot was not surveyed. Plot searches were not undertaken for targeted Greater Bilby survey. These are considered best technique for detecting the species.
25	Biologic (2019g)	Project: Warrawoona Gold Project: Habitat assessment and targeted vertebrate fauna survey. Client: Calidus Resources Survey date: 8-15 July 2018 Survey type: Targeted vertebrate fauna survey for northern quoll, night parrot. Experience: Principal Zoologist Bat Ecologist	4.3km E	Acoustic recordings Motion cameras Opportunistic observations Secondary evidence Habitat assessment/ mapping	Rocky Breakaway Major Drainage Line Hillcrest/ Hillslope Minor Drainage Line Sandplain Rounded hills Stony Plain	1 vertebrate species 1 native mammal	Threatened: Northern quoll (*Dasyurus hallucatus*)	
26	Biologic (2019h)	Project: Warrawoona Gold Project: VHF Bat Foraging Studies. March 2019 Client: Calidus Resources Survey date: 8-15 July 2018 Survey type: Targeted assessment for Pilbara leaf-nosed bat and ghost bat. Experience: Principal Zoologist Bat Ecologist	4.3km E	Trapping (harp and mist net) Tagging Sample collection (DNA) Monitoring via VHF tracking	Cave in Rocky Ridge and Gorge habitat Disused mine adits	2 vertebrate species 2 native mammals	Threatened: Ghost bat (*Macroderma gigas*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*)	
27	Biologic (2019i)	Project: Warrawoona targeted bat assessment: April 2019 Client: Calidus Resources Survey date: 5-10 April 2019 Survey type: Targeted assessment for Pilbara leaf-nosed bat and ghost bat. Experience: Principal Zoologists x 2 Bat Ecologist	4.3km E	Habitat assessment Bat echolocation recorders Video recording Visual counts (census)	Cave in Rocky Ridge and Gorge habitat Disused mine adits	2 vertebrate species 2 native mammals	Threatened: Ghost bat (*Macroderma gigas*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*)	

Reference Number	Reference	Survey details	Proximity to Study Area	Survey methods	Significant species habitat	Vertebrate fauna assemblage found (summary of species richness)	Significant species	Survey limitations/ notes
28	Biologic (2020j)	Project: Warrawoona Gold Project: 2020 Significant Species Survey: Northern Quoll Client: Calidus Resources Survey date: 6-9 July 2020 Survey type: Targeted monitoring survey for northern quoll. Experience: Principal Zoologist Ecologist	4.3km E	Motion cameras	Rocky Breakaway Hillcrest/ Hillslope Minor Drainage Line	1 vertebrate species 1 native mammal	Threatened: Northern quoll (*Dasyurus hallucatus*)	
29	Biologic (2021p)	Project: Warrawoona Gold Project: 2021 Significant Species Survey: Northern Quoll Client: Calidus Resources Survey date: 27 July to 5 August 2021 Survey type: Targeted monitoring survey for northern quoll. Experience: Senior Environmental Scientist (Calidus)	4.3km E	Motion cameras Habitat assessment/ photo monitoring	Rocky Breakaway Hillcrest/ Hillslope Minor Drainage Line	1 vertebrate species 1 native mammal	Threatened: Northern quoll (*Dasyurus hallucatus*)	
30	Biologic (2022g)	Project: Warrawoona Gold Project: 2022 Significant Species Survey: Northern Quoll Client: Calidus Resources Survey date: 19-21 July 2022 Survey type: Targeted monitoring survey for northern quoll. Experience: Senior Zoologists x 2	4.3km E	Motion cameras Habitat assessment/ photo monitoring	Rocky Breakaway Hillcrest/ Hillslope Minor Drainage Line	1 vertebrate species 1 native mammal	Threatened: Northern quoll (*Dasyurus hallucatus*)	
31	Biologic (2023l)	Project: Warrawoona Gold Project: 2023 Significant Species Survey: Northern Quoll Client: Calidus Resources Survey date: 25-27 July 2023 Survey type: Targeted monitoring survey for northern quoll. Experience: Senior Zoologist	4.3km E	Motion cameras Habitat assessment/ photo monitoring	Rocky Breakaway Hillcrest/ Hillslope Minor Drainage Line	1 vertebrate species 1 native mammal	Threatened: Northern quoll (*Dasyurus hallucatus*)	
32	Outback Ecology (2014b)	Project: McPhee Creek haul road project terrestrial vertebrate fauna survey Client: Atlas Survey date: Phase 1: 26 June to 9 July 2013 Phase 2: 14-24 March 2014 Survey type: 2 phase detailed terrestrial vertebrate fauna survey Experience:	9.5 km S	Systematic sampling Active searching Targeted trapping – pitfall, funnel, Elliott, cage Motion sensitive cameras Bat echolocation recording Nocturnal surveys Avifauna census Opportunistic observations Secondary evidence	Rocky Ridge and Gorge Drainage Line Granite Outcrop Spinifex Stony Plain Riverine	215 vertebrate species 33 native mammals 6 introduced mammals 94 birds 73 reptiles 8 amphibians 1 fish	Threatened: Ghost bat (*Macroderma gigas*) Northern quoll (*Dasyurus hallucatus*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*) Bilby (*Macrotis lagotis*) Pilbara olive python (*Liasis olivaceus* subsp. *barroni*) Priority: Western pebble-mound mouse (*Pseudomys chapmani*)	

Reference Number	Reference	Survey details	Proximity to Study Area	Survey methods	Significant species habitat	Vertebrate fauna assemblage found (summary of species richness)	Significant species	Survey limitations/ notes
		Principal Environmental Scientist Senior Environmental Scientists x 2 Environmental Scientists x 7					Spectacled hare-wallaby (*Lagorchestes conspicillatus leichardti*) Brush-tailed mulgara (*Dasycercus blythi*) *Anilios ganei* *Ctenotus uber johnstonei*	
33	Biologic (2019d)	Project: Mt Webber DSO Project: Northern quoll survey 2018. Client: Atlas Survey date: 17 July to 22 August 2018 Survey type: Annual monitoring program for northern quoll. Experience: Senior Zoologist Zoologist	25.5km WSW	Habitat assessment and photo monitoring Motion sensor cameras Opportunistic observations Secondary evidence Spot pattern analysis	Rocky Ridge Gorge Isolated hilltop Granite outcrop Drainage Line	1 vertebrate species 1 native mammal	Threatened: Northern quoll (*Dasyurus hallucatus*)	
34	Biologic (2019e)	Project: Mt Webber DSO Project: Pilbara leaf-nosed bat and ghost bat monitoring survey 2018. Client: Atlas Survey date: 9-19 July 2018 Survey type: Annual monitoring program for Pilbara leaf-nosed bats and ghost bats. Experience: Senior Zoologist Zoologist	25.5km WSW	Habitat assessment and photo monitoring Bat echolocation recorders Scat sheets Opportunistic observations Secondary evidence	Cave in Rocky Ridge and Gorge habitat	2 vertebrate species 2 native mammals	Threatened: Ghost bat (*Macroderma gigas*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*)	
35	Biologic (2020g)	Project: Mt Webber artificial bat roost monitoring Year 1: October 2018 to October 2019. Client: Atlas Survey date: 4 October 2018 to 28 September 2019 Survey type: Annual monitoring program for Mt Webber artificial roosts. Experience: Senior Zoologist Zoologist	25.5km WSW	Bat echolocation recorders Microclimate recorders	Artificial roosts created within waste rock dump sites within mine area	2 vertebrate species 2 native mammals	Threatened: Ghost bat (*Macroderma gigas*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*)	
36	Biologic (2020h)	Project: Mt Webber DSO Project: Northern quoll survey 2019 Client: Atlas Survey date: 25 July to 27 September 2019 Survey type: Annual monitoring program for northern quoll. Experience: Senior Zoologist Zoologist	25.5km WSW	Habitat assessment and photo monitoring Motion sensor cameras Opportunistic observations Secondary evidence Spot pattern analysis	Rocky Ridge and Gorge Isolated hilltop Granite Outcrop Drainage Line	1 vertebrate species 1 native mammal	Threatened: Northern quoll (*Dasyurus hallucatus*)	
37	Biologic (2020i)	Project:	25.5km WSW	Habitat assessment and photo monitoring	Caves in Rocky Ridge and Gorge habitat	2 vertebrate species 2 native mammals	Threatened: Ghost bat (*Macroderma gigas*)	

Reference Number	Reference	Survey details	Proximity to Study Area	Survey methods	Significant species habitat	Vertebrate fauna assemblage found (summary of species richness)	Significant species	Survey limitations/ notes
		Mt Webber DSO Project: Pilbara leaf-nosed bat and ghost bat monitoring survey 2019. Client: Atlas Survey date: 25-28 July 2019 Survey type: Annual monitoring program for Pilbara leaf-nosed bats and ghost bats. Experience: Senior Zoologist Zoologist		Bat echolocation recorders Scat sheets Opportunistic observations Secondary evidence			Pilbara leaf-nosed bat (*Rhinonicteris aurantia*)	
38	Biologic (2021i)	Project: Mt Webber artificial bat roost monitoring Year 2: October 2019 to October 2020. Client: Atlas Survey date: 29 September 2019 – 18 September 2020 Survey type: Annual monitoring program for Mt Webber artificial roosts. Experience: Senior Zoologist Zoologist	25.5km WSW	Bat echolocation recorders Microclimate recorders	Artificial roosts created within waste rock dump sites within mine area	2 vertebrate species 2 native mammals	Threatened: Ghost bat (*Macroderma gigas*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*)	
39	Biologic (2021j)	Project: Mt Webber DSO Project: Northern quoll survey 2020 Client: Atlas Survey date: 18-30 June 2020 Survey type: Annual monitoring program for northern quoll. Experience: Senior Zoologist Zoologist	25.5km WSW	Habitat assessment and photo monitoring Motion sensor cameras Opportunistic observations Secondary evidence Spot pattern analysis	Rocky Ridge and Gorge Isolated hilltop Granite Outcrop Drainage Line	1 vertebrate species 1 native mammal	Threatened: Northern quoll (*Dasyurus hallucatus*)	
40	Biologic (2021k)	Project: Mt Webber DSO Project: Pilbara leaf-nosed bat and ghost bat monitoring survey 2020. Client: Atlas Survey date: 18-30 June 2020 Survey type: Annual monitoring program for Pilbara leaf-nosed bats and ghost bats. Experience: Senior Zoologist Zoologist	25.5km WSW	Habitat assessment and photo monitoring Bat echolocation recorders Scat sheets Opportunistic observations Secondary evidence	Caves in Rocky Ridge and Gorge habitat	2 vertebrate species 2 native mammals	Threatened: Ghost bat (*Macroderma gigas*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*)	
41	Biologic (2022a)	Project: Mt Webber artificial bat roost monitoring Year 3: October 2020 to October 2021. Client: Atlas Survey date: 19 September 2020 – 30 September 2021 Survey type:	25.5km WSW	Bat echolocation recorders Microclimate recorders	Artificial roosts created within waste rock dump sites within mine area	2 vertebrate species 2 native mammals	Threatened: Ghost bat (*Macroderma gigas*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*)	

Reference Number	Reference	Survey details	Proximity to Study Area	Survey methods	Significant species habitat	Vertebrate fauna assemblage found (summary of species richness)	Significant species	Survey limitations/ notes
		Annual monitoring program for Mt Webber artificial roosts. Experience:						
42	Biologic (2022b)	Project: Mt Webber DSO Project: Northern quoll survey 2021 Client: Atlas Survey date: 31 May to 3 June 2021 Survey type: Annual monitoring program for northern quoll. Experience: Zoologists x 2	25.5km WSW	Habitat assessment and photo monitoring Motion sensor cameras Opportunistic observations Secondary evidence Spot pattern analysis	Rocky Ridge and Gorge Isolated hilltop Granite Outcrop Drainage Line	1 vertebrate species 1 native mammal	Threatened: Northern quoll (*Dasyurus hallucatus*)	
43	Biologic (2022c)	Project: Mt Webber DSO Project: Pilbara leaf-nosed bat and ghost bat monitoring survey 2021. Client: Atlas Survey date: 31 May to 4 June 2021 Survey type: Annual monitoring program for Pilbara leaf-nosed bats and ghost bats. Experience: Zoologists x 2	25.5km WSW	Habitat assessment and photo monitoring Bat echolocation recorders Scat sheets Opportunistic observations Secondary evidence	Caves in Rocky Ridge and Gorge habitat	2 vertebrate species 2 native mammals	Threatened: Ghost bat (*Macroderma gigas*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*)	
44	Biologic (2023e)	Project: Mt Webber artificial bat roost monitoring Year 4: October 2021 to October 2022. Client: Atlas Survey date: 1 October 2021 to 30 September 2022 Survey type: Annual monitoring program for Mt Webber artificial roosts. Experience:	25.5km WSW	Bat echolocation recorders Microclimate recorders	Artificial roosts created within waste rock dump sites within mine area	2 vertebrate species 2 native mammals	Threatened: Ghost bat (*Macroderma gigas*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*)	
45	Biologic (2023f)	Project: Mt Webber DSO Project: Northern quoll survey 2022 Client: Atlas Survey date: 26-28 July 2022 Survey type: Annual monitoring program for northern quoll. Experience: Zoologists x 2	25.5km WSW	Habitat assessment and photo monitoring Motion sensor cameras Opportunistic observations Secondary evidence Spot pattern analysis	Rocky Ridge and Gorge Isolated hilltop Granite Outcrop Drainage Line	1 vertebrate species 1 native mammal	Threatened: Northern quoll (*Dasyurus hallucatus*)	
46	Biologic (2023g)	Project: Mt Webber DSO Project: Pilbara leaf-nosed bat and ghost bat monitoring survey 2022. Client: Atlas Survey date: 25-28 July 2022 Survey type: Annual monitoring program for Pilbara leaf-nosed bats and ghost bats.	25.5km WSW	Habitat assessment and photo monitoring Bat echolocation recorders Scat sheets Opportunistic observations Secondary evidence	Caves in Rocky Ridge and Gorge habitat	2 vertebrate species 2 native mammals	Threatened: Ghost bat (*Macroderma gigas*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*)	

Reference Number	Reference	Survey details	Proximity to Study Area	Survey methods	Significant species habitat	Vertebrate fauna assemblage found (summary of species richness)	Significant species	Survey limitations/ notes
		Experience: Zoologists x 2						
47	Ecologia (2010)	Project: Giralia Resources NL Mount Webber Iron Ore Project Vertebrate Fauna Assessment Client: Giralia Resources NL Survey date: 9-20 April 2010 Additional Northern Quoll targeted survey June 2010 Survey type: Detailed fauna survey Experience: Principal Ecologist Herpetologist Ornithologist	25.5km WSW	Active searching Targeted trapping – pitfall, funnel, Elliott, cage Bat echolocation recording Avifauna census Nocturnal survey Opportunistic observations Secondary evidence	Spinifex plains and slopes Rocky breakaways Rivers and creeklines	85 vertebrate species 15 native mammals 1 introduced mammals 35 birds 34 reptiles 4 amphibians Targeted Survey June 3 mammals 2 birds	Threatened: Northern quoll (*Dasyurus hallucatus*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*) Priority: Western pebble-mound mouse (*Pseudomys chapmani*)	
48	MWH (2014e)	Project: Mt Webber DSO Project: Northern quoll monitoring program 2014. Client: Atlas Survey date: 24 June to 5 July 2014 Survey type: Targeted monitoring for northern quoll. Experience: Zoologists x 2	25.5km WSW	Habitat assessment and photo monitoring Elliot (large) trapping Motion sensor cameras Targeted searches Opportunistic observations Secondary evidence	Rocky Ridgeline Gorge Hilltop	3 vertebrate species 5 native mammals 1 introduced mammals 3 birds 1 reptiles	Threatened: Northern quoll (*Dasyurus hallucatus*) Priority: Western pebble-mound mouse (*Pseudomys chapmani*) Other significant: Peregrine falcon (*Falco peregrinus*)	
49	MWH (2014f)	Project: Mt Webber DSO Project: Pilbara leaf-nosed bat and ghost bat monitoring program 2014. Client: Atlas Survey date: 24 June to 5 July 2014 Survey type: Targeted monitoring for Pilbara leaf-nosed bats and ghost bats. Experience: Zoologists x 2	25.5km WSW	Habitat assessment and photo monitoring Bat echolocation recorders Opportunistic observations Secondary evidence	Rocky Ridge and Gorge Drainage Line Stony Plain	2 vertebrate species 2 native mammals	Threatened: Ghost bat (*Macroderma gigas*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*)	
50	MWH (2015)	Project: Mt Webber DSO Project: Pilbara leaf-nosed bat and ghost bat monitoring program 2015. Client: Atlas Survey date: 22 July to 3 August 2015 Survey type: Targeted monitoring for Pilbara leaf-nosed bats and ghost bats. Experience: Zoologists	25.5km WSW	Habitat assessment and photo monitoring Bat echolocation recorders Opportunistic observations Secondary evidence	Caves in Rocky Ridge and Gorge habitat	2 vertebrate species 2 native mammals	Threatened: Ghost bat (*Macroderma gigas*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*)	

Reference Number	Reference	Survey details	Proximity to Study Area	Survey methods	Significant species habitat	Vertebrate fauna assemblage found (summary of species richness)	Significant species	Survey limitations/ notes
51	MWH (2016b)	Project: Mt Webber DSO Project: Northern quoll monitoring program 2016. Client: Atlas Survey date: 9 July to 17 August 2016 Survey type: Targeted monitoring for northern quoll. Experience: Zoologists x 3 Ecologist	25.5km WSW	Habitat assessment and photo monitoring Motion sensor cameras Opportunistic observations Secondary evidence	Rocky Ridge and Gorge Isolated hilltop Granite Outcrop Drainage Line	1 vertebrate species 1 native mammal	Threatened: Northern quoll (*Dasyurus hallucatus*)	
52	MWH (2016c)	Project: Mt Webber DSO Project: Pilbara leaf-nosed bat and ghost bat monitoring program 2016. Client: Atlas Survey date: 1 -10 July 2016 Survey type: Annual monitoring program for Pilbara leaf-nosed bats and ghost bats. Experience: Zoologists x 3 Ecologist	25.5km WSW	Habitat assessment and photo monitoring Bat echolocation recorders Opportunistic observations Secondary evidence	Caves in Rocky Ridge and Gorge habitat	2 vertebrate species 2 native mammals	Threatened: Ghost bat (*Macroderma gigas*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*)	
53	Outback Ecology (2013c)	Project: Mt Webber DSO Project terrestrial vertebrate fauna impact assessment. Client: Atlas Survey dates: 22-24 March 2010 9-20 April 20120 24 Sept – 4 October 2010 13-23 October 2010 1-7 March 2012 Survey type: Reconnaissance, multi-phase level 2 vertebrate fauna survey, targeted survey. Experience: Principal Environmental Scientist Senior Environmental Scientist Environmental Scientists x 6	25.5km WSW	Systematic sampling Active searching Targeted trapping – pitfall, funnel, Elliott, cage Motion sensitive cameras Bat echolocation recording Nocturnal surveys Avifauna census Opportunistic observations Secondary evidence	Rocky Ridge and Gorge Spinifex Sandplain Riverine Drainage Line Granite Outcrop	155 vertebrate species 20 native mammals 2 introduced mammals 68 birds 59 reptiles 6 amphibians	Threatened: Ghost bat (*Macroderma gigas*) Northern quoll (*Dasyurus hallucatus*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*) Pilbara olive python (*Liasis olivaceus* subsp. *barroni*) Priority: Western pebble-mound mouse (*Pseudomys chapmani*) *Anilios ganei*	
54	Outback Ecology (2013d)	Project: Mt Webber DSO Project: Pre-clearance fauna inspection assessment. Client: Atlas Survey date: 19-21 June 2013 Survey type: Targeted survey for northern quoll and Pilbara olive python. Experience: Environmental Scientists x 2	25.5km WSW	Habitat assessments Targeted searches Opportunistic observation Secondary evidence	Rocky Ridge and Gorge	1 vertebrate species 1 native mammal	Threatened: Northern quoll (*Dasyurus hallucatus*)	

Reference Number	Reference	Survey details	Proximity to Study Area	Survey methods	Significant species habitat	Vertebrate fauna assemblage found (summary of species richness)	Significant species	Survey limitations/ notes
55	Stantec (2017)	Project: Mt Webber Project: Pilbara leaf-nosed bat and ghost bat monitoring survey 2017. Client: Atlas Survey date: 22 -31 July 2017 Survey type: Annual monitoring program for Pilbara leaf-nosed bats and ghost bats. Experience: Zoologists x 3	25.5km WSW	Habitat assessment and photo monitoring Bat echolocation recorders Opportunistic observations Secondary evidence	Caves in Rocky Ridge and Gorge habitat	2 vertebrate species 2 native mammals	Threatened: Ghost bat (*Macroderma gigas*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*)	
56	Stantec (2018b)	Project: Mt Webber Project: Northern quoll monitoring survey 2017. Client: Atlas Survey date: 22 July to 31 August 2017 Survey type: Targeted monitoring for northern quoll. Experience: Zoologists x 3	25.5km WSW	Habitat assessment and photo monitoring Motion sensor cameras Opportunistic observations Secondary evidence	Rocky Ridge and Gorge Isolated hilltop Granite Outcrop Drainage Line	1 vertebrate species 1 native mammal	Threatened: Northern quoll (*Dasyurus hallucatus*)	
57	Outback Ecology (2013b)	Project: McPhee Creek iron ore project targeted Pilbara leaf-nosed bat survey. Client: Atlas Survey date: 30 April to 11 May 2012 Survey type: Targeted Pilbara leaf-nosed bat survey Experience: Principal Environmental Scientist Senior Environmental Scientist Environmental Scientists x 3	26 km ESE	Bat detectors Opportunistic observations Secondary evidence Targeted searching	Gorge/ Gully Rocky Outcrop Drainage Line Caves Abandoned mine sites	2 vertebrate species 2 native mammals	Threatened: Ghost bat (*Macroderma gigas*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*)	
58	Bat Call (2016)	Project: MW-AN-27 PLNB roost census July 2016 Client: Atlas Survey date: 1 July 2016 Survey type: Census of Pilbara leaf-nosed bats at MW-AN-27 Experience: Bat Specialist Zoologists	30km WSW	High definition video monitoring Bat echolocation recording	Cave in Rocky Ridge and Gorge habitat	1 vertebrate species 1 native mammal	Threatened: Pilbara leaf-nosed bat (*Rhinonicteris aurantia*)	
59	Outback Ecology (2012c)	Project: Mt Webber DSO Project: Exploration track clearance bat monitoring. Client: Atlas Survey date: 3 March, 2012 Survey type:	30km WSW	Sound and vibration monitoring Observation	Rocky Ridge and Gorge Drainage Line	2 vertebrate species 2 native mammals	No significant species recorded	

Reference Number	Reference	Survey details	Proximity to Study Area	Survey methods	Significant species habitat	Vertebrate fauna assemblage found (summary of species richness)	Significant species	Survey limitations/ notes
		Targeted survey for effect of sound and vibration on Pilbara leaf-nosed bat and ghost bat. Experience: Environmental Scientists x 2						
60	Biologic (2021e)	Project: McPhee Creek consolidated terrestrial vertebrate fauna report. Client: Atlas Survey date: 31 March – 8 April 2020 15-25 June 2020 25-30 August 2020 26 March to 1 April 2021 Survey type: Targeted Vertebrate Fauna Survey. Experience: Senior Zoologist x 2 Zoologist	42km ESE	Habitat assessments Cave assessments Water feature assessments Bat recorders Acoustic recorders Camera traps Targeted searches Nocturnal searches Opportunistic observation Secondary evidence	Gorge/ Gully Breakaway/ Cliff Hillcrest/ Hillslope Drainage Line Spinifex Sandplain Spinifex Stony Plain	44 vertebrate species 6 native mammals 3 introduced mammals 33 birds 1 reptile 1 amphibian	Threatened: Ghost bat (*Macroderma gigas*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*) Northern quoll (*Dasyurus hallucatus*) Pilbara olive python (*Liasis olivaceus barroni*)	
61	Biologic (2021f)	Project: McPhee Creek Project: Targeted Pilbara leaf-nosed bat survey. Client: Roy Hill and Atlas Iron Survey date: 26 March to 1 April 2021 Survey type: Targeted Vertebrate Fauna Survey. Experience: Senior Zoologist Zoologist Principal Chiroptologist	42km ESE	Targeted searches Bat detectors Cave assessments Opportunistic observations Secondary evidence	Caves Water features Drainage Line Gorge/ Gully Hillcrest/ Hillslope Rocky Foothill Breakaway/ Cliff Spinifex Stony Plain Calcrete Plain	5 vertebrate species 4 native mammals 1 reptile	Threatened: Ghost bat (*Macroderma gigas*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*) Northern quoll (*Dasyurus hallucatus*) Pilbara olive python (*Liasis olivaceus barroni*) Priority: Western pebble-mound mouse (*Pseudomys chapmani*)	
62	Biologic (2023a)	Project: McPhee Creek: northern quoll monitoring 2023. Client: HanRoy Iron Ore Projects Survey date: 15-25 May 2023 Survey type: Targeted Monitoring Vertebrate Fauna Survey. Experience: Senior Zoologist x 2 Zoologist x 2	42km ESE	Habitat assessments/ photo monitoring Targeted searches Camera traps Opportunistic observation Secondary evidence	Drainage Line Gorge/ Gully Breakaway/ Cliff	1 vertebrate species 1 native mammal	Threatened: Northern quoll (*Dasyurus hallucatus*)	
63	Biologic (2023b)	Project: McPhee Creek: Pilbara leaf-nosed bat and ghost bat monitoring 2023. Client: HanRoy Iron Ore Projects Survey date: 15-25 May 2023 Survey type: Targeted Monitoring Vertebrate Fauna Survey. Experience: Senior Zoologist x 2 Zoologist x 2	42km ESE	Habitat assessments/ photo monitoring Scat sheets Bat detectors Cave assessments Opportunistic observations Secondary evidence Microclimate monitoring	Caves in Rocky Ridge and Gorge and Breakaway/ Cliff habitats	2 vertebrate species 2 native mammals	Threatened: Ghost bat (*Macroderma gigas*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*)	Partial data loss due to technical issues with bat recording equipment.
64	Biologic (2024a)	Project:	42km ESE	Active searches	Drainage Line	1 vertebrate species	Priority:	

Reference Number	Reference	Survey details	Proximity to Study Area	Survey methods	Significant species habitat	Vertebrate fauna assemblage found (summary of species richness)	Significant species	Survey limitations/ notes
		McPhee Creek: Active Searches. Client: HanRoy Iron Ore Projects Survey date: 15-25 May 2023 Survey type: Targeted Vertebrate Fauna Survey. Experience: Senior Zoologist x 2 Zoologist x 2			Gorge/ Gully Breakaway/ Cliff Rocky Foothill Low Hills and Slopes Spinifex Stony Plain Spinifex Sandy Plain	1 native mammal	Western pebble-mound mouse (*Pseudomys chapmani*)	
65	MWH (2014a)	Project: McPhee Creek 2014 bilby monitoring survey. Client: Atlas Survey date: 15-22 July 2014 Survey type: Targeted monitoring for greater bilby. Experience: Principal Zoologist Zoologist	42km ESE	Habitat Assessment/ photo monitoring Camera traps Targeted searches Opportunistic observations Secondary evidence	Spinifex Sandplain	1 vertebrate species 1 native mammal	Threatened: Bilby (*Macrotis lagotis*)	
66	MWH (2014b)	Project: McPhee Creek 2014 Northern Quoll Monitoring Survey. Client: Atlas Survey date: 15-22 July 2014 Survey type: Targeted monitoring for northern quoll. Experience: Principal Zoologist Zoologist	42km ESE	Trapping (Elliot and cage) Camera traps Targeted searches Opportunistic observations Secondary evidence Habitat assessments/ photo monitoring	Rocky Ridge Rocky Outcrop Major Drainage Sandstone Gorge	1 vertebrate species 1 native mammal	Threatened: Northern quoll (*Dasyurus hallucatus*)	
67	MWH (2014c)	Project: McPhee Creek mine and rail project: Pilbara leaf-nosed bat and ghost bat monitoring 2014. Client: Atlas Survey date: 15-25 July 2014 Survey type: Targeted monitoring for Pilbara leaf-nosed bats and ghost bats. Experience: Principal Zoologist Zoologist	42km ESE	Site Assessments/ photo monitoring Ultrasonic recorders Opportunistic observations Secondary evidence	Water feature in Sandstone Gorge Abandoned mine adit Cave	2 vertebrate species 2 native mammals	Threatened: Ghost bat (*Macroderma gigas*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*)	
68	MWH (2014d)	Project: McPhee Creek Mine and Rail Project: Terrestrial Vertebrate Fauna Survey. Client: Atlas Survey date: 23 May to 3 June 2014 Survey type: Level 2 Detailed Vertebrate Fauna Baseline Survey. Experience: Principal Environmental Scientist	42km ESE	Habitat Assessment/ photo monitoring Systematic sampling Trapping Camera traps Targeted searches Opportunistic observations Secondary evidence Avifauna census Spotlighting	Spinifex Sandplain Drainage Line Riverine Granite Outcrop Rocky Ridge and Gorge	126 vertebrate species 22 native mammals 5 introduced mammals 60 birds 36 reptiles 3 amphibians	Threatened: Northern quoll (*Dasyurus hallucatus*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*) Bilby (*Macrotis lagotis*) Priority: Western pebble-mound mouse (*Pseudomys chapmani*)	

Reference Number	Reference	Survey details	Proximity to Study Area	Survey methods	Significant species habitat	Vertebrate fauna assemblage found (summary of species richness)	Significant species	Survey limitations/ notes
		Environmental Scientists x 3						
69	Outback Ecology (2012a)	Project: McPhee Creek Iron Ore Project: Northern Quoll Baseline Monitoring. Client: Atlas Survey date: 5-15 August 2012 Survey type: Baseline monitoring for northern quoll. Experience: Senior Environmental Scientists x 2 Environmental Scientists x 2	42km ESE	Trapping (Elliot and cage) Camera traps Targeted searches Opportunistic observations Secondary evidence	Rocky Ridge and Gorge Ironstone Ridgetop Spinifex and Stony Plain Channel Iron Deposit Sandstone Ridgetop	3 vertebrate species 3 native mammals	Threatened: Pilbara leaf-nosed bat (*Rhinonicteris aurantia*) Northern quoll (*Dasyurus hallucatus*) Priority: Western pebble-mound mouse (*Pseudomys chapmani*)	Partial limitation in previous knowledge of northern quoll in Pilbara.
70	Outback Ecology (2012b)	Project: McPhee Creek Project terrestrial vertebrate fauna baseline survey Client: Atlas Survey date: Phase 1: September 2011 Phase 2: March 2012 Survey type: 2 phase detailed terrestrial vertebrate fauna survey Experience: Principal Environmental Scientist Senior Environmental Scientists x 2 Environmental Scientists x 2 Zoologists x 4	42 km ESE	Systematic sampling Active searching Targeted trapping – pitfall, funnel, Elliott, cage Motion sensitive cameras Bat echolocation recording Nocturnal surveys Avifauna census Opportunistic observations Secondary evidence	Rocky Ridge and Gorge Drainage Line Granite Outcrop Spinifex Stony Plain Channel Iron Deposit	165 vertebrate species 25 native mammals 5 introduced mammals 72 birds 60 reptiles 3 amphibians	Threatened: Ghost bat (*Macroderma gigas*) Northern quoll (*Dasyurus hallucatus*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*) Bilby (*Macrotis lagotis*) Priority: Western pebble-mound mouse (*Pseudomys chapmani*) Long-tailed dunnart (*Antechinomys longicaudatus*)	
71	Outback Ecology (2014c)	Project: McPhee Creek iron ore project targeted bilby survey. Client: Atlas Survey date: 18-23 March 2013 26 June to 4 July 2013 12 to 15 August 2013 Survey type: Targeted bilby survey Experience: Principal Environmental Scientist Senior Environmental Scientist Environmental Scientists x 3	42 km ESE	Habitat assessments Targeted searches Motion sensor cameras Opportunistic observations	Spinifex Stony Plain Sand Plain	4 vertebrate species 2 native mammals 2 birds	Threatened: Bilby (*Macrotis lagotis*) Priority: Western pebble-mound mouse (*Pseudomys chapmani*)	
72	Biologic (2020d)	Project: Miralga Creek DSO Project: Ghost Bat Monitoring 2020 Client: Atlas Survey date: 13-23 August 2020 Survey type: Targeted baseline survey for ghost bats. Experience: Senior Zoologist Zoologist	42.5 km NNW	Site Assessments/ photo monitoring Ultrasonic recorders Scat Sheets Opportunistic observations Secondary evidence Micro climate recording Census counts	Caves / overhangs	2 vertebrate species 2 native mammals	Threatened: Ghost bat (*Macroderma gigas*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*)	
73	Biologic (2020e)	Project:	42.5 km NNW	Habitat assessments/ photo monitoring	Hillcrest/ Hillslope	1 vertebrate species	Threatened:	One Control Site had no detections

Reference Number	Reference	Survey details	Proximity to Study Area	Survey methods	Significant species habitat	Vertebrate fauna assemblage found (summary of species richness)	Significant species	Survey limitations/ notes
		Miralga Creek DSO Project: Northern Quoll Monitoring 2020 Client: Atlas Survey date: 13-23 August 2020 Survey type: Targeted baseline survey for northern quoll. Experience: Senior Zoologist Zoologist		Targeted northern quoll camera transects	Major Drainage Line Low Stony Hills Medium Drainage Line	1 native mammal	Northern quoll (*Dasyurus hallucatus*)	of northern quoll therefore a new location for control site should be considered for future monitoring.
74	Biologic (2020f)	Project: Miralga Creek Project: Level 2 vertebrate fauna and short-range endemic fauna assessment Client: Atlas Survey date: 9-20 May 2019 11-21 July 2019 Survey type: Two-season Level 2 vertebrate and short-range endemic invertebrate fauna survey. Experience: Senior Zoologist x5 Zoologist Ecologist	42.5 km NNW	Habitat Assessments Systematic sampling Targeted searching Targeted trapping – pitfall, funnel, Elliott, cage Targeted northern quoll trapping Targeted northern quoll camera transects Motion sensitive cameras Bat echolocation recording Acoustic recorders Nocturnal surveys Avifauna census Opportunistic observations Secondary evidence	Gorge/ Gully Hillcrest/ Hillslope Major Drainage Line	154 vertebrate species 24 native mammals 4 introduced mammals 84 birds 39 reptiles 3 amphibians	Threatened: Ghost bat (*Macroderma gigas*) Northern quoll (*Dasyurus hallucatus*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*) Grey falcon (*Falco hypoleucos*) Priority: Western pebble-mound mouse (*Pseudomys chapmani*) Other significant: Peregrine falcon (*Falco peregrinus*)	
75	Biologic (2021g)	Project: Miralga Creek DSO Project: Ghost Bat Monitoring 2021 Client: Atlas Survey date: 11-23 August 2021 Survey type: Targeted monitoring survey for ghost bats. Experience: Senior Zoologist Zoologist	42.5 km NNW	Site Assessments/ photo monitoring Ultrasonic recorders Scat Sheets Opportunistic observations Secondary evidence Micro climate recording Census counts	Caves / overhangs	2 vertebrate species 2 native mammals	Threatened: Ghost bat (*Macroderma gigas*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*)	
76	Biologic (2021h)	Project: Miralga Creek DSO Project: Northern Quoll Monitoring 2021 Client: Atlas Survey date: 11-23 August 2021 Survey type: Targeted monitoring survey for northern quoll. Experience: Senior Zoologist Zoologist	42.5 km NNW	Habitat assessments/ photo monitoring Targeted northern quoll camera transects	Hillcrest/ Hillslope Major Drainage Line Low Stony Hills Medium Drainage Line	1 vertebrate species 1 native mammal	Threatened: Northern quoll (*Dasyurus hallucatus*)	
77	Biologic (2023c)	Project: Miralga Creek DSO Project: Ghost Bat Monitoring 2022 Client: Atlas Survey date: 2-12 August 2022 Survey type: Targeted monitoring survey for northern quoll.	42.5 km NNW	Site Assessments/ photo monitoring Ultrasonic recorders Scat Sheets Opportunistic observations Secondary evidence Micro climate recording Census counts	Caves / overhangs	2 vertebrate species 2 native mammals	Threatened: Ghost bat (*Macroderma gigas*) Pilbara leaf-nosed bat (*Rhinonicteris aurantia*)	

Reference Number	Reference	Survey details	Proximity to Study Area	Survey methods	Significant species habitat	Vertebrate fauna assemblage found (summary of species richness)	Significant species	Survey limitations/ notes
		Experience: Senior Zoologist Zoologist x 3						
78	Biologic (2023d)	Project: Miralga Creek DSO Project: Northern Quoll Monitoring 2022 Client: Atlas Survey date: 2-12 August 2022 Survey type: Targeted monitoring survey for northern quoll. Experience: Senior Zoologist Zoologist x 3	42.5 km NNW	Habitat assessments/ photo monitoring Targeted northern quoll camera transects	Hillcrest/ Hillslope Major Drainage Line Low Stony Hills Medium Drainage Line	1 vertebrate species 1 native mammal	Threatened: Northern quoll (*Dasyurus hallucatus*)	

Appendix B: Habitat Features within the Vicinity of the Study Area - Caves

Cave ID	Latitude	Longitude	Habitat type	Category (GB)	Category (PLNB)	Significant species previously recorded
Within Study Area						
CO-CA-01[1]	-21.4200	119.6738	Rocky Ridge and Gorge	Category 2 (Diurnal Roost)	Category 1 (Permanent Diurnal Roost)	PLNB GB
CO-CA-02	-21.4602	119.6702	Ironstone Ridgetop	Potential Category 4 (Nocturnal Roost)	Category 3 (Transitory roost)	-
CO-CA-03[1]	-21.4678	119.6711	Rocky Ridge and Gorge	Category 2 (Diurnal Roost)	Category 2 (Non-permanent Breeding Roost)	PLNB GB POP
CO-CA-04	-21.4739	119.6683	Rocky Ridge and Gorge	Potential Category 4 (Nocturnal Roost)	Category 3 (Transitory roost)	PLNB
CO-CA-05[1]	-21.4247	119.6742	Rocky Ridge and Gorge	Category 2 (Diurnal Roost)	Category 3 (Transitory Diurnal Roost)	PLNB GB
CO-CA-06	-21.3749	119.685	Rocky Ridge and Gorge	Category 4 (Nocturnal Roost)	Category 4 (Nocturnal Refuge)	PLNB GB
CO-CA-07	-21.4180	119.682	Rocky Ridge and Gorge	Potential Category 4 (Nocturnal Roost)	-	PLNB
CO-CA-08	-21.4200	119.6805	Rocky Ridge and Gorge	Category 4 (Nocturnal Roost)	-	GB
CO-CA-09	-21.4182	119.6741	Ironstone Ridgetop	Potential Category 4 (Nocturnal Roost)	-	PLNB
CO-CA-10[1]	-21.4187	119.6755	Rocky Ridge and Gorge	Category 4 (Nocturnal Roost)	Category 4 (Nocturnal Refuge)	PLNB
CO-CA-11	-21.4895	119.6638	Rocky Ridge and Gorge	Potential Category 4 (Nocturnal Roost)	-	PLNB

Cave ID	Latitude	Longitude	Habitat type	Category (GB)	Category (PLNB)	Significant species previously recorded
CO-CA-12	-21.4520	119.6661	Rocky Ridge and Gorge	Potential Category 4 (Nocturnal Roost)	-	PLNB
CO-CA-13	-21.4602	119.6732	Rocky Ridge and Gorge	Potential Category 4 (Nocturnal Roost)	-	PLNB
CO-CA-15	-21.4238	119.6811	Ironstone Ridgetop	Category 4 (Nocturnal Roost)	-	PLNB GB
CO-CA-16	-21.4340	119.6794	Ironstone Ridgetop	Potential Category 4 (Nocturnal Roost)	-	PLNB
CO-CA-17	-21.4174	119.6764	Rocky Ridge and Gorge	Category 4 (Nocturnal Roost)	-	PLNB GB
CO-CA-19	-21.4109	119.6743	Rocky Ridge and Gorge	-	-	-
CO-CA-20[1]	-21.3971	119.6559	Rocky Ridge and Gorge	Category 3 (Diurnal Roost)	Category 4 (Nocturnal Refuge)	PLNB GB
CO-CA-21	-21.4164	119.6625	Rocky Ridge and Gorge	Category 3 (Diurnal Roost)	Category 4 (Nocturnal Refuge)	PLNB GB
CO-CA-22[1]	-21.3921	119.6524	Rocky Ridge and Gorge	Category 3 (Diurnal Roost)	Category 4 (Nocturnal Refuge)	PLNB GB
CO-CA-23	-21.3964	119.654	Rocky Ridge and Gorge	Category 4 (Nocturnal Roost, potential Diurnal Roost)	Category 4 (Nocturnal Refuge)	PLNB GB
CO-CA-24[1]	-21.3966	119.6539	Rocky Ridge and Gorge	Category 2 (Diurnal Roost, potential Maternity Roost)	Category 4 (Nocturnal Refuge)	PLNB GB NQ
CO-CA-25[1]	-21.3961	119.6536	Rocky Ridge and Gorge	Category 4 (Nocturnal Roost, potential Diurnal Roost)	Potential Category 4 (Nocturnal Refuge)	GB

Cave ID	Latitude	Longitude	Habitat type	Category (GB)	Category (PLNB)	Significant species previously recorded
CO-CA-26	-21.3957	119.6536	Rocky Ridge and Gorge	Category 4 (Nocturnal Roost)	Category 4 (Nocturnal Refuge)	PLNB GB
CO-CA-27[1]	-21.3945	119.6569	Ironstone Ridgetop	Category 2 (Diurnal Roost)	Category 4 (Nocturnal Refuge)	PLNB GB
CO-CA-28	-21.3949	119.6571	Ironstone Ridgetop	Category 3 (Diurnal Roost)	Category 4 (Nocturnal Refuge)	PLNB GB
CO-CA-29	-21.3949	119.6573	Ironstone Ridgetop	Category 4 (Nocturnal Roost, potential Diurnal Roost)	Category 4 (Nocturnal Refuge)	PLNB GB
CO-CA-30[1]	-21.4032	119.6518	Rocky Ridge and Gorge	Category 3 (Diurnal Roost)	Category 4 (Nocturnal Refuge)	PLNB GB NQ
CO-CA-31	-21.3895	119.6727	Rocky Foothill	Category 3 (Diurnal Roost)	Category 4 (Nocturnal Refuge)	PLNB GB
CO-CA-32	-21.4098	119.642	Rocky Foothill	Category 2 (Diurnal Roost)	Category 4 (Nocturnal Refuge)	PLNB GB
CO-CA-33[1]	-21.5197	119.6611	Rocky Ridge and Gorge	Category 2 (Diurnal Roost, potential Maternity Roost)	Category 4 (Nocturnal Refuge)	PLNB GB NQ
CO-CA-34	-21.3972	119.6552	Rocky Ridge and Gorge	Category 4 (Nocturnal Roost, potential Diurnal Roost)	Potential Category 4 (Nocturnal Refuge)	GB
CO-CA-35	-21.4326	119.6135	Rocky Foothill	Category 2 (Diurnal Roost, potential Maternity Roost)	Category 4 (Nocturnal Refuge)	PLNB GB

Cave ID	Latitude	Longitude	Habitat type	Category (GB)	Category (PLNB)	Significant species previously recorded
CO-CA-36	-21.3809	119.6674	Rocky Foothill	Potential Category 4 (Nocturnal Roost)	Potential Category 4 (Nocturnal Refuge)	-
CO-CA-37	-21.3891	119.6726	Rocky Foothill	Category 4 (Nocturnal Roost)	Potential Category 4 (Nocturnal Refuge)	GB
CO-CA-38	-21.4100	119.6423	Rocky Foothill	Category 4 (Nocturnal Roost)	Potential Category 4 (Nocturnal Refuge)	GB NQ
CO-CA-39	-21.4286	119.6443	Rocky Foothill	Potential Category 4 (Nocturnal Roost)	Potential Category 4 (Nocturnal Refuge)	-
CO-CA-40	-21.4373	119.6500	Rocky Foothill	Category 4 (Nocturnal Roost)	Potential Category 4 (Nocturnal Refuge)	GB
CO-CA-41	-21.5133	119.6585	Stony Rise	Category 4 (Nocturnal Roost)	Potential Category 4 (Nocturnal Refuge)	GB
CO-CA-42	-21.4470	119.6157	Rocky Foothill	Category 2 (Diurnal Roost, potential Maternity Roost)	Potential Category 4 (Nocturnal Refuge)	GB
CO-CA-47	-21.4826	119.6703	Rocky Ridge and Gorge	-	-	-
CO-CA-48	-21.3760	119.6489	Rocky Ridge and Gorge	-	-	-
CO-CA-49	-21.376	119.6450	Rocky Ridge and Gorge	Category 4 (Nocturnal Roost)	-	-
Outside Study Area[2]						
CO-CA-18[1]	-21.3503	119.6162	1.8 km N	Category 4 (Nocturnal Roost, potential Diurnal Roost)	Category 4 (Nocturnal Refuge)	PLNB GB NQ
CO-CA-43	-21.3727	119.6823	75 m W	Potential Category 4 (Nocturnal Roost)	Potential Category 4 (Nocturnal Refuge)	POP
CO-CA-45	-21.3651	119.6485	160 m N	Category 4 (Nocturnal Roost)	-	GB

Cave ID	Latitude	Longitude	Habitat type	Category (GB)	Category (PLNB)	Significant species previously recorded
CO-CA-46	-21.3654	119.6414	140 m N	Category 2 (Diurnal Roost)	-	GB
Lalla Rookh [1]	-21.0509	119.2766	54 km NW	Category 2 (Diurnal Roost)	Category 1 (Permanent Diurnal Roost)	PLNB GB
Mt Webber (MW-CA-02) [1]	-21.4631	119.2303	45 km W	-	Category 1 (Permanent Diurnal Roost)	PLNB GB

PLNB – Pilbara leaf-nosed bat; GB – ghost bat; NQ – northern quoll; POP – Pilbara olive python

[1]Regionally significant caves currently being monitored in accordance with Atlas Sanjiv Ridge SSMP (Atlas Iron, 2023)

[2]Includes all known caves within 12 km of the Study Area and some known caves in the broader Pilbara region. Does not include all caves that may be present within the vicinity of the Study Area

Appendix C: Habitat Features within the Vicinity of the Study Area – Water Features

Water feature ID	Latitude	Longitude	Habitat type	Permanence	Significant species recorded
Within Study Area					
CO-WS-01[1]	-21.4105	119.6872	Drainage Line	Permanent	PLNB NQ POP
CO-WS-02	-21.4952	119.6642	Rocky Ridge and Gorge	Semi -permanent	PLNB
CO-WS-03[1]	-21.3752	119.6858	Rocky Ridge and Gorge	Semi -permanent	PLNB
CO-WS-04	-21.3878	119.6526	Rocky Ridge and Gorge	Temporary	PLNB
CO-WS-05	-21.4669	119.6393	Drainage Line	Semi -permanent	PLNB
CO-WS-06	-21.4057	119.6323	Drainage Line	Semi-permanent	PLNB
CO-WS-07	-21.4906	119.6678	Rocky Ridge and Gorge	Unknown	PLNB
CO-WS-08[1]	-21.4518	119.6509	Rocky Ridge and Gorge	Semi -permanent	PLNB NQ
CO-WS-09	-21.4745	119.6689	Rocky Ridge and Gorge	Semi -permanent	-
CO-WS-10	-21.4164	119.6765	Rocky Ridge and Gorge	Semi -permanent	-
CO-WS-11	-21.4392	119.6775	Ironstone Ridgetop	Semi -permanent	-
CO-WS-12	-21.4197	119.673	Rocky Ridge and Gorge	Permanent	-
CO-WS-13[1]	-21.4666	119.6485	Rocky Ridge and Gorge	Permanent	PLNB
CO-WS-14[1]	-21.4677	119.6712	Rocky Ridge and Gorge	Permanent	-
CO-WS-15	-21.3924	119.64	Rocky Foothill	Semi -permanent	-
CO-WS-16	-21.3875	119.6535	Rocky Ridge and Gorge	Permanent	PLNB NQ
CO-WS-17	-21.4193	119.6679	Ironstone Ridgetop	Permanent	-
CO-WS-18	-21.4192	119.6678	Ironstone Ridgetop	Permanent	-
CO-WS-19	-21.3843	119.6592	Drainage Line	Permanent	-
CO-WS-20	-21.3903	119.619	Stony Rise	Potentially permanent	-
CO-WS-29	-21.3775	119.616	Stony Rise	Likely semi-permanent	-
CO-WS-30	-21.3925	119.6245	Stony Rise	Likely semi-permanent	-

Water feature ID	Latitude	Longitude	Habitat type	Permanence	Significant species recorded
CO-WS-31	-21.4068	119.6339	Rocky Foothill	Likely semi-permanent	-
CO-WS-32	-21.4082	119.6348	Drainage Line	Likely semi-permanent	-
CO-WS-33	-21.4246	119.6531	Stony Rise	Potentially permanent	-
CO-WS-34	-21.4237	119.6554	Rocky Foothill	Likely semi-permanent	-
CO-WS-35	-21.4061	119.6603	Stony Rise	Likely semi-permanent	-
CO-WS-36	-21.398	119.6612	Rocky Ridge and Gorge	Likely semi-permanent	-
CO-WS-37	-21.3957	119.6616	Rocky Ridge and Gorge	Likely semi-permanent	-
CO-WS-38	-21.3943	119.6617	Rocky Ridge and Gorge	Potentially permanent	-
CO-WS-39	-21.3941	119.6612	Rocky Ridge and Gorge	Likely semi-permanent	-
CO-WS-40	-21.3895	119.6622	Rocky Foothill	Potentially permanent	-
CO-WS-41	-21.3833	119.6585	Rocky Foothill	Likely semi-permanent	-
CO-WS-42	-21.3825	119.6587	Drainage Line	Likely semi-permanent	-
CO-WS-43	-21.3814	119.6593	Drainage Line	Likely semi-permanent	-
CO-WS-44	-21.3716	119.647	Rocky Ridge and Gorge	Likely semi-permanent	-
CO-WS-45	-21.3717	119.6469	Rocky Ridge and Gorge	Likely semi-permanent	-
CO-WS-46	-21.3938	119.646	Rocky Ridge and Gorge	Likely semi-permanent	-
CO-WS-47	-21.3949	119.6473	Rocky Ridge and Gorge	Likely semi-permanent	-
CO-WS-48	-21.4068	119.6462	Rocky Foothill	Likely semi-permanent	-
Outside Study Area					
CO-WS-21	-21.2429	119.6866	4.7 km N	Semi-permanent	-
CO-WS-22	-21.3236	119.6431	4.7 km N	Likely semi-permanent	-
CO-WS-23	-21.3288	119.6337	4.2 km N	Likely semi-permanent	-
CO-WS-24	-21.3318	119.621	3.8 km N	Likely semi-permanent	-
CO-WS-25	-21.342	119.6154	2.7 km N	Likely semi-permanent	-
CO-WS-26	-21.3427	119.6129	2.7 km N	Likely semi-permanent	-
CO-WS-27	-21.3497	119.6161	1.9 km N	Potentially permanent	-
CO-WS-28	-21.3629	119.6143	420 m N	Potentially permanent	-

[1]Water features currently being monitored in accordance with Atlas Sanjiv Ridge SSMP and Monitoring Strategy (Atlas Iron, 2023; Biologic, 2020a)